Cheyenne Belvoir Ranch Level II Study:

Phase III – V

Final Report

Prepared for:

Wyoming Water Development Commission
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Project 15222.00
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ENGINEERS STATEMENT

I hereby affirm that this Final Report for Cheyenne Belvoir Ranch Level II Study: Phase III – V was prepared under my direct supervision for the owners thereof.

Rocky L. Carns, Registered Professional Engineer
Wyoming Professional Engineer No. 9663
For and on behalf of JR Engineering, LLC

Paul G. Ivancie, Registered Professional Geologist
Wyoming Professional Geologist No. PG-171
For and on behalf of JR Engineering, LLC
INTRODUCTION

On May 27, 2004, JR Engineering, LLC (JR) entered into a contract with the Wyoming Water Development Commission (WWDC) to provide professional engineering services for the Cheyenne Belvoir Ranch Level II Study. The purpose of the Level II study is to characterize the present development of the ground water resources on and around the Cheyenne Belvoir Ranch as well as to determine the potential for future development of water resources.

The following sub-consultants were selected by JR to lend their expertise to the Level II Study:

- Lidstone and Associates (Lidstone), Fort Collins, Colorado: responsible for the environmental survey, permitting and supporting well site and geologic mapping
- COLOG, Golden, Colorado: responsible for the geophysical logging of the Belvoir Well No. 5 and No. 6 and the hydrophysical logging of TH-10 adjacent to the Belvoir No. 6 location
- Mr. David Ekles, University of Wyoming Department of Archaeology, and Laramie, Wyoming: responsible for the archeological survey of the area surrounding Belvoir No. 5, Belvoir No. 6, and six other proposed drill sites on the eastern third of the Ranch.

The Belvoir Ranch (the Ranch) consists of approximately 18,800 acres located to the west of the City of Cheyenne, Wyoming. This acreage figure is not inclusive of any Wyoming State Lands. The project area is located in Sections 16, 18, 19, 20, 21, 22, 23, 25, 28, 30, and 31, of Township 13 N, Range 68 W in the County of Laramie and State of Wyoming. The location of the Belvoir Ranch project area is shown on the Site Map, attached as Appendix A. The Site Map also shows the ten test hole locations, the Belvoir No. 5 production test well, and the new production test well, Belvoir No. 6. The Belvoir No. 6 is located in the SW ¼ of NW ¼ of Section 23, Township 13 N, Range 68 W.

This report summarizes Phases III through V of the Level II Study under WWDC contract 05SCO2902442. Below is a brief description of each phase of the entire contract. Phases I and II were addressed in the initial Cheyenne Ranch Level II Report entitled, Cheyenne Belvoir Ranch Level II Study, Final Report, December 2005.
PHASE I: MEETINGS, RESOURCE EVALUATION, EXPLORATION PROGRAM

Task 1. Scoping Meeting/Project Meetings, Hearing
Task 2. Environmental Report
Task 3. Identification of Service Area, Demand Projections
Task 4. Land Use Compatibility, Permitting Requirements
Task 5. Area Water Resource Evaluation
Task 6. Geotechnical Analysis
Task 7. Ground Water Exploration Programs
Task 8. Phase I Reports

PHASE II: TEST WELL PROGRAM

Task 1. Well Siting, Permits, Testing Program Development
Task 2. Bidding Specifications, Bidding Process
Task 3. Consultant Services During Well Construction
Task 4. Aquifer Testing When Applicable
Task 5. Water Quality, Water Treatment, Reclamation
Task 6. Well Construction Subcontracts
Task 7. Final Reports

PHASE III: MEETINGS, EXPLORATION PROGRAM

Task 1. Scoping Meeting and Project Meetings
Task 2. Aquifer Impact (Belvoir No. 5) and Area Monitoring
Task 3. Environmental Report
Task 4. Identification of Service Area, Demand Projections
Task 5. Land Use Compatibility, Permitting Requirements
Task 6. Area Water Resource Evaluation
Task 7. Geotechnical Analysis
Task 8. Ground Water Exploration Programs

PHASE IV: TEST WELL PROGRAM

Task 1. Well Siting, Permits, Testing Program Development
Task 2. Bidding Specifications, Bidding Process
Task 3. Consultant Services during Well Construction
Task 4. Aquifer Testing
Task 5. Water Quality, Water Treatment, Reclamation
Task 6. Well Construction Subcontracts

PHASE V: SYSTEM DESIGN, COST ESTIMATES, REPORTS

Task 1. Aquifer Impact (Belvoir No. 5 and Belvoir No. 6)
Task 2. System Development Alternatives
Task 3. Selection of Preferred Alternatives
Task 4. Water System Development Master Plan
Task 5. Cost Estimates
Task 6. Economic Analysis and Project Financing
Task 7. Draft, Final and Executive Summary Reports
Task 8. Results Presentation, Public Hearing
Phase II of the Level II Study included a test hole program to explore potential Ogallala Aquifer sources for the Cheyenne BOPU. The test hole program yielded numerous potential well sites and culminated in the construction of the Belvoir No. 5. The location of the Belvoir No. 5, and subsequently the Belvoir No 6, was a direct result of exploration and monitoring of the Ogallala Aquifer beneath the Ranch.

**Phase III and IV**

Phases III and IV of the Level II Study produced a testing and development program for the Ogallala Aquifer, as well as a GIS based mapping project that addresses surface water, land and water ownership and infrastructure on the Belvoir Ranch. Major components of Phase III included long-term water level monitoring, a seven day pumping test of Belvoir No. 5, water quality sampling to determine the viability of future production wells in the Ogallala aquifer, and an in-depth review of water rights and land ownership on the Belvoir Ranch. Additional components of Phase III included the necessary discharge permits associated with pumping the Belvoir No. 5, as well as an environmental report assessing future potential drill-sites that preceded Phase IV (see Appendix B).

The Belvoir No. 5 well was constructed in 2005, with funding and oversight provided by the WWDC. As part of the WWDC 2006-2007 Cheyenne Belvoir Ranch Level II Study – Phase III Exploration Program, JR continued pumping tests on this well in order to project the long-term sustainability of the well, the potential impacts to the surrounding aquifer, and the influence to current and future wells on the Ranch and Lone Tree Creek.

Pumping tests were conducted on the Belvoir No. 5 well from June 13-21, 2006. Prior to pumping, test holes TH-3, TH-4, TH-5, TH-6, and TH-9 were equipped with water level monitoring equipment. This equipment was installed in late March 2006. The Cheyenne Belvoir No. 2 Well was similarly equipped in April 2006. In addition to testing Belvoir No. 5, long term monitoring was conducted on the aforementioned test holes as well as on the Cheyenne Belvoir No. 1 and No. 2, Cheyenne Enl. Borie No. 1 and on Lone Tree Creek. This monitoring campaign was designed to provide the Cheyenne BOPU with a more pronounced model of long-term water level fluctuations as they relate to seasonal conditions and the pumping of the production wells for municipal use.
GIS mapping of the Cheyenne Belvoir Ranch was largely accomplished in Phase III of the Level II study (as shown in Appendix A). JR produced a multi-layered mapping project that outlined all of the surface water components of the Ranch, including water tanks, holding ponds, water lines, land ownership, and specific structural aspects of the Ranch including oil and gas infrastructure. The GIS mapping aspect of Phase III continues to form the basis of all subsequent work on the Belvoir Ranch, including development of a pipeline to connect the Cheyenne BOPU production wells to the Cheyenne BOPU’s Sherard water treatment plant.

In September 2006, JR submitted to the Wyoming State Revolving Fund, an environmental report entitled, Cheyenne Belvoir Ranch Environmental Report Level II Phase II (Appendix B) that provides a full assessment of site conditions ahead of future well development at six proposed drilling locations on the Ranch. The Environmental Report focuses on land use, floodplains, wetlands, cultural resources, biological resources, water quality, socio-economic information, air quality and noise. The report adheres to state guidelines governing site assessments prior to construction. The impact to the Ranch during drilling and post drilling pumping was generally considered minor to non-existent and with documentation of the proposed drilling activities, authority was granted to proceed with Phase IV of the Level II Study.

The primary goal of Phase IV of the Level II Study was to replicate the success of the Belvoir No. 5 and an additional production well of similar scope. The location of the TH-10 (MW-10) and subsequent Belvoir No. 6 was determined in Phase III by the integration of the Belvoir No. 5 pumping test results with the results of the environmental report affirming future potential drill-sites. The pumping test results and aquifer impact study addressing the Belvoir No. 5 and No. 6 (Phase V) are included as a separate report, Belvoir Wells No. 5 & 6, Pumping Test and Aquifer Impact Report, September 2007.

**Phase V**

Phase V involved the aforementioned Aquifer Impact Study, which presented the hydrogeologic and aquifer characteristics of the Belvoir No. 6 well. This well was installed in early 2007 as part of the Phase IV tasks and was completed through the base of the Ogallala Aquifer. Prior to
installing the Belvoir No. 6 well, background information was accumulated, as was field data from TH-10. Prior to the construction of the Belvoir No. 6 well, COLOG of Golden, Colorado was employed to conduct hydrophysics on TH-10 to characterize the lithologic units with the highest flow potential. This information was used to drill, complete, and develop the Belvoir No. 6 production well. This Level II report includes the results of the testing of Belvoir No. 6.

The long–term seven-day pump test for Belvoir No. 6 was conducted as part of the Phase V study. The following pre-existing monitoring wells were used in the Phase V study for water table monitoring and for establishing the radius of influence during the pump test of Belvoir No. 6: Belvoir Ranch TH-3, TH-4, TH-5, TH-6, TH-9, Cheyenne Belvoir No. 1, No. 2, and No. 5, Cheyenne Borie No. 1, and the Cheyenne Belvoir Enl. Borie No. 1. Ultimately, it is proposed that Belvoir No. 6 be incorporated into the potable water supply system for the Cheyenne BOPU.

Other major tasks included in Phase V of the Belvoir Level II Study were: water system development alternatives (including water treatment measures that are deemed necessary for distribution into a potable water supply), selection of preferred alternatives, water system development master plan including a source water protection assessment, cost estimates, economic analysis including sources of project financing, report preparation and delivery of results. The final task of Phase V was a public presentation of these results at a public meeting, held on August 30, 2007.
SYSTEM DEVELOPMENT ALTERNATIVES

The system development alternatives include the preliminary well completion of Belvoir No. 5, No. 6 and the Lone Tree Creek Well No. 2. Access road locations and preliminary costs were estimated but not included, as the Cheyenne BOPU plans to construct any necessary access roads independent of the preliminary design. In addition, the various pipeline scenarios, treatment alternatives and easement costs are presented.

Preliminary Well Completion Belvoir 5, 6 and Lone Tree Creek Well No. 2

For the individual well site completions, the Cheyenne BOPU has determined that the well plans prepared for the Finnerty No. 2 well will act as the standard well site design to be used for all future wells. Standard pump station plans and details have been included in this report for the purpose of estimating the cost to complete the design and construct the well site infrastructure for the Belvoir No. 5, Belvoir No. 6 and Lone Tree Creek Well. Specific site plans for each well will be completed during final design after field surveying is performed at each site. The standard well site plans and details are presented in Appendix C.

Well completion profiles have been prepared for the Belvoir No. 5 and 6 wells (both wells have been drilled and screens and casing have been installed). The Lone Tree Creek Well No. 2 site does not yet have a drilled and cased production well. This well will be drilled and cased as part of the Level III work. The test hole data acquired from this site will be used to estimate the cost of drilling and completing this well.

The estimated construction costs to complete each site are listed in the main cost estimate presented below in Table 1. Using bid costs for the Finnerty and Bell wells, these construction costs were developed in combination with the latest bid data from the 2007 BOPU Rehab program.

Electrical power service costs to each well site were determined through discussions with two local service providers: High West Energy and Black Hills Corporation. The Belvoir wells will acquire power service via extensions of the existing 3-phase power lines in the area. The Lone Tree Creek well site currently has single-phase power and High West Energy has provided a cost
estimate to upgrade this line to 3-phase power. High West has also provided a cost for the Belvoir No. 5 well. Black Hills Corp. provides power for the Belvoir No. 6.

The three well sites will be evaluated for their ability to use a variable frequency drive (VFD) in lieu of a soft start, for the purpose of varying the pumping rate as pumping water levels allow. This will allow the Cheyenne BOPU to adjust each well’s production to maximize pumping based on water demand and aquifer conditions. The design pumping rate for the Belvoir No. 5 well is 500 gallons per minute (gpm) with an assumed 200 feet total dynamic head (TDH) resulting in a 40 horse power (HP) electric three-phase motor. The Belvoir No. 6 design pumping rate is 300 gpm with an assumed TDH of 200 feet resulting in a 25 HP electric three-phase motor. Based on the test hole data acquired from the Lone Tree Creek Well No. 2, a production well is estimated to produce 500 gpm at 350 feet of TDH, requiring a 50 HP electric three-phase motor.

### Table 1: Preliminary Well-Cost Estimates

#### Belvoir No. 5

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Well Pump</td>
<td>$45,000</td>
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<tr>
<td>Piping</td>
<td>$40,000</td>
</tr>
<tr>
<td>Well House</td>
<td>$45,000</td>
</tr>
<tr>
<td>Building Electrical/Mechanical</td>
<td>$45,000</td>
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<tr>
<td>Site Reclamation/Restoration</td>
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<td>SCADA</td>
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<td>Electrical Service</td>
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<td>O&amp;M Manuals</td>
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<td><strong>Engineering Design - 15%</strong></td>
<td><strong>$35,251</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$270,255</strong></td>
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#### Belvoir No. 6

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<thead>
<tr>
<th>Item</th>
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<tbody>
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<td>Well House</td>
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<tr>
<td>Building Electrical/Mechanical</td>
<td>$45,000</td>
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<tr>
<td>Site Reclamation/Restoration</td>
<td>$7,500</td>
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<tr>
<td>SCADA</td>
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<td>Electrical Service</td>
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<td><strong>Subtotal</strong></td>
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<td><strong>Total</strong></td>
<td><strong>$311,363</strong></td>
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Table 1 (continued)

<table>
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<tr>
<th>Item</th>
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<tr>
<td>Production Well Drilling</td>
<td>-</td>
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<tr>
<td>Well Pump</td>
<td>$60,000</td>
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<td>Piping</td>
<td>$40,000</td>
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<td>Well House</td>
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<tr>
<td>Building Electrical/Mechanical</td>
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<td>Site Reclamation/Restoration</td>
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<td><strong>Total</strong></td>
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**Lone Tree Creek Well No. 2 Drilling**

<table>
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<td>Production Well Drilling</td>
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<td><strong>Subtotal</strong></td>
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<td>Geologist/Engineering Design - 20%</td>
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<td><strong>Total</strong></td>
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<th>Description</th>
<th>Cost</th>
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<tr>
<td>Belvoir No. 5 Well Completion</td>
<td>$270,255</td>
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<tr>
<td>Belvoir No. 6 Well Completion</td>
<td>$311,363</td>
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<tr>
<td>Lone Tree No. 2 Well Drilling</td>
<td>$301,300</td>
</tr>
<tr>
<td>Lone Tree No. 2 Well Completion</td>
<td>$602,400</td>
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</tbody>
</table>

**Access: Belvoir No. 5**

Proposed access for the Belvoir No. 5 well site will be through the east entrance of the Belvoir Ranch via Otto Road/State Highway 225. A new 400-foot road will be required to access the well. This road will originate at the closest point on the existing access road that lies south of the well.

**Access: Belvoir No. 6**

The proposed Belvoir No. 6 well site access road should extend north for approximately 1,500 feet from the existing access road that joins the east Belvoir Ranch entrance road. The existing access road, which has one railroad crossing, will likely need improvements over the 2.7 miles from the existing junction with the entrance road to the proposed junction with the well site access road.
Access: Proposed Lone Tree Creek Well

The Lone Tree Creek Site access road as proposed will connect with an existing access road that enters Belvoir Ranch from Harriman Road/State Highway 102. The proposed access road will intersect with an existing access road approximately 2,300 feet to the east of the test bore (near the Kennedy No. 2 well). Improvements may be necessary on portions of the 3.2-mile access road route from Harriman Road. The proposed locations of access roads are shown on the map in Appendix D.

Table 2: Proposed Access Road Cost Estimates

<table>
<thead>
<tr>
<th>WELL SITE NAME</th>
<th>ROADWAY IMPROVEMENT LENGTH (LF)</th>
<th>PROPOSED ROADWAY LENGTH (LF)</th>
<th>GRADING COST</th>
<th>ROADWAY BASE COST</th>
<th>WELL SITE ACCESS ROADWAY COST</th>
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</thead>
<tbody>
<tr>
<td>BELVOIR NO. 5</td>
<td>10,560</td>
<td>400</td>
<td>$963</td>
<td>$90,653</td>
<td>$91,616</td>
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<tr>
<td>BELVOIR NO. 6</td>
<td>14,256</td>
<td>1,500</td>
<td>$3,611</td>
<td>$137,703</td>
<td>$141,314</td>
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<tr>
<td>LONE TREE CREEK</td>
<td>16,896</td>
<td>2,300</td>
<td>$5,537</td>
<td>$171,538</td>
<td>$177,075</td>
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<td><strong>Total</strong></td>
<td>41,712</td>
<td>4,200</td>
<td>$10,111</td>
<td>$399,894</td>
<td>$410,005</td>
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1 GRADING CALCULATED BASED ONLY ON PROPOSED ACCESS ROAD LENGTH
2 PROPOSED ROADWAY BASE COURSE DEPTH = 12"
ROADWAY IMPROVEMENT BASE COURSE DEPTH = 6" ON TOP OF EXISTING

Power Utility Requirements

Power utility costs for the Belvoir No. 5, Belvoir No. 6 and the future Lone Tree Creek Well No. 2 were based on estimated values and service line distances given by either High West Energy or Black Hills Corporation. All service fees are for three-phase power, carrying at least 460 volts with the capacity to power a 50 HP electric motor. Miscellaneous charges are assessed for items such as utility easement crossings on Wyoming State Lands. The distances estimated by the power utilities for the service extensions were very conservative and thus, the actual distance may ultimately be less. The projected date that new power lines could be extended to serve the three wells is spring of 2008.

The locations of the Belvoir No. 5 and the future Lone Tree Creek well are both within the service area of High West Energy. High West’s estimates were based on an approximate cost of $2,500 per pole for a service line extension, with an average span of 240 feet between poles. The service for Belvoir No. 5 will most likely extend from the north side of Interstate 80 and the Union Pacific Railroad. The service for the future Lone Tree Creek well will most likely involve the rebuild of a pre-existing single-phase power line, the final cost of which may actually be less than running a new extension.
As stated above, the Belvoir No. 6 is located within the service area of Black Hills Corporation. Black Hills’ estimates were based on an approximated cost of $13.75 per foot of service line extension. Table 3 contains power utility details for power service to the three wells and their associated pumps.

**Table 3: Power Line Drops**

<table>
<thead>
<tr>
<th>Well ID</th>
<th>Foot HP</th>
<th>Pump HP</th>
<th>Well Location</th>
<th>Closest Power Utility</th>
<th>Linear Dist. (ft)</th>
<th>Poles (avg. span 240')</th>
<th>Cost/pole</th>
<th>Misc. (easements, etc.)</th>
<th>Total Est. Cost</th>
</tr>
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<tbody>
<tr>
<td>Belvoir No. 5</td>
<td>2, 3, 4, 5</td>
<td>up to 50</td>
<td>on line between NW1/4 &amp; NE1/4 of N1/2 T13N, R66W, S21</td>
<td>High West Energy</td>
<td>2,831</td>
<td>12</td>
<td>$2,500.00</td>
<td>$1,004</td>
<td>$31,004</td>
</tr>
<tr>
<td>Belvoir No. 6</td>
<td>6, 7, 8</td>
<td>up to 50</td>
<td>SE1/4 of NW1/4 T13N, R66W, S23</td>
<td>Black Hills Corporation</td>
<td>4,000</td>
<td>16</td>
<td>$55,000.00</td>
<td>$13,750</td>
<td>$68,750</td>
</tr>
<tr>
<td>Lone Tree Creek</td>
<td>2, 3, 9, 10, 11</td>
<td>up to 50</td>
<td>SE1/4 of NE1/4, T13N, R66W, S17</td>
<td>High West Energy</td>
<td>3,960</td>
<td>17</td>
<td>$2,500.00</td>
<td>$500</td>
<td>$43,000</td>
</tr>
</tbody>
</table>

**Notes:**
1. 50 hp to allow for the addition of VFDs as needed on the pumps.
2. Should allow for 6-month lead time for a new line drop/connection from High West Energy.
3. For High West Energy, price estimates are based on a per pole basis (275’ max span, 240’ avg. span); this includes wire, insulation, and service.
4. From N. RR of Sect. 16 to Belvoir 5, distance 2,831 miles.
5. Wyoming State Lands contact: Tina Vigil, (307) 777-6546, tvigil@state.wy.us, $25 application fee + $10/rod or $10/16.5 linear feet, est. dist.=1,615’.
7. Cost estimate from Black Hills Corp. Alan Sturzaki, gave a rough approximation of $10,000/pole to closest 3-Phase power at ~$13.75/pole.
8. Miscellaneous cost listed for Belvoir No. 1 is an estimate based on a price increase Black Hills Corporation said would go into effect next year.
9. High West Energy should be able to rebuild 1-phase line with 3-Phase to Lone Tree Creek Well, especially since they already have the required right-of-way access. Actual cost for rebuild may be less than full build out cost quoted in spreadsheet.
10. The estimated distance for the rebuild of the line to Lone Tree Creek Well is 3/4 of a mile.
11. If value for miscellaneous costs is unknown, $500 was entered as an estimate.

**General:**
If Union Pacific owns land and if power utility does not already own an easement and has to cross U.P. land, U.P. charges at least $10,000/pole and takes 1 yr. avg. for permission (information from Tim Lang of High West Energy).

Total Estimate: $142,754
PRELIMINARY PIPELINE DESIGN

Phase V of the Level II Study requires a preliminary design of the pipeline including capacity, routing scenarios and cost estimates.

Current Proposed Pipeline Phase

When the Belvoir No. 5 and No. 6 wells are completed and placed in service for production, the raw well water will be transported via pipeline to the existing Sherard water treatment plant. The Sherard plant is located approximately 3.5 miles north of the eastern edge of the Belvoir Ranch and is shown on the overall Site Map (Appendix A).

A proposed pipeline route from the new Belvoir wells to the treatment plant is indicated on the Site Map as a solid blue line. An additional pipeline extending to the northwestern part of the Belvoir Ranch will transport water from new wells in the vicinity of the Lone Tree Creek Well No. 2 to Sherard. The current route depicted on the Site Map was placed with due regard to topography, existing pipe alignments, floodplains, existing roadways and crossings. However, this proposed route should be considered a preliminary alignment. When this corridor is surveyed at the design phase, some adjustments in the alignment will likely be necessary.

Pipeline Capacity

The proposed pipeline was designed assuming a conveyance capacity of 6,000 gpm of raw water from the Belvoir Ranch wells. It is assumed that one-half of this 6,000 gpm conveyance capacity will be provided by the Belvoir No. 5 and No. 6 wells, and from future wells located on the eastern half of the ranch. These eastern wells will pump water from the High Plains Aquifer. It is further assumed that the remaining 3,000 gpm is produced from the deeper Casper formation, found along the western reaches of the Ranch.

The incremental pipeline size of 36 inches will convey the design flow of 6,000 gpm with an additional conveyance capacity of 1,800 gpm. This additional capacity could be available to convey raw water from the Cheyenne BOPU Borie field wells. This includes the Borie No. 1, Finnerty No. 2, Elkar No. 7 and the Weber No. 1 wells. The existing raw water transmission lines from these wells are very old and Cheyenne BOPU proposes to construct connections from
these existing wells to the new raw water transmission line. Table 4 presents a summary of the various pipeline capacities.

### Table 4: Pipeline Design Well Production Rates from Belvoir Ranch

<table>
<thead>
<tr>
<th>Well Site</th>
<th>Production (gpm)</th>
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</thead>
<tbody>
<tr>
<td><strong>West Line</strong></td>
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<tr>
<td>Spottlewood Creek Site</td>
<td>800</td>
</tr>
<tr>
<td>Duck Creek Site</td>
<td>500</td>
</tr>
<tr>
<td>Lone Tree Creek Site</td>
<td>800</td>
</tr>
<tr>
<td>Kennedy No. 2</td>
<td>900</td>
</tr>
<tr>
<td><strong>West Line Total</strong></td>
<td><strong>3000</strong></td>
</tr>
<tr>
<td><strong>East Line</strong></td>
<td></td>
</tr>
<tr>
<td>TH-4</td>
<td>500</td>
</tr>
<tr>
<td>Belvoir No. 5</td>
<td>600</td>
</tr>
<tr>
<td>Belvoir No. 6</td>
<td>400</td>
</tr>
<tr>
<td>Future Well Section 22</td>
<td>500</td>
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<tr>
<td>Future Well Section 27</td>
<td>500</td>
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<tr>
<td>Future Well Section 25</td>
<td>500</td>
</tr>
<tr>
<td><strong>East Line Total</strong></td>
<td><strong>3000</strong></td>
</tr>
<tr>
<td><strong>Total Leaving Belvoir Ranch</strong></td>
<td><strong>6000</strong></td>
</tr>
<tr>
<td><strong>Borie Field Connections</strong></td>
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</tr>
<tr>
<td>Borie No. 1</td>
<td>500</td>
</tr>
<tr>
<td>Finnerty No. 2</td>
<td>550</td>
</tr>
<tr>
<td>Elkar No. 7</td>
<td>550</td>
</tr>
<tr>
<td>Webber No. 1</td>
<td>200</td>
</tr>
<tr>
<td><strong>Borie Field Total</strong></td>
<td><strong>1800</strong></td>
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<tr>
<td><strong>Total Delivered to Sherard Plant</strong></td>
<td><strong>7800</strong></td>
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</table>
Piping Scenarios and Costs

Well design production rates, piping scenarios and cost estimates are presented in Appendix E. Some of the scenarios represent large sections of the proposed pipeline, such that costs may be broken down accordingly by section. The scenarios are described below:

Scenario 1 – The minimum piping required to deliver water from the Belvoir No. 5 and 6 wells only. There is no extra capacity for future wells, or for any of the existing Borie field wells.

Scenario 2 – Minimum piping for Belvoir No. 5 and No. 6 wells, with additional capacity for future Belvoir wells, Lone Tree Creek Well No. 2 and existing Borie Field wells.

Scenario 3 – The same as Scenario 2, with the addition of a line out to a future well site near the Lone Tree Creek test hole in the northwestern part of the ranch.

Scenario 4 – A future phase, extending a pipeline from the Lone Tree Creek site to two potential future well sites on the western part of the ranch.

Scenario 5 – A future phase, extending piping from the Belvoir No. 5 to a possible well site near test hole TH-4, and from the main transmission line out to potential sites on the eastern portion of the Ranch. These lines are conceptual. There are no current plans to construct wells where these lines run.

Scenario 6 – This represents full build out. It is a combination of scenarios 3, 4, and 5.

Scenario 7 – This scenario is the same as Scenario 3 without any pipeline from the Belvoir No. 5 and 6 well sites to the main pipeline.

---

1 Some additional scenarios that are not listed in the table, such as using double lines, were verbally discussed with personnel from the Cheyenne BOPU and WWDC, but ultimately were found to be unsuitable for this project.
Materials
The pipeline is assumed to consist of class 150 psi PVC. Depending on costs and availability at the design phase, ductile iron pipe (DIP) may be needed for some of the larger sizes. Table 5 presents the materials costs assumed for this preliminary design.

Table 5: Material Costs

<table>
<thead>
<tr>
<th>PVC Pipe Size (in)</th>
<th>Cost ($/ft)¹</th>
<th>Capacity² (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>$50.00</td>
<td>140</td>
</tr>
<tr>
<td>8</td>
<td>$60.00</td>
<td>300</td>
</tr>
<tr>
<td>10</td>
<td>$65.00</td>
<td>545</td>
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<tr>
<td>12</td>
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<td>16</td>
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<td>18</td>
<td>$100.00</td>
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<tr>
<td>20</td>
<td>$110.00</td>
<td>2325</td>
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<tr>
<td>24</td>
<td>$130.00</td>
<td>3750</td>
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<tr>
<td>30</td>
<td>$170.00</td>
<td>6750</td>
</tr>
<tr>
<td>36</td>
<td>$225.00</td>
<td>10900</td>
</tr>
</tbody>
</table>

¹ Unit cost includes pipe material, excavation, bedding, backfill, and compaction plus 20% markup for fittings and valves.

² Pipe Capacity is based on:
   Hazen-Williams C = 130
   Friction Loss < 1'/1000' (Diam ≥16")
   Friction Loss < 2'/1000' (Diam <16")
Table 6 contains a summary of the assumed pipeline lengths for each project scenario.

**Table 6: Pipeline Segments**

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Pipe Section Description</th>
<th>Pipe Diameter</th>
<th>Pipe Length (Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belvoir to Sherard</td>
<td>Sherard Yard Pipe (See Yard Pipe Section)</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>Sherard to Elkar/Webber Connections</td>
<td>36</td>
<td>14,000</td>
</tr>
<tr>
<td>2</td>
<td>Elkar/Webber to Finnerty/Borie</td>
<td>36</td>
<td>6,400</td>
</tr>
<tr>
<td>3</td>
<td>Finnerty/Borie to Belvoir No. 6 Tee</td>
<td>30</td>
<td>1,700</td>
</tr>
<tr>
<td>Belvoir No. 5 &amp; 6</td>
<td>Belvoir No. 6 Tee to Belvoir East/West Tee</td>
<td>30</td>
<td>3,700</td>
</tr>
<tr>
<td>5</td>
<td>Belvoir No. 6 Tee to Belvoir No. 6 Well</td>
<td>10</td>
<td>2,900</td>
</tr>
<tr>
<td>6</td>
<td>Belvoir East/West Tee to Belvoir No. 5 Tee</td>
<td>24</td>
<td>3,100</td>
</tr>
<tr>
<td>7</td>
<td>Belvoir No. 5 Tee to Belvoir No. 5 Well</td>
<td>16</td>
<td>4,600</td>
</tr>
<tr>
<td>8</td>
<td>Belvoir East/West Tee to Lone Tree Creek Wells</td>
<td>24</td>
<td>43,000</td>
</tr>
<tr>
<td>Future Western Belvoir</td>
<td>Lone Tree Creek Wells to Duck Creek Well</td>
<td>18</td>
<td>18,500</td>
</tr>
<tr>
<td>10</td>
<td>Duck Creek Well to Spottlewood Creek Well</td>
<td>12</td>
<td>10,100</td>
</tr>
<tr>
<td>Future Eastern Belvoir</td>
<td>Belvoir 5 Well to Future Section 20 Well (TH-4)</td>
<td>10</td>
<td>5,300</td>
</tr>
<tr>
<td>12</td>
<td>Belvoir 5 Tee to Section 22 Tee</td>
<td>18</td>
<td>110</td>
</tr>
<tr>
<td>13</td>
<td>Section 22 Tee to Section 22 Future Well</td>
<td>10</td>
<td>2,600</td>
</tr>
<tr>
<td>14</td>
<td>Section 22 Tee to Enl Borie No. 1 Well</td>
<td>16</td>
<td>6,100</td>
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<td>15</td>
<td>Enl Borie No. 1 Well to Future Section 27 Well</td>
<td>10</td>
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<td>16</td>
<td>Enl Borie No. 1 Well to Future Section 25 Well</td>
<td>10</td>
<td>8,300</td>
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</table>

**Future Pipeline Phases**

Some future pipelines, beyond the current phases discussed above, are shown on the site map as blue dashed lines. These blue dashed lines link the proposed lines (indicated with a solid blue line) with some areas that have been permitted by the Cheyenne BOPU to be used as future well sites. There are no wells, either current or planned, at the end points of these lines. These lines are conceptual in nature and are intended to be used only as representative scenarios for pipe cost analysis purposes. Table 7 presents a summary of the pipeline scenarios and costs.
### Table 7: Pipeline Preliminary Cost Scenarios

<table>
<thead>
<tr>
<th>Scenario Number</th>
<th>Scenario Description</th>
<th>Pipe Sections</th>
<th>Pipe Size (in)</th>
<th>Pipe Length (ft)</th>
<th>Cost ($)</th>
<th>Design Capacity (GPM)</th>
<th>Excess Capacity (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Belvoir No. 5 and 6 Wells, minimum single pipe to deliver water. No extra capacity for future wells or existing Borie Field wells.</td>
<td>1</td>
<td>36</td>
<td>-</td>
<td>80</td>
<td>800</td>
<td>10,100</td>
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<td></td>
<td></td>
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<td>12</td>
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<td>80</td>
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<td>Belvoir No. 5 and 6 Wells, single pipe up to Sherard. Design capacity for future 6000 GPM from Belvoir, plus existing Borie Field wells.</td>
<td>1</td>
<td>36</td>
<td>-</td>
<td>80</td>
<td>7800</td>
<td>3100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>36</td>
<td>14,000</td>
<td>$3,150,000</td>
<td>7800</td>
<td>3100</td>
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<td>1</td>
<td>36</td>
<td>-</td>
<td>80</td>
<td>7800</td>
<td>3100</td>
</tr>
<tr>
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<td>36</td>
<td>14,000</td>
<td>$3,150,000</td>
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<td>16</td>
<td>4,600</td>
<td>$590</td>
<td>1100</td>
<td>190</td>
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<td>$13,919,025</td>
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<td>Future Western Phase. Wells at Duck Creek &amp; Spottlewood Creek.</td>
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<td>18,500</td>
<td>$1,830,000</td>
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<td>460</td>
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<td>Engineering Design - 15%</td>
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<td>Total</td>
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</tr>
<tr>
<td>Scenario Number</td>
<td>Scenario Description</td>
<td>Pipe Sections</td>
<td>Pipe Size (in)</td>
<td>Pipe Length (ft)</td>
<td>Cost ($)</td>
<td>Design Capacity (GPM)</td>
<td>Excess Capacity (GPM)</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>-----------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>5</td>
<td>Future Eastern Phase. Design capacity for future 3000 GPM from Eastern Belvoir.</td>
<td>12</td>
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<td></td>
<td>$19,026,750</td>
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<td>7</td>
<td>Full buildout of pipeline from Lone Tree Creek to Sherard Water Treatment Plant without Belvoir Pipelines.</td>
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<td>6000</td>
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<td>3,700</td>
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<td>$5,590,000</td>
<td>3000</td>
<td>750</td>
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<td></td>
<td><strong>Sub-Total</strong></td>
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<tr>
<td></td>
<td><strong>Engineering Design - 15%</strong></td>
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<td></td>
<td>$12,762,700</td>
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</table>
Utility Crossings, Easements and Rights of Way

The pipeline proposed in Phase V of the Cheyenne Belvoir Level II Study will cross parcels belonging to several public and private entities. It will be necessary to coordinate all design and construction activities with the easement owners of these crossings. At this time the following easement owners have been identified:

- Wyoming Department of Transportation (WYDOT)
- Union Pacific Railroad (UPRR)
- Wyoming State Land Board

Crossing Detail Sheets can be found in Appendix F. Appendix G contains an Easement Fee schedule and specific instructions for obtaining the necessary easements from each aforementioned entity.

TREATMENT

JR evaluated two treatment alternatives; on-site well treatment or combined raw water treatment at Sherard. Based on discussions with Cheyenne BOPU, the treatment will be located at the Sherard WTP.

Existing Facilities

Current treatment for groundwater wells from the Borie and Happy Jack well fields consists of either:

- Direct chlorination of the well field supply prior to entering the King I or King II storage reservoirs and/or;
- Blending of well field supply with treated surface water from the surface treatment plant.

Groundwater from the Borie and Happy Jack well fields is also aerated for the removal of Radon prior to entering the King II reservoir. The radon removal aeration structure is additionally used for the removal of Trichloroethylene (TCE) from water procured via the Borie well field.

The existing aeration facility was designed and constructed with the King II Reservoir by Black and Veatch in 1993. The facility was designed to remove 78% of the Radon concentrations that average 540 pCi/l at a maximum flow of 11.2 mgd (7778 gpm). This facility, a poured-in-place
concrete structure, utilizes a packed tower type of aeration system. In 1993, when designing the facility, treatment of TCE was not considered. However, it has since been determined through testing, that small concentrations of TCE are being effectively removed. The Cheyenne BOPU designed the existing facility to meet the proposed Maximum Containment Level (MCL) of 300 pCi/l for Radon.

**EPA Regulations**

The EPA has proposed a Radon maximum contaminant level (MCL) of 300-pCi/l for large community water systems (CWS) that serve greater than 10,000 people and that are not associated with a state or Community Water System Multimedia Mitigation (CWSMM) program for the removal of radon in existing and future buildings. An Alternate MCL (AMCL) of 4,000 pCi/l has been established for a CWS that has a state or CWSMM program for radon. The non-enforceable MCL Goal (MCLG) for radon is zero.

The current EPA regulation for TCE allows a MCL of 5 parts per billion (ppb) and a MCLG of zero. Concentrations above the MCL are classified as unsafe to drink and exceeding the MCL warrants a mandatory public notification.

**Proposed Facilities**

The proposed Belvoir Ranch pipeline is assumed to have a conveyance capacity of up to 8.64 mgd of additional groundwater to the Sherard Water Treatment Plant from the Belvoir No. 5, No. 6 and Lone Tree Creek wells, as well as from potential future well fields south and west of the Belvoir Ranch. It is anticipated that the future wells will contain Radon and TCE concentrations above the MCL of 300 pCi/l and 5 ppb respectively. Of the two treatment options available to the Cheyenne BOPU—individual on-site well treatment or a central treatment facility located at the treatment plant—the Cheyenne BOPU has opted to treat the combined well water at the treatment plant. The Cheyenne BOPU proposes to build a new aeration facility (adjacent to the current facility), which would be capable of removing both radon and TCE. In order to provide backup for the existing facility, the proposed facility would be of equal size and capacity.

The previous groundwater quality analysis performed by Black and Veatch in 1993 for the Bell, Happy Jack, and Borie well fields was used in designing the new facility. The water quality test
results for the three proposed wells from the Belvoir and Lone Tree Creek fields were compared and found to be within the range and close to the weighted mean of the existing wells. Given the number of wells used to calculate this range, it was assumed that water quality levels for future wells would be within this range as well. The combined groundwater quality for the existing well fields is listed in Table 8.

**Table 8: Combined Groundwater Quality of Bell, Happy Jack and Borie Well Fields**

<table>
<thead>
<tr>
<th>Water Quality Element</th>
<th>Range</th>
<th>Flow Weighted Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radon (pCi/l)</td>
<td>150-820</td>
<td>540</td>
</tr>
<tr>
<td>pH (units)</td>
<td>4.5–8.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Temperature (10 deg C)</td>
<td>8.0–13.4</td>
<td>11.1</td>
</tr>
<tr>
<td>Alkalinity (mg/l)</td>
<td>98-269</td>
<td>138</td>
</tr>
<tr>
<td>Hardness (mg/l)</td>
<td>127-240</td>
<td>160</td>
</tr>
<tr>
<td>Calcium (mg/l)</td>
<td>97-212</td>
<td>139</td>
</tr>
<tr>
<td>Magnesium (mg/l)</td>
<td>1-74</td>
<td>20</td>
</tr>
<tr>
<td>Iron (mg/l)</td>
<td>0.001-0.08</td>
<td>0.02</td>
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<tr>
<td>Manganese (mg/l)</td>
<td>0.01-1.2</td>
<td>0.16</td>
</tr>
<tr>
<td>TDS (mg/l)</td>
<td>70-220</td>
<td>147</td>
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</table>

Concentration levels of TCE can range from zero to 14,000 ppb (and sometimes higher) within an individual well over its production life. This can make determining future TCE levels in existing and future wells for the purpose of estimating TCE removal difficult. Due to the unknown TCE concentrations of future well production, a concentration of 100 ppb with a 95% removal rate was used for this report.

The removal efficiency for TCE and radon are temperature sensitive—i.e., more aeration time is required for removal at lower temperatures. Aeration units for TCE and Radon removal were
rated at 10 degrees C (50 degrees F) for water temperature and 10 degrees C for air temperature. Thus, TCE removal rates were a controlling factor in the design of the aeration structure. To achieve removal of TCE to the MCL or lower, the aeration unit designed for 90% removal can handle an inlet TCE concentration of 50 ppb. For 95% removal, the maximum inlet TCE concentration would be 100 ppb. The difference in operating costs for removal rates of 90 and 95 percent was approximately $60,000 due to increased packed column volume. For this evaluation, the 95% removal size is used to achieve the greatest removal rate over the greatest range of concentrations. In order to maintain adequate TCE removal, air temperatures must be maintained at 10 degrees C (especially when outside air temperatures are below 10 degrees C). The air supply for the aeration unit would be through a filtration system that also pre-heats the air. Radon removal required less volume of the packed column and the resulting removal of Radon was 99 percent or greater to less than 3 pCi/l.

Two types of aeration facilities were considered: a poured-in-place concrete structure similar to the existing aeration facility and a prefabricated unit that would be housed in an enclosure. A sketch of the Radon Removal Structure can be found in Appendix H. The costs associated with each type of unit are summarized below in Table 9.

The cost summary indicates that the poured-in-place unit has a lower capital cost than the prefabricated unit. On an annual basis, the operating costs associated with the prefabricated unit are greater since the unit operates in an enclosed structure and the air inside the building must be heated to feed the blowers. Therefore, a certain amount of heat loss that would not occur with the poured-in-place structure is imminent with the enclosed unit.

The Cheyenne BOPU may need to consider replacing the existing aeration facility in the future if TCE levels increase to the point where the existing aeration facility is no longer able to remove TCE at or below the MCL. The proposed aeration unit can be designed and constructed to account for future expansion of the unit, and to add three additional cells and an additional air-handling unit. The multi cell configuration and isolation valves would allow for isolation of individual cells for maintenance or repairs without necessitating shutdown of the entire facility. The cost to expand the facility to twice the capacity would approximately equal the cost of the proposed facility in current year construction dollars as adjusted for a future construction year.
Table 9: Sherard TCE and Radon Treatment Cost Estimate

<table>
<thead>
<tr>
<th>Alternative I</th>
<th></th>
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<tbody>
<tr>
<td>Poured in place concrete structure with internal packed towers (3)</td>
<td>and external air handling unit with pre-heater and filter (21,000 CFM)</td>
</tr>
<tr>
<td>Construction Cost $563,000</td>
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</tr>
<tr>
<td>Engineering Design -15% $84,450</td>
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<tr>
<td>Sub-Total $647,450</td>
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</table>

<table>
<thead>
<tr>
<th>Alternative II</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Prefabricated treatment unit with steel building enclosure (20' W x 80' L x 24' H) and air handling unit to preheat and filter air (21,000 CFM)</td>
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</tr>
<tr>
<td>Construction Cost $849,000</td>
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</tr>
<tr>
<td>Engineering Design -15% $127,350</td>
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<tr>
<td>Sub-Total $976,350</td>
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Sherard Wastewater Treatment Plant Yard Pipe Modifications
The proposed addition of a second aeration facility has prompted the Cheyenne BOPU to evaluate what changes to the existing yard pipe may be necessary in order to allow flows from all well fields to be treated in either aeration unit and subsequently stored in either the King I or King II Reservoirs. The current yard pipe configuration consists of two existing well field pipelines that connect to the aeration facility and discharge into the King II Reservoir. The Cheyenne BOPU would like the ability to route numerous well field pipelines to either aeration facility and then to either the King I or King II Reservoirs.

The Yard Pipe Sketch Plans in Appendix I show the revisions and additions to the yard pipe at Sherard that would provide the flexibility to use either aeration unit and to discharge to either reservoir. A new line between the two reservoirs was not considered in this report in that the yard pipe modifications allow the King II Reservoir to be taken off line for maintenance and allow aerated water to be sent to the King I Reservoir. It is assumed that during normal operations the aerated water will be discharged into the King II Reservoir and the discharge from King II will then be piped to the King I Reservoir before it is released into the system. It appears that currently, there is no need for additional capacity between the two reservoirs.
The cost for these modifications is presented below in Table 10. The unit costs for the yard pipe are greater than the unit costs for the well field pipeline due to the complex nature of constructing adjacent to the facilities and the minimal pipe footage being used.

Table 10: Sherard WTP Preliminary Yard Pipe Costs

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<tr>
<th>Item</th>
<th>Diameter (in)</th>
<th>Material</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Total Cost</th>
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<tr>
<td>Restrained Pipe</td>
<td>36</td>
<td>PVC/DIP</td>
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<td>LF</td>
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<td>45° &amp; 11.25° Bends</td>
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<td>EA</td>
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<td>22.5° &amp; 11.25° Bends</td>
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<td>$16,000</td>
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<td>45° Bends</td>
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<td>$8,000</td>
<td>$24,000</td>
</tr>
<tr>
<td>45° &amp; 11.25° Bends</td>
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<td>DIP</td>
<td>1</td>
<td>EA</td>
<td>$7,000</td>
<td>$7,000</td>
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<td>5</td>
<td>EA</td>
<td>$20,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Tee</td>
<td>36</td>
<td>DIP</td>
<td>4</td>
<td>EA</td>
<td>$12,000</td>
<td>$48,000</td>
</tr>
<tr>
<td>Tee</td>
<td>24</td>
<td>DIP</td>
<td>2</td>
<td>EA</td>
<td>$10,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Cut In For Tees</td>
<td>24</td>
<td>DIP</td>
<td>2</td>
<td>EA</td>
<td>$7,500</td>
<td>$15,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,424,200</td>
</tr>
<tr>
<td>Engineering Design- 15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$363,630</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,787,830</td>
</tr>
</tbody>
</table>
WATER SYSTEM DEVELOPMENT MASTER PLAN

Current Water Sources

Based upon 1994-2005 data, 69% of Cheyenne’s water is supplied from surface water sources. Cheyenne’s surface water supply system includes the collection and delivery of water from the Crow Creek drainage, located about 30 miles west of Cheyenne, and the Douglas Creek Drainage, located in the Snowy Range about 75 miles west of Cheyenne. Cheyenne must replace the water it collects from Douglas Creek, and does so by releasing water collected from the Little Snake River drainage on the western slope of the Continental Divide into the North Platte River. Water from these drainages is collected by five surface water reservoirs (Rob Roy, Lake Owen, Granite Springs, Crystal, and North Crow) that store water for Cheyenne’s use. These reservoirs are capable of storing 39,420 acre feet of water (Cheyenne, 2006).

Cheyenne supplements its surface water use with ground water, which accounts for 31% of the water used between 1994 and 2005. Currently, Cheyenne’s ground water system consists of 40 wells, of which 35 are active and five are currently out of service. These wells are located approximately five to 15 miles west and northwest of Cheyenne, and are situated in four major well fields: the Borie, Happy Jack, Bell, and Federal well fields. Cheyenne’s wells are completed in the High Plains Aquifer, which consists of saturated portions of the Ogallala and White River Formations. The long-term sustainable yield from the well fields was evaluated in both the 1994 and 2003 Master Plans for the Cheyenne Board of Public Utilities. Cheyenne’s ground water wells are adjudicated for 5,500 acre-feet of water production by the State Engineer’s Office. Using historical well field production data and the anticipated response of water levels to well field pumping, the 1994 and 2003 Master Plans estimated the sustainable annual yield of Cheyenne’s well fields at 4,800 and 4,100 acre-feet respectively. This difference represents a decline of 700 acre-feet per year over the nine-year period (Cheyenne, 2006).

One objective of ongoing Master Plan efforts is to reevaluate the response of the High Plains Aquifer to the various factors that affect aquifer water levels and well yield. Data evaluation efforts are on-going, so final conclusions regarding the sustainable yield during periods of average and below average precipitation are not yet available. Based on well field production
from 2002 to 2005, Cheyenne has averaged only 3,648 acre-feet per year. This is a decrease of about 450 acre-feet annually from the 2003 Master Plan estimate of 4,100 (Cheyenne, 2006).

Water Demand
With the completion of the 2003 Water and Wastewater Master Plans, the City of Cheyenne reassessed the quantity of water that will be required to accommodate future growth. The Master Plan also forecasts facilities and water supplies that may be needed to provide adequate and reliable water and wastewater services 20 to 50 years into the future. The 2003 Master Plans also provide a 10-year capital improvement plan for Cheyenne’s water and wastewater systems.

The impetus for expansion of the existing system and its water sources is based on projected demand relative to current supply. According to the Cheyenne Metropolitan Planning Organization (2005), the current capacity of the Board of Public Utilities water system is 40 million gallons per day (mgd) or 122.7 acre feet per day (acfd). While average daily demand as of 2005 is 15 mgd (46 acfd), peak day demand is approximately 37 mgd (113.5 acfd) or roughly 92% of current capacity. Projected total water demand for the Cheyenne Water System is listed in Table 11. Future demands are based on the assumption of a 1% population growth and a per capita annual average use rate of 245 gallons per capita per day (gpcd). Future demand estimates include the community of Cheyenne, South Cheyenne Water and Sewer District, Warren Air Force Base, and other anticipated water users in the City service area (Cheyenne, 2006).

Table 11: Projected Total Water Demand, Cheyenne

<table>
<thead>
<tr>
<th>Year</th>
<th>Service Population Estimates</th>
<th>Per Capita Demand (gpcd)</th>
<th>Projected Total Water Use (AF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>67,221</td>
<td>245</td>
<td>18,460</td>
</tr>
<tr>
<td>2010</td>
<td>72,070</td>
<td>245</td>
<td>19,792</td>
</tr>
<tr>
<td>2020</td>
<td>79,610</td>
<td>245</td>
<td>21,863</td>
</tr>
<tr>
<td>2030</td>
<td>87,939</td>
<td>245</td>
<td>24,150</td>
</tr>
<tr>
<td>2040</td>
<td>97,129</td>
<td>245</td>
<td>26,674</td>
</tr>
<tr>
<td>2050</td>
<td>107,302</td>
<td>245</td>
<td>29,468</td>
</tr>
</tbody>
</table>
**Source Water Master Planning**

To address the issue of providing sufficient water supplies to meet future water demand, the City of Cheyenne initiated the development of a “Wise Water Use Plan,” implemented a comprehensive water conservation program, and enacted a tiered water rate structure. While these water conservation efforts are important, such measures have a limited ability to reduce overall water demands.

The 2003 Master Plan identified and quantified water supply and demand issues that the City of Cheyenne is trying to address, and indicates that the quantity and quality of raw water supply is critical to the continuing growth of Cheyenne’s service area. Volume 3 of the plan provides several recommendations that could be implemented in the Near-Term (NT), Mid-Term (MT) and Long-Term (LT) to increase Cheyenne’s water supply as follows:

- NT – Expand ground water from 4,000 to 5,500 acre-ft / year
- MT – Water conservation at 5%
- MT – Expand ground water from 5,500 to 7,000 acre-ft / year;
- MT – Recycle Water at 10%
- LT – Water conservation at 10%
- LT – Expand ground water from 7,000 to 8,000 acre-ft / year

Note that the development of new groundwater resources is one of the key aspects to meeting future demand that was identified in the 2003 Master Plan. Groundwater is a critical resource for not only meeting summer-time peak demand, but also for maintaining proper water chemistry in the distribution system (i.e., blending for pH control). In addition, groundwater is not as sensitive as surface water to short-term deficiencies in precipitation due to the large water storage capability of aquifer systems. The development of additional groundwater supplies is also critical due to the reduced production and yields from the High Plains Aquifer in the vicinity of the existing well fields, and to maintain an approximately 25% mix of groundwater and surface water in the distribution system to enable compliance with the Lead and Copper Rule.
Belvoir Ranch Water Development Master Planning

The exploration and development of ground water from the Belvoir Ranch represents a significant component of Cheyenne’s future water development plans. Cheyenne’s exploration efforts to date have focused on the two primary aquifers that are accessible at the ranch: the High Plains Aquifer and the Casper Aquifer. The surface water resources on the ranch are limited, and while valuable, are not considered significant for future municipal development purposes.

As shown on Figure 1, the exploration of the High Plains Aquifer has produced two high capacity wells, Belvoir #5 and Belvoir #6, and identified an area in T13N, R68W on the eastern end of the ranch where additional wells could be completed in the Ogallala Aquifer to develop a well field. The exploration effort to date has also included the drilling of 10 test holes in the upper member of the High Plains Aquifer, the Ogallala Aquifer, and completion of eight monitoring wells. Test holes and production wells have revealed the extent and configuration of the Ogallala aquifer, and indicated that the aquifer has excellent development potential. These production wells specifically obtain ground water from saturated portions of the upper member of the High Plains Aquifer. The total number of wells that could be installed in this area and the sustainable yield of the aquifer in this area have yet to be determined.

The lower member of the High Plains Aquifer, the White River Formation, is currently being explored on the ranch to assess its development potential. This portion of the High Plains Aquifer has been the sole source of ground water in Cheyenne’s Federal well field, and was not the subject of this study. The exploration effort that has been proposed for this formation includes drilling up to ten test holes and installing monitoring wells in portions of T13N, R68W as well as T13N, R69W to assess potential ground water yield and water quality. This exploration effort will also include the installation of a test production well for aquifer testing purposes (Trihydro Corporation, 2007). Depending upon the results of this investigation, Cheyenne intends to complete a well field in this lower member of the High Plains Aquifer for the purpose of its municipal use.

Cheyenne has also been exploring the development potential of the Casper Aquifer on the western side of the Belvoir Ranch property. Site investigations completed to date have included the identification of five potential drill sites, the drilling of two test wells at two of the selected
sites, and the drilling of one test hole. The Casper Aquifer appears to have significant
development potential based on its potable quality and 600 to 800 gpm yield of the Lone Tree
No. 1 test well. The development potential of this aquifer is only partially defined at this time;
thus, the number of wells this aquifer will support and its sustainable yield have yet to be
determined. Any well field that may be completed to produce ground water from this aquifer
would be strictly limited to the western edge of the property and hinges upon results of future
exploration efforts.

Based on the success of exploration efforts completed on the High Plains and Casper Aquifers to
date, Cheyenne plans to transmit water developed from these areas to the Sherard Treatment
Plant through a series of new pipelines. There are no plans currently to add additional storage or
pump stations to this portion of the proposed system, as ground water developed from these areas
will flow by gravity to the Sherard Water Treatment Plant. As shown on Figure 1, ground water
from the Casper Aquifer would be piped from the Lone Tree No. 1 in Section 17 of T13, R69W
along the Lone Tree Creek drainage and northern property line to Section 14 of T13N, R68W.
Depending upon the results of future Casper Aquifer exploration, an additional pipeline would be
installed from the Lone Tree No. 1 well and extended south along the western margin of the
property to Section 12 of T12N, R70W to tie in additional wells located along this line.

From Section 14, ground water developed from the Casper Aquifer would be commingled with
ground water developed from the High Plains Aquifer and piped north to the Sherard Treatment
Plant through a new pipeline to be installed parallel to the Borie well field line. Belvoir #5 and
Belvoir #6 would be plumbed directly into the main line and completed with pipelines of
sufficient diameter to allow for the addition of future pipeline extensions to the west, south, and
east as additional wells in the well field are completed. Depending upon results of the White
River exploration, additional pipelines could be extended from the main northern line south.
These pipelines would be added as wells completed in the White River portion of the High Plains
Aquifer are completed.

Due to the TCE contamination of portions of the Ogallala aquifer, Cheyenne plans to add
infrastructure to mitigate this problem. The purpose of the pipeline configuration and
development of ground water from both the Casper and High Plains Aquifers is to dilute the TCE
concentration initially. Cheyenne will also construct a pretreatment system for ground water coming in through this pipeline. This system will consist of an air stripper that will be capable of volatilizing the TCE, thereby removing it from the water.

**Water Rights**

With regard to water rights, Cheyenne holds both surface and ground water rights on Belvoir Ranch. These water rights have historically been used for stock and irrigation purposes at the ranch. As there is currently no ground water restriction, Cheyenne has a couple options with regard to these rights and future development of the property. Cheyenne can obtain new ground water rights on the property, or transfer the existing rights to municipal use subject to the limitation that only the portion that has historically been consumed can be transferred. Assuming no ground water regulation is established, Cheyenne would benefit most by obtaining new ground water rights and is currently moving forward in this direction. However, if regulation is established, there would be benefit to the City to transfer the historical consumptive use of the old rights to municipal use to obtain their earlier priority dates. According to Black and Veatch (2003), Cheyenne has surface and ground water rights of approximately 7.29 cubic feet per second that are tied to the irrigation of 510 acres.

The amount of ground water that the City would be allowed to pump from the High Plains Aquifer is uncertain at this time. Possible overdrafting of the High Plains Aquifer in the vicinity of their current well fields and the existence of pending interference claims with downstream users make this difficult to determine. It is also uncertain how the Wyoming State Engineer’s Office (SEO) will administer use. Historically, the SEO has limited the total production from Cheyenne’s well fields to an aggregate of 5,500 acre-feet. The SEO may place a similar condition on well fields at the ranch that draw water from the High Plains Aquifer, or may opt to increase the overall adjudicated yield. Resolution of potential interference claims with senior downstream users will ultimately dictate the direction that the SEO selects.

While the Casper Aquifer has not been extensively developed to date along the eastern margin of the Laramie Range, obtaining water rights on the Casper Aquifer will depend upon potential interference with surface water rights that are tied to existing springs that emanate from the aquifer. A recent month long test of the Lone Tree No. 1 test well appeared to indicate that
pumping from this well had no impact on Granite Springs. The amount of ground water that Cheyenne will ultimately be able to take from this aquifer hinges on impacts to existing rights and is unclear at this time.²

SOURCE AREA PROTECTION PLAN

The Source Area Protection plan addresses concerns associated with the protection of surface and alluvial headwaters that contribute to the groundwater recharge of Belvoir Well No. 5, Belvoir Well No. 6, and Lone Tree Creek Well No. 1 (proposed location for municipal production well Lone Tree Creek No. 2). The alluvial headwaters also contribute to the water quality of these three wells. Each of the three wells is located within the property boundaries of Belvoir Ranch and is in proximity to, or along, Lone Tree Creek. It is anticipated that all three of the wells will be incorporated into the public water system (PWS) of the Cheyenne BOPU.

For each new municipal well in the State of Wyoming, the Wyoming Department of Environmental Quality (DEQ) requires that a Source Area Assessment and Protection (SWAP) Program be developed and implemented. Per the contract conditions stipulated in regard to the Level II Study, this report does not provide an in-depth assessment of a SWAP program. However, a preliminary assessment of the SWAP is included for each well in order to provide current data that can be used to support the Cheyenne BOPU’s ongoing SWAP effort.

² See references.
Delineation of Well Head Protection Zones

There are three different zones associated with the wellhead protection area (WHPA) of each well. These zones consist of the following:

1. **Zone 1**, or the “Accident Prevention” area, consists of a radial buffer extending 100 feet from each well. This area is considered most susceptible to environmental impacts that could hinder the quality of the well water.

2. **Zone 2** extends upstream/upgradient of Zone 1 and is called the “Attenuation Zone.” Zone 2 for groundwater systems consists of source water that is within a 2-year time of travel (TOT) from the well.

3. **Zone 3** extends upstream/upgradient of Zone 2 and, as it relates to groundwater systems, consists of the source water furthest away from the well. This zone has up to a 5-year TOT.

As distinguished by drainage and topography, Zones 1 through 3 for each of the three wells lie within the Lone Tree Creek Basin. Since Zone 1 is clearly defined by a radial distance of 100 feet from the well, the rest of the source area protection report will focus on Zones 2 and 3. JR Engineering (JR) utilized USGS 7.5-minute topographic maps, well construction logs, lithologic boring logs, and pump test data from each well to obtain the information necessary for delineating Zones 2 and 3.

Table 12 lists the well and aquifer characteristics that would be used in a WHPA delineation model for all three wells. The flow direction for each well is based on a line drawn perpendicular to the groundwater potentiometric contours that are in the proximity of the well. The angle was measured in degrees and in a clockwise direction (starting with zero degrees), oriented north on the potentiometric surface map. The x and y-coordinates are measured in feet with (0,0) starting from the southwest corner of the section the well lies in. For instance, based on this coordinate system, Belvoir No. 5 is located 2,534 feet east, and 4,277 feet north of the SW corner of Section 21, Township 13 North, and Range 68 West. This coordinate system is
similar to the coordinate system used for the City of Cheyenne Wellhead Protection Plan, published in 2006.

**Belvoir No. 5**

Belvoir No. 5 is located along the centerline of the NW and NE ¼ of Section 21, Township 13 North, and Range 68 West. This well was installed to a total depth of 270 feet below ground surface (bgs) with an aquifer thickness of approximately 150 feet (based on the total length of the screened intervals).

Figure 1, entitled, Belvoir Ranch Water Balance (Lidstone and Associates, Inc., October 2006) displays the Lone Tree Creek Basin from the headwaters to the eastern edge of Belvoir Ranch. Zones 2 and 3 were not delineated for Belvoir No. 5 as part of this report. However, the following table shows the general input parameters for a WHPA model of Belvoir No. 5.

### Table 12: Well Characteristics & Aquifer Properties in Proximity of Belvoir Well No. 5

<table>
<thead>
<tr>
<th>Input</th>
<th>Symbol</th>
<th>Value</th>
<th>Units</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>T</td>
<td>73,900 gpd/ft</td>
<td></td>
<td>Pump test data, average value from distance drawdown data</td>
</tr>
<tr>
<td>Aquifer Thickness</td>
<td>b</td>
<td>150 ft</td>
<td></td>
<td>Screened interval from soil boring log and/or well completion log</td>
</tr>
<tr>
<td>Hydraulic Gradient</td>
<td>dh/dx</td>
<td>0.00581 feet/foot</td>
<td></td>
<td>Based on a J.R. Engineering potentiometric surface map from 2005</td>
</tr>
<tr>
<td>Flow Direction</td>
<td></td>
<td>97 degrees</td>
<td></td>
<td>Based on a J.R. Engineering potentiometric surface map from 2005</td>
</tr>
<tr>
<td>Pumping Rate</td>
<td>Q</td>
<td>500 gpm</td>
<td></td>
<td>Pump test and design flow for pump</td>
</tr>
<tr>
<td>Porosity</td>
<td>ø</td>
<td>0.18 N/A</td>
<td></td>
<td>Estimates from WWHPPGD, boring logs, and published data</td>
</tr>
<tr>
<td>Well Radius</td>
<td>r</td>
<td>0.833 ft</td>
<td></td>
<td>Well completion log</td>
</tr>
<tr>
<td>Well Location</td>
<td>x, y</td>
<td>2534, 4277 ft</td>
<td></td>
<td>from SW corner of S21, T13N, R68W, J.R. Engineering Map (2007)</td>
</tr>
<tr>
<td>Time of Simulation</td>
<td>t</td>
<td>2 &amp; 5 years</td>
<td></td>
<td>Two and five years based on WWHPPGD (1997)</td>
</tr>
<tr>
<td>Degree of Aquifer Confinement</td>
<td>N/A</td>
<td>confined</td>
<td>N/A</td>
<td>Pump test data, hydrogeologic observations, and geologic reports</td>
</tr>
<tr>
<td>Hydraulic Conductivity of Confining Layer, if semi-confined aquifer</td>
<td>K'</td>
<td>493 ft/day</td>
<td></td>
<td>J.R. Engineering, Belvoir No. 5 &amp; 6 Pumping Tests &amp; Aquifer Impact Report, August 13, 2007</td>
</tr>
<tr>
<td>Confining Layer Thickness, if semi-confined</td>
<td>b'</td>
<td>245 ft</td>
<td></td>
<td>Lithologic data, geophysical data, and soil boring logs from</td>
</tr>
<tr>
<td>Boundary Condition</td>
<td>N/A</td>
<td>None</td>
<td>N/A</td>
<td>J.R. Engineering Report (August 13, 2007)</td>
</tr>
</tbody>
</table>

Well pump test from J.R. Engineering report (August 13, 2007)
Belvoir No. 6
Belvoir No. 6 is located in the SE ¼ of the NW ¼ of Section 23, Township 13 North, and Range 68 West. The well was installed to a total depth of 406 feet bgs with an aquifer thickness of approximately 139 feet.

Zones 2 and 3 were not delineated for Belvoir No. 6 as part of this report. However, Table 13 shows the general input parameters for a WHPA model of Belvoir No. 6.

Table 13: Well Characteristics & Aquifer Properties in Proximity of Belvoir Well No. 6

<table>
<thead>
<tr>
<th>Input</th>
<th>Symbol</th>
<th>Value</th>
<th>Units</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>T</td>
<td>42,400</td>
<td>gpd/ft</td>
<td>Pump test data, average value from distance drawdown data</td>
</tr>
<tr>
<td>Aquifer Thickness</td>
<td>b</td>
<td>139</td>
<td>ft</td>
<td>Screened interval from soil boring log and/or well completion log</td>
</tr>
<tr>
<td>Hydraulic Gradient</td>
<td>dh/dx</td>
<td>0.006476</td>
<td>feet/foot</td>
<td>Based on a J.R. Engineering potentiometric surface map from 2005</td>
</tr>
<tr>
<td>Flow Direction</td>
<td>dB</td>
<td>103</td>
<td>degrees</td>
<td>Based on a J.R. Engineering potentiometric surface map from 2005</td>
</tr>
<tr>
<td>Pumping Rate</td>
<td>Q</td>
<td>300</td>
<td>gpm</td>
<td>Pump test and design flow for pump</td>
</tr>
<tr>
<td>Porosity</td>
<td></td>
<td>0.18</td>
<td>N/A</td>
<td>Estimates from WWHPGD, boring logs, and published data</td>
</tr>
<tr>
<td>Well Radius</td>
<td>r</td>
<td>0.833</td>
<td>ft</td>
<td>Well completion log</td>
</tr>
<tr>
<td>Well Location</td>
<td>x, y</td>
<td>1056, 3432</td>
<td>ft</td>
<td>from SW corner of S23, T13N, R68W, J.R. Engineering Map (2007)</td>
</tr>
<tr>
<td>Time of Simulation</td>
<td>t</td>
<td>2 &amp; 5 years</td>
<td></td>
<td>Two and five years based on WWHPGD (1997)</td>
</tr>
<tr>
<td>Degree of Aquifer Confinement</td>
<td>N/A</td>
<td>semi-confined</td>
<td>N/A</td>
<td>Pump test data, hydrogeologic observations, and geologic reports (J.R. Engineering, Belvoir No. 5 &amp; 6 Pumping Tests &amp; Aquifer Impact Report, August 13, 2007)</td>
</tr>
<tr>
<td>Hydraulic Conductivity of Confining Layer, if semi-confined aquifer</td>
<td>K'</td>
<td>305</td>
<td>ft/day</td>
<td>Pump test data from J.R. Engineering report (August 13, 2007)</td>
</tr>
<tr>
<td>Confining Layer Thickness, if semi-confined</td>
<td>b'</td>
<td>25</td>
<td>ft</td>
<td>Lithologic data, geophysical data, and soil boring logs from J.R. Engineering Report (August 13, 2007)</td>
</tr>
</tbody>
</table>

Lone Tree Creek No. 2
Lone Tree Creek No. 2 (proposed municipal well) will be located in the SW ¼ of the NE ¼ of Section 17, Township 13 North, and Range 69 West. Currently, Lone Tree Creek No. 1 is installed in this location as a monitoring well to a total depth of 1,348 feet bgs with an aquifer thickness of approximately 956 feet. Because the borehole was left open below the surface casing and the well has not been permitted as a municipal well, Lone Tree Creek No. 1 is being referred to as a test hole/well in other parts of the Cheyenne Belvoir Level II Study. A substantial portion of the recharge for Lone Tree Creek No. 1 stems from fractured flow.
occurring at and before the Lone Tree Creek Sink, which is located approximately one half mile upstream of Lone Tree Creek No. 1. The main water bearing formation for Lone Tree Creek No. 1 is a confined portion of the Casper formation. Therefore, the water that enters the basin downstream of the Lone Tree Creek Sink or the Casper outcrop does not appear to contribute to the recharge of Lone Tree Creek No. 1 or the proposed location of Lone Tree Creek No. 2.

Zones 2 and 3 have been delineated for the proposed location of Lone Tree Creek No. 2 as follows: Zone 2 extends west approximately 1.25 miles from the eastern edge of the Casper outcrop within the Lone Tree Creek Basin (see Figure 2); Zone 3 extends from the eastern edge of Zone 2 to the beginning of the Lone Tree Creek Basin, approximately 13 miles upstream. See the Belvoir Ranch Water Balance, attached as Figure 1.

Table 14: Well Characteristics & Aquifer Properties in Proximity of Proposed Lone Tree Creek Well No. 2

<table>
<thead>
<tr>
<th>Input</th>
<th>Symbol</th>
<th>Value</th>
<th>Units</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>T</td>
<td>81,000</td>
<td>gpd/ft</td>
<td>Pump test data, value from recovery data after constant rate test</td>
</tr>
<tr>
<td>Aquifer Thickness</td>
<td>b</td>
<td>956</td>
<td>ft</td>
<td>Soil boring Log and/or well completion log</td>
</tr>
<tr>
<td>Hydraulic Gradient</td>
<td>dh/dx</td>
<td>0.0506</td>
<td>feet/foot</td>
<td>Based on a Lidstone Associates potentiometric surface map from 2006</td>
</tr>
<tr>
<td>Flow Direction</td>
<td>→</td>
<td>75</td>
<td>degrees</td>
<td>Based on a Lowry &amp; Crist potentiometric surface map (1967)</td>
</tr>
<tr>
<td>Pumping Rate</td>
<td>Q</td>
<td>500</td>
<td>gpm</td>
<td>Pump test and design flow for pump</td>
</tr>
<tr>
<td>Porosity</td>
<td>α</td>
<td>0.18</td>
<td>N/A</td>
<td>Estimates from WWHPPGD, boring logs, and published data</td>
</tr>
<tr>
<td>Well Radius</td>
<td>r</td>
<td>0.719</td>
<td>ft</td>
<td>Well completion log</td>
</tr>
<tr>
<td>Well Location</td>
<td>x, y</td>
<td>3221, 2693</td>
<td>ft</td>
<td>from SW corner of Section 17, T13N, R69W, J.R. Engineering Map (2007)</td>
</tr>
<tr>
<td>Time of Simulation</td>
<td>t</td>
<td>2 &amp; 5</td>
<td>years</td>
<td>Two and five years based on WWHPPGD (1997)</td>
</tr>
<tr>
<td>Degree of Aquifer Confinement</td>
<td>N/A</td>
<td>Confined</td>
<td>N/A</td>
<td>Pump test data, hydrogeologic observations, and geologic reports</td>
</tr>
<tr>
<td>Hydraulic Conductivity of Confining Layer, if semi-confined aquifer</td>
<td>Kc</td>
<td>84.73</td>
<td>ft/day</td>
<td>Pump test data from Lidstone &amp; Associates report (October 2006)</td>
</tr>
<tr>
<td>Confining Layer Thickness, if semi-confined</td>
<td>b'</td>
<td>257</td>
<td>ft</td>
<td>Lithologic data, geophysical data, and soil boring logs</td>
</tr>
<tr>
<td>Boundary Condition</td>
<td>N/A</td>
<td>Slight</td>
<td>N/A</td>
<td>Encountered approximately 850 min. into constant rate (600 gpm) test</td>
</tr>
</tbody>
</table>
Susceptibility Assessment of Wells

Part of the Source Area Protection plan mandates that an assessment be conducted on each well’s susceptibility to environmental contaminants/impacts or aquifer characteristics (such as boundary conditions) that might impede the production of the well. In order to determine the water quality of the wells, groundwater samples were taken from each well during the pump test and delivered to Energy Laboratories in Casper, Wyoming for analysis. The samples were analyzed for drinking water related constituents including: physical properties, bacteria (fecal coliform and iron related), major ions, total metals, radionuclides, total cyanide, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs - pesticides, herbicides, and carbonates).

Susceptibility forms were filled out for each well and are located in Appendix J. These forms also contain information about the subsurface lithology, aquifer properties, and wellhead completion of each well.
Figure 2
Zone 2 for Lone Tree Creek No. 1
SYSTEM DEVELOPMENT COST SUMMARY

Tables 15 through 21 present cost summaries of the six design alternatives for all scenarios previously presented. It is important to note that Tables 15 through 20 include the costs associated with the drilling and casing of the Belvoir No. 5 and No. 6 wells. These drilling and casing costs were initially paid for by the WWDC, however, the Cheyenne BOPU has agreed to reimburse the WWDC for these costs. Thus they have been included in each preliminary design cost alternative.

ECONOMIC ANALYSIS

Task 7 of Phase V required JR to prepare an economic analysis, the purpose of which is to assist the Cheyenne BOPU in determining its ability to finance the preferred alternative. This effort incorporated a summary of the Cheyenne BOPU’s preferred funding alternatives, which include grants, loans and all WWDC eligible and non-eligible costs. In addition, this effort includes a summary of future maintenance costs and debt service requirements.

JR has provided a preliminary design and cost summary of six alternatives as previously discussed. The costs associated with each of the five alternatives are presented in Table 16 through 21 (below). There are several potential sources of funding for the scenario selected by the Cheyenne BOPU. These sources include, but are not limited to, the following:

- WWDC grant for eligible costs identified in this Level II Study.
- WWDC loan at an interest rate of 4 percent for a period of 30 years.
- Wyoming Drinking Water State Revolving Fund (SRF) loan package, for costs not covered by the WWDC grant, at an interest rate of 2.5 percent for a period of 20 years.
Financing Analysis for each Alternative

The Cheyenne BOPU has indicated a desire to seek grant funding from the WWDC, which would include two-thirds of the cost of the preliminary design for all eligible WWDC expenditures for the specific phases included in this Level II study. In addition, the Cheyenne BOPU has indicated that it will seek a loan to finance the costs not covered by the WWDC grant from the SRF at a 2.5 percent interest rate with a loan term of 20 years. It is important to note that the Cheyenne BOPU must demonstrate surety of its SRF loan prior to receiving WWDC grant funds.

The Cheyenne BOPU presently services 21,414 accounts inside its service district and 148 accounts outside of its service district (based on information provided by the Cheyenne BOPU). The five-year average annual water provided to these accounts is 4.1 billion gallons. Each of the four financing alternatives presents the estimated annual increase in the cost per account and per 1,000 gallons in order to service the 20-year SRF debt. In addition to the capital financing alternatives, O&M costs were included. Table 15 presents the anticipated O&M costs for Belvoir Wells No. 5 & 6, the Lone Tree Well No. 2 and the additional treatment requirements.

The O&M costs presented in Table 15 are based on a 10-year major replacement cost of all wells’ pumping systems. In addition, based on information provided by the Cheyenne BOPU, these costs include man-hours per well per week for routine maintenance, meter readings, and a unit man-hour cost of $20/hour. The estimated required additional man-hours required for the treatment O&M is 10 hours per week. Given the scope of each alternative, it was assumed that a minimum of 728 man-hours per year would be required for each well and 520 man-hours per year for treatment O&M operations.

Tables 16 through 21 present a summary of WWDC eligible and non-eligible costs, as well as the anticipated financing structure for each of the previously discussed alternatives. WWDC eligible costs to be potentially funded under Level III activities include all construction costs (with the exception of treatment), access roads and operating costs. The Cheyenne BOPU has indicated that it will develop all required access roads independently of this preliminary cost estimate.
JR has identified the WWDC grant and the SRF loan package (at an interest rate of 2.5 percent for 20 years) as the desired funding scenario for each of the four alternatives contained in Tables 16 through 21.

Table 15: O&M Costs

<table>
<thead>
<tr>
<th>Options: Based on Scenarios 1 through 7</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
<th>Alternative 5</th>
<th>Alternative 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belvoir No. 5 Well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity 40 HP $0.10/Kwh</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 yr Well Maintenance Cost</td>
<td>$8,000</td>
<td>$8,000</td>
<td>$8,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 yr Well Maintenance Major Cost</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man Hour Cost - 14 hours/week for each well</td>
<td>$15,000</td>
<td>$15,000</td>
<td>$15,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual O &amp; M Cost</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belvoir No. 6 Well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity 25 HP $0.10/Kwh</td>
<td>$6,800</td>
<td>$6,800</td>
<td>$6,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 yr Well Maintenance Cost</td>
<td>$8,000</td>
<td>$8,000</td>
<td>$8,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 yr Well Maintenance Major Cost</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man Hour Cost - 14 hours/week for each well</td>
<td>$15,000</td>
<td>$15,000</td>
<td>$15,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual O &amp; M Cost</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lone Tree Creek Well No. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity 50 HP $0.10/Kwh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 yr Well Maintenance Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 yr Well Maintenance Major Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man Hour Cost - 14 hours/week for each well</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual O &amp; M Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCE/Radon Removal Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blower 25 HP $0.10/Kwh</td>
<td>$6,800</td>
<td>$6,800</td>
<td>$6,800</td>
<td>$6,800</td>
<td>$6,800</td>
</tr>
<tr>
<td>Aeration Maintenance</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
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<tr>
<td>Cleaning Aeration Spray</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Heads Every 5 Years</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Man Hour Cost - 10 hours/week</td>
<td>$8,800</td>
<td>$8,800</td>
<td>$8,800</td>
<td>$8,800</td>
<td>$8,800</td>
</tr>
<tr>
<td>Alternative Totals</td>
<td>$92,400</td>
<td>$134,400</td>
<td>$59,600</td>
<td>$59,600</td>
<td>$134,400</td>
</tr>
</tbody>
</table>

Cheyenne Belvoir Ranch Level II Report
O&M Cost Summary for Alternatives 1 through 6

JR has identified the WWDC grant and the SRF loan package (at an interest rate of 2.5 percent for 20 years) as the desired funding scenario for each of the four alternatives contained in Tables 16 through 21.
Alternative 1 consists only of the cost to construct and case the TH1, 2, 3, 4, 5, 6, 9, and 10 holes, and the Belvoir No. 5 and No. 6 wells. This expense was incurred directly by the WWDC and must be paid back by the Cheyenne BOPU. Therefore, this cost is woven into the foregoing four alternatives presented below.

Table 16: Alternative 1

<table>
<thead>
<tr>
<th>Cheyenne Belvoir Ranch Level II Report</th>
<th>WWDC Eligible Costs</th>
<th>WWDC Non-Eligible Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No.5 &amp; No. 6</td>
<td>$218,000</td>
<td></td>
<td>$218,000</td>
</tr>
<tr>
<td>Totals</td>
<td>$218,000</td>
<td>$0</td>
<td>$218,000</td>
</tr>
</tbody>
</table>

Financial for Alternative 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant</td>
<td>$146,060</td>
</tr>
<tr>
<td>SRF</td>
<td>$71,940</td>
</tr>
<tr>
<td>SRF @ 2.5% - 20 year Annual Payment</td>
<td>$4,615</td>
</tr>
<tr>
<td>Annual Cost Increase per Account</td>
<td>$0.21</td>
</tr>
<tr>
<td>Annual Cost Increase for 1000 gallons</td>
<td>$0.00</td>
</tr>
<tr>
<td>Annual O&amp;M Cost Increase per Account</td>
<td>$0.00</td>
</tr>
<tr>
<td>Annual O&amp;M Cost Increase per 1000 gallons</td>
<td>$0.00</td>
</tr>
<tr>
<td>Total Annual Cost Increase per Account</td>
<td>$0.21</td>
</tr>
<tr>
<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

1 Based on 21,414 inside city & 148 outside city - total 21,562
2 Based on 4.1 billion average annual water usage
3 O&M Cost includes electricity, 2704 man hours/yr, 5 yr pump maintenance costs and required treatment filter replacement
Alternative 2 comprises completion of pumping plant facilities for the Belvoir No. 5 and No. 6 wells, the pipeline system from both of these wells to the Sherard WTP, yard piping at Sherard and the Sherard WTP TCE/Radon treatment facility.

### Table 17: Alternative 2

<table>
<thead>
<tr>
<th>Cheyenne Belvoir Ranch Level II Report</th>
<th>WWDC Eligible Costs</th>
<th>WWDC Non-Eligible Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Construction Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No.5 &amp; No. 6</td>
<td>$218,000</td>
<td></td>
<td>$218,000</td>
</tr>
<tr>
<td>Engineering &amp; Legal Design Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of Final Design and Specifications</td>
<td>$990,652</td>
<td>$448,080</td>
<td>$1,438,732</td>
</tr>
<tr>
<td>Permitting and Mitigation</td>
<td>$3,100</td>
<td></td>
<td>$3,100</td>
</tr>
<tr>
<td>Legal Fees</td>
<td>Note 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td>$86,000</td>
<td></td>
<td>$86,000</td>
</tr>
<tr>
<td>Cost of Components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline Costs</td>
<td>$6,099,590</td>
<td></td>
<td>$6,099,590</td>
</tr>
<tr>
<td>Pipeline Boring at Crossings</td>
<td>$1,408,000</td>
<td></td>
<td>$1,408,000</td>
</tr>
<tr>
<td>Belvoir 5 Well Completion</td>
<td>$235,004</td>
<td></td>
<td>$235,004</td>
</tr>
<tr>
<td>Belvoir 6 Well Completion</td>
<td>$270,750</td>
<td></td>
<td>$270,750</td>
</tr>
<tr>
<td>Sherard WTP Yard Pipe</td>
<td>$2,424,200</td>
<td></td>
<td>$2,424,200</td>
</tr>
<tr>
<td>Sherard WTP TCE/Radon Treatment Alternative I</td>
<td>$563,000</td>
<td></td>
<td>$563,000</td>
</tr>
<tr>
<td>Alternative Construction Cost Sub-Total #1</td>
<td>$8,013,344</td>
<td>$2,987,200</td>
<td>$11,000,544</td>
</tr>
<tr>
<td>Engineering Costs = CCS#1 x 10%</td>
<td>$801,334</td>
<td>$298,720</td>
<td>$1,100,054</td>
</tr>
<tr>
<td>Sub-Total #2</td>
<td>$8,814,678</td>
<td>$3,285,920</td>
<td>$12,100,598</td>
</tr>
<tr>
<td>Contingency = Sub-Total #2 x 30%</td>
<td>$2,644,404</td>
<td>$985,776</td>
<td>$3,630,180</td>
</tr>
<tr>
<td>Construction Cost Total</td>
<td>$11,459,082</td>
<td>$4,271,696</td>
<td>$15,730,778</td>
</tr>
<tr>
<td>Project Cost Total</td>
<td>$12,756,834</td>
<td>$4,719,776</td>
<td>$17,476,610</td>
</tr>
<tr>
<td>67% Grant</td>
<td>$8,547,079</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33% Loan</td>
<td>$4,209,755</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Financing for Alternative 2

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant</td>
<td>$8,547,079</td>
</tr>
<tr>
<td>SRF</td>
<td>$8,929,531</td>
</tr>
<tr>
<td>SRF @ 2.5% - 20 year Annual Payment</td>
<td>$572,804</td>
</tr>
<tr>
<td>Annual Cost Increase per Account †</td>
<td>$26.57</td>
</tr>
<tr>
<td>Annual Cost Increase for 1000 gallons ‡</td>
<td>$0.14</td>
</tr>
<tr>
<td>Annual O&amp;M Cost Increase per Account ‡</td>
<td>$4.29</td>
</tr>
<tr>
<td>Annual O&amp;M Const Increase per 1000 gallons</td>
<td>$0.02</td>
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<tr>
<td>Total Annual Cost Increase per Account</td>
<td>$30.85</td>
</tr>
<tr>
<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.16</td>
</tr>
</tbody>
</table>

*1 Based on 21,414 inside city & 148 outside city - total 21,562
2 Based on 4.1 billion average annual water usage
3 O&M Cost includes electricity, 2704 man hours/yr, 5 yr pump maintenance costs and required treatment filter replacement
Alternative 3 consists of drilling and casing the proposed Lone Tree Creek Well No. 2, the completion of the pumping plant facilities for the Lone Tree Creek Well No. 2, the completion of pumping plant facilities for the Belvoir No. 5 and No. 6 wells, the pipeline from the Lone Tree Creek Well No. 2 to Sherard and the pipelines necessary for the integration of the Belvoir No. 5 and No. 6 wells to the main pipeline to Sherard.

Table 18: Alternative 3

<table>
<thead>
<tr>
<th>Cheyenne Belvoir Ranch Level II Report</th>
<th>WWDC Eligible Costs</th>
<th>WWDC Non-Eligible Costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Construction Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No. 5 &amp; No. 6</td>
<td>$218,000</td>
<td></td>
<td>$218,000</td>
</tr>
<tr>
<td><strong>Engineering &amp; Legal Design Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of Final Design and Specifications</td>
<td>$2,030,938</td>
<td>$448,080</td>
<td>$2,479,018</td>
</tr>
<tr>
<td>Permitting and Mitigation</td>
<td>$3,100</td>
<td></td>
<td>$3,100</td>
</tr>
<tr>
<td>Legal Fees</td>
<td>Note 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td>$110,800</td>
<td></td>
<td>$110,800</td>
</tr>
<tr>
<td><strong>Cost of Components</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline Costs</td>
<td>$12,103,500</td>
<td>$12,103,500</td>
<td></td>
</tr>
<tr>
<td>Pipeline Boring at Crossings</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
<td></td>
</tr>
<tr>
<td>Belvoir 5 Well Completion</td>
<td>$234,000</td>
<td>$234,000</td>
<td></td>
</tr>
<tr>
<td>Belvoir 6 Well Completion</td>
<td>$270,750</td>
<td>$270,750</td>
<td></td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Drilling and Casing</td>
<td>$502,000</td>
<td>$502,000</td>
<td></td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Completion</td>
<td>$262,000</td>
<td>$262,000</td>
<td></td>
</tr>
<tr>
<td>Sherard WTP Yard Pipe</td>
<td>$2,424,200</td>
<td>$2,424,200</td>
<td></td>
</tr>
<tr>
<td>Sherard WTP TCE/Radon Treatment Alternative I</td>
<td>$563,000</td>
<td>$563,000</td>
<td></td>
</tr>
<tr>
<td><strong>Alternative Construction Cost Sub-Total #1</strong></td>
<td>$14,780,250</td>
<td>$2,987,200</td>
<td>$17,767,450</td>
</tr>
<tr>
<td>Engineering Costs = CCS#1 x 10%</td>
<td>$1,478,025</td>
<td>$298,720</td>
<td>$1,776,745</td>
</tr>
<tr>
<td>Sub-Total #2</td>
<td>$16,258,275</td>
<td>$3,283,920</td>
<td>$19,544,195</td>
</tr>
<tr>
<td>Contingency = Sub-Total #2 x 30%</td>
<td>$4,877,483</td>
<td>$985,776</td>
<td>$5,863,259</td>
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<tr>
<td>Construction Cost Total</td>
<td>$21,135,758</td>
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<td>$28,218,372</td>
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<tr>
<td>67% Grant</td>
<td>$15,744,059</td>
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<td></td>
</tr>
<tr>
<td>33% Loan</td>
<td>$7,754,537</td>
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</tbody>
</table>

Financing for Alternative 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant</td>
<td>$15,744,059</td>
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<tr>
<td>SRF</td>
<td>$12,474,313</td>
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<td>SRF @ 2.5% - 20 year Annual Payment</td>
<td>$800,191</td>
</tr>
<tr>
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<td>Annual Cost Increase for 1000 gallons 2</td>
<td>$0.19</td>
</tr>
<tr>
<td>Annual O&amp;M Cost Increase per Account 3</td>
<td>$6.23</td>
</tr>
<tr>
<td>Annual O&amp;M Const Increase per 1000 gallons</td>
<td>$0.03</td>
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<tr>
<td>Total Annual Cost Increase per Account</td>
<td>$43.34</td>
</tr>
<tr>
<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.23</td>
</tr>
</tbody>
</table>

1 Based on 21,414 inside city & 148 outside city - total 21,562
2 Based on 4.1 billion average annual water usage
3 O&M Cost includes electricity, 2704 man hours/yr, 5 yr pump maintenance costs
and required treatment filter replacement
Alternative 4 consists of drilling and casing the proposed Lone Tree Creek Well No. 2, the completion of the pumping plant facilities for the Lone Tree Creek Well No. 2, and the pipeline from the Lone Tree Creek Well No. 2 to Sherard. This alternative does not include the completion of Belvoir Wells No. 5 and No. 6 nor the pipelines necessary to integrate the Belvoir No. 5 and No. 6 wells to the main pipeline to Sherard. This alternative does, however, include the Sherard WTP TCE/Radon treatment facility.

Table 19: Alternative 4

<table>
<thead>
<tr>
<th>Cheyenne Belvoir Ranch Level II Report</th>
<th>Cost Summary for Preferred Alternative 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Eligible Costs</td>
<td>WWDC Non-Eligible Costs</td>
</tr>
<tr>
<td>Non-Construction Costs</td>
<td></td>
</tr>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No. 5 &amp; No. 6</td>
<td>$218,000</td>
</tr>
<tr>
<td>Engineering &amp; Legal Design Costs</td>
<td></td>
</tr>
<tr>
<td>Preparation of Final Design and Specifications</td>
<td>$1,804,400</td>
</tr>
<tr>
<td>Permitting and Mitigation</td>
<td>$3,100</td>
</tr>
<tr>
<td>Legal Fees</td>
<td>Note 2</td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td>$110,800</td>
</tr>
</tbody>
</table>

Cost of Components

| Pipeline Costs                         | $11,098,000 | $11,098,000 |
| Pipeline Boring at Crossings           | $1,408,000 | $1,408,000 |
| Lone Tree Well No. 2 Drilling and Casing | $502,000 | $502,000 |
| Lone Tree Well No. 2 Completion        | $262,000 | $262,000 |
| Sherard WTP Yard Pipe                  | $2,424,200 | $2,424,200 |
| Sherard WTP TCE/Radon Treatment Alternative 1 | $563,000 | $563,000 |
| Alternative Construction Cost Sub-Total #1 | $13,270,000 | $2,987,200 | $16,257,200 |
| Engineering Costs = CCS#1 x 10%        | $1,327,000 | $298,720 | $1,625,720 |
| Sub-Total #2                           | $14,597,000 | $3,285,920 | $17,882,920 |
| Contingency = Sub-Total #2 x 30%       | $4,379,100 | $983,776 | $5,363,876 |
| Construction Cost Total                | $18,976,100 | $4,271,696 | $23,247,796 |
| Project Cost Total                     | $21,112,400 | $4,719,776 | $25,832,176 |
| 67% Grant                              | $14,145,308 |       |
| 33% Loan                               | $6,967,092 |       |

Financing for Alternative 4

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
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<tbody>
<tr>
<td>WWDC Grant</td>
<td>$14,145,308</td>
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<tr>
<td>SRF</td>
<td>$11,686,868</td>
</tr>
<tr>
<td>SRF @ 2.5% - 20 year Annual Payment</td>
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</tr>
<tr>
<td>Annual Cost Increase per Account 1</td>
<td>$34.77</td>
</tr>
<tr>
<td>Annual Cost Increase for 1000 gallons 2</td>
<td>$0.18</td>
</tr>
<tr>
<td>Annual O&amp;M Cost Increase per Account 3</td>
<td>$2.76</td>
</tr>
<tr>
<td>Annual O&amp;M Const Increase per 1000 gallons</td>
<td>$0.01</td>
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<tr>
<td>Total Annual Cost Increase per Account</td>
<td>$37.53</td>
</tr>
<tr>
<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.20</td>
</tr>
</tbody>
</table>

1 Based on 21,414 inside city & 148 outside city - total 21,562
2 Based on 4.1 billion average annual water usage
3 O&M Cost includes electricity, 2704 man hours/yr, 5yr pump maintenance costs and required treatment filter replacement
Alternative 5 consists of drilling and casing the proposed Lone Tree Creek Well No. 2, the completion of the pumping plant facilities for the Lone Tree Creek Well No. 2, and the pipeline from the Lone Tree Creek Well No. 2 to Sherard. This alternative does include the completion of the Belvoir Well No. 5 and No. 6 and the necessary pipelines to integrate the Belvoir No. 5 and No. 6 wells to the main pipeline to Sherard. This alternative includes the Sherard WTP TCE/Radon treatment facility.

Table 20: Alternative 5

<table>
<thead>
<tr>
<th>Cheyenne Belvoir Ranch Level II Report</th>
<th>Cost Summary for Preferred Alternative 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Eligible Costs</td>
<td>WWDC Non-Eligible Costs</td>
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<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No.5 &amp; No. 6</td>
<td>$218,000</td>
</tr>
<tr>
<td>Engineering &amp; Legal Design Costs</td>
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</tr>
<tr>
<td>Preparation of Final Design and Specifications</td>
<td>$1,955,225</td>
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<tr>
<td>Permitting and Mitigation</td>
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<tr>
<td>Legal Fees</td>
<td>Note 2</td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td>$110,800</td>
</tr>
<tr>
<td><strong>Cost of Components</strong></td>
<td></td>
</tr>
<tr>
<td>Pipeline Costs</td>
<td>$12,103,500</td>
</tr>
<tr>
<td>Pipeline Boring at Crossings</td>
<td>$1,408,000</td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Drilling and Casing</td>
<td>$502,000</td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Completion</td>
<td>$262,000</td>
</tr>
<tr>
<td>Sherard WTP Yard Pipe</td>
<td>$2,424,200</td>
</tr>
<tr>
<td>Sherard WTP TCE/Radon Treatment Alternative I</td>
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</tr>
<tr>
<td>Alternative Construction Cost Sub-Total #1</td>
<td>$14,275,500</td>
</tr>
<tr>
<td>Engineering Costs = CCS#1 x 10%</td>
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<tr>
<td>Sub-Total #2</td>
<td>$15,703,050</td>
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<tr>
<td>Contingency = Sub-Total #2 x 30%</td>
<td>$4,710,915</td>
</tr>
<tr>
<td>Construction Cost Total</td>
<td>$20,413,965</td>
</tr>
<tr>
<td>Project Cost Total</td>
<td>$22,701,090</td>
</tr>
<tr>
<td>67% Grant</td>
<td>$15,209,730</td>
</tr>
<tr>
<td>33% Loan</td>
<td>$7,491,360</td>
</tr>
<tr>
<td><strong>Financing for Alternative 5</strong></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant</td>
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<td>Annual Cost Increase per Account 1</td>
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<td>$39.09</td>
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<tr>
<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.21</td>
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</tbody>
</table>

1 Based on 21,414 inside city & 148 outside city - total 21,562
2 Based on 4.1 billion average annual water usage
3 O&M Cost includes electricity, 2704 man hours/yr, 5 yr pump maintenance costs and required treatment filter replacement
Alternative 6 integrates the costs of all construction expenses at full build out and includes the drilling and casing of the proposed Lone Tree Creek Well No. 2, the completion of the pumping plant facilities for the Lone Tree No. 2 well, the completion of pumping plant facilities for the Belvoir No. 5 and No. 6 wells, the pipeline from the Lone Tree Creek Well No. 2 to Sherard and the necessary pipelines to integrate the Belvoir No. 5 and No. 6 wells, as well as any future eastern and western wells to the main pipeline to Sherard. This alternative includes the Sherard WTP TCE/Radon treatment facility. Table 22 presents the summary of all six alternatives discussed above.
### Table 21: Alternative 6

<table>
<thead>
<tr>
<th>Cost Summary for Preferred Alternative 6</th>
<th>WWDC Eligible Costs</th>
<th>WWDC Non-Eligible Costs</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td><strong>Non-Construction Costs</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No.5 &amp; No. 6</td>
<td>$218,000</td>
<td></td>
<td>$218,000</td>
</tr>
<tr>
<td><strong>Engineering &amp; Legal Design Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of Final Design and Specifications</td>
<td>$2,697,163</td>
<td>$448,080</td>
<td>$3,145,243</td>
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<tr>
<td>Permitting and Mitigation</td>
<td></td>
<td>$3,100</td>
<td>$3,100</td>
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<tr>
<td>Legal Fees</td>
<td>Note 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td></td>
<td>$110,800</td>
<td>$110,800</td>
</tr>
</tbody>
</table>

| **Cost of Components** | | |
| Pipeline Costs | | $16,545,000 | $16,545,000 |
| Pipeline Boring at Crossings | | $1,408,000 | $1,408,000 |
| Belvoir 5 Well Completion | | $234,000 | $234,000 |
| Belvoir 6 Well Completion | | $270,750 | $270,750 |
| Lone Tree Well No. 2 Drilling and Casing | | $502,000 | $502,000 |
| Lone Tree Well No. 2 Completion | | $262,000 | $262,000 |
| Sherard WTP Yard Pipe | | $2,987,200 | $3,624,179 |

| Sherard WTP TCE/Radon Treatment Alternative I | | |
| Alternative Construction Cost Sub-Total #1 | | $19,221,750 | $3,285,920 | $22,507,670 |
| Engineering Costs = CCS#1 x 10% | | $1,922,175 | $328,592 | $2,250,767 |
| Sub-Total #2 | | $21,143,925 | $3,614,512 | $24,758,437 |
| Contingency = Sub-Total #2 x 30% | | $6,343,178 | $1,084,354 | $7,427,531 |
| Construction Cost Total | | $27,487,103 | $4,698,866 | $32,185,968 |
| Project Cost Total | | $30,516,166 | $5,146,946 | $35,663,111 |

| **67% Grant** | $20,445,831 |
| **33% Loan** | $10,070,335 |

### Financing for Alternative 6

<table>
<thead>
<tr>
<th>Item</th>
<th>Financing Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant</td>
<td>$20,445,831</td>
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<td>Annual O&amp;M Cost Increase per Account</td>
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<td>Annual O&amp;M Const Increase per 1000 gallons</td>
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<td>Total Annual Cost Increase per Account</td>
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<td>Total Annual Const Increase per 1000 gallons</td>
<td>$0.25</td>
</tr>
</tbody>
</table>

1 Based on 21,414 inside city & 148 outside city - total 21,562

2 Based on 4.1 billion average annual water usage

3 O&M Cost includes electricity, 2704 man hours/yr, 5 yr pump maintenance costs and required treatment filter replacement
Table 22: Cost Summary for Design Alternatives
Cheyenne Belvoir Ranch Level II Report
Cost Summary for Alternatives 1 through 6

<table>
<thead>
<tr>
<th>WWDC Eligible Costs</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
<th>Alternative 5</th>
<th>Alternative 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well Construction: TH 1, 2, 3, 4, 5, 6, 9, 10 &amp; Belvoir No.5 &amp; No. 6 ¹</td>
<td>$218,000</td>
<td>$218,000</td>
<td>$218,000</td>
<td>$218,000</td>
<td>$218,000</td>
<td>$218,000</td>
</tr>
<tr>
<td>Engineering &amp; Legal Design Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation of Final Design and Specifications ²</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permitting and Mitigation</td>
<td>$3,100</td>
<td>$3,100</td>
<td>$3,100</td>
<td>$3,100</td>
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<td>Legal Fees ³</td>
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<td>Note 2</td>
<td>Note 2</td>
<td>Note 2</td>
<td>Note 2</td>
<td>Note 2</td>
</tr>
<tr>
<td>Acquisition of Access and Rights of Way</td>
<td>$86,000</td>
<td>$110,800</td>
<td>$110,800</td>
<td>$110,800</td>
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</tr>
<tr>
<td>Cost of Components</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline Costs</td>
<td>$6,099,590</td>
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<td>$12,103,500</td>
<td>$12,103,500</td>
<td>$16,545,000</td>
</tr>
<tr>
<td>Pipeline Boring at Crossings from Belvoir No. 5 &amp; 6 to Sherard</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
<td>$1,408,000</td>
</tr>
<tr>
<td>Belvoir 5 Well Completion</td>
<td>$235,004</td>
<td>$234,000</td>
<td>$234,000</td>
<td>$234,000</td>
<td>$234,000</td>
<td>$234,000</td>
</tr>
<tr>
<td>Belvoir 6 Well Completion</td>
<td>$270,750</td>
<td>$270,750</td>
<td>$270,750</td>
<td>$270,750</td>
<td>$270,750</td>
<td>$270,750</td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Drilling and Casing</td>
<td>$502,000</td>
<td>$502,000</td>
<td>$502,000</td>
<td>$502,000</td>
<td>$502,000</td>
<td>$502,000</td>
</tr>
<tr>
<td>Lone Tree Well No. 2 Completion</td>
<td>$262,000</td>
<td>$262,000</td>
<td>$262,000</td>
<td>$262,000</td>
<td>$262,000</td>
<td>$262,000</td>
</tr>
<tr>
<td>Alternative Construction Cost Sub-Total #1</td>
<td>$0</td>
<td>$8,013,344</td>
<td>$14,780,250</td>
<td>$13,270,000</td>
<td>$14,275,500</td>
<td>$19,221,750</td>
</tr>
<tr>
<td>Engineering Costs = CCS#1 x 10%</td>
<td>$0</td>
<td>$801,334</td>
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<td>$1,427,550</td>
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<tr>
<td>Sub-Total #2</td>
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<td>$8,814,678</td>
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<td>$14,597,000</td>
<td>$15,703,050</td>
<td>$21,143,925</td>
</tr>
<tr>
<td>Contingency = Sub-Total #2 x 30%</td>
<td>$0</td>
<td>$2,644,404</td>
<td>$4,877,483</td>
<td>$4,379,100</td>
<td>$4,710,915</td>
<td>$6,343,178</td>
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<tr>
<td>Construction Cost Total</td>
<td>$0</td>
<td>$11,459,082</td>
<td>$21,135,758</td>
<td>$18,976,100</td>
<td>$20,413,965</td>
<td>$27,487,103</td>
</tr>
<tr>
<td>Project Cost Total</td>
<td>$218,000</td>
<td>$12,756,834</td>
<td>$23,498,596</td>
<td>$21,112,400</td>
<td>$22,701,090</td>
<td>$30,516,166</td>
</tr>
<tr>
<td>67% Grant</td>
<td>$146,060</td>
<td>$8,547,079</td>
<td>$15,744,859</td>
<td>$14,145,308</td>
<td>$15,209,730</td>
<td>$20,445,831</td>
</tr>
<tr>
<td>33% Loan</td>
<td>$71,940</td>
<td>$4,209,755</td>
<td>$7,754,537</td>
<td>$6,967,092</td>
<td>$7,491,360</td>
<td>$10,070,335</td>
</tr>
</tbody>
</table>

¹ Cost of well construction and casing for existing test holes and production wells - to be paid by Cheyenne BOPU.
² 15% of total construction costs from Tables 1, 7, 9 & 10
³ All legal fees are assumed to be negligible given the Cheyenne BOPU owns the Belvoir Ranch and has an existing easement and good relationship with the owners of the King Ranch.
References for System Master Plan Section


Appendix A: Site Plat
Appendix B: Environmental Report
CHEYENNE BELVOIR RANCH
ENVIRONMENTAL REPORT
LEVEL II, PHASE 2

Prepared for:
Wyoming State Revolving Fund

Prepared by:
Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E
Fort Collins, Colorado 80525

In Association with:
JR Engineering
6020 Greenwood Plaza Boulevard
Greenwood Village, Colorado 82401

November 2006
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# FIGURES

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# ATTACHMENTS

Attachment A Natural Resource Conservation Service Correspondence
Attachment B Laramie County Director of Public Works Correspondence
Attachment C US Army Corps of Engineers Correspondence
Attachment D State Historic Preservation Office Correspondence
Attachment E US Fish and Wildlife Service Correspondence
Attachment F Department of Environmental Quality - Air Quality Division Correspondence
1.0 INTRODUCTION
1.1 General

Belvoir Ranch is located in southern Laramie County, Wyoming southwest of the City of Cheyenne (City). For this report, the specific area of interest lies in T13N, R68W, sections 22, 23, 25, 26, and 27 (Figure 1). This site area, consisting of six (6) privately held sections has been purchased by the City for the development of future municipal water supply sources. The Wyoming Water Development Commission (WWDC) is funding the drilling of one (1) test hole and one (1) test well as part of the Belvoir Ranch Level II study. The test hole and test well will be approximately 400 feet in depth and will explore the Tertiary High Plains Aquifer on the Belvoir Ranch property. The test well will be completed; aquifer testing conducted, and water quality samples collected. If the exploration should encounter suitable quantities of good quality water, the Cheyenne Board of Public Utilities (BOPU) may decide to acquire the well and incorporate it into the City’s municipal water supply. The approximate location of the test hole and test well are shown on Figure 2.

1.2 Purpose and Need of Project

The purpose of this project is to

- perform exploratory drilling on the Belvoir Ranch area of southern Laramie County;
- document aquifer characteristics at one test well site; and,
- construct one test well for the BOPU.

1.3 Project Description

The WWDC is funding the drilling and analysis of one (1) test hole (TH-10, at the location labeled A on Figure 1) and one (1) test well (Belvoir #6) on the Belvoir Ranch property (Figure 2). TH-10 and Belvoir #6 will be drilled and completed in the SWNW Section 23, T13N, R68W approximately 100 feet apart. JR Engineering (JR) evaluated six (6) potential drill sites and chose one (1) location to conduct exploratory drilling (TH-10). The BOPU will drill one (1) of the sites during the fall of 2006 but would appreciate the flexibility to drill at the other sites in the future. Clearance to drill the other sites has been granted by all agencies mentioned below. Depending on the quality and quantity of ground water found, the BOPU may decide to acquire the well and incorporate it into the City’s municipal water supply. Drilling and test pumping will be completed by fall of 2006. This project will accomplish the following tasks:

- drill a test hole, run geophysical suite, and complete as a monitoring well;
- drill and complete a test well to Wyoming Department of Environmental Quality (WDEQ) public water system standards;
- conduct pump testing to determine aquifer characteristics at the test well site; and,
- collect water quality samples to assess the suitability of this water for municipal drinking water use.
PROPOSED TEST WELL SITE LOCATION:
SW/4 OF NW/4, SEC 23, T 13N, R 68W, 6TH PM, WYOMING

TEST WELL SITE MAP
CHEYENNE BELVOIR RANCH
JOB NO. 15222.00
SEPTEMBER 6, 2006

J&R ENGINEERING
A Western Company
6220 Greenwood Plaza Blvd. • Englewood, CO 80111
303-740-9393 • Fax 303-729-9068 • www.jrengineering.com
2.0 ALTERNATIVE TO THE PROPOSED ACTION

The alternative to the proposed activity is no action.

3.0 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

3.1 Land Use, Important Farmland and Formally Classified Land

Affected Environment. The proposed impact area consists of six (6) test hole sites, which are located on six (6) privately held sections, all of which are located on the Belvoir Ranch. Land use for the project impact year is classified as livestock grazing and wildlife habitat.

The Laramie County Soil Survey – Western Part indicates there are no prime forests, range, or farm lands located within the proposed areas of disturbance. The primary soil series in the disturbance area are the Breece, Evanston, Ipson, and Trimad. These soils generally form in gravelly loamy alluvium and have an A-horizon that ranges in thickness from zero (0) to six (6) inches. Soils are generally well drained and have a moderate permeability. The vegetation community type is a shrub-grassland. Common vegetation species include, Wyoming big sagebrush, wheatgrasses, needle-and-thread grass and Indian ricegrass. Along the channel bottom and riparian zone of Lone Tree Creek, the soils are deeper in comparison to the surrounding terrace and hillslope areas and are classified as a sandy loam. The soil series associated with this area is the Weed Loam.

No formally classified lands, as outlined below, are located within the project area. No formally classified land will be visually impacted by the proposed project.

- National Parks and Monuments;
- National Natural Landmarks;
- National Battlefield Park Sites;
- National Historic Sites and Parks;
- Wilderness Areas;
- Wild, Scenic, and Recreational Rivers;
- Wildlife Refuges;
- National Seashores, Lake Shores, and Trails;
- Wyoming State Parks and Historic Sites;
- National Forests and Grasslands; and,
- Native American Owned Lands.

Environmental Consequences. No long-term change in land use will occur with the implementation of the proposed alternative. Attachment A contains the correspondence with the Natural Resource Conservation Service (NRCS). Lidstone and Associates, Inc. (LA) sent Ed Burton of the NRCS a letter dated August 15, 2006 describing this year’s action. He indicated
via telephone on September 18, 2006 that he had no changes from the previous letter dated October 19, 2004. In that letter NRCS indicated their primary concern is with wind and water erosion from the proposed test hole sites. In reality, the amount of land disturbed at each site will be relatively small, generally one (1) acre in size. To reduce the potential for wind and water erosion, certain Best Management Practices (BMPs) will be implemented. When drilling, the rigs will be strategically oriented to act as wind breaks. Water will also be applied, as needed, to reduce fugitive dust. During the drilling process, runoff from drill pads will be controlled by BMPs, such as silt fence, straw bales, and/or berms. When drilling is complete, the area will be scarified and seeded with a mixture that is approved by the landowner, which should minimize erosion by wind or water.

There will be no major visual impacts as a result of the implementation of any drilling activity. Short term visual impacts are associated with the drill rig and related equipment during the drilling phase. Long-term impacts would be associated with the construction of a well house should the City decide to purchase the test well and put it into production. Given the relatively small size of one of these structures the impact is considered minimal.

No long-term change in land use will occur with the construction of the test hole or a municipal supply well. Before drilling and potential construction of transmission lines, a utility locate will be performed.

3.2 Floodplains

Affected Environment. Streams within the proposed impact areas range from perennial to intermittent. The Federal Emergency Management Agency (FEMA) through the National Flood Insurance Program has developed a Flood Insurance Rate Map (FIRM) for the unincorporated areas of Laramie County. Flood mapping within the Belvoir Ranch indicates that lands adjacent to Goose, Willow, and Lone Tree creeks are mapped as Zone A and lie within Special Flood Hazard Areas (SFHA) inundated by the 100-Year Flood. The average width of the SFHA is approximately 300 feet. No base flood elevations have been determined for the Zone A SFHA. Outside the SFHA, all other lands are mapped as Zone X, which is described as “areas determined to be outside the 500-year floodplain.” All proposed activities will take place a minimum of 500 feet from defined stream channel banks, indicating they lie within Zone X lands.

Environmental Consequences. There are no consequences associated with the proposed alternative. All proposed activities will occur outside the defined SFHA. LA contacted the Laramie County Director of Public Works with regard to the proposed drilling and test activities as described in the letter, which is included as Attachment B to this report. Through verbal communication, Mr. Beard expressed that he does not have any jurisdiction and therefore did not comment on the project.

3.3 Wetlands

Affected Environment. The United States Army Corps of Engineers (USACOE) was contacted to determine if Jurisdictional Wetlands or Waters of the United States existed within areas proposed for disturbance. The USACOE reviewed the National Wetlands Inventory map, the Borie 7.5 minute quadrangle topographic map, and false color infrared images of the area and determined that it appears there are wetland areas adjacent to Lone Tree Creek that would be
considered to be Waters of the United States. The proposed test sites and well appear to be located in uplands, but if additional fill must be placed in wetlands or Lone Tree Creek to provide access to the well sites, on-site wetland delineation will be required. Because the project will not result in the discharge of fill material into Jurisdictional Wetlands or Waters of the United States, a permit from the USACOE is not required at this time. Correspondence with the USACOE is located in Attachment C. The protocol for the drill pad construction includes maintaining a minimum 500-foot buffer zone between drilling and testing operations and defined channel banks. This buffer zone should ensure adequate protection of the riparian zone and its inhabitants.

Environmental Consequences. The USACOE has determined that there are wetland areas adjacent to Lone Tree Creek that would be considered to be Waters of the United States. Since drill pad construction includes maintaining a minimum 500-foot setback between drilling and defined channel banks, there will be no impacts to wetlands associated with the Belvoir Ranch test hole and well drilling project.

3.4 Cultural Resources

The Wyoming State Historical Preservation Office (SHPO) has been contacted concerning the proposed impact areas. LA contracted David G. Eckles of The Office of The Wyoming State Archaeologist at The University of Wyoming to perform a Class I literature review of the proposed disturbance area. Mr. Eckles conducted a file search of the SHPO Cultural Records Office database, Laramie, Wyoming on August 4, 2006. The results of the file search indicated that one (1) accessioned survey and two (2) sites had been recorded near the project areas. The previous survey was for a fiber optic cable performed in 1987 outside the current project areas. The route of the Cheyenne-Twin Mountains Wagon Road (48LA613) was documented with reference to GLO Plat Maps (Rosenburg 1987).

Mr. Eckles conducted a field survey of all six (6) potential drilling sites on August 7, 2006. The route of the trail crosses within one-quarter (1/4) mile to over one (1) mile of the proposed test holes, but if this is the actual route of the trail, a bladed and graveled ranch road has obliterated it. No traces of the original trail were found in the project area. No new cultural sites or isolated finds were found in the project area. Cultural resource clearance was recommended for the area. A copy of this report is included in Attachment D and was submitted to the SHPO. SHPO’s letter of concurrence is included in Attachment D.

3.5 Biological Resources

Affected Environment. Attachment E contains the correspondence with the U.S. Fish and Wildlife Service (USFWS) concerning biological resources at the Belvoir Ranch. Comments from the USFWS address five (5) issues: (1) Threatened and Endangered (T&E) species, (2) migratory birds, (3) wetlands and riparian areas, (4) Platte River water depletions, and (5) sedimentation. In accordance with Section 7 of the Endangered Species Act, USFWS has determined that T&E species may potentially occur within the permit area. The species in question include the Preble’s Meadow Jumping Mouse. Also, the Colorado Butterfly Plant, a threatened perennial herb, may exist in the permit area. According to the letter dated September 15, 2006, the USFWS does not have any new concerns with the proposed project based on the
commitment by the BOPU to comply with recommendations made in their November 24, 2004 letter (Attachment E).

To prevent harming the habitat of these threatened species, the USFWS recommended that the ground disturbance associated with drilling test wells be set back greater than 300 feet from streams and ephemeral draws in the proposed project area. Maintaining a buffer width of at least 300 feet in addition to limiting sedimentation from drilling, will provide protection for any current populations and habitat of the Colorado Butterfly Plant and Preble’s Meadow Jumping Mouse and protect riparian areas from degradation.

There are no known nesting migratory birds associated with the Belvoir Ranch. However, work that could lead to the take of a migratory bird including an eagle, their young, eggs, or nests (for example, if you are going to erect new well sites, roads, or power lines in the vicinity of a nest), will be coordinated with the USFWS office before any actions are taken. Removal or destruction of such nests, or causing abandonment of a nest could constitute violation of the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act and will be strictly avoided. Removal of any active migratory bird nest or nest tree is prohibited and will also be avoided. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. JR and LA recognize that, mitigation, as determined by the local USFWS field office, may be required for loss of these nests.

Water depletions to the Platte River system may affect the federally listed whooping crane, interior least tern, piping plover, pallid sturgeon, bald eagle, Eskimo curlew, and western prairie fringed orchid. Depletions include evaporative losses and/or consumptive use, often characterized as diversions from the Platte River or its tributaries less return flows. Any actions that may result in water depletion to the Platte River system will be identified. All water developed from the wells for aquifer testing purposes will be discharged back to the drainage under conditions of the National Pollutant Discharge Elimination System (NPDES) discharge program administered by the WDEQ/Water Quality Division (WQD). The tertiary aquifers are confined in the area, so this discharge will result in a net increase in flow to tributary drainages.

The USFWS has classified sedimentation as the number one pollutant of our Nation’s waterways. BMPs will be implemented within the project area wherever necessary with regard to sedimentation. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize disturbed areas.

Environmental Consequences. The construction activities are considered to be short term. Disturbance will be limited to one underground test hole and one (1) test well. Disturbances associated with this type of construction do not cover an extensive area. A small area of land will be baron of cover at each site during drilling, but will be covered promptly with straw crimp-
down until the area becomes revegetated. Impacts to wildlife are anticipated to be non-existent. Sediment will be controlled at all drilling sites and discharge points.

3.6 Water Quality

Affected Environment. The quality and quantity of ground water in the area will be assessed immediately after the test well is completed.

Environmental Consequences. The only discharge of water that will occur during this project will be associated with the pump testing of the test well. This testing will be used to evaluate the ground water quality as well as to determine the design production rates for the test/production well. An eight (8) hour stepped rate test is proposed for the test well to determine long-term test pumping rates. A seven (7) day constant rate test will also be conducted. This discharge will be permitted under the NPDES program administered by the WDEQ/WQD. As a condition of the NPDES permit, water samples will be obtained and analyzed for Total Suspended Solids and BMPs will be implemented to prevent erosion by the discharge.

Construction specifications will provide in depth description of the sediment control and revegetation measures to be implemented. Please see Attachment A for comments solicited from the NRCS addressing sediment control measures. No degradation of surface or ground water quality is anticipated during or after the completion of this project.

3.7 Costal Resources

There will be no impacts to coastal resources as the project is not located in the coastal region of the United States or along the Great Lakes region.

3.8 Socio-economic Information

The section of the Belvoir Ranch where the ground water test, drilling, and well construction will take place is inhabited by the ranch manager and a city employee that serves as ranch caretaker. There will be no socio-economic affects due to this project.

3.9 Air Quality

The drilling processes will result in minor impacts to air quality. There will be a slight increase in motor vehicle emissions and possible odors from heavy equipment and minor dust during the construction period. After the project has been completed, air quality will revert to its original state. Attachment F contains a letter from the WDEQ Air Quality Division (AQD). The WDEQ/AQD indicates that they do not anticipate any adverse air quality impacts with the possible exception of fugitive dust during construction and that this issue should be adequately addressed with watering and/or chemical stabilization.

3.10 Noise

The noise generated from the implementation of this ground water study will be strictly associated with construction activities. Typical construction noise includes air compressors, generators, equipment engines, drilling equipment, and traffic noise.
4.0 MITIGATION

This Environmental Report has evaluated the environmental impacts associated with the drilling of one (1) test hole and one (1) test well for ground water exploration on Belvoir Ranch. The benefit of drilling this test hole is to explore the aquifer characteristics, water quality and quantity of ground water available in the Belvoir Ranch area. If sufficient quantities of good quality water are found, the BOPU will acquire the test well to utilize as a municipal well to support the water needs of the City of Cheyenne.

The drill sites and equipment will be kept a minimum of 500 feet away from the banks and flood plain of Lone Tree Creek so as not to interfere with sensitive plant or animal species residing near the drainage. Care will be taken when drilling to prevent excess dust and wind or water erosion from taking place. Drill rigs will be strategically positioned to act as wind breaks. A water truck will be available to dampen the soil if the wind should cause problems. After drilling, the disturbed area will be seeded and straw will be crimped down to prevent fugitive dust. Drilling plans and specifications will address site revegetation.

No known nesting migratory birds are currently associated with the project area on the Belvoir Ranch. Work that could lead to the take of a migratory bird (for example, if a migratory bird began nesting in the vicinity of one of the well sites), would be coordinated with USFWS before any actions were taken.

5.0 PUBLIC PARTICIPATION

A public hearing was held on Monday, October 23, 2006, to allow citizens to comment on the Belvoir Ranch Level II, Phase 2 Project. The meeting was called to Order at 10:08 A.M. by Bud Spillman, Manager Water Treatment Division, of the Cheyenne BOPU. Mr. Spillman presented the title of the Project and the purpose of the Public Meeting. The information portion of the meeting included a summary of the Environmental Report and each of the Regulatory Agencies’ responses to the proposed project. These agencies include:

1. The NRCS to evaluate potential impacts to existing land use, soils classification, wind and water erosion and visual impacts.
2. FEMA to identify impacts associated with potential flooding within the Special Floodplain Hazard Area.
3. The USACOE to evaluate the potential impacts to jurisdictional wetlands.
4. The Wyoming SHPO for potential impacts to cultural resources.
5. The USFWS to evaluate potential impacts to threatened and endangered species, migratory birds, wetlands and riparian areas, Platte River depletions, and sedimentation.
6. Wyoming DEQ/AQD to evaluate potential impacts to air quality.

All of these agencies documented their concurrence that no adverse environmental consequences will result from the project as indicated in this Environmental Report. The Wyoming State Engineer’s Office has issued a permit for the drilling of the Test Well. An application for a Permit to Construct the test well has been submitted to the WDEQ/WQD.
Questions from the attendees and the corresponding responses included the following:

**Question 1:** Will there be problems with the injection well from Dyno-Nobel and their waste contaminating the Belvoir #6 water supply?

**Response:** Injection of waste water at the Dyno-Nobel facility will not impact the aquifer supplying water to the proposed Belvoir #6 well. WDEQ/WQD permitted four (4) injection wells at the Coastal Chem, Inc. facility, now Dyno-Nobel, in 2000 under permit number UIC 00-035. These four (4) wells are permitted to inject non-hazardous waste into the Hygiene sandstone member of the Pierre Shale formation. The permitted injection zone is at depths ranging from 5,807 to 6,309 feet below ground surface. The proposed Belvoir #6 well will be completed in the overlying High Plains Aquifer at a depth of 400 feet. Monitoring of injection rates and pressures, well integrity monitoring, a monitoring network consisting of 25 wells around the injection wells, and quarterly monitoring of the waste stream are all required by the permit. In the Statement of Basis for the permit, Item V states that “A groundwater review has been conducted to insure that no groundwater will be impacted by this system.”

**Question 2:** What are the constituents within the waste stream from Dyno-Nobel?

**Response:** Permit UIC 00-035 addresses this question: “Coastal Chem is currently authorized to inject waste from a plant manufacturing Ammonium Nitrate, Urea, Anhydrous Ammonia, Dry Ice, Methyl Tert-Butyl Ether (MTBE) and Methanol, and other nonhazardous industrial wastes into the hygiene sandstone member of the Pierre Shale Formation for disposal. The wastewater disposed of contains significant levels of Ammonia, Nitrate, Urea, Methanol and Total Dissolved Solids. Before any other industrial waste is approved for injection, documentation will be required to show that it is non-hazardous waste.”

**Question 3:** What is the High Plains Aquifer? How does the Casper Formation tie into this Project?

**Response:** The High Plains Aquifer on the Belvoir Ranch is comprised of the Tertiary Ogallala Formation and undifferentiated members of the White River Group. These formations consist of laterally and vertically discontinuous sandstones and conglomerates that are interbedded with siltstones and claystones.

The Paleozoic Casper Formation outcrops in the hills near the western boundary of the Belvoir Ranch. This formation dips steeply to the east and is buried by several thousand feet of sediments on the eastern side of the ranch. A thin veneer of tertiary sediments overlie the older formations near the outcrop area. Both the Paleozoic Casper Formation, and the Tertiary Aquifer are saturated on the western end of the Belvoir Ranch. Recent test drilling indicated that although they are in lithologic contact, they are not hydrologically connected. This project does not consider the Casper Formation as a viable aquifer on the eastern side of the ranch.

**Question 4:** Are there any test holes on the west end of the Belvoir Ranch?

**Response:** A series of test holes were drilled by the WWDC in the tertiary aquifer west of the site proposed for Test Hole 10 as part of the Level II, Phase 1 investigation. Additional test
holes were drilled by the WWDC to explore conditions in the Paleozoic Aquifer beneath the far western portion of the ranch.

**Question 5:** Are there any test wells in Duck Creek or Goose Creek?

**Response:** One test well was drilled in the vicinity of Duck Creek as part of the Paleozoic Ground Water Grant investigation. All ground water in that test hole was produced from the Casper Formation. The Tertiary sediments were dry at Duck Creek. The production from this test well was lower than expected so further exploration at this location was not recommended. No test wells have been drilled on Goose Creek.
ATTACHMENT A

Natural Resource Conservation Service
Correspondence
August 15, 2006

Mr. Ed Burton  
Wyoming State Conservationist  
US Department of Agriculture, NRCS  
100 East B Street, Room 3124  
Casper, WY  82602  

Applicants:  
Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY  82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626  

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY  82001  
Attn: Tim Wilson, Director  
307-637-6460  

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells  

Dear Mr. Burton:  

Lidstone and Associates, Inc. (LA) is preparing a second Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities’ Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of a project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. The test hole will be approximately 300 to 400 feet deep. If the exploration encounters suitable quantities of good quality water, the Cheyenne Board of Public Utilities may decide to acquire the wells and incorporate them into the City’s municipal water supply. At that time, the City may seek funding through the State Revolving Fund Loan program to help finance the well costs.  

Multiple test hole locations have been identified, and ultimately one municipal well may be drilled as part of this project. LA is currently evaluating six potential drill sites. These sites are labeled A through G on the attached map. Currently Site A is the preferred location pending utility clearance. Access to each site will be limited to existing routes wherever possible. A short description and the legal locations of each site are presented in Attachment A. An area of approximately one-half acre may be disturbed during drilling of the test hole. We hope to begin drilling in the fall of 2006, depending upon weather conditions and the drilling contractor’s schedule.
Mr. Ed Burton
August 15, 2006
Page 2

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency’s jurisdiction. Please review this project with respect to your agency’s concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns. For your reference, I have attached a copy of your letter dated October 19, 2004, in response to our 2004 request for site review. The issues raised in your October 2004 letter will be addressed in our Environmental Report.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,

LIDSTONE AND ASSOCIATES, INC.

Katherine J. Laudon, P.G.
Vice President

KJL:rece
Enclosures: Attachment A - Location Descriptions of Potential Drill Sites
Map of proposed test holes
NRCS Letter dated October 19, 2004

c: w/ Enc.
Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002
Tim Wilson, Cheyenne Board of Public Utilities
Bruce Brinkman, Wyoming Water Development Commission
Paul Ivancie, JR Engineering

Send By: Regular Mail

X:\OPEN\WYIR102\ER Letters\NRCS ER Ltr.doc
Attachment A
Location Descriptions of the Cheyenne Belvoir Ranch
Proposed Test Hole Sites

Please refer to the attached map, Cheyenne Belvoir Ranch. All seven sites are within the Belvoir Ranch Boundary.

**Site A** – SW NW Section 23, T 13N, R 68W

**Site B** – NE NW Section 22, T 13N, R 68W

**Site D** – NE NE Section 27, T 13N, R 68W

**Site E** – SE NW Section 26, T 13N, R 68W

**Site F** – SW NE Section 26, T 13N, R 68W

**Site G** – NW SW Section 25, T 13N, R 68W
Figure 1. Map of proposed test holes (designated by symbols, TH) and previously recorded sites.
Lindstone and Associates, Inc.
Eric Martin, E.I.T.
Project Engineer
4025 Automation Way, Building E
Fort Collins, Colorado 80525

Dear Mr. Martin,

The Natural Resources Conservation Service has reviewed project for the Cheyenne Board of Public Utilities in regards to the drilling of test wells on the Belvoir Ranch for potential water supply for the city of Cheyenne.

In your letter you stated that access to each drill site will be limited to existing routes wherever possible. You also went on to say that there may be up to 20 acres may be disturbed during drilling at each site. Because of the disturbance and potential wind erosion, we would like to see a plan put in place prior to the start of any work describing the erosion control measures that will be taken for each site. There should also be a plan developed discussing the revegetation of each of the disturbed sites prior to the beginning of the drilling.

If you have any questions, or need to discuss this comment with us, please contact either myself at 307-233-6750 or please contact Doug Gasseling, Conservation Agronomist, Cheyenne, Wyoming, at 307-772-2320, ext. 101.

Sincerely,

[Signature]

LINCOLN “ED” BURTON
State Conservationist
ATTACHMENT B

Laramie County Director of Public Works
Correspondence
August 15, 2006

Mr. Don Beard  
Director, Laramie County Public Works  
2503 E. Fox Farm Road  
Cheyenne, WY  82007

Applicants:  
Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY  82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY  82001  
Attn: Tim Wilson, Director  
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells

Dear Mr. Beard:

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Multiple test hole locations have been identified, and ultimately one municipal well may be drilled as part of this project. LA is currently evaluating six potential drill sites. These sites are labeled A through G on the attached map. Currently Site A is the preferred location pending utility clearance. Access to each site will be limited to existing routes wherever possible. A short description and the legal locations of each site are presented in Attachment A. An area of approximately one-half acre may be disturbed during drilling of the test hole. We hope to begin drilling in the fall of 2006, depending upon weather conditions and the drilling contractor’s schedule.
Mr. Don Beard  
August 15, 2006  
Page 2

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency’s jurisdiction. Please review this project with respect to your agency’s concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,

LIDSTONE AND ASSOCIATES, INC.

Katherine J. Laudon, P.G.  
Vice President

KJL:rec  
Enclosures:  
Attachment A - Location Descriptions of Potential Drill Sites  
Map of proposed test holes

cc: w/ Enc.  
Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002  
Tim Wilson, Cheyenne Board of Public Utilities  
Bruce Brinkman, Wyoming Water Development Commission  
Paul Ivancic, JR Engineering

Send By:  
Regular Mail
ATTACHMENT C

US Army Corps of Engineers
Correspondence
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DEL RAYE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

Reply to
Attention of:

SEP 25 2006

September 21, 2006

Wyoming Regulatory Office

Mr. Tim Wilson
Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, Wyoming 82001

Dear Mr. Wilson:

This letter is in response to a request we received on August 18, 2006, from Ms. Katherine Laudon of Lidstone and Associates, Inc., for a jurisdictional determination concerning possible impacts to waters of the United States that could result from the drilling of six test drinking water wells on the Belvoir Ranch southwest of Cheyenne. The wells include TH-A, TH-B, TH-D, TH-E, TH-F, and TH-G, and are located in Sections, 22, 23, 25, 26, and 27, Township 13 North, Range 68 West, Laramie County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. Wetlands are defined as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are characterized by growth of vegetation such as bulrush, cattails, rushes, sedges, and willows.


I reviewed the National Wetlands Inventory map for the project area, the 7.5-minute topographic map for the Borie quadrangle, and false color infrared images of the area available on the University of Wyoming’s Geographic Information Service Center’s website at http://whisky.wygis.wyvo.edu/natrona11/dogrr/. Based upon these sources of remote sensing data, it appears that there are wetland areas adjacent to Lone Tree Creek that would be considered to be waters of the United States. Please be aware that the information sources listed above do not provide an official wetland delineation. They simply provide an idea of the potential presence or absence of wetlands. However, they generally provide a good indication of approximate wetland boundaries.
The proposed wells themselves appear to be located in uplands, but if additional fill must be placed in wetlands or Lone Tree Creek to provide access to the well sites, an on-site wetland delineation will be required to determine if there are waters of the United States within the project area that are subject to regulation, and to establish their exact locations and boundaries. A wetland delineation consultant should be contacted to complete a report identifying all waterways and wetlands, including intermittent, ephemeral, and seasonal water features within the project area. If any water features are identified, that report must be submitted to our office for review and approval. A list of consultants is available from our web site.

Please be aware that the landowner is responsible for obtaining authorization prior to commencing with any activities that include a discharge of dredged or fill material in wetlands or other waters of the U.S. The type of authorization depends on the extent of impacts to wetlands and other waters of the U.S. Existing general permits known as nationwide permits authorize many activities with minor impacts. Our office issued a Public Notice effective on March 18, 2002, describing all of the nationwide permits currently in effect in Wyoming based upon information contained in Part II of the Federal Register published on January 15, 2002 (Volume 67, No. 10). A copy of the Public Notice is also available from our web site. Please pay particular attention to nationwide permit (NWP) 14 with regards to construction of roads within wetlands and other waters of the United States. If a pre-construction notification (PCN) is required, please ensure you include all the information specified in the associated instructions. A standard (individual) permit would be required if the cumulative affects on waters of the U.S. for a single and complete project exceed the nationwide permit criteria. A permit application with instructions is also available from our web site.

If you have any questions concerning this determination or would like to discuss our permit requirements in more detail, please contact me at (307) 772-2300 and reference file No. 200540131.

Sincerely,

[Signature]

Michael A. Burgan
Project Manager
Wyoming Regulatory Office

Copy Furnished:

[Signature]

Katherine Laudon
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, Colorado 80525-3448
August 15, 2006

Mr. Matt Bilodeau  
Cheyenne Regulatory Office  
US Army Corps of Engineers  
2232 Dell Range Blvd., Suite 210  
Cheyenne, WY  82009

Applicants:  

Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY  82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626  

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY  82001  
Attn: Tim Wilson, Director  
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells

Dear Mr. Bilodeau:

Lidstone and Associates, Inc. (LA) is preparing a second Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities’ Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of a project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. The test hole will be approximately 300 to 400 feet deep. If the exploration encounters suitable quantities of good quality water, the Cheyenne Board of Public Utilities may decide to acquire the wells and incorporate them into the City’s municipal water supply. At that time, the City may seek funding through the State Revolving Fund Loan program to help finance the well costs.

Multiple test hole locations have been identified, and ultimately one municipal well may be drilled as part of this project. LA is currently evaluating six potential drill sites. These sites are labeled TH-A, TH-B, TH-D, TH-E, TH-F and TH-G on the attached map. Currently Site A is the preferred location pending utility clearance. Access to each site will be limited to existing routes wherever possible. A short description and the legal locations of each site are presented in Attachment A. An area of approximately one-half acre may be disturbed during drilling of the test hole. We hope to begin drilling in the fall of 2006, depending upon weather conditions and the drilling contractor’s schedule.
The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency’s jurisdiction. Please review this project with respect to your agency’s concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns. For your reference, I have attached a copy of your letter dated January 4, 2005, in response to our 2004 request for site review. The issues raised in your January 2005 letter will be addressed in our Environmental Report.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.

Katherine J. Laudon, P.G.
Vice President

KJLrce
Enclosures: Attachment A - Location Descriptions of Potential Drill Sites
Map of proposed test holes
USCOE Letter dated January 4, 2005

cc: w/ Enc.
Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002
Tim Wilson, Cheyenne Board of Public Utilities
Bruce Brinkman, Wyoming Water Development Commission
Paul Ivancie, JR Engineering

Send By: Regular Mail
January 4, 2005

Wyoming Regulatory Office

Mr. Tim Wilson
Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, Wyoming 82008

Dear Mr. Wilson:

This letter is in response to a request we received on September 27, 2004, from Lidstone and Associates, Inc., for a jurisdictional determination concerning the location of nine proposed test wells on the Belvoir Ranch southwest of Borie, Wyoming. On October 4, 2004, Ms. Erin Martin (Lidstone and Associates) indicated the location of the water lines would be determined at a later date if one or more of the test wells are developed as a municipal well. Then on January 4, 2005, Ms. Martin indicated access to the proposed well sites would be achieved either from existing access roads, or potentially from the Union Pacific Railroad right-of-way, and no new stream crossings would be required. The test wells are located in the SE/4 of the NW/4 of Section 31, the NW/4 of the SE/4 of Section 30, the NW/4 of the SE/4 of Section 19, the SW/4 of the NE/4 of Section 20 (State Lease Land), the NE/4 of the NW/4 of Section 21, the NW/4 of the NE/4 of Section 28 (State Lease Land), the SW/4 of the NW/4 of Section 22, and the SE/4 of the NW/4 and the SE/4 of the SE/4 of Section 25. All proposed test wells are located in Township 13 North, Range 68 West, Laramie County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations were published in the November 13, 1986, edition of the Federal Register (Vol. 51, No. 219) at 33 CFR Parts 320 through 330. Information on Section 404 program requirements in Wyoming can be obtained from our web site at http://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm.

Based on the information provided, the National Wetlands Inventory (NWI) map for the area, and the 7.5-minute topographic maps for the Emkay and Borie quadrangles, it has been determined that there are no wetlands or other waters of the United States at the location of the wells. Therefore, Department of the Army authorization is not required for the project because it does not require the discharge of fill material in wetlands or other waters of the United States.
This determination does not eliminate the requirement to obtain any other applicable federal, state, tribal, or local permits that may be required.

In the March 28, 2000, edition of the Federal Register (Vol. 65, No. 60), the Corps implemented an administrative appeals process for jurisdictional determinations. This letter serves as an approved jurisdictional determination. Enclosed is a Notification of Administrative Appeal Options and Process (NAO) form. You may appeal the determination to the Division Engineer's appeal officer, Mr. Mores Bergman. Section "D" of the NAO explains the procedures for an appeal. The NAO form must be submitted to Mr. Bergman at the address shown on the NAO form prior to March 7, 2005, or you will forfeit your right to an administrative appeal.

Any deviations from the plans and specifications for the project, as provided on September 20, 2004, and January 4, 2005, could require additional review from this office.

Thank you for your interest in cooperating with the requirements of the U.S. Army Corps of Engineers regulatory program. If you have any questions regarding this determination, please contact Mr. Michael Burgan in our office at (307) 772-2300 and reference file No. 200440309.

Sincerely,

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

Enclosure

Copies Furnished (w/o enclosures):

Harold Kemp
Wyoming Office of State Lands and Investment
Herschler Building, 3 West
122 West 25th Street
Cheyenne, Wyoming 82002

Erin Martin
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, Colorado 80525-3448
ATTACHMENT D

State Historic Preservation Office
Correspondence
Aug 21, 2006

Katherine J. Laudon
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, CO 80525-3448

Re: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells (SHPO File # 0806JRD031)

Dear Mrs. Laudon:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that no historic properties, as defined in 36 CFR § 800.16(l)(1), will be affected by the project as planned.

We recommend the Environmental Protection Agency allow the project to proceed in accordance with state and federal laws subject to the following stipulation:

If any cultural materials are discovered during construction, work in the area shall halt immediately, the federal agency must be contacted, and the materials evaluated by an archaeologist or historian meeting the Secretary of the Interior’s Professional Qualification Standards (48 FR 22716, Sept. 1983).

This letter should be retained in your files as documentation of a SHPO concurrence on your finding of no historic properties affected. Please refer to SHPO project #1004SJS001 on any future correspondence regarding this project. If you have any questions, please contact Joseph Daniele, Archaeologist/Review and Federal Consultation at 307-777-8793.

Sincerely,

Sara Needles
State historic Preservation Office
August 15, 2006

Ms. Claudia Nissley  
Wyoming State Historic Preservation Office  
Barrett Building, 2301 Central Avenue  
Cheyenne, WY  82002

Applicants:

Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY  82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY  82001  
Attn: Tim Wilson, Director  
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells

Dear Ms. Nissley:

Lidstone and Associates, Inc. (LA) is preparing a second Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities’ Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of a project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. The test hole will be approximately 300 to 400 feet deep. If the exploration encounters suitable quantities of good quality water, the Cheyenne Board of Public Utilities may decide to acquire the wells and incorporate them into the City’s municipal water supply. At that time, the City may seek funding through the State Revolving Fund Loan program to help finance the well costs.

Multiple test hole locations have been identified, and ultimately one municipal well may be drilled as part of this project. LA is currently evaluating six potential drill sites. These sites are labeled A through G on the attached map. Currently Site A is the preferred location pending utility clearance. Access to each site will be limited to existing routes wherever possible. A short description and the legal locations of each site are presented in Attachment A. An area of approximately one-half acre may be disturbed during drilling of the test hole. We hope to begin drilling in the fall of 2006, depending upon weather conditions and the drilling contractor’s schedule.
The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response.

David Eckles with the Office of the Wyoming State Archaeologist has conducted a Class III Cultural Resource Survey of the proposed Test Hole sites. I have included a copy of his report with this letter. He did not find any cultural sites or isolated finds within the proposed project area and recommended cultural clearance for the project.

Within your letter of response, please indicate if additional permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns. For your reference, I have attached a copy of your letter dated October 8, 2004, in response to our 2004 request for site review. The issues raised in your October 2004 letter will be addressed in our Environmental Report.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,

LIDSTONE AND ASSOCIATES, INC.

Katherine J. Laudon, P.G.
Vice President

KJL:roc
Enclosures: Attachment A - Location Descriptions of Potential Drill Sites
Map of proposed test holes
SHPO Letter dated October 8, 2004

cc: w/ Enc. Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002
Tim Wilson, Cheyenne Board of Public Utilities
Bruce Brinkman, Wyoming Water Development Commission
Paul Ivancie, JR Engineering

Send By: Regular Mail
A CLASS III CULTURAL RESOURCE SURVEY
WATER WELL TEST HOLE SITES
WWDC CHEYENNE BELVOIR RANCH
LEVEL II PHASE II STUDY
LARAMIE COUNTY, WYOMING

By
David Eckles

Prepared for
Lidstone and Associates

Submitted by
Office of the Wyoming State Archaeologist
Wyoming Department of State Parks and Cultural Resources
Dept. 3431, 1000 E. University Ave.
Laramie, Wyoming 82071

Project Number WY-28-2006

August 2006
ABSTRACT

A class III cultural resource survey of six proposed water well test holes in Laramie County, Wyoming was performed by the Office of the Wyoming State Archaeologist as part of the Wyoming Water Development Commission Cheyenne Belvoir Ranch Level II Study. No cultural sites or isolated finds were found in the project areas. Cultural resource clearance is recommended for the project area with the standard stipulations.
<table>
<thead>
<tr>
<th>Consultant Project No: WY-28-06</th>
<th>Agency No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review and Compliance No:</td>
<td>Cultural Records Office No:</td>
</tr>
</tbody>
</table>

**AUTHOR(S):** David Eckles  
**REPORT TITLE** (include client name, undertaking name, survey project type, and report number):  

**DATE OF REPORT (M/D/Y/YR):** August 9, 2006  
**LEAD AGENCY** (e.g., BLM ADMINISTRATIVE UNIT):  
**SURVEY ORGANIZATION/NAME:** Office Wyoming State Archaeologist  
**FEDERAL PERMIT NO.** (e.g., BLM CULTURAL RESOURCE USE PERMIT):  
**BRIEF DESCRIPTION OF UNDERTAKING:** Construction of six water well test holes.

**SURVEY METHODS:**  
- **X** Standard 30 Meter Transects  
- Non-Standard (Describe in body of report)  
- Survey Width (All Linear Inventory):  
  - **100 feet** (individual road or pipeline corridor)  
  - **150 feet** (parallel road/pipeline corridor)  
  - **Other** (indicate width: )

**COUNTY(IES):** Laramie  
**USGS QUAD MAPS (NAME, DATE):** Borie, 1970

**LANDOWNER:**  
- *BLM__BuREC__FS__NPS_ X PRIVATE_STATE__USFWS  
- OTHER (Specify):  

**LEGAL DESCRIPTION** (T/R/Sec/up to 4 qtrs and identify template corner):  
**Test Hole A (0.23 acre):**  
T13N R68W Section 23, portions SE/NE/NE/SW/NW (template NW)

**Test Hole B (0.23 acre):**  
T13N R68W Section 22, portions NW/NW/NW/NW/NE (template NE)

**Test Hole D (0.23 acre):**  
T13N R68W Section 27, portions SE/NW/SW/NE/NE (template NE)

**Test Hole E (0.23 acre):**  
T13N R68W Section 26, portions NW/SW/NE/SE/NW (template NW)

**Test Hole F (0.23 acre):**  
T13N R68W Section 26, portions NE/NW/NW/SW/NE (template NE)

**Test Hole G (0.23 acre):**  
T13N R68W Section 25, portions NE/NE/SW/NW/SW (template SW)
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<th>BLOCK:</th>
<th>LINEAR:</th>
<th>TOTAL:</th>
<th>TOTAL ACREAGE:</th>
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<td></td>
<td></td>
</tr>
<tr>
<td>NON-FED SURFACE</td>
<td><strong>1.38</strong></td>
<td></td>
<td></td>
<td><strong>1.38</strong></td>
</tr>
</tbody>
</table>

FILE SEARCH DATE(S): 8/4/06  
FIELD WORK DATE(S) (MO/DY/YR): 8/7/06  
FIELD PERSONNEL: David Eckles  
SURVEY RESULTS: _X_ NO CULTURAL MATERIAL  __# ISOLATED FIND(S)  __#SITE(S)

+ attach continuation sheets for additional data. * check all that pertain
PROJECT SETTING

The project area is located west of Cheyenne, Wyoming in the Denver-Julesburg Basin of southeastern Wyoming (Figures 1-2). The proposed test well sites are generally located on the upper terraces and ridges above Lone Tree Creek, the major drainage in the area. Ephemeral drainages flow generally southeast and northeast from the ridges into Lone Tree Creek. Soils are sandy silt with a high gravel content. Grus (decomposed granite bedrock) is also present in the higher reaches of the upland ridge systems. Bedrock geology consists of Miocene age sandstones, siltstones, tuffaceous claystones, and conglomerates of the Ogallala formation, and Quaternary age clay, silt, sand and gravel deposits along flood plains (Love and Christiansen 1985). All of the proposed test holes are located in upland areas covered with grus; there is little to no Holocene sediment in these areas. Vegetation in the project area consists of a grassland steppe community with blue grama grass, fringed sage, blue grass, rye grass, yucca, prickly pear cactus, barrel cactus, wildflowers, and small forbs. Elevation ranges from 6450-6670 ft (1966.4-2033.5 m). Ground visibility is 20-60 percent.

METHODOLOGY

A file search was conducted of the State Historic Preservation Office Cultural Records Office database, Laramie, Wyoming on August 4, 2006. The results of the file search indicated that one accessioned survey and two sites had been recorded near the project areas. The previous survey was for a fiber optic cable performed in 1987 outside the current project areas. The route of the Cheyenne-Twin Mountains Wagon Road (48LA613, eligible to the NRHP) has been documented with reference to GLO Plat Maps (Rosenberg 1987). The route of the tail crosses within one-quarter mile to over one mile of the proposed test holes. However, in the areas of test holes F and G the trail has been obliterated by bladed and gravelled ranch roads. Overall, no traces of the original trail were found in the project areas. There will be no effect. The Lincoln Highway (48LN117, eligible to the NRHP) crosses from about one-quarter mile to over one mile north of the proposed test holes. It is not visible from any of the project locations. Construction of the test holes may result in a temporary visual intrusion. There will be no adverse effect.

The project was surveyed on foot in warm, clear weather conditions. Transects were walked a maximum of 30 meters apart in a zig-zag fashion in order to maximize areal coverage. The purpose of this procedure was to find surface occurrences of cultural remains, i.e., prehistoric and historic artifacts and features. In order to ensure the adequacy of the survey, cut banks, rodent backdirt, animal trails, erosional
Figure 1. Map of proposed test holes (designated by symbols, TH) and previously recorded sites.
Test hole F, view east.

Test hole B, view northwest.

Figure 2. Photographs of representative examples of test holes.
cuts, and ant hills were carefully examined. Photographs were taken of the project area. All field notes, photographs, and project files are housed at the Office of the Wyoming State Archaeologist, Laramie.

SURVEY RESULTS

No cultural sites or isolated finds were found in the project areas. Cultural resource clearance is recommended for the project areas with the standard stipulations.

REFERENCES CITED

Love, J.D., and Ann Coe Christiansen

Rosenberg, Robert G.
October 5, 2004

Erin Martin, E.I.T
Project Engineer
Lidstone and Associates
4025 Automation Way, Building E
Fort Collins, CO 80525-3448

RE: State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells (SHPO Review # 1004SJS001)

Dear Ms. Martin:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

A file search by our staff on September 30, 2004 for Township 13 North, Range 68 West Sections 19, 20, 21, 22, 25, 28, 30 and 31 shows that a cultural resource survey has not been conducted in the area of potential effect. Following 36 CFR Part 800, and prior to any ground disturbing activities, we recommend you carry out appropriate efforts necessary for identification of historic properties, which may include background research, consultation, consideration of visual effects, sample field investigations or field survey. The identification efforts must be conducted by an archeologist or historian meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983). For your information, we have enclosed a current list of qualified cultural resource consultants. A report detailing the results of these efforts should be provided to SHPO staff for our review and comment.

We have enclosed a copy of a Cultural Resource consultants list for your use. Please refer to SHPO project control number #1004SJS001 on any future correspondence dealing with this project. If you have any questions, please contact Sara Needles at 307-777-7498.

Sincerely,

Claudia Nissley
State Historic Preservation Officer

Enclosure
In Reply Refer To:
ES-61411/W.39/WY06SL0251

Katherine J. Laudon, P.G.
Vice President
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, Colorado 80525-3448

Dear Ms. Laudon:

Thank you for your letter of August 15, 2006, received in our office on August 17, regarding the proposed State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells in Wyoming. Based on the commitment by Cheyenne Board of Public Utilities to comply with recommendations made in our November 24, 2004, letter and to address all concerns identified therein, we have no concerns.

The U.S. Fish and Wildlife Service (Service) feels that sufficient information was provided to determine the effects of this project to federally listed species and to conclude whether this project is likely to adversely affect those species. Based on the information provided in your letter, it is unlikely that the proposed work will adversely affect any threatened or endangered species or migratory birds. You may consider this project, as proposed, to be in compliance with the Endangered Species Act of 1973, as amended (Act), 16 U.S.C. 1531 et seq. and the Migratory Bird Treaty Act, 16 U.S.C. 703.

This project should be re-analyzed if new information reveals effects of the action that may affect listed species or designated or proposed critical habitat (1) in a manner or to an extent not considered in this letter, (2) if the action is subsequently modified in a manner that causes an effect to a listed species or designated or proposed critical habitat that was not considered in this letter, and (3) if a new species is listed or critical habitat is designated that may be affected by this project.

We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species and migratory birds. If you have further questions regarding this letter or your responsibilities under the Act, please contact our office at the letterhead address or phone (307)772-2374.

Sincerely,

Mary Jennings
Field Supervisor
Wyoming Field Office

cc: WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
DEQ, Water Quality Division, Cheyenne, WY (B. Mark)
BOPU, Board of Public Utilities, Cheyenne, WY (T. Wilson)
August 15, 2006

Mr. Brian T. Kelly  
Field Supervisor  
Wyoming Field Office  
US Fish and Wildlife Service  
Cheyenne, WY 82001

Applicants:

Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY 82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY 82001  
Attn: Tim Wilson, Director  
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells

Dear Mr. Kelly:

Lidstone and Associates, Inc. (LA) is preparing a second Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities’ Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of a project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. The test hole will be approximately 300 to 400 feet deep. If the exploration encounters suitable quantities of good quality water; the Cheyenne Board of Public Utilities may decide to acquire the wells and incorporate them into the City’s municipal water supply. At that time, the City may seek funding through the State Revolving Fund Loan program to help finance the well costs.

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The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns. For your reference, I have attached a copy of your letter dated November 24, 2004, in response to our 2004 request for site review. The issues raised in your November 2004 letter will be addressed in our Environmental Report.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,

LIDSTONE AND ASSOCIATES, INC.

[Signature]

Katherine J. Laudon, P.G.
Vice President

KJ.Lrce
Enclosures:
Attachment A - Location Descriptions of Potential Drill Sites
Map of proposed test holes
USFWS Letter dated November 24, 2004
cc: w/ Enc.
Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002
Tim Wilson, Cheyenne Board of Public Utilities
Bruce Brinkman, Wyoming Water Development Commission
Paul Ivancie, JR Engineering
Send By:
Regular Mail
In Reply Refer To:
ES-61411/W.39/WY8829

Ms. Erin Martin, Project Engineer
Lidstone and Associates, Incorporated
4025 Automation Way, Building E
Fort Collins, Colorado 80525

Dear Ms. Martin:

Thank you for your letter of September 20, 2004 regarding the Belvoir Ranch Water Supply Wells. The Belvoir Ranch Water Supply Project involves drilling up to nine test wells to explore the aquifer characteristics for potential development and use for the City of Cheyenne, Wyoming’s municipal water supply. The Belvoir Ranch Water Supply Wells project is proposed to occur within Sections 19, 20, 21, 22, 25, 28, 30, and 31 of Township 13 North, Range 68 West in Laramie County, Wyoming. On November 23, 2004, a visit to the proposed development site was conducted by you, Jessica Homyack of my staff, Bruce Brinkman of the Wyoming Water Development Commission, and Kate Laudon from Lidstone and Associates.

In response to your request to review the proposed action, we are providing you with comments on (1) threatened, endangered and candidate species, (2) migratory birds, and (3) wetlands and riparian areas. The U.S. Fish and Wildlife Service (Service) provides recommendations for protective measures for threatened and endangered species in accordance with the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 et seq.). Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act.

In accordance with section 7 of the Act, we have determined that threatened or endangered species may potentially occur within the permit area. We would appreciate receiving information as to the status of each of these species within the permit area as well as your determination of effects from this project.

<table>
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<tr>
<th>SPECIES</th>
<th>STATUS</th>
<th>HABITAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preble's meadow jumping mouse (Zapus hudsonius preblei)</td>
<td>Threatened</td>
<td>Riparian habitats east of Laramie Mts. and south of the N. Platte River</td>
</tr>
</tbody>
</table>
Colorado butterfly plant Threatened Wet meadows in floodplains

*Gaura neomexicana* ssp. *coloradensis*

If the proposed action may lead to consumptive use of water in the Platte River System, impacts to threatened and endangered species inhabiting the downstream reaches of these systems should be included in the evaluation.

| Platte River species | Endangered | Downstream riverine habitat of the Platte River in Nebraska |

**Preble's meadow jumping mouse:** The Preble's meadow jumping mouse (Preble's) is a small rodent in the Zapodidae family and is 1 of 12 recognized subspecies of the species *Z. hudsonius*, the meadow jumping mouse. The diet of the Preble's consists of seeds, fruits, fungi and insects. Hibernation occurs from October to May in small underground burrows. Nests are made of grass, leaves or woody material in burrows the mouse excavates several centimeters underground. Preble's are primarily nocturnal or crepuscular, but have been observed during daylight. They occur in low undergrowth consisting of grasses, forbs, or a mix of both, in wet meadows and riparian corridors, or where tall shrubs and low trees provide adequate cover. Additionally, Preble's exhibits a preference for lush vegetation along watercourses or herbaceous understories in wooded areas with close proximity to water. In Wyoming, Preble's has been recently documented in Albany, Laramie, Platte and Converse Counties, and may occur in Goshen County. If a proposed project will result in a disturbance to suitable habitat within any of these five counties, surveys should be conducted prior to any action. Due to the difficulty in identifying the Preble's, surveys should be conducted by knowledgeable biologists trained in conducting these surveys.

**Colorado butterfly plant:** The Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) is a perennial herb endemic to moist soils in wet meadows of floodplain areas in southeastern Wyoming, north-central Colorado, and extreme western Nebraska between elevations of 5,000 and 6,400 feet. These plants are often found in low depressions or along bends in wide meandering stream channels a short distance upslope of the actual channel. Threats to the plant include non-selective herbicide spraying, haying and mowing schedules that inhibit the setting of seed, land conversion for cultivation and competition from noxious weeds. The low numbers and limited distribution contribute to the plant's vulnerability. Surveys should be conducted during flowering season which normally occurs in August although some temporal variability exists from site to site and from year to year depending on annual climatic conditions. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the Colorado butterfly plant to experts who can provide training/services.

Critical habitat was proposed for the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) on August 6, 2004 in Laramie and Platte counties in Wyoming, Kimball County in Nebraska, and Weld County in Colorado (69 FR 47834). According to the project description,
surface disturbing activities may occur in or near proposed critical habitat identified as Reach 3, Unit 7 in Laramie County, Wyoming. For additional information see Federal Register notice (69 FR 47834). Management considerations for the Colorado butterfly plant include: maintaining surface and subsurface water flows that provide the essential hydrological regime that supports the species; appropriate restraints on application of herbicides used to control noxious weeds; preventing habitat degradation caused by plant community succession; and preventing harmful habitat fragmentation from residential and urban development that detrimentally affects plant-pollinator interactions, leads to a decline in species reproduction, and increases susceptibility to non-native plant species.

**Platte River water depletions:** Water depletions to the Platte River system may affect the federally listed whooping crane (*Grus americana*), interior least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or adverse modification of designated critical habitat for the whooping crane and the northern Great Plains breeding population of the piping plover. Depletions include evaporative losses and/or consumptive use, often characterized as diversions from the Platte River or its tributaries less return flows. Project elements that could be associated with depletions to the Platte River system include, but are not limited to, ponds (detention/recreation/irrigation storage/stock watering), lakes (recreation/irrigation storage/municipal storage/power generation), reservoirs (recreation/irrigation storage/municipal storage/power generation), created or enhanced wetlands, hydrostatic testing of pipelines, wells, diversion structures, dust abatement, and water treatment facilities. Any actions that may result in a water depletion to the Platte River system should be identified. The document should include: an estimate of the amount and timing of average annual water use (both historic and new uses) and methods of arriving at such estimates; location of where water use or diversion occurs as specifically as possible; if and when the water will be returned to the system; and what the water is being used for. Note that if the project has peculiarities or oddities, the Service may have more specific questions regarding the potential consumptive use of water.

**Migratory birds:** Please recognize that consultation on listed species may not remove your obligation to protect the many species of migratory birds, including eagles and other raptors protected under the MBTA or BGEPA. The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing.

Work that could lead to the take of a migratory bird including an eagle, their young, eggs, or nests (for example, if you are going to erect new wells sites, roads, or power lines in the vicinity of a nest), should be coordinated with our office before any actions are taken. Removal or
destruction of such nests, or causing abandonment of a nest could constitute violation of one or both of the above statutes. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. Mitigation, as determined by the local U.S. Fish and Wildlife Service field office, may be required for loss of these nests. No permits will be issued for an active nest of any migratory bird species, unless removal of an active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present on, or near the project area, timing is a significant consideration and needs to be addressed in project planning.

**Sedimentation:** Sedimentation is the number one pollutant of our Nation’s waterways. Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment-control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

**Additional Conservation Recommendations:** The Service recommends that ground disturbance associated with drilling test wells for the Belvoir Ranch Water Supply project be greater than 300 feet from streams and ephemeral draws in the proposed project area. Maintaining a buffer width of at least 300 feet in addition to limiting sedimentation from drilling will provide protection for current populations and habitat of Colorado Butterfly Plant and habitat for Preble’s Meadow Jumping Mouse.

If you have questions regarding our comments or your responsibility under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*, please contact Jessica Hornyack of my staff at the letterhead address or phone (307) 772-2374, extension 24.

Sincerely,

![Signature]

Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc:  WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
     WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
     WWDC, Hydrologic Engineer, Cheyenne, WY (B. Brinkman)
August 24, 2006

Ms. Katherine J. Laudon, P.G.
Vice President
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Ft. Collins, Colorado 80525-3448

RE: Air Quality Division Second Review of the Belvoir Ranch Water Supply Project

Dear Ms. Laudon:

The Air Quality Division has reviewed your letter dated August 15, 2006 regarding the Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of this project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. Many test hole locations have been identified, however one municipal well may be drilled as part of this project. The test hole will be approximately 300 to 400 feet deep and disturb approximately one-half acre of land during drilling. Based on your letter, two sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the planned construction activities. These sections are WAQSR Chapter 3, Section 2(f) regarding fugitive dust control and Chapter 10, Section 2 regarding open burning.

Chapter 3, Section 2(f) requires persons engaged in the clearing or leveling of land, earthmoving, excavation, movement of trucks or construction equipment over access roads or cleared land, and demolition activities to control fugitive dust emissions using frequent watering and/or chemical stabilization of the affected areas. This section also requires prompt removal of earth or other materials from paved streets. As long as such control measures are taken during completion of this project, the Division expects the impact on ambient air quality from active construction activities will be minimized.

The Division notes that, due to the scope of the well project, a large area of cleared land will most likely be generated. As a result, the Division highly recommends that all areas of cleared land be scarified to prevent wind generated fugitive dust. Such areas that will remain construction free and/or without cover for approximately four weeks or more should be scarified and have straw crimped into the ground to prevent fugitive dust generation. Areas that will remain construction free and/or without cover for extended periods of time, eight weeks or more, should be seeded as well. Silt or plastic fencing designed to act as a wind break should also be utilized near residential areas and local businesses to help protect these areas from fugitive dust, blowing straw, and construction debris.
In regard to Chapter 10, Section 2, this regulation prohibits the disposal of any trade wastes, including wood, construction materials, or other discarded materials, by open burning. All such materials generated by the project should be disposed of by an alternative means.

It appears, based on your letter, that no building demolition or renovation activities will take place during the completion of this project. If this turns out not to be the case, please be aware that Chapter 3, Section 8 regarding asbestos removal applies to these types of activities. Chapter 3, Section 8 requires an initial work-site inspection prior to any demolition or renovation activities at a work site. This includes a thorough inspection of the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos. This section also contains specific notification requirements and procedures for asbestos emissions control which may be applicable. Please contact Mr. Tony Wagner or Mr. Robert Rodriguez with the Division at (307) 777-7394 and (307) 777-7584, respectively, for further information.

If you have any questions regarding this matter, please feel free to contact me at (307) 777-3771 or at the address listed on the previous page.

Sincerely,

Melissa J. Meares
Air Quality Engineer
Air Quality Division

MJM/mjm

xc: David Finley, Administrator Air Quality Division
Laramie County Compliance File
District 1 File
August 15, 2006

Ms. Melissa J. Meares  
Environmental Specialist  
Wyoming DEQ, Air Quality Division  
122 West 25th Street  
Cheyenne, WY 82002

Applicants:

Wyoming Water Development Commission  
6920 Yellowtail Road  
Cheyenne, WY 82008  
Attn: Bruce Brinkman, Project Manager  
307-777-7626

Cheyenne Board of Public Utilities  
P.O. Box 1469  
Cheyenne, WY 82001  
Attn: Tim Wilson, Director  
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund Loan for the Belvoir Ranch Water Supply Wells

Dear Ms. Meares:

Lidstone and Associates, Inc. (L.A) is preparing a second Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities’ Belvoir Ranch Water Supply Project. The Wyoming Water Development Commission is funding a second phase of a project to drill a test hole to explore the aquifer characteristics and water quality of the Ogallala Aquifer on the Belvoir Ranch Property in southern Laramie County. The test hole will be approximately 300 to 400 feet deep. If the exploration encounters suitable quantities of good quality water, the Cheyenne Board of Public Utilities may decide to acquire the wells and incorporate them into the City’s municipal water supply. At that time, the City may seek funding through the State Revolving Fund Loan program to help finance the well costs.

Multiple test hole locations have been identified, and ultimately one municipal well may be drilled as part of this project. LA is currently evaluating six potential drill sites. These sites are labeled A through G on the attached map. Currently site A is the preferred location pending utility clearance. Access to each site will be limited to existing routes wherever possible. A short description and the legal locations of each site are presented in Attachment A. An area of approximately one-half acre may be disturbed during drilling of the test hole. We hope to begin drilling in the fall of 2006, depending upon weather conditions and the drilling contractor’s schedule.
Ms. Melissa J. Mearcs  
August 15, 2006  
Page 2

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency’s jurisdiction. Please review this project with respect to your agency’s concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns. For your reference, I have attached a copy of your letter dated October 1, 2004, in response to our 2004 request for site review. The issues raised in your October 2004 letter will be addressed in our Environmental Report.

If you require additional information, please contact Rita Edinger or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,

LIDSTONE AND ASSOCIATES, INC.

Katherine J. Laudon, P.G.  
Vice President

KJL:rec  
Enclosures:  
Attachment A - Location Descriptions of Potential Drill Sites  
Map of proposed test holes  
DBQ Letter dated October 1, 2004

cc: w/ Enc.  
Brian Mark, WyDEQ/WQD, Herschler Bldg. 4W, 122 W. 25th St., Cheyenne, WY 82002  
Tim Wilson, Cheyenne Board of Public Utilities  
Bruce Brinkman, Wyoming Water Development Commission  
Paul Ivancie, JR Engineering

Send By:  
Regular Mail
Ms. Erin Martin, E.I.T.
Project Engineer
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Ft. Collins, Colorado 80525-3448

RE: Air Quality Division Review of the Belvoir Ranch Water Supply Project

Dear Ms. Martin:

The Air Quality Division has reviewed your letter submitted September 20, 2004 regarding the Belvoir Ranch Water Supply Project. The location for the nine potential test holes will be in southern Laramie County within the Belvoir Ranch Boundary. Two of the sites are located on state leases. The specific location descriptions follow: Site #1 – SE NW Section 31, T 13N, R68W; Site #2 – NW SE Section 30, T 13N, R 68W; Site #3 – NW SE Section 19, T 13N, R 68W; Site #4 – SW NE Section 20, T 13N, R 68W (State Lease); Site #5 – NE NW Section 21, T 13N, R 68W; Site #6 – NW NE Section 28, T 13N, R 68W (State Lease); Site #7 – SW NW Section 22, T 13N, R 68W; Site #8 SW NW Section 25, T 13N, R 68W; Site #9 – SE SE Section 25, T 13N, R 68W. Based on your letter, two sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the planned construction activities. These sections are WAQSR Chapter 3, Section 2(f) regarding fugitive dust control and Chapter 10, Section 2 regarding open burning.

Chapter 3, Section 2(f) requires persons engaged in the clearing or leveling of land, earthmoving, excavation, movement of trucks or construction equipment over access roads or cleared land, and demolition activities to control fugitive dust emissions using frequent watering and/or chemical stabilization of the affected areas. This section also requires prompt removal of earth or other materials from paved streets. As long as such control measures are taken during completion of this project, the Division expects the impact on ambient air quality from active construction activities will be minimized.

The Division notes that, due to the scope of the well project, a large area of cleared land will most likely be generated. As a result, the Division highly recommends that all areas of cleared land be scarified to prevent wind generated fugitive dust. Such areas that will remain construction free and/or without cover for approximately four weeks or more should be scarified and have straw crimped into the ground to prevent fugitive dust generation. Areas that will remain construction free and/or without cover for extended periods of time, eight weeks or more, should be seeded as well.
Silt or plastic fencing designed to act as a wind break should also be utilized near residential areas and local businesses to help protect these areas from fugitive dust, blowing straw, and construction debris.

In regard to Chapter 10, Section 2, this regulation prohibits the disposal of any trade wastes, including wood, construction materials, or other discarded materials, by open burning. All such materials generated by the project should be disposed of by an alternative means.

It appears, based on your letter, that no building demolition or renovation activities will take place during the completion of this project. If this turns out not to be the case, please be aware that Chapter 3, Section 8 regarding asbestos removal applies to these types of activities. Chapter 3, Section 8 requires an initial work-site inspection prior to any demolition or renovation activities at a work site. This includes a thorough inspection of the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos. This section also contains specific notification requirements and procedures for asbestos emissions control which may be applicable. Please contact Mr. Gerald Blackwell or Mr. Robert Rodriguez with the Division at (307) 777-7394 and (307) 777-7584, respectively, for further information.

If you have any questions regarding this matter, please feel free to contact me at (307) 777-3771 or at the address listed on the previous page.

Sincerely,

Melissa Meares
Melissa J. Meares
Environmental Specialist
Air Quality Division

MJM/mjm

xc: Dan Olson, Air Quality Division Administrator
Glenn Spangler, SSC District Engineer
Laramie County Compliance File
Appendix C: Standard Well Plans
ELECTRICAL PLAN VIEW
WELL BUILDING TYPICAL W/ GROUNDING PLAN

LIGHTING FIXTURE SCHEDULE

<table>
<thead>
<tr>
<th>TYPE</th>
<th>AMPS / VOLTAGE</th>
<th>VOLTAGE</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>1 / 120</td>
<td>120</td>
<td>MOUNTED FIXTURE WITH LIMIT FLARE BASE, STAINLESS STEEL, INSULATED CONDUCTOR, EXTERIOR LIGHTING, RECESSED FIXTURE, PLASTIC WIRE, WIRE CASING, CABLE, AND 6 INCH FLANGE EMBRACE, VENKALIT EXTERIOR, FINIAL, TWO CORNER MOUNTS MAX.</td>
</tr>
<tr>
<td>B</td>
<td>1 / 60</td>
<td>120</td>
<td>MOUNTED FIXTURE WITH LIMIT FLARE BASE, STAINLESS STEEL, INSULATED CONDUCTOR, EXTERIOR LIGHTING, RECESSED FIXTURE, PLASTIC WIRE, WIRE CASING, CABLE, AND 6 INCH FLANGE EMBRACE, VENKALIT EXTERIOR, FINIAL, TWO CORNER MOUNTS MAX.</td>
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EQUIPMENT PANEL ELEVATION
TYPICAL PANEL LAYOUT - NOT TO SCALE

ELECTRICAL
PLAN AND ELEVATION - E3
JOB NO. 15222.00
8/01/07
SHEET 3 OF 4

JR ENGINEERING
A Venture Company
102 Canal Avenue, Cheyenne, WY 82001
Appendix D: Access Road Locations
Appendix E: Pipeline Cost Alternatives
Pipeline Design Well Production Rates from Belvoir Ranch

<table>
<thead>
<tr>
<th>West Line</th>
<th>Production (gpm)</th>
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<tbody>
<tr>
<td>Spottlewood Creek Site</td>
<td>800</td>
</tr>
<tr>
<td>Duck Creek Site</td>
<td>500</td>
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<tr>
<td>Lone Tree Creek Site</td>
<td>800</td>
</tr>
<tr>
<td>Kennedy No. 2</td>
<td>900</td>
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<td><strong>West Line Total</strong></td>
<td><strong>3000</strong></td>
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<table>
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<tr>
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<tr>
<td>TH-4</td>
<td>500</td>
</tr>
<tr>
<td>Belvoir No. 5</td>
<td>600</td>
</tr>
<tr>
<td>Belvoir No. 6</td>
<td>400</td>
</tr>
<tr>
<td>Future Well Section 22</td>
<td>500</td>
</tr>
<tr>
<td>Future Well Section 27</td>
<td>500</td>
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<tr>
<td>Future Well Section 25</td>
<td>500</td>
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<tr>
<td><strong>East Line Total</strong></td>
<td><strong>3000</strong></td>
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| Total Leaving Belvoir Ranch| 6000             |

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<thead>
<tr>
<th>Boric Field Connections</th>
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<tbody>
<tr>
<td>Boric No. 1</td>
<td>500</td>
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<tr>
<td>Finnerty No. 2</td>
<td>550</td>
</tr>
<tr>
<td>Elkay No. 7</td>
<td>550</td>
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<tr>
<td>Webber No. 1</td>
<td>200</td>
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<tr>
<td><strong>Boric Field Total</strong></td>
<td><strong>1800</strong></td>
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| Total Delivered to Sherman Plant | 7800 |

### Pipe Sections

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<thead>
<tr>
<th>Section Number</th>
<th>Pipe Section Description</th>
<th>Pipe Diameter (in)</th>
<th>Pipe Length (Ft)</th>
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<tr>
<td>1</td>
<td>Sherard Yard Pipe (See Yard Pipe Section)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sherard to Elko/Webber Connections</td>
<td>36</td>
<td>14,000</td>
</tr>
<tr>
<td>3</td>
<td>Elko/Webber to Pinnery/Borie</td>
<td>36</td>
<td>6,400</td>
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<tr>
<td>4</td>
<td>Pinnery/Borie to Belvoir No. 6 Tee</td>
<td>30</td>
<td>1,700</td>
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<tr>
<td></td>
<td>Belvoir No. 5 &amp; 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Belvoir No. 6 Tee to Belvoir East/West Tee</td>
<td>30</td>
<td>2,700</td>
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<td>6</td>
<td>Belvoir No. 6 Tee to Belvoir No. 6 Well</td>
<td>10</td>
<td>2,900</td>
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<tr>
<td>7</td>
<td>Belvoir East/West Tee to Belvoir No. 5 Tee</td>
<td>24</td>
<td>3,100</td>
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<td>Belvoir No. 5 Tee to Belvoir No. 5 Well</td>
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<td>9</td>
<td>Belvoir East/West Tee to Lone Tree Creek Wells</td>
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<td></td>
<td>Future Western Belvoir</td>
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<tr>
<td>10</td>
<td>Lone Tree Creek Wells to Duck Creek Well</td>
<td>18</td>
<td>18,500</td>
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<tr>
<td>11</td>
<td>Duck Creek Well to Spottlawood Creek Well</td>
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<td>10,100</td>
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<td></td>
<td>Future Eastern Belvoir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Belvoir 5 Well to Future Section 20 Well (TH-4)</td>
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<td>5,300</td>
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<td>13</td>
<td>Belvoir 5 Tee to Section 22 Tee</td>
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<td>110</td>
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<td>14</td>
<td>Section 22 Tee to Section 22 Future Well</td>
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<td>15</td>
<td>Section 22 Tee to Enie Borie No 1 Well</td>
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<td>6,100</td>
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<td>16</td>
<td>Enie Borie No 1 Well to Future Section 27 Well</td>
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<td>3,400</td>
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<tr>
<td>17</td>
<td>Enie Borie No 1 Well to Future Section 25 Well</td>
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<td>8,300</td>
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<table>
<thead>
<tr>
<th>PVC Pipe Size (in)</th>
<th>Cost ($/ft)</th>
<th>Capacity (GPM)</th>
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<tr>
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<td>30</td>
<td>$170.00</td>
<td>6750</td>
</tr>
<tr>
<td>36</td>
<td>$225.00</td>
<td>10900</td>
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</tbody>
</table>

1 Unit cost includes pipe material, excavation, bedding, backfill, and compaction plus 20% markup for fittings and valves.

2 Pipe Capacity is based on:
   Hazen-Williams C = 130
   Friction Loss < 1'/1000' (Diam ≥ 16")
   Friction Loss < 2'/1000' (Diam < 16")

WWDC Cheyenne Belvoir Ranch Water Supply Piping
CHEYENNE BELVOIR RANCH
PIPELINE SCENARIO MAP

Red Numbers are Pipeline Sections used in Piping Scenarios

Legend
- Meteorological Stations
- Belvoir No. 5 Well
- Belvoir No. 6 Well
- Project Test Holes 2005
- Wells Drilled 2007
- ACOE Monitor Wells
- Large Existing Wells
- Small Existing Wells
- Paleozoic Project Wells
- Oil & Gas Wells
- Proposed Pipeline Alignment
- Possible Future Pipelines
- Existing City Well Lines
- Existing Stock Water Pipelines
- City Permits - Future Well Sites
- Wyoming State Lands
- Belvoir Ranch Boundary
- Sheridan Treatment Plant

City of Cheyenne
Board of Public Utilities

J.R. Engineering
A Wyocon Engineering Company

Legend

City of Cheyenne
Board of Public Utilities

J.R. Engineering
A Wyocon Engineering Company
Appendix F: Crossing Detail Sheets
Appendix G: Easement Fee Summary
### Easement Fees Associated with Permitting, On Site Supervision, & Distance Based Costs

<table>
<thead>
<tr>
<th>Crossing Sheets</th>
<th>Location</th>
<th>Utility Easement Fees</th>
<th>Approx. Crossing Length &amp; Embankment (Feet)</th>
<th>Approx. Crossing Length &amp; Embankment (Feet)</th>
<th>Boring Cost (use fictional)</th>
<th>Location Details (as marked on Google Earth)</th>
<th>County</th>
<th>UTM (NAD 83)</th>
<th>Elev.</th>
<th>Proximity To</th>
<th>Misc.</th>
<th>DEM Map (1:24000)</th>
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<tr>
<td>1</td>
<td>I-60</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Landwre 41.111279 104.850722 12N 68W 19 13</td>
<td>504137</td>
<td>4565111</td>
<td>9128</td>
<td>NA</td>
<td>Alignment moved to perpendicular</td>
<td>Boile</td>
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<tr>
<td>2</td>
<td>Otis Rd/GCR 225</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>Lansew 41.02300 104.82827 13N 68W 13 15</td>
<td>504142</td>
<td>4565849 6698</td>
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<td>Boile</td>
<td></td>
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<td>3</td>
<td>Lower RR 1 track</td>
<td>$1500.00</td>
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<td>NA</td>
<td>NA</td>
<td>Lansew 41.00514 104.84421 13N 68W 22 13</td>
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<td>4564229 9501</td>
<td>S of 460, W of Main Gasline</td>
<td>Boile</td>
<td></td>
<td></td>
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<td>4</td>
<td>Upper RR 2 tracks</td>
<td>$1500.00</td>
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<td>NA</td>
<td>NA</td>
<td>Lansew 41.00514 104.84421 13N 68W 15 13</td>
<td>504142</td>
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<td>S of 460, W of Main Gasline</td>
<td>Boile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SLB Section 16</td>
<td>$25.80</td>
<td>$10,000.00</td>
<td>$200 per year</td>
<td>NA</td>
<td>Lansew 323 9,325 13N 68W 19 13</td>
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<td>9</td>
<td>Gas Line</td>
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<td>NA</td>
<td>NA</td>
<td>Lansew 230 173,000 13N 68W 12 13</td>
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<td>NA</td>
<td>obvious wooded area on topo</td>
<td>Boile</td>
<td></td>
</tr>
</tbody>
</table>

**Footnotes:**

1. $1000.00 represents a minimum charge for engineering review.
2. Presently unknown costs associated with UP personnel onsite to handle train traffic.
3. All SLB crossings will be found under same permit.
5. Costs per rod are only minimum guidelines, there exists the potential that costs will be much higher. Such is the case with project 03-2297-00 in Sec. 30, T14N, R68.
6. Costs per rod were $74.00. Costs per rod are determined by market value of costs associated with private land crossing easements.
7. Cost estimate based on 24,000 linear feet, $500.00 per acre @ 50% of assumed land value.
8. It is projected that there will be costs associated with on-site supervision from the pipeline owner during boring activities.

Additional SLB Fees include compensation for affected State Land Board Leases. Surface Impact Payment of $2.00 per rod. Actual distances for the $2.00 per rod fee are presently unknown.

Boring Cost estimated at $70.00 per linear foot except for railroads the estimate is $100 per linear foot.

Easement fees are assessed on a $1 per foot of width per rod basis (i.e. a 15 foot wide easement would be $15 per rod). The pipeline and the associated maintenance road is projected to be 20' wide.
Wyoming Department Of Transportation—Utility Department

All questions and inquiries regarding utility crossing easements for the Wyoming Department of Transportation (WYDOT) should be directed to either District Maintenance Engineer Tim McGary or Maintenance Technician Kit Westbrook. Mr. Westbrook is responsible for processing all applications for easements and rights-of-way. Both Mr. McGary and Mr. Westbrook can be reached at (307) 745-2100.

Each proposed crossing location require a “Utility License”. In this case there will be two: Otto Road (aka State Highway 225) and Interstate 80. The utility licensing packet is can be found at http://www.dot.state.wy.us/default.jsp?scode=homus. (http://www.dot.state.wy.us → click on the “house in the middle of the ‘O’ in WYDOT” on the left side of the page → click on Agency Operations → Utility Selection → WYDOT Utility License packet). Unlike the two other applications outlined below, there are no fees associated with processing the WYDOT easement application.

Included in the Utility License Packet is the “UAR State Map”, which divides the State of Wyoming into five separate WYDOT districts. This map indicates that the proposed Phase V pipeline is in District 1. The District in which the pipeline is located will determine specific stipulations from Form M 54-A that are applied during the installation and construction period. Finally, Form M-54 contains that actual application for a license to place a utility on WYDOT land.

In addition to these District-specific stipulations from Form M 54-A, WYDOT reserves the right to impose sight specific stipulations upon any proposed crossing. These stipulations are not indicated in the Utility License Application but are determined based upon the location of each individual crossing. WYDOT also mandates that any pipeline that crosses a state thoroughfare be cased from right-of-way to right-of-way.

Upon positively identifying mile markers (to the nearest tenth of a mile) along both thoroughfares for each crossing-location (i.e. I-80 and Otto Road), an on site-meeting to
discuss the site-specific stipulations must be arranged. This meeting can be set up by contacting Division Maintenance Engineer Tim McGary and/or Maintenance Technician Kit Westbrook at WYDOT. If all necessary information is present and available at the time of the site-visit, the application-processing period is generally much shorter. Processing times for the applications can range from 1 to 4 weeks.

The WYDOT Utility License Application packet contains sample applications to guide the applicant in successfully applying for a utility crossing.

**Union Pacific Railroad**

All questions and inquiries regarding the crossing-application materials for Union Pacific Railroad should be directed to Ernestine Burtley, Union Pacific Real Estate Division Representative. Ms. Burtley can be reached at (402) 544-8801 or via email at ewburtley@up.com.

A Union Pacific utility crossing requires the filing of only two forms: a one-page Application and the one-page “Exhibit A”. These forms can be found at [http://www.up.com](http://www.up.com) → Industrial Development → Real Estate and Utility Specifications → Follow the prompts and complete (1) the Application and (2) Exhibit A. Upon completing both forms, they can be emailed directly to Ms. Burtley at ewburtley@up.com.

Generally, processing time for crossing-applications is 30 to 45 days. There is no fee associated with processing the applications but there is a minimum $1500 charge for a Union Pacific engineer to review the application materials. It is anticipated that this engineer review fee will be closer to $3000 for the proposed Phase V pipeline.

Additional costs associated with the railroad will include Union Pacific personal onsite during construction to oversee safety associated with working along an active rail line. Personal dispatched by the railroad will operate as flaggers warning incoming trains of
activity in close proximity to the rail line. Costs associated with Union Pacific personal
are unknown at the present. The Union Pacific Representative in charge of track
Maintenance for the Cheyenne region is Greg Hinker, who can be reached at (307) 778-
3557

**Wyoming State Land Board**

All questions and inquiries regarding the application and the related procedures for a
utility crossing on Wyoming State Land Board parcel should be directed to Leann
Hopson, Land Representative for the State Land Board. Ms. Hopson can be reached at
(307) 777-7331 or via email at lhops@state.wy.us.

The application can be found at [http://sfl-web.state.wy.us](http://sfl-web.state.wy.us) → Divisions → Real Estate
Management and Farm Loans → Real Estate Management → Easements → Non-
Roadway Easement Application. Please note that this application must be printed and
submitted on 8½ x 14, Legal size paper. According to Ms. Hopson, the application will
be refused if submitted on standard 8½ x 11 paper.

An original copy of each application with signatures must be submitted to the State Land
Board—the application documents may not be submitted electronically. The application
must be submitted with the $25 application filing fee as well as an 8½ x 14 topographic
map that delineates the proposed route of the utility (pipeline). If additional (temporary)
working area beyond the easement corridor is needed during the construction period, a
Temporary Use Permit for Construction must also be submitted with an additional $25
application fee.

The Wyoming State Land Board easement application is slightly more involved than the
two preceding applications. If parallel pipelines are being installed then an easement
application, survey and narrative must be submitted for each pipeline. However,
according to Ms. Hopson, the easement charge will be applied to only one of the
pipelines due to their close proximity (easement fees are described in greater detail
Ms. Hopson stated that if parallel pipelines were warranted, these charges would be levied based upon only one pipeline and not two. According to Ms. Hopson, the simplest way to ensure a timely response from potentially affected lessees is to send the comment form via certified mail with a specified turnaround time (i.e. "please remit any comments within 10 business days of the postmarked date").

However, if comments are still not received within the specified time frame, a copy of the Surface Lessee and Notification and Comment form along with a copy of the green certified mail receipt can be submitted with the application in lieu of the completed Comment form. Should submission in this manner be necessary, the Wyoming State Land Board will pursue the lessee for comments and thus help to avoid further delays in submitting the application.

The timeframe for processing the applications can range from two days to one full week. However, this is for preliminary approval only. A timeframe was not specified for final approval.

Before the application can be submitted to the State Land Board, the applicant must submit the Surface Lessee Notification and Comment form to any Wyoming State Land Board Lessees whose lease may be crossed by the proposed pipeline. The proposed pipeline crosses 5 separate leases in four sections (16, 18, 20 and 22), all located in Township 13N, Range 68W. One of the leases is held by the King Ranch Company (P.O. Box 905, Cheyenne, WY 82003) and the other four are held by the City of Cheyenne (c/o Mike Abel, Planning and Development Department, 2101 O’Neil Avenue, Cheyenne WY 82001).

The fees associated with crossing state land are broken down into two main categories. The cost for the easement, and a “surface impact payment” which acts as compensation to any current lessees of state land which the pipeline will cross. A general overview of the associated costs is outlined in the accompanying spreadsheets of easement costs.
Damage impact payment or “surface impact payment” will be assessed at $2.00 per rod (one rod = 16.5 feet). The footages of leased land by the King Ranch Company and the City of Cheyenne are presently unknown. It can be assumed that the $2.00 per rod fee will be applied to the land leased by the King Ranch Company but not by the land leased by the City of Cheyenne since it is the cities pipeline.

As noted above, all easements require a survey, and in the case of the Phase V proposed pipeline, a survey must be completed for each pipeline. Although not enumerated in the State Land Board policy, there is generally a 15-foot minimum width for all easements. Easement fees are assessed on a $1 per foot of width per rod basis (i.e. a 15 foot wide easement would be $15 per rod). The price calculations associated with the permitting of the pipeline though State Lease Land are projected to be 30' allowing enough room for the pipeline and accompanying service road. The aforementioned price guide is only a rough and usually low estimate. Actual costs for crossing State Land are based around the market value for similar work on surrounding private lands. While it is estimated to be $30 per rod this price is often dramatically higher. Previous pipeline work through State Land by the city of Cheyenne to the Sherard Treatment Plant cost as much as $74.00 per rod. The actual costs of the easements and the additional fees can be and will be determined through more research with the State Land Board.
To whom it may concern:

Attached is a packet of information that pertains to any entity proposing to place a utility facility within the Wyoming Department of Transportation (WYDOT) right of way or on WYDOT land in District _______ in ____________, Wyoming.

**UAR State Map.pdf** This is a state map of Wyoming divided into the 5 WYDOT districts. The city names where the district offices are located are enclosed in a box. Contact the District Maintenance Engineer in the district where the work is taking place.

**Form M-54:** This is the application for a license to place a facility on WYDOT land. It needs to be filled out in its entirety. The “Licensee” is the ultimate owner or entity who will take responsibility for the installation once construction is completed. The M-54 must be signed by an authorized representative of the Company.

**Form M-54A:** District ______ Stipulations: This is a list of installation/construction criteria that will be required in Transportation District ______ in the State of Wyoming. Not all may apply to your application. It is a menu for us to pick from and we may add other stipulations for specific problems. When you receive this list attached to your approved license, it will be specific to your installation.

**Form M-54B:** This is a list of requirements specific to Fiber Optics Communications Facilities encroachment in WYDOT right of way.

**Form M-54C:** This sheet gives the minimum requirements for Contractor Insurance

**Examples:** The following pages are examples of drawings that the Utility needs to submit along with the M-54. They identify the location of the installation in relation to various physical landmarks along the proposed route of installation. For instance, the distance off the right of way fence, or off the edge of the pavement.

STATE OF WYOMING
PREPARED BY THE
WYOMING DEPARTMENT OF TRANSPORTATION

CONTACT THE DISTRICT MAINTENANCE ENGINEER
IN THE DISTRICT AREA WHERE THE WORK IS TAKING PLACE

<table>
<thead>
<tr>
<th>DISTRICT NUMBER</th>
<th>MAILING ADDRESS</th>
<th>TELEPHONE NUMBER</th>
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<tbody>
<tr>
<td>1</td>
<td>3411 S. 3RD STREET, LARAMIE, WY 82070</td>
<td>307 746-2100</td>
</tr>
<tr>
<td>2</td>
<td>900 BRYAN STOCK TRAIL, CASPER, WY 82001</td>
<td>307 473-3222</td>
</tr>
<tr>
<td>3</td>
<td>P.O. BOX 1260, ROCK SPRINGS, WY 82902-1260</td>
<td>307 352-3000</td>
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<tr>
<td>4</td>
<td>10 E. BRUNDAGE LANE, SHERIDAN, WY 82801</td>
<td>307 674-2311</td>
</tr>
<tr>
<td>5</td>
<td>P.O. BOX 481, BASIN, WY 82410</td>
<td>307 568-3413</td>
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</tbody>
</table>
TRANSPORTATION COMMISSION OF WYOMING and its
WYOMING DEPARTMENT OF TRANSPORTATION

LICENSE

1. **Parties.** The parties to this License are ____________________________, hereinafter referred to as Licensee, whose address is _____________________________________________________________________________________ and the TRANSPORTATION COMMISSION OF WYOMING and its WYOMING DEPARTMENT OF TRANSPORTATION, whose address is 5300 Bishop Blvd, Cheyenne, WY 82009-3340, hereinafter referred to as Agency.

2. **Purpose of License.** The Licensee is planning the construction of a _____________________________________________________________________________________ hereinafter referred to as Facility, located in:

   Section _____ Township _____ Range _____ Milepost _______
   GPS Coordinates: Entering R/W: Longitude _______ (Dec.deg.) Latitude _______ (Dec.deg.)
   Exiting R/W: Longitude _______ (Dec.deg.) Latitude _______ (Dec.deg.)
   (GPS Datum NAD/83 accuracy to ±30"
   Route ___________ County(ies) ___________________ Maintenance Section _______
   ACCESS CONTROLLED: Yes ____ No ___
   upon the property the Agency acquired for and/or utilized in the operation and maintenance of a state highway. (For encroachments, attach a separate sheet detailed each change in direction within the right-of-way with the above information.)

3. **Term of License and Required Approvals.** This License is effective when all parties have executed it and authority to proceed has been granted by the Agency.

4. **Responsibilities of Licensee.**

   a. **Condition of Approval.** As a condition of approval for this license, the Licensee agrees to locate the Facility identified by this license at the Licensee's expense, in accordance with Wyoming Statute § 37-12-301 et. seq. Wyoming Underground Facilities Notification Act, to include the nature, location and depth of the Facility. The location and depth will be described on an engineering drawing, using three dimensional planes and a datum reference determined by the Agency. If unanticipated or unusual circumstances are encountered during Facility construction which force a deviation in excess of two feet from the approved horizontal alignment, the respective district maintenance engineer will be contacted prior to making the deviation, for approval of the deviation and an amended exhibit will be filed by the Licensee. See Plan/Staking Sheet.

   b. **Plan/Staking Sheet.** The Licensee shall attach hereto a plan sheet and/or staking sheet showing the proposed facilities to be placed within the Agency’s right-of-way. This plan sheet, shall be designated Exhibit “A” and made a part of this License. Upon completion of the proposed work, the Licensee shall submit to the Agency “As-Constructed” plans showing the actual location of the facilities within the Agency’s right-of-way. Exhibit “A” and the “As-Constructed” plans shall comply with the Wyoming Department of Transportation Utility Accommodation Regulation and the following requirements:

   **PLAN VIEW REQUIREMENTS**
   - Existing roadway, right-of-way line, right-of-way fence, and cross fences if they are not on the right-of-way line.
   - Existing approaches, intersecting roads or streets, drainage ditches, irrigation ditches, pipes, and culverts that have to be crossed
• Existing major utility facilities.
• Proposed Facility alignment with offset distances from either the roadway centerline or right-of-way line.
• Location of existing facilities on the highway right-of-way that are owned and operated by the Company.
• Proposed locations of all support appurtenances such as air relief valves, manholes, pedestals, junction boxes, line marker, vent pipes, guys and anchors, etc.
• Size and/or capacity of the proposed Facility, that is, kV, number of cable pairs, pipe diameter, pipe type, wall thickness (for carrier and casing), product to be carried, max. operating psig, etc.
• Indicate with a highlighter, appropriate symbol, or verbiage (for example, "As-Constructed") the new Facility so that it is easily recognizable for someone reading the drawing(s).
• Legal description: Section, Township, and Range with North Arrow.
• Reference new Facility to the nearest milepost marker using a compass direction and footage. Example: "1231' east of milepost 30."
• All bridge attachments must be reviewed and approved by the WYDOT Bridge Program. Bridge attachments should indicate if the Facility is to be placed in an existing conduit or a new conduit on the bridge. Bridge attachments are addressed in the WYDOT Utility Accommodation Regulation.

AERIAL HIGHWAY CROSS SECTION
• Low sag design clearance above the high point of the roadway.
• Existing or proposed under-built facilities, including those by others.
• Cross section view of the highway right-of-way indicating the location of poles or support structures relative to the roadway centerline or right-of-way lines.

BURIED HIGHWAY CROSS SECTION
• Cross section view of the highway right-of-way at the crossing, showing the depth of the Facility relative to natural ground, roadway drainage ditch, and the roadway template.
• If casing pipe or conduit is used, indicate by dimension where the casing will end.
• If heavy wall thickness pipe is used instead of casing pipe, show where the heavy wall thickness pipe transitions back to normal thickness pipe.

The maximum sheet size shall be 11" x 17". Use of Agency supplied project plans and cross sections is recommended as most of the above requirements are met, saving time and expense to both parties. Contact the Agency for availability of paper plans and/or electronic design files.

c. Facility Placement. The Facility will be placed in a manner conforming to recognized standards, applicable federal, state, or local laws, codes, ordinances, and regulations; in the exact location shown on the attached "Exhibit A"; and as directed by the Agency. Placing the Facility in a location other than originally approved without obtaining prior Agency approval by submitting a revised "Exhibit A", will void the license.

d. Changes. Any future alterations, modifications, or removals of the Facility within the highway right-of-way, required and requested by the Agency, shall be completed without delay. Adjustments will be accomplished at no expense to the Agency, unless otherwise provided for by law. Any costs due to delays or lack of response to the Agency or an Agency contractor resulting from the failure of the Licensee to perform the required adjustments necessitated by a highway construction project or maintenance activities, will be borne by the Licensee.

e. Limitations. This license will not be modified, transferred, or assigned without the written consent of the Agency. This license does not allow for installation of additional facilities, nor does this license set aside a strip of land of specific width for the exclusive use by the Licensee.

f. Cancellation/Nullification. The Licensee is required to notify the Agency in writing to cancel and/or nullify any issued license if the described Facility is not constructed within the prescribed time limits, scheduled to be removed, or taken out of service. No Facility will be allowed to be abandoned in place. The Facility must be removed at the time of abandonment.

g. Facility Access. The maintenance, use, inspection, and access to the Facility shall be accomplished from locations outside of the lines of no access or access control. Ingress or egress to and from the Facility from the traveled ways of an access controlled road is hereby expressly forbidden.
h. Traffic Control. The Licensee agrees to the standards for traffic control as outlined in the Agency’s Traffic Control for Roadway Work Operations manual. Standards developed by the Licensee may be substituted for the cited manual provided they have been approved by the district traffic engineer. The Licensee must cease all operations if they do not comply with traffic control standards. Traffic control plans and road closure plans will be submitted to the Agency’s engineer for approval prior to starting any work on highway right-of-way.

i. Contaminated Soil. Any Licensee installing a new Facility or replacing/upgrading an existing Facility that encounters any type of contaminated soil, will at the Licensee’s expense manage the contaminated soil in accordance with current DEQ regulations.

5. Responsibilities of Agency. This license is issued pursuant to Wyoming Statute § 1-26-813, Right-of-Way Along Public Ways . . . , and grants permission for the Licensees to occupy a portion of the right-of-way controlled by the Agency. This permission is limited by the type of controlling interest held by the Agency. Responsibility to satisfy any other fee (deeded) interest rests with the Licensee.


a. Additional Stipulations. Additional specific district stipulations may be attached to this form by the Agency as specified by the Wyoming Department of Transportation Utility Accommodation Regulation. The Licensee agrees to incorporate the applicable requirements into the design of the Facility and assures compliance with these requirements during the construction of the Facility. Non-compliance will void this permit.

b. Ambiguities. The parties agree that any ambiguity in this License shall not be strictly construed, either against or for either party, except that any ambiguity as to sovereign immunity shall be construed in favor of sovereign immunity.

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

d. Applicable Law/Venue. The construction, interpretation and enforcement of this License shall be governed by the laws of the State of Wyoming. The Courts of the State of Wyoming shall have jurisdiction over this License and the parties, and the venue shall be the First Judicial District, Laramie County, Wyoming. The parties intend and agree that the State of Wyoming and the Agency do not waive sovereign immunity by entering into this License, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statute § 1-39-104(a), Granting Immunity From Tort Liability, and all other state law.

e. Award of Related Licenses. The Agency may undertake or award supplemental or successor Licenses for work related to this License. The Licensee shall cooperate fully with other contractors and the Agency in all such cases.

f. Construction Methods. The license is issued with the understanding that conventional construction methods like: trenching, plowing, boring, pole setting by truck, etc. will be used. Activities like blasting, erection of poles or structures by helicopter, and other non-conventional methods will require specific prior approval by the Agency’s engineer.

g. Entirety of License. This License, consisting of five (5) pages, and the attached Exhibits and Additional Stipulations consisting of the pages stamped thereon, represents the entire and integrated License between the parties and supersedes all prior negotiations, representations, and Licenses, whether written or oral.

h. Indemnification. The Licensee agrees to forever indemnify the Agency and save it harmless from all liability for damages to property, or injury to or death of persons, including all costs and expenses related thereto, arising wholly or in part, or in connection with the existence, construction, alteration, maintenance, surveillance, repair, renewal, use, or removal of the facility by the Licensee or his agents, for those facilities located within the State or Federal highway system described or noted herein.

If the Licensee is a political subdivision of the State, the following provision applies in lieu of the above cited paragraph:
The Licensee hereby agrees to indemnify and hold harmless the Agency against all loss, liability, and damage that arises out of any activities of the Licensee, its agents, employees, and contractors in the performance of any construction, maintenance, repair, or other work on the Agency's property.

Allegations or proof of negligence or other legal fault on the part of the Agency will not defeat the Agency's rights under this provision or relieve the Licensee, its contractors, and agents of their duty to indemnify and hold harmless the Agency, but the Agency will be responsible for any percentage of fault that may be attributable to it pursuant to law, and the obligation of the Licensee, its contractors and agents to indemnify and hold harmless the Agency will be reduced by the percentage of fault attributable to the Agency.

l. Inspectors. Based upon the complexity, construction methods or other concerns, the Agency may assign part-time or full-time inspector(s) to the Licensee’s project. The cost of such inspection will be at the sole expense of the Licensee, and the Agency’s District Offices will initiate an Authority for Rendering Special Services (ARS), as provided in Operating Policy 24-3, to cover such costs.

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

k. Proof of Insurance. The Licensee shall not commence work on this License until the Licensee has obtained all insurance required, provided a copy of all policies to the Agency, and such insurance has been approved by the Agency. Approval of the insurance shall not relieve or decrease the liability of the Licensee. The Licensee’s insurance certificates shall be furnished or countersigned by a resident agent authorized to do business in the State of Wyoming.

l. Sovereign Immunity.

For private (non governmental) entities (which include utility companies, railroads):

The State of Wyoming and Agency do not waive sovereign immunity by entering into this Agreement, except to the extent necessary for the Parties to pursue an agreement action to clarify or enforce the written terms of this Agreement. In all other situations, the State of Wyoming and the Agency specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statue § 1-39-104(a), and all other state law. Designations of venue, choice of law, enforcement actions, and similar provisions should not be construed as a waiver of sovereign immunity.

For other governmental entities (municipality, county, board, commission, another state, water districts, sewer districts and other “instrumentalities” of local governments):

The State of Wyoming and Agency do not waive sovereign immunity by entering into this Agreement and the Licensee does not waive governmental immunity, except to the extent necessary for the Parties to pursue an agreement action to clarify or enforce the written terms of this Agreement. In all other situations, the State of Wyoming and the Agency specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statue § 1-39-104(a), and all other state law. Designations of venue, choice of law, enforcement actions, and similar provisions should not be construed as a waiver of sovereign immunity.

m. Third-Party Beneficiary Rights. The parties do not intend to create in any other individual or entity the status of third party beneficiary, and this License shall not be construed so as to create such status. The rights, duties and obligations contained in this License shall operate only between the parties to this License, and shall inure solely to the benefit of the parties to this License. The provisions of this License are intended only to assist the parties in determining and performing their obligations under this License.

n. Titles Not Controlling. Titles of paragraphs are for reference only, and shall not be used to construe the language in this License.

o. Waiver. The waiver of any breach of any term or condition in this License shall not be deemed a waiver of any prior or subsequent breach.
p. Work in Vicinity of Other Utilities. The Licensee is hereby advised that any work operation in the vicinity of electric power lines shall be in compliance with Wyoming Statute § 37-3-301 et seq., Wyoming High Voltage Power Lines and Safety Restrictions Act, and the Licensee is further advised to comply with the provisions of Wyoming Statute § 37-12-301 et seq., Damage to Underground Public Utilities Facilities.

7. Signatures. In witness thereof, the parties to this License, either personally or through their duly authorized representatives, have executed this License on the days and dates set out below, and certify that they have read, understood, and agreed to the terms and conditions of this License.

The effective date of this License is the date of the signature last affixed to this page.

LICENSEE

Printed Name and Title

Signature ________________________________________________  Date __________________________

(______) _______ - _______  (______) _______ - _______
Phone Number  Fax Number  E-mail

AGENCY

District Representative Printed Name and Title

Signature __________________________________________  Date __________________________
The following stipulations which have been checked are applicable to the attached license:

The maintenance foreman at ______________________ shall be notified before any work is begun and after work is completed.

All disturbed areas are to be returned to their original condition. All surface debris, boulders, etc., as a result of construction activity are to be removed from the right-of-way.

The licensee shall be responsible for any damage to the highway and its appurtenances as a result of this installation at any time such damage occurs.

The minimum depth of placement is to be _____ inches below the bottom of ditch.

All pedestals, vents, etc., are to be installed at the right-of-way line, or as agreed and/or approved.

Subsequent leakage of any ditches breached by this installation which results in damage to the roadway and/or appurtenances or results in drainage problems on the right-of-way, are the responsibility of the licensee, and will be promptly repaired upon notification by WYDOT.

Crossing of the roadway is to be made by jacking, dry boring or mining __________________________ from the roadway edge.

Crossing of all paved approaches encountered along the route of the installation shall be __________________________

All gas pipeline facilities within the highway right-of-way shall be designed for Class 3 locations per Title 49 CFR: Transportation, Part 192, Transportation of natural and other gases by pipeline; minimum Federal safety standards.

Casing type and method of installation shall be reviewed by the D.M.E. in __________________________ prior to installation and shall be capable of withstanding the traffic and roadbed loads. The casing or conduit shall be installed in a manner to prevent the formation of a waterway under the highway, and if used, shall run right-of-way to right-of-way, or as determined by the WYDOT district office based on field conditions.

Where casing ends are below ground, they should be suitably installed to protect the entrance of foreign matter which would prevent removal of the cover.

An open trench method of installation is approved.

The trench is to be backfilled and compacted daily, no open trenching is to be left overnight.

The backfill is to be compacted to 95 percent density as shown on the enclosed diagram and resurfaced as indicated. Temporary surfacing may be installed as needed but must be brought up to standard upon completion of the work.

Gravel surfaces in paved travel lanes must be surfaced within three days.

All appurtenances and pole locations must be installed outside the highway right-of-way.

Minimum vertical clearance for overhead crossings will be 18 feet for all crossings.

A letter specifying the name and location of an individual who will be representing the licensee on the job and is capable of instituting immediate changes in traffic control or work operation to bring them into compliance with the terms of the license.

No materials or equipment will be stockpiled or parked (within the R/W) (within 30' of the traveled way).

No work will be conducted from the roadway surface.

A preconstruction conference will be scheduled with prior to commencing work.
The electrical lines must be marked as indicated on the attached sheet.

The company will enter into agreement with WYDOT and pay for inspection by WYDOT during construction.

The company will bore under all paved side roads and approaches affected by the work on WYDOT property.

All Contractors will have insurance in place as noted in attachment M-54C.

All cable installed on Interstate right-of-way will be installed within 5'-0" of the right-of-way fence. Any deviation from this requirement will be approved by WYDOT’s inspector.

Installation will be limited to the cable and related facilities noted in the application. Installation of additional cable in the empty ducts being installed at this time will require notification to WYDOT and a separate permit describing the additional cable.
ATTACHMENT TO LICENSE
FOR
FIBER OPTICS COMMUNICATIONS FACILITIES

I. REQUIREMENTS FOR HIGHWAY CROSSINGS AND ENCROACHMENTS

A. Boring of Crossing

1. All crossings of highways, roads and paved approaches shall be bored or have a casing pushed under the roadway embankment (template).

2. The diameter of the bore shall not exceed the casing diameter by more than five percent (5%).

3. The face of the boring and/or receiving pit shall be located no closer than 15 feet to the constructed roadway embankment (template), and/or no closer than 30 feet to the edge of the traveled way. (See Detail Sheets)

4. Casing material shall be of a yield strength and wall thickness to withstand a combination of highway dead and live loading.

5. Abandoned or unusable bores shall be filled with a sand slurry or grout.

6. On divided highways no boring and/or receiving pit will be allowed in the median if the median strip is less than 120 feet wide, measured between the edge of the traveled ways of the inside lanes. (See Detail Sheets)

B. Depth of Facility, Trenching Details, Ducts

1. The facility shall be placed at a depth of not less than forty-eight inches (48") below existing ground or pavements, except for solid rock. (See Detail Sheet)

2. At crossings of drainage pipes, culverts, boxes, stock passes, irrigation pipes or siphons and related ditches, the facility shall be a minimum of forty-eight inches (48") below the pipe and/or ditch flow line.

3. The typical construction detailed drawings shall apply as follows:
   a. Rural Areas (Detail A)
      (1) For crossing of the right-of-way
          The facility may be plowed to the location of the Bore/Receiving Pit
      (2) Under the Roadway Embankment
          A casing pipe, of a size to allow for future cables, shall be bored under the full width of the embankment.
      (3) At Grade Separations
          When crossing under a structure, the cross-road may be followed to the embankment. Then a casing pipe must be bored in a location outside of the area between rear faces of abutments to allow for future bridge and cross-road widening. (See Detail "C")
      (4) Parallel encroachments within the right-of-way shall be confined to within 15 feet of the right-of-way line, unless otherwise approved. The facility may be plowed in at the specified depth. (See Detail Sheet)
      (5) Parallel encroachments will not be allowed in slopes of 2:1 or steeper, areas of frequent slope maintenance activity or erosive soil.
      (6) Parallel encroachments are not allowed within 40 feet of the edge of the traveled way to allow for a 30 foot safety zone, for ongoing maintenance and minor widening; and an additional 10 feet for placement of highway signs and guardrail.
(7) Buried facility construction in non-rippable rock shall be as per the detail sheet.

b. Urban Areas (Detail B)

(1) Parallel installations shall be as close to the right-of-way line as possible.

(2) Installations under the existing pavement or sidewalk shall be in existing ducts or newly installed ducts of sufficient size to accommodate future cable placement. Parallel installations will be in a duct of sufficient size to allow for future addition of cables and roadway widening.

(3) Parallel encroachments will not be allowed in slopes of 2:1 or steeper, areas of frequent slope maintenance or erosive soils.

(4) Parallel encroachments are not allowed within 10 feet from the back of sidewalk to allow for highway sign and guardrail placement.

4. The Licensee shall bury a marker tape and/or locate circuit between 18" and 24" below the top of ground or pavement (except for bored crossings) in order to assist in accurate locating and to provide warning to anyone digging. (See Detail Sheets)

5. Backfill of all trenches and/or boring pits within the highway right-of-way shall be placed in lifts and compacted to obtain a density no less than that of the adjacent undisturbed ground.

6. Pavement cuts, when approved by the District Engineer, shall be repaired to the Department's current standard.

C. Location of Facility within Highway Right-of-Way (Details "A" and "B")

1. Should any change in cable location occur during construction, in excess of two feet (2') from what is shown on the location plans submitted as Exhibit "A" with this license and/or agreement, prior written approval shall be obtained from the Department's Engineers, and the corrected location shall be noted on the "As Constructed Plans."

2. Manhole locations shall be shown on the Exhibit or as a detail sheet addendum to the Exhibit. Manhole tops shall be flush with the surrounding terrain. Casing vents, if used, shall be located at the right-of-way fence.

3. Amplifier sites and/or any facility requiring frequent or periodic access shall be located off the highway right-of-way. If a new approach is needed for access to such a site, application must be made to the Department's District Office by separate procedure.

4. The Licensee shall place cable marker posts at both sides of the highway right-of-way at crossings, as well as at 1,000 foot intervals or line of sight, whichever is shorter, for parallel encroachments.

D. Restoration of Highway Right-of-Way

1. The Licensee shall restore the highway right-of-way to its original condition upon completion of the initial construction, as well as any time thereafter when facility maintenance and/or repair has taken place and the ground has been disturbed, as directed by the Department's Engineer.

2. Drainage ditches disturbed by the cable placement shall be restored and the soil compacted to assure proper flow to prevent future erosion.

3. Should the Department's normal maintenance discover that erosion has taken place in the Licensee's previous work area or due to the Licensee's maintenance activities, the Department shall notify the Licensee of the problem and the Licensee shall take corrective action within thirty (30) days from the date of notification.
4. Fence cuts shall be repaired to Department Standards. Temporary fence may be required during construction, as directed by the District Maintenance Engineer.

5. Reseeding of disturbed ground shall be in accordance with the Department’s specifications and as directed by the Department’s Engineer.

E. As Constructed Plans

Upon completion of construction, the Licensee shall provide two (2) copies of “As Constructed Plans” to the District Maintenance Engineer. These plans shall reflect the actual location of the facilities installed relative to the roadway centerline, as well as updated details of any road crossings. (Also see Exhibit____)

F. Exhibits

Exhibits showing the proposed alignment of the facility shall accompany all applications, whether for a crossing or for a parallel encroachment. The Exhibit shall consist of the following:

1. Plan view sheets showing the existing road and highway right-of-way line, with the location of the proposed facility plotted relative to and with dimensions to either the roadway centerline or right-of-way line.

2. Land Description (¼ Section, Section, Township, and Range) and an accurate distance tie to a highway station or a highway milepost.

3. Location of all appurtenances like manholes, pedestals, junction boxes, line markers, etc.

4. Depth of bury, location and length of casing on road bores, type and size of casing pipe, location of casing vents (if applicable).

5. Cross sectional view of roadway template at crossings, and the relative location of the proposed facility to the roadway template, ditch and right-of-way line.

II. EXCEPTIONS TO THIS POLICY

A. The provisions of construction Detail Sheets shall not be deviated from without specific written approval of the Department’s Staff.

B. When extenuating circumstances exist (whether environmental, economical, engineering/design related, difficult terrain, or other situations) the Department's Engineer may vary from the requirements of construction Details "A", "B" and "C", on a case by case basis, and upon making a thorough review of the specific situation.

C. The intent of this policy is to safeguard the facility, as well as not to unreasonably encumber the public right-of-way involved nor to unreasonably restrict the further use of the public right-of-way by the Department or other existing or future tenants.

III. URBAN AND RURAL AREAS DEFINED

A. Urban Area

As related to utility accommodation, the term Urban Area is any area where residences and/or businesses are clustered (not necessarily within the city limits), where frequent approaches, utility lines and drainage facilities are likely to be encountered, and where the potential exists for future widening of the road to a multi-lane facility.

B. Rural Area

Any other segment of the State highway system not falling within the ‘Urban Area’ description.
TO BE SUBMITTED BY LICENSEE OR IF WORK IS TO BE DONE BY CONTRACT

ATTACHMENT TO LICENSE
FOR
CONTRACTOR INSURANCE

The Licensee agrees that the contract it awards for the construction of said Facility shall provide that:

A. The contractor or Licensee shall indemnify and save harmless the Agency and the Licensee from all claims, suits, losses, damages or expenses, whatsoever, on account of injuries to or death of any and all persons whomsoever, including the Contractor, Subcontractors, employees of the Contractor, Subcontractor, Agency, and Licensee, and any and all damage to, loss, or destruction of property to whomsoever it belongs, including property owned by, rented to, or in the care, custody or control of the parties hereto, the Contractor, Subcontractors and their employees, arising or growing out of, or in any manner connected with work performed during construction of the Facility, or caused or occasioned in whole or in part by reason of, or arising during the presence of the person or of the property of the Contractor, Subcontractors, their employees or agents, upon or in the proximity of the property of the Agency or the Licensee. And the Contractor shall defend at its own expense, in the name and on behalf of the Agency and the Licensee, all claims or suits for injuries to or death of persons or damage to property arising or growing out of the work performed during construction of the Facility.

B. The Licensee agrees to furnish to the Agency a certified copy of the Licensee's Contractors public liability and property damage liability insurance policy providing for a limit of not less than Five Hundred Thousand Dollars ($500,000) for all damages arising out of the bodily injuries to or death of one person, and, subject to that limit for each person, a total of not less than One Million Dollars ($1,000,000) for all damages to or destruction of property during the contract period.

Said certified copy of the policy shall be executed by a corporation qualified to write the same in the Agency of Wyoming, and said certificate of insurance shall be delivered to and approved by the Agency prior to entry upon and use of the Agency's highway right-of-way by the Licensee or the Licensee's contractor.

The insurance herein specified shall be carried until all work to be performed under the terms of the contract has been satisfactorily completed and accepted by the Licensee and the Agency.

If unusual circumstances or hazards are caused by the Licensee's work on the highway right-of-way, the Agency reserves the right to require insurance coverage in higher amounts, and/or write a special agreement for the conditions.
SUGGESTED METHODS OF PROTECTION FOR FACILITIES LOCATED IN BORROW AREAS/CONSTRUCTION PERMITS

SEE SECTION 106.30 OF THIS REGULATION

NOTE: THE DIMENSIONS SHOWN ON THESE DRAWINGS MAY HAVE TO BE ADJUSTED TO FIT THE REQUIREMENTS OF THE OWNER OF THE FACILITY.

( NO SCALE )

EXISTING UTILITY POLE

EXISTING GROUND LINE

3.0 METERS (10')

EARTH BERM

3.0 METERS (10')

BORROW

1/4 (6') OR FLATTER

PROTECTION DETAIL FOR UTILITY POLES LOCATED IN BORROW AREAS

2.6 METERS (12')

EARTH BERM

3.6 METERS (12')

1.5 METERS (5') ADDITIONAL COVER

EXISTING GROUND LINE

PROTECTION DETAIL FOR PIPELINE HAUL ROAD CROSSING

EXISTING BURIED PIPELINE

4.9 METERS (16')

EXISTING GROUND LINE

4.9 METERS (16')

BORROW

1/4 (6') OR FLATTER

1/4 (6') OR FLATTER

EXISTING BURIED UTILITIES

PROTECTION DETAIL FOR BURIED UTILITIES LOCATED IN BORROW AREAS
WYOMING DEPARTMENT OF TRANSPORTATION
GENERAL
UTILITY CONSTRUCTION DETAILS
DETAIL "A"
(NO SCALE)

75mm (3") CONCRETE CAP
600MM (24") MIN. COVER
CARRIER OR DUCT OF SUFFICIENT SIZE TO ALLOW FOR FUTURE NEED.
BACKFILL WITH SOIL

BURIED CONSTRUCTION IN ROCK

CARRIER OR DUCT OF SUFFICIENT SIZE TO ALLOW FOR FUTURE NEED.

DIRECT BURIED CONSTRUCTION IN SOIL

MIN. OF 37m (121") MEDIAN ON DIVIDED ROADS FOR ABOVE GROUND INSTALLATION OR BORE/RECEIVING PITS.
TEMPORARY FACILITIES MIN. OF 9m (30") FROM EDGE OF TRAVELED WAYS.

TRAVELED WAY
AREA OF UTILITY OCCUPANCY, OR AS APPROVED

4.5m (15") MIN.

RIGHT-OF-WAY LINE

FACE OF PIT MIN. OF 4.5m (15") FROM DITCH OR EMBANKMENT SLOPE.

UTILITY LINE

CASING PIPE OF SUFFICIENT STRENGTH TO CARRY HIGHWAY DEADLINE LOADS AND OF SUFFICIENT SIZE TO ALLOW FOR FUTURE NEED; OR HEAVY WALL THICKNESS CARRIER PIPE.

LOCATION OF MARKER TAPE AND/OR LOCATE CIRCUIT IF USED BY UTILITY.

NATURAL GROUND RESTORATION AS PER DEPARTMENT STANDARDS.

NO PARALLEL OR ABOVE GROUND FACILITIES WITHIN 12m (40") OF EDGE OF TRAVELED WAY AND SLOPES OF 1:2 (2:1) OR STEEPER.

900m (36") MIN. SEE TEXT FOR SPECIFIC DEPTH.
WYOMING DEPARTMENT OF TRANSPORTATION
GENERAL
UTILITY CONSTRUCTION DETAILS
DETAIL "B"

( NO SCALE )

TRENCH CONSTRUCTION

AREA OF UTILITY OCCUPANCY,
OR AS APPROVED.

NO PARALLEL UTILITY LINES OR BORE
PITS IF SLOPES ARE 1:2 (2:1) OR STEEPER

UTILITY FACILITY PLACEMENT UNDERNEATH THE PAVED ROADWAY AND SIDEWALK
TO BE IN LOCATIONS THAT CAUSE THE LEAST AMOUNT OF INTERRUPTION TO
TRAFFIC FLOW DURING CONSTRUCTION AND MAINTENANCE.
COMMUNICATIONS/POWER CABLES TO BE IN DUCTS OF SUFFICIENT SIZE TO
ALLOW FOR FUTURE EXPANSION.

UTILITY DESIGN FOR CONSTRUCTION UNDER THE ROADWAY TEMPLATE
SHOULD BE OF SUFFICIENT DEPTH TO ALLOW FOR PERIODIC REPLACEMENT
OF THE PAVEMENT AND BASE COURSE TO A MIN. OF 460mm (18').

RIGHT-OF-WAY LINE
CASING PIPE OF SUFFICIENT STRENGTH TO CARRY
HIGHWAY DEAD/LIVE LOADS AND OF SUFFICIENT
SIZE TO ALLOW FOR FUTURE NEED; OR
HEAVY WALL THICKNESS CARRIER PIPE.

AREA OF UTILITY OCCUPANCY,
OR AS APPROVED.

NO PARALLEL UTILITY LINES OR BORE
PITS IF SLOPES ARE 1:2 (2:1) OR STEEPER

TRENCH BACKFILL IN LIFTS AND
COMPACTED AS PER DEPARTMENT
STANDARDS.

LOCATION OF MARKER TAPE
AND/OR LOCATE CIRCUIT IF
USED BY THE UTILITY.

CARRIER OR DUCT OF SUFFICIENT
SIZE TO ALLOW FOR FUTURE NEED.

900mm (36') MIN. SEE TEXT
FOR SPECIFIC DEPTH.
WYOMING DEPARTMENT OF TRANSPORTATION
UTILITY ENCROACHMENT
AT
GRADE SEPARATION
DETAIL "C"
(NO SCALE)

REAR FACE OF ABUTMENT
WINGWALL

AREA FOR BORED
UTILITY CROSSINGS

NO ENCROACHMENT BETWEEN
REAR FACES OF ABUTMENTS
UNLESS SPECIFICALLY APPROVED

AREA FOR BORED
UTILITY CROSSINGS

ELEVATION

TYPICAL FOR SINGLE
OR TWIN STRUCTURES

PLAN

REAR FACE OF ABUTMENT
WINGWALL

4.5m (15 ft)

CROSSROAD

EMBANKMENT

EMBANKMENT

EMBANKMENT

EMBANKMENT
CONSTRUCTION DETAILS FOR RURAL AREAS
DETAIL "A"
(NO SCALE)

CONSTRUCTION IN SOIL

LOCATION OF MARKER TAPE
AND/OR LOCATE CIRCUIT

CABLE: MAY BE PLACED
AS PER DETAILS.

CASING PIPE OF SUFFICIENT
STRENGTH TO CARRY HIGHWAY DEAD AND LIVE
LOADS.

BORERECEIVING PIT

BORE/RECEIVING PIT

ROADWAY TEMPLATE
AND EMBANKMENT

TROVEY WAY

12m (40') MIN.

4.5m (15') MIN. FROM
TOE OF SLOPE

4.5m (15') MAX. AREA OF
UTILITY OCCUPANCY, OR AS
APPROVED

RIGHT-OF-WAY
LINE

NO ACCESS LINE

1200mm (48') MIN.

1200mm (48') MIN.

BORERECEIVING PIT

CASING PIPE OF SUFFICIENT SIZE
TO ALLOW FOR FUTURE CABLES.

4.5m (15') MIN. FROM
TOE OF SLOPE

MIN. OF 39m (128') MEDIAN ON DIVIDED
ROADS FOR ABOVE GROUND INSTALLATION
OR BORE/RECEIVING PITS.

TEMPORARY FACILITIES MIN. OF 9m (30')
FROM EDGE OF TRAVELED WAYS.

NO UTILITIES IN SAFETY ZONE OF 9m (30')
PLUS 3m (10') FOR SIGNS AND GUARDRAIL.
NO UTILITIES IN SLOPES OF 1:2 (2:1) OR
STeeper.

CONSTRUCTION IN ROCK

75mm (3') CONCRETE CAP

BACKFILL
WITH SOIL

600MM (24") MIN.
TO TOP OF DUCT

Duct OF SUFFICIENT SIZE TO
ALLOW FOR FUTURE CABLES.

WYOMING DEPARTMENT OF TRANSPORTATION
FIBER OPTICS
CONSTRUCTION DETAILS
FOR
RURAL AREAS
DETAIL "A"
(NO SCALE)

NATURAL GROUND RESTORATION
AS PER DEPARTMENT STANDARDS.
WYOMING DEPARTMENT OF TRANSPORTATION
FIBER OPTICS
CONSTRUCTION DETAILS
FOR
URBAN AREAS
DETAIL "B"
(NO SCALE)

NATURAL GROUND AND/OR PAVEMENT
RESTORATION AS PER DEPARTMENT
STANDARDS.

TRENCH BACKFILL IN LIFTS
AND COMPACTED AS PER DEPARTMENT
STANDARDS.

LOCATION OF MARKER TAPE
AND/OR LOCATE CIRCUIT.

DUCT OF SUFFICIENT SIZE TO
ACCOMMODATE FUTURE CABLES.

AREA OF UTILITY OCCUPANCY

NO UTILITY LINES OR BORE PITS
IF SLOPES ARE 1:2 (2:1) OR STEEPER

CABLE PLACEMENT WITHIN PAVED AREAS AND SIDEWALK TO BE
IN EXISTING DUCTS OR NEWLY CONSTRUCTED DUCTS, IN A
LOCATION THAT CAUSES THE LEAST AMOUNT OF INTERRUPTION
TO TRAFFIC FLOW DURING CONSTRUCTION AND/OR MAINTENANCE.

RIGHT-OF-WAY LINE

BORED CASING PIPE OF SUFFICIENT
STRENGTH TO CARRY HIGHWAY DEAD
AND LIVE LOADS.

1200mm (48"")

CASING PIPE OF SUFFICIENT SIZE
TO ALLOW FOR FUTURE CABLES.

RIGHT-OF-WAY LINE

AREA OF UTILITY OCCUPANCY

NO UTILITY LINES OR BORE PITS
IF SLOPES ARE 1:2 (2:1) OR STEEPER
ENCASED NON-FLAMMABLE PIPELINE CROSSING

NOTE: ALL AVAILABLE DIMENSIONS MUST BE FILLED IN TO PROCESS THIS APPLICATION.

NO SCALE

STEEL CASING WALL THICKNESS CHART

MINIMUM DIAMETER OF CASING PIPE

- 1.75" / 1/4" OVER 90°
- 2.125" / 5/16" OVER 80° - 90°
- 2.500" / 3/8" OVER 70° - 80°
- 3.125" / 1/2" OVER 60° - 70°
- 4.000" / 5/8" OVER 50° - 60°
- 5.000" / 3/4" OVER 40° - 50°
- 6.000" / 1" OVER 30° - 40°
- 7.000" / 1 1/4" OVER 20° - 30°
- 8.000" / 1 1/2" OVER 10° - 20°

OVER 40° MUST BE APPROVED BY R.R. CO.

NOTE: THIS CHART IS ONLY FOR SMOOTH STEEL CASING PIPES WITH MINIMUM YIELD STRENGTH OF 35,000 PSI.

FORMULA TO FIGURE CASING LENGTH WITH ANGLE OF CROSSING OTHER THAN 90°

\[ L = \frac{B}{\sin A} \]

B = CASING LENGTH
A = ANGLE OF CROSSING

EXHIBIT "A"

FOR RAILROAD USE ONLY

UNION PACIFIC RAILROAD CO.

M. P. ENCASED CROSSING AT

E. S.

EXHIBIT "A"

CROSSING AT

APPLICATION DATE

WARNING

IN ALL OCCASIONS, U. P. COMUNICATIONS DEPARTMENT MUST BE CONTACTED IN ADVANCE OF ANY WORK TO DETERMINE EXISTENCE AND LOCATION OF FIBER OPTIC CABLE.

PHONE: 1-800-336-9193
APPLICATION

(Please allow 30-45 days for crossings and 90-120 days for encroachments)

1. Name of Licensee

   (Exact Name of the Owner of the Utility)

   State of Incorporation ______; if not incorporated, please list entity’s legal status

2. Address, email, phone and Fax number of Licensee

   Email __________________________ Phone ____________ Fax ____________

3. Name, address and phone number of individual to whom agreement is to be mailed

   if different than Item 2.

4. Contact information for individual to contact in the event of questions.

   Email __________________________ Phone ____________ Fax ____________

5. Location of installation –

   ____________________________ (City, County and State)

   ________________Ft (N), (S), (E), or (W) of the (N), (S), (E), (W) or (center) line of

   Section ________; Township ______________ (N), (S); Range __________ (E), or (W)

   *Texas applications, provide local Survey detail __________________________

6. Do you have an existing agreement at this location with Union Pacific that is affected

   by this request.

   ( ) No  ( ) Yes, Union Pacific’s Audit No. or Folder No. ________________________

7. Is this installation a crossing ______ or an encroachment ______ or both ______

8. Will this facility serve Union Pacific Railroad? ________ Yes ________ No

UNION PACIFIC RAILROAD
1400 DOUGLAS STREET MS 1690
OMAHA NE  68179
1. Application for Easement:

   a.) To be completed by applicant as instructed on the form and according to Easement Rules and Regulations. Submit the form, printed on 8½ X 14, LEGAL SIZE PAPER, with the $25.00 application fee together with any fees required as stated in the Rules and Regulations. INCLUDE an 8½ X 14 inch topographic map delineating the route (if a topo map is unavailable, call 307-777-6521 and one will be provided).

   b.) Temporary Use Permit for Construction: If you require extra working area, outside the requested permanent easement corridor, you must submit this application together with $25.00 application fee and consideration for excess construction area needed.

2. Surface Lessee Notification and Comment Form:

   a.) This form must be completed, signed by the lessee and submitted with the application form. If it does not accompany the application, your application will not be processed.

3. Surface Impact Payment:

   a.) Surface impact payments are based on the surface impact schedule provided by this office and paid entirely to the surface lessee. Please note Section 7 (a) in rules for complete details.

4. **ALL EASEMENTS REQUIRE A SURVEY**

   a.) While a survey is required, the survey does not need to be obtained until after Board approval of the application.

5. Easement Post Construction Report:

   a.) To be completed and submitted by applicant when construction is complete. Note Section 7 paragraph (g) of the rules for time frame for completion of the project.

6. Preliminary Approval of Application

   a.) Upon request, the Director of the Office of State Land and Investments can give preliminary approval to your application. Written preliminary approval means that the application will be recommended to the Board for approval and you may proceed with your operations once the required deposit is received.

7. Submit Application to:

   Office of State Lands and Investments
   122 West 25th, 3W
   Cheyenne, WY 82002

   (Please discard any attached form that does not apply to your easement)
STATE OF WYOMING
BOARD OF LAND COMMISSIONERS
NON-ROADWAY EASEMENT APPLICATION

APPLICATION NO. ____________________________
(Assigned by Office)

County: ____________________________

Company Project Reference: ____________________________

APPLICANT:
Name: ____________________________
Address: ____________________________

Phone: ____________________________
Fax: ____________________________
E-Mail: ____________________________

Agent: ____________________________
Address: ____________________________

Phone: ____________________________
Fax: ____________________________
E-Mail: ____________________________

NOTE: REQUIREMENT – Attach an 8.5" X 14" copy of a U.S. Geological Survey topographic map with the route delineated (indicate where the project originates). If you need assistance obtaining a topographic map, call LeeAnn Hopson at 307-777-6521.

1. LEGAL DESCRIPTION OF STATE LAND TRAVERSED BY PROPOSED EASEMENT

<table>
<thead>
<tr>
<th>Legal Description</th>
<th>Sec.</th>
<th>Twp.</th>
<th>Rng.</th>
<th>Length/ft.</th>
<th>County</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

(For office use)

2. Description of Proposed Easement:
   a. Specific Purpose: ____________________________
   b. Point of Origin: ____________________________
   c. Destination: ____________________________
   d. Diameter of Pipeline: _________ Facility Buried: Yes _________ No _________
   e. Length in Feet _________ Width in feet required for completed easement: _________
   f. Is the applicant the mineral lessee on parcel(s) applied for? Yes _________ No _________

3. Consideration for easement: $ _________ per rod/foot/acre.

4. I certify that I have paid $ _________ per rod/foot/acre to the other landowners in the area pertaining to this request for an easement. You are required to furnish names and address of the landowners involved with the same.

5. Are you paying the other landowners annual rental on this facility? Yes [ ] No [ ] If yes, what is the annual rental you are paying? $ _________

6. Are you requesting preliminary approval? Yes [ ] No [ ]

7. For oil and gas purposes: Are minerals [ ] State minerals [ ] Federal minerals [ ] Fee minerals

*********************************************************
This form must be fully completed and be accompanied by the executed Lessee Comment Form. If not, all will be returned.
*********************************************************

__________________________________________
Signature of Applicant

__________________________________________
Date

__________________________________________
Preliminary Approval by the Director of State Lands and Investments

__________________________________________
Date

(Continue to Temporary use permit form if required)
THIS SHEET IS TO BE USED ONLY IF YOU DO NOT HAVE ENOUGH SPACE ON THE FIRST PAGE OF THE APPLICATION. IF YOU DO NOT USE, PLEASE DISCARD.
THANK YOU.

Easement No. ___________________________  Project Name/No. ___________________________

<table>
<thead>
<tr>
<th>Legal Description</th>
<th>Sec.</th>
<th>Twp.</th>
<th>Rng.</th>
<th>Length/Ft</th>
<th>County</th>
<th>Acres</th>
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</tbody>
</table>
TEMPORARY USE PERMIT APPLICATION
(In conjunction with Easement Application)

APPLICATION NO. ____________________________________________
(Assigned by Office)

ONE YEAR TEMPORARY USE PERMIT FOR CONSTRUCTION ACTIVITY ONLY
ADDITIONAL PERMIT APPLICATION FEE: $25.00
(If not applicable, please discard page)

1. Complete the following when temporary use outside the completed easement corridor is required during construction.
   a. Additional width required for construction of easement: ________________
      State the width required OVER completed easement requested
   b. Length required for construction if different from completed easement:
   c. Number of acres temporarily affected for construction of easement: ______
   d. Remit $10.00 per acre affected or the minimum payment of $100.00
      which ever is greater: $________

2. Are you requesting preliminary approval? [ ] Yes [ ] No

********************************************************************************

__________________________ ________________________
Signature of Applicant Date

__________________________ ________________________
Preliminary Approval by the Director of
The Office of State Lands and Investments Date

Board Date of Final Approval _______________________________
STATE OF WYOMING
BOARD OF LAND COMMISSIONERS
SURFACE LESSEE NOTIFICATION AND COMMENT FORM

(Sections A & B to be completed by applicant)

A. PROJECT/ACTIVITY INFORMATION:
   
   Type of Project: __________________________________________
   
   Company Involved:
   
   Name: __________________________________________
   
   Address: __________________________________________
   
   Phone: ________________________________

   State Land Involved:
   
   Section _____ Township _____ Range _____ County ________
   
   Section _____ Township _____ Range _____ County ________
   
   Section _____ Township _____ Range _____ County ________

B. SURFACE LESSEE INFORMATION:

   Surface Lessee:
   
   Lease No. __________________________________________
   
   Name: __________________________________________
   
   Address: __________________________________________
   
   Phone: ________________________________

C. SURFACE LESSEE COMMENTS: (to be completed by surface lessee)

Lessee: Please execute this form and return to the applicant or to our office. Your comments concerning any activities on your lease are important to this office. If you have no comments, please execute the form, to let us know that you have been notified of the project. Thank you.

(Signature of Lessee) (Date)

(Please type or print name)

ADDITIONAL INFORMATION AND INSTRUCTIONS:

1. The completed Surface Lessee Notification and Comment Form must accompany the easement or temporary use permit application when submitted to Office of State Land and Investments for processing.

2. Surface Impact payment will be made directly to the surface lessee by the applicant in accordance with the approved impact payment schedule. The schedule will be reviewed and revised annually.
STATE OF WYOMING
BOARD OF LAND COMMISSIONERS

EASEMENT POST CONSTRUCTION REPORT

APPLICATION / EASEMENT NO. ______________________

1. I certify that construction on the easement is complete along with the following:
   - (Check all that apply).
     [ ] Backfilling
     [ ] Contouring
     [ ] Re-seeding
     [ ] Clean up of area
     [ ] Fencing
     [ ] All payments for surface damages have been made.

2. "As built" survey plat.
   [ ] Attached
   [ ] As previously submitted to the Office of State Lands and Investments
   [ ] Other - Explanation:

3. "As built" written narrative legal description.
   [ ] Attached
   [ ] As previously submitted to the Office of State Lands and Investments
   [ ] Other - Explanation:

4. When the survey plat and written narrative description that is forwarded with the easement application represents an existing facility and is the "as built" survey and written narrative description, execute this form and submit it along with the application.

5. Was this an existing facility at the time of application? Yes [ ] No [ ]

Signature of Applicant ___________________________ Date _______________________

Type or print name _____________________________

(This form MUST be submitted before the Grant of Easement document can be issued. If not previously submitted, the Office requires a post construction survey).
CHAPTER 3 RULES, REGULATIONS AND POLICIES
of the
BOARD OF LAND COMMISSIONERS

SURVEY PLAT INSTRUCTIONS

Section 13. Survey Plats: The board shall not accept any plat locating an easement on state land unless the plat complies with the requirements of W.S. 33-29-139(a) and is of a size described by W.S. 33-29-139(a)(i) or (ii).

Plats shall be prepared on polyester base drafting film in minimum thickness of four-thousandths (.004) inch using waterproof black ink. The original showing the survey of the easement properly located with respect to the public land survey system shall be filed. The plat shall depict the easement accurately enough to facilitate the location of the easement on the ground by any competent surveyor or engineer. The plat shall comply with the following specific requirements:

1. Scale of the plat shall be a minimum of 1,000 feet to the inch for all facilities placed on state lands. A larger scale is acceptable when necessary to explicitly represent the details of the survey and/or facility. In no case shall the physical dimensions of the plat be any larger than 8 x 14 inches. W.S. 33-29-139(a)(ii).

2. Courses of the center line of the easement or the perimeter (in the case of closed traverses) shall be inscribed on the plat of survey either along the line segment depicted or in a tabular manner using point numbers. All bearings shall be defined as being in relation to a true cardinal direction or as a deflection from a known monument line of common knowledge. Stationing of deflection points along the traverse are optional.

3. The points of entry into and exit from state lands shall be accurately tied by surveyed course to the nearest corner of the public land survey system unless nearest corner is more than six miles distant. If the corner is in excess of six miles, the tie shall be made to a prominent permanent natural object or monument readily recognized and recoverable.

4. All section boundaries, quarter lines ( ) and sixteenth (1/16) subdivision lines of said section shall be shown on the plat of survey in their entirety for all sections directly affected by the easement. Subdivisions of the section shall be based on and in accordance with approved existing plats of survey. The section, township, range and principal meridian shall be inscribed on the face of the plat.

5. The width of linear easements shall be indicated on the plat in relation to the surveyed center line of the permanent easement. Widths shall be delineated on each side of the center line as well as the overall width of the corridor. In those cases when the width is not uniform or of equal distance from the center line throughout the length of the easement, the location and amount of the change in width shall be explicitly shown.

Closed traverse easements shall show the total acreage encompassed within the traverse as well as the acreage encompassed in each one sixteenth (1/16) subdivision.

The total length of the easement on each parcel of state land affected or traversed along with the acreage encompassed shall be stated.

6. The original plat filed shall bear upon its face a statement of the surveyor or engineer who made the survey. The statement shall include the date of the survey, the title of the person making the survey, the company or entity the survey was accomplished for and the kind of facility being constructed within the confines of the survey. Surveyor shall affix his/her registered seal and affix the Wyoming license number. W.S. 33-29-134(a).

7. A written narrative description of the survey shall accompany the plat and may be written on a separate sheet of paper.
LEGAL DESCRIPTION

AN EASEMENT LOCATED IN THE EA, 3/2 SEC/1/4, OF SECTION 38, TOWNSHIP 14
NORTH, RANGE 118 WEST, 6TH P.M., LINCOLN COUNTY, WYOMING. SAID EASEMENT SHALL BE 15.00 FEET WIDE, 7.50 FEET ON EACH SIDE OF THE FOLLOWING DESCRIED CENTERLINE:

BEGINNING AT A POINT ON THE SOUTH LINE OF SAID SECTION 38 LINING N 82°30'00" W, 718.35 FEET FROM THE SOUTHEAST CORNER THEREOF;
THENCE N 04°33'12" E, 226.00 FEET
THENCE N 17°28'00" E, (75.89 FEET)
THENCE N 26°30'30" E, 515.35 FEET TO THE POINT OF BEGINNING SAID EASEMENT BEING 1926.71 FEET OR 116.77 ROADS, MORE OR LESS, IN LENGTH.

CERTIFICATE OF SURVEYOR
STATE OF WYOMING
COUNTY OF LINCOLN

PLEASE NOTE

This is a sample only. The submitted plat must be on 8½ X 14 Mylar. The legal description does not have to be on the Mylar, it can be on a separate sheet of white paper. The Surveyor's seal, with original signature and date, must be affixed.
**SURFACE IMPACT PAYMENT SCHEDULE FOR EASEMENTS**  
(Paid Directly to the Surface Lessee)  
APPROVED BY THE BOARD ON JUNE 2, 2005

Surface Impact Payments for Easements are to be paid directly to the surface lessee and are **not** part of the consideration paid to the state for the easement. The surface impact payments represent a one-time payment for adverse impacts to the lessee’s grazing lease and operations. The consideration for the easement is to be negotiated with and paid directly to the Office. The surface impact payment schedule eliminates the necessity for negotiation with the surface lessees with respect to payment for impacts to the leasehold operations, including nuisance and inconvenience, created by the Easement. The lessee must still be contacted and notified of your proposed easement, and you must submit the executed lessee comment form with your application. If the surface lessee(s) refuses to execute a lessee comment form, the applicant should indicate that fact on its application, along with a summary of the applicant’s efforts at trying to obtain the executed lessee comment form. The surface lessee is encouraged to negotiate location of the easement which will reduce the adverse impacts to its leasehold operations. If the surface lessee refuses to negotiate the location of the easement, OSLI staff will work directly with the applicant to locate its easement.

THIS SCHEDULE IS SUBJECT TO CHANGE BY THE BOARD; SEE BOARD RULES – Chapter 3, Section 5(a)

<table>
<thead>
<tr>
<th>TYPE OF USE</th>
<th>SURFACE IMPACT PAYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil &amp; Gas Pipeline (≤ 30’ wide)</td>
<td>$5.00 per rod</td>
</tr>
<tr>
<td>Production Water Pipeline (≤ 15’ wide)</td>
<td>None, if providing water to livestock or for irrigation. If not, $2.00 per rod.</td>
</tr>
<tr>
<td>Common Easement Corridor (more than one utility constructed in the same corridor, at the same time) (≤ 30’ wide)</td>
<td>$5.00 per rod</td>
</tr>
<tr>
<td>Domestic or Livestock Water Pipeline (≤ 15’ wide)</td>
<td>None – if providing water to livestock or for irrigation. If not – $2.00 per rod</td>
</tr>
<tr>
<td>Power line (large transmission lines)</td>
<td>$5.00 per rod</td>
</tr>
<tr>
<td>Powerline (distribution lines)</td>
<td>None – when providing power to state land or surface lessee operations. If not – $2.00 per rod</td>
</tr>
<tr>
<td>Roadway to private land or residences (new construction)</td>
<td>Greater of $5.00 per rod or $250.00</td>
</tr>
<tr>
<td>Roadway to private land or residences (existing road)</td>
<td>None</td>
</tr>
<tr>
<td>Irrigation ditches</td>
<td>None – If benefiting state land water rights or surface lessee operations. If not – $5.00 per rod</td>
</tr>
<tr>
<td>Snow fences (WyDOT) &amp; living snow fences (conservation districts)</td>
<td>None</td>
</tr>
<tr>
<td>Reservoirs (watershed, recreation)</td>
<td>None</td>
</tr>
<tr>
<td>Public roads and Highways</td>
<td>None</td>
</tr>
<tr>
<td>Any other approved use documented by an Easement</td>
<td>To be determined by the Office</td>
</tr>
</tbody>
</table>

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1 The Board of Land Commissioners encourages the bundling of facilities into a common easement corridor whenever possible. If utilities are installed in the same corridor at the same time, only a single SIP will be assessed for the entire construction operation in the amount listed for “Common Easement Corridor.” If the applicant (or other 3rd party) later seeks to install another line in the same easement corridor, (i.e., not at the same time as the prior utility(ies), another SIP will be assessed at the full rate charged for the easement type requested (e.g., if the applicant requests an easement for an Oil/Gas pipeline in the same corridor, then it would pay a SIP of $5.00 per rod; if it is a Production Water Pipeline, $2.00/rod, etc.)
Appendix H: Radon Removal Structure
Appendix I: Yard Pipe Details
Appendix J: Susceptibility Forms
SUSCEPTIBILITY ASSESSMENT FORM
Version 1.0

IMPORTANT! Please complete one form for each groundwater source used in the water system.

PART I: SYSTEM INFORMATION

Well owner/manager: City of Cheyenne/Jim Van Dorn

Water system name: Cheyenne Municipal Water System

County: Laramie

Public Water System Number: WY 5600011

Well depth in feet: 270

Source name: Belvoir No. 5

State Engineer's Office Permit No.: 39-5-189, Temporary filing #, permit not approved yet

Number of connections: 21,414 Population Served: 60,000

Township: 13 N Range: 68 W Section: 21 On line between NW1/4 & NE1/4 of N1/2

Latitude/longitude (if available): 

How was lat./long. determined?

_____ global positioning device _____ survey _____ topo. map other: _____
PART II: Well Construction and Source Information

1. Date well originally constructed (month/day/year): October 12, 2005
   Last reconstruction (month/day/year): N/A

2. Well Driller: Sargent Irrigation

3. Type of well:

<table>
<thead>
<tr>
<th>Drilled</th>
<th>Rotary</th>
<th>Bored</th>
<th>Cable Tool</th>
<th>Dug</th>
<th>Springs</th>
<th>Ranney Collector</th>
<th>Driven</th>
<th>Jetted</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
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</table>

Other: Reverse Circulation

Additional Comments:

4. State Engineer's Office Statement of Completion Well Report Available?
   
   X N/A – Not published yet
   ___ NO

   If no well log is available, please attach any other records documenting well construction such as boring logs, "as-built" diagrams, engineering reports, or well reconstruction logs.

5. Average Pumping Rate 500 gallons per minute (gpm)

   WSEO adjudicated (permitted) pumping rate: Not  gpm
   Adjudicated


   If not documented, how was pumping rate determined?
6. Is this source treated?

[ ] YES  [ ] NO

If so, what type of treatment:

<table>
<thead>
<tr>
<th>Disinfection</th>
<th>Filtration</th>
<th>Carbon Filter</th>
<th>Air Stripper</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Purpose of treatment (describe materials to be removed or controlled by treatment):

Control biological agents, remove dissolved radon gas and TCE

7. Is source chlorinated, is chlorine residual maintained?

[ ] YES  [ ] NO

Residual Level: 0.02 (Point closest to source.)

8. Wellhead Elevation (feet above mean sea level): 6589

How was elevation determined?

<table>
<thead>
<tr>
<th>topo. map</th>
<th>altimeter</th>
<th>drill/well Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Other: _______________________________________

9. Depth to top of screened interval: 110 Feet below wellhead

10. Depth to groundwater (static water level): 82 Feet below wellhead

How was water level determined?

[ ] Well Log  [ ] Measured  [ ] Other
11. If a source is a flowing well or spring, what is the shut-in pressure?
   
   N/A psi (pounds per square inch), or
   
   _____ feet above wellhead

12. If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with the source?

   _____ yes  N/A no

13. Confining layers (This question can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions):

   Is there evidence of a confining layer in the drilling log, well log, or geologic/engineering report?

   X yes   _____ no

   If there is evidence of a confining layer, is the depth to groundwater more than 20 feet above the bottom of the lowest confining layer?

   X yes   _____ no

14. 'Accident Prevention Zone' (Zone 1 of WHPA):

<table>
<thead>
<tr>
<th>50 feet</th>
<th>100 feet</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
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</tbody>
</table>
15. Wellhead control and access:

No Wellhead control: ________________________________

Wellhead enclosed in a wellhouse  NO

Pitless adapter ______

Controlled access (please describe): Well is located within fenced and
                                   Locked  BOPU property. No pump installed yet.

Other uses for wellhouse (please describe): ________________________________

16. Surface casing and annular seal:

Surface casing present?  Yes____

Depth of surface casing:  110 feet____

Surface casing material:  Steel____

Annular seal present?  Yes____

Depth of annular seal:  40 feet____

Annular seal material:  Cement____
17. **Surface seal and well opening:**

**Surface casing present?** Yes  
**Surface casing material and diameter:** Steel 1.5 feet

**Height of casing above ground:** 2 feet

**Well cap in place?** Yes  
**Well capped locked?** Yes

**Surface seal present?** Yes  
**Surface seal material:** Cement

**Surface seal length:** 20 feet  
**Surface seal thickness:** 0.25 feet

**Condition of seal:** Good

**Seal slope away from casing:** Yes
PART III: ASSESSMENT OF WATER QUALITY

1. Indicate if any of the following potential contaminant sources listed on the Table are present with Zones 1, 2, or 3 of the WHPA.

<table>
<thead>
<tr>
<th>Type of Potential Source</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide application</td>
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<tr>
<td>Stormwater injection wells</td>
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<tr>
<td>Other injection wells</td>
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<tr>
<td>Abandoned water wells</td>
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<tr>
<td>Abandoned oil wells</td>
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<tr>
<td>Landfills, dumps, disposal area</td>
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<td></td>
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<tr>
<td>Known hazardous materials cleanup site</td>
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<tr>
<td>Known water quality problems</td>
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<td></td>
<td>X</td>
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<tr>
<td>Population density greater than 1 house/acre</td>
<td></td>
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<td>Septic systems, cesspools, outhouses</td>
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<tr>
<td>Wastewater or sewage treatment lagoons</td>
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<tr>
<td>Sites used for land application of sewage sludge or other wastes</td>
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</tbody>
</table>

If other recorded or potential sources of groundwater contamination exist within the WHPA describe below.

Livestock grazing

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
2. **Source specific water quality records:**

   Please indicate the occurrence of any test results since 1986 that meet the following conditions:

   | A. Nitrate as N: (Nitrate MCL = 10 mg/l) |  
   |-----------------------------------------|---|
   | Results greater than MCL |   |
   | <2 mg/l nitrate | X |
   | 2-5 mg/l nitrate |   |
   | >5 mg/l nitrate |   |
   | No nitrate sampling records | |

   | B. VOCs: (VOC detection level 0.5 µg/l) |  
   |--------------------------------------|---|
   | Results greater than MCL | X |
   | VOCs detected at least once | X |
   | VOCs never detected |   |
   | No VOCs sampling records | |

   | C. SOCs: (Pesticides/Herbicides) |  
   |----------------------------------|---|
   | Results greater than MCL |   |
   | SOCs detected at least once |   |
   | SOCs never detected | X |
   | No SOCs sampling records |   |

If any SOCs were detected, please identify and date. Laboratory data sheets may be submitted in lieu of compiling list. If SOCs tests were performed, but no SOCs detected, list test methods here:  
E515.1, E504.1, E505, E525.2, E531.1
<table>
<thead>
<tr>
<th>D. Bacteria Contamination:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any bacterial detection(s) in the past 3 years in samples collected from the source (not distribution sampling records)</td>
<td>Yes-just Iron related, no fecalcoliform</td>
</tr>
<tr>
<td>In past 3 years, has source had a bacteriological contamination problem found in distribution samples that was attributed to the source</td>
<td>No</td>
</tr>
<tr>
<td>Bacteria sampling records</td>
<td>Yes</td>
</tr>
</tbody>
</table>
PART IV: GEOGRAPHIC OR HYDROLOGIC FACTORS CONTRIBUTING TO A NON-CIRCULAR ZONE OF CONTRIBUTION

1. Is there evidence of a potential hydrologic boundary within the WHPA? (Does the boundary extend over a stream, river, lake, up a steep slope, or over a mountain or ridge?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

If Yes, please mark and identify on the WHPA map; Please describe:

A hydrologic boundary exists far upstream of Belvoir 5 called the Ogalla Saturation Boundary and may effect the pumpage of Belvoir No. 5 after long-term pumping.

2. Aquifer Material

A. Have drilling logs, well logs, geologic maps, aerial photos, geologic/engineering reports and/or aquifer/pump test data been reviewed and analyzed for the presence of faulting, fracturing and karst conditions, both within the aquifer as well as within any overlying strata or sediments?

   _X_ YES     _NO_

Indicate which of the above have been reviewed; cite references used:  
Well log

Belvoir Wells 5 & 6 Pumping Tests and Aquifer Impact Report (J.R. Engineering 2007)

B. Do any of the information sources in (A) above indicate that the well is located in an area where the underground conditions are fractured, faulted or karst?

   ___ YES    _X_ NO
3. Does any of the information in (2A) above indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

   X YES      NO

4. Are there other high-capacity wells (agricultural, municipal, and/or industrial) located within the WHPAs?

   X YES      NO

A. Presence of groundwater extraction wells removing more than approximately 500 gallons per minute within...

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

B. Presence of groundwater recharge wells or heavy irrigation within.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the WHPA for this source. Where possible, reference them to the locations on the map.

Alluvial channel of Lone Tree Creek
SUSCEPTIBILITY ASSESSMENT FORM
Version 1.0

IMPORTANT! Please complete one form for each groundwater source used in the water system.

PART I: SYSTEM INFORMATION

Well owner/manager: City of Cheyenne/Jim Van Dorn

Water system name: Cheyenne Municipal Water System

County: Laramie

Public Water System Number: WY 600011

Well depth in feet: 408

Source name: Belvoir No. 6

State Engineer’s Office Permit No.: Unknown/not permitted yet

Number of connections: 21,141 Population Served: 60,000

Township: 13 N Range: 68 W Section: 23 SE1/4 of NW1/4

Latitude/longitude (if available):

How was lat./long. determined?

____ global positioning device ____ survey ____ topo. map other: ____
PART II: Well Construction and Source Information

1. Date well originally constructed (month/day/year): March 15, 2007
   Last reconstruction (month/day/year): N/A

2. Well Driller: Sargent Irrigation

3. Type of well:

<table>
<thead>
<tr>
<th>Drilled</th>
<th>Rotary</th>
<th>Bored</th>
<th>Cable Tool</th>
<th>Dug</th>
<th>Springs</th>
<th>Ranney Collector</th>
<th>Driven</th>
<th>Jetted</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Other: Reverse Circulation

   Additional Comments:

4. State Engineer's Office Statement of Completion Well Report Available?
   
   X NO – Not filled yet
   
   NO

   If no well log is available, please attach any other records documenting well
   construction such as boring logs, "as-built" diagrams, engineering reports,
   or well reconstruction logs.

5. Average Pumping Rate 300 gallons per minute (gpm)

   WSEO adjudicated (permitted) pumping rate: Not Established gpm

   Source of Information: J.R. Engineering, Belvoir No. 5 & 6 Pumping

   If not documented, how was pumping rate determined?
6. Is this source treated?

   X YES ____ NO

   If so, what type of treatment:

<table>
<thead>
<tr>
<th>Disinfection</th>
<th>Filtration</th>
<th>Carbon Filter</th>
<th>Air Stripper</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

   Purpose of treatment (describe materials to be removed or controlled by
treatment):
   Control biological agents, dissolved Radon gas, TCE

7. Is source chlorinated, is chlorine residual maintained?

   X YES ____ NO

   Residual Level: 0.02 ________ (Point closest to source.)

8. Wellhead Elevation (feet above mean sea level): 6588

   How was elevation determined?

<table>
<thead>
<tr>
<th>topo. map</th>
<th>altimeter</th>
<th>drill/well Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

   Other: ________________________________

9. Depth to top of screened interval: 178 Feet below wellhead

10. Depth to groundwater (static water level): 110 Feet below wellhead

   How was water level determined?

   ____ Well Log   X Measured   ____ Other
11. If a source is a flowing well or spring, what is the shut-in pressure?

\[\text{N/A }\text{ psi (pounds per square inch), or }\]

\[\text{____ feet above wellhead}\]

12. If source is a flowing well or spring, is there a surface impoundment, reservoir, or cachment associated with the source?

\[\text{____ yes }\text{ N/A }\text{ no}\]

13. Confining layers (This question can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions):

Is there evidence of a confining layer in the drilling log, well log, or geologic/engineering report?

\[\text{X yes }\text{ ____ no}\]

If there is evidence of a confining layer, is the depth to groundwater more than 20 feet above the bottom of the lowest confining layer?

\[\text{X yes }\text{ ____ no}\]

14. ‘Accident Prevention Zone’ (Zone 1 of WHPA):

<table>
<thead>
<tr>
<th>50 feet</th>
<th>100 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
15. Wellhead control and access:

No wellhead control

Wellhead enclosed in a wellhouse  No

Pitless adapter

Controlled access (please describe) Well is located within fenced and, locked BOPU property. No pump installed yet

Other uses for wellhouse (please describe):

__________________________________________________________________________

16. Surface casing and annular seal:

Surface casing present?  Yes

Depth of surface casing:  40 feet

Surface casing material:  Steel

Annular seal present?  Yes

Depth of annular seal:  60 feet

Annular seal material:  Cement
17. Surface seal and well opening:

Surface casing present? Yes Height of casing above ground: 2 feet

Surface casing material and diameter: Steel 1.5 feet

Well cap in place? Yes Well capped locked? NA

Surface seal present? Yes Surface seal material: Cement

Surface seal length: 40 feet Surface seal thickness: 0.25 feet

Condition of seal: Good

Seal slope away from casing: Yes
PART III: ASSESSMENT OF WATER QUALITY

1. Indicate if any of the following potential contaminant sources listed on the Table are present with Zones 1, 2, or 3 of the WHPA.

<table>
<thead>
<tr>
<th>Type of Potential Source</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater injection wells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other injection wells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abandoned water wells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abandoned oil wells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfills, dumps, disposal area</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Known hazardous materials cleanup site</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Known water quality problems</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Population density greater than 1 house/acre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic systems, cesspools, outhouses</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wastewater or sewage treatment lagoons</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sites used for land application of sewage sludge or other wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If other recorded or potential sources of groundwater contamination exist within the WHPA describe below.

Livestock grazing

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
2. Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions:

<table>
<thead>
<tr>
<th>A. Nitrate as N: (Nitrate MCL = 10 mg/l)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td></td>
</tr>
<tr>
<td>&lt;2 mg/l nitrate</td>
<td>X</td>
</tr>
<tr>
<td>2-5 mg/l nitrate</td>
<td></td>
</tr>
<tr>
<td>&gt;5 mg/l nitrate</td>
<td></td>
</tr>
<tr>
<td>No nitrate sampling records</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. VOCs: (VOC detection level 0.5 μg/l)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td>X</td>
</tr>
<tr>
<td>VOCs detected at least once</td>
<td>X</td>
</tr>
<tr>
<td>VOCs never detected</td>
<td></td>
</tr>
<tr>
<td>No VOCs sampling records</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. SOCs: (Pesticides/Herbicides)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td></td>
</tr>
<tr>
<td>SOCs detected at least once</td>
<td></td>
</tr>
<tr>
<td>SOCs never detected</td>
<td>X</td>
</tr>
<tr>
<td>No SOCs sampling records</td>
<td></td>
</tr>
</tbody>
</table>

If any SOCs were detected, please identify and date. Laboratory data sheets may be submitted in lieu of compiling list. If SOCs tests were performed, but no SOCs detected, list test methods here:

E515.1, E504.1, E505, E525.2, E531.1
<table>
<thead>
<tr>
<th>D. Bacteria Contamination:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any bacterial detection(s) in the past 3 years in</td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>samples collected from the source (not</td>
<td></td>
</tr>
<tr>
<td>distribution sampling records)</td>
<td></td>
</tr>
<tr>
<td>In past 3 years, has source had a bacteriological</td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>contamination problem found in distribution</td>
<td></td>
</tr>
<tr>
<td>samples that was attributed to the source</td>
<td></td>
</tr>
<tr>
<td>No bacteria sampling records</td>
<td></td>
</tr>
</tbody>
</table>
PART IV: GEOGRAPHIC OR HYDROLOGIC FACTORS CONTRIBUTING TO A NON-CIRCULAR ZONE OF CONTRIBUTION

1. Is there evidence of a potential hydrologic boundary within the WHPA? (Does the boundary extend over a stream, river, lake, up a steep slope, or over a mountain or ridge?)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

If Yes, please mark and identify on the WHPA map; Please describe:

________________________________________________________________________

________________________________________________________________________

2. Aquifer Material

A. Have drilling logs, well logs, geologic maps, aerial photos, geologic/engineering reports and/or aquifer/pump test data been reviewed and analyzed for the presence of faulting, fracturing and karst conditions, both within the aquifer as well as within any overlying strata or sediments?

  X  YES  _____ NO

Indicate which of the above have been reviewed; cite references used:

Well log

Belvoir Wells 5 & 6 Pumping Tests and Aquifer Impact Report (J.R. Engineering 2007)

B. Do any of the information sources in (A) above indicate that the well is located in an area where the underground conditions are fractured, faulted or karst?

_____ YES  X  NO
3. Does any of the information in (2A) above indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

   X  YES  _____  NO

4. Are there other high-capacity wells (agricultural, municipal, and/or industrial) located within the WHPAs?

   X  YES  _____  NO

A. Presence of groundwater extraction wells removing more than approximately 500 gallons per minute within...

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

B. Presence of groundwater recharge wells or heavy irrigation within...

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
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<td>X</td>
<td></td>
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<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the WHPA for this source. Where possible, reference them to the locations on the map.

Aalluvial channel of Lone Tree Creek
SUSCEPTIBILITY ASSESSMENT FORM
Version 1.0

IMPORTANT! Please complete one form for each groundwater source used in the water system.

PART I: SYSTEM INFORMATION

Well owner/manager: City of Cheyenne/Victor Spencer

Water system name: Cheyenne Municipal Water System

County: Laramie

Public Water System Number: WY 600011

Well depth in feet: 1348

Source name: Lone Tree Creek No. 1

State Engineer's Office Permit No.: Not permitted yet

Number of connections: 21,414 Population Served: 60,000

Township: 13 N Range: 69 W Section: 17 SE1/4 of NE1/4

Latitude/longitude (if available): __________

How was lat./long. determined?

____ global positioning device ____ survey ____ topo. map other: ____
PART II: Well Construction and Source Information

1. Date well originally constructed (month/day/year): February 4, 2006
   Last reconstruction (month/day/year): N/A

2. Well Driller: Layne Western

3. Type of well:

<table>
<thead>
<tr>
<th>Drilled</th>
<th>Rotary</th>
<th>Bored</th>
<th>Cable Tool</th>
<th>Dug</th>
<th>Springs</th>
<th>Ranney Collector</th>
<th>Driven</th>
<th>Jetted</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other: Air Hammer

Additional Comments:

4. State Engineer's Office Statement of Completion Well Report Available?
   _____ No, only completed as a test hole   _____ YES

If no well log is available, please attach any other records documenting well construction such as boring logs, "as-built" diagrams, engineering reports, or well reconstruction logs.

5. Average Pumping Rate  500  gallons per minute (gpm)

WSEO adjudicated (permitted) pumping rate:  Not Established  gpm


If not documented, how was pumping rate determined?
6. Is this source treated?

   X   YES   ___ NO

   If so, what type of treatment:

<table>
<thead>
<tr>
<th>Disinfection</th>
<th>Filtration</th>
<th>Carbon Filter</th>
<th>Air Stripper</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

   Purpose of treatment (describe materials to be removed or controlled by treatment):
   Control biological agents, remove dissolved radon gas and TCE

7. Is source chlorinated, is chlorine residual maintained?

   X   YES   ___ NO

   Residual Level: 0.02 ___ (Point closest to source.)

8. Wellhead Elevation (feet above mean sea level): 7105

   How was elevation determined?

<table>
<thead>
<tr>
<th>topo. map</th>
<th>altimeter</th>
<th>drill/well Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Other: ________________________________

9. Depth to top of screened interval: 387 open borehole Feet below wellhead

10. Depth to groundwater (static water level): 108 Feet below wellhead

    How was water level determined?

    ___ Well Log   X   Measured   ___ Other
11. If a source is a flowing well or spring, what is the shut-in pressure?

    n/a psi (pounds per square inch), or
    _____ feet above wellhead

12. If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with the source?

    _____ yes  n/a  no

13. Confining layers (This question can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions):

    Is there evidence of a confining layer in the drilling log, well log, or geologic/engineering report?

        X  yes  _____ no

    If there is evidence of a confining layer, is the depth to groundwater more than 20 feet above the bottom of the lowest confining layer?

        X  yes  _____ no

14. 'Accident Prevention Zone' (Zone 1 of WHPA):

<table>
<thead>
<tr>
<th>50 feet</th>
<th>100 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
15. Wellhead control and access:
   - No wellhead control
   - Wellhead enclosed in a wellhouse
   - Pitless adapter

   Controlled access (please describe): Located within fenced and locked BOPU property. No pump installed yet

   Other uses for wellhouse (please describe):

16. Surface casing and annular seal:
   - Surface casing present? Yes
   - Depth of surface casing: 387 feet
   - Surface casing material: Steel
   - Annular seal present? Yes
   - Depth of annular seal: 387 feet
   - Annular seal material: Cement
17. Surface seal and well opening:

Surface casing present?  Yes  Height of casing above ground:  2 feet
Surface casing material and diameter:  Steel  1.2 feet
Well cap in place?  Yes  Well capped locked?  NA
Surface seal present?  Yes  Surface seal material:  Cement
Surface seal length:  30 feet  Surface seal thickness:  0.15 feet
Condition of seal:  Good
Seal slope away from casing:  Yes
PART III: ASSESSMENT OF WATER QUALITY

1. Indicate if any of the following potential contaminant sources listed on the Table are present with Zones 1, 2, or 3 of the WHPA.

<table>
<thead>
<tr>
<th>Type of Potential Source</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticide application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater injection wells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other injection wells</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Known water quality problems</td>
<td>No</td>
<td></td>
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<tr>
<td>Population density greater than 1 house/acre</td>
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<td>Wastewater or sewage treatment lagoons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sites used for land application of sewage sludge or other wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If other recorded or potential sources of groundwater contamination exist within the WHPA describe below.

Livestock grazing

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
2. Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions:

<table>
<thead>
<tr>
<th>A. Nitrate as N: (Nitrate MCL = 10 mg/l)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td></td>
</tr>
<tr>
<td>&lt;2 mg/l nitrate</td>
<td>X</td>
</tr>
<tr>
<td>2-5 mg/l nitrate</td>
<td></td>
</tr>
<tr>
<td>&gt;5 mg/l nitrate</td>
<td></td>
</tr>
<tr>
<td>No nitrate sampling records</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. VOCs: (VOC detection level 0.5 µg/l)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td></td>
</tr>
<tr>
<td>VOCs detected at least once</td>
<td>X</td>
</tr>
<tr>
<td>VOCs never detected</td>
<td></td>
</tr>
<tr>
<td>No VOCs sampling records</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. SOCs: (Pesticides/Herbicides)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Results greater than MCL</td>
<td></td>
</tr>
<tr>
<td>SOCs detected at least once</td>
<td></td>
</tr>
<tr>
<td>SOCs never detected</td>
<td>X</td>
</tr>
<tr>
<td>No SOCs sampling records</td>
<td></td>
</tr>
</tbody>
</table>

If any SOCs were detected, please identify and date. Laboratory data sheets may be submitted in lieu of compiling list. If SOCs tests were performed, but no SOCs detected, list test methods here:

E515.1, E504.1, E505, E525.2, E531.1
<table>
<thead>
<tr>
<th>D. Bacteria Contamination:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any bacterial detection(s) in the past 3 years in samples collected from the source (not distribution sampling records)</td>
<td>Yes</td>
</tr>
<tr>
<td>In past 3 years, has source had a bacteriological contamination problem found in distribution samples that was attributed to the source</td>
<td>No</td>
</tr>
<tr>
<td>No bacteria sampling records</td>
<td></td>
</tr>
</tbody>
</table>
PART IV: GEOGRAPHIC OR HYDROLOGIC FACTORS CONTRIBUTING TO A NON-CIRCULAR ZONE OF CONTRIBUTION

1. Is there evidence of a potential hydrologic boundary within the WHPA? (Does the boundary extend over a stream, river, lake, up a steep slope, or over a mountain or ridge?)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

If Yes, please mark and identify on the WHPA map;
Please describe: ______________________________________________________

Area includes Lone Tree Creek

2. Aquifer Material

A. Have drilling logs, well logs, geologic maps, aerial photos, geologic/engineering reports and/or aquifer/pump test data been reviewed and analyzed for the presence of faulting, fracturing and karst conditions, both within the aquifer as well as within any overlying strata or sediments?

   X  YES  _____  NO

Indicate which of the above have been reviewed;
cite references used: Well log
Lowry and Crist (1967); Lidstone (2006)

B. Do any of the information sources in (A) above indicate that the well is located in an area where the underground conditions are fractured, faulted or karst?

   X  YES  _____  NO
3. Does any of the information in (2A) above indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

_____ YES  X  NO

4. Are there other high-capacity wells (agricultural, municipal, and/or industrial) located within the WHPAs?

_____ YES  X  NO

A. Presence of groundwater extraction wells removing more than approximately 500 gallons per minute within...

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

B. Presence of groundwater recharge wells or heavy irrigation within...

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 2</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Zone 3</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the WHPA for this source. Where possible, reference them to the locations on the map.

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________