FINAL REPORT

SUBMITTED TO

WYOMING WATER DEVELOPMENT COMMISSION

LEVEL II – ALTA GROUNDWATER SUPPLY STUDY

Prime Consultant:

RENDZVOUS ENGINEERING, P.C.
P.O. Box 4858
25 South Gros Ventre Street
Jackson, Wyoming 83001
307-733-5252

Subconsultant:

HINCKLEY CONSULTING
P.O. Box 452
165 North Fifth
Laramie, Wyoming 82070
307-745-0066

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TABLE OF CONTENTS

I. BACKGROUND / CHRONOLOGY .................................................................1

II. SERVICE AREA ......................................................................................10

III. DEMAND PROJECTIONS .................................................................16

IV. HYDROGEOLOGIC INVESTIGATIONS AND WELL TESTING ...............19

V. IMPROVEMENT ALTERNATIVES AND ESTIMATED COSTS ..............24

VI. FINANCING AND USER FEE ANALYSIS ...........................................35

APPENDIX A – HYDROGEOLOGY AND GROUNDWATER TECHNICAL
Excerpts from Level I Report on Groundwater

APPENDIX B – JULY 17, 2003 LETTER REQUESTING CHANGE TO THE LEVEL II
STUDY PROJECT SCOPE

APPENDIX C – STRATA DATA – GEOPHYSICAL LOGGING

APPENDIX D – WATER LEVEL DATA

APPENDIX E – WATERCAD ANALYSIS AND DATA

APPENDIX F – ALTA PARK WELL TESTING AND COMPLETION INFORMATION

APPENDIX G – TARGHEE TOWNE LEGAL DOCUMENTS -- ORDER TO FORM
DISTRICT, EXPLORATORY WELL NO. 1 AGREEMENT

APPENDIX H – LEAK DETECTION REPORTS, 2002 AND 2004

APPENDIX I – REQUEST FOR ADDITIONAL LEVEL II FUNDING – 2004

APPENDIX J – EXPLORATORY WELL DATA AND INFORMATION

APPENDIX K – SUBDIVISION PLAT MAPS OR RECORD FOR TARGHEE TOWNE
WATER DISTRICT

APPENDIX L – AVAILABLE TARGHEE TOWNE WATER RIGHT INFORMATION
TABLES

Table 1  List of Properties within Targhee Towne Water District ......................... 11-12
Table 2  Projected Maximum Day / Peak Hour Use – Targhee Towne W/D ...... 17
Table 3  Proposed Well Pump Information .............................................................. 25
Tables 4- 7  Cost Estimate Tables for Recommended Improvements .............. 27-30
Tables 8  Preliminary System Input Parameters ...................................................... 32
Tables 9  Preliminary System Control Settings ....................................................... 33
Table 10  Preliminary Output Information ................................................................. 34
Table 11  Proposed Funding by System Component ............................................... 36
Table 12  Estimated Operation and Maintenance Costs ....................................... 37
Table 13  Estimated User Costs .............................................................................. 38

FIGURES

Figure 1  Targhee Towne Well Locations ................................................................. 6
Figure 2  Targhee Towne Service Area Map ......................................................... 13
Figure 3  Targhee Towne Area Map ..................................................................... 14
I. BACKGROUND / CHRONOLGY

2001
The Targhee Towne Subdivision homeowners first submitted an application to the Wyoming Water Development Commission in the fall of 2001 to assist in making long overdue upgrades to their water system, which dates to the early 1970’s. (First Filing Plat # 195 filed in April of 1971) The system had at times experienced inadequate water supply and numerous outages at the same time additional homes were being added to the development. As a public community system (System # 5600787) as defined by the EPA under the Safe Drinking Water Act, the Targhee Towne Water System also had a number of recorded violations, mostly related to incomplete monitoring and reporting. The water system itself predates the Wyoming DEQ (and most regulations and standards in Wyoming governing the construction of public water systems), consequently little was known about the details of the system construction and conformance with current health and safety standards. Adding to this problem was the lack of any available engineering plans or specifications related to the system. In addition, the original developers were no longer involved with the subdivision as all lots have been sold to individual landowners.

2002
A Level I study was completed during the summer and fall of 2002 which investigated the existing system in detail and identified a number of deficiencies and issues (Level I – Alta Master Plan, November 2002). The study also projected existing and future water needs for the Targhee Towne Development and the anticipated service area around Targhee Towne. A leak detection study using sensitive listening equipment was also conducted (See Appendix H). Key findings from the Level I are summarized by system component and listed below:

- SUPPLY WELLS: Well No. 1 demonstrated the potential for pumping rates in up to 700 gpm during the summer (June - August) months but had significant sediment issues at the higher rates. Additional pump testing was recommended to help flush out the sediments as this well was completed with a 16 inch steel casing and appeared to have potential sustain flows as high as 500 gpm. Well No. 2 was shown to be directly influenced by pumping in Well No. 1 (located about 40 feet horizontally from Well No. 1) and similarly had sediment issues when Well No.1 was pumped vigorously. (The Well # 2 pump and motor was subsequently replaced following the 2002 pump testing as a result of the sediment generated during the testing.) Well No. 2 was also limited by the 6 inch steel casing and was recommended for low flow duty only.

- DISTRIBUTION SYSTEM: The distribution system was constructed with 6 inch and 4 inch rigid type solvent weld PVC piping with limited number of mainline isolation valves. Little information was available about service connections and other details since there were no known construction drawings for the system. Also, leakage was found to be significant and estimated at over 35,000 gpd on the entire system. A leak detection study was conducted but with the PVC materials and limited number of valves and access points, unable to precisely quantify the amount and specific locations.
Given the age, type of piping, and existing leakage, the Level I report recommended that the entire distribution system be replaced with municipal grade PVC pipe with rubber gasket joints to provide flexibility and allow for temperature expansion.

- **STORAGE / CONTROL SYSTEM:** The lack of elevated storage tank options necessitated the use of a pressurized hydro-pneumatic tank system. However, the existing system had an aging (30 plus years old) buried 6000 gallon steel pressurized tank and a manually operated replacement air pump that allowed for frequent “water logging” conditions. The existing building that housed the tank and controls had a settled floor and poor access to valves located in a lower level pit. The building structure was also in poor condition. The Level I report recommended that this tank be replaced with variable frequency drives on the supply wells and smaller pre-charged bladder type hydro-pneumatic tanks that did not require replacement air. A new control building with a standby generator sized to operate all the supply pumps was also part of the Level I recommendation. Options for gravity or pumped storage were significantly more costly and not selected for this small system.

The Level I Study also recommended that an exploratory well be drilled on the same homeowner association owned Lot 20 A as the two existing Targhee Towne supply wells to supplement supply and provide an additional water source for the growing needs. This site was chosen on the strength of the pump test data for Targhee Towne Well #1, evidence from wells on surrounding properties suggesting that higher rates of groundwater production were unique to this site and logistical advantages due to the proximity to power and existing piping. A budget was developed based upon a target depth of 400 feet and submitted in October for approval to the WWDC and 2003 Wyoming Legislature. The Targhee homeowners submitted a request for funding in accordance with the Level I recommendation.

In mid November of 2002 when additional night time flow measurements were being taken (to verify system leakage estimates), it was discovered that the water level in Targhee Town Well No. 1 had dropped significantly from a summer level of about 125 feet to a depth of 180 feet. This 55 foot water level drop in a period of three months had never been documented previously and presented a new concern for the pumping capacity of the existing wells. Both wells No. 1 and No. 2 relied on perforations at depths from about 140 feet to 185 feet (located at the lower extend of the alluvial/glacial gravels and above the volcanic bedrock) for a large portion of its supply; which zone would be dry based upon November water level reading. This finding prompted the installation of a continuous recording level measuring transducer to better quantify water levels during the late fall and winter months. The results from the water level measurements are discussed in several subsequent technical memorandums (See Appendix A). Data from the measurements which occurred over several years appears in Appendix D.

**2003**

In February of 2003, the Targhee Towne Homeowners Association began efforts to form a Water District as required by the WWDC for Level II funding. It was the intent of the Water District to take over ownership and operational responsibilities of the
water system, thereby making the system eligible for grant and loan funds. The District was formally established in August of 2003. (See attached Order filed on 8-5-03, Appendix G). This order was required prior to the authorization to start work on the Level II project.

The results from the winter time water level measurements and concerns about sediment prompted the Targhee Towne Board of directors to reconsider the Level I recommendation to drill an exploratory well adjacent to Well No. 1. A meeting held on June 26, 2003 (following the 2003 authorization to fund the Level II study) with the Targhee Towne Board of Directors, representatives from the WWDC and project consultants to discuss options. A letter dated July 17, 2003 was subsequently submitted by the project consultants to the WWDC to request changes to the Level II Scope of Work. (See Appendix B) The proposed changes were designed to reallocate funds to allow the drilling of exploratory wells at locations separate form the existing supply wells. In addition, the Task 2 Scope under “Well Siting” was expanded to provide funds to perform additional geo-physical logging of the two existing wells and TV the well bores; perform additional reconnaissance level pump testing on the adjacent wells in the area, perform testing on a well to be drilled for the Alta Park project.

Because of prior commitments and a heavy work load, the geo-physically logging firms contacted were not able to perform the work until September of 2003. Strata-Data of Casper performed the geophysical logging and TV inspection work on the Targhee Towne wells No. 1 and No. 2 from September 10 to the 14, 2003. The preliminary results were viewed with the District Board on September 14, 2003. A detailed summary of the logging and field investigations is attached. (See Appendix C)

During this time, the plan to drill a new well for the Alta Park was postponed until the spring of 2004 -- due to county funding and scheduling issues. Also, it became apparent after looking at well options and the desire of the District Board to use multiple wells for their system that additional funding would be needed. Therefore, a request for additional funding was submitted to the WWDC and 2004 Wyoming State Legislature for additional funding to drill two shallow exploratory wells. (See Appendix I) Additional water level monitoring also took place during this period to help verify that the prior large seasonal fluctuations were representative and is discussed in technical memorandums that appear in Appendix A.

2004
Following the authorization of additional Level II funding in the spring of 2004, a planning meeting was conducted in June of 2004 to discuss project goals and objectives and to report on past findings and results. Efforts to secure test well drilling locations and easements were also presented. Information from the surveillance level pump testing suggested that a well located at the far west extent of the district – taking advantage of what appeared to be the deepest portion of the more permeable alluvial gravel deposits – was suggested. A remnant property created by the Altamont subdivision located east of the State Line Road and a site on the Bob Blair property, also located at the western extent of the district, were suggested candidates for the first well.
Discussions were held with the Teton County Board of Commissioners in February of 2004 to consider use of the Altamont Park area (Lot 28 of the Altamont Subdivision) as a possible drill site. This site was identified as a park area on the approved final plat but was never formally dedicated to Teton County. The commissioners were amenable to use of the site subject to approval from the original sub-divider, Leonard Lewis. However, further research into ownership issues and complications associated with the use of this site made this it less desirable.

Members of the Targhee Board therefore began discussions with Bob Blair who indicated a willingness to participate in providing a well site with limited cost or conditions. A survey map was prepared of the possible sites and after a number of discussions, an easement was secured in September of 2004, which was subsequently recorded in November or 2005, prior to the sale of the land to a new owner. A copy of the final easement is attached which is the site of Test Well # 1. (See Appendices G and J)

Also in the spring of 2004, the Teton County Parks and Recreation department authorized the drilling and testing of the Alta Park Well. A well site on the southern boundary of the water district was selected and therefore had interest for the upcoming groundwater exploration program. The well was intended to provide irrigation water for the new park area and Alta Elementary School. The well was completed to a depth of about 220 feet, however, experienced a deposit of the fine grained ash material that had been seen in a number of the wells in the area. The well completion involved only the alluvial gravel materials as this well was dedicated to use during the irrigation season when groundwater levels were higher. A copy of the well completion for this irrigation well is attached in Appendix F.

Discussions were also initiated with Teton County about the use of portions of the existing county road easement, which ran through the Targhee Towne Subdivision, as possible well drilling sites. Several remnant parcels outside of the main roadway were being considered as well drilling sites. Meetings were held with the County Road Supervisor, County Attorney and County Clerk about this possibility. An arrangement to drill in the right of way, outside of the main road surface area was made which allowed for the drilling of Test Well # 2. A site plan for this well location is attached Appendix J.

Also during the summer of 2004, work was done to investigate known leaks and add isolation valves as an interim measure to keep the water system functional. Local excavation contractor Sutton Excavation was hired to repair leaks and install isolation valves to allow the system to operate on a temporary basis. A copy of the report prepared in conjunction with this effort is attached. The leak detection work also provided additional information about the existing distribution system that supported the recommendation to replace the entire system. This included a make shift solvent weld repair and the finding that there are numerous existing service connections that run to vacant lots that may contribute to the system leakage. Leakage experts were also onsite at the time of the work but were unable to isolate additional leaks. A copy of the leak detection report appears in Appendix H.
With two remote well sites available (Blair property and county road right of way), bids were solicited for the drilling of two exploratory wells. Because of the significant change in seasonal water levels, the well drilling was intentionally let during the fall period. Andrew Well Drilling from Idaho Falls was the low bidder and awarded the project. Attempts were also made to get the well drilling underway in time to have preliminary results so the Level III funding could be secured for 2005. Well permits for the exploratory wells were also completed during this time.

Drilling was started in November of 2004 on Test Well # 1 at the Blair property. This well is discussed in greater detail in the June 27, 2006 memorandum by project geologist Bern Hinckley who was on-site during the majority of the drilling. (See Appendix A) This well failed to develop water from the upper alluvial gravel zone (which was dry at the time of the drilling and testing) and only limited water from the lower volcanic bedrock. Subsequent pump testing indicated that this well had a sustained yield less than 10 gpm with considerable drawdown and was therefore eliminated from future consideration as a supply well.

A second well (Test Well # 2) was started in late November 2004 at south end of the project within a county road right of way remnant. This well is located about 1000 feet west of the Alta Park well drilled by Teton County Parks and Recreation and was chosen due to its separation from the two existing wells, logistical advantages at the south end of the distribution system and potential shown with the Alta Park Well. This well takes water from both alluvial gravels and fractured bedrock and has a yield of about 100 gpm. More details are provided in the 6-27-06 memo. However, because Test Well # 2 provided less than the anticipated demand, a third well was attempted at the location just offset to the south (Lot 20A, Targhee Towne) of the existing Targhee Towne Well # 1 and # 2.

An application was also filed with the Wyoming Water Development Commission in October of 2004 for Level III funding to complete the well connections, install a new generator / control building and purchase the completed wells. A summary status report was prepared to accompany the application and is attached to this report. (See Appendix I) Figure 1 shows the location of all three test wells, two existing wells and key information related to the wells for this system. Additional test well information is provided in Appendix J.

2005

Test Well # 3 was located on Targhee Towne Lot 20A about 120 feet from Targhee Towne Well # 1. This site was chosen based upon the original recommendations relative to potential for encountering higher yields from the fractured bedrock in this area and more recent (summer 2004) information from a successful well drilled to the east in the Alta Meadows subdivision. This well was started in late December and continued into January. Exploratory Well # 3 did not encounter water in the upper alluvial gravel zone but did encounter flows in excess of 250 gpm water from the lower volcanic rock. However, this well encountered significant deposits of volcanic ash sediment within the volcanic rock fracture zones which required a long development time before the well was sufficiently stable to pump reasonably quality water. More information on the well is provided in the 6-27-06 memorandum. The
general success of this well allowed the Water Development Commission and State Legislature to approve Level III grant funding in the amount of $366,000 for the completion of the water system during the 2005 session. However, the Level II funding was contingent upon demonstration of adequate water from the exploratory wells.

The construction of a third exploratory well (only two wells were originally budgeted) and substantial time required for the development of the two exploratory wells (51 hours for Exploratory Well # 3 and 32 hours for Exploratory Well # 2 at $220 per hour) resulted in a depletion of the available funds for the Level II project. Consequently, only limited funds were available for pump testing of the wells under the original contract funding. Testing was completed on Exploratory Well No. 3 (total of 48 hours) however, Exploratory Well No. 2 was only tested for 6 hours due to problems with the measuring equipment. No testing was done under the original contract of Exploratory Well No. 1. Also because of budget limitations, the District installed at their own cost a permanent power service (to be reimbursed under Level III funding) at the Exploratory Well # 2 site to reduce the testing cost and to minimize noise impacts during the testing.

Additional Level II funding was requested from the WWDC to complete the well testing and prepare a Level II report and analysis. Additional funding was available but could only be authorized and released upon the final completion of another WWDC Level II project authorized under the same Legislative appropriation from 2004. The additional funding did not become available until the May of 2006.

During the summer of 2005, an application for a DEQ State Revolving Fund Drinking Water Loan was made to pay for the non-grant portion of the proposed Level III project. A substantial portion of this loan request was for the individual residential water service connections which were not grant eligible under the WWDC program. The SLIB staff reviewing the application required extensive financial information from the recently formed District which resulting in a delay until the December 2005 Board meeting. A loan in the amount of $486,000 was ultimately authorized with final loan documents completed in early 2006.

During October and November of 2005, the representatives from the District noticed excessive noise in the operation of their only active supply well, Targhee Towne Well # 1. A pump contractor was hired to lower the pump, as water levels were at the lowest level experienced in several years, which was thought to be contributing to the noise in the well pump. However, while work was taking place on the submersible pump, the existing pump and motor broke off from the drop pipe due to corroded fitting just above the pump discharge and fell to the bottom of the well. (The pump and motor remain in the well at the time of this report). A new pump and motor was installed by the District at their own cost.

Following this episode, additional water level measurements were made. Although the level of the transducer probe was affected by the submersible pump wiring, water levels as low as 230 feet were recorded during this period. The water level subsequently rose, as experienced in previous years, to levels in the range of 160
feet during the later part of December. See the 6-27-06 memo for more discussion. Additional water level data are included in Appendix D.

2006

Additional funding to complete the Level II Study became available in the spring of 2006. Consequently, a pump test was arranged for Exploratory Well # 2 and Exploratory Well #1 (Exploratory Well # 3 pump testing was completed in early 2005.). The testing verified that Exploratory Well # 2 was capable of flows in excess of 90 gpm and that Exploratory Well # 1 did not have sufficient capacity (less than 10 gpm) to justify its use. The 6-27-06 technical memorandum discusses the pump test results in greater detail.

A contract for Level III engineering services was prepared and discussed during the spring of 2006 with a final version signed by the District Board in May of 2006. During this time, the final technical memorandum (6-27-06 Aquifer / Well Testing Analysis) on the well testing program was prepared and submitted.

In August 2006, several design meetings were held with representatives of the Targhee Towne Water District and the design team. Harmony Design, which was based in Driggs, Idaho and had staff living within the water district were added to the project team to help expedite the completion of plans for the Level III design due to a heavy work load experienced by the prime consultant, Rendezvous Engineering. During the meetings, several key design criteria were established for the Level III construction and are summarized below:

1. The three supply well pumps would be designed to provide basic domestic and irrigation flow needs and not be designed for fire protection. Fire flow, if determined desirable or necessary, would be added at some later date. Total production flow in the range of about 250 to 300 gpm is anticipated for the basic system needs. The wells and piping would be configured to allow increased production in the future with the installation of larger pumps.

2. All wells would be furnished with variable frequency drives (VFD’s) and water level probes to allow maximum flexibility and adjustment of the individual well capacity for different seasons and groundwater conditions. A simple liquid chlorination system or systems would be paced off the flow meters.

3. The transmission system would be designed for long term needs and would be sized as 8 inch mains, to allow for future fire flows. Three hydrants would be located on the system, which would be used as “fill” hydrants to replenish fire tanker trucks rather than provide a direct suction line connection to fire pumper trucks. The lines would be PVC or HDPE depending upon overall costs and installation issues.

4. The control building would be sized for all the required control equipment plus a propane generator. Additional space would be provided for a future UV disinfection system and cartridge filter, which would not be installed as a part of this project. There would be two separate inlet lines for each well (Targhee
Towne Well #1 and Exploratory Well #3) and a third line for a possible future third well. The lines would be sized to allow for future well expansion.

5. Exploratory Well #2 would also be used as a part of the system and would include remote flow meter, liquid chlorinator and be linked to the main controls by means of a non-licensed radio-telemetry controller. All water system components would be located in a below ground vault and away from the actively used road areas.

6. No storage would be provided at this time due to the additional cost for the tank and booster pump station. Also, there are no available sites within the district to provide gravity flow storage. An area would be left on Lot 20 A to allow for modest sized below ground storage tank (80,000 to 120,000 gallons) should this become necessary or desirable in the future.
II. SERVICE AREA

The primary service area is the Targhee Towne Water District which includes the Targhee Towne water system and several surrounding properties currently connected to the existing community water system. There are 70 lots, including a small bed and breakfast, that are a part of the service area, with a total of about 45 active service connections. A future domestic service connection to the Alta Park Well bathroom facility (summer use only) is also proposed to take place in 2007. The service area ranges in elevation from a low of about 6400 feet at the west end to 6460 feet at the Lot 20 A well site on the east side of the subdivision and includes and area (exclusive of the road right of way)of about 44.5 acres. Overall lots in the service area average a little over ½ acre (0.62 aces). All lots within the service area use on-site septic tanks and leach fields for waste water treatment. Table 1 lists the properties within the District based upon the Teton County Geographic Information System.

Adjacent to Targhee Towne are a number of existing subdivisions and meets and bounds tracts with densities in the range of one house per 3 to 5 acres. Also in this area are non-community water systems consisting of the Alta Elementary School, an Episcopal Church and the Teton Teepee lodging facility, all of which rely on individual wells. Figure 2 shows the general area service based upon the Teton County Geographic Information System for lot lines and 2003 digital aerial photography with five-foot contours.

Based upon the available information, there appears to be limited interest in the development of an extensive regional water system at this time. Most homeowners prefer private water wells, even if with additional cost and less supply. Several wells in the area are reported to be in the 600 foot range with yields of less than 10 gpm. Service beyond the current system may have greater appeal once there is a demonstrated public system with adequate water. At the present, the service area is expected to be the Targhee Towne Water District with an allowance for five additional single family lots for future expansion. Future expansions beyond this level would also be possible with the addition of new wells or by upsizing (within the recommended hydrologic limitations) of the existing wells.

City of Driggs

The City of Driggs, Idaho has recently re-developed their spring source located about 6400 feet east of Targhee Towne along Teton Creek. (See Figure 3, SEO Permit 11330, DOP = 6-28-12, 1.0 cfs; and Permit 7265E, DOP = 6-8-99, 1.5 cfs). The spring, which is at an elevation of about 6540, flows by gravity through an 8 inch main to a new 1.0 MG tank located about 2200 feet east of the district at an elevation of about 6480. A new 10 inch main runs from the tank to service areas west of the Idaho-Wyoming State line and the City of Driggs. Although the springs are reported to produce in excess of 600 gpm, the extensive growth occurring in and
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<td>20 ABC</td>
<td>1.34</td>
<td>TARGHEE TOWNE WATER DISTRICT</td>
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Note: M&B = meets and bounds
Lots Served: 70  
Existing Connections: 45  
Total Area: 44.5 ac +/-  

Note: Figures do not include Alta Park

FIGURE 2  
TARGHEE TOWNE SERVICE AREA
around the City of Driggs, Idaho is expected to require this and additional water supply to sustain the new and proposed development. Consequently, this system is not expected to have much potential to serve water users in Wyoming, both due to pressure and supply limitations.

**Alta Community Pipeline**

Also in this area is the Alta Community Pipeline system, which has at its source a small spring located on Forest Service lands about 3.5 miles east of Targhee Towne in Teton Canyon. The spring serves a wide range of properties which extend several miles north of Targhee Towne and west into the State of Idaho. Although most of the lands served are presently used for agricultural purposes, future development would result in a significant increase in use on this relatively small system. Also, no systematic flow data has been made available for this spring. In addition, little is known about the size and conditions of the distribution system, which has been in service for more than 30 years and is believe to be constructed with smaller diameter pipes sized for culinary use only. An estimated 75 to 100 gpm was observed in this spring during a past site inspection performed as a part of the Teton County Master Plan Study during the summer of 1998. The State Engineer’s Office records show permit number 6840 with a date of priority of August 8, 1905 and flow rate of 0.29 cfs (130 gpm) for the Alta Community Pipeline.
III. DEMAND PROJECTIONS

Existing Use

Existing water use is discussed and documented in the Level I Report completed in November of 2002. However, due to deficiencies within the current system, use is restrained to levels less than would be expected for a rural residential development with irrigation demands. In addition, the use within the existing system includes a disproportionate share of leakage, which is expected to be significantly reduced with a new distribution system. Consequently, existing use patterns are not expected to provide much guidance for future system planning.

Projected Use

The future water supply must be capable of supplying, as a minimum, the maximum day flow. This represents the maximum flow expected to occur during the peak summer irrigation season during a 24 hour period. With a suburban subdivision such as Targhee Towne, this maximum day flow is dictated by irrigation use. Even with the addition of water meters (which is a part of the planned improvements), the trend is for increased water use as homes develop more extensive landscaping. Table 2 presents an estimate of the existing and projected flow for the proposed service area based upon unit factors of 850 gpcd for summer and 150 gpcd for winter, which factors have been observed in other similar small subdivisions. An allowance for 5 additional residential future lots has been included in the estimated demands. These estimates assume leakage is significantly reduced with the installation of a new distribution system.

The Targhee Towne water system wells pump directly to the system and without any significant storage must also accommodate instantaneous peak flows. Based upon the observed flows per capita in other similar subdivisions, Table 2 also projects peak hour demands, which will determine ultimate well pump sizes. These figures assume a peaking factor of 3.0 times the maximum day flow for instantaneous peak demands during the summer months and a factor of 5.0 times the maximum day use during the winter months.

The lower peaking factor during the summer months relates to the fact that water use during this period is largely dictated by irrigation use which are typically spread out over several hours and often occur more than one time per day. Also, irrigation often occurs during the early morning hours or late evening hours when other household peak demands are low. As a result, the maximum day use which is measured over 24 hours already includes a large component of irrigation use and is expected to be closer to the peak hour use estimates. These peak hour estimates suggest that the system would be capable to provide on the average about 5.0 gpm for each lot.
## TABLE 2. PROJECTED MAXIMUM DAY / PEAK HOUR USE
TARGHEE TOWNE WATER DISTRICT AND PROJECTED SERVICE AREA FOR SUMMER AND WINTER CONDITIONS

<table>
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<tr>
<th>DESCRIPTION</th>
<th>NUMBER OF LOTS</th>
<th>PERSONS PER LOT</th>
<th>ESTIMATED POPULATION</th>
<th>SUMMER USE</th>
<th>WINTER USE</th>
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<td>GALLONS PER DAY PERSON, GPD</td>
<td>TOTAL DAY USE, GPD</td>
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<td>Residential Lots within Targhee Towne Water District Connected to System</td>
<td>45</td>
<td>3</td>
<td>135</td>
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<td>114,750</td>
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<tr>
<td>SUBTOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>114,750</td>
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<tr>
<td>Future Lots within Targhee Towne Water District</td>
<td>25</td>
<td>3</td>
<td>75</td>
<td>850</td>
<td>63,750</td>
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<tr>
<td>Alta Park Bathroom Facility (No Irrigation)</td>
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<td>Future Lots Outside Targhee Towne Water District</td>
<td>5</td>
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<td>15</td>
<td>850</td>
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<tr>
<td>TOTAL</td>
<td>75</td>
<td></td>
<td>225</td>
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<td>192,750</td>
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</table>

**NOTES:**

1) Assumes new distribution system with minimal leakage
2) Assumes irrigation at rates similar to other developments in the area.
3) Assumes Max day to Peak hour ratio of 3.0:1.0 during summer, 5.0:1.0 during winter
4) Water provided per lot in GPM:
In the winter months, water use is almost entirely determined by inside house fixture units and occupancy. Most of the fixture unit peak uses occur over a short period of time (10 to 20 minutes) and therefore can result in a much lower maximum day use. To compensate for the potential for multiple concurrent uses, a higher peaking factor is used. This analysis results in an estimated average winter demand in the range of 1.6 gpm per lot.

The projections suggest that a future system will need to provide combined flows in the range of 375 to 400 gpm to satisfy peak hour demands at full build-out. More accurate and site specific peak demand data can ultimately be generated for the District with the installation of new flow meters equipped with data loggers to measure use on continuous basis. This data can be collected prior to reaching build-out conditions to allow for more accurate peak demand sizing and modifications to pump sizes to accommodate the needs.

Fire Demand

One and two family residences, as specified by insurance company criteria, typically require fire flows in the range of 1000 gpm. However, flows of this magnitude are often difficult to achieve on smaller systems and with limited equipment and manpower available to respond to a fire, are not often practical for many rural areas. Consequently, fire flows of 500 gpm are often suggested for smaller systems as a more achievable compromise. Flows less than 500 gpm can also be used to fill tanker trucks to shuttle water to areas where there are no municipal hydrants. Special signs noting that fire flows are limited should be posted on fire hydrants use in this manner. Current plans for the Targhee Water District are to install hydrants but to limit their flow to the water available from the supply wells.

As previously discussed, the system is being designed without storage for the following reasons:

1) A storage system would need to be constructed underground due the sensitive aesthetic issues of the area and limitations for a elevated buried tank, adding to the overall cost

2) A storage system would require a separate booster pump station which would also add significantly to the overall cost.

3) Fire fighting capabilities are also constrained in this rural area, limiting the value of a pressure hydrant system at this time.

Space has been reserved at the well site for a future tank. Also eight (8) inch mains are also being installed to allow for future fire supply options.
IV. HYDROGEOLOGY AND WELL CONSTRUCTION

This section references hydrogeology technical memorandums and analyses prepared in conjunction with the Level II study and exploratory well drilling which are attached in Appendix A to this report. Additional information on the geologic setting and background for the area is provided in the November 2002 Level I report.

See APPENDIX A for:

- June 27, 2006: Alta Level II Aquifer / Well Testing Analysis / Well Construction Recommendations
- February 10, 2004: Alta Level II Groundwater Investigations

The following is an excerpt from the Level I report which discusses the geologic setting and provides background on the local geology. See Appendix A for a generalized stratigraphic column applicable to the Targhee Towne area.

EXCERPTS FROM NOVEMBER, 2002 LEVEL I REPORT (See original report for tables and figures)

Hydrogeologic Setting

Stratigraphy. The Targhee Towne subdivision is located on a wedge of sediment transported out of the Teton Mountains along the channel of Teton Creek. Cox (1976) has mapped this material as “glacial-moraine deposits”, overlain along the Wyoming:Idaho border by “alluvium and glacial-outwash deposits”. In the area immediately south of Teton Creek, Pampeyan et al. (1967) have mapped these materials as simply “alluvial fan deposits” and, across the steeper slopes, “colluvium”. At some locations, however, they have identified intermixed deposits of “Morainal deposits - unconsolidated unstratified till composed of heterogeneous mixture of rock types; particles range from clay to large angular boulders”.

Beneath these surficial materials are mapped a sequence of volcanic deposits, termed “rhyolite tuff and flows” by Cox (1976), the “Kirkham Hollow Volcanics - mainly pinkish- to yellowish-gray compact rhyolitic vitric-crystal tuff.” by Pampeyan et al. (1967), and the “Huckleberry Ridge Tuff” by Love et al. (1992). RME (2001) further suggest that this sequence of volcanic and alluvial material includes lake sediments deposited during periodic natural damming of the Teton Creek basin.
The thickness of this volcanic/alluvial blanket is not well-defined and may vary substantially from place to place. Scattered outcrops of the underlying bedrock present on the mountain front east of our study area suggest that at depth beneath the subdivision, one would encounter sandstone, limestone, and shale formations of late-Paleozoic and early-Mesozoic age.

In summary, beneath the general study area is a complex sequence of glacial, alluvial, volcanic and, possibly, lacustrine material, within which groundwater production characteristics is likely to be quite variable.

Figure 5 includes the locations of various water wells, the logs of which were reviewed for this investigation. Most of these logs were completed by local well drillers; the detail and terminology varies widely. With minor exceptions, these logs were compiled from the files of the Wyoming State Engineer’s Office, from the Statements of Completion submitted with water-well permitting documents.

At the two Targhee Towne wells, a change from unconsolidated gravel, clay, sand, and boulders to bedrock materials (“rock”, “rock fractures”, and “hard rock” on one log; “gray limestone”, “gray shale”, and “red shale” on the other) occurs at approximately 180 feet in depth. Similar transitions from descriptions of unconsolidated deposits to bedrock materials are common in the 170 - 250 ft. range for other wells in the area. We interpret the upper unit to be a mixture of:

- glacial deposits: e.g. “boulders laying in clay”, “boulders, clay, gravel”, “clay and sand”, “clay, gravel, boulder”, “clay sand”, “clay gravel”, “blue clay”; and, possibly;

- alluvial fan deposits: e.g. “large boulders”, “sand, gravel, boulders”, “pea gravel and sand”;

- lacustrine deposits: e.g. “Gray clay”, “clay”.

Descriptions of clay-containing units are the most common by far in the upper sections of wells in this area.

The lower unit appears to be an assortment of:

- bedrock: e.g. “gray rock”, “black rock”, “rock”, “fractured rock”, “broken rock”, “shale”, “shale rock”, “broken rock”; and

- volcanic materials: e.g. “lava”, “broken rock, clay seams”, “lava rock”, “rhyolite rock”.

The relative age of these materials requires that the volcanic materials lie above the bedrock units, but no pattern of distribution is apparent. The most common specific rock type described is “shale”; “Limestone” is included on no log other than that for the Targhee Towne No. 1 well.
Structure. No faults have been mapped through the study area. The alluvial deposits likely have a generally westward dip, but the interbedding of lenses, layers and channels of varying lithology almost certainly dominates the areal distribution of permeability. Similarly, the underlying volcanic materials are unlikely to exhibit any areally pervasive layering. Bedrock beneath the volcanics likely dips moderately westward. (Pampeyan et al. (1967) measured dips commonly in the 20-30° range in outcrops south of the study area).

Groundwater Production

Most wells in the study area have permitted yields in the 10-15 gpm range. This means that they are capable of producing at least this much groundwater for time periods generally on the order of at least a few hours. (They may be capable of producing more, but the typical domestic installation is adequately served at the permit-listed rate.) However, the well depths necessary to achieve adequate levels of production vary widely. Table 4 compiles basic information from the Statements of Completion for permitted water wells in the study area. Wells 17, 18, and 19 are virtually side-by-side, for example, yet vary from 120 to 400 feet in depth. Targhee Towne Well No. 1, 307 ft. deep, reports production of over 500 gpm. The next closest well outside the subdivision, No. 10, is 600 ft deep, yet has a permitted yield of only 25 gpm.

For most of the wells in the area, the main water-bearing zone noted during drilling is in the lower unit, i.e. below the unconsolidated glacial and alluvial deposits. Fracturing and “broken” rock are common in drillers’ descriptions of the main water-bearing zones.

Only three of these wells include reported quantitative test data, i.e. measured production over a specified time period, with a measured drawdown. Like the well depths, wide variation in productivity is indicated, with the Targhee Towne (no. 1) and Mohr (no. 4) wells reporting moderate to high specific capacities (production divided by drawdown) and the church well (no. 9) reporting poor production capabilities.

Groundwater Flow

Figure 5 includes groundwater level elevations for the study area. In most cases, these were measured during August and September of 2002, although data for areas further from Targhee Town come from the Statements-of-Completion filed by the well drillers. The groundwater elevation data have been contoured to provide an approximation of the groundwater gradients and flow directions in the area. This contouring is not well constrained by the available groundwater level data in certain areas. Measurements made for this study are fairly consistent for the area from the Targhee Towne wells westward (Well Nos. 1 - 9). Contouring eastward is suggested...
based on extension of this groundwater table surface and its general correspondence with local maximum reported groundwater level elevations.

Groundwater flow is from east to west beneath the study area, reflecting recharge at the toe of the mountain front and from local irrigation and natural discharge to springs and streams further west, in Idaho. The horizontal groundwater gradient is approximately 174 ft. per mile (a gradient of 0.033). RME (2001) used a gradient of 0.022 based on more generalized mapping of groundwater levels by Kilburn, 1964.

The groundwater table is well below the elevation of Teton Creek, making the creek a potentially significant source of recharge through the study area and precluding groundwater development from locally depleting streamflow. (Streamflow infiltration is unlikely to increase due to additional, local groundwater development.)

Large seasonal fluctuations in groundwater level are demonstrated by serial measurements of water levels in the Targhee Towne wells and are suggested by the variations in completion-report water levels (measured at different times of year). The depth-to-water initially reported upon completion of Well No. 1 (12/17/71) was 113 ft. The 1999 Statement-of-Completion for Well No. 2 (no date listed) reports a depth-to-water of 150 ft. At the time of testing for this study (7/31/02) the depth-to-water in both wells was 125 ft., but was measured at 165 ft. in association with pump work done 10/14/02. In response to this surprising drop in water level, a continuous monitor has been installed in Well No. 1 to collect detailed information over the 2002/2003 winter period. As of 11/20/02, the non-pumping water level was at a depth of 180.5 ft.

At this level, the majority of the perforated intervals in both Well No. 1 and No. 2 are above the water table. The impact of the reduced saturated thickness of the aquifer on its performance could be an important issue, although indications from the pump test (discussed below) suggest that the majority of groundwater production was from deeper zones.

In addition to seasonal variations in groundwater levels, there is evidence of substantial vertical gradients. The depth to groundwater at Well No. 11 was reported as 190 feet upon completion of the well in November 1992 and was measured for the present study at 188 feet in August 2002. This was one of the first wells drilled in the Table Rock Subdivision. The similarity in water levels suggests no large decline in area groundwater levels with increased development over the last decade, and, more specifically, that the water level observed in August 2002 was reflective of natural conditions rather than being temporarily depressed due to pumping. (The water level also appeared to be stable at the time of measurement, rather than recovering measurably from recent pumping.) Our contouring of the regional groundwater table, based on other wells in the wider area, suggests a groundwater elevation some 60 feet higher than was measured at Well No. 11. This, and the 130-ft. variation in groundwater elevations suggested by the 5 wells in this subdivision (Nos. 10 - 14), may perhaps best be explained by vertical groundwater gradients. Under this scenario, higher strata may have substantially
higher static water levels, but may not be sufficiently productive to yield adequate water for well development. Thus, wells drilled to sufficient depth to produce adequately have encountered progressively lower static water levels. The Table Rock Subdivision well data and Well No. 7 appear to show some tendency in this regard.

Thus, the surface represented by Figure 5 may be more useful in defining general flow directions and gradients than in predicting groundwater elevations at a particular spot and date. For the same reason, water-supply wells drilled in this area should penetrate 150 feet or more of saturated aquifer to ensure sufficient water production during times of depressed water tables.
V. IMPROVEMENT RECOMMENDATIONS AND ESTIMATED COSTS

The recommended improvements are presented for the three main water system components. Costs are also presented based upon concept level designs and information from the well testing program. It should be noted that the supply wells are assumed to have a summer (high groundwater) capacity and a winter (low groundwater) capacity as a result of changing groundwater conditions common to the area.

Supply Wells

As discussed in the hydrogeology section, three wells are proposed to be a part of the permanent supply system. The seasonal water levels, recommended pumps, horsepower and capacities are summarized in Table 3 for both winter and summer conditions. All three wells would be furnished with variable frequency drives to allow wells to maintain a constant pressure under varying demand conditions and allow for adjustments with the changing water levels. A WaterCAD computer model has been prepared for both summer and winter conditions for use in determining the specific head conditions for the wells and submersible pumps. A summary of the results from the modeling is presented in Appendix E.

Total connected horsepower is estimated to be in the range of 55 hp with a maximum combined capacity of about 500 gpm during the summer months. The maximum capacity during the winter months is expected to be in the range of about 300 gpm. The wells would be completed with weld on type pitless adaptors given that flows are anticipated to be less than 200 gpm at each location.

Each well would be equipped with the appropriate piping and valves to insure that a given well could be isolated and pumped to waste while the other wells can remain in operation. This is a DEQ requirement but is especially important in this situation given that volcanic ash sediments have been observed in all most all wells drilled in this area and have been a problem on the two existing wells. Periodic flushing by pumping to waste at maximum rates is the recommended method to control and manage the sediments common to these formations.

Also, existing Targhee Towne Well No. 2 will be abandoned with the new system. This well has a low production rate (less than 70 gpm), sediment issues and a 6 inch casing which limit its value in the overall system operation. The well casing will remain as it can serve as a monitoring well for the area.

Control Building

A single story control building is proposed at the south end of Lot 20A. The building would house electrical controls, chlorinator, generator, operator station while
### TABLE 3. PROPOSED WELL PUMP INFORMATION

<table>
<thead>
<tr>
<th>WELL</th>
<th>GROUND ELEVATION</th>
<th>PRODUCTION CASING, IN</th>
<th>SUMMER</th>
<th>WINTER</th>
<th>PUMP SETTING, FT</th>
<th>SUMMER</th>
<th>WINTER</th>
<th>CONCEPT PUMP MODEL</th>
<th>PUMP CAPACITY (MAX) GPM</th>
<th>HORSE POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targhee Towne Well # 1</td>
<td>6460</td>
<td>16</td>
<td>125</td>
<td>195</td>
<td>240</td>
<td>7.0</td>
<td>2.0</td>
<td>6 CEL - 120</td>
<td>135</td>
<td>15</td>
</tr>
<tr>
<td>Exploratory Well # 2</td>
<td>6420</td>
<td>8</td>
<td>90</td>
<td>140</td>
<td>170</td>
<td>2.5</td>
<td>1.5</td>
<td>6 CEL - 120</td>
<td>130</td>
<td>15</td>
</tr>
<tr>
<td>Exploratory Well # 3</td>
<td>6460</td>
<td>8</td>
<td>125</td>
<td>195</td>
<td>300</td>
<td>2.0</td>
<td>2.0</td>
<td>6 CEL - 120</td>
<td>135</td>
<td>15</td>
</tr>
</tbody>
</table>

**NOTES:**

1) Pump setting for Exploratory Well # 3 is below casing but within competent bedrock
2) Concept Pump Models based upon information provided by Goulds Pumps
3) A pump shroud will be required for Targhee Towne Well # 1 to induce cooling flow past the submersible motor.
4) Pump models revised from preliminary to allow use of same pump equipment in each well.
providing room to add a UV disinfection system and cartridge filter in the future. Preliminary sizing calls for a single story 18 foot by 26 foot building. Piping would be arranged to allow independent pump to waste from the two wells to be used in the final with separate flow meters. Inlet pipe would be oversized to allow for future expansion and the addition of a third well at this location. Preliminary sizing for the two connected wells is based upon 15 hp submersible pumps with 460 VAC three phase motors, each with capacities in the range of 85 to 100 gpm. With a total of 30 hp and related electrical demands, a generator size in the range of about 60 KW is projected. A buried propane tank would be provided as the primary fuel source for the generator. A 36 to 48 hour run time would be provided to allow for longer power outages that are possible in this location.

The building would also be equipped with a non-licensed radio telemetry system that would control the operation of the remotely located Exploratory Well # 2. This remote well along with the two on-site wells would turn on and off based upon demands and maintaining a set operating pressure. Different well operation sequences are anticipated for winter and summer operations.

**Transmission / Distribution System**

The entire transmission / distribution system will be replaced as a part of this project to eliminate problems associated with the existing solvent weld PVC piping. The piping would be eight (8)\(^1\) inch AWWA C-900 PVC with gasket joints or AWWA C-906 HDPE with fused joints. All piping will be buried to a minimum depth of 7 feet to prevent freezing. To help minimize conflicts with the existing system, the new transmission line would be located on the opposite side of the road from the current line and out of the gravel surface area to the extent possible. Three fire hydrants are also proposed which would initially be used as fill hydrants to supplement tanker trucks as previously discussed. The main lines would be sufficiently sized to allow the hydrants to be converted to regular fire pumper truck connection hydrants at some future time with the addition of additional well supply or booster pump capacity.

Also as a part of this effort, the service lines to the lots will be replaced and meters installed. These items, which are specific to the distribution of water to individual users rather than the supply and transmission of water to the overall system, are not eligible for WWDC grant funding. The District is also planning to use Ford Meter Box PVC meter pits for cold climates to allow the meters to be installed outside of the existing residences. The meters (Sensus) will be equipped with radio readout capability to simplify data collection and individual meter reading and billing.

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\(^1\) A short section of 10 inch piping was shown in the original estimate for the development but has been changed to 8 inch, which is adequate to serve the anticipated needs.
### TABLE 4. TARGHEE TOWNE WATER DISTRICT / CAPITAL COST SUMMARY

<table>
<thead>
<tr>
<th>Description</th>
<th>TOTAL</th>
<th>WWDC ELIGIBLE</th>
<th>WWDC GRANT</th>
<th>WWDC LOAN</th>
<th>DEQ SRF LOAN</th>
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</thead>
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<tr>
<td>WATER SUPPLY WELLS - LEVEL II PAYBACK (@ 50%)</td>
<td>$42,465</td>
<td>$42,465</td>
<td></td>
<td>$42,465</td>
<td></td>
</tr>
<tr>
<td>WATER SUPPLY WELLS - LEVEL III CONSTRUCTION</td>
<td>$114,080</td>
<td>$114,080</td>
<td>$57,040</td>
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<td>$57,040</td>
</tr>
<tr>
<td>CONTROL BUILDING / VAULTS / WELL CONNECTIONS</td>
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<td>$362,200</td>
<td>$181,100</td>
<td></td>
<td>$181,100</td>
</tr>
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<td>TRANSMISSION LINES</td>
<td>$256,020</td>
<td>$256,020</td>
<td>$128,010</td>
<td></td>
<td>$128,010</td>
</tr>
<tr>
<td>METERS / SERVICES</td>
<td>$119,100</td>
<td>0</td>
<td>0</td>
<td></td>
<td>$119,100</td>
</tr>
<tr>
<td>TOTAL CONSTRUCTION</td>
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<td>$774,765</td>
<td>$366,150</td>
<td>$42,465</td>
<td>$485,250</td>
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<tr>
<td>TOTALS ROUNDED</td>
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<td>$775,000</td>
<td>$366,000</td>
<td>$42,000</td>
<td>$486,000</td>
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</table>

PERCENT OF TOTAL

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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0%</td>
<td>86.7%</td>
<td>40.9%</td>
<td>4.7%</td>
<td>54.4%</td>
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</tbody>
</table>

Note: Rounded totals used in final financing and estimates.
## TABLE 5. COST ESTIMATES FOR WATER SUPPLY WELLS

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<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
<th>EST QTY</th>
<th>UNIT</th>
<th>ESTIMATED UNIT COST</th>
<th>TOTAL COST</th>
<th>LEVEL II PAYBACK, 50%</th>
<th>LEVEL III COST</th>
<th>REMARKS</th>
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<tbody>
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<td>Mobilization</td>
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<td>LS $3,000</td>
<td>$3,000</td>
<td>$1,500</td>
<td>New Well # 3, Existing site, Level II costs, Target Yield - 200 gpm, Level II cost</td>
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<tr>
<td>2</td>
<td>14&quot; Surface Casing</td>
<td>20</td>
<td>LF $75</td>
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<td>$750</td>
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<td></td>
<td></td>
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<td>cu ft $30</td>
<td>$300</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
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<td>LF $55</td>
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<td>$11,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10&quot; Nominal Steel Casing</td>
<td>250</td>
<td>LF $32</td>
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<td>$4,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10&quot; Drive Shoe</td>
<td>1</td>
<td>EA $650</td>
<td>$650</td>
<td>$325</td>
<td>Well # 3 construction, Level III cost</td>
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<tr>
<td>7</td>
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<td>$8,000</td>
<td>$4,000</td>
<td>WWDC costs</td>
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<td></td>
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<tr>
<td>8</td>
<td>Well Development</td>
<td>24</td>
<td>HR $220</td>
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<td>$2,640</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
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<td>LS $3,000</td>
<td>$3,000</td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
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<td>12</td>
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<td>LS $10,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td>Well # 3 construction, Level III cost</td>
<td></td>
<td></td>
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<td>13</td>
<td>Electrical Cable</td>
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<td>LS $1,200</td>
<td>$1,200</td>
<td>$1,200</td>
<td>Well # 4, County ROW, 100 gpm target yield, Level II cost</td>
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<td></td>
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<tr>
<td>14</td>
<td>Pilotless Unit</td>
<td>1</td>
<td>LS $7,500</td>
<td>$7,500</td>
<td>$7,500</td>
<td>WWDC costs</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>Miscellaneous fittings</td>
<td>1</td>
<td>LS $2,500</td>
<td>$2,500</td>
<td>$2,500</td>
<td>Well # 4 construction, Level III cost</td>
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<tr>
<td>16</td>
<td>Drop Pipe, 4 inch</td>
<td>200</td>
<td>LF $20</td>
<td>$4,000</td>
<td>$4,000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Well # 3 Completion</td>
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<td>$24,365</td>
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<td>$3,000</td>
<td>$1,500</td>
<td>New Well # 4, County ROW, 100 gpm target yield, Level II cost</td>
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<td>20</td>
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<td>400</td>
<td>LF $36</td>
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<td>$7,200</td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>8&quot; Nominal Steel Casing</td>
<td>250</td>
<td>LF $20</td>
<td>$5,000</td>
<td>$2,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>8&quot; Drive Shoe</td>
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<td>EA $400</td>
<td>$400</td>
<td>$200</td>
<td></td>
<td></td>
<td></td>
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<td>23</td>
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<td>$6,500</td>
<td>$3,250</td>
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<td></td>
<td></td>
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<tr>
<td>24</td>
<td>Well Development</td>
<td>24</td>
<td>HR $220</td>
<td>$5,280</td>
<td>$2,640</td>
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<tr>
<td>25</td>
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<td>$3,000</td>
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<tr>
<td>26</td>
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<td>HR $85</td>
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<td>Water Quality Testing</td>
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<td>$3,000</td>
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<td></td>
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<tr>
<td>28</td>
<td>Pump / Motor Well # 4</td>
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<td>$7,500</td>
<td>Well # 4 construction, Level III cost</td>
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<td>29</td>
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<td>$1,200</td>
<td>$1,200</td>
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<td>30</td>
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<tr>
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<td>LF $17</td>
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<td>$2,640</td>
<td>2005 work</td>
<td></td>
<td></td>
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<td>$10,000</td>
<td>$10,000</td>
<td>Upgrade to Well #1, New pump and drop pipe to provide 200 gpm, 30 hp, Level III Work</td>
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<td>Electrical Cable</td>
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<td>LS $1,200</td>
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<td>$1,200</td>
<td></td>
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<td></td>
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<td>1</td>
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<td></td>
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<tr>
<td>37</td>
<td>Miscellaneous Fittings</td>
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<td>LS $2,500</td>
<td>$2,500</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Drop Pipe, 4 inch</td>
<td>200</td>
<td>LF $20</td>
<td>$4,000</td>
<td>$4,000</td>
<td></td>
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<td>Well # 1 Upgrade</td>
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<td>$31,480</td>
<td>$31,480</td>
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<tr>
<td></td>
<td>TOTAL CONSTRUCTION</td>
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<td>Water Rights, all wells</td>
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<td>Easements Allowance</td>
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<td>Final Esements</td>
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<td>41</td>
<td>Legal Allowance</td>
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<td>$1,500</td>
<td>Review documents</td>
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<td>Engineering, Design</td>
<td>10.0%</td>
<td></td>
<td>$18,700</td>
<td>$7,800</td>
<td>Design, bidding</td>
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<td></td>
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<tr>
<td>43</td>
<td>Construction Phase</td>
<td>10.0%</td>
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<td>$18,700</td>
<td>$7,800</td>
<td>Survey layout, periodic inspection, QA/ QC</td>
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<td>44</td>
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<td>$28,000</td>
<td>$11,700</td>
<td>Per WWDC</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Engineering, Permitting, Administration, Contingency</td>
<td></td>
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<td>$73,900</td>
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<td>TOTAL PROJECT ESTIMATE</td>
<td></td>
<td></td>
<td>$261,350</td>
<td>$42,465</td>
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<td>ACTUAL COST</td>
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### TABLE 6. COST ESTIMATES FOR CONTROLS /FLOW METERS / BUILDING / UNDERGROUND VAULTS

<table>
<thead>
<tr>
<th>NO.</th>
<th>ITEM</th>
<th>EST. QUANTITY</th>
<th>UNIT</th>
<th>ESTIMATED UNIT COST</th>
<th>TOTAL</th>
<th>REMARKS</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>1</td>
<td>LS</td>
<td>$ 3,000</td>
<td>$ 3,000</td>
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</tr>
<tr>
<td>2</td>
<td>Piping</td>
<td>1</td>
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<tr>
<td>3</td>
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<tr>
<td>4</td>
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<td>SQ FT</td>
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<tr>
<td>12</td>
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<td>Well # 1 Sub-Total</td>
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<td>Piping, Fittings</td>
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<td>16</td>
<td>Flow Meter</td>
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<td>LS</td>
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<td>Controls</td>
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<tr>
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<tr>
<td>20</td>
<td>Vault</td>
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<td>LS</td>
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<td>$ 8,000</td>
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<tr>
<td>21</td>
<td>Pressure Tanks</td>
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<td>$ 1,000</td>
<td>$ -</td>
<td></td>
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<tr>
<td>22</td>
<td>Power Service</td>
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<td>LS</td>
<td>$ 3,500</td>
<td>$ 3,500</td>
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<td>23</td>
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<td>LS</td>
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<td>$ 2,500</td>
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</tr>
<tr>
<td></td>
<td>Well # 3 Sub-Total</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>Mobilization</td>
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</tr>
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<td>27</td>
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<tr>
<td>28</td>
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<tr>
<td></td>
<td>Well # 4 Sub-Total</td>
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<td>TOTAL CONSTRUCTION</td>
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<td></td>
<td>Teton County Building</td>
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<td>Permitting Allowance</td>
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<td>Easements</td>
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<td></td>
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<td></td>
<td>Review documents</td>
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<td>36</td>
<td>Legal Allowance</td>
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<td></td>
<td>$ 1,000</td>
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<td></td>
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<tr>
<td>37</td>
<td>Engineering, Design</td>
<td>10.0%</td>
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<td>$ 26,600</td>
<td></td>
<td>Survey layout, periodic</td>
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<td></td>
<td></td>
<td></td>
<td>inspection, QA QC</td>
</tr>
<tr>
<td>38</td>
<td>Construction Phase</td>
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<td></td>
<td>$ 26,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Contingencies</td>
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<td></td>
<td>$ 40,000</td>
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<td>Per WWDC</td>
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<tr>
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<td>$ 96,700</td>
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<tr>
<td></td>
<td>TOTAL PROJECT ESTIMATE</td>
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<td>$ 362,200</td>
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<td>NO.</td>
<td>ITEM</td>
<td>EST. QUANTITY</td>
<td>UNIT</td>
<td>ESTIMATED UNIT COST</td>
<td>TOTAL</td>
<td>WWDC ELIGIBLE</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>---------------</td>
<td>------</td>
<td>---------------------</td>
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<tr>
<td>1</td>
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<td>1</td>
<td>LS</td>
<td>$ 5,000</td>
<td>$ 5,000</td>
<td>$ 5,000</td>
</tr>
<tr>
<td>2</td>
<td>Class 150 PVC, 10 inch</td>
<td>640</td>
<td>LF</td>
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<td>$ 17,920</td>
<td>$ 17,920</td>
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<tr>
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<td>$ 2,200</td>
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<tr>
<td>4</td>
<td>Valves, 10 inch</td>
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<td>EA</td>
<td>$ 1,000</td>
<td>$ 2,000</td>
<td>$ 2,000</td>
</tr>
<tr>
<td>5</td>
<td>Class 150 PVC, 8 inch</td>
<td>5300</td>
<td>LF</td>
<td>$ 23</td>
<td>$ 121,900</td>
<td>$ 121,900</td>
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<tr>
<td>6</td>
<td>Fittings, 8 inch</td>
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<td>EA</td>
<td>$ 400</td>
<td>$ 4,400</td>
<td>$ 4,400</td>
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<tr>
<td>7</td>
<td>Valves, 8 inch</td>
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<td>EA</td>
<td>$ 850</td>
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<td>$ 5,100</td>
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<td>$ 63,000</td>
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<td>Services, Vacant Lots</td>
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<td>EA</td>
<td>$ 400</td>
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<td>$ 14,000</td>
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<td>Site/ Road Restoration</td>
<td>5000</td>
<td>LF</td>
<td>$ 5</td>
<td>$ 25,000</td>
<td>$ 25,000</td>
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<td>Fire Hydrants</td>
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<td>EA</td>
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<td>$ 11,200</td>
<td>$ 11,200</td>
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<tr>
<td></td>
<td>TOTAL CONSTRUCTION</td>
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<td></td>
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<td>$ 183,520</td>
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<td>17</td>
<td>Special Permitting</td>
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<td>$ 2,500</td>
<td>$ 2,500</td>
</tr>
<tr>
<td>18</td>
<td>Easements</td>
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<td>$ 3,000</td>
<td>$ 3,000</td>
<td>$ 3,000</td>
</tr>
<tr>
<td>20</td>
<td>Engineering, Design, Permitting</td>
<td>10.0%</td>
<td></td>
<td>$ 27,200</td>
<td>$ 18,400</td>
<td>$ 8,800</td>
</tr>
<tr>
<td>21</td>
<td>Construction Phase</td>
<td>10.0%</td>
<td></td>
<td>$ 27,200</td>
<td>$ 18,400</td>
<td>$ 8,800</td>
</tr>
<tr>
<td>22</td>
<td>Contingencies</td>
<td>15.0%</td>
<td></td>
<td>$ 41,000</td>
<td>$ 27,700</td>
<td>$ 13,300</td>
</tr>
<tr>
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<td>Engineering, Permitting, Administration, Contingency</td>
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<td></td>
<td>$ 103,400</td>
<td>$ 72,500</td>
<td>$ 30,900</td>
</tr>
<tr>
<td></td>
<td>TOTAL PROJECT ESTIMATE</td>
<td></td>
<td></td>
<td>$ 375,120</td>
<td>$ 256,020</td>
<td>$ 119,100</td>
</tr>
</tbody>
</table>
The new service lines would be polyethylene (PE) and connect from the main to
meter pit and from the meter pit to the existing service lines, which vary in type and
size. A minimum service size of 1 inch IPS (Class 160 psi PE) is proposed.

**Capital Cost Estimates**

Tables 4 through 7 present capital cost estimates for the recommended
improvements based upon the use of three independent wells, two at the current site
and one remote location. These estimates were also the basis for funding
applications with the WWDC and State Loan and Investment Board Safe Drinking
Water Revolving Loan Fund program.

All cost estimates include allowances for special permitting where required,
engineering design and construction administration along with allowances for
easements and legal costs. A 15 percent contingency factor has also been added
given that all costs are based upon concept level designs that are likely to change as
more detailed designs are completed.

**System Operation**

The well controls are anticipated to be based upon system pressure measured at the
main control building and flow measured on each well at the main control building
and the Exploratory Well # 2 site. The first (lead) well would turn on when the
pressure drops. Additional (lag 1 and lag 2) wells would be added as the combined
measured flow, based upon flow meters from three locations, increased. The wells
would be shut down in reverse order as the flow decreased and after minimum run
times were achieved. The controls would also allow alternation of the lead, lag 1 and
lag 2 positions or specific wells to be locked in a given position.

In addition, each well would monitor groundwater level conditions and modulate flow
to maintain a minimum level over the submersible pump setting to avoid pumping at
rates that would exceed the seasonal capacities of the wells. The VFD for a given
wells would then switch control to maintain a specified water level above the
submersible pump.

A programmable controller is anticipated that would allow set points to be modified
to meet specific conditions and allow adjustments for the different seasons –
primarily winter and summer. A non-licensed radio telemetry system is proposed to
provide the communication link between the main control building and remote
terminal to be located at the Exploratory Well # 2 site. Tables 8 through 10
summarize preliminary input data, control parameters and output information
anticipated to be used in the system operation and programming.

Close coordination with the control system provider will be required both to insure
that the key elements of the system are addressed and modifications made provide
adequate control and operation. Additional programming details and ladder diagrams for the control logic will be required as a part of the submittals for the purchase of the control system for this facility.

<table>
<thead>
<tr>
<th>INPUT PARAMETER</th>
<th>LOCATION</th>
<th>MEASUREMENT RANGE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow from TT#1 Well</td>
<td>Main Control Building Piping</td>
<td>Flow, 0 to 500 gpm</td>
<td>Analog flow from meters to pace separate chlorinators dedicated to each well</td>
</tr>
<tr>
<td>Flow from Exp Well # 3</td>
<td>Main Control Building Piping</td>
<td>Flow, 0 to 500 gpm</td>
<td></td>
</tr>
<tr>
<td>Flow from Exp Well # 2</td>
<td>Vault at Exp Well # 2 Site, via RTU</td>
<td>Flow, 0 to 300 gpm</td>
<td>High and Low pressure alarms to be incorporated into the controls</td>
</tr>
<tr>
<td>System Pressure</td>
<td>Main Control Building Piping</td>
<td>Pressure, 0 to 100 psi</td>
<td></td>
</tr>
<tr>
<td>Water Level In Wells</td>
<td>TT #1 Well, transducer in well</td>
<td>Level, 0 to 230 feet (Above pump setting)</td>
<td>Low water level alarm to be incorporated into the operation</td>
</tr>
<tr>
<td></td>
<td>Exp Well # 2, via RTU, transducer in well</td>
<td>Level, 0 to 230 feet (Above pump setting)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exp Well # 3, transducer in well</td>
<td>Level, 0 to 230 feet (Above pump setting)</td>
<td></td>
</tr>
</tbody>
</table>

Other system input parameters for alarm but not for control: High / Low Building Temperature Alarm at Main Control, High / Low Temperature Alarm at Vault, Power Condition at Main Control, Power Condition at Vault.
<table>
<thead>
<tr>
<th>SETTING</th>
<th>ANTICIPATED OPERATING RANGE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Pressure</td>
<td>30 to 90 psi</td>
<td>Well pumps to modulate flow to maintain a set system pressure, if groundwater conditions are adequate.</td>
</tr>
<tr>
<td>Minimum Water Level TT#1</td>
<td>5 to 50 feet (above submersible pump setting)</td>
<td>Well pumps to modulate flow to maintain minimum level and set pressure once the minimum water level is reached.</td>
</tr>
<tr>
<td>Minimum Water Level Exp # 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Water Level Exp # 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe Setting TT#1</td>
<td>90 to 250 feet</td>
<td></td>
</tr>
<tr>
<td>Probe Setting Exp # 2</td>
<td>75 to 200 feet</td>
<td>Well pumps to modulate flow to maintain minimum level and set pressure once the minimum water level is reached.</td>
</tr>
<tr>
<td>Probe Setting Exp # 3</td>
<td>90 to 250 feet</td>
<td>Setting in feet for the actual probe depth for use in well control and monitoring groundwater level.</td>
</tr>
<tr>
<td>Lead Pump, Lag1, Lag2</td>
<td>TT #1, EXP # 2, EXP # 3, Alt</td>
<td>Allows selection of any of the three well pumps or automatic alternation.</td>
</tr>
<tr>
<td>Lead, Lag1, Lag2 Pump Start Time Delay</td>
<td>0 – 1000 sec</td>
<td>0 to 16 minutes of delay for both start and stop signals.</td>
</tr>
<tr>
<td>Lead, Lag1, Lag2 Pump Stop Time Delay</td>
<td>0 – 1000 sec</td>
<td></td>
</tr>
<tr>
<td>Max Flow, TT#1</td>
<td>20 to 400 gpm</td>
<td>Represents the maximum flow from a given well, based upon its known characteristics, to turn on the next well in sequence. This value may change from summer to winter</td>
</tr>
<tr>
<td>Max Flow, Exp #2</td>
<td>50 to 100 gpm</td>
<td></td>
</tr>
<tr>
<td>Max Flow, Exp #3</td>
<td>100 to 400 gpm</td>
<td></td>
</tr>
</tbody>
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### TABLE 10. PRELIMINARY OUTPUT INFORMATION

<table>
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<th>PARAMETER</th>
<th>ANTICIPATED RANGE</th>
<th>REMARKS</th>
</tr>
</thead>
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<tr>
<td>Total Combined Flow, instantaneous</td>
<td>0 to 500 gpm</td>
<td>Instantaneous flow to be recorded every minute (1440 times per day) for troubleshooting and system analysis</td>
</tr>
<tr>
<td>Total Combined Flow, cumulative</td>
<td>No Limit</td>
<td>Records daily (24-hour) flow for operations and control purposes, each well to have separate totalizers</td>
</tr>
<tr>
<td>System Pressure</td>
<td>0 to 90 psi</td>
<td>Pressure to be recorded every minute (1440 times per day) for troubleshooting and system analysis</td>
</tr>
<tr>
<td>Water Level, TT#1</td>
<td>100 to 250 feet</td>
<td>Water level to be recorded every minute (1440 times per day) for troubleshooting and system analysis</td>
</tr>
<tr>
<td>Water Level, Exp # 2</td>
<td>75 to 180 feet</td>
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</tr>
<tr>
<td>Water Level, Exp # 3</td>
<td>100 to 250 feet</td>
<td></td>
</tr>
<tr>
<td>Events</td>
<td>Date and Time of Event</td>
<td>Events to include pump starts, stops, alarms</td>
</tr>
</tbody>
</table>

A licensed operator will be required to run the new system, similar to the current system. With the use of only wells and liquid chlorine, a Level I certification is anticipated.
The following summarizes the funding currently secured for the Level III improvements project. Also included is an updated user fee analysis based upon estimated costs for the various

**WWDC Level III Funding**

As previously noted, the 2005 Wyoming State Legislature approved funding for construction of the water system improvements. A total grant amount of **$366,000** was approved along with a loan of **$42,000**. The grant portion represents 50% of the eligible costs. The loan portion covers the portions of the well construction that is not eligible for DEQ-SRF funding due to the fact that the work was completed under the Level II exploratory program before the final Environmental Assessment could be completed for the entire project. Table 11 provides a detailed breakdown of the funding by system component. Also shown are the factors used in determining debt service payment for the loans secured for the project. Actual costs where available are also shown.

**DEQ-SRF – Drinking Water State Revolving Fund**

State Revolving Fund Loans were secured in December of 2005 for a total amount of **$486,000**. These funds cover items that are not eligible for WWDC grant and provide the 50 per cent local match of the WWDC grant funds. As noted in Table 11, the service connections and meters are not WWDC eligible.

**User Fee Analysis**

A monthly user fee cost was also estimated based upon estimated system operating costs (Table 11.) and debt service payment shown in Table 12. These items are combined in Table 13 to show overall monthly and annual estimated costs. The Table 13 figures assume that 100% of the annual operating costs are paid by the active service taps. These figures would be reduced slightly if a standby fee were charged to the vacant lots.
# TABLE 11. PROPOSED FUNDING BY SYSTEM COMPONENT

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>TOTAL</th>
<th>% WWDC GRANT</th>
<th>% WWDC LOAN</th>
<th>% DEQ LOAN</th>
<th>DEQ SRF LOAN</th>
<th>ESTIMATED ANNUAL COST</th>
<th>ESTIMATED MONTHLY PAYMENT PER LOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER SUPPLY WELLS - LEVEL II PAYBACK (@ 50%)</td>
<td>$35,837</td>
<td>0%</td>
<td>-</td>
<td>100%</td>
<td>0%</td>
<td>$3,124</td>
<td>$3.72</td>
</tr>
<tr>
<td>WATER SUPPLY WELLS - LEVEL III CONSTRUCTION</td>
<td>$114,080</td>
<td>50%</td>
<td>0%</td>
<td>-</td>
<td>50%</td>
<td>$3,659</td>
<td>$4.36</td>
</tr>
<tr>
<td>CONTROL BUILDING / VAULTS / WELL CONNECTIONS</td>
<td>$362,200</td>
<td>50%</td>
<td>0%</td>
<td>-</td>
<td>50%</td>
<td>$11,617</td>
<td>$13.83</td>
</tr>
<tr>
<td>TRANSMISSION LINES</td>
<td>$256,020</td>
<td>50%</td>
<td>0%</td>
<td>-</td>
<td>50%</td>
<td>$8,211</td>
<td>$9.78</td>
</tr>
<tr>
<td>METERS / SERVICES</td>
<td>$119,100</td>
<td>0%</td>
<td>-</td>
<td>0%</td>
<td>100%</td>
<td>$7,640</td>
<td>$9.10</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>$887,237</td>
<td>41.3%</td>
<td>4.0%</td>
<td>54.7%</td>
<td></td>
<td>$34,252</td>
<td>$40.78</td>
</tr>
<tr>
<td><strong>ACTUAL TOTALS</strong></td>
<td>$887,837</td>
<td>36.6%</td>
<td>3.5%</td>
<td>55.9%</td>
<td></td>
<td>$34,300</td>
<td>$40.83</td>
</tr>
</tbody>
</table>

WWDC = Wyoming Water Development Commission  
DEQ SRF = Department of Environmental Quality, State Revolving Fund  
WWDC ANNUAL LOAN PAYMENT $3,124  
DEQ SRF ANNUAL LOAN PAYMENT $31,176 (Assumes full use of loan)  
Note: DEQ SRF not eligible for wells constructed under Level II project, as they pre-date the required environmental assessment report. Cost for Environmental Analysis report based upon costs incurred on similar projects with little or no environmental issues.
TABLE 12. ESTIMATED ANNUAL OPERATION AND MAINTENANCE COST

<table>
<thead>
<tr>
<th>ITEM</th>
<th>OPTION: THREE INDEPENDENT WELLS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>$2,500</td>
<td>Set aside for pumps, electrical replacement</td>
</tr>
<tr>
<td>Chlorine</td>
<td>$350</td>
<td>Sodium Hypochlorite System</td>
</tr>
<tr>
<td>Fuel</td>
<td>$200</td>
<td>Generator</td>
</tr>
<tr>
<td>Power</td>
<td>$6,000</td>
<td>Pump operation, building heat, $500/ mo avg, estimate only</td>
</tr>
<tr>
<td>Labor</td>
<td>$5,040</td>
<td>2 hours per week @$35/hr plus additional 40 hours annually</td>
</tr>
<tr>
<td>Testing</td>
<td>$1,800</td>
<td>EPA testing for community system, lab fees, shipping</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$2,500</td>
<td>Bonding, Insurance and miscellaneous administration costs</td>
</tr>
<tr>
<td><strong>ANNUAL OPERATION AND MAINTENANCE</strong></td>
<td><strong>$18,390</strong></td>
<td>Estimated costs only. Actual costs to be determined by District Board of Directors</td>
</tr>
</tbody>
</table>
### TABLE 13. USER COSTS FOR DEBT SERVICE AND OPERATION / MAINTENANCE

TOTAL LOTS: 70  
OCCUPIED LOTS: 45  
ESTIMATED ANNUAL O&M: $18,390

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COST PER MONTH</th>
<th>COST PER YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER SUPPLY WELLS - LEVEL II PAYBACK (@ 50%)</td>
<td>$3.72</td>
<td>$44.64</td>
</tr>
<tr>
<td>WATER SUPPLY WELLS - LEVEL III CONSTRUCTION</td>
<td>$4.36</td>
<td>$52.27</td>
</tr>
<tr>
<td>CONTROL BUILDING / VAULTS / WELL CONNECTIONS</td>
<td>$13.83</td>
<td>$165.96</td>
</tr>
<tr>
<td>TRANSMISSION LINES</td>
<td>$9.78</td>
<td>$117.31</td>
</tr>
<tr>
<td>METERS / SERVICES</td>
<td>$9.10</td>
<td>$109.14</td>
</tr>
<tr>
<td>MONTHLY DEBT SERVICE, TOTAL PER VACANT LOT</td>
<td>$40.83</td>
<td>$490.00</td>
</tr>
<tr>
<td>MONTHLY OPERATION AND MAINTENANCE COST PER OCCUPIED LOT</td>
<td>$34.06</td>
<td>$408.67</td>
</tr>
<tr>
<td>TOTAL MONTHLY FEES PER OCCUPIED LOT / DEBT SERVICE PLUS O&amp;M</td>
<td>$74.89</td>
<td>$898.67</td>
</tr>
</tbody>
</table>

Note: Estimated costs based upon the assumption that the occupied lots are responsible for 100% of the Operation and Maintenance costs. Actual amount to be determined by the Targhee Towne Board of Directors.
This memo is provide to summarize where we are headed on Targhee Towne with respect to the groundwater supply portion of the 2003 study.

The original plan for the 2003 Level II study was to drill an offset well in the immediate vicinity of the existing Well Nos. 1 & 2 in order to: 1) evaluate subsurface conditions (e.g. the composition of the geologic materials, the degree of consolidation, and the location of water-producing zones at various depths); and 2) provide an additional, high-volume source of groundwater which, if successful, could eliminate the need for construction of water storage facilities. In addition, we planned to attempt to permanently remove loose or mobilizable sediment from the existing wells (during which efforts an alternate water supply would be provided).

That plan was significantly reconsidered in response to the June 26 scoping meeting, which focused on the district’s concerns with the potential fragility of their existing wells and the possibility that additional groundwater development work at that site would create unacceptable, possibly permanent, levels of sediment production into the district system.

Accordingly, the groundwater evaluation program was reconstituted around a broader, more cautious approach, including the following elements (Tasks 2A, 2B, and 2C of your memo of July 17, 2003):

1. Alta Community Park Well - This well is to be drilled by Teton County in a lot adjacent to the Targhee Towne district. Especially given the involvement of Rendezvous Engineering in the siting and construction of the well, it provides a unique opportunity to enhance our understanding of subsurface conditions in the area prior to the major expense of the WWDC-sponsored construction of additional wells for the district. To the extent possible, the same data will be collected from this well as cited above for the originally planned additional Targhee Towne well. Unfortunately, we have no control over the timing of this drilling, it has been delayed over the summer, and it is only now moving towards commencement. Combining the monitoring of construction of this well with the other activities described below may not be suited to the project schedule.
2. Additional Examination of Vicinity Wells - Over the course of the 2002 study, we concluded that the existing Targhee Towne wells were potentially in a highly favorable segment of the aquifer (or aquifers). Well depths to achieve even the modest goals of domestic well production (5 - 10 gpm) vary from 120 to 600 feet across the study area. While the Targhee Towne wells (300 and 400 ft. deep) are capable of producing over 500 gpm with 70 feet of drawdown, the drawdown measured in the nearby church well (500 ft. deep) was reportedly 200 feet when pumping only 20 gpm. Additional testing of existing wells is planned to investigate whether yields comparable to those available at the site of the existing Targhee Towne wells can be achieved in other areas in or adjacent to the district. Candidates for such testing include the Park Well discussed above, a recently-completed well owned by Don McKelvey, the church well, the Alta School well, and private wells as cooperative owners can be identified. While this work could be conducted at any time (with the exception of waiting on completion of the Park well), for efficiency, our intention is to combine this with other work at the site - either the drilling of the Park well or the logging of the existing Targhee Towne wells.

3. Logging Targhee Towne Wells - Subsequent to the June 26 meeting, a program of well logging was proposed to provide additional information on the existing wells without the potential impact of additional well construction or well “development” (i.e. sediment removal) work. Available logging companies have been contacted, cost estimates received, and a contractor selected for the following activities:

A. Television Survey - Both of the existing Targhee Towne wells will be videoed from surface to total depth. From this imagery, we hope to observe the location, density, and condition of casing perforations, verify casing placement, and observe the condition of the open-hole portions of the wells (240 - 307 ft. in Well No. 1; 305 - 420 ft. in Well No. 2). Also, conflicting information about the current depth of each well will be resolved.

B. Spinner Survey - A “spinner” is a device for measuring the flow of water at discrete depths in a casing or borehole. Water level information suggests the presence of separate shallow and deep aquifers at this site. It may be possible to directly assess this through observation of flow between the two. In addition, the groundwater production of individual zones may be identified in the open-hole portion of these wells, based on the rate at which water injected into the well is taken into the formation. (We intend to leave one of the two wells connected into the district system at all times. That well will also be the source of injection water to assess uptake rates in the well being logged.)

Well No. 1 is completed with driven casing (subsequently knife perforated), but Well No. 2 was completed with 6-inch casing in an 8-inch borehole. Thus, particularly in the case of Well No. 2, water may move freely behind the casing, entering the casing perforations without regard for the locations of water-producing zones. This may frustrate identification of specific water-bearing zones using the spinner survey. Logging will require coordination between Driggs Plumbing to remove the existing pumps, Strata Data to complete the logging, and us to monitor results. We are currently making the
necessary arrangements, looking at a Sept. 3 - 9 start-up.

Following completion of these investigations, a meeting with the district and the WWDC program manager will be necessary to develop the next steps. Possibilities include: 1) selection of a drill site remote from the existing wells and completion and testing of a new well; 2) additional investigations at the site of the existing wells; 3) reevaluation of project storage components; and 4) some combination of these.
MEMORANDUM

TO: Bob Ablondi        DATE:  February 10, 2004
FROM: Bern Hinckley    PROJECT: Alta - Level II

SUBJECT: September 10-14, 2003 Groundwater Investigations

The Scoping Meeting for the WWDC Alta Level II Water Supply Study was held June 26, 2003. Following official formation of the Targhee Towne Water District in early August, by letter of August 19, the WWDC project manager authorized commencement of work under a scope of services revised to respond to sponsor concerns with the short and long-term integrity of their existing water supply wells. This memo provides the results of work under Phase I, Tasks 2A and 2B of the July 17, 2003 revised Scope of Services. Well No. 1 video logs were shared with board members on Sept. 12. A verbal summary of the following material was presented to representatives of the District Board on Sept. 14.

I. Investigations of Targhee Towne No. 1 and No. 2 water-supply wells.

A. Pumping Equipment

The pump in Well No. 2 was found to be pumping 40 gpm into the water system (43 psi on tank gage) on Sept. 10, down from 52 gpm measured under identical conditions on June 27. This indicates an unusually rapid decrease in pump performance, perhaps related to entry of sediment into the wellbore. Given the poor performance history of pumps in this well, it may be desirable to have a qualified technician perform an autopsy on one of the several previous pump/motor assemblies removed from this well to determine the cause of failure.

Well No. 2 open discharge (i.e. to the surface with no back pressure) was measured at 84 gpm.

The pump in Well No. 1 was found to be pumping 61 gpm into the water system, approximately the same as measured in June, 2003. (The readings from the flow meter installed at the wellhead were compared to those measured with a bucket and stopwatch under the same discharge pressure and found to be within 3%.)

Well No. 1 discharge through the wellhead piping and flow meter (but not into the water system) was measured at 80 gpm.

The pump control setup at the time of these investigations had both pumps coming on in response to a pressure switch in the small storage tank adjacent to the wells. With a combined production of 100 gpm and an average demand of only 20 gpm (4:45 PM,
9/10/03), the pumps were cycling on/off approximately every 2 minutes. The life of this equipment could be improved by establishing a “lead / backup” setup where the second well would only come on if needed to keep up with the immediate demand.

B. Well Condition

To investigate the physical condition of these wells, a television survey was completed of both boreholes. The attached Figure 1 summarizes the observations from that survey.

The construction of both wells is consistent with the Statements of Completion filed with the Wyoming State Engineer’s Office at the time they were drilled. Figure 1 provides the observed footages; the only one significantly different than reported is the top of the perforations in Well No. 2, which was found to be 149, rather than 140 ft.

Sediment. Assuming the original reports of total depth were correct, both wells have experienced some infilling of sediment since their completion - 25 ft. in Well No. 1, and 64 ft. in Well No. 2. (Well No. 1 was completed in 1971; No. 2 was completed in 1999.) Calculation of the volume of sediment necessary to produce the observed changes in depth shows the quantity of sediment to be substantially greater in Well No. 1 – 35 ft³ vs. 12 ft³ in Well No. 2.

We have located no measurements of the depth of Well No. 1 subsequent to the original driller’s report, so cannot distinguish between: 1) an initial pulse of sediment when the well was first being developed/tested; and 2) a slow accumulation of sediment over the years. There is no indication in the currently open portion of either hole of formation collapse; the formation exposed in both holes appears to be solid right down to the current total depth. The presence of what appears to be a small chunk of mortar at the bottom of Well No. 1 suggest deposition some time ago. (If the chunk is mortar, the logical time to have entered the well was during wellhead construction.)

The current bottom of Well No. 2 is at 356 ft. Although we received a report of 315 ft. having been measured at the time the pump in this well was replaced in the fall of 2002, we have been unable to confirm this report. The appearance of the bottom - loose sediment easily stirred up by the camera - offers no clue as to the timing of this infilling, but is consistent with an accumulation of sediment over time.

Well No. 2 was thought to have been filled in to a depth of 260 ft. based on its pumping mud in the spring of 2003, appearing to be stuck in the casing, and only being restored to production when raised 20 ft. in the well (personal communication, Dave Driggs). This proved not to be the case, however, as the wellbore was open to 356 ft. Those who worked on this problem concluded that sediment had packed in around the pump during a winter of inactivity, perhaps encouraged by the relatively small size and lack of plumbness of the well (i.e. the pump appears to lay against the side of the well). The pump outside diameter
is 3.75 in., the casing inside diameter is nominal 6 in. (.25 wall) , which would not normally be a problem.

Sediment within the wellbore is much more common in Well No. 2 than in Well No. 1. Particularly in the 200 - 230 ft. interval (in the lower, 6-inch diameter casing and above the location of the pump), a thick white sediment scale is present. It has the appearance of a smooth plaster coating, perhaps smoothed by the passage of the pump during installation and removal. This “plaster” scale is largely absent above the step out to the larger casing diameter at 186 ft. The abundance of sediment in this portion of the well indicates the source is not from below (i.e. the open-hole portion of the well), but that sediment is entering the borehole from some higher zone through the slotted casing (149 - 205 ft.). The two wells cannot be rigorously compared due to the substantial difference in casing diameter, but it appears that sediment is more abundant in Well No. 2.

Our interpretation of the drillers’ logs from these wells indicates the top of rhyolite bedrock at approximately 180 ft. Microscopic examination of the sediment produced during the 2002 pumping of Well No. 1 indicates it is predominantly less than 0.02mm in diameter (coarse silt size) and of quartz and/or volcanic glass composition. This is consistent with either the weathered top of rhyolite flows or overlying loess deposits in the alluvial/glacial section.

Well Condition. The open-hole portions of both wells – below 243 ft in No. 1 and below 305 ft in No. 2 - appear to be in good condition, without indications of collapse or conspicuous erosion. The small cavities conspicuous in outcrops of this rhyolite deposit are readily observable in both wells, but are particularly large and abundant in the interval immediately below the casing in Well No. 2. The open-hole portion of No. 2 is all lower than the open-hole portion of No. 1 (see Figure 1), so the lateral extent of such features cannot be determined. These cavities are the result of gas pockets present during the deposition of this volcanic unit and are unlikely, by themselves, to create useful aquifer permeability. Minor fractures were observed intersecting the wellbore in the 340 - 350 ft. interval of Well No. 2. (These were noted on the driller’s log as “fractured rock”.)

No cracks, partings, or other overt indications of casing damage were observed in either well. Where views of the full thickness of the casings are available through the 1/4-inch perforations, the casing appears to be in good condition. In Well No. 1, the perforations are generally clean, with little evidence of either corrosion or encrustation. In Well No. 2, the perforations appear to show encrustation in the 149 - 170 ft. interval, although this may be a function of their original, somewhat ragged character due to being constructed with a cutting torch and/or to their periodic wetting as the water table fluctuates through this section. (The perforations in Well No. 1 were constructed with a casing knife.)

The newer (by 28 years) casing of Well No. 2 is smoother, with less scaling and pitting, than the casing in Well No. 1. In both wells, scale is most apparent in the interval subject to periodic wetting and drying as seasonal water levels change, i.e. from 130 - 180 ft., and
perhaps subject to water entering the casing and running down the inside from locally perched water tables. The casings in both wells also appear to be in relatively good condition. There is no conspicuous corrosion around the perforations. The only notable scaling appears to be sediment plastered against the sides of the casing in Well No. 2.

Well No. 2 is sufficiently out of plumb (i.e. not perfectly vertical) that it is obvious where water runs along one side.

The condition of the annulus between the casings and boreholes in these wells is difficult to assess. Glimpses are available through the perforations, however. Throughout Well No. 1, angular fragments of rock can commonly be seen lodged in the perforations. In many cases, what appears to be in-situ formation material is observable immediately behind the perforations. These observations are consistent with the construction method for this well, i.e. the casing having been driven into place as the well was drilled. At the end of the casing, it is clearly in direct contact with the surrounding formation. The opportunity for significant movement of groundwater behind the casing in Well No. 1 appears to be limited.

Observations through the perforations in Well No. 2 do not suggest such a snug association with the surrounding formation. Through the 165 - 185 ft. interval, perforations are commonly filled with lodged sediment fragments or what appears to be formation material is visible immediately behind the perforations. From 185 - 203 ft., however, there appears to be a void immediately behind the casing. The lowest perforations, at 205 ft., are largely filled with rock fragments as above. At the bottom of the casing in Well No. 2 (305 ft.), the 6-inch casing appears to be in direct contact with the formation.

In neither well did the neutron density logs suggest substantial voids behind the casing, but use of this log for that purpose was something of a long shot.

Perforations are relatively sparse in both wells, especially when compared with the open area achievable with comparable lengths of well screen. Based on the reported size of 2.25 X .25 inches and the observation of 10 perforations/ft in Well No. 1, were all 60 gpm coming through these perforations, an entrance velocity of 0.07 ft/sec is indicated. Based on the reported size of 4 X .25 inches and the observation of 1 slot/ft in Well No. 2, were all 40 gpm coming through these perforations, an entrance velocity of 0.23 ft/sec is indicated. A common design criteria to minimize well losses and sediment entrainment is to maintain an entrance velocity below .10 ft/sec. The indication of high well efficiency for Well No. 1 was confirmed by the 2002 pump testing, in which production rates as high as 500 gpm were achieved before indications of measureably different drawdown values inside vs. outside the casing. No testing has been performed on Well No. 2.

C. Water-Bearing Zones
The static water level at the time of logging (9/12/03) was 152 ft. Figure 2 provides the water levels recorded since automatic measuring equipment was installed in Well No. 1 in November, 2002. Most significant is that the aquifer dropped to a level of 184 ft. in April of 2003. This leaves dewatered much of the strata potentially producing water for the July, 2002 pump test.

A visual indication of groundwater movement in the wellbore is available from the video image, as tiny particles of sediment and scale knocked off the sides of the well move up or down. To assess interactions between the two wells, observations were made with the companion well pumping and stopped. In Well No. 1, water appeared to move up from below and down from above to leave the well in the 185 - 195 ft. interval when Well No. 2 was pumping. Thus, water appeared to be entering the borehole from the open-hole (and higher perforated) portions of Well No. 1, then crossing over to Well No. 2 through the 185-195 ft. interval. (The open-hole portion of Well No. 1 is cased off in Well No. 2; see Figure 1.)

In Well No. 2, this relationship was not observed. Observation of sediment movement did not indicate flow up from the open-hole portion of the well when Well No. 1 was pumped.

There was no indication of water flow within either wellbore when the companion well was not pumping. Whether the small particles available to track movement were being carried downward by flow between aquifer zones or simply settling under gravity could not be distinguished.

A spinner log was completed of each well in an attempt to develop additional information on specific water-bearing zones. In each case, the spinner was raised from the bottom of the well at a constant velocity, while both pumps were off and while water was injected into each well by it’s companion (i.e. 80 gpm from Well No. 2 was injected into Well No. 1; 80 gpm from Well No. 1 was injected into Well No. 2). Changes in the water velocity measured at the spinner can thus indicate the permeable zones where water is leaving the casing or wellbore. (Due to the apparently tight fit of the driven casing in Well No. 1, discussed above, “leaving the casing” is likely synonymous with “leaving the wellbore”. In Well No. 2, movement of water up and down the wellbore behind the casing may be occurring.

Although the potential for down-hole flow between a higher and a lower aquifer has been indicated by area groundwater levels, in neither well was borehole flow under non-injection conditions identifiable with the spinner log. During injection, both wells were measurably losing water to the 180 -190 ft. interval. Elsewhere in the wells, changes in water flow, if present, were insufficient to overcome the “noise” in the spinner response.

Natural gamma-ray logging of both wells was completed to develop information on aquifer stratigraphy. Although the signal is dampened by the presence of casing, this log is still responsive to variations in formation characteristics behind the casing. Generally, clay-
rich layers produce a stronger gamma signal than clean sands and the latter are the most likely water-bearing strata. Based on this concept, water-producing zones are suggested in the 150-165 ft. and 192 -205 ft. intervals of these wells. This follows the driller’s log from Well No. 1, on which “Water- Bearing Formation” is listed from 140 - 165 ft. (“large gravel and clay”), and from 190 - 195 ft. (“porous limestone”). The driller’s log “Water- Bearing Formation” listing for the 235 - 260 ft. interval (“gray shale”) is not reflected in the gamma log, although the switch from cased to open-hole creates a large step-up in the gamma signal which may mask subtle formation changes. None of the three “Water-Bearing Formation” citations from the driller’s log for Well No. 2 have expression in the well’s gamma log: 170 - 180 ft. (“soft - like sand”); 225 - 260 ft. (“rock fractures”); 340 - 345 (“fractured rock”). An additional entry for 395 - 420 ft. (“fractured rock”) covers a section of the borehole that is now filled with sediment.

The gamma logs from both wells can be grossly correlated between 40 and 230 ft., indicating no dramatic changes in strata over this short distance. Exceptions include locally higher gamma activity in Well No. 1 around 64 ft. and from 115-125 ft. that is not reflected in Well No. 2, and a zone around 192 ft. that is high in Well No. 2, but low in Well No. 1. Both wells produce a relative gamma low around 200 ft., although the interval is displaced somewhat: 197 -205 ft. in Well No. 1; 194 -203 ft. in Well No. 2.

Neutron density logs were run in both wells in an attempt to gather additional stratigraphic information, but the inter-well correlation is poor and little of diagnostic value was observed.

D. Groundwater Production

Well No. 1 was reported to have been tested at 513 gpm when it was drilled in 1971. The reported static water level was 113 ft. The test drew the water level down to 183 ft. The well was pump tested at 550 gpm (among other, lower rates) in July, 2002. During this test, the water level was drawn down from a static level of 129 ft. to a pumping water level of 200 ft. The latter test was accompanied by periodic episodes of substantial sediment production. (No indication of sediment production was included with the earlier test report.) No test data have been developed for Well No. 2.

Both of the pump tests of Well No. 1 took place at times of relatively high static groundwater level. Production at times of lower groundwater levels would most likely be less, perhaps substantially less. This is of particular concern if, as indicated by the logging discussed above, the main water-producing zone at this site is around 190 ft. in depth.

The two tests cited above found approximately the same specific capacity, 7.5 gpm per foot of drawdown. The 2002 testing included lower rates, where well losses were substantially less and specific capacities of approximately 20 gpm/ft were achieved. If the indications of the logging program are correct in terms of the main water-producing zone, there are times of the year when the available drawdown (the column of water above the water-
producing zone) is as little as 10-15 ft. Thus, maximum groundwater production capacity during times of low groundwater levels at this site may be on the order of 150-200 gpm.

The data on Figure 2 come from 4 readings per day, taken at 2AM, 8AM, 2PM, and 8PM. This schedule was designed to catch periods of maximum recovery (e.g. 2AM) and of maximum drawdown (e.g. 8AM) to provide an approximation of specific capacity through the range of groundwater levels. Review of the data from 11/20/02 to 5/8/03 and from 11/5/03 to 2/2/04 (periods in which it appears the wells were managed in a consistent manner) suggests the specific capacity of the well is substantially greater when the aquifer water level is higher than approximately 165 ft. (depth-to-water) than when the water level has dropped below this level.

The suggestion from the water-level data is contrary to that from the logging investigations in that the former suggests the importance of the higher aquifer zones whereas the latter emphasizes the importance of the top-of-bedrock zone (approximately 190 ft.). In either case, it does not appear that the lower, bedrock portions of these wells are the major water-producing zones. In either case, the data suggest seasonally low groundwater levels could present a significant constraint on the maximum groundwater production capacity of this site.

The 2002 testing also found that the Wells No. 1 and 2 draw down virtually simultaneously, i.e. well drawdown interference is approximately 100%. Thus, the combined capacity of the wells is not substantially more than either well could do alone, given a sufficiently large pump. (Of course, Well No. 2 is of too small diameter to accommodate a larger pump, but the principle applies to future, larger-diameter wells at this site.)

E. Conclusions

1. The main water-bearing zone in these wells appears to be near the top of bedrock (rhyolite) at approximately 185 - 195 ft. below the surface. (This is consistent with the experience of the local driller, Denning, who has completed many domestic wells in the area.) Comparison with a maximum seasonal depth to water (pumping water level) of 184 ft. suggests a potentially limited ability to sustain production if additional water-level declines occur in this area in the future.

2. Although a definitive identification cannot be made, the apparent main water-bearing zone in both wells, the ready communication between the two wells, the abundance and location of loose sediment in Well No. 2, the absence of reported sediment with the initial (1971) testing of Well No. 1, the pattern of sediment occurrence in the two wells during our 2002 testing, and the absence of visible formation through the perforations in portions of Well No. 2 all support the hypothesis that the 185 - 205 ft. zone in Well No. 2 is the major source of sediment for these wells.
3. Maximum groundwater production capacity from these wells may decline significantly during periods of relatively low groundwater levels due to the dewatering of the shallower water-bearing zones and the reduction in available drawdown within the main water-bearing zone. Although maximum groundwater production potential may decline, the wells are currently being used at substantially less than maximum potential rates. If substantially increased production is desired from either of these wells in the future, an aquifer test at a time of low groundwater levels is recommended.

4. Both Well No. 1 and Well No. 2 are in good condition in terms of the visible integrity of the casings and boreholes. While additional development work is likely to temporarily entrain additional sediment, it is quite unlikely to compromise long-term well function. Similarly, it is likely that this site could support additional well development without compromising the integrity of the existing wells.

5. The relatively small diameter of Well No. 2 precludes installation of a higher-capacity pump, generates relatively high casing entrance velocities, and may aggravate problems of sediment production and pump “clogging” due to the close fit of the pump in the casing.

6. When the pump in Well No. 1 was pulled to allow logging of the well, it was found to have been set at a depth of 190 ft., only 6 ft. below the seasonal low groundwater level. Upon reinstallation, the pump was set 20 ft. lower (210 ft.) to insure submergence under varying groundwater level and pumping conditions. A setting to at least this depth should be maintained in the future.

II. Vicinity Groundwater Investigations

In association with the detailed logging of Well Nos. 1 and 2 described above, additional investigations were made of groundwater conditions in the surrounding area. These investigations augment those presented in our 2002 report. (See Figure 4, Table 5, and the accompanying discussion of that report.)

A. Well Test Data

1. Alta School Well
   Static depth-to-water (9/12/03) = 141.18 ft. (below top of casing; GL + 1.7 ft.)
   Surface elevation = 6446 ft. MSL
   Groundwater elevation approx. 6307 ft. MSL. (This is 20 ft. lower than was measured in the nearby church well 7/8/02.)
   Discharge > 12 gm
   Drawdown = 29 ft. (specific capacity = 0.7 gpm/ft if discharge = 20 gpm)

2. McKelvey Well
   Static depth-to-water (9/12/03) = 125.78 ft. (below top of casing, GL + 1.5 ft.)
Surface elevation = 6460 ft. MSL  
Groundwater elevation approx. 6336 ft. MSL.

3. Love Well  
Depth-to-water (9/13/03) = 133.22 ft. (below top of casing; GL + 1.4 ft.)  
Surface Elevation = 6422 ft. MSL  
Groundwater elevation approx. 6290 ft. MSL  
(This is 29 ft. lower than was measured 7/8/02.)  
Discharge = approx. 33 gpm (extrapolated from measuring 3 of 7 sprinkler heads)  
Drawdown = 3.0 ft. (specific capacity = 11 gpm/ft)

4. Gust Well  
Static depth-to-water (9/13/03) = 124.08 ft. (below top of casing; GL + 1.5 ft.)  
Surface elevation = 6413 ft. MSL  
Groundwater elevation approx. 6290 ft. MSL  
(This is 4.6 ft. lower than was measured 7/8/02.)  
Discharge = 27.2 gpm (averaged over 3 pumping cycles)  
Drawdown = 4.24 ft. (specific capacity = 6.5 gpm/ft)

5. Farrier Well  
Static depth-to-water (9/13/03) = 138.65 ft. (below top of casing; GL + 0.9 ft.)  
Surface elevation = 6488 ft. MSL  
Groundwater elevation approx. 6350 ft. MSL  
(This is 28 ft. lower than was reported with the 1994 Statement of Completion (no date). The surface elevation for this well was incorrectly reported in our 2002 report.)  
Discharge = 13.6 gpm (averaged over 4 pumping cycles)  
Drawdown = 1.82 ft. (specific capacity = 7.5 gpm/ft)

6. Terbush Well  
Static depth-to-water (9/13/03) = 194.30 ft. (below top of casing; GL + 1.2 ft.)  
Surface elevation = 6510 ft. MSL  
Groundwater elevation approx. 6317 ft. MSL  
(This is 6 ft. lower than was measured 7/8/02.)  
Discharge = 10.3 gpm  
Drawdown = >200 ft.(?) (Drawdown was still 40 ft. following 43 minutes of recovery)  
(specific capacity = <0.05(?) gpm/ft)

7. Targhee Towne Well No. 1  
Static depth-to-water (9/10/03) = 152.70 ft. (below top of casing; GL + 1.2 ft.)  
Surface elevation = 6460 ft. MSL
Groundwater elevation approx. 6309 ft. MSL  (See Figure 2 for daily depths to water in this well.)
Discharge = 61 gpm
Drawdown = 3.5 ft. (specific capacity = 17.4 gpm/ft. The specific capacity of this and other wells in the area may vary with the depth to water as the effective aquifer thickness changes.)

B. Discussion

Although stable (i.e. static) water levels were sought in all cases, the groundwater levels measured in these wells are complicated somewhat by the effects of pumping. (All are active wells.) Nonetheless, the seasonal decline in groundwater levels documented in the Targhee Towne wells (Figure 2) appears to be reflected in the comparison of the mid-September, 2003 values cited above with their mid-July, 2002 counterparts. A decline of approximately 20 feet from July to September is indicated both on Figure 2 and in the above measurements. This demonstrates that the phenomenon is not unique to the immediate vicinity of the Targhee Towne wells, but is, as expected, an area-wide feature of the annual groundwater cycle.

As discussed in our 2002 report, the productivity of the aquifer in this area varies widely from well-to-well. The parameter called “specific capacity” (gpm per ft. of drawdown) provides an assessment of local aquifer productivity (in contrast to simply looking at the production rates of installed pumps). For example, if a 20 gpm well has only 2 ft. of drawdown, it taps a far more productive aquifer than a 50 gpm with 50 ft. of drawdown.

The most productive wells for which we have data (specific capacities > 10 gpm/ft) are the Targhee Towne wells, the Mohr well (northwest of the Targhee Towne subdivision), and the Love well (in the northern part of the Altamount Subdivision). In the middle range (1 - 10 gpm/ft) are the Farrier and Gust wells. Least productive (specific capacity < 1 gpm/ft) are the Terbush, Alta School, Episcopal Church, and Schultz wells.

While one certainly cannot rule out the possibility of a high-yield well being developed in a zone of locally high permeability (e.g. a gravel lense, fractured bedrock) virtually anywhere in this area, previous groundwater development experience and the data collected over the course of our work in the area provides several general conclusions:

1. Sites capable of yields on the order of those tested from Targhee Towne No. 1 (500 gpm) are likely rare.

2. Sites capable of yields in the 100 gpm range with acceptable drawdown may occur across much of the area if wells penetrate the upper zones of the bedrock, i.e. depths on the order of 250 ft. Based on the experience and data available to date, such sites are
somewhat more likely west and northwest of the existing Targhee Towne wells than east and south.

3. Depths-to-water of 125 to 185 feet should be anticipated throughout the area, along with large seasonal variation in the groundwater elevation. Wells should be drilled and completed sufficiently deep and pumps set sufficiently deep to accommodate these fluctuations.

C. Additional Exploration

Based on the investigations discussed above (along with our previous work in the area, e.g. our Nov. 2002 report) and the direction of the district board of directors, additional groundwater exploration is focusing on the area west of Targhee Towne Well Nos. 1 and 2. Several potential sites in the northwest corner of the subdivision are being evaluated. If long-term access can be secured, one or more slim, exploration wells will be completed in this area, which, if successful, will be followed by construction of a full-size production well. It is anticipated that a new well will become part of the overall water-supply system and will be managed in conjunction with the existing two wells. Once a new well has been successfully added to the functioning water system, the desirability of additional well development (e.g. to control sediment production) or well construction (e.g. to replace Well No. 2) at the site of the existing wells will be evaluated.
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* 4. (6318) Well reference with groundwater elevation (ft) from well completion report or past measurements.

* 5. 6318 Well reference with groundwater elevation (ft) measured on 9-12-03 / 9-13-03.

Rendezvous Engineering, P.C.
MEMORANDUM

TO: Bob Ablondi                      DATE: June 27, 2006
FROM: Bern Hinckley                 PROJECT: Alta Water-Supply Project, Level II
SUBJECT: Aquifer / Well Testing Analysis

Summary

Because of the significant impact of seasonal fluctuations in groundwater levels, production assessments are developed separately for the high-groundwater season, i.e. early-June through mid-August, and low-groundwater season, i.e. mid-November through late-April. These recommendations reflect estimated well potential, without regard for specific demands or overall system engineering/economics. Considerations of daily and seasonal demand patterns, provision of peaking capability, multiple well management, and accommodation of potentially large seasonal differences in capacity should all be appropriately accommodated in final design and operation.

| TargheeTowne Water-Supply Well Maximum Sustained Production Rate Recommendations (gpm) |
|-----------------------------------------------|---------------|-----------------|-----------------|
| Well                                          | High-groundwater | Low-groundwater | Notes                  |
| TargheeTowne No. 1                           | 350            | 40              | 80 gpm at low-water if Exploration Well No. 3 not used; pump setting at 240 ft. |
| TargheeTowne No. 2                           | Diameter and sediment problems recommend use for monitoring only. |
| Exploration Well No. 1                       | Productivity insufficient to justify construction of facilities to bring into system. |
| Exploration Well No. 2                       | 200            | 100             | pump setting at 170 ft. |
| Exploration Well No. 3                       | 300            | 200             | reduce to 250 gpm if used simultaneously with TargheeTowne No. 1; pump setting at 300 ft. |
Short-term yields (e.g. fire flows) somewhat in excess of these values could likely be provided, although the nature of well-entrance losses and near-well permeabilities for the lower aquifer are such that the additional increment available is likely small. Periodic reassessment of these values is recommended as additional performance and water-level data are acquired from actual practice.

Introduction

This memo summarizes aquifer/well testing conducted under Wyoming Water Development Commission (WWDC) projects for the TargheeTowne subdivision in Teton County, Wyoming (Sec. 19, T44N, R118W) over the 2004 - 2006 period. (The initial aquifer/well evaluation work on this project took place in 2002/2003; details have been provided in previous memos and reports.) Figure 1 presents the location of the 5 wells tested, 2 of which are the historical supply wells for the subdivision and 3 of which were drilled under the current exploration/evaluation program. Figures 2 - 5 present the construction details for each well.

The aquifer in this area consists of two units: 1) approximately 200 ft. of glacial and alluvial deposits, overlying 2) a thick (well beyond the depth of any of the study wells) series of rhyolite welded tuff deposits (volcanic material). Sand and gravel lenses in the upper aquifer are quite productive of groundwater, where and when they are saturated, but are quite localized in occurrence and are subject to large annual fluctuations in groundwater levels. Groundwater productivity in the lower aquifer is also highly variable, as a function of the distribution of fractures and of varying degrees of consolidation of the rhyolite as it cooled. Finally, sediment production is a common problem with wells in this area, primarily as a result of irregularly distributed zones of unconsolidated volcanic ash. Unlike most previous wells in the area, the wells completed for this project were extensively developed upon the completion of drilling, apparently with good results regarding continuing sediment production.

Fluctuations in static groundwater levels of as much as 70 ft. have been observed over annual cycles. This is problematic for two reasons: 1) the most productive zones in some wells are eliminated as falling groundwater levels leave them unsaturated; and 2) the drawdown available to produce groundwater to wells varies through the year. Figure 6 presents seasonal groundwater level data collected from TargheeTowne No. 1. The continuous data from Nov. 2002 to July 2004 show a seasonal low in mid-November (corroborated in 2004 and 2005); an odd, mid-winter high around New Years; an early spring low of varying timing and magnitude; and a mid-summer high in July. Sporadic data from other wells in and around the subdivision demonstrate a similar water-level seasonality.

Similar fluctuations are reported for other wells in the area. In a well at the Teton Creek Resort (just west of the stateline adjacent to TargheeTowne), for example, aquifer water levels are reported to have dropped approximately 50 ft. (from 50 ft. below surface to 100 ft. below surface) between mid-summer and late-October, with a resulting drop in well production from 500 gpm to 150 gpm.
TargheeTowne No. 1

As previously reported on, this well was test pumped in early August, 2002, at rates from 60 to 600 gpm. The highest rates were far in excess of the 60-80 gpm of the permanent pump installed in the well. At the highest rate, drawdown was 75 ft. (pumping water level = 200 ft.) and episodic high concentrations of sediment were generated. This test was conducted at a time of highest groundwater levels (depth-to-water = 125 ft.), so had the maximum saturated thickness to work with.

November, 2005 provided a picture of well production at the opposite extreme, when groundwater levels were so low that production of only 60 gpm appears to have produced a pumping water level of approximately 230 ft. or more. At that time, the upper aquifer was virtually dry, providing mainly the poorly productive (at that site, at that depth) lower aquifer to supply the well. Figure 6 data for this period are strongly influenced by the pumping of the well, in addition to reflecting a generally lower “static” groundwater level in the surrounding aquifer. Given the relatively poor productivity of the well under these conditions, static water levels are estimated to have been in the vicinity of 185-195 ft.

The 2002 test analysis, and subsequent observations of this well, concluded that the productivity of the well declines dramatically once the pumping water level falls below approximately 160 ft. When the groundwater levels in the surrounding aquifer are high, however, a pumping water level of 160 ft. can likely support production in excess of 400 gpm. Based on the data of Figure 6 and the historical production experience of this well, sustained high-water (i.e. summer) production of 300 - 350 gpm is available, primarily from the upper aquifer. With installation of a new pump in mid-November, 2005, this well is currently producing 75-80 gpm, with pumping water levels varying as background levels in the surrounding aquifer. Whether the Nov. 2005 experience reflects lowest aquifer water levels is unclear, however, as there were also a variety of mechanical problems with the pump installation which were resolved as background water levels rose significantly (see Figure 6).

It appears that discharge on the order of 75 gpm is available from this well at times of low groundwater levels. Simultaneous production from Exploration Well No. 3 (discussed below), however, will lower water levels in TargheeTowne No. 1, resulting in an associated loss of production capacity as the available drawdown is reduced. The details of this relationship cannot be confidently predicted from data currently available, but pump design should consider both wells. If Exploration Well No. 3 is to be pumped at maximum rates (e.g. 200 gpm) during low-water periods, the additional contribution available from TargheeTowne No. 1 may be less than 40 gpm. During periods of high-water levels, with saturation of the upper aquifer layers, the two wells will perform more independently and combined production of approximately 600 gpm should be possible.

A pump setting of 240 ft. is recommended for this well if it is to be used at low-water times of year. The well is cased (16-inch diameter) to that depth, so can accommodate a large pump.
Video of the open-hole below 240 ft. indicates no mechanical/stability reason not to set a pump into the open-hole portion of the well, but drawing the pumping water level down to those depths would reduce the efficiency of the well and should not be necessary.

Another conclusion of the 2002 testing of this well was that additional development work at high discharge rates could improve well productivity and reduce long-term sediment production. This could best be accomplished with highest background water levels (e.g. <130 ft.) and maximum pumping rates (e.g. 500 gpm), to maximize the flow of water moving sediment out of the wellbore and into the well for discharge to the surface. Concern with sediment and well integrity while this well is the mainstay of the water system argued against aggressive development at that time, but once alternate groundwater sources are on-line, the recommendation to vigorously develop TargheeTowne No. 1 should be revisited.

**TargheeTowne No. 2**

This well was also tested to some extent in 2002, by virtue of serving as an observation well for the testing of TargheeTowne No. 1. This well is 40 ft. away from TargheeTowne No. 1 and is hydraulically connected with TargheeTowne No. 1 via a very-high permeability zone (open fractures?) at approximately 190 ft. Drawdown in the two wells is identical when either one is pumped, up to a discharge of approximately 500 gpm, at which point the interconnection is insufficient to continue to provide virtually instantaneous match of water level in TargheeTowne No. 2 with water level in TargheeTowne No. 1. Because TargheeTowne No. 2 is only 6 inches in diameter below 186 ft., it cannot easily accommodate a high-volume pump. TargheeTowne No. 2 was originally drilled to provide a pumping equipment backup for the previously single-well water system.

Continuing sediment-production in this well – to the point of clogging up the pump and locking the pump in the hole, the close hydraulic connection with TargheeTowne No. 1, and the availability of alternative wells now argue for the abandonment of TargheeTowne No. 2 as a water-supply well. The step-down in well diameter at 186 ft., combined with the well being out of plumb, has made it difficult to use electric sounders or transducers to monitor water levels below that point, but the well remains somewhat useful as a monitoring point.

Given the close communication with TargheeTowne No. 1, if the well is to be abandoned at some point, care should be taken not to plug the aquifer. Any plugs should be emplaced only above the highest perforated section, i.e. above 149 ft.

**Exploration Well No. 1**

This well is cased to a depth of 220 ft. through unproductive glacial and alluvial material and completed open-hole through rhyolite bedrock to a total depth of 385 ft. Airlift during 2004 drilling produced a maximum of approximately 3 gpm as casing was advanced (0 to 220 ft.), and a maximum of 15 gpm when the hole was open from 220 to 385 ft. Water-level recovery
measurements demonstrated a production rate (i.e. filling the well casing) of 7 gpm during recovery at 70 ft. of residual drawdown, an approximate specific capacity of 0.3 gpm/ft, and an approximate transmissivity of 50 gpd/ft. It was on the strength of these poor indications that additional exploratory drilling at alternate sites was pursued.

The May, 2006 pump test of this well consisted of an hour of production at 9.3 gpm (producing 23 ft. of drawdown, i.e. a specific capacity of 0.4 gpm/ft) and a short period of production at 27 gpm, which produced 50 ft. of drawdown in only 14 minutes. Both the initial step (9.3 gpm) and the recovery data from this short test indicate a near-well transmissivity of approximately 100 gpm/ft, although the recovery data suggest an effective, later (further from well) transmissivity on the order of 900 gpd/ft. (See Figure 7 for a plot of the recovery data.)

The static water level at the time of well completion (Nov., 2004) was 148 ft; the static water level at the May, 2006 test was 121 ft. Because the water entering this well is all from the deep bedrock aquifer, changes in static water level are less significant than if productive strata were being left unsaturated, although pumping water levels will be correspondingly deeper if the surrounding static water level is lower. Similarly, winter production is likely to be less than summer production for the same pumping water level.

Projection of the drawdown observed during this test, and assuming no additional well losses with higher pumping rates, the well could theoretically produce 20-30 gpm with a pumping water level of 300 ft. (The range in calculated potential discharge corresponds with a range in static water levels from 100 to 150 ft.) This also assumes no deterioration of aquifer performance as the saturated thickness were substantially reduced by pumping. Actual performance may be poorer than these calculations suggest.

If the well is to be used, a setting of 300 ft. is suggested for a pump with capacity to produce 15 - 20 gpm from that depth.

**Exploration Well. No. 2**

Figure 4 provides a schematic of this well. It is screened opposite a productive gravel between 175 and 185 ft., and is completed open-hole through rhyolite bedrock from 260 ft. to a total depth of 360 ft. Airlift production during drilling indicated groundwater coming in a ratio of approximately 1:5 from the gravel and rhyolite portions of the hole (8 gpm from the gravel during drilling while advancing casing; 45 gpm from the rhyolite with the gravel cased off).

Step test data suggest an efficient well, with a fairly stable 40-minute specific capacity of approximately 2.8 gpm/ft across various discharge rates at that time of year (i.e. mid-May; depth-to-water = 95 ft.). Drawdown data from a one-day test at 75 gpm (Figure 8) indicate a near-well transmissivity of approximately 1,200 gpd/ft, but an effective long-term transmissivity of 24,000 gpd/ft. Recovery data show a similar pattern (800 and 20,000 gpd/ft.).
Extrapolation of test data to a sustained pumping period of 3 months has been done assuming: 1) a relatively high static water level of 95 ft., like at the time of the May, 2006 test; 2) maintenance of the test specific capacity at higher-than-tested discharge rates; and 3) the late-test-data effective transmissivity persists over time. Under this scenario, a continuous discharge of 200 gpm would draw the pumping water level down to a few feet above the top of the screen section. These three assumptions are evaluated below:

1. Static Water Level. The following table provides available water-level data for Exploration Well. Well No. 2.

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<th>Date</th>
<th>Depth-to-Water (ft.)</th>
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<td>3/12/05</td>
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<td>5/16/06</td>
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Although only sporadic, these data generally correspond with the pattern of continuous water levels monitored over the 2002 - 2004 period at TargheeTowne Well No. 1, both in terms of large fluctuations and the seasonality of fluctuations, e.g. higher in May than in December, and higher in December than in March.

The depth-to-water at TargheeTowne No. 1 was 140 ft. during the May, 2006 testing of Exploration Well No. 2. This is nearer the high level of 130 ft. (July, 2004) than the low level of 185 ft. (April, 2003) in Well No. 1, suggesting that the Exploration Well No. 2 2006 test occurred at a particularly favorable time of year. If the comparison between the wells holds true over the annual cycle, the static groundwater level in Exploration Well No. 2 may rise to a depth of 85 ft. during the middle of July and fall to a depth of 140 ft. in mid-November and late March.

These data suggest that it is unlikely seasonal low water levels will leave the gravel zone (175 - 185 ft.) unsaturated, although lower formation water levels provide less head to move water toward a pumping well. Also, if the pumping water level falls below the top of the screens, air may be entrained as water cascades from this zone into the well. Drawdown of 26 ft. was measured after 1 day of pumping at 75 gpm. With only 35 ft. of drawdown available above the gravel zone if the static water level were 140 ft., a maximum winter discharge rate of 100 gpm is indicated.

2. Specific Capacity. Although May, 2005 specific capacity was relatively constant around 2.8 gpm/ft over test rates of 30, 50, and 75 gpm, the fractured nature of the rhyolite portion of the
aquifer suggests turbulent flow losses may occur at higher discharge rates.

In March, 2005 a higher-discharge pump test was conducted on this well without benefit of reliable depth-to-water measurements during pumping. From a static water level of 124 ft., the well was unable to sustain production of 100 gpm without perceptible air entrainment, i.e. the pumping-water-level was below the top of the screen at 175 ft. A specific capacity of less than 2 gpm/ft is indicated. At a production rate of 225 gpm it appeared the pumping water level was near the pump intake at 315 ft., suggesting a specific capacity of approximately 1.2 gpm/ft.

In the absence of direct test data addressing the issue of well losses at higher discharge rates, caution is advised. Drawing the pumping water level down past the screen section is not desirable in terms of air entrainment and the effects of wetting/drying cycles on screen surfaces, but, as noted above, the bulk of the water appears to be coming from the lower aquifer. Thus, the well should remain productive at lower-than-screens pumping water levels. Because this 8-inch well is completed with a 6-inch liner below 175 ft., however, room for a deeper-set pump is limited.

3. Transmissivity. An effective transmissivity of 24,000 gpd/ft is not unreasonable for this aquifer, particularly considering the contribution of the upper aquifer. However, recovery data from the aborted March, 2004 pump test (30 ft. lower static water level) indicate an effective transmissivity on the order of 5,000 gpd/ft, perhaps partially reflecting the smaller available saturated thickness.

**Exploration Well. No. 3**

This well was sited to take advantage of the locally productive aquifer discovered by TargheeTowne Well No. 1 and to minimize the construction necessary to tie in with the existing water system. It is cased to a depth of 256 ft. through relatively unproductive glacial and alluvial material and completed as a 6-1/8-inch diameter open-hole through rhyolite bedrock to a total depth of 436 ft. Because the static water level was 180 ft. at the time this well was drilled, the productivity of seasonally-saturated higher zones could not be directly assessed. Since these upper zones are open to nearby TargheeTowne No. 1 and No. 2, however, and there was clearly little production from the most prolific depth in TargheeTowne No. 1 and 2 (185 - 195 ft.), no screens or perforations were placed in the upper aquifer in Exploration Well No. 3.

Given the persistent, albeit intermittent, sediment-production problems with TargheeTowne No. 1 and No. 2, considerable effort was made to fully develop Exploration Well No. 3 during the air-lift period following well drilling. Heavy concentrations of sediment occurred during development air-lifting, but the well was eventually developed to the point where discharge remained clear through on/off cycles and extended production periods.

Based on data collected during drilling, the bulk of the water in Exploration Well No. 3 is coming from fractured intervals below 300 ft., most notably from a zone around 340 ft. (Figure
Despite the differing water-bearing zones however, the hydraulic connection between Exploration Well No. 3 and the TargheeTowne No. 1 and 2 wells is obvious in the inter-well responses to pumping. During March, 2005 observations, On/Off cycles (10 minutes on, 15 minutes off) of 60 gpm pumping at TargheeTowne No. 1 generated approximately 8-ft. drawdown/recovery cycles at TargheeTowne No. 1 and corresponding 0.2-ft. drawdown/recovery cycles at Exploration Well No. 3. Figure 9 shows an example of the cycling of drawdown at TargheeTowne No. 1 that occurred throughout the testing of Exploration Well No. 3. (In this case, the cycling is between 177 and 194 ft. due to the background drawdown imposed by the pumping of Exploration Well No. 3.) Figure 10 shows the companion cycling observed in Exploration Well No. 3 during the pre-test period.

The depth-to-water at TargheeTowne Well No. 1 was approximately 164 ft. (level varied over pumping cycles) during the March, 2005 testing of Exploration Well No. 3. Based on comparison with seasonal patterns of groundwater levels measured at Well No. 1 (Figure 6), long-term use of Exploration Well No. 3 can likely anticipate water levels as much as 40 ft. higher during the summer peak (July) and 20 ft. lower during the winter lows (November and, in some years, March).

Exploration Well No. 3 was pump tested in March, 2005 and found to be the most productive of the three wells completed over the course of the exploration program. As anticipated based on the fractured nature of the aquifer, the specific capacity of the well decreases dramatically at higher pumping rates (presumably, as turbulent head losses increase at the wellbore). Figure 11 presents the step test data, which show considerable additional drawdown as higher pumping rates relative to the specific capacity experienced at 46 gpm.

Drawdown data from both Exploration Well No. 3 and from TargheeTowne No. 1 (as an observation well) indicate a transmissivity of approximately 4700 gpd/ft in the immediate area of the wells. Figures 12 and 13 present the drawdown data from Exploration Well No. 3 and from TargheeTowne No. 1, respectively. (TargheeTowne No. 1 values are averaged across each on/off cycle of that well; night-time periods of recovery in that well are indicated on Figure 13.) Although somewhat obscured by the pumping cycles of the well, observation data from TargheeTowne No. 1 also suggest an aquifer storage coefficient of approximately 0.007, as indicated by the idealized “Theis” aquifer line on Figure 13. This is a reasonable value for a locally-confined fractured-rock aquifer. This storage characteristic serves to provide a fairly rapid drawdown response between the two wells, at least in terms of the lower (rhyolite) aquifer. (The upper aquifer, open to the TargheeTowne No. 1, is not open to Exploration Well No. 3.)

In the later (beyond 800 minutes) drawdown data from Exploration Well No. 3, the presence of an aquifer boundary is indicated. As depicted on Figure 14, idealized modeling of a positive boundary at a distance of 300 ft. produces a drawdown trace quite similar to that observed from Exploration Well No. 3. (A comparable response in TargheeTowne No. 1 cannot be discerned,
but may have been obscured by the drawdown/recovery cycles from that well’s own pumping throughout the test period.) This “boundary” is modeled as a linear source of unlimited recharge. In reality, the boundary is a simply the reflection of a zone of much higher permeability, e.g. more intense and/or open fractures in the rhyolite, a less consolidated portion of the rhyolite aquifer, or access between the rhyolite aquifer and an overlying productive gravel lense in the upper aquifer (e.g. the high-permeability zone encountered in TargheeTowne No. 1 and 2). The geometry and location of such a boundary cannot be identified from a single-well test.

To assess the long-term production potential of Exploration Well No. 3, the test data have been projected to a continuous pumping period of 3 months, adjusted for seasonal water-level fluctuations assuming a constant specific capacity, adjusted for different pumping rates also assuming a constant specific capacity (2 gpm/ft), and constrained to draw the aquifer down to no less than 50% of its low-water saturated thickness (i.e. a pumping water level of 300 ft.).

The following values result:

low-season static water level = 184 ft. (depth-to-water)
maximum production to maintain pumping depth-to-water less than 300 ft. = 232 gpm

high-season static water level = 124 ft. (depth-to-water)
maximum production to maintain pumping depth-to-water less than 300 ft. = 352 gpm

The assumption of a constant specific capacity based on the 200 gpm pump test likely underestimates drawdown at higher rates and overestimates drawdown at lower rates, so production targets of 200 and 300 gpm are more appropriate for the high and low-water seasons, respectively.

Given the hydraulic connection between Exploration Well No. 3 and TargheeTowne No. 1, and assuming TargheeTowne No. 1 would be used primarily for summer (i.e. high-groundwater-level) peaking, Exploration Well No. 3 will have to accommodate a certain amount of interference drawdown. Since TargheeTowne No. 1 appears capable of producing 350 gpm (primarily from the upper aquifer) with less than 25 ft. of drawdown if aquifer levels are high, the greatest possible impact it could have on Exploration Well No. 3 is 25 ft. Reduction of the above maximum pumping recommendation to accommodate this effective reduction in “static” water level changes the calculated value to 300 gpm. This is reduced to 250 gpm to accommodate discharge-based reduction of specific capacity.

Calculations are based on a projected 3-month pumping water level of 264 ft. for 200 gpm pumping with a static water level of 164 ft., i.e. drawdown of 100 ft., long-term specific capacity of 2.0 gpm/ft.
Figure 2 - Targhee Towne Wellfield

Well #1 (1971)
- 16" steel casing
- 2002/2003 range of static water levels
- 2 1/4" x 1/4" knife slots
- 2 1/4" x 1/4" torque slots
- 2 1/4" x 1/4" torque slots
- 8" open hole
- Hole partially filled in
- 20 ft range of static water levels

Well #2 (1999)
- 8" steel casing
- 4" x 1/4" torque slots
- 8 5/8" steel casing
- 10 1/2" borehole
- Cement seal
- 436 ft

Exp #3 (2005)
- 167 ft (3/8/05)
- 178 ft
- 185 - 195 ft
- 192 ft
- 195 ft
- 200 ft
- 205 ft (pump setting, 9/8/03)
- 205 ft
- 205 ft
- 240 ft (11/05 pump setting)
- 246 ft (pump setting, 9/8/03)
- 246 ft (pump setting, 9/8/03)
- 256 ft (end of casing)
- 282 ft
- 307 ft
- 307 ft
- 307 ft (end of casing)
- 307 ft (end of casing)
- 356 ft
- 356 ft
- 420 ft
- 420 ft
- 436 ft

Bedrock
Alluvial/Glacial Sediments

8" open hole
Figure 3 - Targhee Towne Exploration Well #1
WYOMING WATER DEVELOPMENT COMMISSION
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6405 ft.
Andrew Well Drilling; Air Rotary; Nov. 2004

- 14" borehole
- 20 ft
- 10 1/2" steel casing
- 121.2 ft (5/17/06)
- 148 ft (11/04)
- 220 ft (end of casing)

- 8" open hole
- 385 ft

- Mixed Alluvium / Glacial Deposits
- Fine sand layer
- Rhyolite Tuff

- 198 ft
- 205 ft
- 385 ft
Figure 4 - Targhee Towne Exploration Well #2

Wyoming Water Development Commission
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6420 ft.
Andrew Well Drilling; Air Rotary; Dec. 2004

6½" borehole
- 10 ft

8 5/8" steel casing
- 94.9 ft (5/16/06)
- 107 ft (12/28/04)
- 124 ft (3/12/05)

60-slot screen
- 175 ft
- 185 ft

8 5/8" bore hole
- 260 ft (end of casing)

6" steel casing
- 400 ft

6" open hole
- 400 ft

Cement seal
- 20 ft

Alluvial/Glacial Sediments
(although)

Rhyolite Tuff
- 400 ft
Figure 5 - Targhee Towne Exploration Well #3
WYOMING WATER DEVELOPMENT COMMISSION
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6460 ft.
Andrew Well Drilling ; Air Rotary; Jan. 2005

- 10 1/2" borehole
- 20 ft
- 8 5/8" steel casing
- 167 ft (3/8/05)
- 256 ft (end of casing)
- 436 ft

- 8" open hole

Alluvial/Glacial Sediments
Rhyolite Tuff

- 180 ft
- 250 ft
- 300 ft
- 350 ft
- 400 ft

- 50 ft
- 100 ft
- 150 ft
- 200 ft
- 250 ft
- 300 ft
- 350 ft
- 400 ft

Depth
Fig. 6 - TargheeTowne Well No. 1 water-level data

depth-to-water (ft)

date

2002

2003

2004

other

1/3/05

Exp#3 test
3/12/05

Exp#1 and #2 tests
6/17/06

TT#1 test
7/31/2002

11/5/2004

10/10/2002

11/17/04

2005

average daily or spot (well off) values

7/28/2006

water level swings

plot
Figure 7 - Alta Exploration No. 1 - Recovery (Q = 27 gpm)

min

10.00

0.00

0

100.00

1.00

10.00

20

30

40

50

60

drdn (ft)

indicated effective T = 900

indicated effective T = 100
Figure 8 - Alta Exploration No. 2 - 75 gpm constant-rate test

indicated effective $T = 1,200$

indicated effective $T = 24,000 \text{ gpd/ft}$
Figure 9 - Alta TargheeTowne Well 1 (57 gpm) and Exploration No. 3 recovery data

- TargheeTowne No. 1
- Exploration Well No. 3

minutes of recovery

depth-to-water in TT#1 (ft)

< ---- last of pumping at Expl. Well No. 3 ----->  <------ recovery from pumping at Expl. Well No. 3 ------->

OFF/ON pumping cycle at TargheeTowne No. 1
Figure 10 - Alta Exploration Well No. 3 during pre-test pumping of TargheeTowne Well 1

one-minute measurements

OFF/ON pumping cycle at TargheeTowne Well
Figure 11 - Alta Exploration No. #3 - Step Test

- Discharge Rate (gpm)
- 46-minute drawdown (ft.)

Additional head loss relative to 48 gpm step

Step test data

Idealized aquifer
Figure 12 - Alta Exploration Well No. 3 drawdown data

- Static water level = 168
- Indicated effective $T = 5,000$
- Flow rates: 200 gpm, 235 gpm, 224 gpm, 200 gpm
Figure 13 - Alta TargheeTowne Well 1
(response to pumping Exploration Well No. 3, 200-225 gpm)

Idealized aquifer calculation for
\( S = 0.007, \ T=4500 \text{ gpd/ft}, \ d = 112 \text{ ft} \)

Values are the maximum depth to water over each TargheeTowne Well 1 pumping cycle.

8:00 PM - 6:30
Figure 14 - Alta Exploration Well No. 3 (224 and 200 gpm)

Idealized aquifer calculations
T= 4500 gpd/ft; S = .007

w/ boundary at 300 ft.

w/out boundary

min

100 1000 10000
Figure 1 - Cenozoic Stratigraphy of the Teton Region

<table>
<thead>
<tr>
<th>GEOLOGIC AGE</th>
<th>COLOR ON DIAGRAM</th>
<th>FORMATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holocene and</td>
<td></td>
<td>Stream deposits, glacial outwash, and talus</td>
<td>Sand, gravel, and silt along present streams and on outwash plains; jumbled broken rock in talus slopes; thickness variable.</td>
</tr>
<tr>
<td>Pleistocene</td>
<td></td>
<td>Landslide deposits</td>
<td>Jumbled debris on steep hummocky slopes; thickness variable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Younger glacial deposits</td>
<td>Till and associated gravel, sand, and silt in well-preserved moraines; thickness variable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Older glacial deposits</td>
<td>Glacial debris, gravel, sand, and silt in deposits on which morainal topography is subdued or obliterated; thickness variable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Upper lake sequence</td>
<td>Shale, brown-gray, sandstone, and conglomerate; 0 to 500 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower lake sequence</td>
<td>Shale, siltstone, and sandstone, gray, green, and red; 0 to 200 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Volcanic and intrusive rocks</td>
<td>Andesite, basalt, rhyolite flows and tuffs, and plugs; thickness variable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellowstone Group and similar units</td>
<td>Rhyolite welded tuff, gray to brown, hard to punky, containing abundant glassy quartz and feldspar crystals and local gas cavities; 0 to about 500 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bivouac Formation and volcanic rocks</td>
<td>Conglomerate containing pebbles and cobbles of Precambrian rocks and pebbles and cobbles of younger sedimentary and volcanic rocks; one welded tuff of Yellowstone Group in upper part; 0 to 1,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tecwinit Formation</td>
<td>Limestone, tuff, and claystone, white, soft; 0 to 6,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colter Formation</td>
<td>Conglomerate, red and gray, containing white tuff, diatomite, and red and white claystone; 0 to 5,500 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wind River and Indian Meadows Formations</td>
<td>Volcanic conglomerate, tuff, and sandstone, white to green-brown, containing locally derived fragments of basalt and andesite; locally contains intrusive and extrusive basalts; 0 to 7,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wiggins Formation</td>
<td>Volcanic conglomerate, gray to brown, containing white tuff layers; 0 to about 3,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unnamed sequence</td>
<td>Tuff, conglomerate, volcanic mudflow breccia, sandstone, and claystone, green; underlain by variiegated claystone and quartzite pebble conglomerate; 0 to 1,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Claystone and sandstone, variiegated, and locally derived conglomerate; persistent coal and gray shale zone in middle; 2,000 to 3,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sandstone and claystone, greenish-gray and brown; variiegated at top; intertonguing at base with quartzite pebble conglomerate; 1,000 to 2,000 feet thick.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conglomerate, brown; consists chiefly of rounded pebbles and cobbles of quartzite; coal and claystone locally at base; 500 to 5,000 feet thick.</td>
</tr>
</tbody>
</table>

July 17, 2003

Mr. Kevin Boyce, Project Manager
Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, Wyoming 82002

RE: Alta Level II Study
Re-Statement of Project Objectives and Scope of Services

Dear Kevin:

This letter summarizes comments and concerns expressed during the June 26, 2003 project meeting with the board members from the soon-to-be-formed Targhee Towne Water District. The letter also re-states the project water supply needs and suggests modifications for the 2003 Level II Study Scope of Services to assist the Targhee Towne Water District and the WWDC in the selection of the most appropriate water supply option to upgrade the existing system.

Targhee Towne Comments and Concerns. The following summarizes our understanding of the comments and concerns expressed during the June 26, 2003 project meeting.

1. **No Disruption to the Existing Wells.** The Targhee Town board members all expressed significant reservations regarding any additional high-volume pumping or development of the existing Well #1 and Well #2 as suggested in our scope of services for the Level II study. It appears that a sediment episode in May 2003, when Well #2 became plugged and ceased to operate, raised the concern among the Targhee Towne residents that the existing wells may be unstable and that additional development activity may exacerbate sediment problems. Consequently, the Targhee Towne representatives were adamant that additional drilling or testing near the existing wells should only take place if a “permanent” alternative water source was available to the system in the event that water quality (i.e. sediment production) in the existing wells was permanently impacted by adjacent drilling and testing.

2. **Desire to Place New Well(s) at Locations Separate from Wells #1 and #2.** The Level I study recommended that new well drilling efforts be focused at the location of Wells #1 and #2. This location was selected largely due to the fact that the two Targhee Towne wells appear to outperform (in terms of production rates and drawdown) other existing surrounding wells. Thus, this site was judged to have good potential for a high-yield well that could eliminate the need for a storage tank and booster pump system. In addition, piping and engineering logistics and construction and operation costs favor the existing site by clustering all equipment and facilities in the same location. However, because of the concerns expressed above, the Targhee Towne Board has
requested that alternative drilling sites be pursued, even if this option results in multiple well sites and additional system costs.

3. **Desire to Provide Chlorine Contact Time.** Although both current and pending EPA regulations regarding groundwater source disinfection (Groundwater Rule) do not require groundwater systems such as Targhee Towne to add chlorine (or other type of disinfection) or provide contact time for the disinfectant, there is concern that future changes in the regulations will require this for the water system. The current conceptual plans presented in the Level I study propose that the groundwater be discharged directly, following chlorine addition, to the distribution system. The Targhee Board suggested that this requirement be investigated as a part of the study.

4. **Include Option to Provide Fire Protection with Pond(s) and Dry Hydrant(s).** Targhee Towne representatives suggested that a “pond” and dry hydrant option should be considered for fire protection, similar to what has been done for the adjacent Altamont and Alta Meadows subdivision. The Targhee Towne representatives acknowledged that options for a pond site were limited within Targhee Towne Subdivision but felt that this option should be considered as a possible cost savings measure.

**Water Supply Needs.** The following is a restatement of the projected water supply for the Targhee Towne Water District from the Level I study. These demands are based upon Targhee Towne flow data from 2002 and experience with similar small systems.

1. **Projected Maximum Day Demand:** 200 gpm (288,000 gpd) Represents the anticipated maximum water use in a 24-hour period (including expanding the water system to 25 additional lots), driven by summertime irrigation demands. (The current combined production rate with the pumps installed in Wells # 1 and # 2 is about 120 gpm, with the existing undersized piping and flow meter.) This maximum day demand will be required for any type of system configuration – with or without storage – and should be able to be sustained for most of the summer months.

2. **Projected Peak Instantaneous Demand:** 500 gpm. Represents the anticipated maximum water use at any time, also driven by summertime irrigation demands. Although usually occurring for 30 minutes or less, this demand rate establishes requirements for pumping capacity and is most significant when water is pumped directly from wells to the distribution system without the benefit of a large storage tank.

3. **Fire Demand:** 0, 500 or 1000 gpm. Current Teton County Regulations would require a residential development such as Targhee Towne to provide a “central hydrant system” capable of producing flows of 1000 gpm for two hours. (Teton County Fire Protection Resolution Chapter II) However, since Targhee Towne predates these regulations, there are no specific standards that apply. The Level I report presented three options: no fire flow; a 500 gpm central system; and a 1000 gpm central system. The 500 gpm was the recommended option, mostly on the basis of cost. Fire flows are typically added to the maximum day demand (200 gpm) resulting in a total demand for this alternative of about 700 gpm for the minimum two-hour period. An independent pond and dry hydrant option was not considered in the Level I study as this would not likely be eligible for WWDC funding.
Principal Water Supply Options. After reviewing the comments from the Targhee Towne representatives and the available technical information, we believe that there are three principal water supply options that can potentially satisfy future water supply requirements for the Targhee Towne District and warrant consideration in the Level II Study: Concept level costs have been developed for each option -- based upon numerous assumptions -- for general comparison purposes along with a listing of advantages and disadvantages. (See Table 1) (Other aspects of the overall water system such as leak detection, transmission and distribution, etc. that are the same under all supply alternatives are not addressed here or in Table 1.)

1. Multiple (three or four) Wells with a Total Capacity of 700 gpm (or 500 gpm without fire protection) at Current Site Without Storage.

2. Two Wells with a Total Capacity of 200 gpm at Current Site with a storage tank and booster pumps. (The storage and booster pumps for this option can also be configured with and without fire flow.)

3. Multiple Wells with a Total Capacity of 700 gpm (or 500 gpm without fire protection) at New Site(s) Without Storage.

Based on the initially favorable results of the Level I testing with respect to production capacity, options 1 and 2 were the focus of the Level I Study. Option 3 has been added in response to concerns raised by the Targhee Towne representatives over additional use of the existing well site. On the basis of construction and maintenance costs and engineering logistics, Option 1 with fire flows was previously recommended for additional evaluation under the Level II study. If sediment problems at the existing well site could be overcome, that alternative had the greatest potential for meeting project objectives.

Suggested Scope of Services, Budget and Schedule Modifications. Three additional tasks and the modification of two tasks are suggested to allow a more thorough investigation of the suggested water supply alternatives in response to Board concerns. The additional information developed as a result of these tasks is designed to help the Targhee Towne Water District and WWDC make a more informed decision with regard to the drilling of an exploratory well and the ultimate water supply system option that will serve the district.

Phase I / Task 2A. Logging of Wells # 1 and # 2. This task is designed to provide additional information about the condition of the existing wells without subjecting the wells to the stress of additional pump testing / development. It may be possible to develop useful information on the condition of the wellbores behind the perforated casing using geophysical logs; the open-hole portions of the wells are available for direct inspection through television and/or caliper-log inspection. The production characteristics of individual zones within each well may be amenable to investigation using a “spinner” log accompanied by a small submersible pump. The temporary removal of the pumps from these wells would also allow resolution of conflicting reports of current depths. (Well No. 2 was reported to have been measured at 415 ft deep in October, 2002, yet was reported to be filled with sediment to a depth of 270 ft. in May, 2003.) Because all three water-supply options involve the continued use of these
wells, additional investigation of their condition is recommended in any case. Additional activity to address sediment-production issues would then be based on the results of this logging investigation. The tests would be conducted independently on each well to allow one well to operate normally at all times. The subdivision would be subject to this reduced pumping capacity for approximately 1 day during logging activities.

Phase I / Task 2B. Reconnaissance-level Pump Testing of Surrounding Wells. This task is provided to generate information on the feasibility of construction of high-yield (>150 gpm) wells at sites other than the existing wellfield. The owner of the recently-completed Alta Meadows Fire Well (50 gpm) has volunteered this well for limited testing. It may be possible to perform similar, short-term tests on other near-by wells (e.g. Alta School, Episcopal Church, Altamount private wells). These tests would be performed using installed pumping equipment and electric sounders or transducers for short periods to obtain order-of-magnitude estimates of aquifer transmissivity. (The only time-drawdown data located for any wells in this area produce estimates of 8,000 gpd/ft effective transmissivity for the Targhee Towne wells and 60 gpd/ft for the Episcopal Church well. A transmissivity of at least 1,500 gpd/ft is necessary to sustain production of 150 gpm.)

Phase I / Task 2C. Testing and Monitoring of the Alta Park Well. Similar to the previous task, this work is suggested to obtain additional information on the feasibility of drilling additional wells for Targhee Towne outside the existing wellfield. This task represents a formal effort to monitor the drilling of this well (examination of drill cuttings, coordination with driller) and to assist in its testing. The Parks and Recreation Department has indicated that they do plan to drill this well in 2003 and budget has been allocated. However, timing of this well drilling will likely delay any meaningful results until late August.

Phase I Task 6. Well Construction Subcontracts. This scope would be modified to allow an option of drilling two (2) 8-inch exploratory wells vs. one (1) 10 inch well. The location of the wells would be based upon the information developed in Tasks 2A, 2B, and 2C. The 8-inch wells would be designed for flows in the range of 150 to 250 gpm compared to flows in the range of 350 to 500 gpm with the 10-inch well.

Phase II Task 1. Conceptual Design. Added to this scope item would be the analysis of disinfection options that would include the provision for chlorine contact time for systems with and without storage tanks. In addition, a conceptual design, siting options and preliminary costs will be developed for a fire protection option that includes a pond and dry hydrant.

Budgeting for the suggested scope modifications would be accomplished by shifting costs from the various tasks to the three new tasks as shown in Table 2. This proposed budget revision is still preliminary, as we are working to develop concrete costs for the logging portion of Task 2A.

Proposed tasks 2A, 2B, and 2C would take place in advance of the final siting for the exploratory well(s). A second project meeting would follow these tasks where the data would
be presented and a decision made for drilling an exploratory well or wells. These additional tasks would likely delay the primary drilling contract until September. They would also reduce the time available to finish a final report and budget recommendations in time for the November WWDC / Select Water Committee Meeting. A revised bar chart schedule is enclosed.

We look forward to the opportunity to discuss this letter and the suggested scope modifications with you in greater detail.

Sincerely,

Robert T. Ablondi, P.E
Project Engineer

Bern S. Hinckley, P.G.
Project Geologist

Cc: Lee Simmons, Targhee Towne Water District
RE: 8/17 Re-statement of Project Objectives, WWDC Alta Level II Water Supply Study

Dear Mr. Ablondi,

On August 15, I received a phone message from Lee Simmons informing me that the Targhee Towne Water District has been formed. With this requirement fulfilled, Rendezvous Engineering may go about acquiring subcontractors to perform original tasks and "additional tasks" outlined in your 8/17 letter.

Additional Phase I Tasks 2A and 2B, while not specified in the original scope of services, are certainly within a reasonable plan for the testing program. As for inserted Phase I, Task 2C, while there is no formal reciprocal arrangement between WWDC and Teton County to sit this well, this effort can fit in as an increment of the testing program for exploration. There is no overall budget increase for addition of Phase I Tasks 2A, 2B, and 2C, as re-stated, nor will a contract amendment be needed to accommodate these items. Please bill these under Phase I Task 2, 4, or 6 in your invoicing to WWDC for this work.

As for the November 1 WWDC continuing project application deadline, we need to be acutely aware in the Level II effort conducted in the next 2 months if a possible budget increase for the Level II is warranted. As a result of the testing you will conduct, if there are conclusions that compromise the existing Level II budget such that additional funding is needed to adequately complete the feasibility study, then we need to inform the sponsor so they may apply for the expanded project funding by November 1. The same goes for Level III funding requests by November 1. If it is clear by mid- to late October that a system component can go to a design/construction phase then it should be pursued if that decision can be made.

Thank you for providing the summary and goal re-statement. This really helps both myself and the sponsor in the thought process as we progress through this project.

Most Cordially,

KEVIN J. BOYCE, P.G.
WWDC Project Manager
This video is not available online. To view: please contact our office.

Email: library@wrds.uwyo.edu
Phone: (307) 766-6661
Fax: (307) 766-3785
WRDS Main Office Phone: (307) 766-6651

**Mailing Address:**
Water Resources Data System Library
Dept 3943
1000 E University Ave
Laramie, WY 82071

**Physical Address:**
Room 230
Wyoming Hall
University of Wyoming
Laramie, WY 82071
Notes for pumping test conducted at Targee towne well #1, located adjacent to Targee Towne Rd, in the Northwest portion of the subdivision. Casing diameter was measured to be 10-1/2". Initial activity was to torch-cut top of steel casing to gain access to well. Approximately 1" was removed from casing. Static water level prior to pump setting was 121.2'. Sounder cable was disturbed also at 220'. Bottom of well was not detected with cable. Pump was set with 17x lengths of 2" galv. steel drop pipe (21' each). Attempts to set with 18x lengths reached well bottom before complete. Length of pump and check valve is approx. 6'. Transducer was installed by suspended cable to a depth of 67.9' below water table. Pump cable was attached to 75kw diesel generator. During testing, connection with transducer was interrupted. Attempts to reconnect were temporarily successful, but ultimately failed. Continuation of test with sounder was contemplated, but rejected due to poor well performance and increasing amounts of sand produced with discharge as test progressed. Casing was sealed off with welded steel plate featuring removable steel cap after removal of pump.
## Pump Test Data Record

<table>
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<tr>
<th>Test Name/ Time</th>
<th>Discharge Setting</th>
<th>Time to fill Container (sec)</th>
<th>Discharge (gpm)</th>
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Test notes from pumping test conducted on Targee towne well (well #2?) located adjacent to Targee Towne Rd in south-southwest portion of subdivision. Casing diameter was measured to be 8-5/8". Initial activity was to torch-cut top of steel casing to gain access to well. Approximately 6" of stick-up was removed as result. Static water level measured prior to pump set was 94.9' below top of casing. Sounder cable encountered disturbance also at 170', 260', and seemed to reach bottom of well at 400'. Pump was set with 15x lengths of 2' galv. steel drop pipe (21' each). Length of pump and check valve to inlet is approx. 6 feet. Test transducer was lowered by attaching cable to a depth of 72.5' below water initial water table. Pump cable was connected to junction box located approx. 100' to the South. 2" PVC pipe was used to convey water approx. 50 to the west, where it was directed past a low ridge to prevent ponding immediately near well. At the initial beginning of pumping, this pipe became disconnected, and required a suspension of pumping until reconnected (roughly 10 minutes). Step test and constant rate tests were conducted, with intervening recovery period. Constant test was run throughout night, inspected twice. Rate appeared to remain constant throughout. Minimal ponding of discharged water suggested rapid infiltration. See attached spreadsheets for record of pump discharge measurements and transducer data. Casing was sealed with welded steel plate featuring removable steel cap after removal of pump.
TEST WELL # 2 - CONSTANT RATE TEST
# Pump Test Data Record

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<td>Pipe Size (in. dia.):</td>
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## Test Data

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<th>Discharge (gpm)</th>
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**Note:** Prior to 1st step, piping failure caused an interruption in pumping rates, and pumping was suspended. This occurred between 10:19 and 10:34.

Pump inlet was set at approx. 320' btoc.

Water was conveyed and discharged to ground surface approximately 50 ft. west of well.

Infiltration was apparent.
Targhee Towne Well # 1

Date
06-Nov-05 13-Nov-05 20-Nov-05 27-Nov-05 04-Dec-05 11-Dec-05

Depth to Water from Top of Casing (Feet)

Note: Transducer at 231.1 feet below top of casing.
Targhee Towne Well #1

Note: Transducer at 231.1 feet below top of casing. Measurement Interval: 2 min

Water Level Below Transducer

Time

11/13/05 12:00 AM
11/13/05 1:00 AM
11/13/05 2:00 AM
11/13/05 3:00 AM
11/13/05 4:00 AM
11/13/05 5:00 AM
11/13/05 6:00 AM
11/13/05 7:00 AM
11/13/05 8:00 AM
11/13/05 9:00 AM
11/13/05 10:00 AM
11/13/05 11:00 AM
11/13/05 12:00 PM
11/13/05 1:00 PM
11/13/05 2:00 PM
11/13/05 3:00 PM
11/13/05 4:00 PM
11/13/05 5:00 PM

Water Level below Top of Casing (Feet)
### Scenario: Summer

#### Steady State Analysis

#### Junction Report

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<th>Label</th>
<th>Elevation (ft)</th>
<th>Zone</th>
<th>Base Flow (gpm)</th>
<th>Type</th>
<th>Pattern</th>
<th>Demand Calculated (gpm)</th>
<th>Calculated Hydraulic Grade (ft)</th>
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### Scenario: Summer
### Steady State Analysis

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<th>Elevation (ft)</th>
<th>Pump Definition</th>
<th>Intake Pump Grade (ft)</th>
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<td>Zone</td>
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<td>Fixed</td>
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<td>J-17</td>
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<td>Demand</td>
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<td>65.11</td>
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### Scenario: Winter
#### Steady State Analysis
#### Pump Report

<table>
<thead>
<tr>
<th>Label</th>
<th>Elevation (ft)</th>
<th>Pump Definition</th>
<th>Intake Pump Grade (ft)</th>
<th>Discharge Pump Grade (ft)</th>
<th>Discharge (gpm)</th>
<th>Pump Head (ft)</th>
<th>Calculated Water Power (Hp)</th>
<th>Initial Pump Status</th>
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<td>Gould_6CEL-15hp</td>
<td>6,270.00</td>
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<tr>
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<td>0.00</td>
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To: Rendezvous Engineering  
Attn: Bob Ablondi  
Fax: (307) 733-2334  

Alta Park Well Log  

<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Description</th>
<th>Notes</th>
</tr>
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<tr>
<td>0 - 2</td>
<td>Top Soil</td>
<td></td>
</tr>
<tr>
<td>2 - 15</td>
<td>Cobbles, Gravel</td>
<td></td>
</tr>
<tr>
<td>15 - 35</td>
<td>Large Cobbles, 1 - 2' Gravel</td>
<td>Hard Drilling</td>
</tr>
<tr>
<td>35 - 43</td>
<td>Cobbles, Gravel, Clay</td>
<td>Medium Drilling</td>
</tr>
<tr>
<td>43 - 112</td>
<td>Large Cobbles, Gravel, Bound with Clay - Very Tight</td>
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</tr>
<tr>
<td>112 - 134</td>
<td>Smaller Gravel, Clay - Getting Looser</td>
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</tr>
<tr>
<td>134 - 141</td>
<td>Gravel</td>
<td>1st Water 10 - 15 GPM</td>
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<tr>
<td>141 - 150</td>
<td>Clay, Gravel</td>
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<tr>
<td>150 - 159</td>
<td>Gravel (4&quot;) with Occasional Boulder - 40+ GPM</td>
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<tr>
<td>159 - 163</td>
<td>Gravel &amp; Clay</td>
<td>Water Slowing</td>
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<tr>
<td>163 - 187</td>
<td>Cobbles, Gravel with Sand</td>
<td>40 - 50 GPM</td>
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<tr>
<td>187 - 190</td>
<td>Grey Mudstone - Semi-Soft</td>
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<tr>
<td>190 - 201</td>
<td>Grey Mudstone - Harder</td>
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</tr>
<tr>
<td>201 - 220</td>
<td>Grey, Very Fine, Silty Sand</td>
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Name: Alta Park Well

Well No.: 1

Well Cuttings From Depth: 150-155 Feet

Weight of Sample Tested (Dry): 6527.6 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0.0937</td>
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<tr>
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<td>114.4</td>
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<tr>
<td>16</td>
<td>0.0469</td>
<td>5912.1</td>
<td>90.57%</td>
<td>395.1</td>
</tr>
<tr>
<td>30</td>
<td>0.0234</td>
<td>6242.2</td>
<td>95.63%</td>
<td>330.1</td>
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<tr>
<td>40</td>
<td>0.0165</td>
<td>6370.9</td>
<td>97.60%</td>
<td>128.7</td>
</tr>
<tr>
<td>50</td>
<td>0.0117</td>
<td>6448.3</td>
<td>98.79%</td>
<td>77.4</td>
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<td>0.0098</td>
<td>6478.5</td>
<td>99.25%</td>
<td>30.2</td>
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<td>80</td>
<td>0.0070</td>
<td>6510.0</td>
<td>99.73%</td>
<td>31.5</td>
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<td>100</td>
<td>0.0059</td>
<td>6522.3</td>
<td>99.92%</td>
<td>12.3</td>
</tr>
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<td>200</td>
<td>0.0029</td>
<td>6526.5</td>
<td>99.98%</td>
<td>4.2</td>
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<tr>
<td>Pan</td>
<td>0</td>
<td>6527.6</td>
<td>100%</td>
<td>1.1</td>
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</tbody>
</table>

Grain Size Distribution

Cumulative Percent Retained

Grain Size in Thousandths of an inch

Grain Size Distribution-Alta-Park 3/16/2007
Name: Alta Park Well
Well No.: 1
Project No.:

Well Cuttings From Depth: **150-155 (no # 8)** Feet
Weight of Sample Tested (Dry): **1125** Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0.0937</td>
<td>114.4</td>
<td>10.17%</td>
<td>114.4</td>
</tr>
<tr>
<td>10</td>
<td>0.0787</td>
<td>509.5</td>
<td>45.29%</td>
<td>395.1</td>
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<tr>
<td>16</td>
<td>0.0469</td>
<td>839.6</td>
<td>74.63%</td>
<td>330.1</td>
</tr>
<tr>
<td>30</td>
<td>0.0234</td>
<td>1045.7</td>
<td>92.95%</td>
<td>77.4</td>
</tr>
<tr>
<td>40</td>
<td>0.0165</td>
<td>1075.9</td>
<td>95.64%</td>
<td>30.2</td>
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<tr>
<td>50</td>
<td>0.0117</td>
<td>1107.4</td>
<td>98.44%</td>
<td>31.5</td>
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<td>60</td>
<td>0.0098</td>
<td>1119.7</td>
<td>99.53%</td>
<td>12.3</td>
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<tr>
<td>80</td>
<td>0.0070</td>
<td>1123.9</td>
<td>99.90%</td>
<td>4.2</td>
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<td>0%</td>
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<tr>
<td>200</td>
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**Grain Size Distribution**

![Grain Size Distribution Graph](image-url)
Name: Alta Park Well
Project No.:

Well Cuttings From Depth: 155-160 Feet
Weight of Sample Tested (Dry): 4814.8 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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<tbody>
<tr>
<td>8</td>
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<td>3560.9</td>
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<tr>
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<td>3736.4</td>
<td>77.60%</td>
<td>175.5</td>
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<td>16</td>
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<td>89.46%</td>
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<tr>
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<td>4601.7</td>
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<td>294.4</td>
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<td>40</td>
<td>0.0165</td>
<td>4665.8</td>
<td>96.91%</td>
<td>64.1</td>
</tr>
<tr>
<td>50</td>
<td>0.0117</td>
<td>4699.3</td>
<td>97.60%</td>
<td>33.5</td>
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<tr>
<td>60</td>
<td>0.0098</td>
<td>4713.7</td>
<td>97.90%</td>
<td>14.4</td>
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<tr>
<td>80</td>
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<td>98.18%</td>
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<td>100</td>
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<td>4735.1</td>
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<tr>
<td>200</td>
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<td>4771.3</td>
<td>99.10%</td>
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<tr>
<td>Pan</td>
<td>0</td>
<td></td>
<td>0%</td>
<td>43.5</td>
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Grain Size Distribution

Grain Size in Thousandths of an inch

Well Gradation-Alta-Park 3/16/2007
Name: Alta Park Well
Project No.: 1

Well Cuttings From Depth: 155-160 (no #8) Feet
Weight of Sample Tested (Dry): 1253.9 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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<td>175.5</td>
<td>14.00%</td>
<td>175.5</td>
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<tr>
<td>10</td>
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<td>746.4</td>
<td>59.53%</td>
<td>570.9</td>
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<td>16</td>
<td>0.0469</td>
<td>1040.8</td>
<td>83.01%</td>
<td>294.4</td>
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<td>0.0234</td>
<td>1104.9</td>
<td>88.12%</td>
<td>64.1</td>
</tr>
<tr>
<td>40</td>
<td>0.0165</td>
<td>1138.4</td>
<td>90.79%</td>
<td>33.5</td>
</tr>
<tr>
<td>50</td>
<td>0.0117</td>
<td>1152.8</td>
<td>91.94%</td>
<td>14.4</td>
</tr>
<tr>
<td>60</td>
<td>0.0098</td>
<td>1166.1</td>
<td>93.00%</td>
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<tr>
<td>80</td>
<td>0.0070</td>
<td>1174.2</td>
<td>93.64%</td>
<td>8.1</td>
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<tr>
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<tr>
<td>200</td>
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Grain Size Distribution

Well Gradation-Alta-Park  3/16/2007
Name: Alta Park Well  
Project No.:  
Well No.: 1  
Well Cuttings From Depth: 170-175 Feet  
Weight of Sample Tested (Dry): 4028.7 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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</thead>
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<td>2577.3</td>
<td>63.97%</td>
<td>2577.3</td>
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<tr>
<td>10</td>
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<td>2714.5</td>
<td>67.38%</td>
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<td>16</td>
<td>0.0469</td>
<td>3192.5</td>
<td>79.24%</td>
<td>478</td>
</tr>
<tr>
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<td>0.0234</td>
<td>3564.8</td>
<td>88.49%</td>
<td>372.3</td>
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<tr>
<td>40</td>
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<td>91.06%</td>
<td>103.9</td>
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<td>50</td>
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<td>3759.8</td>
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<tr>
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<td>0.0070</td>
<td>3796.5</td>
<td>94.24%</td>
<td>36.7</td>
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<td>26.2</td>
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<tr>
<td>Pan</td>
<td>0</td>
<td></td>
<td>0%</td>
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<td></td>
<td></td>
<td></td>
<td>4028.7</td>
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</table>

**Grain Size Distribution**

- **Cumulative Percent Retained**
- **Grain Size in Thousandths of an inch**

**Well Gradation-Alta-Park**  3/16/2007
Name: Alta Park Well

Well No.: 1

Well Cuttings From Depth: 170-175 (no #8) Feet
Weight of Sample Tested (Dry): 1451.4 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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<td>137.2</td>
<td>9.45%</td>
<td>137.2</td>
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<td>615.2</td>
<td>42.39%</td>
<td>478</td>
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<tr>
<td>16</td>
<td>0.0469</td>
<td>987.5</td>
<td>68.04%</td>
<td>372.3</td>
</tr>
<tr>
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<td>1091.4</td>
<td>75.20%</td>
<td>103.9</td>
</tr>
<tr>
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<td>0.0165</td>
<td>1157.3</td>
<td>79.74%</td>
<td>65.9</td>
</tr>
<tr>
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<td>0.0117</td>
<td>1182.5</td>
<td>81.47%</td>
<td>25.2</td>
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<tr>
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<td>1219.2</td>
<td>84.00%</td>
<td>36.7</td>
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<tr>
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<td>0.0029</td>
<td>1451.4</td>
<td>100%</td>
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Grain Size Distribution

![Grain Size Distribution Graph]

Well Gradation-Alta-Park  3/16/2007
Name: Alta Park Well

Well No.: 1

Well Cuttings From Depth: 180-185 Feet

Weight of Sample Tested (Dry): 3018 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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<tbody>
<tr>
<td>8</td>
<td>0.0937</td>
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<td>78.10%</td>
<td>2357.2</td>
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<tr>
<td>10</td>
<td>0.0787</td>
<td>2426.2</td>
<td>80.39%</td>
<td>69</td>
</tr>
<tr>
<td>16</td>
<td>0.0469</td>
<td>2660.2</td>
<td>88.14%</td>
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</tr>
<tr>
<td>30</td>
<td>0.0234</td>
<td>2851.2</td>
<td>94.47%</td>
<td>191</td>
</tr>
<tr>
<td>40</td>
<td>0.0165</td>
<td>2918.0</td>
<td>96.69%</td>
<td>66.8</td>
</tr>
<tr>
<td>50</td>
<td>0.0117</td>
<td>2964.5</td>
<td>98.23%</td>
<td>46.5</td>
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<tr>
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<td>0.0098</td>
<td>2981.1</td>
<td>98.78%</td>
<td>16.6</td>
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<tr>
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<td>99.39%</td>
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<td>99.96%</td>
<td>8.9</td>
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<tr>
<td>Pan</td>
<td>0</td>
<td></td>
<td>0%</td>
<td>1.2</td>
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</tbody>
</table>

Grain Size Distribution

Grain Size in Thousandths of an inch

Well Gradation-Alta-Park 3/16/2007
Name: Alta Park Well  
Well No.: 1

Well Cuttings From Depth: 180-185 (no#8) Feet
Weight of Sample Tested (Dry): 660.8 Grams

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Number</th>
<th>Slot Opening (Grain Size)</th>
<th>Cumulative Weight Retained</th>
<th>Cumulative Percent Retained</th>
<th>Sample Wt (g)</th>
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<td>660.8</td>
<td>0%</td>
<td>1.2</td>
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Grain Size Distribution

Cumulative Percent Retained

Grain Size in Thousandths of an inch
ALTA PARK WELL DISCUSSION
Board of County Commissioners
8-30-04 / Bob Ablondi – Rendezvous Engineering

1. DESIGN: Based upon the Targhee Towne Water Supply Project Findings 2002 - 2003, WWDC sponsored study. Well logs in the area show "mixed glacial and alluvial material" to about 180 to 200 feet on top of volcanic bedrock – rhyolite (depths highly variable due to nature in which bedrock occurred). Assisted by geologist Bern Hinckley, Hinckley Consulting, Laramie, Wyoming.

2. KEY ISSUES: Sediment (volcanic ash) and changing water levels (see graph) Ash is not well documented in well log records.

3. BID DOCUMENTS: Water from both gravels and volcanic bedrock. Growing data supports the concept that most water is from the gravel rather than bedrock. Suggested 350 foot total depth, although gravels end about 180 feet.

4. DRILLING RESULTS: Bedrock at about 190 feet, depth of well casing. Ash deposit at 201 feet. Ended hole at 220. Good water bearing gravels at 163 to 187.

5. COMPLETION PLAN: Cement plug to 200 feet. Pea gravel to 190. Blank pipe to 185. Well screen (60 slot, 0.060 inches), from 185 to 167. Pull back 8 inch casing to 167.

6. PUMP TESTING: Step Test / 6-16-04. 25 to 85 gpm. Steady State Test: 31.5 hours (6-17 to 6-19) @ 75 to 80 gpm. Observed sediment during early part of test, later clearing. Still sediment when pump was turned on and off vigorously.

7. PUMP SELECTION: 10 hp Goulds CLC 75 gpm @ 320 feet TDH

8. TWO RECOMMENDATIONS FOR CONNECTION TO SYSTEM:
   a. Provide separate discharge to waste to flush possible sediment. Typical for most wells, particularly for this well since it will be off during the winter months and sediment is an issue in this formation.
   b. Install flow limiting device (i.e. "Dole Valve") until gaining more experience with this well. Potential for 75 -80 gpm, however, sediment more likely at higher flows. Potential sediment problems out weigh cost for valve. Also, unsure how closely this well will parallel water levels in the Targhee Towne well.

9. WELL COST: About $8,000 below contract bid price due to changes in the design during drilling.
ALTA COMMUNITY PARK
IRRIGATION WELL

8" STEEL CASING
(8.825" O.D.)

MIXED GLACIAL AND
ALLUVIAL MATERIAL

FIGURE K Packer

180' (VARIABLE)

6" BLANK PIPE
SECTION (20')
(6.825" O.D.)

250'

OPEN AT BOTTOM

8" TELESCOPE SCREENED
SECTION (40')
(7.53" O.D.)

6" BLANK PIPE
WELDED TO SCREEN

350'

VOLCANIC BEDROCK

6" NOMINAL HOLE
OPEN HOLE

NOTE:
ALL DEPTHS SHOWN ARE APPROXIMATE AND
FOR ESTIMATING PURPOSES. FINAL DEPTHS
MAY CHANGE DEPENDING UPON CONDITIONS
ENCOUNTERED.

FIGURE 2
WELL
SCHEMATIC

NO SCALE
ALTA PARK WELL
ALTA COMMUNITY PARK
IRRIGATION WELL

8" STEEL CASING
(8.625" O.D.)

8" NOMINAL HOLE

MIXED GLACIAL AND
ALLUVIAL MATERIAL

FIGURE K
PACKER

6" BLANK PIPE
SECTION (.5")
(6.625" O.D.)

Cement Plug

8" TELESCOPE
SCREENED SECTION (.90)
(7.53" O.D.)
(167-185)

VOLCANIC BEDROCK

NO SCALE

FIGURE 2
WELL SCHEMATIC

ALTA PARK WELL
ALTA PARK WELL

DATE / TIME

DEPT TO WATER (FT)

Step Test 6-16-04

2:00 PM 3:00 PM 4:00 PM 5:00 PM 6:00 PM

0.0 20.0 40.0 60.0 80.0 100.0

98.0 ft 2:30 PM 5:09 PM 99.4 ft

below transducer

98.0 ft 2:30 PM

25 gpm

40 gpm

60 gpm

75 gpm

85 gpm

5:09 PM 99.4 ft
DIMENSIONS AND WEIGHTS

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<th>HP</th>
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(All dimensions in inches and weights in lbs. Do not use for construction purposes.)

PLEASE NOTE:
- Order motors separately.
- For intermediate horsepower pumps consult factory.
- Solid line is recommended operating range. The dotted line (- - --) signifies an alternate pump selection is available.
- Please specify all options changes in W.E. order number.

MATERIALS OF CONSTRUCTION

<table>
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<tr>
<th>Part Name</th>
<th>Material</th>
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<tr>
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<td>Bronze Bearings</td>
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<td>ASTM A240 S 30400</td>
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<tr>
<td>Suction Strainer</td>
<td>ASTM A240 S 30400</td>
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Goulds
Vaughn,

Attached is a sketch of the proposed completion for the Alta Park Well. This plan calls for the placement of a cement plug in the bottom of the well to isolate the fine grained ash material encountered from about 200’ to 220’. This ash material has been encountered in several wells in the area and has caused problems for submersible pumps.

We suggest a total of 20 feet of 8-inch telescope size 60 slot well screen\(^1\) placed from 185’ to 167’, allowing a two-foot overlap into the well casing. The well casing would be retracted to 165’. We also suggest a 5 foot long 6 inch diameter steel pipe tail section welded to the bottom of the screen that would support on top of the cement plug. This tail pipe should also have a bottom plate.

We would anticipate setting the well pump intake at about 165’ to maximize the available drawdown. This is based upon a current static water depth of about 135’ and an anticipated seasonal low water table of about 160’ at this location\(^2\). This would mean that the pump motor would extend partially into the screened section.

Following the installation of the screen and development of the well, we anticipate developing the well for an estimated 16 hours. We would then run a test with a test pump capable of producing up to 250 gpm at a total head of 175 feet TDH. We would also want to be prepared to run the test pump for as long as 48 hours.

We will also need a unit price (per cubic foot) from you for the cement plug. Based upon the suggested completion, there would be a potential for about 12 cubic feet of cement required. Please call with any comments or questions.

---

\(^1\) Johnson stainless steel “v” notch or approved equal.
\(^2\) Based upon measurements taken at the Targhee Towne Well #1
Vaughn,

Based upon my review of the pump test, it appears that we can pump about 80 gpm with some confidence. I would suggest that we choose a pump with a design flow of 80 gpm and total dynamic head of 320 feet. A 3 inch drop pipe should work and I would set the pump down at 160 feet plus the depth of the pitless and pump end. (8 lengths of pipe) Also, a No. 10 AWG cable should be adequate assuming we have a 10 hp 460 VAC motor.

As far as pump end is concerned, my Goulds catalog is old but a Model 5 CLC 10hp 6 stage 3.72” impeller looked reasonable. See what you think.

We will also need to figure a way to allow the pump to drain back when not in use. (automatic bleeder valve?) I don’t want to rely on the maintenance people to manually open a valve, knowing that this is not likely to happen.

Give me a call so we can discuss the final completion items for this well.

Bob Ablondi
RIGHT-OF-WAY EASEMENT AND USE AGREEMENT

This agreement, made this 11th day of December, 1981, by and between William J. Schneider, GRANTOR, and Alta Associates, a California Partnership, by James D. Ball, General Partner, GRANTEE.

1. Grant of Right-of-Way Easement. That for Ten Dollars ($10.00) and other good and valuable consideration, receipt whereof being hereby acknowledged, the Grantor hereby grants and conveys to the Grantee, its successors and assigns, an easement and right-of-way over, across and through a strip of land 60 feet in width generally along the Grantor's south property line, for that tract of land recorded in the Office of Clerk of Teton County, Wyoming in Book 103 of Photo on Pages 870 to 872, more particularly described in Exhibit "A" attached hereto and by this reference made a part hereof, to be used for ingress and egress for vehicular and foot traffic, snow storage and the construction and maintenance of the uses within the easement area, to serve the northern half of that land owned by Grantee and generally contiguous with Grantor's land on the east.

2. Easement to Run with Land. This grant of easement is hereby granted unto the Grantee, its successors and assigns, as appurtenant to that portion of Grantee's land being served by this easement and shall also run with the Grantor's land and title thereto and be binding on Grantor, his heirs and any person who shall thereafter acquire title to Grantor's property.

3. Easement Not to be Obstructed. The Grantor and Grantee shall use the rights-granted herein with due regard to the rights of the other and their use thereof, and shall not use the easement in any way that will impair the rights of others to use it, and shall not obstruct passage thereon.

4. Common Easement. The easement described herein shall also be for the use and benefit of the Grantor, his heirs, successors and assigns.

5. Maintenance and Repair. The Grantee, its successors and assigns, covenants with Grantor, that from time to time as necessary to serve the Grantee's property, at its own cost and expense, to maintain and repair the easement and the improvements on the land and easement so that the Grantee, its successors and assigns, may have the benefit of the easement.

V. Jolynn Cooper
expense, will construct, repair and maintain in a proper, substantial and workmanlike manner, the above-described easement.

6. Indemnification. Grantee agrees to hold harmless and indemnify the Grantor from and against any and all claims, suits, actions, damages and/or causes of action arising from any personal injury, loss of life and/or damage to property sustained on or about the easement area, and from and against all costs, counsel fees, expenses and liabilities incurred in and about any such claim, the investigation thereof or the defense at any levels of any action or proceedings brought thereon, and from and against any orders, judgments and/or decrees which may be entered therein. Included in the foregoing provisions for indemnification are any expenses that Grantor may be compelled to incur in bringing suit for the purpose of enforcing rights under this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this agreement to be effective on the day and year first above written.

GRANTOR:

[Signature]

William J. Schneider

GRANTEE:

Alta Associates, a California Partnership

By: [Signature]

James D. Hall, General Partner

The foregoing instrument was acknowledged before me by William J. Schneider this 11day of December, 1981.

Witness my hand and official seal.

[Signature]

Notary Public

My Commission Expires:

[Stamp]
STATE OF WYOMING
COUNTY OF TETON

The foregoing instrument was acknowledged before me by James D. Ball as General Partner of Alta Associates, a California Partnership this 14th day of December, 1981.

Witness my hand and official seal.

[Signature]
Notary Public

My Commission Expires:

[Notary Seal]
Judith M. (Signature)
County of Teton
State of Wyoming
My Commission Expires Nov. 14 1984
DESCRIPTION
OF A
ROADWAY EASEMENT
FROM
WILLIAM J. SCHNEIDER
TO
ALTA ASSOCIATES.

To wit:—

That part of a tract of land of record in the Office of the Clerk of
Teton County, Wyoming in Book 103 of Photo on pages 870 to 872 which is part
of the NE/4 of Section 20, T44N, R118W, 6th P.M., Wyoming bounded as
follows:

On the south by the south line of said tract, identical with the
north lines of Lot 23 and Lot 20B of Targhee Towne Custom Home Sites Tract
No. 1, a subdivision of record in said Office as Plat No. 195;

on the west by the west line of said tract, identical with the east
right-of-way line of Treasure Drive of said Subdivision;

on the north by a line parallel with and 60 feet north of said south
line;

and on the east by the east line of said tract, identical with the
west line of a tract of record in said Office in Book 100 of Photo on pages
287 to 289.

Peter M. Jorgensen
Professional Engineer and Land Surveyor
Wyoming Registration No. 2612

July 29, 1981

EXHIBIT "A"
BEFORE THE BOARD OF COUNTY COMMISSIONERS
OF
TETON COUNTY, WYOMING

IN THE MATTER OF THE
ESTABLISHMENT OF THE TARGHEE TOWNE WATER DISTRICT

---

Grantor: BOARD OF COUNTY COMMISSIONERS
Grantee: THE PUBLIC

Doc: 9062666 R8 517 pg 566-567 Filed at 12:30 on 08/05/03
By Sherry L Dalgle, Teton County Clerk Filed: 0.00

ORDER ESTABLISHING THE TARGHEE TOWNE WATER DISTRICT

This matter of the Petition for formation of the Targhee Towne Water District was duly heard by the Teton County Board of Commissioners on the 15th day of April, 2003, and the Board of County Commissioners ordered that the question of the organization of the proposed District and the establishment of its initial Board of Directors be submitted to the electors of the District at an election to be held for such purpose.

The election was held on the 15th day of July, 2003, by mail ballot. The judges of the election have filed with the Board of County Commissioners a Certificate of Election Results dated July 21, 2003, which shows that a majority of the ballots cast were FOR the organization of the District, as follows: 20 votes FOR and 1 votes AGAINST organization of the District. The Certificate of Election Results further shows that ballots cast for the initial Board of Directors were as follows: G. L. Simmons for a five (5) year term: 21 votes; Donald R. Mckelvey for a four (4) year term: 21 votes; Ronald A. Lien for a four (4) year term: 21 votes; Rich Berges for a three (3) year term: 21 votes; and Jan Friedlund for a three (3) year term: 19 votes.

IT IS THEREFORE ORDERED AND RESOLVED, pursuant to W.S. § 41-10-101 et. seq. that:

1. The District is hereby declared to be duly and lawfully organized.
2. The name of the District shall be the “Targhee Towne Water District”. The boundaries of the District are described in Exhibit A attached hereto.
3. The initial Board of Directors of the District is hereby designated as follows:
   - Rich Berges to serve for a three (3) year initial term;
   - Jan Friedlund to serve for a three (3) year initial term;
   - Donald R. Mckelvey to serve for a four (4) year initial term;
   - Ronald A. Lien to serve for a four (4) year initial term;
   - G. L. Simmons to serve for a five (5) year initial term.
4. Two copies of this Order shall be transmitted forthwith to the Secretary of State of the State of Wyoming and one copy transmitted to the public funds division of the Department of Audit of the State of Wyoming.
5. The address for the District is P.O. Box 1137, Alta, Wyoming, 83414.

EFFECTIVE this 5th day of August, 2003

BOARD OF COUNTY COMMISSIONERS
TETON COUNTY, WYOMING

[Signature]
Chairman

Sherry L. Dalgle, County Clerk

ATTEST,

Sherry L. Dalgle, County Clerk
Exhibit A

Legal Description of the Targhee Towne Water District

Targhee Towne Subdivision: Consisting of three plats of record in the office of the Clerk of Teton County, Wyoming
1. Plat # 0195 filed April 23rd, 1971 Titled, Targhee Towne Custom Home Sites, Tract No.1, Teton County, Wyoming Part of Section 19, 20, & 30, T44N, R11BW.
2. Plat # 0204 filed December 7th, 1971 Titled, Targhee Towne Custom Home Sites, Tract No. 2, Teton County, Wyoming Part of Section 19 & 20, T44N, R11BW
3. Plat # 0206 filed February 1st, 1972 Titled, Targhee Towne Custom Home Sites, Tract No. 3, Teton County, Wyoming Part of Lot 3, Section 19 & SW 1/4 Section 20, T44N, R11BW

Lot #10, Les Trappeurs' Subdivision:
According to that plat recorded in the office of the Clerk of Teton County on February 1, 1983 in Book 1 of Maps, page 19 as plat number 532.

Also, the following parcels of record in the office of the Clerk of Teton County, Wyoming:
 Parcel Identification Number: 22-44-18-19-4-00-004, Book 398 of Photos page 598, approximately 0.65 acres of this parcel. This parcel and Lot #40 of the Targhee Towne Custom Home Sites are currently being combined and split into two parcels. The resulting two parcels are roughly 1 acre in size. This combination of about 0.65 acres of PIDN 22-44-18-19-4-00-004 and Lot #40 of the Targhee Towne Custom Home Sites results in a new Lot #69 of the Targhee Towne Custom Homesites. This action has been completed.
 Parcel Identification Number: 22-44-18-19-4-00-005, Book 445 of Photos pages 96-111
 Parcel Identification Number: 22-44-18-19-4-00-008, Book 453 of Photos page 11
 Parcel Identification Number: 22-44-18-20-3-00-008, Book 427 of Photos page 944
 Parcel Identification Number: 22-44-18-20-3-00-009, Book 462 of Photos pages 1024-1028
Date: January 17, 2007

To: Deb Wuersch

From: Don Barney

Subject: Trenching Permit – Targhee Towne Water District

Please find enclosed a copy of the approved trenching permit applied for by Targhee Towne Water District. I have also enclosed a copy of the Resolution information you requested, which recognizes that Targhee Towne County Road No. 22-24S has been added to the Teton County Road System.

If you have questions, please contact me at our office.
APPLICATION AND AGREEMENT
FOR TRENCHING AND UTILITY INSTALLATION

The undersigned, Application, hereby applies to the Road Superintendent of Teton County, Wyoming, for a permit to do certain excavating, trenching, installation and burial of utilities, on, under and through a portion of a county or public road right-of-way; the exact location and detailed description of the same being described particularly as follows:

Conversion of Test Well (U.W. 163463) to Supply Well for future use by Taghee Towne Water District. Installation of Control vault, appurtenances to hook to existing water main.

A map or diagram of said project being attached hereto and submitted therewith.

Continuing Obligations of Applicant. Applicant hereby agrees to be solely and entirely responsible for any back filling, tamping, repairing, repaving, settling, sagging, or any other condition created by or arising out of said excavation for a period of five (5) years from the date the same is commenced.

Applicant shall be solely and totally responsible for any damage that may occur to their utility. Teton County and the Teton County Road Department personnel do not acquire any responsibility of this utility by issuing this permit.

Applicant hereby makes this application and represents to the Road Superintendent of Teton County that said excavation has not commenced and shall not commence until receipt, in writing, of the approval of said Road Superintendent.

Dated: January 4, 2007

APPLICANT:

Agent, Taghee Towne Water District

APPROVAL

The undersigned, Road Superintendent of Teton County hereby approves of the foregoing, subject to the following conditions:

__________________________

Amon Creamer

Road Superintendent

Teton County
CONDITIONS OF TRENCHING

Utility Company: Teton County Water District

Date: 1/17/02

1) The company shall notify the traveling public of any anticipated delays due to construction.

2) The company shall provide data to the department that certifies the specifications for trenching were met by contractor (compaction, gravel depth, etc.).

3) The company shall be responsible for assuring appropriate work zone signing is used by the contractor (RE: MUTCD).

4) The utility being installed in the right of way is a "guest" and at any later date when this utility is in the way of future construction the utility shall be moved by the utility owner at no cost to Teton County.

5) Minimum buried depth for non-electric installation shall be 30 inches from any existing surface elevation.
EXHIBIT TO ACCOMPANY
TETON COUNTY, WYOMING
APPLICATION FOR TRENCHING
AND
UTILITY INSTALLATION
Targhee Towne Water District

Job # 06-013 Alta III
January 4, 2007
KC/DW

(Targhee Towne Supply Well No. 4
(formerly Targhee Towne Test Well #2)
TELECOPY MESSAGE

DATE: 1/3/07
FROM: Don Barney

PLEASE HAND DELIVER TO:

PERSON: Rick Wanerch
COMPANY: Pendleton Engineering
FAX NO.: 733-7334

TOTAL NUMBER OF PAGES *INCLUDING* COVER SHEET: 6

NOTE:

Rev,

Here is the form and resolution you requested.

Best regards,

Don

PLEASE NOTIFY IF ALL PAGES OF THIS TRANSMISSION ARE NOT RECEIVED.
Teton County Commissioners Minutes
on Targhee Town Road 22-24S

Doyle Dickerson petition the Board to accept the Road in Targhee Towne I. Resolution will be prepared by Mr. Scherbel and Adopted next month.

RESOLUTION

WHEREAS, the Board of County Commissioners of Teton County deem the public interest requires that a road be established to be known as the TARGHEE TOWNE COUNTY ROAD No. 22-24S consisting of Frontier Drive; Buckskin Road except between Lots 9, 10, and 11; and Treasure Drive to Lots 40 and 68 as the same appear on the subdivision maps of record for Targhee Towne - Tract Nos. K, 2, and 3, Custom Home sites of record in the Office of the Clerk of Teton County as Plat No. 195 and Plat No. 204 and Plat No. 206; together with a map for Treasure Drive from Lots 40 and 68 and thence westerly to the Wyoming-Idaho State Line and Teton County Road No. 22-16.

WHEREAS, a right-of-way easement has been secured from Targhee Development Corporation and Idaho Corporation encompassing the patented lands involved.

Mark Rockefeller, for Donna Linsenman and John Feffs. Development Permit for construction of a loop road within the proposed Alta Ranch Subdivision. Holly gave the review. There was some discussion on issuing a development permit for the road construction before final plat. Jerry moved seconded by Max to approve subject to a letter written to the applicant stating that this in no way guarantees approval of the subdivision, and that a letter of credit will be required for any improvements not
PROTECTIVE COVENANTS FOR TARGHEE TOWNE CUSTOM HOMESITES, TETON COUNTY, STATE OF WYOMING

KNOW ALL MEN BY THESE PRESENTS: That TARGHEE DEVELOPMENT CORPORATION, an Idaho Corporation, being the owner of that certain tract of land situated in Teton County, Wyoming, and described as follows, to-wit:

Lots 1 thru 40, Tract No. 1
Of TARGHEE TOWNE CUSTOM HOMESITES in the County of Teton, State of Wyoming, as shown on the recorded plat thereof.

In order to protect subsequent lots and home owners in said TARGHEE TOWNE CUSTOM HOMESITES in the County of Teton, Wyoming, and in order to assure a uniform and desirable use, occupancy and buildings on said real property, do hereby impress the above described real property with the following covenants and restrictions:

A. No lot shall be used, except for residential purposes. No building shall be erected, altered, placed or permitted to remain on any lot other than one detached single family dwelling not to exceed 2 stories in height and a private garage for not more than three cars.

B. No building shall be erected, placed or altered on any lot until the construction plans and specifications, and a plot plan showing the location of the structure, have been approved by the Architectural Control Committee, as to quality of workmanship and materials, harmony of external design with existing structures, and as to location with respect to topography and finish grade elevation. No chain link, wire mesh, barbwire, or metal fences will be allowed. Approval shall be provided in paragraphs H & I.
C. No dwelling shall be permitted on any lot wherein the
ground floor area of the main structure, exclusive of
one story open porches and garages, shall not be less than
1,000 square feet.

D. No building shall be located on any lot nearer to the
front lot line than 30 feet, nor nearer to the side lot line
than 10 feet, nor nearer than 15 feet on the wide yard of the
corner lot. For the purpose of these covenants, steps and
open porches shall not be considered as a part of a building;
provided, however, that this shall not be construed to permit
any portion of a building on a lot to encroach upon another
lot.

E. Basements for the installation and maintenance of
utilities and drainage facilities are reserved as shown on
the recorded plat thereof.

F. No noxious or offensive activity shall be carried on
upon any lot, nor shall anything be done thereon which may be or
become an annoyance or nuisance to the neighborhood. No
hunting or molesting of any animals shall be carried on
within TARGHEE TOWNE, nor shall any firearms be discharged.

G. No structure of a temporary character, trailer,
basement, tent, shack, garage, barn, or other outbuilding
shall be used on any lot at any time as a residence either
temporarily or permanently, a one-time exception will be
allowed to allow a construction trailer to be placed upon
any one lot for 120 consecutive days during the construction
of buildings upon the lot.

H. The Architectural Control Committee is composed of
Lyle and Doyle Dickerson, Jeffery Stone, two lot owners of
TARGHEE TOWNE CUSTOM HOMESITES, and one person to be selected
from the staff of an acceptable engineering firm in the State of Idaho, or State of Wyoming, said person to be selected by the other five members of the Architectural Control Committee. A majority of the committee may designate a representative to act for it. In the event of death or resignation of any member of the committee, the remaining members shall have full authority to designate a successor. Neither the members of the committee, nor its designated representatives, shall be entitled to any compensation for services performed pursuant to this covenant. At anytime, the then record owners of a majority of the lots shall have the power through a duly recorded written instrument to change the membership of the committee or to withdraw, or restore to the committee any of its powers and duties.

I. The committee's approval or disapproval, as required in these covenants shall be in writing. In the event the committee or its designated representative fails to approve or disapprove within thirty (30) days after plans and specifications have been submitted to it, or in any event, if no suit to enjoin the construction has been commenced prior to the completion thereof, approval will not be required and the related covenants shall be deemed to have been fully complied with.

J. No sign of any kind shall be displayed to the public view on any lot except one professional sign of not more than 216 sq. in., one sign of not more than five square feet advertising the property for sale or rent, or signs used by a builder to advertise the property during the construction and sales period.

K. No animals, livestock, or poultry of any kind shall be raised, bred or kept on any lot, except that dogs, and cats or other household pets may be kept on leash provided
that they are not kept, bred, or maintained for any commercial purpose.

L. No lot shall be used or maintained as a dumping ground for rubbish. Trash, garbage or other waste shall not be kept, except in sanitary containers. All incinerators, or other equipment for the storage or disposal of such material shall be kept in a clean and sanitary condition and not become offensive or a nuisance. Garbage shall not be visible from any other property or street and shall be disposed of to comply with health standards of the State of Wyoming.

M. No individual water supply system shall be permitted on any lot unless such system is located, constructed and equipped in accordance with the requirements, standards and recommendations of the State and Municipal Health Authorities and all laws, regulations and ordinances, State and Municipal. Approval of any such system installed shall be obtained from such authority.

N. No individual sewage-disposal system shall be permitted on any lot unless such system is located, constructed and equipped in accordance with standards and requirements of the Wyoming State Department of Public Health. Approval of such system shall be obtained from the Health Authority having jurisdiction, and said sewage disposal system shall be constructed in conformity with all Municipal, County and State Health Authorities.

O. No fence, wall, hedge, or shrub planting which obstructs sight lines at elevations between two and six feet above the roadways shall be placed or permitted to remain on any corner lot within the triangular area formed by the street property lines and the line connecting them at points 25 feet
from the intersection of the street lines, or in the case of a rounded property corner from the intersection of the street property lines extended, except with approval of the Architectural Control Committee. The same sight-line limitations shall apply on any lot within ten feet from the intersection of a street property line with the edge of a driveway or alley pavement. No tree shall be permitted to remain within such distance of such intersections unless the foliage line is maintained at sufficient height to prevent obstruction of such sight lines, except with written approval of the Architectural Control Committee.

P. All permanent power lines, both primary and secondary, will be placed underground. The only overhead line will be the supply line for temporary construction purposes.

Q. The Architectural Control Committee must approve the cutting of all trees on each and every lot, said approval to be allowed only when the removal of trees is absolutely essential for the building of a structure upon the property, the committee having both the aesthetic and practical impact of said cutting to be the primary consideration in allowing said cutting.

R. Only one dwelling shall be built upon any lot. No lot may be further subdivided without the approval of the Architectural Control Committee.

S. No structure built upon any lot shall have a metal roof of any kind. Upon chimneys a spark screen shall be installed which will meet the requirements of the Architectural Control Committee.

T. Enforcement of the protective covenants shall be by proceedings at law or in equity against any person or persons violating or attempting to violate any covenant, either to restrain violation or to recover damages.
U. Invalidation of any provision of these covenants by judgment of court order shall in no way affect any of the other provisions, which shall remain in full force and effect.

These covenants are to run with the land and shall be binding upon all parties and all persons claiming under them, until the 22nd day of April, 1996, at which time said covenants shall be automatically extended for successive periods of ten years, unless by a vote of the majority of the then owners of the lots in said TARGHEE TOWNE CUSTOM HOMESITES, Tract No. 1, it is agreed to change said covenants in whole or in part.

IN WITNESS WHEREOF, the owners of the aforesaid property, does hereby impress the above protective covenants this 22nd day of April, 1971.

TARGHEE DEVELOPMENT CORPORATION
an Idaho Corporation

[Signature]
Its President

Attest:

[Signature]
Secretary-Treasurer
On this 22nd day of April, 1971, Before me, the undersigned notary public in and for the State of Wyoming, personally appeared Shayne T. Linderman and Doyle I Dickerson, known to me to be the President and Secretary-Treasurer of Targhee Development Corporation, which corporation subscribed to the within instrument, and acknowledged to me that they executed the same on behalf of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year first above written.

[Notary Public Signature]

County Clerk Notary Public for Wyoming
Residing at Jackson, Wyo.
My Commission Expires: 1/1/20
TEMPORARY ACCESS AGREEMENT

1. **Parties.** The parties to this Access Agreement are Robert L. and Judith A. Blair, [Landowner] whose address is 590 Targhee Towne Road, P.O. Box 135 Driggs, Idaho 83422; and Rendezvous Engineering, PC., [Consultant] whose address is 25 South Gros Ventre Street, P.O. Box 4858, Jackson, Wyoming 83001.

2. **Purpose of Access Agreement.** The Wyoming Water Development Commission [WWDC] desires to undertake a project known as the Alta Level II Water Supply Project [Project] to explore for and develop an underground source of water for the Targhee Towne Water District [Sponsor]. The 57th Session of the 2003 Legislature of the State of Wyoming authorized and appropriated funds to the WWDC for the Project to drill a well and study the feasibility of providing water from the well to the Sponsor. The WWDC and the Sponsor wish to develop the well and appurtenances necessary to provide water from the well to the Sponsor. The purpose of this Access Agreement and Easement is for the Consultant to obtain access to and a permanent easement on lands owned and occupied by the Landowner to drill, monitor, test, operate, repair, develop and maintain the well and to install and maintain a pipeline as required by the WWDC or the Sponsor to deliver water from the well to the Sponsor for its intended use.

This temporary agreement shall govern for a sufficient period of time such that the Consultant may carry out the aforementioned effort. The Access Agreement shall remain in force for the term (See Item 3), or as amended, or until the Sponsor makes a decision and meets all legal requirements to purchase the well and such action is approved by the WWDC and the Wyoming Legislature. If the well performance meets the Sponsor's needs and requirements for a municipal supply source, then the Landowner and the Sponsor may negotiate terms of a permanent well and pipeline access and easement in lieu of this Access Agreement.

3. **Effective Date and Term of Access Agreement.** This Access Agreement is effective when all parties have executed it. This Access agreement shall expire five (5) years from the date of the last signature under Item 7 herein.

4. **Payment.** In consideration of the sum of five hundred dollars ($500.00) paid by the Consultant, the receipt of which is hereby acknowledged by the Landowner, the parties have entered into the Access Agreement described herein.

5. **Specific Provisions.**

   A. **Well Access.** Landowner hereby acknowledges, grants, bargains, sells and conveys to the Consultant, its subconsultants, contractors, subcontractors, agents, employees and assigns the right to construct a test well and to enter and transport personnel and equipment upon Landowner's land described in Exhibit A, and proposed well site shown on Exhibit B,
with the right of ingress to and egress from said well site over Landowner's land from the Targhee Towne Road as may be reasonably required to drill, monitor, test, operate, repair and otherwise maintain the test well.

B. Well Easement. Landowner hereby acknowledges, grants, bargains, sells and conveys to the Consultant, its subconsultants, contractors, subcontractors, agents, employees and assigns a temporary access easement of an area 50 feet from the well for the purpose of drilling, developing, casing, monitoring, operating and maintaining the test well.

C. Operating Rules. The following operating rules shall apply to all activities of the Consultant, its subconsultants, contractors, subcontractors, agents, employees and assigns:

(1) Notice shall be given to Landowner by telephone 24 hours prior to entering upon Landowner's land.

(2) No pit or trench will be left unattended for any period of time without fencing, and all necessary precautions will be taken to avoid damage or injury to Landowner and Landowner's licensees, permittees and property. Decisions on the access route over Landowner's property to the well site shall be made in consultation with the Landowner.

(3) Landowner's lands, roadways, or roadway improvements disturbed as a result of activities performed under this agreement will be reclaimed by grading and reseeding and by other restoration or reconstruction as necessary. Landowner shall, in advance of such reclamation or other restoration, be advised of the reclamation plan.

D. Abandonment of Well. In the event the WWDC determines that the well is to be abandoned, Landowner shall have the option of taking over the well at a cost not to exceed the consideration the Landowner received for the access and easement provided by this Agreement. Landowner shall be given notice of any intent to plug and abandon the well and shall have ten (10) days thereafter to exercise the option in writing. If Landowner exercises the option, Landowner shall become responsible for future operations and properly plugging and abandoning the well if Landowner decides or is required to do so, and the WWDC, its consultants, subconsultants, contractors, subcontractors, agents, employees and assigns shall have no further responsibility for operating or plugging and abandoning the well. If Landowner does not exercise the option, the WWDC shall properly plug and abandon the well. In the event the Landowner exercises its option to take over the exploration well as aforesaid, Landowner, hereby grants to the State of Wyoming, its agents and employees, the right of access over Landowner's property to said well for purposes of from time to time, monitoring hydraulic head of said well.

E. Assignment to Sponsor. The Consultant may assign this Access Agreement to the WWDC or the Targhee Towne Water District.
F. **Appurtenance to Land.** This Access Agreement shall run with the land and shall be binding upon and inure to the benefit of all signatory parties hereto, their successors and assigns.

6. **General Provisions.**

A. **Amendments.** Any changes, modifications, revisions or amendments to this Access Agreement which are mutually agreed upon by the parties to this Access Agreement shall be incorporated by written instrument, executed and signed by all parties to this Access Agreement.

B. **Applicable Law/Venue.** The construction, interpretation and enforcement of this Access Agreement shall be governed by the laws of the State of Wyoming. The Courts of the State of Wyoming shall have jurisdiction over this Access Agreement and the parties, and the venue shall be the First Judicial District, Laramie County, Wyoming.

C. **Entirety of Access Agreement.** This Access Agreement, consisting of five (4) pages, a legal description (Exhibit A) and a map of the proposed well (Exhibit B) represents the entire and integrated Access Agreement between the parties and supersedes all prior negotiations, representations, and agreements, whether written or oral.

D. **Notices.** All notices arising out of, or from, the provisions of this Access Agreement shall be in writing and given to the parties at the address provided under this Access Agreement, either by regular mail or delivery in person.

E. **Sovereign Immunity.** The State of Wyoming and the WWDC do not waive sovereign immunity by allowing the Consultant to enter into this Access Agreement, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyo. Stat. 1-39-104(a) and all other state law.

7. **Signatures.** In witness thereof, the parties to this Access Agreement, either personally or through their duly authorized representatives, have executed this Access Agreement on the days and dates set out below, and certify that they have read, understood, and agreed to the terms and conditions of this Access Agreement.
The effective date of this Access Agreement is the date of the signature last affixed to this page.

[Robert T. Ablondi, Vice President] 9-15-09

STATE OF WYOMING )
COUNTY OF Teton ) ss

The foregoing instrument was acknowledged before me this 15 day of September, 2004, by Robert T. Ablondi.

Kimberly K. Tait - Notary Public

(Seal)
STATE OF WYOMING  
COUNTY OF Teton  

The foregoing instrument was acknowledged before me this 7th day of October, 2004, by Robert L. Blair.

(Seal)

DAVID L. KEARSLEY  
Notary Public  
State of Idaho

10-1-04
Date

STATE OF WYOMING  
COUNTY OF Teton  

The foregoing instrument was acknowledged before me this 7th day of October, 2004, by Judith A. Blair.

(Seal)

DAVID L. KEARSLEY  
Notary Public  
State of Idaho
EXHIBIT A

LEGAL DESCRIPTION

A portion of Government Lot 3, Section 19, Township 44 North, Range 118 West 6th P.M., County of Teton, State of Wyoming and being more particularly described as follows:

Beginning at a point that is South 89° 58' 10" West 5.00 feet from the S.W. Corner of Lot 40 of TARGHEE TOWNE CUSTOM HOME SITES, Tract No. 1, Teton County, Wyoming; and running thence South 89° 58' 10" West 454.92 feet; thence South 0° 07' West 409.95 feet to a point of curve with a radius of 20.00 feet and a chord that bears South 44° 57' 25" East 28.32 feet; thence 31.36 feet along said curve; thence North 89°58'10" East 276.05 feet to a point of curve with a radius of 50.00 feet and a chord that bears North 44° 58' 10" East 70.71 feet; thence 78.54 feet along said curve; thence North 0° 01' 50" West 270.00 feet to a point of curve with a radius of 110.00 feet and a chord that bears North 43° 43' 50" East 147.7186 feet; thence 172.79 feet along said curve to the point of beginning.
POSSIBLE FUTURE PERMANENT EASEMENT AREA
AREA = 0.015 ACRES

TRANSFORMER (FUTURE)
BURIED CONTROL/CHLORINATION VAULT (FUTURE)
POWER JUNCTION (FUTURE)

CONNECT TO EXISTING SYSTEM (FUTURE)

EXISTING TREES

EXISTING WATER SERVICE

TREES

EXHIBIT B
BLAIR PROPERTY WELL ACCESS EASEMENT MAP
RE: Water Line Leak Detection

Mike Piker, inspector for Rendezvous Engineering, was on site to oversee and assist Greg Sutton of Sutton Excavation in excavating the existing subdivision water main at six predetermined locations (see attachment 1). At each water main location the pipe was inspected and tested for leaks. Geoff Ashworth of Hughes Leak Detection was on site and used ultra sonic equipment to check the water main for leaks. Also present during portions of the site work was Lee Simmons, President Targhee Town Water District, Ron Lien, board member, and Bob Ablondi, Project Manager Rendezvous Engineering. After inspection and leak testing, the water main location was carefully marked and each excavation trench was backfilled for safety.

The following is a detailed report for each excavated water main location:

Location 2 – Mike Piker met Greg Sutton of Sutton Excavation at 7:30 a.m. at Targhee Town. Since the backhoe was already on the south end of the subdivision it was decided to start at location 2 and work towards the north locations. The 6” water main was found at 9:20 a.m. and was located approximately 7.5’ deep and 8’ off the east edge of the road. The condition of the pipe could not be determined from visual inspection. Geoff Ashworth of Hughes Leak Detection tested the pipe for leaks at 9:25 a.m. No leaks were discovered.

Location 6 – There were power utilities located in the vicinity of this location. This slowed progress until the exact location of the power lines from the existing sector box could be located. See Illustration 2. The 6” water main was finally found at 11a.m. It was located 7’ deep and approximately 10’ east of the sector box, 12’ north...
of the existing fence and 16’ southeast of the road edge. The condition of the pipe could not be determined from visual inspection. Ultra Sonic testing did not reveal any leaks.

![Image 1](image1.png)

**Illustration 2**  
Red flagging Indicates Water Main Location  
Note Power Lines at the Lower Right

**Location 5** – The 4” water main was found at 12:15 p.m. This section of pipe showed evidence of a repair. The repair appeared to be a sleeve section of larger pipe diameter glued to the 4” main and held tightly by a corroding metal hose clamp and wood shim. See Illustration 3. The water main was located 5’ deep and 10.5’ north of the edge of the roadway. Ultra Sonic testing did not reveal any leaks.

![Image 2](image2.png)

**Illustration 3**  
Existing Water Main Pipe Repair at Location No. 5

**Location 3** – Excavation was started at this location at 12:30 p.m. At 12:45 p.m. the water main was hit by the backhoe bucket and broken. This inspector immediately isolated the north end of the water system at the isolation valve located between lots 19 and 20. Once the system was isolated, Sutton Excavation pumped the water from the hole to expose the break and make the repair. See Illustration 4.
The repair was made using a section of ASTM D1785 4” Sch. 40 PVC pipe and two ductile iron couplings. See Illustration 5. The water main was back on line by 3:45 p.m. and tested for leaks. None were detected. The existing pipe was noted as SDR-26, ASTM 2241 PVC and appeared to be relatively new compared to other inspected locations. The water main is 4.5’ deep and located 12’ from the road edge.

**Location 1** – The 6” water main was located at 1:15 p.m. Visual inspection did not show any damage and no leaks were detected. The water main was 6.5’ deep and located 11’ from the edge of the road. It should be noted that the excavation damaged a large portion of the homeowner’s flower garden which is located within the road.
right of way. See illustration 6. This location was excavated because a new isolation valve is to be installed. This valve will isolate the south portion of the water distribution system.

After inspection and Ultra Sonic testing at each location, the trenches were backfilled for safety. All work was completed at 5:45 p.m.

Conclusions

Five of six locations were excavated and leak tested. No leaks were found at any of the test points. The one location that was not tested was location #4. See attachment 1. At this area it was noted that the ground was saturated and water could actually be seen seeping up from the surface. It was decided that excavation without repairing the pipe in this area would create a bigger problem. The water main at this location should be repaired as soon as possible.

None of the excavation points along the 6” water main provided any opportunity to see pipe fittings or markings. Therefore, it was not possible to make any general assessments of the condition of the pipe. However, excavation points of the 4” water main along the north side of the subdivision did reveal some information. As noted above, the 4” main is SDR 26 pipe with glued joints and at least one substandard repair (location 5). This indicates that this portion of the water main is in poor condition. It should also be noted bury depth of the 4” water main is much shallower than the 6” main on the south end of the water distribution system. Although the inspection and testing points were limited, these points suggest that as a minimum this section of the system should be replaced.
BACKGROUND: The Targhee Towne Water District operates a small community water system (EPA #5600787) in Alta, Wyoming serving approximately 43 existing homes and a population of about 100. There is also a potential for a total of about 75 homes with a population with about 190 people along with several miscellaneous uses including a public park (bathroom facility), elementary school, church and bed and breakfast to be connected to the system in the future. The water system was originally constructed in the early 1970's, proceeding all current construction standards and criteria for water systems.

A November 2002 WWDC Level I (Alta Master Plan) report identified numerous deficiencies with the existing water system and recommended a number of major system-wide improvements. The study also provided estimated costs for the improvements along with funding options. Given the limited resources of the small district and the substantial financial needs, most all available funding options required the formation of a special district and the solicitation of loan and grant funds from the Wyoming Water Development Commission and Department (WWDC) of Environmental Quality State Revolving Fund (DEQ-SRF) for drinking water. A water district was subsequently formed in 2003.

A follow-up Level II study was authorized by the legislature in 2003 which was designed to investigate groundwater options in the area. The Level I study recommended drilling a test well adjacent to the current main supply well. However, continued were concerns raised by the members of the Targhee Towne District relative to the production of fine volcanic sediments from the existing well and interference between the two existing main supply wells and a proposed third well. This prompted the Level II study to look at alternative sites that were physically separated from the main well site on the west and south sides of the service area. Well logs and limited pump test data from the general area suggested the potential for deeper water bearing alluvial deposits further to the west. A first site that is about 300 feet from the western boundary of the current district boundary was identified and an access easement for exploratory drilling negotiated during the summer of 2004. A second site located in within a widened section of the County Road Right of Way was also identified on the south side of the district. The Level II study was amended in 2004 to allow additional time and provide funds for a possible second exploratory well.

The Level I and Level II studies also revealed, through an extensive groundwater level monitoring effort, a substantial drop in water level that occurs in the Alta area from summer to fall. A water table drop of about 60 feet was observed between the July 2002 and November 2002 in the Targhee Town Well # 1. A similar drop was
also observed in 2003. There was also a recent report of a significant drop in production in one higher capacity well located in Idaho just south and west of the District, as a result of the general water table drop. This change in water table suggests that well yields may vary greatly from summer to winter season and supports the importance and value of a drilling and testing program conducted during low groundwater periods to better define the year-round production capabilities.

**LEVEL II STATUS:** A contract for an exploratory well was bid and awarded to Andrew Well Drilling. The first exploratory well, near the west boundary of the District, was drilled to a depth of approximately 360 feet in November 2004. Preliminary estimates of yield are in the range of 15 to 20 gpm, mostly from the lower volcanic bedrock formation common to the area. A more complete pump test is scheduled for later this month.

A second test well has been drilled to a depth of 400 feet and completed with the installation of a stainless steel on the south side of the District. The well screen, set at a depth from 175 to 185 feet, takes advantage of coarse gravels deposits in addition to small fractures in the deeper bedrock formation for the production of water. Preliminary results, based upon air lifting from the bottom of the hole, indicate a flow in the range of 50 to 100 gpm. More complete testing is scheduled for the next several weeks. This second exploratory well location is also adjacent to the water distribution system and would similarly be independent from both the existing well site and the exploratory well site on the west side.

A third exploratory well is planned for a site approximately 100 feet from the main existing supply well on a lot currently owned by the District. This well would replace existing Well # 2 which is recommended for abandonment. This additional well would be added to the system to make up for lower than anticipated yields from the first two exploratory well. This additional well will help the District to achieve the desired goal of a total combined 500 gpm production rate.

**RECOMMENDED IMPROVEMENTS:** Given the continued concerns for sediment in the area and potential risks associated with a single source of supply, a multiple well system is proposed for the Targhee Towne District. This would include an upgrade of the existing well (Well # 1) which is anticipated to yield between 200 and 300 gpm. In addition, the plan assumes that a second well at the west end of the district (Well # 3) with be added with a projected, yielding 25 to 50 gpm. A third well would also be added at the south end (Well # 4) with an estimated yield of about 75 to 100 gpm. And a replacement for Well # 2 would be added at the existing site with an anticipated yield of 100 to 150 gpm. The actual yields at each of the three sites may be modified depending upon the results of the drilling and testing, however are expected to total about 500 gpm from all sources. This overall plan also assumes the abandonment of the existing Well # 2, which has experienced significant and continuing sediment problems during the past year. Overall estimated capital costs are summarized in Table 1.
Costs for the water supply wells are summarized in Table 2. Because the new wells are being drilled as a part of the Level II study, the initial drilling cost is paid by the WWDC. If the wells are successful, the District will be responsible for the purchase of the wells which would include 50% of the actual drilling costs. The purchase price would not include the testing and engineering associated with the exploratory drilling contract. However, this 50% would not be eligible for WWDC grant funding (50% has already been paid for as a part of the Level II study) nor would it be eligible for a DEQ State Revolving Fund drinking water loan. The DEQ-SRF loan requires the preparation of an Environmental Assessment before any ground disturbing activities. The District’s 50% portion would however be eligible for a WWDC loan. The remaining well improvements, including the installation of the well pumping equipment and drop pipe, would be completed under a Level III construction project as summarized in Table 2.

Although the independent well option gives the District greater flexibility and supply to meet future needs, each well site will require an independent flow meter and disinfection equipment as required by DEQ standards. The new remote wells assume the use of underground concrete vaults for controls, flow meter and disinfection systems to minimize above ground structures and costs. A new building is proposed at the existing Well # 1 site (on land owned by the Targhee Towne Water Company, the entity previously responsible for the water system), which house the central controls and a generator that would provide standby power for Well # 1 and new Well # 5. All supply wells would be controlled using variable frequency drive (VFD) units that would modulate pump motor speed and pumping rates based upon demand to maintain a constant pressure in the system. The VFD arrangement eliminates the need for a large storage tank while allowing pumps to ramp up and ramp down gradually on start up and shut down to minimize pressure transients. Control and communication among the wells would be accomplished with a radio telemetry system that would send signals to a central location. Estimated costs for the well connections, flow metering, disinfection and controls is presented in Table 3.

A second major component of the system improvements includes the construction of a new transmission system that would carry the water from the three potential well sites to the points of use. A leakage study along with findings from several piping repairs completed in 2004 support the need to upgrade the existing piping, originally installed in the early 1970’s. The existing piping utilizes solvent weld joints which do not provide for movement or flexibility in the system. Also the system was constructed with a number of different pipe pressure classes and without any isolation valves. Also while repairs were completed this past summer, an unused service tap was discovered adjacent to an undeveloped lot. Discussions with a local plumber familiar with the original system indicate that these service connections exist for all lots in the subdivision but were never marked. The unused service connections are suspected to contribute to the observed system leakage which was identified in the Level II study to be in the range of 35,000 gpd. These factors have provided an additional incentive to District Board to replace the existing piping. The Level I Study also recommended that the
piping be replaced, given the age, type of pipe joints and ongoing leakage problems.

A preliminary piping plan was prepared in the Level I Study which suggested that transmission lines would be installed within the existing Teton County Road right of way that runs through the District. The proposed plan would not however include any of the loop lines suggested in the Level I study as there are currently no available easements or immediate demands in these areas which are outside of the District boundary. The incorporation of supply wells at the ends of the transmission system, which was not considered in the original Level I study, would help eliminate some of the needs and benefits of the looped system. Also, the piping would be constructed to allow for future extensions, should they be required.

It is also recommended that the transmission lines be constructed with 8-inch minimum diameter piping to accommodate current and future needs. The 8-inch piping provides about twice the capacity of a 6-inch line yet typically increases the total installed cost per foot cost by less than 20 percent. Also since a large portion of the piping would be installed adjacent to or within the County roadway, the added costs for road restoration and repairs favor an installation that will have a longer useable life. The 8-inch piping would also have greater flexibility for fire protection which can be accomplished with combined well yields of 500 gpm. The 8-inch piping would also reduce in-pipe velocities and the potential for water hammer. Transmission line costs are estimated in Table 4.

A portion of the proposed improvements related to the transmission line piping would not however be eligible for WWDC funding. These items would include the service connections and meters to individual lots and residences. The district would also have the potential to install fire hydrants on the transmission line if the well yields were able to meet a minimum recommended flow of about 500 gpm. Funding for these portions of the system would come from the DEQ-SRF loan program as discussed in the following section.

PROJECT COST ESTIMATES AND FUNDING: Based upon the estimates provided, the total project costs, including engineering, administration and contingencies is estimated to be approximately $ 894,000. Table 1 summarizes the project capital costs for each of the major components.

The Targhee Towne Water District does not have adequate reserves to pay for any of the new improvements and would need to seek funding from the WWDC and DEQ. Of the total estimated cost of $ 894,000, about $ 775,000 would be eligible for WWDC funding, including a $ 366,000 grant. The balance would be eligible for a WWDC loan. However, because the annual loan rate is 2.5 % for the DEQ-SRF funding compared to 6.0 % for the WWDC program, a WWDC loan is recommended for only the portion of the wells which are not eligible for the DEQ loan, or a total of about $42,000. The balance of the funding would likely come from a DEQ-SRF loan in the amount of $ 486,000, including the costs for the non-
WWDC eligible water distribution components. The funding sources are summarized as follows:

<table>
<thead>
<tr>
<th>TOTAL PROJECT</th>
<th>$ 894,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC GRANT</td>
<td>$ 366,000</td>
</tr>
<tr>
<td>WWDC LOAN</td>
<td>$  42,000</td>
</tr>
<tr>
<td>DEQ-SRF LOAN</td>
<td>$ 486,000</td>
</tr>
</tbody>
</table>

Based upon terms of 20 years and interest rates of 6.00% and 2.50% respectively for the WWDC and DEQ loans, annual payments are estimated to be about $3,700 for the WWDC loan and $31,200 for the DEQ-SRF loan, for a total annual payment obligation of about $34,900. It is anticipated that this debt service would be paid from user fees or a special assessment added to the property taxes for landowners in the district. Table 5 provides additional details.

Cost estimates have also been prepared for the anticipated operation and maintenance needs for the upgraded system. Given the small number of current users, the estimate is based upon minimum requirements of the system to maintain user fees at an affordable level, as itemized in Table 6. With 43 existing users and the assumption that daily operation is funded by active users, monthly fees for O&M are estimated to be in the range of $43.00. When added to the anticipated debt service for the system improvements, the total monthly cost to users is estimated to be about $ 83.22 for the recommended improvements as shown in Table 7.
October 30, 2004

Mr. Mike Besson, Director
Wyoming Water Development Commission
Herschler Building, 4th Floor West Wing
Cheyenne, Wyoming 82002

VIA FAX (307-777-6819) AND REGULAR MAIL

RE: Application for Funding Assistance
Targhee Towne Water District

Dear Mr. Besson

With this letter we would like to submit our request for Level III grant and loan funding assistance for the construction of critical water supply system improvements for the Targhee Water District. The proposed improvements along with the estimated costs are described in the November 2002 Level I report and in the findings from the ongoing Level II study, both sponsored by your agency. A brief summary of the proposed improvements is also attached to this letter.

The recommended improvements were selected with careful consideration by the Targhee Towne Board of Directors over the past several months and incorporate recommendations provided by residents of the District and consulting engineers and geologists engaged by the WWDC to conduct the technical studies. The specific improvements have been designed to address the existing system deficiencies yet achieve the maximum value for the limited resources available to the District.

The Targhee Towne will also be seeking complimentary funding assistance through the Department of Environmental Quality Drinking Water Revolving Loan Fund for the majority of the matching funds for this project. Also, the District is requesting a WWDC loan for a small portion of the project which is not technically eligible for the DEQ loan. A summary of the estimated costs and requested funds has been included with this letter.

We thank you and the Water Development Commission for your continued assistance to help solve our water system problems. We look forward to the opportunity to further describe our request and to respond to questions at the upcoming Water Development Commission meeting in Casper next month.
Respectfully Submitted,

TARGHEE TOWNE WATER DISTRICT

Lee Simmons,
President

Cc: Kevin Boyce, WWDC Project Manager

Enclosures: Tables 1-7 / Cost Estimates, Funding Analysis
Summary of Proposed Improvements
May 11, 2005

Mr. Kevin Boyce, Project Manager  
Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, Wyoming 82002

RE: Alta Level II Groundwater Investigation Study  
Proposed Project Amendment No. 2

Dear Kevin:

This letter provides a progress report, budget update, and request for consideration of additional funding and time for the completion of the Alta Level II Groundwater Investigation Study.

As you are aware, we have completed three exploration wells within the Targhee Towne Subdivision. The original plan was to complete maximum of two wells, with the objective of adding sufficient groundwater supplies to sustain subdivision demands through the planning period. The goal of this groundwater exploration program was an additional 200 gpm of long-term production. Exploration sites were selected based on evaluation of records from local domestic wells (which have had widely varying results), testing of the two existing subdivision-supply wells, and a desire to minimize inter-well interference and vulnerability to local contamination episodes by moving to areas some distance from the two existing wells.

Unfortunately, the first exploration well was relatively unproductive. Careful observations during air-rotary drilling suggested less than 40 gpm capacity. The second exploration well encountered substantially better conditions – airlift production during drilling reached approximately 80 gpm – and the site is well located with respect to future system piping upgrades. This was still short of long-term needs, however, so a third exploration well was completed near the “known” productivity of the 2 existing supply wells. This site produced a well that appears to be capable of augmenting groundwater supplies to the target level, i.e. 200 gpm.

In both the second and third exploration wells, considerable sediment was encountered during airlift development. Sediment production has plagued the existing wells since their inception and is a common problem for other, smaller wells in the area. In our previous work with the subdivision, we have recommended aggressive development to remove what we believe may be isolated pockets of poorly-welded ashflow tuff, but concerns with well integrity precluded testing this hypothesis on the existing wells. Therefore, given the opportunity to investigate this important issue through the exploration wells, we expended considerably more time on airlift development than had been anticipated initially. At this point, it appears that this extra effort has paid off. Not only do both exploration wells No. 2
and No. 3 appear to have been developed beyond the point of serious sediment production, but a model has been demonstrated for the possible rehabilitation of the existing water-supply wells.

Aquifer testing at exploration well No. 3 was completed in early March. Aquifer testing at exploration well No. 2 succeeded only in securing minimal drawdown/production data and a groundwater sample for laboratory analysis before the failure of water-level-monitoring equipment (and the inability to accommodate backup equipment to the necessary depths) required test termination. Considering the desirability of a production well remote from the current wellfield, the poor performance of exploration well No. 1, and the continued indications of good groundwater production and quality from exploration well No. 2, we recommend completion of the original aquifer testing at well No. 2 to support the final Level II work on this project. The attached spreadsheet presents the financial impact of these three, unanticipated expenses -- 1) the additional exploration well; 2) the additional well development time; and 3) the failure of the initial well/aquifer test -- all of which have generated additional drilling/testing contractor costs as well as additional engineering/supervision costs.

Thus, our recommendation is to request an additional budget allocation of $25,000 to provide a re-testing of exploration well No. 2 and completion of the Phase 2 analyses and reporting as outlined in the original scope of work. We would also plan to perform a short duration pump test on Test Well No. 1 to better quantify its actual pumping capability. The Targhee Towne District still has a possible interest in this well as source during the off season when demands are low. A derivation of the specific budget request by Task is included in the attached information.

We anticipate that the testing would be completed in the next 30 days, as this information will be critical to the final design of the well pump equipment. The written report would take an additional 45 days or until about the end of August 2005. However, to avoid the need for any further project amendments, it may be best to extend the contract until December 31, 2005 as you had previously suggested.

Please let us know if you need any additional information with respect to either the technical or financial aspects of the project that would be helpful to your deliberations or presentation to the Commission.

Sincerely,

Robert T. Ablondi

Cc: Bern Hinckley
    Lee Simmons

Enclosure: Cost updates and Estimates for Level II Project
<table>
<thead>
<tr>
<th>Task, Short Description</th>
<th>Budget</th>
<th>ORIGINAL per contract</th>
<th>REVISED per 7-17-03 letter</th>
<th>Cost to Date (10-18-03)</th>
<th>Cost to Date (1-17-04)</th>
<th>Additional Request</th>
<th>Revised Budget</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>Task 1. Meetings</td>
<td>$ 5,000</td>
<td>$ 4,000</td>
<td>$ 4,621.71</td>
<td>$ 3,990.17</td>
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<td>$ 8,500</td>
<td>Additional meetings to allow for project time extension</td>
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<tr>
<td>Task 2. Well Siting</td>
<td>$ 2,500</td>
<td>$ 2,500</td>
<td>$ 2,845.55</td>
<td>$ 2,528.26</td>
<td>$ 2,500</td>
<td>$ 5,000</td>
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<td>Task 2A. Well Siting</td>
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<td>Task 2B. Geophysical Logging</td>
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<td>$ 9,062.96</td>
<td>$ 9,279.11</td>
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<td>Task 2C. Reconnaissance-level Pump Testing</td>
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<td>$ 3,478.03</td>
<td>$ 3,087.99</td>
<td>$ 1,000</td>
<td>$ 4,000</td>
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<td>Task 2D. Monitoring Alta Park Well</td>
<td>$ 2,500</td>
<td>$ 2,034.34</td>
<td>$ 1,062.50</td>
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<td>$ 3,500</td>
<td>Drilling to be completed this winter</td>
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<tr>
<td>Task 3. Bidding</td>
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<td>$ 4,000</td>
<td>$ 990.00</td>
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<td>Task 4. Services During Well Construction</td>
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<td>$ 1,123.02</td>
<td>$ 860.18</td>
<td>$ 7,500</td>
<td>23,000</td>
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<td>$ 6,000</td>
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<td>Task 6. Well Construction Contracts</td>
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<td>$ -</td>
<td>$ 35,000</td>
<td>115,000</td>
<td>Allow for a two 400 ft slim holes and one 10&quot; production well, 5 day pump testing</td>
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<td>$ 180.00</td>
<td>$ 3,671.70</td>
<td>$ 1,000</td>
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<td>$ 2,645.26</td>
<td>$ 2,000</td>
<td>$ 5,000</td>
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<td>3,500</td>
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<td>Task 5. Economic Analysis</td>
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<td>$ 5,500</td>
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<tr>
<td>Task 6. Environmental Report</td>
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<td>$ -</td>
<td>$ -</td>
<td>$ 2,000</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 7. Project Reports</td>
<td>$ 10,000</td>
<td>$ 9,000</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 1,000</td>
<td>$ 10,000</td>
<td>Revised to original budget</td>
<td></td>
</tr>
</tbody>
</table>

**Total Request**

- **ORIGINAL per contract**: $160,000
- **REVISED per 7-17-03 letter**: $160,000
- **Cost to Date (10-18-03)**: $26,682
- **Cost to Date (1-17-04)**: $30,313
- **2004 Budget Request**
  - **Original Budget**: $62,000
  - **Total Request**: $222,000
Rendezvous Project No: 03-014

November 12, 2004

Mr. Don Barney
Teton County Road and Levee Supervisor
P.O. Box 9575
Jackson, Wyoming 83002

RE: Targhee Towne Water District
    Exploratory Well

Dear Don:

Enclosed is an application for trenching and utility installation for the construction of an exploratory well in the Targhee Towne County Road. As mentioned in my letter from November 5, 2004, we are currently only requesting authorization to drill and test the well. If successful, we would submit a separate request next year to install an underground vault for the well controls and valves. The attached maps show the proposed location. As previously mentioned, the well is being drilled for the Targhee Towne Water District with funding provided by the Wyoming Water Development Commission.

The test well will involve an eight inch production casing with a 12 inch surface casing for a sanitary seal. The eight inch casing will extend 18 inches to 24 inch above the ground. A temporary steel cap will be welded to the top of the well upon completion.

Also attached for your information is a copy of U.W. Permit 163463 which was issued by the State Engineer's Office for this well.

Please call if you have any questions or need additional information.

Sincerely,

Bob Ablondi
APPENDIX K

Lithologic Descriptions

WYOMING WATER DEVELOPMENT COMMISSION
Targhee Towne Test #1 - U.W. 163462

Sampling interval was every ten feet to 200 ft., every five feet after that, below ground level while drilling with air-lift circulation. Reported footages correspond to examination of bagged samples.

<table>
<thead>
<tr>
<th>Footage</th>
<th>Principal Lithology</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>Silt, Sand, Gravel</td>
<td>Brn silt, calcareous (calc) sand, gravel (granite, dark aphanitic lms, hard pink fgr qtz sst, red mottled qtzite</td>
<td></td>
</tr>
<tr>
<td>10 - 20</td>
<td>Silt, Sand, Gravel</td>
<td>Brn silt, vf sand, pebbles to 2&quot; dia; granitic pebbles most common</td>
<td></td>
</tr>
<tr>
<td>20 - 30</td>
<td>Silt, Sand, Gravel</td>
<td>Aa, granitic and lms pebbles dominant (lms hard, gray-dark gray, aphanitic), crs particles of qtz, lms, granite common; hard, vf-fgr, qtz sst/qtzite</td>
<td>Matrix seems to contain little to no clay, aa</td>
</tr>
<tr>
<td>30 - 40</td>
<td>Silt, Sand, Gravel</td>
<td>Aa; more black lms, abun-danat granitic pebbles and fragments, white-tan fgr qtzite, med-dk gray lms, lgt gray, vfgr-mgr, qtzite</td>
<td></td>
</tr>
<tr>
<td>40 - 50</td>
<td>Silt, Sand, Gravel</td>
<td>Aa, mostly pink and white granitic fragments; abundant med gray-blk, hard, aphanitic lms; lgt gray, f-mgr rhyolite(?)</td>
<td>Appears to have a few vugs, otherwise hard, dense, sugary - logged as “qtzite” above; one clast of well-rounded, mgr, qtz sand in vfgr, hard, dirty sst matrix (like tiny qtz bubbles in tan sst matrix)</td>
</tr>
<tr>
<td>Interval</td>
<td>Description</td>
<td>Petrographic Details</td>
<td>Comments</td>
</tr>
<tr>
<td>----------</td>
<td>-------------</td>
<td>----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>50 - 60</td>
<td>Silt, Sand, Gravel</td>
<td>Gray and pink granite, lgt-dk gray aphanitic lms; crs, rounded non-calc qtz sst aa; lgt gray, dense, vfgr-aphanitic rhyolite(?)</td>
<td>Matrix has enough clay to be somewhat sticky and make weak thread, i.e. much more than above. Driller says one boulder was 2 ft through, very slow, he thinks granite.</td>
</tr>
<tr>
<td>60 - 70</td>
<td>Silt, Sand, Gravel</td>
<td>Med. gray, aphanitic lms., tr. stickiness, fragments, lgt. gray rhyolite (?)</td>
<td>Less clay than above</td>
</tr>
<tr>
<td>70 - 80</td>
<td>Silt, Sand, Gravel</td>
<td>Med-dk gray, hard, fgr lms; lgt gray, hard, dense, vfgr rhyolite(?); pink granite, minor hard, clean qtz sst aa</td>
<td>Well-rounded crs grains in vf sand/silica cement matrix - no porosity</td>
</tr>
<tr>
<td>80 - 90</td>
<td>Silt, Sand, Gravel</td>
<td>Brn silt; rock fragments: mixed lith aa; minor brick red, dense, vf-fgr sst, non-calc sand fraction is almost all qtz grains, rounded</td>
<td>Slow, steady progress</td>
</tr>
<tr>
<td>90 - 100</td>
<td>Silt, Sand, Gravel</td>
<td>Gray lms aa; lgt gray rhy (dense, aphanitic - vfgr); crs-fgn tan sst; pink and white granite; tr red sst aa; passing sieve fraction: qtz grains and fragments</td>
<td>Continue drilling steady, no boulders, faster drilling; air pressure up</td>
</tr>
<tr>
<td>100 - 110</td>
<td>Silt, Sand, Gravel</td>
<td>Fragments aa, but many more larger chunks (&gt;1/4’’); few fines in settled sample; visible passing sieve fraction is mostly qtz but w/ lithic grains; new fragments: gray chert, chocolate aphanitic lms; black irony sst</td>
<td>Drill slow and steady; no change in air pressure</td>
</tr>
<tr>
<td>110 - 120</td>
<td>Silt, Sand, Gravel</td>
<td>Mixed lith fragments and pebbles w/ dk lms pre-dominant aa; fewer large fragments; new appearance: tr “clay” balls</td>
<td>Faster drilling (drilling much faster since about 109 ft.; enough clay to make a stubby thread with sandy cuttings</td>
</tr>
<tr>
<td>Depth</td>
<td>Material</td>
<td>Description</td>
<td>Drilling Characteristics</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>120 - 130</td>
<td>Silt, Sand, Gravel</td>
<td>Vf-mgr sand, qtz w/ some lithic grains; gravel and fragments of larger sizes, mixed lith aa</td>
<td>Drilling relatively fast; boulder at 128 ft.</td>
</tr>
<tr>
<td>130 - 140</td>
<td>Silt, Sand, Gravel</td>
<td>Med-dk gray, hard, vfgr-aphanitic lms; lgt gray, hard vfgr rhy(?)%; minor amounts of brick-red, f-mgr, dirty sst; pink and white granites; olive-colored, aphanitic lms; tr balls of reddish brn clay with sand</td>
<td>Relatively faster drilling since 132 ft.; on boulder at 135 ft., very slow; fragment curvatures, mostly (&lt;\frac{1}{2})&quot; dia, but some are fully angular fragments – any dia original cobble/boulder</td>
</tr>
<tr>
<td>140 - 150</td>
<td>Silt, Sand, Gravel</td>
<td>Dk lms; white-lgt pink, sugary sst; rhy(?) aa; tr white granite; well-graded from fn sand to gravel to fragments of cobbles(?)%; appears to have higher sand fraction, no sign of clay balls, slurry from foam is med brn, silty (as in all samples so far)</td>
<td>At 145 ft., slow, bouldery; at 149 ft., relatively fast last 2-3 ft.; making a little water since 147 ft.</td>
</tr>
<tr>
<td>150 - 160</td>
<td>Silt, Sand, Gravel</td>
<td>Dk lms, some lgt gray rhy(?)%, some white, pink, red, sugary sst, tr granites, less fine fraction than above, fewer large fragments</td>
<td>Drilling relatively quickly; driller thinks clay and silt present (based on lack of water rather than samples or air pressure)</td>
</tr>
<tr>
<td>160 - 170</td>
<td>Silt, Sand, Gravel</td>
<td>Med-dk gray lms; lgt gray rhy(?)%, minor red, yellow, white sugary sst, tr minor yellow-stained and gray granite; finer fraction: qtz sand, poorly sorted; minor lithic granite, also gray gravel, mixed lith aa</td>
<td>Drilling relatively faster, more cobbles than boulders; slow pounding on a boulder at about 163 ft., through boulder at 164 ft.; driller thinks drilling below water table; making a little water</td>
</tr>
<tr>
<td>170 - 180</td>
<td>Silt, Sand, Gravel</td>
<td>Sand and fragments are mix of gray lms and lgt gray rhy (?), siltier still, otherwise aa</td>
<td>On hard rock at 178-179 ft., broke through at 179 ft.; after clean hole, blow – produces vf-fgr gray sand (qtz w/ some</td>
</tr>
<tr>
<td>Interval</td>
<td>Description</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----------</td>
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<td></td>
</tr>
<tr>
<td>180 - 190</td>
<td>Silt, Sand, Gravel</td>
<td>Dk lms fragments predominate, w/ lgt gray rhy(?) or qtzite, tr yellow sst, all hard and dense, little to no stickiness in brn silt matrix; coarse fraction: mixed lith gravel and fragments aa</td>
<td></td>
</tr>
<tr>
<td>190 - 200</td>
<td>Silt, Sand, Gravel</td>
<td>Aa, with way more silt and sand than above; vf sand with gravel</td>
<td></td>
</tr>
<tr>
<td>200 - 205</td>
<td>Silt, Sand Gravel</td>
<td>Vf sand aa; soft, lgt gray with blk specks, non-calc, silty sst(?) (tuff(?)); some dark lms aa; tr white, hard, vf-mg sst aa; tr dk red-brn sandy siltstone moderately indurated (ind)</td>
<td></td>
</tr>
<tr>
<td>205 - 210</td>
<td>Silt, Sand, Gravel</td>
<td>Gray, soft sst, sand poorly sorted, (qtz grains, angular-rounded) w/ blk specks, non-calc; tr mod ind dk red-brn, silty sst</td>
<td></td>
</tr>
<tr>
<td>210 - 215</td>
<td>Silt, Sand, Gravel</td>
<td>Med-dk gray, hard vfgr-aphanitic lms; soft, lgt gray w/ blk grains, tuff(?); hard larger gray, homogeneous, non-calc, rhy(?); tr blk, hard “concretion” chunks; tr red, yellow sst aa</td>
<td></td>
</tr>
<tr>
<td>215 - 220</td>
<td>Rhyolite</td>
<td>Almost all sand-size, non-calc, qtz grains and black specks; the rare intact grains are soft, lgt gray, sst?/tuff? aa. Heavy foam brings up fragments: almost all soft, gray, blk-speckled tuff, with dry lms grains)</td>
<td></td>
</tr>
</tbody>
</table>

Pebbles and grains are silt coated but does not appear to be tight silt matrix; drilling slow and steady

Fast drilling; very little water; air pressure up from 196-200 ft.; driller says “gummy”

Summary; mixed lith (mostly tuff(?) and lms)

Fairly homogeneous sample, bedrock at about 205 ft. assuming tr grains above were contaminated held in pipe

Chunks look like pen-size aggregations of the black “specks” in the tuff(?); slow, steady drilling; blowing water from well (1-2 gpm)
some blk bladey inclusions, some coarse qtz grain inclusions

<table>
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<tr>
<th>Interval</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>220 - 225 Rhyolite</td>
<td>Aa, sli better consolidation (more chips) blk-speckled rhy tuff</td>
</tr>
<tr>
<td>225 - 230 Rhyolite</td>
<td>Lgt gray rhy aa, but w/ sli reddish hue</td>
</tr>
<tr>
<td>230 - 235 Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>235 - 240 Rhyolite</td>
<td>Aa, but with 2 color phases; lgt gray aa and lgt reddish gray; also tr red-stained joint faces</td>
</tr>
<tr>
<td>240 - 245 Rhyolite</td>
<td>Lgt gray (tr lgt pink), dense, mod-ind, frgr rhy, w/ black obsidian(?) phenocrysts w/ black halos, round and angular qtz phenocrysts, tr red-stained fracture faces</td>
</tr>
<tr>
<td>245 - 250 Rhyolite</td>
<td>Almost all med gray rhy, aa</td>
</tr>
<tr>
<td>250 - 255 Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>255 - 260 Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>260 - 265 Rhyolite</td>
<td>Gray, homogeneous rhy aa</td>
</tr>
<tr>
<td>265 - 270 Rhyolite</td>
<td>Aa; tr red-stained fracture faces</td>
</tr>
<tr>
<td>270 - 275 Rhyolite</td>
<td>Aa, sli darker color than above</td>
</tr>
<tr>
<td>275 - 280 Rhyolite</td>
<td>Aa</td>
</tr>
</tbody>
</table>
280 - 285 Rhyolite Med gray, dense, med-ind rhy; in detail is gray w/ white marbling, abundant dark phenocrysts, qtz grains and fragments; mostly fngr, but some frags of coarse-gr Making 0-2 gpm

285 - 290 Rhyolite Aa, yellow-green halos

290 - 295 Rhyolite Aa; tr soft white powdery non-calc lumps; med-crs gr (whole unit is coarser than above)

295 - 300 Rhyolite Aa

300 - 305 Rhyolite Mostly gray and white mod-ind, mottled, vf-crs gr rhy tuff w/ abundant qtz and dark phenocrysts, pumice lumps, reddish halos/stains; minor white and lgt yellow, soft aggregations of shards, grains, phenocrysts ore shows a flattened fabric, pumice lump, tr cavity “rind”-altered bright yellow textures and colors like outcrop to the east The proportion of those light-colored, softer masses is much greater than the traces seen in some samples above. From 302-305 ft, “pretty broken up”; no water production

305 - 310 Rhyolite Gray mottled rhy aa; tr grass green and bright yellow altered fragments, tr red mottling

310 - 315 Rhyolite Rhy aa; no soft material, white fragments are mod-ind, tr red mottling aa

315 - 320 Rhyolite Rhy aa, mostly med gray, but some fragments of many colors: red, white, bright orange, light yellow; no examples of the soft white grains seen above
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<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>320 - 325</td>
<td>Rhyolite</td>
<td>Rhyolite with fine-crystal grains, mottled and stained rhyolite, abundant quartz fragments, alteration colors, dark phenocrysts; moderately indurated.</td>
</tr>
<tr>
<td>325 - 330</td>
<td>Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>330 - 335</td>
<td>Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>335 - 340</td>
<td>Rhyolite</td>
<td>Mottled heterogeneous rhyolite with sticky slurry (no chunks); thin sample, clayey.</td>
</tr>
<tr>
<td>340 - 345</td>
<td>Rhyolite</td>
<td>Rhyolite; silty, but much better recovery than last sample. Short, fast drilling – 343 - 344.5 ft, foam turns white.</td>
</tr>
<tr>
<td>345 - 350</td>
<td>Rhyolite</td>
<td>Heterogeneous rhyolite; traces of soft light gray rhyolite like up at 210 ft. Slugging foam to bring up cuttings; here set up a pipe outflow on pond where foam is settling; appears to be picking up silt in flow. Quart jar fills in 2½ sec – 6 gpm. Driller injecting about 3 gpm, drilling like it’s broken up.</td>
</tr>
<tr>
<td>350 - 355</td>
<td>Rhyolite</td>
<td>Aa; i.e. mostly medium gray, moderately indurated, mottled, heterogeneous rhyolite, with traces of minor soft white-light gray, soft, black-speckled rhyolite. Catch complete sample in jar, settles relatively quickly to cloudy water; quart jar fills in 2 sec – 8 gpm. Driller agrees, no significant water above 200 ft.</td>
</tr>
<tr>
<td>355 - 360</td>
<td>Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>360 - 365</td>
<td>Rhyolite</td>
<td>Aa</td>
</tr>
<tr>
<td>365 - 370</td>
<td>Rhyolite</td>
<td>Aa; traces of obsidian grain lumps.</td>
</tr>
</tbody>
</table>
assume the fast drilling sections are the soft white material (looks like the outcrop)

<table>
<thead>
<tr>
<th>Interval</th>
<th>Rhyolite</th>
<th>Description</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>370-375</td>
<td>Rhyolite</td>
<td>Aa; tr bright yellow and white pumicy (crystal pockets) frags continuing</td>
<td>Five gal bucket fills in 15 sec – 20 gpm</td>
</tr>
<tr>
<td>375-380</td>
<td>Rhyolite</td>
<td>Rhy aa; tr obsidian</td>
<td>Returns looked sli siltier, so settle a bucket; settles quickly; five gal bucket fills in 18 sec – 17 gpm, while drilling at 378 ft; drilling steadier, consistently hard</td>
</tr>
<tr>
<td>380-385</td>
<td>Rhyolite</td>
<td>Rhy aa; less light-colored material than above, although the basic gray rhy is still quite heterogeneous at small scale (mottling, phenocrysts, vfn-crs grains)</td>
<td></td>
</tr>
</tbody>
</table>


APPENDIX J

Penetration Rate

WYOMING WATER DEVELOPMENT COMMISSION
Targhee Towne Test #1 - U.W. 163462

The following penetration rates are average values for 10 ft. intervals as recorded between samples captured during drilling of the 10-inch / 8-inch diameter borehole in minutes per foot.

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>00</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>37</td>
</tr>
<tr>
<td>100</td>
<td>36</td>
<td>31</td>
<td>16</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>32</td>
<td>25</td>
<td>--</td>
<td>20</td>
</tr>
<tr>
<td>200</td>
<td>11</td>
<td>44</td>
<td>55</td>
<td>--</td>
<td>17</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>300</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>29</td>
<td>--</td>
</tr>
</tbody>
</table>

-- Penetration rate not recorded
APPENDIX J

Well Histories

WYOMING WATER DEVELOPMENT COMMISSION
Targhee Towne Test #1 - U.W. 163462

11/10/04 Drill 14-inch hole to 20 ft. and set 14-inch casing to 20 ft. Drilling 10-inch hole from 20 to 50 ft. and driving 10 5/8-inch O.D., 0.25-inch wall casing with hammer bit. (Driller thinks he can drill 60 ft/day.)

11/11/04 Continue drilling 10-inch hole from 50 to 80 ft.

11/12/04 Continue drilling 10-inch hole from 80 to 131 ft.

11/13/04 Continue drilling 10-inch hole from 131 to 160 ft. Finish joint at 160 ft. Little water if any.

11/15/04 SWL = 157 ft. (TOC) with hole drilled to 160 ft. Continue drilling 10-inch hole from 160 to 200 ft. No water production just below 160 ft. Driller says they blew 20 gpm when continued drilling at 180 ft. Measure 5 gpm at 180 ft.

11/16/04 SWL = 147 ft. (TOC) with hole drilled to 200 ft., after setting overnight. Continue drilling 10-inch hole from 200 to 220 ft. Blowing water from well at 220 ft. at about 1-2 gpm. Start rigging up for 8-inch open whole drilling. Drilled 5 ft. to centralize 8-inch hole.

11/17/04 SWL = 147 ft. (TOC) with hole drilled to 225 ft., after setting overnight. Proceed with 8-inch open hole drilling from 225 to 345 ft. with hammer bit and air circulation with foam. Just below 225 ft., no water production beyond about 3 gpm injecting; at 245 ft, making < 2 gpm, if any; at 258 ft., 0-2 gpm; at 285 ft., 0-2 gpm.

11/18/04 SWL = 147 ft. (TOC) with hole drilled to 345 ft., after setting overnight. Continue drilling 8-inch hole from 345 to 385 ft. At 348 ft., 5 gpm; at 356 ft., 7 gpm; at 365 ft., 22 gpm; at 375 ft., 20 gpm. At 375 ft., conductivity = 290, temp. = 6.7 °C. At 378 ft., 17 gpm; at 385 ft., 19 gpm. Finish rod at 385 ft. (TD). All outflow measurements made using bucket and stopwatch. Outflow measurements at 348, 356, 375, and 378 ft. were adjusted for 2 gpm injection; those at 365 ft. and 385 ft. were made with airlift only, no injection. At 385 ft., 17 gpm were measured after 1 hour of airlift development; 17 gpm were measured during recovery at 220 ft. water level.
Figure 2 - Targhee Towne Wellfield

Well #1 (1971)
- 16" steel casing
- 2002/2003 range of static water levels
- 2 1/4" x 1/4" knife slots
- 4" x 1/4" torch slots
- 2 1/4" x 1/4" open hole
- 10 1/2" borehole
- 240 ft (11/05 pump setting)
- 243 ft (end of casing)
- Hole partially filled in

Well #2 (1999)
- 8" steel casing
- 243 ft (9/8/03)
- 152 ft (end of casing)
- 8 5/8" steel casing
- 10 1/2" borehole
- 240 ft (11/05 pump setting)
- 152 ft (end of casing)
- 243 ft (pump setting, 9/8/03)
- 184 ft
- 185 - 195 ft
- 178 ft
- 139 ft
- 129 ft

Exp #3 (2005)
- 6" steel casing
- 152 ft
- 152 ft
- 256 ft (end of casing)
- 246 ft (pump setting, 9/8/03)
- 246 ft
- 205 ft
- 186 ft
- 178 ft
- 152 ft
- 129 ft
- 10 1/2" borehole
- 8" open hole

Depth
- 40 ft
- 72 ft
- 20 ft
- 436 ft

Bedrock

Alluvial/Glacial Sediments

2002/2003 range of static water levels
Figure 3 - Targhee Towne Exploration Well #1
WYOMING WATER DEVELOPMENT COMMISSION
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6405 ft.
Andrew Well Drilling ; Air Rotary; Nov. 2004

Depth

0 ft
10 ft
20 ft
30 ft
40 ft
50 ft
60 ft
70 ft
80 ft
90 ft
100 ft
110 ft
120 ft
130 ft
140 ft
150 ft
160 ft
170 ft
180 ft
190 ft
200 ft
210 ft
220 ft
230 ft
240 ft
250 ft
260 ft
270 ft
280 ft
290 ft
300 ft
310 ft
320 ft
330 ft
340 ft
350 ft
360 ft
370 ft
380 ft
390 ft
400 ft

14" borehole
- 20 ft
10 1/2" steel casing
- 121.2 ft (5/17/06)
- 148 ft (11/04)
8" open hole
- 220 ft (end of casing)

Mixed Alluvium / Glacial Deposits
Fine sand layer
- 198 ft
- 205 ft

Rhyolite Tuff
- 385 ft

Cement seal
- 0 ft
Figure 4 - Targhee Towne Exploration Well #2
WYOMING WATER DEVELOPMENT COMMISSION
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6420 ft.
Andrew Well Drilling; Air Rotary; Dec. 2004

- 10 1/2" borehole
- 8 5/8" steel casing
- 6" steel casing
- 6" open hole

- 20 ft
- 94.9 ft (5/16/06)
- 107 ft (12/28/04)
- 124 ft (3/12/05)
- 175 ft
- 185 ft
- 260 ft (end of casing)
- 400 ft

Cement seal

Alluvial/Glacial Sediments (approximate)

Rhyolite Tuff

- 400 ft
Figure 5 - Targhee Towne Exploration Well #3

WYOMING WATER DEVELOPMENT COMMISSION
T44N, R118W, NE ¼, SE ¼, Section 19; Approx. Elev. = 6460 ft.
Andrew Well Drilling ; Air Rotary; Jan. 2005

10 1/2" borehole
- 20 ft

8 5/8" steel casing
- 167 ft (3/8/05)

8" open hole
- 256 ft (end of casing)
- 436 ft

Depth

0 ft
50 ft
100 ft
150 ft
200 ft
250 ft
300 ft
350 ft
400 ft

Alluvial/Glacial
Sediments
Rhyolite Tuff
- 180 ft

cement seal
Mr. Bob Ablondi  
Rendezvous Engineering  
P.O. Box 4858  
Jackson, Wyoming  
83001

September 26, 2002

Re: WWDC Alta Master Plan

Dear Bob:

As requested in your letter of September 17, 2002, I have checked the records of the State Engineer and State Board of Control for water rights attached to the following description.

All lands within ¼ mile of the Targhee Towne Subdivision as shown on the maps which accompanied your letter. More particularly described as follows:

**TOWNSHIP 44 NORTH RANGE 118 WEST**

<table>
<thead>
<tr>
<th>SECTION</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Lots 1, 2, 3, and 4</td>
</tr>
<tr>
<td>20</td>
<td>SW1/4 NE1/4</td>
</tr>
<tr>
<td></td>
<td>W1/2</td>
</tr>
<tr>
<td></td>
<td>W1/2 SE1/4</td>
</tr>
<tr>
<td>29</td>
<td>NW1/3</td>
</tr>
<tr>
<td>30</td>
<td>Lots 1 and 2</td>
</tr>
</tbody>
</table>

As a result of my search I offer the following:

**GROUND WATER**

14 valid ground water permits totaling 696.0 gpm were found. The permit number, name, priority, use(s), amount in gpm, status, and location are all included on the spread sheet enclosed. Also enclosed are copies of each permit and where available, copies of the statement of completion.

**SURFACE WATER**

Permit No. 1190, *The Central Canal as changed to the North Side Canal*, diverting from Teton Creek with a priority of April 11, 1896, approximately 551.29 acres attach to the area in question. The lands are included in Certificate of Record 32, Pages 289, 290, and 291 and Certificate of Record 61, Page 154.

Permit No. 6338 Enl., *The Enlargement of the North Side Canal*, diverting from Teton Creek with a priority of April 9, 1962, approximately 16.9 acres attach to the area in question. These lands are included in Certificate of Record 70, Page 58.
Permit No. 7420, The South Side Canal diverting from Teton Creek with a priority of October 2, 1906, approximately 91.0 acres attach to the area in question. These lands are included in Certificate of Record 46, Pages 146 and 150 and Certificate of Record 64, Page 28.

Permit No. 5093 Enl., The Enlargement of The South Side Canal diverting from Teton Creek with a priority of September 6, 1935, approximately 40.0 acres attach to the area in question. These lands are included in Certificate of Record 64, Page 283.

Permit No. 7421, The R.B. Dalley Ditch, which diverts from Teton Creek with a priority of October 2, 1906, approximately 42.0 acres attach to the area in question. These lands are included in Certificate of Record 46, Page 294.

Permit No. 6840, The Pratt Ditch which diverts from Teton Creek with a priority of August 8, 1905, approximately 63.90 acres attach to the area in question. These lands are included in Certificate of Record 32, Page 292

Permit No. 7193 Enl., The Enlargement of the North Side Canal, which diverts from Teton Creek with a priority of February 5, 1996, Reservoir Supply for Permit No. 10542 Res. at a rate of 0.221 cfs not to exceed 4.98 acre-feet in any one year. Certificate of Record 81, Page 448.


(Please keep in mind that the records indicate that the Targhee Towne Subdivision is also covered in the surface water rights listed above. The acreage figures given include the subdivision.)

Copies of the referenced certificates of appropriation, as well as some prints of the accompanying maps, are also enclosed.

Since I was not quite sure how you were going to use this information, I have attempted to include everything. Please review and let me know, at your earliest convenience, if this will do. If not, I will provide whatever else is needed.

Very truly yours,

[Signature]

Water Right Services
## Alta Level II Groundwater Chemistry

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Well No.</th>
<th>EPA Drinking Water Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>Exp. #3</td>
</tr>
<tr>
<td>Sample Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/16/05</td>
<td>3/12/05</td>
<td>10/02</td>
</tr>
</tbody>
</table>

### MICROBIOLOGICAL

| Bacteria, Iron Related (CFU/ml)       | 5,000 | 5,000 |
| coliform (mg/l)                      | 3     | <1    | <1    | <1    | <1    |
| e-coli (mg/l)                        | <1    | <1    | <1    | <1    | <1    |

### MAJOR IONS (mg/L)

| Acidity, Total as CaCO3              | <1.0 | <1.0 |
| Alkalinity, Total as CaCO3           | 149  | 155  | 201  | 169  | 172  | 144  | 136  | 136  |
| Carbonate, CO3                       | <1.0 | <1.0 |
| Bicarbonate, HCO3                    | 182  | 189  |
| Boron                                | <0.1 | <0.1 |
| Calcium                              | 44   | 48   | 56.3 | 51.9 | 50.0 | 42.5 | 40.4 | 40.0 |
| Chloride                             | <1.0 | <1.0 | <1.0 | 1.33 | 1.49 | 0.77 | 0.73 | 0.74 | 250 |
| Fluoride                             | <0.1 | 0.1  | 0.1  | 1.0  |
| Magnesium                            | 11   | 13   | 21.4 | 12.7 | 15.7 | 11.0 | 10.5 | 10.5 |
| Nitrogen, Nitrate+Nitrite as N       | 0.2  | 0.9  | 3.06 | 0.92 | 1.81 | 0.20 | 0.021 | 0.21 | 10.0 |
| Nitrogen, Nitrite as N               | <0.1 | 1.0  |
| Potassium                            | <1.0 | <1.0 | 1.2  |
| Silica                               | 8.1  | 14   |
| Sodium                               | <1.0 | 1    | 3.0  | 1.4  | 1.53 | 0.97 | 1.03 | 1.02 |
| Sulfate                              | 8    | 5    | 6.8  | 3.83 | 3.92 | 2.85 | 3.41 | 3.32 | 250 |

### NON-METALS (mg/L)

| Cyanide                              | <0.005 | <0.005 |

### PHYSICAL PROPERTIES

| Conductivity (umhos/cm)              | 286    | 308    |
| Corrosivity (unitless)               | 0.43   | 0.57   |
| Hardness as CaCo3 (mg/L)             | 157    | 187    | 229   | 182   | 190   | 152   | 144   | 143   |
| pH (s.u.)                            | 7.99   | 8.08   | 7.96  | 7.88  | 7.84  | 7.94  | 8.05  | 8.02  | 6.5 - 8.5 |
| Total Dissolved Solids (mg/L)        | 148    | 150    | 200   | 143   | 198   | 198   | 138   | 133   | 500   |
| Turbidity                            | 5.18   |


<table>
<thead>
<tr>
<th>Constituent</th>
<th>Well No.</th>
<th>EPA Drinking Water Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>Exp. #3</td>
</tr>
<tr>
<td>Sample Date</td>
<td>3/16/05</td>
<td>3/12/05</td>
</tr>
<tr>
<td><strong>METALS - TOTAL (mg/L)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.6</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Antimony</td>
<td>&lt;0.001</td>
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<tr>
<td>Arsenic</td>
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<td>Iron</td>
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<td>Lead</td>
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<td>Manganese</td>
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<tr>
<td>Mercury</td>
<td>&lt;0.0005</td>
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</tr>
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<td>Nickel</td>
<td>&lt;0.02</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Selenium</td>
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</tr>
<tr>
<td>Silver</td>
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<td>&lt;0.01</td>
</tr>
<tr>
<td>Thallium</td>
<td>&lt;0.00004</td>
<td>&lt;0.00004</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.03</td>
<td>&lt;0.01</td>
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<tr>
<td><strong>RADIONUCLIDES - TOTAL (pCi/L)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Alpha</td>
<td>4.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Gross Alpha precision (+-)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Gross Beta</td>
<td>&lt;2.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Gross Beta precision (+-)</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Radium 226</td>
<td>&lt;0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Radium 228</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Radium 226 + Radium 228</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Uranium, Natural (mg/l)</td>
<td>0.002</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Primary: MCL - maximum contaminant level; Arsenic EPA MCL will be revised to 0.010 mg/l (10 ppb) as of 1/23/06
NO PROPOSED DOMESTIC WATER SOURCE.

NO PROPOSED PUBLIC SEWAGE DISPOSAL SYSTEM.

NO PUBLIC MAINTENANCE OF STREETS OR ROADS.

SELLER DOES NOT WARRANT TO PURCHASER THAT HE HAS ANY RIGHTS TO THE NATURAL FLOW OF ANY STREAM WITHIN OR ADJACENT TO THE SUBDIVISION.

WYOMING LAW DOES NOT RECOGNIZE ANY ARPAHIAN RIGHTS WITH REGARD TO THE CONTINUED NATURAL FLOW OF A STREAM OR RIVER FOR PERSONS LIVING ON THE BANKS OF THE STREAM OR RIVER.

Land Use District: Residential-Agricultural
Environmental Protection District: None

Total Acreage: 30.00 Acres
Number of Lots: 10 Lots
Density: 3 Acres/Lot
TARGHEE TOWNE COUNTY ROAD NO. 22-24S

CERTIFICATE OF SURVEY

State of Wyoming

County of Teton

The undersigned surveyors certify that the foregoing subdivision of part of Targhee Towne Custom Home Sites Tract No. 1, located within part of the WYOMING COUNTY Section 20, Township 24 North, Range 3 West, Principal Meridian, as shown on the plans located in the office of this Surveyor, are a fair and true representation of the surveys performed in accordance with the laws of the State of Wyoming. The survey was made and is certified under my hand and official seal on this 11th day of September, 2004.

Geoffrey S. Peterson, P.L.S.

Deborah J. Berges

AUGUST 12, 2004

CERTIFICATE OF ACKNOWLEDGMENT

State of Wyoming

County of Teton

The undersigned surveyors certify that the foregoing subdivision of part of Targhee Towne Custom Home Sites Tract No. 1, located within part of the WYOMING COUNTY Section 20, Township 24 North, Range 3 West, Principal Meridian, as shown on the plans located in the office of this Surveyor, are a fair and true representation of the surveys performed in accordance with the laws of the State of Wyoming. The survey was made and is certified under my hand and official seal on this 11th day of September, 2004.

Geoffrey S. Peterson, P.L.S.

Deborah J. Berges

AUGUST 12, 2004

THIS SUBDIVISION WILL BE CONNECTED TO THE TARGHEE TOWNE WATER DISTRICT.

NO PROPOSED PUBLIC SEWER DISPOSAL SYSTEM.

EACH LOT IS PROPOSED FOR INDIWUAL SEPTIC SYSTEMS.

PUBLIC MAINTENANCE OF TARGHEE TOWNE COUNTY ROAD NO. 22-24S IS PROVIDED.

SUBDIVISION SHALL BE SUBJECT TO FURTHER PROVISION EXCEPT IN ACCORDANCE WITH THE TETON COUNTY LAND DEVELOPMENT REGULATIONS.

SELLER DOES NOT WARRANT TO THE PURCHASER THAT HE OR SHE HAS ANY RIGHTS TO THE WINDING CURVE OR ANY STREAM RUNNING OR ADJOINING TO THE SUBDIVISION.

WYOMING LAW DOES NOT PERMIT ANY OWNER(S) WITH RESPECT TO THE WINDING CURVE OR ANY STREAM OR DITCH FOR PERSONS USING ON THE BANKS OF THE STREAM OR DITCH.

TARGHEE TOWNE CUSTOM HOME SITES

TRACT NO. 1

FOURTH FILING

LOTS 25, 26 AND 27

TETON COUNTY, WYOMING

ADJACENT TO TARGHEE TOWNE CUSTOM HOME SITES TRACT NO. 1"
TARGHEE TOWNE CUSTOM HOME SITES TRACT NO. 3

PROJECT DETAILS

OWNERS: J. SIMMONS & K. SIMMONS
P.O. BOX 714
JACKSON, WY 83001

SURVEYOR: R. SIMPSON & SONS, INC.
2430 ALTA TOWNE CIRCLE
JACKSON, WY 83001

ZONING DISTRICT: ALTA, TETON COUNTY, WYOMING

OWNER: ALTA, WYOMING

PROJECT AVERAGE: 1.29 ACRES

NUMBER OF LOTS: 5

SUBMIT DATE: JANUARY 31, 2006

REVISION DATE: SEPTEMBER 18, 2006

FINAL PLAT

TARGHEE TOWNE CUSTOM HOME SITES
TRACT NO. 3
SECOND FILING

BEING IDENTICAL WITH

LOTS 54, 55, AND 56 TARGHEE TOWNE CUSTOM HOME SITES
TRACT NO. 3
LOCATED WITHIN

FW1/4SW1/4 SECTION 20 T44N, R118W, 6TH P.M.
TETON COUNTY, WYOMING

SHEET 1 OF 2
THIS SUBDIVISION IS SERVED BY AN EXISTING COMMUNITY WATER SYSTEM.

NO PROPOSED PUBLIC SEWAGE DISPOSAL SYSTEM.

SELLER DOES NOT WARRANT TO THE PURCHASER THAT HE HAS ANY RIGHTS TO THE NATURAL FLOW OF ANY STREAM WITHIN OR ADJACENT TO THE SUBDIVISION.

WYOMING LAW DOES NOT RECOGNIZE ANY RIPARIAN RIGHTS WITH REGARD TO THE NATURAL FLOW OF A STREAM OR RIVER FOR PERSONS LIVING ON THE BANKS OF THE STREAM OR RIVER.

Legend:

- Indicates a 1/2 inch diameter steel, rebar found this survey, replaced by a 5/8 inch diameter steel, rebar with an aluminum cap inscribed "PLS 6447".
- Indicates a 5/8 inch diameter steel, rebar with an aluminum cap inscribed "PLS 6447".

LOT LINE
LOT LINE VACATED BY THIS PLAT
EASEMENT
FINAL PLAT
TARGHEE TOWNE CUSTOM HOME SITES
TRACT NO. 3 SECOND FILING
BEING IDENTICAL WITH LOTS 54, 55, AND 56 TARGHEE TOWNE CUSTOM HOME SITES
TRACT NO. 3
LOCATED WITHIN NW1/4SW1/4 SECTION 20
T44N, R118W, 6TH P.M.
TETON COUNTY, WYOMING

SHEET 2 OF 2
APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHEL BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is domestic and/or stock watering, will be considered as ground water appropriations.

FOR OFFICE USE

PERMIT NO. U.W. _______________ Note: Do not fill this form. Use typewriter or print neatly.

WATER DIVISION NO. 4 DISTRICT 13
U.W. DISTRICT Teton Co.

APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING

TARGHEE-TOWNE SUPPLY WELL #4

1. Name of applicant

TARGHEE TOWNE WATER DISTRICT 2) NWDC Phone: 307-353-8125

2. Address of applicant

PO Box 147 ALT: WY 8201 1-137

3. Name & address of agent to receive correspondence and notices

PO Box 1868 JACKSON WY 82001 Phone: 307-733-5252

Rendvous Engineering, PC

4. Use to which the water will be applied:

☐ Domestic: Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served:_____

☐ Stock Watering: Normal livestock use at four tanks or less within one mile of well or spring. Stockwatering pipelines and commercial feedlots are a miscellaneous use. Number of stock tanks:_____

☐ Irrigation: Watering of commercially grown crops (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., is miscellaneous use).

☐ Municipal: Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. is classified as miscellaneous use. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.

☐ Industrial:

☐ Miscellaneous: Any use of water not defined under previous definitions such as stock water pipelines, subdivisions, mine dewatering, mineral/well exploration drilling, potable supplies in office, etc. (Describe in REMARKS)

☐ Drink water supply

☐ Other (Describe in Remarks)

☐ Service area consisting of

☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane will require a permit from the Wyoming Oil and Gas Conservation Commission.

☐ Monitor, Observation

Note: a WDEQ permit may be required

☐ Test Well: (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 58 West.)

Teton County, SE 1/4 SE 1/4 of Sec. 19, T. 44 N., R. 11 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract/Block of the subdivision (or Address) of the Resurvey Location: Tract_____, Block_____, Lot_____.

6. Estimated depth of the well or spring is ______ feet. Estimated production interval is ____ ft. to ____ ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: ______ gallons per minute.

Note: if domestic and/or stock use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: ______ acre-feet.

Circle appropriate units: (Gallon) (Foot) (Acre Foot) A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below.

TABULATION BOX

<table>
<thead>
<tr>
<th>TWP</th>
<th>RNS</th>
<th>SEC</th>
<th>NW1</th>
<th>NW2</th>
<th>SW1</th>
<th>SW2</th>
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</tr>
</tbody>
</table>

Permit No. U.W. _______________ Book No. 1302 Page No. 68
STATE OF WYOMING

STATE ENGINEER'S OFFICE

This instrument was received and filed for record on the 12th day of January, A.D. 2007.

 Permit No. U.W. 179516

II

THE STATE OF WYOMING

STATE ENGINEER

This is to certify that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not constitute the granting of right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.

Subject to the further provisions of laws of Wyoming, 1957, and any subsequent amendments thereto.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion will be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 2008.

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 20th day of February, 2007.

PATRICK T. TYRRELL, State Engineer

Signature of Applicant or Authorized Agent: January 9, 2007

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

DOMESTIC AND/OR STOCK WATERING USES

(Domestic use is defined as use of water in 3 single family dwellings or less, non-commercial watering of lawns and gardens totaling one acre or less.)

IRRIGATION, MUNICIPAL, INDUSTRIAL, MISCELLANEOUS, COAL BED METHANE

$50.00

MONITOR (For water level measurements or chemical quality sampling) or TEST WELL

No Fee

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

This section is not to be filled in by applicant.
PERMIT NO. U.W. 179516
T.F. No. 39-9-496

PERMIT STATUS

Priority Date January 12th, 2007 Approval Date FEB 21 2007

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. A meter acceptable to the State Engineer is required to accurately measure the total quantity of water produced from this well.

2. An annual report shall be submitted to the State Engineer no later than February 15 of each year stating the total amount of water produced from this well each month during the previous January 1 to December 31, twelve (12) month period.

3. The report shall identify the well by name, location, permit number and shall identify the type of meter used for the measurement.

4. The report shall contain at least two (2) semi-annual measurements of the static water level in the well as measured twenty-four (24) consecutive hours after pumping has ceased. The dates the measurements were obtained and the period of time the well was "shut-in" prior to obtaining the measurements must be specified.

5. The State Engineer reserves the right, upon written request, to modify or waive all or any portion of these conditions and limitations.

February 21, 2007

PATRICK T. TYRRELL, State Engineer
STATE OF WYOMING  
OFFICE OF THE STATE ENGINEER  
HERSCHLER BLDG., 4-E  
CHEYENNE, WYOMING 82002  
(307) 777-6163  

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER  
APPLICATION FOR WELLS AND SPRINGS  

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is domestic and for stock watering, will be considered as ground water appropriations. 

Temporary Filing No. U.W. 39-10-4.96  

PERMIT NO. WATER DIVISION NO. DISTRICT U.W. DISTRICT  
179517 4 73 Teton Co.  

NOTE: Do not fold this form. Use typewriter or print neatly with black ink. ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE. 

FOR OFFICE USE ONLY  

NAME AND NUMBER OF WELL OR SPRING  
TARGHEE TOWNE WATER SUPPLY W#3  

1. Name of applicant(s)  
TARGHEE TOWNE WATER DISTRICT  
Phone: 307-353-8125  
PO BOX 1137 ALTAY WY 83111-1137 

2. Address of applicant(s)  
MAILING ADDRESS) (CITY) (STATE) (ZIP)  
PO BOX 1137 ALTAY WY 83111-1137  

3. Name & address of agent to receive correspondence and notices  
RENTZEO ENGINEERING, P.C. PO BOX 428 JAC KSON Phone: 307-332-5252 

4. Use to which the water will be applied:  

- Domestic: Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served?  
- Stock Watering: Normal livestock use at four tanks or less within one mile of well or spring. Stockwatering pipelines and commercial feedlots are a miscellaneous use. Number of stock tanks?  
- Irrigation: Watering of commercially grown crops (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc. is miscellaneous use).  
- Municipal: Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. is classified as miscellaneous use. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.  
- Industrial: Long term use of water for the manufacture of a product or production of lignite or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)  
- Miscellaneous: Any use of water not defined under previous definitions such as stock water pipelines, subdivisions, mine dewatering, mineral exploration drilling, potable supplies in office, etc. Describe in REMARKS. Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.  
- Coalbed Methane: Water produced in the production of coal bed methane gas. Note: wells used in the production coal bed methane will require a permit from the Wyoming Oil and Gas Conservation Commission.  
- Monitor, Observation: Note: a WDEQ permit may be required  
- Test Well: (Describe in REMARKS)  

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of SE 12, Township 14 North, Range 68 West.)  

- Townley County, NE 1/4 SW 1/4 of Sec. 20, T.44 N., R.18 W. of the 6th P.M. (W.R.M.)  
Wyoming. If located in a platted subdivision, also provide Lot/Square Block of the Subdivision (or Addn) of the tract. Resurvey Location: Tract , (or Lot)  

6. Estimated depth of the well or spring is feet. Estimated production interval is ft. to ft.  

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used:  
NOTE: If for domestic and/or stock use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.  

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: Circle appropriate units: (Gallons) (Acres Feet) A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.  

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Permit No. U.W. 179517  
Book No. 1302  
Page No. 69
...The application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or off the land surface.

For additional conditions and limitations see attached status sheet.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion will be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 2007.

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 20th day of January, A.D. 2007.

Patrick T. Tyrrell, State Engineer
PERMIT NO. U.W. 179517
T.F. No. 39-10-496

PERMIT STATUS

FEB 21 2007

Priority Date January 12th, 2007 Approval Date

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. A meter acceptable to the State Engineer is required to accurately measure the total quantity of water produced from this well.

2. An annual report shall be submitted to the State Engineer no later than February 15 of each year stating the total amount of water produced from this well each month during the previous January 1 to December 31, twelve (12) month period.

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5. The State Engineer reserves the right, upon written request, to modify or waive all or any portion of these conditions and limitations.

Date of Approval

PATRICK T. TYRRELL, State Engineer