BEULAH
LEVEL I WATER SUPPLY STUDY
FINAL REPORT

NOVEMBER 2003
SUBMITTED TO
WYOMING WATER DEVELOPMENT COMMISSION
AND
COMMUNITY OF BEULAH, WYOMING
PREPARED BY
WESTON ENGINEERING, INC.
WITH ASSISTANCE FROM
ENTECH, INC.
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INTRODUCTION

This chapter provides an introduction and background information for the Wyoming Water Development Commission (WWDC) - funded Level I Master Plan Water Supply Project sponsored by the Community of Beulah.

PROJECT LOCATION, DEMOGRAPHICS, AND POPULATION

The Community of Beulah is located in Crook County in northeastern Wyoming (Figure I-1). The Community of Beulah is a residential community with an elevation of approximately 3,512 feet. It is located approximately two miles west of the Wyoming-South Dakota state line along Interstate-90 (I-90) and U.S. 14.

Most of the residents of the Community of Beulah are self-employed, retired or commute to Spearfish, South Dakota or coal mines of the Powder River Basin where they are employed. In addition, a small number of people are employed in the agricultural business.

The current population is 33, as reported on the signs at the entrances to the community along U.S. 14. The population reported on the sign is an estimate according to the Traffic Division of the Wyoming Department of Transportation (WYDOT).

STATEMENT OF THE PROBLEM

The area in the vicinity of Beulah has been occupied for over 100 years. The Town of Beulah was platted in 1885 by Alexander Moorcroft; however, the town was never incorporated. Residents and businesses have always relied on individual wells and septic systems. As the population has grown, the potential for interaction between shallow wells and septic leach fields has increased. In addition, many residents complain of poor water quality and insufficient quantities of water from wells completed in the shallow alluvium or the Spearfish Formation.

In 2003, the Community of Beulah (Sponsor) applied to the WWDC to fund a Level I master plan study. The Sponsor requested a review of the potential for developing a deeper groundwater source to serve as a central municipal source and to develop alternatives for central transmission, storage and distribution systems. The Sponsor's application for funding was approved during the 2003 Wyoming State Legislative Session.
SCOPE OF THIS STUDY

The Weston Engineering, Inc. (WESTON) project team consists of WESTON personnel and their subconsultant, EnTech, Inc. The purpose of this Beulah Level I Water Supply Study is to determine a service area for Beulah; conduct a geologic and hydrologic investigation of a potential water supply source; conduct a well siting study; develop a conceptual design for a supply well and appurtenances, treatment, storage, transmission, and distribution system; estimate costs for the project; and determine the approximate monthly cost per user for financing and operating the system.

The economic analyses included in this study contain recommendations relative to the annual financial commitments that the water users would have to make to retire the project debt and meet operation and maintenance costs for the water supply alternatives. A proposed rate schedule is also presented.

SCOPE OF THIS REPORT

This Chapter provides the introduction to the study and report. Chapter II summarizes the process that was used to determine the service area and discusses the estimated current and projected water demands. Chapter III provides a discussion of the geologic and hydrogeologic setting in the Beulah area. Chapter IV discusses the criteria used to site a well and proposed locations. Chapter V presents the conceptual design of the water supply well and the transmission, storage, and distribution system and associated conceptual-level costs. Chapter VI provides an economic analysis and project financing. Chapter VII presents the study conclusions and recommendations.

SCOPING MEETING

A project scoping meeting was held on July 9, 2003 at the Beulah Community Hall. The WESTON technical project team attended this meeting, along with Chris Abernathy of the WWDC and interested area citizens. A list of meeting attendees is presented in Appendix B. Topics of discussion included the scope of work, the proposed service area, criteria to be used to select the proposed well site, potential system alternatives, and proposed additions to the scope of work.

There were no additions to the scope of work identified by the scoping meeting attendees.

PREVIOUS REPORTS

The only previous WWDC study conducted in the Beulah area was the Aladdin Level I Study conducted by Soda Butte Services, Inc. in 1994. The Aladdin Level I Study considered a reconnaissance-level public water system for Beulah. The conceptual design included a 1,240-foot deep Madison well; a four, six, and eight inch pipeline network; and a 100,000 gallon storage...
INTRODUCTION

BEULAH LEVEL I WATER SUPPLY STUDY

tank. The predicted cost for the water system, with meters and taps, was $646,000. The per tap monthly cost was estimated to be $49.50 for 35 users or $38.88 for 45 users.

ACKNOWLEDGMENTS

This project could not have been completed without the technical assistance and guidance of Chris Abernathy of the WWDC. Thanks are also due to Greg Forsberg, Bill and Jane Dunbar, and Dan Island of the Beulah Community. Appreciation is also given to the residents of Beulah Land Estates for allowing WESTON staff to interrupt their water supply during testing of the Beulah Land Estates well.
CHAPTER II

SERVICE AREA, POPULATION, AND PROJECTED WATER SUPPLY NEEDS

This chapter addresses the methodology used to define the Community of Beulah water supply system service area and population projections. Estimated current and future water demands are also discussed in this chapter.

SERVICE AREA

The WESTON Team began the process of determining the Community of Beulah Water Supply service area by reviewing land ownership records at the Crook County Assessor’s Office and identifying the number of current dwellings in the Beulah area. Initially, all landowners located within a three-mile radius of the Beulah Town Plat were identified and a survey developed by WESTON was mailed to these landowners. Of the 42 surveys that were mailed, 28 were returned to WESTON. A total of 20 of the respondents expressed interest in joining a Community of Beulah water district. Table II-1 summarizes the survey response results. A summary of the results, along with copies of the surveys, is compiled in Appendix C. Based on the locations of those who positively responded to the survey (see Figure II-1), an initial service area was identified that encompassed an area extending approximately two miles east to west along I-90 and 1.5 miles to the north of I-90. However, because of the high projected cost associated with extending service to outlying areas of the initial service area for just a few connections, the service area was reduced to the area depicted in Figure II-1.

As depicted in Figure II-1, Beulah Land Estates (BLE) has been included within the Beulah water supply service area. BLE is currently serviced by an independent water supply and distribution system, but may require development of a second water supply well in the future. Population and water demand scenarios for this study were thus developed both with and without BLE. Of the 32 lots in the BLE subdivision, only three dwellings have been built to date.

POPULATION

The small Community of Beulah is surrounded by agricultural properties that serve as cattle ranches and/or dry land farms. Crops grown in the area include alfalfa, hay and other forage crops that provide winter feed for livestock. Beulah has a small business district located along U.S. 14. Commercial activity includes two gas station/convenience stores, one of which also includes a café and bar, one campground with 16 camping spaces, one bar and café that is currently not in operation, and one motorcycle parts store. Beulah also has a community hall and a two-bay fire station. Because the Community of Beulah is not an incorporated town, there are no official census numbers. However, WYDOT population signs on the outskirts of town list the population of Beulah at 33 people.
For the purpose of estimating the population within the Community of Beulah service area identified in Figure II-1, WESTON conducted a windshield survey to identify the number of dwellings within the service area. Not including the three houses in BLE, the number of dwellings in the service area is currently 32. Based on the results of the mailing survey summarized in Appendix C, the average number of persons per dwelling was determined to be 1.8, which was rounded up to two persons/dwelling for the purpose of estimating the population. The current population of Beulah was thus determined by multiplying the number of houses by two, for an estimated population of 64 (see Table II-2).

The current population of BLE was determined by multiplying the current number of dwellings (three) by the average number of persons per dwelling obtained from the mailing survey (three), for a total of nine people (see Table II-2). Adding the population of Beulah to the population of BLE results in a total current service area population estimate of 73 persons.

For water system planning purposes, the population of the service area was projected 20 years into the future, to the year 2023. The Wyoming Department of Administration and Information (DAI), Economic Analysis Division estimates a one percent annual growth rate for Crook County. However, these projections should be tempered by an understanding that Beulah is a bedroom community, with residents that commute to jobs in a variety of industries including energy and tourism. While these two industries are unpredictable and subject to wide ranges in employment conditions, property taxes that are lower than those in neighboring South Dakota make Beulah an attractive community in which to live. Furthermore, a mild climate and proximity to larger communities make the Beulah area attractive to retirees. With the development of a suitable public water system, rapid expansion of the community could occur. To account for the increased potential for growth, WESTON applied a 1.5 percent annual population growth rate to the current estimated population of Beulah (64) for the purposes of this study.

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**TABLE II-1**

<table>
<thead>
<tr>
<th>BEULAH AREA SURVEY RESPONSE RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys Mailed</td>
</tr>
<tr>
<td>Surveys Returned</td>
</tr>
<tr>
<td>Surveys Not Returned</td>
</tr>
<tr>
<td>Respondents Interested in Joining Beulah Water District</td>
</tr>
</tbody>
</table>
## TABLE II-2

COMMUNITY OF BEULAH ESTIMATED CURRENT POPULATION
AND WATER DEMAND

### CURRENT POPULATION

(Without BLE)
32 Houses x 2 people/house

32 Houses x 2 people/house

64 people

(With BLE)

Assume 3 houses in BLE x 3 people/house

Assume 3 houses in BLE x 3 people/house

9 people

Total Current Beulah Population (with BLE)

Total Current Beulah Population (with BLE)

73 people

### CURRENT AVERAGE DAILY DEMAND

(Without BLE)

Residential use: 64 people x 200 gallons/day

Residential use: 64 people x 200 gallons/day

12,800 gpd

Business use

Business use

5,955 gpd

Total current Beulah area average daily demand (without BLE):

Total current Beulah area average daily demand (without BLE):

18,755 gpd

13 gpm

(With BLE)

Residential use: 73 people x 200 gallons/day

Residential use: 73 people x 200 gallons/day

14,600 gpd

Business use

Business use

5,955 gpd

Total current Beulah area average daily demand (with BLE):

Total current Beulah area average daily demand (with BLE):

20,555 gpd

14 gpm

### CURRENT MAXIMUM DAILY DEMAND

(Without BLE)

Residential use: 64 people x 544 gallons/day

Residential use: 64 people x 544 gallons/day

34,816 gpd

Business use

Business use

35,350 gpd

Total current Beulah area maximum daily demand (without BLE):

Total current Beulah area maximum daily demand (without BLE):

70,166 gpd

49 gpm

(With BLE)

Residential use BLE: 9 people x 1,000 gallons/day

Residential use BLE: 9 people x 1,000 gallons/day

9,000 gpd

Business use

Business use

35,350 gpd

Total current Beulah area maximum daily demand (with BLE):

Total current Beulah area maximum daily demand (with BLE):

79,166 gpd

55 gpm

BLE = Beulah Land Estates; gpd = gallons per day; gpm = gallons per minute

(a) Number of homes based on actual home count within service area; number of people/house based on average number of persons/dwelling obtained from survey results (see Appendix C)

(b) See Table II-4
The 2023 population of BLE was estimated by assuming an 80 percent build-out of the 32 lots that are currently part of the subdivision. Based on the number of persons per dwelling of three, the 2023 projected population of BLE was estimated to be 78 (see Table II-3).

**WATER DEMAND**

**Present Water Consumption**

Because all of the Beulah area residents are currently supplied by water from individual wells or by hauling water, there are no available water consumption records. Chapter XII of the DEQ-WQD Rules and Regulations estimates that the average per capita daily use for Wyoming public water systems is 125 gallons per capita per day (gpcd), while the maximum daily usage is 340 gpcd. Because the average daily rates for surrounding communities are generally higher than 125 gpcd, a rate of 200 gpcd was used to determine the current and future average daily consumption for the Community of Beulah service area. Using a multiplier of 2.72, the maximum daily demand was determined to be 544 gpcd. In addition, due to the large lot sizes and the expressed desire of BLE residents to irrigate a large portion of their lots, a consumption rate of 1,000 gpcd was used for the maximum daily BLE water consumption estimates. Table II-2 summarizes the current average and maximum daily water demand projections using the population estimates discussed above.

In addition to the residential population, the present average and maximum daily water consumption rates for Beulah area businesses were also estimated. Table II-4 provides a summary of the assumptions used to derive the estimated rates. The information regarding the average and maximum number of customers per day provided in Table II-4 is based on personal interviews with Beulah area business owners. The rate per customer for each business use is based on standard rates recommended by the Utah Department of Environmental Quality (Utah DEQ, 1998).

**Future Water Consumption**

Table II-3 provides projected water consumption estimates for the year 2023, expressed as gpcd. These estimates are based on the assumption of a 1.5 percent annual population growth rate, which estimates a 2023 projected population of 86 people for the Beulah area, not including BLE. The table also provides the source capacity needed to meet the present and future water requirements.

The future water consumption rates for the BLE were estimated assuming that 80 percent of the 32 existing lots would be built out in twenty years. Assuming a population of 3 people per home, the estimated population of BLE in 2023 is 78 people.
# Table II-3

COMMUNITY OF BEULAH ESTIMATED 2023 POPULATION AND WATER DEMAND

## 2023 Population Projection

<table>
<thead>
<tr>
<th>Without BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 2023 Beulah area population <em>(a)</em></td>
<td>86 people</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated 2023 BLE: 26 houses x 3 people/house <em>(b)</em></td>
<td>78 people</td>
</tr>
<tr>
<td>Estimated 2023 Beulah area population (with BLE):</td>
<td>164 people</td>
</tr>
</tbody>
</table>

## 2023 Average Daily Demand

<table>
<thead>
<tr>
<th>Without BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential use: 86 people x 200 gallons/day</td>
<td>17,200 gpd</td>
</tr>
<tr>
<td>Business use <em>(c)</em>:</td>
<td>8,021 gpd</td>
</tr>
<tr>
<td>Total 2023 Beulah area average daily demand (without BLE):</td>
<td>25,221 gpd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential use: 164 people x 200 gallons/day</td>
<td>32,800 gpd</td>
</tr>
<tr>
<td>Business use <em>(c)</em>:</td>
<td>8,021 gpd</td>
</tr>
<tr>
<td>Total 2023 Beulah area average daily demand (with BLE):</td>
<td>58,021 gpd</td>
</tr>
</tbody>
</table>

## 2023 Maximum Daily Demand

<table>
<thead>
<tr>
<th>Without BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential use: 86 people x 544 gallons/day</td>
<td>46,784 gpd</td>
</tr>
<tr>
<td>Business use <em>(c)</em>:</td>
<td>47,611 gpd</td>
</tr>
<tr>
<td>Total 2023 Beulah area maximum daily demand (without BLE):</td>
<td>94,395 gpd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With BLE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential use BLE: 78 people x 1,000 gallons/day</td>
<td>78,000 gpd</td>
</tr>
<tr>
<td>Business use <em>(c)</em>:</td>
<td>47,611 gpd</td>
</tr>
<tr>
<td>Total 2023 Beulah area maximum daily demand (with BLE):</td>
<td>172,395 gpd</td>
</tr>
</tbody>
</table>

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BLE = Beulah Land Estates; gpd = gallons per day; gpm = gallons per minute

(a) Population estimate based on 1.5% annual growth rate
(b) BLE 2023 estimate based on assuming 80% buildout of 32 existing lots = 26 homes
(c) See Table II-4
### TABLE II-4

**BEULAH BUSINESS WATER USE ESTIMATES**

(AVERAGE AND MAXIMUM)

#### BEULAH AREA BUSINESS WATER USE ESTIMATES (AVERAGE DAILY DEMAND):

<table>
<thead>
<tr>
<th>Business</th>
<th>Average Use (gpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp Fish Campground:</td>
<td>600 gpd</td>
</tr>
<tr>
<td>Campground showers:</td>
<td>300 gpd</td>
</tr>
<tr>
<td>Trading Post gas station/bar/grill:</td>
<td>1,000 gpd</td>
</tr>
<tr>
<td>State Line Station:</td>
<td>2,000 gpd</td>
</tr>
<tr>
<td>State Line Station Apartments:</td>
<td>1,000 gpd</td>
</tr>
<tr>
<td>Buffalo Jump Bar:</td>
<td>1,000 gpd</td>
</tr>
<tr>
<td>Motorcycle Parts Store:</td>
<td>25 gpd</td>
</tr>
<tr>
<td>Fire station:</td>
<td>5 gpd</td>
</tr>
<tr>
<td>Community Center:</td>
<td>25 gpd</td>
</tr>
</tbody>
</table>

**TOTAL CURRENT BUSINESS WATER USE:**

5,955 gpd

4 gpm

**TOTAL 2023 BUSINESS WATER USE: (a)**

8,021 gpd

6 gpm

#### BEULAH AREA BUSINESS WATER USE ESTIMATES (MAXIMUM DAILY DEMAND):

<table>
<thead>
<tr>
<th>Business</th>
<th>Maximum Use (gpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp Fish Campground:</td>
<td>600 gpd</td>
</tr>
<tr>
<td>Campground showers:</td>
<td>4,500 gpd</td>
</tr>
<tr>
<td>Trading Post gas station/bar/grill:</td>
<td>5,000 gpd</td>
</tr>
<tr>
<td>State Line Station:</td>
<td>20,000 gpd</td>
</tr>
<tr>
<td>State Line Station Apartments:</td>
<td>2,720 gpd</td>
</tr>
<tr>
<td>Buffalo Jump Bar:</td>
<td>2,000 gpd</td>
</tr>
<tr>
<td>Motorcycle Parts Store:</td>
<td>500 gpd</td>
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<tr>
<td>Fire station:</td>
<td>5 gpd</td>
</tr>
<tr>
<td>Community Center:</td>
<td>25 gpd</td>
</tr>
</tbody>
</table>

**TOTAL CURRENT MAXIMUM DAILY BUSINESS WATER USE:**

35,350 gpd

25 gpm

**TOTAL 2023 MAXIMUM DAILY BUSINESS WATER USE (a):**

47,611 gpd

33 gpm

---

Reference for usage rates: Utah Drinking Water Regulations (R309-203, Table 203-2)

Note: Information on average and maximum business customer numbers based on personal communication with respective business owners

(a) 2023 business use based on 1.5% annual growth rate
The anticipated average daily demand water needs for the estimated 2023 Beulah population of 86 residents, including business establishments, is 25,221 gpd, which would require a source capacity of 18 gpm. The anticipated maximum daily demand for the estimated 2023 Beulah population is, including business establishments, is 94,395 gpd, which would require a source capacity of 66 gpm. If BLE is included in the service area, the 2023 average daily demand would be 40,021 gallons and the maximum daily demand would be 172,395 gallons, which would require source capacities of 28 and 120 gpm, respectively.

Based on a review of the DEQ rules and regulations governing adequate water storage and supply redundancy, the Beulah water system must have more than one well or storage equal to twice the maximum daily demand. In a two-well system, the DEQ rules require that the least productive source be capable of supplying the design average daily demand with the largest well out of service.

SUMMARY OF SOURCE CAPACITY REQUIREMENTS

- The maximum average daily water consumption for the present estimated population of 64 (not including BLE) is estimated to be 70,166 gallons, requiring a source capacity of 49 gpm. The maximum daily water consumption including BLE is 79,166 gallons, requiring a source capacity of 55 gpm.

- The 20-year projected population of the Beulah area (not including BLE) is 86 persons with a projected maximum daily water consumption of 94,395 gallons, requiring a source capacity of 66 gpm. The 20-year projected population, including BLE, is 164 persons with a projected maximum daily water consumption rate of 172,395 gallons, requiring a source capacity of 120 gpm.
CHAPTER III

GEOLOGIC AND HYDROGEOLOGIC SETTING

PREVIOUS INVESTIGATIONS

The geology of the northern Black Hills has been studied extensively; however, little site-specific geologic information is available for the area in the immediate vicinity of the Community of Beulah. Darton summarized the geology and water resources of the northern portion of the Black Hills and adjoining regions in 1909 (Darton, 1909). In addition, the geology of the Beulah area is further described in U.S. Geological Survey Bulletin 1580 (DeWitt and others, 1986).

Hodson and others (1973) conducted a regional overview of groundwater resources in the Powder River Basin and adjacent areas that includes Beulah. Feathers and others (1980) summarized the known hydrogeologic data in the Powder River Basin in the report prepared for the Wyoming Water Resources Research Institute (WRRI). Figure III-1 is a geologic map of the study area, derived from Hodson and others (1973).

STRUCTURAL SETTING

The Community of Beulah is located in the northern Black Hills of South Dakota and Wyoming on the extreme eastern margin of the Powder River Basin. The Black Hills Uplift is a doubly plunging anticline that was formed during the Laramie Orogeny approximately 60 to 65 million years ago. Most of the rocks that form the core of the Black Hills Uplift are composed of high-grade Proterozoic metasedimentary rocks, which were intruded by a large body of relatively undeformed granite. These Precambrian rocks, which were uplifted and eroded over a long period of time, were overlain by Paleozoic Era limestones and sandstones followed by deposition of the red beds, sandstones, and black shales of the Mesozoic Era. All of these rocks were uplifted during the Laramide Orogeny. During the early Tertiary, a west-northwest trending belt of stocks, laccoliths, dikes, and sills intruded the Black Hills area. The area in the vicinity of Beulah is characterized by several structural features resulting from the igneous intrusive activity. This includes Devil’s Tower in the Bear Lodge Igneous Complex, located approximately 15 miles west of Beulah, and Tinton Dome, which is part of the Mineral Hill Ring Igneous Complex, located approximately 10 miles south of Beulah. Although several small domes occur west and southwest of Beulah, none of these structures are located within the study area.

STRATIGRAPHY

The stratigraphic thickness of the lower Mesozoic and Paleozoic rocks is approximately 3,000 feet at the eastern margin of the Powder River Basin near Beulah. The focus of this study is the Paleozoic section because of large yields obtained from some Paleozoic wells throughout the eastern Powder River Basin and Black Hills. The following section provides a summary of the
GEOLOGIC MAP KEY

Qal  Quaternary Alluvium
Twr  White River Formation
Ti   Intrusive rocks
Kbs  Belle Fourche and Mowry Shales, Newcastle Sandstone, and Skull Creek Shale, Undivided
KJim Inyan Kara Group and Morrison Formation
Jsg  Sundance and Gypsum Spring Formations
TiPs Spearfish Formation
Pmo  Minnekahta Limestone and Opeche Shale
PPm  Minnelusa Formation
MDpe Pahaspa Limestone and Englewood Formation
OEr  Ordovician and Cambrian Rocks
pGr  Precambrian Igneous and Metamorphic Rocks
general lithology and thickness of the Paleozoic and lower Mesozoic formations that are present in the project study area. The formation descriptions, which are based on those provided by DeWitt and others (1986), are presented in order from oldest to youngest.

**Deadwood Formation**

The Lower Ordovician and Upper Cambrian Deadwood Formation is a succession of sandstone, shale, siltstone, and dolomite that locally contains a basal conglomerate (DeWitt and others, 1985) that unconformably overlies the Precambrian igneous and metamorphic rocks. The Deadwood Formation thins southward from about 500 feet in northern Crook County to about 200 feet in the Newcastle area.

**Englewood Formation**

The Upper Devonian and Lower Mississippian Englewood Formation, which unconformably overlies the Deadwood Formation, consists of argillaceous dolomite and moderately thin-bedded limestone that is approximately 50 feet thick in the study area. According to DeWitt and others (1985), the Englewood Formation contains a basal shale horizon in the northern Black Hills.

**Madison Limestone**

The Lower Mississippian Madison Limestone (Pahasapa Limestone), which conformably overlies the Englewood Formation, consists of massive fine-grained limestone and dolomitic limestone with thin-bedded dolomite and limestone and locally contains chert. The upper portion of the Madison Limestone is highly cavernous. The Madison Limestone is approximately 500 to 600 feet thick in the study area.

**Minnelusa Formation**

The Lower Permian and Pennsylvanian Minnelusa Formation, which unconformably overlies the Madison Limestone, is composed of interbedded fine-to coarse-grained sandstone, sandy dolomite, and limestone, with some shale and siltstone and local beds of gypsum and anhydrite. The lower part of the formation consists of shale, dolomite, radioactive black shale, anhydrite, and sandstone. The upper part consists of dolomite, anhydrite, aeolian sandstone, siltstone, and cherty dolomite (DeWitt and others, 1985). Well logs indicate that the Minnelusa Formation is approximately 625 feet thick in the study area (Wyoming State Engineer's Office, various).

**Opeche Shale**

The Lower Permian Opeche Shale, which unconformably overlies the Minnelusa Formation, is approximately 100 feet thick in the study area. It consists of maroon, fine-grained sandstone interbedded with siltstone, shale, claystone, and gypsum.
Minnekahta Limestone

The Lower Permian Minnekahta Limestone, which conformably overlies the Opeche Shale, is approximately 40 feet thick in the study area. It consists of fine-grained, thin-bedded, high-calcium limestone and dolomitic limestone.

Spearfish Formation

The Upper Permian and Triassic Spearfish Formation, which conformably overlies the Minnekahta Limestone, consists of red shale, siltstone, sandstone, and white gypsum. The lower portion of the formation contains thick beds of gypsum. The beds of gypsum are exposed south and west of Beulah. The Spearfish Formation is up to 815 feet thick in the study area.

Sundance Formation

The Middle Jurassic Sundance Formation, which unconformably overlies the Spearfish Formation, consists of greenish-gray shale and interbedded yellowish-gray fine-grained sandstone. The Sundance Formation is approximately 370 to 400 feet thick in the study area. The Sundance Formation crops out on the bluffs located approximately 2.5 miles north of Beulah.

HYDROSTRATIGRAPHY

As discussed above, two major investigations have been conducted to assess the groundwater resources in the Powder River Basin and the Northern Black Hills: (1) Hodson and others (1973), and (2) Feathers and others (1980). Both of these studies involved compiling and analyzing data from drillers' logs for existing water wells, springs, and some oil well tests.

Based on WESTON's experience in South Dakota and the eastern Powder River Basin, as well as information obtained from the drilling logs summarized in Table III-1, the Minnelusa and Madison Aquifers have been identified as the aquifers of concern for this study. Although Feathers and others (1980) defined the Madison Aquifer system as all of the saturated and permeable rocks in the Paleozoic section below the Opeche Shale, the discussion in this report is limited to the Minnelusa and Madison aquifers. The Minnelusa and Madison aquifers are distinct in the Beulah area, based on significant differences in shut-in pressures and water quality between the two aquifers.

Table III-1 is a compilation of information obtained from selected drillers' logs from water wells completed in the Minnelusa and Madison formations in the study area. Copies of the logs listed in Table III-1 are provided in Appendix D. Figure III-2 depicts the locations of the wells listed in Table III-1. Figure III-3 provides east-west and north-south geologic cross sections based on geologic information obtained from the drillers' logs listed in Table III-1.
<table>
<thead>
<tr>
<th>Permit No.</th>
<th>Location</th>
<th>Date Drilled</th>
<th>Total Depth (Feet)</th>
<th>Formation</th>
<th>Yield (gpm)</th>
<th>Static Water Level (feet bgs)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>31782</td>
<td>SWSW Sec 28 T. 53 N, R. 60 W</td>
<td>1917</td>
<td>960</td>
<td>Madison</td>
<td>25</td>
<td>6</td>
<td>Hardness=99.4 mg/L; Poor Water Quality</td>
</tr>
<tr>
<td>31784</td>
<td>SWSW Sec 28 T. 53 N, R. 60 W</td>
<td>1963</td>
<td>1,000</td>
<td>Madison</td>
<td>8.5</td>
<td>Flowing</td>
<td>Good Drinking Water</td>
</tr>
<tr>
<td>32710</td>
<td>NENW Sec 29 T. 53 N, R. 60 W</td>
<td>1940</td>
<td>910</td>
<td>Minnelusa</td>
<td>25</td>
<td>Flowing</td>
<td>No Log</td>
</tr>
<tr>
<td>33406</td>
<td>SWSW Sec 28 T. 53 N, R. 60 W</td>
<td>1912</td>
<td>420</td>
<td>Minnelusa</td>
<td>750</td>
<td>25</td>
<td>No Log</td>
</tr>
<tr>
<td>58743</td>
<td>SWSW Sec 21 T. 53 N, R. 60 W</td>
<td>1981</td>
<td>957</td>
<td>Minnelusa</td>
<td>7</td>
<td>Flowing</td>
<td>12 psi of shut-in pressure</td>
</tr>
<tr>
<td>64649</td>
<td>NWSE Sec 7 T. 52 N, R. 60 W</td>
<td>1983</td>
<td>100</td>
<td>Minnelusa</td>
<td>10</td>
<td>26</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>65671</td>
<td>NESW Sec 13 T. 52 N, R. 61 W</td>
<td>1984</td>
<td>580</td>
<td>Madison</td>
<td>20</td>
<td>475</td>
<td>No Pump Test, Drilled Blind</td>
</tr>
<tr>
<td>69963</td>
<td>SWNE Sec 7 T. 52 N, R. 60 W</td>
<td>1985</td>
<td>152</td>
<td>Minnelusa</td>
<td>20</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>82153</td>
<td>NWSW Sec 15 T. 52 N, R. 61 W</td>
<td>1990</td>
<td>230</td>
<td>Minnelusa</td>
<td>10</td>
<td>110</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>82694</td>
<td>NESW Sec 17 T. 52N, R. 60 W</td>
<td>1956</td>
<td>137</td>
<td>Minnelusa</td>
<td>5</td>
<td>20</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>82695</td>
<td>SWNW Sec 8 T. 52 N, R. 60 W</td>
<td>1950</td>
<td>185</td>
<td>Minnelusa</td>
<td>5</td>
<td>10</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>82696</td>
<td>SESE Sec 9 T. 52 N, R. 60 W</td>
<td>1959</td>
<td>173</td>
<td>Madison</td>
<td>10</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>84063</td>
<td>NENE Sec 27 T. 53 N, R. 61 W</td>
<td>1991</td>
<td>900</td>
<td>Minnelusa</td>
<td>10</td>
<td>90</td>
<td>Water contains dead gas</td>
</tr>
<tr>
<td>Permit No.</td>
<td>Location</td>
<td>Date Drilled</td>
<td>Total Depth (Feet)</td>
<td>Formation</td>
<td>Yield (gpm)</td>
<td>Static Water Level (feet bgs)</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------</td>
<td>--------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>-------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>84743</td>
<td>NWSE Sec 26 T. 53 N, R. 61 W</td>
<td>1955</td>
<td>855</td>
<td>Minnelusa</td>
<td>7</td>
<td>24</td>
<td>Unknown Driller, No Pump Test</td>
</tr>
<tr>
<td>85420</td>
<td>NW1/2, LOT 2 T. 53 N, R. 60 W</td>
<td>1991</td>
<td>1,539</td>
<td>Madison</td>
<td>20</td>
<td>+159</td>
<td>SEO Monitoring Well</td>
</tr>
<tr>
<td>85421</td>
<td>NW1/2, LOT 2 T. 53 N, R. 60 W</td>
<td>1991</td>
<td>1,300</td>
<td>Minnelusa</td>
<td>7</td>
<td>+18</td>
<td>SEO Monitoring Well</td>
</tr>
<tr>
<td>85805</td>
<td>SE SE Sec 32 T. 53 N, R. 61 W</td>
<td>1991</td>
<td>867</td>
<td>Madison</td>
<td>192</td>
<td>386</td>
<td>SEO Monitoring Well</td>
</tr>
<tr>
<td>85806</td>
<td>SE SE Sec 32 T. 53 N, R. 61 W</td>
<td>1991</td>
<td>580</td>
<td>Minnelusa</td>
<td>11</td>
<td>550</td>
<td>SEO Monitoring Well</td>
</tr>
<tr>
<td>107964</td>
<td>NESW Sec 13 T. 52 N, R. 61 W</td>
<td>1998</td>
<td>700</td>
<td>Madison</td>
<td>10</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>109669</td>
<td>NWSE Sec 12 T. 52 N, R. 61 W</td>
<td>1999</td>
<td>600</td>
<td>Madison</td>
<td>25</td>
<td>80</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>110736</td>
<td>NWNW Sec 31 T. 53 N, R. 60 W</td>
<td>1998</td>
<td>495</td>
<td>Minnelusa</td>
<td>16</td>
<td>20</td>
<td>Island No. 1 Well</td>
</tr>
<tr>
<td>111107</td>
<td>SENW Sec 30 T. 53 N, R. 60 W</td>
<td>2000</td>
<td>1,640</td>
<td>Madison / Englewood</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>122258</td>
<td>SENE Sec 20 T. 53 N, R. 60 W</td>
<td>2000</td>
<td>700</td>
<td>Minnelusa</td>
<td>18</td>
<td>60</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>125509</td>
<td>NESW Sec 24 T. 53 N, R. 61 W</td>
<td>2000</td>
<td>1,582</td>
<td>Madison</td>
<td>25</td>
<td>100</td>
<td>No Pump Test</td>
</tr>
<tr>
<td>133735</td>
<td>NWSW Sec 21 T. 53 N, R. 60 W</td>
<td>2001</td>
<td>1,745</td>
<td>Madison</td>
<td>25</td>
<td>Flowing</td>
<td></td>
</tr>
<tr>
<td>142755</td>
<td>T. 53 N, R. 60 W</td>
<td>2002 ENL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following discussion is a summary of the water-bearing potential for the Minnelusa and Madison aquifers based on information summarized by Hodson and others (1973) and Feathers and others (1980), as well as from the well logs listed in Table III-1. In general, most of the rocks that comprise the Minnelusa and Madison aquifers exhibit relatively small interstitial (primary) permeabilities. However, these aquifers offer the potential to yield quantities of water greater than 500 gallons per minute (gpm) if a well is completed in an area where secondary permeability due to fractures caused by folding and faulting of the rocks is encountered.

**Minnelusa Aquifer**

The upper portion of the Minnelusa Aquifer has been extensively developed for production of oil and gas through primary and secondary recovery methods. The presence of oil and gas has affected water quality of the aquifer in some areas. According to well data presented in Feathers and others (1980), two wells in the Sundance area that develop water from the Minnelusa Aquifer yield approximately 200 gpm. Although the Minnelusa Aquifer reportedly has significant primary (intergranular) porosity, secondary porosity resulting from brecciation due to collapse after anhydrite dissolution (Bowles and Braddock, 1963) is common in the eastern Powder River Basin near the outcrop.

Transmissivity data from the Minnelusa Aquifer are sparse but may be on the order of several hundred gallons per day per foot (gpd/ft) or less (Feathers and others, 1980). Specific capacities range from 0.1 to 10 gallons per minute per foot (gpm/ft) of drawdown and yields are generally less than 200 gpm (Feathers and others, 1980).

**Madison Aquifer**

The Madison Aquifer consists of the saturated and permeable parts of the Madison Limestone. The porosity of the Madison Aquifer results from: (1) solution enlarged voids and fractures, (2) intercrystalline porosity in the limestones and dolomites, and (3) fracturing. Regionally extensive karst resulted from penecontemporaneous and later widespread post-depositional erosion and dissolution of the Madison Limestone. In general, most cavern development is in the upper third of the unit. Where fractured and cavernous zones are saturated in the Madison Limestone, they will yield large quantities of water to wells penetrating them. The Madison Aquifer is the source of supply for many municipalities in the area surrounding Beulah, including a well recently completed for the Town of Moorcroft (WESTON, 2002), which is located approximately 40 miles southwest of Beulah. The Madison Aquifer also supplies the nearby towns of Sundance, Alladin, and Hulett.

Transmissivities in the Madison Aquifer generally vary from 1,000 to 60,000 gpd/ft, but may exceed 300,000 gpd/ft locally (Feathers and others, 1980). Specific capacities range from 0.5 to over 50 gpm/ft of drawdown and yields generally vary from 600 to 1,200 gpm, but may be higher. The effective transmissivity of the Madison Aquifer in the vicinity of the Moorcroft Madison well,
which yields approximately 600 gpm, was estimated to be 10,600 gpd/ft, as determined from long-term pumping tests (WESTON, 2002).

Based on data obtained from two pairs of State Engineer’s Office (SEO) monitoring wells listed in Table III-1, the Madison and Minnelusa Aquifers are not in hydraulic communication in the Beulah area. Information provided for one pair, located approximately two miles northeast of Beulah (Permit No. 85420 was completed in the Madison Aquifer and Permit No. 85421 was completed in the Minnelusa Aquifer), indicates that the shut-in pressure in the Madison well is significantly higher than that in the Minnelusa well. Similarly, another well pair located approximately five miles west of Beulah indicates that the static water level in the well completed in the Madison Aquifer (Permit No. 85805) is significantly higher than that completed in the Minnelusa Aquifer (Permit No. 85806). Copies of hydrographs for these wells are provided in Appendix E.

Beulah Land Estates Well Test

The Beulah Level I project scope of work includes assessing the potential of the Minnelusa and Madison aquifers to serve as a source of drinking water for a municipal water system. The well in the Beulah area that has the greatest potential to meet DEQ and SEO requirements for a public water supply well is the well serving BLE (Permit No. 111107). Because the BLE well could potentially serve as a public water supply well and is readily accessible for testing, it was decided to conduct a short aquifer test on the well and to collect water quality samples for analysis.

The BLE well was drilled in 1998 to a total depth of 1,640 feet. The well is constructed with 7-inch casing from the ground surface to a depth of 1,130 feet, with a 5 1/2-inch liner from 1,018 to 1,260 feet, and is open to the Madison Limestone and Englewood Formation. A copy of the statement of completion filed with the SEO is provided in Appendix D.

The driller was interviewed by WESTON personnel to determine whether any production capacity testing had been conducted on the well. The driller indicated that the only testing he was aware of was airlifting of the well at the conclusion of drilling operations (Personal Communication, Ken Taylor, August 18, 2003). Table III-2 provides a summary of the BLE well airlifting program. The specific capacity of the well, based on the airlifting results, ranges from 0.21 to 0.25 gpm/ft.
On August 20, 2003 WESTON conducted a brief aquifer test on the BLE Well. Because there is currently no storage for the BLE water system, any testing of the well required disrupting service to the three residences using the system. After discussing an acceptable duration of service disruption with the homeowners, it was decided to take the well out of operation for a period of five hours, which would allow one hour for reconfiguring the well house plumbing and four hours for testing and recovery. The initial shut-in pressure of the well was 50 psi at the water meter in the well house. Flow rates were measured with the in-line flow meter in the well house and were verified with a 5-gallon bucket and stop watch. The well was tested at flow rates of 10, 20, and 25 gpm. Figure III-4 is a log-log plot of the step-test data. The data plots along a line with a slope of one, which indicates that entry of water into the well is nearly 100 percent efficient at the tested rates (Driscoll, 1986). Table III-3 provides a summary of the step-test results and shows that the specific capacity values are consistent with the results of the airlifting performed after the well was drilled (see Table II-2). Raw data collected from the BLE Well step-test are presented in Appendix F.

Enhancement of water production from the BLE well could be realized with installation of a pump. Using the more conservative specific capacity of 0.21 gpm/ft, it would be possible to pump 125 gpm at a total dynamic head of 800 feet with a 40 horsepower (HP) pump. Prior to installing a pump, a constant-rate pump test would need to be performed to verify the production capacity of the well and to satisfy DEQ requirements. Power upgrades required to operate the 40 HP pump would include installation of 3-phase power or an add-a-phase or roto-phase unit. Furthermore, a cement bond log should be performed on the well casing to verify that the well construction is sufficient for a public water supply well and that the casing is protected from corrosion from the formations overlying the Madison Limestone.
BEULAH LAND ESTATES WELL
STEP-TEST SUMMARY
AUGUST 20, 2003

![Graph showing discharge vs. drawdown with steps 10, 20, 25 GPM and a line with slope of one.]

FIGURE III - 4
WATER QUALITY

Minnelusa Aquifer

Typically, the lower part of the Minnelusa Aquifer yields water of higher quality than the upper zones (Feathers and others, 1980) because gypsum deposits in the upper part of the Minnelusa Aquifer contribute substantial sulfate to the formation water. Water quality data collected from two SEO monitoring wells installed in this aquifer located west and north-northeast of Beulah are listed in Table III-4. As shown in Table III-4, the quality of water sampled from these wells is poor, with hardness values ranging from 830 to 1,600 mg/L and sulfate values ranging from 770 to 1,600 mg/L. Copies of the laboratory analytical results for the wells shown in Table III-4 are provided in Appendix G.

Madison Aquifer

Table III-5 provides water quality data from four wells completed in the Madison Aquifer located in the vicinity of Beulah. In general, the quality of water in the Madison Aquifer is fair, with Total Dissolved Solids (TDS) values less than 1,000 mg/L in the samples where it was analyzed. However, water in the Madison Aquifer is generally hard and may require treatment to reduce hardness. In addition, sulfate at concentrations of 250 mg/L or greater tends to have a laxative effect on those not accustomed to such levels. However, the sulfate tends to lose effect after a short period of constant exposure to the water. Copies of the laboratory analytical results for the wells shown in Table III-5 are provided in Appendix G.
### TABLE III-4

**ANALYTICAL RESULTS FOR LOCAL MINNELUSA WELLS**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>EPA Drinking Water Standard</th>
<th>UW 85806 1/31/92</th>
<th>UW 85421 1/31/92</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (no units)</td>
<td>6.5-8.5&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>7.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Total Dissolved Solids (mg/L)</td>
<td>500&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Conductivity (micromhos/cm @25°C)</td>
<td>NS</td>
<td>2,510</td>
<td>1,470</td>
</tr>
<tr>
<td>Alkalinity (Total, mg CaCO₃/L)</td>
<td>NS</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Bicarbonate (mg CaCO₃/L)</td>
<td>NS</td>
<td>150</td>
<td>94</td>
</tr>
<tr>
<td>Calcium (mg/L)</td>
<td>NS</td>
<td>540</td>
<td>240</td>
</tr>
<tr>
<td>Carbonate (mg CaCO₃/L)</td>
<td>NS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>250&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>5.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Hardness (mg/L)</td>
<td>NS</td>
<td>1,600</td>
<td>830</td>
</tr>
<tr>
<td>Iron (mg/L)</td>
<td>0.30&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>0.15</td>
<td>13</td>
</tr>
<tr>
<td>Magnesium (mg/L)</td>
<td>NS</td>
<td>68</td>
<td>57</td>
</tr>
<tr>
<td>Nitrate as N (mg/L)</td>
<td>10.0&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Potassium (mg/L)</td>
<td>NS</td>
<td>5.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Sodium (mg/L)</td>
<td>NS</td>
<td>22</td>
<td>7.2</td>
</tr>
<tr>
<td>Fluoride (mg/L)</td>
<td>4.0&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>NA</td>
<td>0.5</td>
</tr>
<tr>
<td>Manganese (mg/L)</td>
<td>0.05&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>NA</td>
<td>1.0</td>
</tr>
<tr>
<td>Silica (mg/L)</td>
<td>NS</td>
<td>NA</td>
<td>2.5</td>
</tr>
<tr>
<td>Sulfate (mg/L)</td>
<td>250&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>1,600</td>
<td>770</td>
</tr>
</tbody>
</table>

Notes: NS = No Standard; NA = Not Analyzed; ND = Not Detected

(a) EPA Secondary Drinking Water Standard (non-enforceable)

(b) EPA Primary Drinking Water Standard Maximum Contaminant Level (enforceable)
### GEOLOGIC AND HYDROGEOLOGIC SETTING

**BEULAH LEVEL I WATER SUPPLY STUDY**

#### TABLE III-5

**ANALYTICAL RESULTS FOR LOCAL MADISON WELLS**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>EPA MCL</th>
<th>UW 111107 (8/7/03)</th>
<th>UW 99756 (9/26/95)</th>
<th>UW 85420 (1/28/92)</th>
<th>UW 85805 (1/28/92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (no units)</td>
<td>6.5-8.5(a)</td>
<td>7.26</td>
<td>7.9</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td>Total Dissolved Solids (mg/L)</td>
<td>500(a)</td>
<td>617</td>
<td>787</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Conductivity (micromhos/cm @25°C)</td>
<td>NS</td>
<td>864</td>
<td>956</td>
<td>707</td>
<td>771</td>
</tr>
<tr>
<td>Alkalinity (Total, mg CaCO₃/L)</td>
<td>NS</td>
<td>215</td>
<td>187</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Bicarbonate (mg CaCO₃/L)</td>
<td>NS</td>
<td>262</td>
<td>228</td>
<td>210</td>
<td>120</td>
</tr>
<tr>
<td>Calcium (mg/L)</td>
<td>NS</td>
<td>100</td>
<td>135</td>
<td>84</td>
<td>93</td>
</tr>
<tr>
<td>Carbonate (mg CaCO₃/L)</td>
<td>NS</td>
<td>ND</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>250(a)</td>
<td>1.0</td>
<td>2.1</td>
<td>1.2</td>
<td>23</td>
</tr>
<tr>
<td>Hardness (mg/L)</td>
<td>NS</td>
<td>460</td>
<td>589</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Iron (mg/L)</td>
<td>0.30(a)</td>
<td>ND</td>
<td>0.49</td>
<td>4.6</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Magnesium (mg/L)</td>
<td>NS</td>
<td>48</td>
<td>61.2</td>
<td>47</td>
<td>40</td>
</tr>
<tr>
<td>Nitrate as N (mg/L)</td>
<td>10.0(b)</td>
<td>0.24</td>
<td>0.22</td>
<td>&lt;0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Potassium (mg/L)</td>
<td>NS</td>
<td>2.0</td>
<td>2.7</td>
<td>3.3</td>
<td>5.2</td>
</tr>
<tr>
<td>Sodium (mg/L)</td>
<td>NS</td>
<td>4.0</td>
<td>5.7</td>
<td>4.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Fluoride (mg/L)</td>
<td>4.0(b)</td>
<td>0.7</td>
<td>0.88</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Manganese (mg/L)</td>
<td>0.05(a)</td>
<td>NA</td>
<td>0.02</td>
<td>0.24</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Silica (mg/L)</td>
<td>NS</td>
<td>NA</td>
<td>11.0</td>
<td>3.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Sulfate (mg/L)</td>
<td>250(b)</td>
<td>276</td>
<td>393</td>
<td>240</td>
<td>270</td>
</tr>
</tbody>
</table>

**Notes:**
- **NS** = No Standard; **NA** = Not Analyzed; **ND** = Not Detected
- (a) EPA Secondary Drinking Water Standard (non-enforceable)
- (b) EPA Primary Drinking Water Standard Maximum Contaminant Level (enforceable)
CHAPTER IV

WEL SITING CRITERIA AND PROPOSED LOCATIONS

WESTON begins each well siting study by identifying potential target aquifers and developing a conceptual model of the selected aquifer system. The next step in well siting is to select several preliminary sites and then to assess each preliminary site with respect to a variety of criteria, including geologic and hydrogeologic setting, water quality, infrastructure considerations, land ownership and access issues, future water system expansion, potential interference issues, wellhead protection concerns, and site-specific considerations. The most important criterion in siting any well is the hydrogeologic setting. Whereas most wells are sited out of convenience and in close proximity to points of use, WESTON has learned that maximizing the potential of the well to produce significant quantities of high quality water is the most important criterion. Each of the criteria is discussed in the following paragraphs.

WELL SITING CRITERIA

Geologic and Hydrogeologic Setting

The geologic setting controls which formations are present, the lithology of the rocks, and the depth at which the formations occur. The hydrogeologic setting controls the presence and movement of groundwater within the formations. Saturated, permeable formations (aquifers) must be identified that are likely to yield sufficient quantities of water for the intended uses.

For municipal well siting studies in Wyoming, well sites frequently must target geologic structural deformation that enhances primary permeability. This is especially important for formations that have very low primary permeabilities such as the Madison Limestone. Structures that have the highest potential for development of secondary permeability are anticlines and in some instances, faults and fractures.

Unfortunately, there are no promising geologic structural targets within the Beulah study area. Although a prominent northwest-southeast trending anticline is located approximately three miles to the east of Beulah, it is located in South Dakota and thus outside the study area. In addition to reviewing published geologic maps of the study area, high altitude infrared aerial photographs were studied to determine the presence of linear features present on the ground surface that may indicate faulting or fracturing at depth. No prominent linear features were identified on the infrared photos. Site visits also failed to identify significant structural targets.

Land Ownership and Access

Land ownership of the proposed well site is important to the selection of potential well sites because of access issues. An access agreement must be established for a well site on privately
owned properties. Preference will be given for well sites on property with landowners willing to work favorably with the Community of Beulah or on publicly-owned lands.

Water Quality

When considering target aquifers, the quality of the water from the aquifers must be compared to the intended uses. For the Community of Beulah, the target aquifer must yield water that meets the primary drinking water standards, as established by the EPA. Although the existence of water quality data for each of the EPA regulated constituents are rare for many aquifers in Wyoming, the TDS concentration is one water quality parameter that is regulated by the EPA that can serve as an indicator of overall water quality and is a commonly measured constituent. The EPA secondary standard for TDS for public water systems is 500 mg/L, with a recommendation not to exceed 1,000 mg/L for water systems that cannot obtain better quality water. In most aquifers, the longer the residence time of the groundwater the poorer the water quality. This trend is the result of the groundwater dissolving constituents of the rock it is passing through. Generally, the closer the point of withdrawal or well is to the recharge area, the lower the TDS. As shown in Table III-5, the available water quality for wells completed in the Madison Aquifer in the Beulah area are generally good, although TDS values are above 500 mg/L and the water is extremely hard. In addition, sulfate values are generally above 250 mg/L, which may have a tendency to produce a laxative effect on those not accustomed to such levels. A comparison between the water quality results for samples collected from the Minnelusa and Madison aquifers presented in Tables III-4 and III-5, respectively, indicates that the water quality of the Minnelusa Aquifer is significantly worse that that of the Madison Aquifer.

Proximity to Proposed Infrastructure

Because there is no existing infrastructure that supplies water to Beulah residents, a successful exploration well should be located as close as possible to the proposed water system in order to reduce the cost of transmitting water to the users. With all other factors being equal, preference will be given to the site that is closest to the proposed pipelines and storage facility.

The BLE water system currently consists of a well, wellhouse, and distribution system. The distribution system consists of 4-inch PVC pipe, which is sufficient for delivering domestic water to the taps within the subdivision, but cannot generally provide sufficient flows for fire protection nor act as transmission mains for the entire Beulah area. Because the existing pipelines cannot be used as transmission mains for the entire Beulah area, proximity to BLE was not considered when selecting a well site.

Future Water System Expansion and/or System Connections

Predicting future water system expansion in the Beulah area is difficult because much of the land surrounding the community is privately owned and is not zoned. Some property owners northeast and south of Beulah have expressed interest in subdividing land, but formal plans have
not been made and submitted to the Crook County Clerk’s Office. For the purposes of siting an exploration well for an upcoming Level II Water Supply Study, future water system expansion outside of the currently developed Beulah community and BLE should be given a lower priority than proximity to the delineated Beulah service area.

Potential Interference with Existing Wells

Interference with nearby wells completed in the Minnelusa and Madison aquifers should not be a concern for possible well development. The closest Madison or Minnelusa wells to the Beulah community are located over one mile to the northwest, northeast, and east (see Figure III-2). In addition, as discussed in Chapter III, information obtained from two sets of SEO monitoring well pairs completed in the Minnelusa and Madison aquifers indicates that the two aquifers are not in hydraulic communication (see hydrographs provided in Appendix E). Thus any potential interference from the proposed Beulah water supply well would only affect wells completed in the Madison Aquifer. Given the small average daily demand of 28 gpm projected for the year 2023, it is highly unlikely that production from a Beulah water supply well would have a significant impact on nearby wells completed in the Madison Aquifer.

Wellhead Protection Concerns

The Wyoming Wellhead Protection Program Guidance Document, Version 3.0 (DEQ, 1997) recommends considering potential sources of contamination when siting new municipal wells. Because the proposed wells are confined by low permeability units, activities at the ground surface at the well sites are unlikely to affect the quality of the water in the water bearing zones targeted in this project. However, it should be recognized that land uses in the area and upgradient of the wells where the aquifer crops out have the potential to contaminate the targeted aquifer.

Site Specific Concerns

Because each well site is unique, there may be site-specific issues that do not apply to the other well siting criteria. These issues must be identified and evaluated on a site-by-site basis.

PROPOSED WELL SITES

Based on water quantity and quality, the Madison Aquifer has been identified as the most feasible target for an exploration well within the study area. Because the Madison Aquifer generally has a low primary permeability, an exploration well drilled into this water-bearing unit should ideally intercept secondary permeability development by geologic structural deformation to yield the quantities of water desired. However, because no such geologic structures have been identified within the Beulah study area, the well sites were selected because they afforded the greatest convenience with respect to proximity to proposed infrastructure and land ownership. Land ownership and access issues were also considered in the selection process.
WELL SITING CRITERIA AND PROPOSED LOCATIONS

BEULAH LEVEL I WATER SUPPLY STUDY

Each of the proposed well sites and the well siting criteria is discussed in the following sections. Because the target aquifer at each site is confined by hundreds of feet in thickness of low permeability materials, and the distances from the outcrop of the Madison Aquifer to the well sites are large, the degree of wellhead protection at each site is considered good and therefore not discussed for each site. The sites are not presented in order of preference and final selection of a site will likely be made by selecting the preferred water system alternative. Table IV-1 provides a summary of well siting data and criteria for comparison.

Well Site 1

Site Location. Site 1 is located on the easterly side of the Community of Beulah, northwesterly from the State Line Station (see Figure III-2). The well site is shown on the B-B’ cross section presented in Figure III-3.

Hydrogeologic Considerations. The projected top of the Madison Aquifer at this location is approximately 950 feet and the projected depth to the base of the Madison Limestone at this location is approximately 1,550 feet (see Figure III-3).

Land Ownership and Access. The land at this site is owned by Mr. Dale Bell, who has indicated his willingness to allow a well to be drilled and constructed on his property. Mobilization of equipment and materials to the drilling site should be relatively easy at this location.

Water Quality. The water quality of the Madison Aquifer at Site 1 is expected to be fair. Based on water quality data from local wells completed in the Madison Aquifer, the TDS will most likely be above 500 mg/L and less than 1,000 mg/L, hardness levels will be elevated, and sulfate levels will likely be above 250 mg/L.

Proximity to Proposed Infrastructure. Well Site 1 is located directly across U.S. 14 northwest of the State Line Station. It is estimated that a tie-in from the well site to the nearest proposed pipeline along U.S. 14 would be less than 500 feet.

Potential Interference with Existing Wells. Because the nearest permitted Madison Aquifer wells to Site 1 are located over one mile to the northwest, northeast and east (see Figure III-2), interference with other wells is not expected to be a concern.

Well Site 2

Site Location. Site 2 is located in the Community of Beulah, north of I-90 and just east of the Community Center (see Figure III-2). The well site is projected 2,200 feet to the east onto the B-B’ cross section presented in Figure III-3.
Hydrogeologic Considerations. The projected top of the Madison Aquifer at this location is approximately 925 feet and the projected depth to the base of the Madison Limestone at this location is approximately 1,525 feet (see Figure III-3).

Land Ownership and Access. The land at this site is owned by Crook County. The Crook County Commissioners have indicated their willingness to allow a well to be drilled and completed at this location at no charge to the Community of Beulah (Personal Communication with Greg Forsberg, August 10, 2003). Mobilization of equipment and materials to the drilling site should be relatively easy at this location.

Water Quality. The water quality of the Madison Aquifer at Site 2 is expected to be fair. Based on water quality data from local wells completed in the Madison Aquifer, the TDS will most likely be above 500 mg/L and less than 1,000 mg/L, hardness levels will be elevated, and sulfate levels will likely be above 250 mg/L.

Proximity to Proposed Infrastructure. This site lies in the heart of Beulah and is located within 150 feet of the proposed pipeline along U.S. 14 included in all of the alternatives identified in Chapter V.

Potential Interference with Existing Wells. Because the nearest permitted Madison Aquifer wells to Site 2 are over one mile to the northwest, northeast and east (see Figure III-2), interference with other wells is not expected to be a concern.

SITE RANKING

Several criteria have been used to compare the two preliminary well sites. The criteria are summarized in Table IV-1, along with the ranking and estimated cost for each proposed site. Until an exploration well is drilled at either of the sites, the potential for production cannot be determined with any certainty.
### TABLE IV-1

PRELIMINARY WELL SITE COMPARISON WITH CRITERIA

<table>
<thead>
<tr>
<th>PRELIMINARY WELL SITE</th>
<th>LOCATION</th>
<th>DEPTH OF WELL AND APPROXIMATE COST*</th>
<th>LAND OWNERSHIP OF WELL SITE</th>
<th>POTENTIAL FOR INTERFERENCE</th>
<th>ANTICIPATED WATER QUALITY</th>
<th>PROXIMITY TO PROPOSED CONNECTING PIPELINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NW NW Sec. 32, T53N, R60W</td>
<td>1,550 feet $188,518</td>
<td>Dale Bell</td>
<td>Low</td>
<td>Fair</td>
<td>500 feet</td>
</tr>
<tr>
<td>2</td>
<td>NE NE Sec. 31, T53N, R60W</td>
<td>1,525 feet $185,568</td>
<td>Crook County</td>
<td>Low</td>
<td>Fair</td>
<td>150 feet</td>
</tr>
</tbody>
</table>

* Estimated cost for drilling, constructing, and testing the well is itemized in Chapter V.
CHAPTER V

CONCEPTUAL DESIGN AND COST ESTIMATES

INTRODUCTION

Public water supply systems are typically comprised of five primary components: supply source(s), treatment, transmission, storage, and distribution. This chapter provides a summary of traditional water system components, three water system alternatives, conceptual level cost estimates for each of the alternatives, a comparison of the three alternatives, and a recommendation for selection of the preferred alternative.

WATER SYSTEM COMPONENTS

Water Supply Source

The expense of capital investment and operation makes use of a surface water treatment plant cost-prohibitive for most small public water systems. A well or wells completed in the Madison Aquifer is the most cost-effective source of water for the Community of Beulah. DEQ standards require that either two wells supply water for a public water system or that one well and finished water storage equal to twice the maximum daily demand be constructed. If two wells are constructed, then the wells should be capable of supplying the average daily demand with the most productive well out of service. Table V-1 summarizes the water demand projections presented in Chapter II of this report.

TABLE V-1

YEAR 2023 PROJECTED WATER DEMANDS

<table>
<thead>
<tr>
<th>DEMAND SCENARIO</th>
<th>DEMAND (Gallons Per Day)</th>
<th>DEMAND CAPACITY (Gallons Per Minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Day, Without BLE</td>
<td>25,221</td>
<td>18</td>
</tr>
<tr>
<td>Average Day, With BLE</td>
<td>40,021</td>
<td>28</td>
</tr>
<tr>
<td>Maximum Day, Without BLE</td>
<td>94,395</td>
<td>66</td>
</tr>
<tr>
<td>Maximum Day, With BLE</td>
<td>172,395</td>
<td>120</td>
</tr>
</tbody>
</table>
Treatment

The DEQ currently does not require that groundwater-based systems treat the water prior to consumption, unless the water does not meet primary drinking water standards established by the U.S. Environmental Protection Agency (EPA). Based on water quality data collected from nearby Madison Aquifer wells, there is no indication that a Madison Aquifer well drilled for the Community of Beulah will require treatment. EPA's upcoming Groundwater Disinfection Rule will likely require disinfection of groundwater prior to distribution to consumers. Although several methods for disinfection of groundwater are used, the most common and cost-effective means is currently chlorination.

Transmission

A traditional public water system uses a transmission system to convey water from the source(s) to a storage tank. Routing of water from the water source to a storage tank through a transmission line aids in providing adequate contact time for disinfection and/or treatment prior to distribution of water to the nearest user.

Storage

Water storage facilities serve three primary purposes. These include: (1) meeting peak hour water demand, when temporary demand exceeds supply capacity, (2) meeting fire flow demands without the need for large pumping facilities, and (3) providing for emergency reserves. Secondary benefits derived from storage include increased contact time for effective disinfection and allowing water supply wells to recover from extended operation. Based on the information provided in Table V-1, the Community of Beulah's 2023 average daily demand is estimated to be either 25,221 or 40,021 gallons, depending upon inclusion of BLE in the water system. DEQ regulations require that public water systems with average daily demands up to 50,000 gallons have storage equal to the average daily demand and that systems with an average daily demand between 50,000 and 500,000 gallons have storage capacity equal to the average daily demand, plus fire storage. For the purposes of the conceptual-level design, storage to meet fire flow demands are established at 1,000 gpm for a two-hour period (120,000 gallons). A storage tank of this size would satisfy DEQ requirements.

Distribution

The distribution system is comprised of pipes and associated appurtenances required to deliver water to individual taps. Many water systems combine the distribution and transmission systems, which can reduce initial capital costs, but can create operational and maintenance problems. Although one disadvantage to this arrangement is increased potential for water stagnation in water storage tanks, effective design of tank piping can minimize the potential for such
stagnation. The distribution system should be sized to minimize service pressure losses and when possible, to allow future expansion of services without replacement of the pipeline.

WATER SUPPLY

Before a public water system can be developed for the Community of Beulah, the water supply source must be secured. The typical procedure for developing a new well under the WWDC program is to drill, construct, and test an exploration well in a Level II water supply project. After testing the exploration well for both productivity and water quality, a conceptual design of the water system is developed based on the results of the exploration well program. The Level II water supply project is conducted with no financial contribution from the sponsor unless the well is purchased from the WWDC in completion of a Level III water supply project.

Figure V-1 is a preliminary design diagram for an exploration well completed in the Madison Limestone at Site 1. The preliminary design for a well at Site 2 is the same as for Site 1, but is 25 feet shallower. Based on the geologic cross-sections presented in Figure III-3, the top of the Madison Limestone at Site 1 will be encountered at a depth of approximately 950 feet below ground surface (bgs) and the base of Madison Limestone will be encountered at approximately 1,550 feet bgs. At Site 2, the top of the Madison Limestone will be encountered at a depth of approximately 925 feet bgs and the base of the Madison Limestone will be encountered at approximately 1,525 feet bgs. Based on the data from existing wells in the area presented in Table III-1, a well completed in the Madison Aquifer at either site will flow at the ground surface.

As shown in Figure V-1, a well at either site is designed to be completed with casing and cement grout across the formations overlying the Madison Aquifer in order to minimize intrusion of poor quality groundwater, as well as to prevent corrosion of the steel casing. The selected well will also be designed with an open borehole within the Madison Aquifer.

Tables V-2 and V-3 provide an engineer’s estimate of the subcontractor costs for drilling, constructing, and testing the Site 1 and 2 wells, respectively. Table V-4 provides a summary of the estimated costs for installation of a pump and motor and other appurtenances required to complete a well at either location.
NOTE: DEPTHS AND LENGTHS OF WELL APPURtenANCES ARE DIAGRAMMATIC ONLY. FINAL DESIGN TO BE DETERMINED BY THE ENGINEER.

ESTIMATED 68 PSI SHUT-IN PRESSURE (157 FEET OF HEAD)

NOTE: CENTRALIZERS SHALL BE PLACED EVERY 200 FEET.

T.D. = 1,550 FEET

8-INCH GATE VALVE
200 PSI PRESSURE GAUGE
0 - 75 FEET: 10 3/4-INCH STEEL SURFACE CASING
+1.0 - 950 FEET: 7 5/8-INCH O. D. STEEL CASING, 26.40 POUNDS PER FOOT

TYPE G OR H CEMENT GROUT FOR BOTTOM 300 FEET, REMAINDER TO BE "LIGHT" CEMENT GROUT

75 - 950 FEET: 9 7/8-INCH DIAMETER BOREHOLE

GUIDE SHOE

950 - 1,550 FEET: 6 3/4-INCH OPEN BOREHOLE

BEULAH LEVEL I WATER SUPPLY STUDY
SITE 1 EXPLORATION WELL
PRELIMINARY DESIGN DIAGRAM
FIGURE V - 1

WESTON
GROUNDWATER • ENGINEERING
TABLE V-2
ENGINEER'S ESTIMATE FOR DRILLING
BEULAH EXPLORATION WELL AT SITE 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization and Demobilization</td>
<td>1</td>
<td>L.S.</td>
<td>$20,500</td>
<td>$20,500</td>
</tr>
<tr>
<td>2</td>
<td>Drill for, Furnish, Install, and Cement 10 3/4-Inch Surface Casing</td>
<td>75</td>
<td>L.F.</td>
<td>$100</td>
<td>$7,500</td>
</tr>
<tr>
<td>3</td>
<td>Drill 9 7/8-inch Diameter Hole</td>
<td>875</td>
<td>L.F.</td>
<td>$40</td>
<td>$35,000</td>
</tr>
<tr>
<td>4</td>
<td>Open Hole Geophysical Logging</td>
<td>1</td>
<td>L.S.</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>5</td>
<td>Furnish and Install 7 5/8-inch O.D. Steel Casing</td>
<td>951</td>
<td>L.F.</td>
<td>$18</td>
<td>$17,118</td>
</tr>
<tr>
<td>6</td>
<td>Furnish and Install Cement Seal</td>
<td>1</td>
<td>L.S.</td>
<td>$14,000</td>
<td>$14,000</td>
</tr>
<tr>
<td>7</td>
<td>Cased Hole Geophysical Logging</td>
<td>1</td>
<td>L.S.</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>8</td>
<td>Furnish and Install 8-Inch Gate Valve</td>
<td>1</td>
<td>L.S.</td>
<td>$3,500</td>
<td>$3,500</td>
</tr>
<tr>
<td>9</td>
<td>Drill 6 3/4-inch Diameter Hole</td>
<td>600</td>
<td>L.F.</td>
<td>$35</td>
<td>$21,000</td>
</tr>
<tr>
<td>14</td>
<td>Standby Time</td>
<td>8</td>
<td>Hours</td>
<td>$225</td>
<td>$1,800</td>
</tr>
<tr>
<td>15</td>
<td>Well Development and Rig Time</td>
<td>12</td>
<td>Hours</td>
<td>$325</td>
<td>$3,900</td>
</tr>
<tr>
<td>16</td>
<td>Air Development</td>
<td>12</td>
<td>Hours</td>
<td>$400</td>
<td>$4,800</td>
</tr>
<tr>
<td>17</td>
<td>Furnish, Install, and Remove Pump Testing Equipment</td>
<td>1</td>
<td>L.S.</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>18</td>
<td>Conduct Pump Test</td>
<td>176</td>
<td>Hours</td>
<td>$150</td>
<td>$26,400</td>
</tr>
</tbody>
</table>

**TOTAL**                                                                 | **$188,518**
## TABLE V-3

ENGINEER’S ESTIMATE FOR DRILLING
BEULAH EXPLORATION WELL AT SITE 2

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Price</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization and Demobilization</td>
<td>1</td>
<td>L.S.</td>
<td>$20,500</td>
<td>$20,500</td>
</tr>
<tr>
<td>2</td>
<td>Drill for, Furnish, Install, and Cement 10 3/4-Inch Surface Casing</td>
<td>75</td>
<td>L.F.</td>
<td>$100</td>
<td>$7,500</td>
</tr>
<tr>
<td>3</td>
<td>Drill 9 7/8-inch Diameter Hole</td>
<td>850</td>
<td>L.F.</td>
<td>$40</td>
<td>$34,000</td>
</tr>
<tr>
<td>4</td>
<td>Open Hole Geophysical Logging</td>
<td>1</td>
<td>L.S.</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>5</td>
<td>Furnish and Install 7 5/8-inch O.D. Steel Casing</td>
<td>926</td>
<td>L.F.</td>
<td>$18</td>
<td>$16,868</td>
</tr>
<tr>
<td>6</td>
<td>Furnish and Install Cement Seal</td>
<td>1</td>
<td>L.S.</td>
<td>$15,500</td>
<td>$15,500</td>
</tr>
<tr>
<td>7</td>
<td>Cased Hole Geophysical Logging</td>
<td>1</td>
<td>L.S.</td>
<td>$4,000</td>
<td>$4,000</td>
</tr>
<tr>
<td>8</td>
<td>Furnish and Install 8-Inch Gate Valve</td>
<td>1</td>
<td>L.S.</td>
<td>$3,500</td>
<td>$3,500</td>
</tr>
<tr>
<td>9</td>
<td>Drill 6 3/4-inch Diameter Hole</td>
<td>600</td>
<td>L.F.</td>
<td>$35</td>
<td>$21,000</td>
</tr>
<tr>
<td>14</td>
<td>Standby Time</td>
<td>8</td>
<td>Hours</td>
<td>$225</td>
<td>$1,800</td>
</tr>
<tr>
<td>15</td>
<td>Well Development and Rig Time</td>
<td>12</td>
<td>Hours</td>
<td>$325</td>
<td>$3,900</td>
</tr>
<tr>
<td>16</td>
<td>Air Development</td>
<td>12</td>
<td>Hours</td>
<td>$400</td>
<td>$4,800</td>
</tr>
<tr>
<td>17</td>
<td>Furnish, Install, and Remove Pump Testing Equipment</td>
<td>1</td>
<td>L.S.</td>
<td>$22,000</td>
<td>$22,000</td>
</tr>
<tr>
<td>18</td>
<td>Conduct Pump Test</td>
<td>176</td>
<td>Hours</td>
<td>$150</td>
<td>$26,400</td>
</tr>
</tbody>
</table>

**TOTAL**  $185,568
### TABLE V-4

**ENGINEER’S ESTIMATE FOR COMPLETION OF THE BEULAH EXPLORATION WELL**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pitless Adaptor With Watertight Vented Cap</td>
<td>1</td>
<td>L.S.</td>
<td>$2,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>2</td>
<td>15 HP (125 gpm) Pump and Motor</td>
<td>1</td>
<td>L.S.</td>
<td>$3,500</td>
<td>$3,500</td>
</tr>
<tr>
<td>3</td>
<td>3-Inch Drop Pipe</td>
<td>350</td>
<td>L.F.</td>
<td>$10</td>
<td>$3,500</td>
</tr>
<tr>
<td>4</td>
<td>Check Valves and Fittings</td>
<td>1</td>
<td>L.S.</td>
<td>$635</td>
<td>$635</td>
</tr>
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**TOTAL** $75,835
BLE WELL DESIGN AND COST ESTIMATE

Research conducted as part of this Level I study determined that the BLE well ( Permit No. 111107) has not been formally approved by the DEQ for use as a water supply source for a public water system. Figure V-2 is an approximate as-built diagram of the BLE well, as interpreted from the Statement of Completion filed with the SEO. One minor modification has been made to the as-built diagram to account for an error in the reported cased intervals according to the driller.

A review of DEQ requirements for public water supply wells and the data provided in the Statement of Completion revealed three deficiencies that would need to be addressed in order for the well to serve as a public water supply.

- DEQ regulations require that the annular space between the borehole wall and the casing be at least two inches. As shown on Figure V-2, the annular space between the 8 3/4-inch borehole and the 7-inch casing is only 1.13 inches. An application could be made to DEQ to request a variance for the reduced annular space.

- The cement used in the BLE well is reported to be Portland Type I/II. A cement bond log should be performed on the well to evaluate the adequacy of the cement seal and bond to the casing. If the bond log yields positive results, a request for a variance for cementing materials can be made to DEQ. If the bond log shows the cement seal is inadequate, it may be possible to perforate the casing across the appropriate intervals and squeeze cement into the annular space.

- The DEQ requires that all public water supply wells be tested at a rate of at least 150 percent of the design capacity for a period of 24 hours. To date, the BLE well has not been tested to DEQ requirements.

Use of the BLE well in the Beulah public water system will also require filing of an enlargement with the SEO for an increase in production and for additional points of use.

It may be advantageous to both construct a new well drilled for the Community of Beulah and use the BLE well for the Beulah public water system. Using the BLE well as part of the water system will require testing the well and obtaining variances from the DEQ and SEO, as discussed above. The estimated costs for evaluating the well and obtaining the required permitting is provided in Table V-5. The estimated costs for installing pumping equipment, pump controls, and electrical equipment, including a new wellhouse at the BLE well, is $110,000.
DESIGN DETAILS

SURFACE CASING: UNKNOWN DEPTH AND DIAMETER

0 - 1,130 FEET: 7-INCH O. D. STEEL CASING (0.317 WALL THICKNESS)

250 SACKS OF PORTLAND TYPE I/II CEMENT

0 - 1,260 FEET: 8 3/4-INCH DIAMETER BOREHOLE

1,018 - 1,260 FEET: 5 1/2-INCH O. D. STEEL CASING (0.275 WALL THICKNESS)

1,260 - 1,640 FEET: OPEN BOREHOLE, UNKNOWN DIAMETER

T.D. = 1,640 FEET

NOT TO SCALE
CONCEPTUAL DESIGN OF STORAGE AND DISTRIBUTION SYSTEM

Three water delivery system alternatives are considered for the Beulah community water system. These alternatives, which vary significantly in the approach to developing a public water supply system, are discussed individually in the paragraphs below and are compared to one another at the conclusion of this chapter.

*Alternative A – Service to Community of Beulah and BLE*

This delivery system alternative is depicted in Figure V-3 and would involve construction of the following components:

- A transmission main would extend from the proposed well at Site 1 west along U.S. 14 and northerly through the BLE Subdivision. A 10-inch diameter pipeline would extend along U.S. 14 and an 8-inch diameter pipeline would extend from the Redwater Road-U.S. 14 intersection to its endpoint northwest of the subdivision.

- A new 125,000 gallon storage tank would be constructed at a ground elevation of approximately 3,700 feet on a site west of the northwest corner of the BLE Subdivision. The dimensions of the proposed tank are 24 feet high by 30 feet in diameter. A tank of this size would provide for a fire flow of 1,000 gpm for a two-hour period. The 8-inch main discussed
above would terminate at the tank. It is necessary to construct the tank at this elevation in order to provide minimally acceptable water pressure to the highest lots within the BLE.

- A connection of the existing BLE Subdivision water distribution system would be made to the new transmission main at two locations. The existing BLE distribution system consists almost entirely of 4-inch PVC water mains which would continue to be used for distribution of water to the subdivision.

- Two 8-inch distribution mains, each approximately 150 feet long, would be constructed within the Community of Beulah to serve properties not directly adjacent to U.S. 14.

- Service lines and meter pits would be installed to each property requesting service. Existing service lines within BLE would require only meter pits.

- Flushing/fire hydrants would be installed at the end of all dead-end mains and at appropriate locations within the Community.

Because of the relatively large size of the proposed storage tank when compared to the estimated demand, it will be important for the system to be constructed and operated so water within the storage tank does not stagnate. This can be accomplished by: (1) constructing piping at the tank site so that water entering the tank through one pipe must leave via a different pipe, thereby assuring flow through the tank; and (2) adjusting well pump operating points so that the pump energizes at a minimal acceptable level when the tank is nearly empty, thereby utilizing the tank throughout its maximum acceptable operating range. Normally stagnation is not a problem during the peak summer demand period.

Static water pressure at the lowest point of the service area (3,510 feet above mean sea level (msl) at Sand Creek crossing of U.S. 14) will be approximately 85 to 90 psi, and the highest point of service (3,610 feet msl within BLE) will see approximately 40 psi during maximum demand periods.

With this alternative, it will be important to mandate that no home construction takes place at an elevation above 3,620 feet within BLE. Although the upper lots of this rural subdivision are platted so that portions of the lots are higher than this elevation, construction of homes higher than 3,620 feet could risk insufficient water pressure to these homes.

This alternative also assumes that WYDOT will allow the placement of transmission mains within the U.S. 14 corridor in areas where there is no feasible alternative to locating them outside of the highway right-of-way. WYDOT's general policy is to prohibit pipelines that run parallel to the roadway, instead requiring the procurement of easements outside of the right-of-way. However, personal communication with the northeast Wyoming WYDOT District Engineer (personal
communication, Mark Gillette, 2003) indicated that WYDOT would work with the Beulah community in areas where easement procurement is impractical.

Advantages and Disadvantages of Alternative A

Advantages of constructing Alternative A include the ability to service all of Beulah as well as BLE. The option also allows for easy well site access and will allow for use of a 50 percent grant package from WWDC for financing almost all piping up to the individual service lines.

Disadvantages of constructing Alternative A include routing water from the well through the water system prior to storage. Potential operational problems that can arise from sending water first to a storage tank include any sediment or entrained air in the well water will enter the distribution system and negatively impact water quality at the tap. Furthermore, routing water through the distribution system prior to storage significantly reduces contact time for disinfection. There is a possibility that water in the storage tank can stagnate because water is pulled out of the transmission lines before it is removed from the tank to meet demands. Another disadvantage of Alternative A is that BLE will be required to participate immediately, even though not all lots have been sold. To meet debt service obligations, each lot in BLE will need to pay a monthly tap fee even if the lot does not use water or alternatively, fees from other water system users would need to increase to meet debt and operational costs.

Alternative B – Service to Beulah Only with Standpipe

This delivery system alternative, depicted in Figure V-4, would involve construction of the following components:

- An 8-inch transmission main would be constructed along U.S. 14 from a well located at proposed Well Site 2 to the east end of Beulah to a point just north of the I-90 interchange. With this alternative, only the Beulah Community would be served. The BLE subdivision would not be served under this alternative.

- A new 240,000 gallon standpipe storage tank would be located at a site just north of the I-90 interchange at a ground elevation of approximately 3,580 feet. The 8-inch transmission main discussed above would terminate on its easterly end at this location. The dimensions of the proposed tank are 92 feet high by 21 feet in diameter. A tank of this size would provide for a fire flow of 1,000 gpm for a two-hour period.

A standpipe of this height is necessary in order to provide minimally acceptable water pressure for the highest proposed service connection, which under this alternative is the State Line Station. Although construction of an elevated tank would reduce the volume required when compared with a standpipe, tank constructors have indicated that costs are
less for standpipes than for elevated tanks with similar capacities. Additionally, some of the water at a lower elevation within a standpipe can assist in meeting fire flow requirements.

- Two 8-inch distribution mains, each approximately 150 feet long, would be constructed within the Community of Beulah to serve properties not directly adjacent to U.S. 14.
- Service lines and meter pits would be installed to each property requesting service.
- Flushing/fire hydrants would be installed at the end of all dead-end mains and at appropriate locations within the Community.

The static water pressure at the lowest point of the service area (Sand Creek crossing of U.S. 14) will be approximately 70 psi during low-demand times and the static water pressure at the highest point of service (State Line Station) will be approximately 35 to 40 psi during peak-demand times.

The recommendation made for Alternative A relative to the means of preventing water stagnation within the standpipe will be even more important with Alternative B because the tank size is almost double that proposed for Alternative A.

Similar to Alternative A, this alternative assumes that WYDOT will allow the placement of transmission mains within the U.S. 14 right-of-way in areas where there is no feasible alternative to locating them outside of the highway right-of-way.

**Advantages and Disadvantages of Alternative B**

Advantages of this alternative include lower estimated construction costs than Alternative A; however, this alternative does not serve BLE, which reduces the number of services to pay for the proposed improvements. Access to the well and storage tank sites is good under this alternative. Furthermore, Alternative B will allow for use of a 50 percent grant from WWDC for financing almost all piping up to the individual service lines.

As with Alternative A, routing water through the distribution system prior to storage may result in a reduction in water quality at the tap and reduction of contact time for disinfection. Alternative B also requires installation of a standpipe tank, which could possibly result in large amounts of stagnant water within the standpipe.

**Alternative C – Service to Beulah Only with Southerly Tank**

This delivery system alternative, depicted in Figure V-5, would involve construction of the following components:
PROPOSED SERVICE AREA BOUNDARY

PROPOSED WELL SITE 2 LOCATION

PROPOSED 8" DISTRIBUTION MAINS

PROPOSED 125,000 GALLON TANK
GROUND ELEVATION = 3660'
OVERFLOW ELEVATION = 3684'

PROPOSED 8" TRANSMISSION MAINS
• An 8-inch transmission main would be constructed that extends from Well Site 2 east along U.S. 14 to the intersection of the gravel pit road in Section 29. As with Alternative B, only the Community of Beulah would be served by this alternative. The BLE subdivision would not be served under this alternative.

• A new 125,000 gallon storage tank would be constructed at a ground elevation of approximately 3,660 feet on a hill located south of I-90 just west of County Road 108 (see Figure V-5). The dimensions of the proposed tank are 24 feet high by 30 feet in diameter. A tank of this size would provide for a fire flow of 1,000 gpm for a two-hour period.

• A 6-inch transmission main would extend from the well along County Road 108 to the proposed storage tank.

• An 8-inch transmission main would extend from the proposed tank along County Road 108 back towards Beulah to connect with the 8-inch transmission main along U.S. 14.

• Two 8-inch distribution mains, each approximately 150 feet long, would be constructed within the Community of Beulah to serve properties not directly adjacent to U.S. 14.

• Service lines and meter pits would be installed to each property requesting service.

• Fire hydrants would be installed at the end of all dead-end mains and at appropriate locations within the Community.

The static water pressure at the lowest point of the service area (Sand Creek crossing of U.S. 14) would be approximately 75 psi during low-demand times and the static water pressure at the highest point of service (State Line Station) would be approximately 35 to 40 psi during peak-demand times.

As with Alternatives A and B, this alternative assumes that WYDOT will allow the placement of transmission mains within the U.S. 14 right-of-way in areas where there is no feasible alternative to locating them outside of the right-of-way.

Advantages and Disadvantages of Alternative C

An advantage of this alternative includes lower estimated construction costs than Alternative A. However, this alternative does not serve BLE, which reduces the number of services to pay for the proposed improvements. Furthermore, under WWDC funding strategies, the pipeline along U.S. 14 may not be eligible for a 50 percent grant. However, it is likely that a 50 percent grant could be obtained under the State Land and Investments Board (SLIB) for the distribution piping. Access to the well and storage tank sites is good under Alternative C.
CONCEPTUAL DESIGN AND COST ESTIMATES

BEULAH LEVEL I WATER SUPPLY STUDY

This alternative offers the advantage of a storage tank location that is closer to the proposed well site than the other alternatives. This advantage will be important if future EPA Safe Drinking Water Act requirements require chlorine contact time prior to delivery into the water delivery system. Alternative C should easily meet contact times, unlike Alternatives A and B, which would require construction of new transmission lines from the respective well sites to the tanks that are not currently part of the proposed project.

Disadvantages of this alternative include a smaller number of taps to share costs of debt service and operational costs.

CONCEPTUAL-LEVEL COST ESTIMATES

Alternative A – Service to Community of Beulah and BLE

Estimated costs for delivery system Alternative A are provided in Table V-6. No service line connections are proposed for BLE, as they are already in existence. However, meter pits are proposed for this subdivision in addition to the new service line connections within the Community of Beulah.

Alternative B – Service to Beulah Only with Standpipe

Estimated costs for delivery system Alternative B are provided in Table V-7. To investigate the potential for reducing capital costs to a “bare bones” water system, Alternative B was modified to utilize 4-inch water mains (versus 8-inch) and reduce storage to meet solely peak hourly demand (i.e., no fire flow storage). The cost savings associated with reducing the pipeline size and tank storage capacity is approximately $80,000. The $80,000 reduction in cost is approximately 16 percent of the total Alternative B costs, as shown in Table V-7. Developing a water system with the reduced storage capacity and smaller diameter pipeline would limit the capacity of the proposed water system and would require reconstruction of some system components with future growth or system expansion without a significant reduction in cost.

Alternative C – Service to Beulah Only with Southerly Tank

Estimated costs for delivery system Alternative C are provided in Table V-8. Although the storage tank under this alternative is the same size as that proposed for Alternative A, the cost for a 125,000 gallon storage tank under this alternative is somewhat higher than for Alternative A due to the presence of gypsum at the proposed tank location that could potentially require overexcavation and placement of structural fill. Should this alternative be selected, it would be necessary to perform a sufficient geotechnical investigation at the proposed tank site to ascertain the proper tank foundation requirements.
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<tr>
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<th>Unit</th>
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<th>Unit Cost</th>
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<td>$65,000</td>
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* Non-eligible costs
### TABLE V-7

**CONCEPTUAL-LEVEL COST ESTIMATE FOR ALTERNATIVE B**

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<tr>
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<td></td>
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<td>$5,000</td>
</tr>
<tr>
<td>Acquisition of Access &amp; ROW</td>
<td>LS</td>
<td></td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Mobilization, bonds &amp; insurance</td>
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<td>8&quot; gate valve &amp; box</td>
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| Construction Cost Subtotal                |      |      | $713,713  |        |
| Engineering Costs @ 10% of Construction Subtotal |      |      | $71,371   |        |
| Subtotal                                  |      |      | $885,085  |        |
| Construction Contingency @ 15%            |      |      | $117,763  |        |
| Construction Cost Total                   |      |      | $902,847  | $902,847|
| Project Cost Total                        |      |      | $989,219  |        |

* Non-eligible costs
TABLE V-8
CONCEPTUAL-LEVEL COST ESTIMATE FOR ALTERNATIVE C

<table>
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<tr>
<th>Description</th>
<th>Unit</th>
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<td>LF</td>
<td>5,870</td>
<td>$28</td>
<td>$164,360</td>
</tr>
<tr>
<td>6&quot; waterline (transmission)</td>
<td>LF</td>
<td>3,070</td>
<td>$12</td>
<td>$36,840</td>
</tr>
<tr>
<td>8&quot; waterline (distribution)*</td>
<td>LF</td>
<td>3,530</td>
<td>$30</td>
<td>$105,900</td>
</tr>
<tr>
<td>Underground utility crossing</td>
<td>EA</td>
<td>20</td>
<td>$200</td>
<td>$4,000</td>
</tr>
<tr>
<td>8&quot; gate valve &amp; box</td>
<td>EA</td>
<td>7</td>
<td>$1,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>6&quot; gate valve &amp; box</td>
<td>EA</td>
<td>2</td>
<td>$900</td>
<td>$1,800</td>
</tr>
<tr>
<td>Fire hydrant assembly</td>
<td>EA</td>
<td>5</td>
<td>$4,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Service connections*</td>
<td>EA</td>
<td>40</td>
<td>$2,000</td>
<td>$80,000</td>
</tr>
<tr>
<td>Meter pits*</td>
<td>EA</td>
<td>40</td>
<td>$700</td>
<td>$28,000</td>
</tr>
<tr>
<td>Seeding</td>
<td>SY</td>
<td>16,960</td>
<td>$1</td>
<td>$16,960</td>
</tr>
<tr>
<td>Crushed base course</td>
<td>CY</td>
<td>326</td>
<td>$10</td>
<td>$3,263</td>
</tr>
<tr>
<td>Asphalt restoration</td>
<td>SY</td>
<td>1,150</td>
<td>$20</td>
<td>$23,000</td>
</tr>
<tr>
<td>125,000 gallon storage tank</td>
<td>LS</td>
<td>1</td>
<td>$150,000</td>
<td>$150,000</td>
</tr>
<tr>
<td>Telemetry system</td>
<td>LS</td>
<td>1</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Construction Cost Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$729,429</td>
</tr>
<tr>
<td>Engineering Costs @ 10% of Construction Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$72,943</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td>$802,372</td>
</tr>
<tr>
<td>Construction Contingency @ 15%</td>
<td></td>
<td></td>
<td></td>
<td>$120,356</td>
</tr>
<tr>
<td>Construction Cost Total</td>
<td></td>
<td></td>
<td></td>
<td>$922,728</td>
</tr>
<tr>
<td>Project Cost Total</td>
<td></td>
<td></td>
<td></td>
<td>$1,008,171</td>
</tr>
</tbody>
</table>

* Non-eligible costs
OPERATION AND MAINTENANCE COSTS

Concept-level monthly operation and maintenance (O&M) costs for the complete water system are provided in Table V-9. Until an alternative is selected and an exploration well drilled and tested, further refinements of O&M costs are difficult to develop.

<table>
<thead>
<tr>
<th>O&amp;M ITEM</th>
<th>ESTIMATED COST PER MONTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Services</td>
<td>$500</td>
</tr>
<tr>
<td>Electrical Costs</td>
<td>$450</td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td>$350</td>
</tr>
<tr>
<td>Infrastructure Depreciation</td>
<td>$250</td>
</tr>
<tr>
<td>Accounting and Clerical</td>
<td>$500</td>
</tr>
<tr>
<td><strong>TOTAL ESTIMATE</strong></td>
<td><strong>$2,050</strong></td>
</tr>
</tbody>
</table>

RECOMMENDED ALTERNATIVE

Table V-10 provides a summary and comparison of the three alternatives presented in this chapter. The only alternative that provides service to BLE is Alternative A. If BLE is prepared to participate in the Beulah water system, then Alternative A should be selected. Should BLE elect not to participate in the Beulah water system, Alternative C is recommended, based on greater advantages and only slightly higher costs than Alternative B.
<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
<th>ESTIMATED COST</th>
</tr>
</thead>
</table>
| A           | Serves both Beulah and BLE  
Larger Population to Share Costs | Requires BLE Participation to be Financially Feasible  
Possible Water Stagnation in Tank  
No Well Isolation  
Most Expensive Alternative | Delivery System: $1,126,007  
Well: $188,518  
Well Completion: $75,835  
Total: $1,390,360 |
| B           | Lowest Cost  
Does Not Require BLE Participation | No Service to BLE  
Smaller Population to Share Costs  
Possible Water Stagnation in Tank  
No Well Isolation  
Excess Storage | Delivery System: $989,219  
Well: $185,568  
Well Completion: $75,835  
Total: $1,250,622 |
| C           | Lower Cost  
Well Isolation  
Does Not Require BLE Participation | No Service to BLE  
Smaller Population to Share Costs  
Possible Water Stagnation in Tank | Delivery System: $1,008,171  
Well: $185,568  
Well Completion: $75,835  
Total: $1,269,574 |
SELECTION OF PREFERRED ALTERNATIVE

As discussed at the end of Chapter V, the preferred alternative for the Beulah community water system is Alternative A. While Alternative A is the most expensive alternative developed from this study, it provides the greatest potential for meeting the drinking water needs of the most residents in the Beulah area. However, selection of Alternative A requires participation from residents in BLE. If the residents of BLE are not willing to participate in the Beulah water system, then Alternative C is the recommended alternative. This chapter provides an economic analysis and discussion of project financing for both Alternative A and Alternative C.

LAND USE

According to the 1998 Crook County Land Use Plan as amended on February 5, 2003, Crook County recognizes and promotes new development of water for municipal purposes for future economic and cultural growth. The plan provides a formal outline of the planning process as it relates to Federal and State managed lands and Federal and State regulations on private property. It states that when land is transferred from private to public ownership, the planning board will consider the impact the transfer will potentially have on the economy of the area. Because the preferred alternative described above would help protect the existing groundwater and surface water resources in the Beulah area and help promote economic growth by providing a reliable source of groundwater for area residents and businesses, it would be in compliance with the Land Use Plan for Crook County. A copy of the Crook County Land Use Plan is provided in Appendix H.

FUNDING OPTIONS

Several State and Federal grant and loan programs are available to assist the Community of Beulah in funding water system improvements. The grant and loan programs of the following funding agencies have been investigated and applicable parts of their requirements are indicated below. The Community can use tap fees, user fees, or water fund reserves to reduce local debt and repay loans or bonds arising from completion of a Level III Project. Collection of money for water reserve funds could begin as soon as a water district is formed to pay for loan origination fees and other costs.

Wyoming Water Development Commission (WWDC)

Items eligible for WWDC funding include water source development (well drilling and construction) and storage and transmission facilities and improvements. The percentages of grants and loans are set at the discretion of the WWDC, but cannot exceed 70 percent grant and 30 percent loan for eligible costs. New
development projects are typically funded with a 50 percent grant and a 50 percent loan, with the 50 percent loan sometimes funded with monies from other State or Federal sources. The WWDC loan portion can presently be financed at six percent interest for a 30-year term for municipal and domestic projects.

As stated above, WWDC funding is normally specified for water source development, storage, and transmission infrastructure. Many of the recommended improvements identified in this study, including construction and completion of a new well, construction of a storage tank, and construction of a transmission line, are eligible for WWDC funding. Distribution infrastructure is generally not eligible for WWDC 50 percent grant funding.

State of Wyoming Land and Investment Board (SLIB)

This state agency provides grants and loans to be utilized for the development of infrastructure within communities and special districts around the State of Wyoming. Water and sewer projects receive a higher priority for SLIB funding due to their importance to the health and safety of Wyoming citizens. SLIB grants are usually available for up to 50 percent of the cost for project development. Loans for the non-grant share of project-eligible costs are available at 6 percent, with a one percent origination fee. An SLIB loan has a term of 30 years.

USDA Rural Utility Service (RUS)

All water system components are eligible for RUS funding. However, the amount of RUS grant funding is based on the Median Family Income (MFI) for the project area and the availability of funds. According to the RUS (Roy Prior, personal communication, September 18, 2003), the MFI must be $26,276 or less to qualify for grant funding. According to the U.S. Census Bureau, the 1999 MFI for the portion of Crook County in the vicinity of Sundance, which includes the Community of Beulah, was $38,906. Thus the Community of Beulah does not appear to qualify for RUS grant funds. It is possible to have an income survey conducted for the community if it is believed that the MFI for Beulah is lower than that of the Sundance rural census district.

RUS loans may be available for the project.

Wyoming Department of Environmental Quality’s State Revolving Fund (SRF)

The SRF program is intended to provide low interest loans to finance water system improvements. Eligible projects are installation or upgrade of water treatment facilities, water line replacement or extension, new water supply system components, water source development/rehabilitation to replace contaminated sources, and installation or replacement of storage facilities or transmission lines. The maturity date of the loans can be up to 20 years. The length of time for repayment depends upon the borrower’s ability to repay and how quickly the revenue sources generate repayment funds. The interest
rate for the loans is currently at 2.5 percent. The loans have a 0.5 percent origination fee, which is collected at loan closing.

FUNDING APPROACH

At the direction of the WWDC Project Manager, the funding approach used in this section is based on 50 percent grant and 50 percent loan for WWDC-eligible costs. The debt repayment for the loan portion is based on a WWDC-sourced 30-year term at an interest rate of 6.0 percent. Non-eligible costs will either need to be paid for up front by the individual water users or the proposed water district, or financed through another funding agency. For the purposes of this report, it was assumed that non-eligible costs would be financed through another agency, such as the SLIB, at a rate of six percent over a 30-year term.

WATER CUSTOMER ABILITY-TO-PAY

The ability of water customers to pay for the preferred water system alternative is presented in the following section. Any proposed community water supply project must be reviewed within the context of the water system debt structure and utility rates to be paid by the prospective customers. A discussion on the proposed water service connections and equivalent dwelling units (EDU) and debt service resulting from construction of the preferred alternative is presented in this chapter. Recommended annual financing commitments necessary to retire the construction debt and meet operation and maintenance costs are also included.

Water Service Connections and Equivalent Dwelling Units (EDU)

Table VI-1 provides a summary of the type and size of taps, as well as the number of each type of tap, that would be required to serve the Community of Beulah based on the population and service estimates discussed in Chapter II. It has been assumed that a typical water service connection for the Community of Beulah residential taps would be 3/4-inch and the commercial taps would be 1 1/4-inch.

The EDU, according to the RUS, is defined as "the level of service provided to a typical rural residential dwelling". For the purposes of this chapter, a typical rural residential dwelling water service connection is defined as a 3/4-inch service with a 3/4-inch by 5/8-inch water meter. For the purpose of calculation, one EDU equals one 3/4-inch water meter. Water services that are larger than 3/4-inch are equated to an EDU by a ratio of the cross-sectional area of the service line according to the following formula, where "D" is the diameter of the service line and "V" is the equivalent value.

\[ \text{EDU}_{3/4} \times \left( \frac{D^2_{\text{size}}}{D^2_{3/4}} \right) = V \times \text{EDU}_{\text{size}} \]

For the purpose of EDU projections, all calculations are based on EDU and not individual taps. It has been assumed that the number of commercial and public authority services will be unchanged over the 20-year design period. The number of EDUs in the proposed Community of Beulah water system is provided in Table VI-1.
ECONOMIC ANALYSIS AND PROJECT FINANCING

BEULAH LEVEL I WATER SUPPLY STUDY

TABLE VI-1

COMMUNITY OF BEULAH EDU CALCULATIONS FOR THE YEAR 2003

<table>
<thead>
<tr>
<th>CATEGORY OF TAP</th>
<th>NUMBER OF TAPS</th>
<th>TAP SIZE (INCHES)</th>
<th>EDU</th>
<th>EDU/TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential, Assumed 3/4&quot; x 5/8&quot; Meter (not including BLE)</td>
<td>32</td>
<td>3/4</td>
<td>1.0</td>
<td>32.00</td>
</tr>
<tr>
<td>Residential, Assumed 3/4&quot; x 5/8&quot; Meter (BLE only)</td>
<td>32*</td>
<td>3/4</td>
<td>1.0</td>
<td>32.00</td>
</tr>
<tr>
<td>Commercial, Assumed 1 1/4&quot; Meter</td>
<td>6</td>
<td>1 1/4</td>
<td>2.78</td>
<td>16.68</td>
</tr>
<tr>
<td>Public Authority, Community Hall, Assumed 1 1/4&quot; Meter</td>
<td>1</td>
<td>1 1/4</td>
<td>2.78</td>
<td>2.78</td>
</tr>
<tr>
<td>Public Authority, Fire Hall, Assumed 1 1/4&quot; Meter</td>
<td>1</td>
<td>1 1/4</td>
<td>2.78</td>
<td>2.78</td>
</tr>
<tr>
<td>Total 2003 Taps Without BLE</td>
<td>40</td>
<td>TOTAL EDUs</td>
<td>54.24</td>
<td></td>
</tr>
<tr>
<td>Total 2003 Taps With BLE</td>
<td>72</td>
<td>TOTAL EDUs</td>
<td>86.24</td>
<td></td>
</tr>
</tbody>
</table>

* 32 Taps currently in place, 3 are currently active.

Debt Service Resulting From Level III Project

Alternative A. The total estimated cost for construction of Alternative A is $1,390,360. Table VI-2 summarizes the debt service resulting from construction of Alternative A through a Level III Project. The debt service includes 50 percent of the WWDC-eligible aspects of the storage tank and transmission line, as provided in Table V-6 and the well completion costs in Table V-4. The distribution mains, meter pits, and service connections in Table V-6 are not grant/loan eligible through the WWDC. It is assumed that these items are financed through a 6.0 percent loan for a 30-year term. Purchase of the exploration well is 50 percent of the costs of construction (see Table V-3), less the costs of geophysical logging and pump testing (Items 4, 7, 17, and 18).
## TABLE VI-2

**ESTIMATED COSTS REQUIRING DEBT SERVICE FROM LEVEL III PROJECT ALTERNATIVE A**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eligible Level III Costs (Table V-6)</td>
<td>$930,607</td>
</tr>
<tr>
<td>2</td>
<td>Beulah Exploration Well Equipment (Table V-4)</td>
<td>$75,835</td>
</tr>
<tr>
<td>3</td>
<td>Beulah Exploration Well Purchase (Table V-2)</td>
<td>$64,559</td>
</tr>
<tr>
<td>4</td>
<td>WWDC Grant (50 Percent of Items 1 and 2)</td>
<td>$503,221</td>
</tr>
<tr>
<td>5</td>
<td>Level III Balance</td>
<td>$567,780</td>
</tr>
<tr>
<td>6</td>
<td>Non-Eligible Costs (Table V-6)</td>
<td>$195,400</td>
</tr>
</tbody>
</table>

**TOTAL ESTIMATED PROJECT COSTS REQUIRING DEBT SERVICE FOR ALTERNATIVE A**

$763,180

**Alternative C.** The total estimated cost for construction of Alternative C is $1,269,574. Table VI-3 summarizes the debt service resulting from construction of Alternative C through a Level III Project. The debt service includes 50 percent of the WWDC-eligible aspects of the storage tank and transmission line, as provided in Table V-8 and the well completion costs in Table V-4. The distribution mains, meter pits, and service connections are not grant eligible through the WWDC. It is assumed that these items are financed with a 6.0 percent loan over a 30-year term. Purchase of the exploration well is 50 percent of the costs of construction (see Table V-3), less the costs of geophysical logging and pump testing (Items 4, 7, 17, and 18).

**Operation and Maintenance Costs of Alternatives A and C.** For the purposes of the initial cost estimate, it has been assumed that the cost for operation and maintenance is the same for Alternatives A and C. Because Alternative A serves more users and has more infrastructure, the cost of operation for Alternative A will be higher than Alternative C, but the costs will be paid for by more users. The annual operation and maintenance costs, expressed as an average cost per year over a period of thirty years, are estimated to be $24,600. Assumptions used in deriving the average annual operation and maintenance costs are provided in Table V-8.
TABLE VI-3

ESTIMATED COSTS REQUIRING DEBT SERVICE FROM LEVEL III PROJECT
ALTERNATIVE C

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eligible Level III Costs (Table V-8)</td>
<td>$794,271</td>
</tr>
<tr>
<td>2</td>
<td>Beulah Exploration Well Equipment (Table V-4)</td>
<td>$75,835</td>
</tr>
<tr>
<td>3</td>
<td>Beulah Exploration Well Purchase (Table V-3)</td>
<td>$64,584</td>
</tr>
<tr>
<td>4</td>
<td>WWDC Grant (50 Percent of Items 1 and 2)</td>
<td>$435,053</td>
</tr>
<tr>
<td>5</td>
<td>Level III Balance</td>
<td>$499,637</td>
</tr>
<tr>
<td>6</td>
<td>Non-Eligible Costs (Table V-8)</td>
<td>$213,900</td>
</tr>
</tbody>
</table>

TOTAL ESTIMATED PROJECT COSTS REQUIRING DEBT SERVICE FOR ALTERNATIVE C $713,537

Cash Reserve and Depreciation. Because the Community of Beulah does not appear to be eligible for RUS grant funding, maintenance of a cash reserve is not assumed. Depreciation was estimated to be $250 per month.

Water Customer Costs for Alternative A

EDU Costs. As shown in Table VI-4, the cost for construction, operation, and maintenance of the Beulah Exploration Well and the Level III Project, financed with a 30-year loan, is projected to produce a monthly water rate of $122.98, expressed as dollars per month per EDU, assuming the BLE is not included under the alternative. If BLE is included, the projected monthly water rate is $77.35.

Per Tap Costs. The average monthly per tap cost for the construction, operation, and maintenance of the Beulah Exploration Well and the Level III Project, financed with a 30-year loan, is projected to be $166.76 without BLE and $92.64 with BLE.
### Alternative A without BLE

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Service</th>
<th>EDU</th>
<th>EDU/Type</th>
<th>Monthly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential, Assumed 0.75&quot; X 0.63&quot; meter</td>
<td>32</td>
<td>0.75</td>
<td>1.00</td>
<td>32.00</td>
<td>$3,935.31</td>
</tr>
<tr>
<td>Commercial, Assumed 1.00&quot; X 1.25&quot; meter</td>
<td>6</td>
<td>1.25</td>
<td>2.78</td>
<td>16.68</td>
<td>$2,051.28</td>
</tr>
<tr>
<td>Public Authority, Town Hall</td>
<td>1</td>
<td>1.25</td>
<td>2.78</td>
<td>2.78</td>
<td>$341.88</td>
</tr>
<tr>
<td>Public Authority, Fire Hall</td>
<td>1</td>
<td>1.25</td>
<td>2.78</td>
<td>2.78</td>
<td>$341.88</td>
</tr>
<tr>
<td>Total EDUs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>54.24</td>
</tr>
<tr>
<td><strong>Total per month per EDU</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$122.98</td>
</tr>
</tbody>
</table>

**Average Monthly User Fee**

$122.98

### Alternative A with BLE

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Service</th>
<th>EDU</th>
<th>EDU/Type</th>
<th>Monthly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential, Assumed 0.75&quot; X 0.63&quot; meter</td>
<td>64</td>
<td>0.75</td>
<td>1.00</td>
<td>64.00</td>
<td>$10,672.56</td>
</tr>
<tr>
<td>Commercial, Assumed 1.00&quot; X 1.25&quot; meter</td>
<td>6</td>
<td>1.25</td>
<td>2.78</td>
<td>16.68</td>
<td>$2,781.54</td>
</tr>
<tr>
<td>Public Authority, Town Hall</td>
<td>1</td>
<td>1.25</td>
<td>2.78</td>
<td>2.78</td>
<td>$463.59</td>
</tr>
<tr>
<td>Public Authority, Fire Hall</td>
<td>1</td>
<td>1.25</td>
<td>2.78</td>
<td>2.78</td>
<td>$463.59</td>
</tr>
<tr>
<td>Total EDUs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>86.24</td>
</tr>
<tr>
<td><strong>Total per month per EDU</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$77.35</td>
</tr>
</tbody>
</table>

**Average Monthly User Fee**

$77.35
Water Customer Costs for Alternative C

**EDU Costs.** As shown in Table VI-5, the cost for construction, operation, and maintenance of the Beulah Exploration Well and the Level III Project, financed with a 30 year loan, is projected to produce a monthly water rate of $117.44, expressed as dollars per month per EDU.

**Per Tap Costs.** The average monthly per tap cost for the construction, operation, and maintenance of the Beulah Exploration Well and the Level III Project, financed with a 30-year loan, is projected to be $159.25.

**RATE STRUCTURE**

Public water systems use a variety of strategies to meet debt service and operational costs. Many systems impose a monthly service fee that is independent of the quantity of water used. Some of these systems provide a base volume of water for the monthly service fee. This fee is often used to ensure debt service can be paid during low demand periods when revenues from water usage decreases. Furthermore, as would be important in implementation of Alternative A with service to BLE, the monthly service fee is assessed when infrastructure is in place but demand is non-existent. Table VI-6 provides monthly service fees for several northeastern Wyoming public water systems as reported by the WWDC (2002).

The second charge levied by most public water systems is a water consumption fee. This fee is typically assessed to cover both debt service and operational costs. Some water systems establish rates on a set rate per 1,000 gallons consumed, while other systems increase the rate charged per 1,000 gallons with increased rates of consumption. Table VI-6 also contains the water consumption rate schedule for several northeastern Wyoming public water systems. For ease of comparison, the WWDC has summarized the cost for 20,000 gallons of water consumed in a single month for the water system users. These values are provided in the right column of Table VI-6.

To meet the anticipated debt service and operational costs for Alternative A, the Beulah public water system must generate $80,044.20 of revenue per year. With BLE participation, the average daily demand in 2003 was estimated to be 20,555 gallons, which equals 7,502,575 gallons annually. If active water users (73 persons with 35 residential taps and 8 business taps) are to pay for water consumed, without a monthly service fee, the cost per 1,000 gallons consumed would need to be $10.67. Setting a $20.00 per month service fee for all taps (including vacant lots in BLE), and providing the first 1,000 gallons would decrease the cost of additional water consumed to $9.41 per 1,000 gallons. The cost for 20,000 gallons with the $20.00 monthly service fee would be $198.79. This rate is considerably higher than all other public water systems shown in Table VI-6. With $20.00 per month service fee for a household of two persons, and an average per capita consumption of 200 gallons, the average daily water bill per person would be $4.11.
TABLE VI-5
MONTHLY BASE RATE CALCULATIONS FOR 2003
ALTERNATIVE C

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Service</th>
<th>EDU</th>
<th>EDU/Type</th>
<th>Monthly Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential, Ass</td>
<td>32</td>
<td>0.75</td>
<td>1.00</td>
<td>32.00</td>
<td>$5,095.85</td>
</tr>
<tr>
<td>Commercial, Ass</td>
<td>6</td>
<td>1.25</td>
<td>2.78</td>
<td>16.68</td>
<td>$2,656.21</td>
</tr>
<tr>
<td>Public Authority,</td>
<td>1</td>
<td>1.25</td>
<td>2.78</td>
<td>2.78</td>
<td>$442.70</td>
</tr>
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<td>Average Monthly User Fee</td>
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## TABLE VI-6
WATER CHARGE SUMMARY TABLE
FOR NORTHEASTERN WYOMING PUBLIC WATER SYSTEMS

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<th>SYSTEM NAME</th>
<th>MONTHLY SERVICE FEE</th>
<th>BASE VOLUME PROVIDED PER MONTH (gallons)</th>
<th>RATE PER ADDITIONAL 1,000 GALLONS</th>
<th>COST FOR 20,000 GALLONS PER MONTH</th>
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<td>4,000</td>
<td>$1.75</td>
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<td>Wright</td>
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<td><strong>5,208</strong>*</td>
<td><strong>$1.91</strong>*</td>
<td><strong>$43.54</strong>*</td>
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</table>

* Excludes systems with no limit on water consumption
If Alternative C is selected, the Beulah public water system must generate $69,167.06 of revenue per year. The estimated average daily demand in 2003 for the Community of Beulah is 18,755 gallons, which equals 6,845,575 gallons annually. If active water users (64 persons with 32 residential taps and 8 business taps) are to pay for water consumed, without a monthly service fee, the cost per 1,000 gallons consumed would need to be $11.17. Setting a $20.00 per month service fee for all taps and providing the first 1,000 gallons, would decrease the cost of additional water consumed to $10.50 per 1,000 gallons. The cost for 20,000 gallons with the $20.00 monthly service fee would be $219.50. This rate is much higher than all other public water systems shown in Table VI-6. With $20.00 per month service fee for a household of two persons, and an average per capita consumption of 200 gallons, the average daily water bill per person would be $4.52.

As taps are added to either alternative and water demand increases, the cost per 1,000 gallons of water will decrease.
CHAPTER VII

CONCLUSIONS

In preparation of this Level I water supply study, the WESTON/ EnTech project team has:

- Developed a service area for a Beulah community water system;
- Estimated population and water demands through the year 2023 for the service area;
- Reviewed the geology and hydrogeology of the Minnelusa and Madison aquifers in the vicinity of Beulah;
- Recommended two exploration well sites;
- Presented three water supply system alternatives with cost estimates for each alternative; and
- Conducted an economic analysis, developed estimated monthly costs on a per tap basis, and provided sample water rates to meet debt service and operations costs for two of the alternatives.

The proposed service area includes the Beulah Town plat, the State Line Station, residences located along U.S. 14 to a point approximately one mile west of the Beulah Town plat, and BLE. The present population within the service area is estimated to be 73 people. The projected population in 2023 is 164 people, including BLE. The projected population without BLE in 2023 is 86 people.

The most promising geologic target for developing sufficient quantities of water with suitable quality for a Beulah community water system is the Madison Aquifer. A review of the geology of the area did not reveal the presence of any geologic structures that could enhance groundwater production. Because no geologic structure was identified, two sites were recommended that are close to proposed infrastructure. It is predicted that a well at either site will need to be drilled to a depth of approximately 1,550 feet and will cost approximately $190,000 to drill, construct, and test (excluding permitting and engineering fees).

Three water supply system alternatives were developed for this water supply study. Alternative A incorporates a well located near the State Line Station and a water storage tank northwest of BLE. This alternative would provide water service to BLE. Alternative B utilizes a well located near the community hall and a standpipe storage tank near the State Line Station. Alternative C
BEULAH LEVEL I WATER SUPPLY PROJECT

proposes drilling a well near the community hall and constructing a standard water tank south of I-90 near County Road 108. Neither Alternative B or C includes providing water service to BLE.

Based on the advantages and disadvantages of each of the three alternatives, as well as the estimated costs of construction, the recommended alternative if BLE participates in a Beulah community water system is Alternative A. If BLE elects not to participate in the Beulah community water system, then Alternative C is the preferred alternative. The estimated construction costs for Alternatives A and C are $1,390,360 and $1,269,574, respectively. The estimated average monthly per tap costs for meeting debt service and operation costs for Alternative A is $92.64 with BLE and $166.76 without BLE. The estimated average monthly per tap costs for meeting debt service and operation costs for Alternative C is $159.25.

If the residents within the proposed service area are interested in pursuing construction of a public water supply system, a water district must be formed. With a successful application to the WWDC, an exploration well could be drilled, constructed, and tested during completion of a Level II water supply project. The results of the exploration well program will be used to refine the conceptual design of the water system and to develop more accurate conceptual-level cost estimates. If the exploration well yields sufficient quantities of water and the community agrees to pursue construction of the water system, then an application for a Level III water supply project can be made to the WWDC for final design and construction of the water system.
REFERENCES CITED


Crook County Land Use Plan, 1998: approved by Crook County Board of Commissioners on 11/4/98, amended on 12/4/01 and 2/5/03.


Personal Communication, Mark Gillette, WYDOT District Engineer, July 2003.


Wyoming State Engineer’s Office, various, water well permits archived in Cheyenne, Wyoming.

APPENDIX B

SCOPING MEETING
BEULAH
COMMUNITY MEETING

When: Wednesday July 9, 2003 at 7:00 p.m.

Where: Beulah Community Hall

Who: All Beulah area residents are invited to attend

Why: The Wyoming Water Development Commission, Weston Engineering, Inc., and Mid-West Assistance will be holding a kick-off meeting for the Beulah Level I Water Supply Project. Local residents are strongly encouraged to attend and to provide input regarding this water system feasibility study.

Questions?? Please call Weston Engineering, Inc. at (307) 745-6118 or (307) 468-2427.
BEULAH COMMUNITY MEETING

July 9, 2003 7:00 p.m. at the Beulah Community Hall

All Beulah area residents are invited to attend the kick-off meeting for the Beulah Level I Water System Feasibility Study.

For Questions please call Weston Engineering, Inc. at (307) 745-6118.
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<td>NYTA - Subconsultant to western</td>
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<td>Jerry Hunt</td>
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<td>Bill Smiley</td>
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<td>Marjara McDowell</td>
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<td>Ralphie Rushbaugh</td>
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Date Mailed: Date Mailed
Date Received: Date Received
Phone: Phone
Number people: Number people
Water use: Water use
Source: Source
Water District: Water District
Monthly Payment: Monthly Payment
Comments: Comments

No Number: No Number
N/A: N/A
Stock Water: Stock Water
--: --
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<td>2</td>
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<td>Well</td>
<td>Yes</td>
<td>40-50</td>
<td></td>
</tr>
<tr>
<td>Simon</td>
<td></td>
<td>6/24/03</td>
<td>6/30/03</td>
<td>643-3113</td>
<td>2</td>
<td>Domestic</td>
<td>Well</td>
<td>Yes</td>
<td>40-50</td>
<td></td>
</tr>
<tr>
<td>Six T Nine Ranch</td>
<td>5361 14 020</td>
<td>6/3/03</td>
<td>6/23/03</td>
<td>635-2613</td>
<td>2</td>
<td>Residence, Livestock</td>
<td>Well</td>
<td>Yes</td>
<td>Not sure</td>
<td></td>
</tr>
<tr>
<td>Name of Water User</td>
<td>Lot Number of User</td>
<td>Date Mailed</td>
<td>Date Received</td>
<td>Phone</td>
<td>Number people</td>
<td>Water use</td>
<td>Source</td>
<td>Water District</td>
<td>Monthly Payment</td>
<td>Comments</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------</td>
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<td>----------------</td>
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<td>----------</td>
</tr>
<tr>
<td>Tackett</td>
<td>5361 13 017</td>
<td>6/3/03</td>
<td>6/20/03</td>
<td>605-341-7248</td>
<td>None</td>
<td>No use</td>
<td>None</td>
<td>Yes</td>
<td>30-40</td>
<td>Not occupying the property, Dan and Brandi own 40 acres, and Tackett Partnership owns 1280 acres</td>
</tr>
<tr>
<td></td>
<td>5361 24 0480</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thomas</td>
<td></td>
<td>6/3/03</td>
<td></td>
<td>No Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wales</td>
<td>5360 30 18</td>
<td>6/3/03</td>
<td>6/30/03</td>
<td>283-1673</td>
<td>2</td>
<td>Domestic</td>
<td>Well</td>
<td>Yes</td>
<td>30-40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5361 25 035</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Webb</td>
<td>5360 31 020</td>
<td>6/3/03</td>
<td></td>
<td>No Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Meri & Lori Griswold 49 American 1,
Address and Lot Number: Lot #16 Beulahland Estates Gillette, WY 82716
Telephone Number: (307) 686-6622 Number of People in Residence: Not currently living there

What is your water used for? Watering trees

What is the source of your water supply?

Well_____ Haul Water _____ Don't know_______

Would you be interested in joining a water district?

Yes_____ No_____ Don't know_____

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40_____ $40-$50____ $50-$60_____ $60-$70_____

Comments: _____________________________________________

_____________________________________________________

_____________________________________________________

_____________________________________________________

_____________________________________________________

_____________________________________________________

WESTON
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Bradley & Greg Zeschberg

Address and Lot Number:

Telephone Number: 643 2222 Number of People in Residence: 2

What is your water used for? House

What is the source of your water supply?

Well X Haul Water Don't know

Would you be interested in joining a water district?

Yes X No Don't know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 $40-$50 X $50-$60 $60-$70

Comments: __________________________________________

__________________________________________________

__________________________________________________

__________________________________________________

WESTON

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Wayne Fredrickson
Address and Lot Number: 5880 Old Highway 141
Telephone Number: (307) 468-2369 Number of People in Residence: 1

What is your water used for? Household

What is the source of your water supply?

Well X Haul Water Don't know

Would you be interested in joining a water district?

Yes No Don't know X

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 X $40-$50 $50-$60 $60-$70

Comments: ____________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

WESTON
GROUNDWATER - ENGINEERING
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Thank you in advance for your consideration of this important local issue.

<table>
<thead>
<tr>
<th>Property Owner Name:</th>
<th>Leo Crago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address and Lot Number:</td>
<td>4252 State Hwy 424, Alden, WY 82710</td>
</tr>
<tr>
<td>Telephone Number:</td>
<td>307-896-3247</td>
</tr>
<tr>
<td>Number of People in Residence:</td>
<td>2</td>
</tr>
</tbody>
</table>

What is your water used for? **Misc.**

What is the source of your water supply?

- Well **X**
- Haul Water
- Don't know

Would you be interested in joining a water district?

- Yes
- No **X**
- Don't know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- $30-$40
- $40-$50
- $50-$60
- $60-$70

Comments: Contacted Leo Crago & spoke to Olive, she stated that they were the Crago Ranch Trust & that they were not interested in a water system. She said they had their own well & water.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Mark E. & Lucile Bradley

Address and Lot Number:

Telephone Number: Number of People in Residence:

What is your water used for?

What is the source of your water supply?

Well______ Haul Water______ Don't know______

Would you be interested in joining a water district?

Yes______ No______ Don't know______

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40______ $40-$50______ $50-$60______ $60-$70______

Comments:________________________

No longer own property in Beulah area.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: William J. or Mary Jane Dunbar
Address and Lot Number: PO Box 246 #3 Meescroft Beulah WY
Telephone Number: 643-5684 Number of People in Residence: 2
What is your water used for? Personal use
What is the source of your water supply?
Well X Haul Water Don't know
Would you be interested in joining a water district?
Yes X No Don't know
What monthly amount would you be willing to pay to be included in the water district (check any that apply)? $30-$40 X $40-$50 $50-$60 $60-$70
Comments:____________________________
____________________________
____________________________
____________________________
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: 333 Hamer Drive  
Block 6 Lots 7-12  
Address and Lot Number: 10 and 33  Waterfront 501 2201  
Telephone Number: 307-673-2222  Number of People in Residence: 1  
What is your water used for? Home Use

What is the source of your water supply?  
Well  __  Haul Water  ____  Don’t know  ____

Would you be interested in joining a water district?  
Yes  ____  No  ____  Don’t know  ____

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?  
$30-$40  ____  $40-$50  ____  $50-$60  ____  $60-$70  ____

Comments: ____________________________
                        ____________________________
                        ____________________________
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Raymond Simon
Address and Lot Number: 5868 Old Hwy 14; Lots 3 & 4
Telephone Number: 307 643 3113 Number of People in Residence: 2

What is your water used for? Bathing, Drinking, Cooking, Yard

What is the source of your water supply?

Well X Haul Water _____ Don't know_____

Would you be interested in joining a water district?

Yes X No ______ Don't know_____

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40_____ $40-$50 X _____ $50-$60_____ $60-$70_____

Comments: Couldn't return prior to June 20
as not received until 2 June 25

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Leonard Wales

Address and Lot Number: B07-356 BEULAH WY 82719

Telephone Number: 383-1673 Number of People in Residence: 2

What is your water used for? 

What is the source of your water supply?

Well X Haul Water Don’t know

Would you be interested in joining a water district?

Yes X No Don’t know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 X $40-$50 $50-$60 $60-$70

Comments:

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

WESTON

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: [Name]
Address and Lot Number: PO Box 235
Telephone Number: 307-283-2712
Number of People in Residence: 6
What is your water used for? Domestic
What is the source of your water supply? Natural Spring
Well X Haul Water Don’t know
Would you be interested in joining a water district? Yes X No Don’t know
What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
$30-$40 X $40-$50 $50-$60 $60-$70
Comments: Don’t need now, but in the future it would be nice. He has a developed spring and is concerned about impacts.

PARK PHONE 6-30-03 @ 1:20pm

WESTON
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: [Name]  [Name]
Address and Lot Number: [Address]  [Lot Number]
Telephone Number: [Phone Number]  Number of People in Residence: [Number]
What is your water used for? [Indicate use]  [Indicate use]

What is the source of your water supply?

Well  Haul Water  Don't know

Would you be interested in joining a water district?

Yes  No  Don't know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40  $40-$50  $50-$60  $60-$70

Comments: [Comments]

[Signatures]

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: **MARILYN KLINKMAN**

Address and Lot Number: **BLOCK 4 - LOTS 7-8-9-10-11**

Telephone Number: **307-648-2151** Number of People in Residence: **2 + 1**

What is your water used for? Well water used for showers, laundry

What is the source of your water supply?

- Well [X]  
- Haul Water [X]  
- Don't know [ ]

Would you be interested in joining a water district?

- Yes [X]  
- No [ ]  
- Don't know [ ]

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- $30-$40 [X]  
- $40-$50 [ ]  
- $50-$60 [ ]  
- $60-$70 [ ]

Comments:

Address - 5865 HWY 14 - 1 residence - 2 people

Address 5867 HWY 14 - 1 Residence - Rented out

1 person living there.

It would be so nice to have good drinking water at the tap.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Dale Beel (Buffalo Jump Realty)
Address and Lot Number: Old Hwy 14 - Beulah, Wyo
Telephone Number: 643-2297 Number of People in Residence: 2/4

What is your water used for? Business

What is the source of your water supply?

Well [ ] Haul Water [ ] Don't know [ ]

Would you be interested in joining a water district?

Yes [ ] No [ ] Don't know [ ]

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 [ ] $40-$50 [ ] $50-$60 [ ] $60-$70 [ ]

Comments: We have 7 properties near Beulah 5 right in or around Beulah. Would appreciate a deep Madison well.

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Six-T Nine Ranch, Inc.

Address and Lot Number: 356 Redwater Rd.

Telephone Number: (307)-635-2613

Number of People in Residence: 7

What is your water used for? Residence, Livestock, lawns

What is the source of your water supply?

- Well [✓]  
- Haul Water [ ]  
- Don't know [ ]

Would you be interested in joining a water district?

- Yes [✓]  
- No [ ]  
- Don't know [ ]

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- Not sure at this point [✓]  
- $30-$40 [ ]  
- $40-$50 [ ]  
- $50-$60 [ ]  
- $60-$70 [ ]

Comments: ____________________________________________________________

__________________________________________________________

__________________________________________________________

__________________________________________________________

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Dean L. Jensen

Address and Lot Number: 5777 Old Hwy 14

Telephone Number: 307 283-1164 Number of People in Residence: 3

What is your water used for? Household use

What is the source of your water supply?

Well ✓ Haul Water Don't know

Would you be interested in joining a water district?

Yes ✓ No Don't know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 ✓ $40-$50 $50-$60 $60-$70

Comments:______________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Dan and Brandi Tackett
Address and Lot Number: Lot 10 in Island properties 1280 ac. adjacent to Island is 40 ac. Properties
Telephone Number: 605-341-7248
Number of People in Residence: None in use
What is your water used for? No water used at this point - no source
What is the source of your water supply? None
Would you be interested in joining a water district? Yes
What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
   $30-$40
   $40-$50
   $50-$60
   $60-$70

Comments: We currently are not occupying the property. Dan & Brandi Tackett own a 40 ac. parcel and Tackett Family Limited Partnership own 1280 ac.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Zelma Meyer

Address and Lot Number: 5842 Old Hwy 14 Beulah WY 82072

Telephone Number: 307-283-2125 Number of People in Residence: 2

What is your water used for? Everything

What is the source of your water supply?

Well X Haul Water X Don’t know

Would you be interested in joining a water district?

Yes X No Don’t know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 X $40-$50 $50-$60 $60-$70

Comments: I really hope we get the water for it will be so good for the community of Beulah
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: DRY CREEK CORP
Address and Lot Number: P.O. Box 493, Spearfish, SD 57783
Telephone Number: 605-642-2341 Number of People in Residence: N/A

What is your water used for? LIVESTOCK

What is the source of your water supply?
Well  X  Haul Water  _  Don't know  _

Would you be interested in joining a water district?
Yes  _  No  X  Don't know  _

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
$30-$40  _  $40-$50  _  $50-$60  _  $60-$70  _

Comments: Am NOT interested & will NOT be included in Beulah Water Dist
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Thank you in advance for your consideration of this important local issue.

Property Owner Name:  
Address and Lot Number:  
Telephone Number:  
Number of People in Residence:  
What is your water used for?  
What is the source of your water supply?  
Well  X  Haul Water  Don't know  
Would you be interested in joining a water district?  
Yes  X  No  Don't know  
What monthly amount would you be willing to pay to be included in the water district (check any that apply)?  
$30-$40  X  $40-$50  $50-$60  $60-$70  
Comments:  

WESTON  
GROUNDWATER ENGINEERING
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Dale Bell
Address and Lot Number: 5930 Old Hwy 14, Stateline Station
Telephone Number: (307) 643-2247 Number of People in Residence:
What is your water used for? Public & private all uses

What is the source of your water supply?
Well V Haul Water Don’t know

Would you be interested in joining a water district?
Yes V No Don’t know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
$30-$40 V + $40-$50 $50-$60 $60-$70

Comments: Softer, safer, deep water would be helpful.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name:  
Address and Lot Number:  
Telephone Number:  
Number of People in Residence:  

What is your water used for?  

What is the source of your water supply?  

Would you be interested in joining a water district?  

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?  

Comments:  

Per conversation with Ben Jordan, we (Blesmires) are interested in discussing the use of our well for the project.

DANIEL P. ISLAND
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Jean Reinecke
Address and Lot Number: 382 Lower Rodwater Road
Telephone Number: 307-737-2515 Number of People in Residence: 2

What is your water used for? Domestic

What is the source of your water supply?

Well [ ] Haul Water [ ] Don't know [ ]

Would you be interested in joining a water district?

Yes [ ] No [ ] Don’t know [ ]

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40 [ ] $40-$50 [ ] $50-$60 [ ] $60-$70 [ ]

Comments: New Address

2537 Hwy 14 E
Clearmont, WY 82835
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Thank you in advance for your consideration of this important local issue.

Property Owner Name:  
Address and Lot Number:  
Telephone Number:  
Number of People in Residence:  

What is your water used for?  
What is the source of your water supply?  

Would you be interested in joining a water district?  

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?  

Comments:
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Bill Mary Shepperson

Address and Lot Number: Beulah WY 5863

Telephone Number: 980-4567 Number of People in Residence: 1

What is your water used for? House and watering garden

What is the source of your water supply?

- Well
- Haul Water
- Don't know

Would you be interested in joining a water district?

- Yes
- No
- Don't know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- $30-$40
- $40-$50
- $50-$60
- $60-$70

Comments:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: Emma C. Reinhold Living Trust

Address and Lot Number: 352 W. 16 P. t. Road

Telephone Number: 283-2581 Number of People in Residence: 1

What is your water used for? Domestic, Livestock

What is the source of your water supply?

Well, Well, Haul Water, Don’t know

Would you be interested in joining a water district?

Yes, No, Don’t know

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

$30-$40, $40-$50, $50-$60, $60-$70

Comments: I'm 3 miles south of Beulah and am not interested now. However, within 10 years, my ranch will probably be subdivided. I might be interested in having water available to the lot although I suspect that I'm too far from Beulah for that to be practical.

Ernest Reinhold
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: ____________
Address and Lot Number: ____________
Telephone Number: ____________ Number of People in Residence: ____________

What is your water used for? ____________

What is the source of your water supply?

- Well ____________
- Haul Water ____________
- Don't know ____________

Would you be interested in joining a water district?

- Yes ____________
- No ____________
- Don't know ____________

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- $30-$40 ____________
- $40-$50 ____________
- $50-$60 ____________
- $60-$70 ____________

Comments: ____________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
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Thank you in advance for your consideration of this important local issue.

<table>
<thead>
<tr>
<th>Property Owner Name:</th>
<th>Sand Creek Country Club</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address and Lot Number:</td>
<td></td>
</tr>
<tr>
<td>Telephone Number:</td>
<td>307-643-2880</td>
</tr>
<tr>
<td>Number of People in Residence:</td>
<td>25 Homes</td>
</tr>
</tbody>
</table>

What is your water used for? ____________________________

What is the source of your water supply?

- Well ✔
- Haul Water ______
- Don’t know ______

Would you be interested in joining a water district?

- Yes ______
- No ✔
- Don’t know ______

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?

- $30-$40 ______
- $40-$50 ______
- $50-$60 ______
- $60-$70 ______

Comments: All of the homes in the Country Club have very good wells & joining a water district would be of no benefit.

![Weston Engineering Logo]
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: JAMES R. & CYNTHIA HADDEN
Address and Lot Number: PO341 607 Redwater Rd
Telephone Number: 3072832077 Number of People in Residence: 3
What is your water used for? DOMESTIC
What is the source of your water supply?
Well ☑ Haul Water ______ Don't know ______
Would you be interested in joining a water district?
Yes ☑ No ______ Don't know ______
What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
$30-$40 ☑ $40-$50 ______ $50-$60 ______ $60-$70 ______
Comments: WE HAVE A DECENT WELL, HOWEVER WE WOULD LIKE SOFTER WATER WHICH MIGHT BE PROVIDED BY A WATER DISTRICT. WE ARE VERY SUPPORTIVE OF A BEULAH WATER SYSTEM.
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Thank you in advance for your consideration of this important local issue.

Property Owner Name: [signature]
Address and Lot Number: 5997 Old Highway 14
Telephone Number: 707 643 1799
Number of People in Residence: [number]

What is your water used for? [description]

What is the source of your water supply?
- Well [x]
- Haul Water [ ]
- Don't know [ ]

Would you be interested in joining a water district?
- Yes [ ]
- No [x]
- Don't know [ ]

What monthly amount would you be willing to pay to be included in the water district (check any that apply)?
- $30-$40 [ ]
- $40-$50 [x]
- $50-$60 [ ]
- $60-$70 [ ]

Comments: [space for comments]

[Signature]

WESTON
GROUNDDWATER • ENGINEERING
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
for Domestic or Stock Watering Use Only

A preferred water right is given to such use when the yield or flow does not exceed .066 cubic feet per second or 25 gallons per minute. Domestic use refers to household use and the watering of lawns and gardens for family use, not to exceed one acre.

Permit No. U.W. 31782
Water Division No. C (r) 
U.W. District Crook Co.

**Completed Prior to May 24, 1968**

NAME OF WELL

Reinecke

1. Owner Reinecke Ox Yake Ranch
2. Address Bodie, Var. 82772
3. Agent to receive correspondence E. Reinecke

4. Name & address of driller John Havaman (deceased)

5. Well is constructed on lands owned by Reinecke Ox Yake Ranch (Obtaining of easement or right of way is the responsibility of the applicant. Include copy if land is privately owned and owner is not a co-applicant.)

6. Type of construction: Dug □ Drilled □ Cable □ Type of Rig: Cable

Driven □ Jet □ Other

7. Use of Water—Domestic □ Stock □

8. Means of conveyance, distance and direction to point of use

9. Date started: 1917
10. Date completed: 1920 (including pump)
11. Date after completion when water was used: 19/7

WELL DESCRIPTION

Total Depth: 760 ft.

Depth to Water Level: 6 ft.

TEST DATA

Yield: 25 gal/ft

Drawdown: 3 ft.

How Tested: Pump

Length of Test:

PUMP DATA

Type: (Turbine, Centrifugal, etc.) Electric, Gas, etc.)

Power Source: Electric

Horsepower: 10

Amount of Water Being Used: 25

(Gallons per Minute)

CASING RECORD

Plain casing

Size: 6" Drift Kind: Iron pipe from 0 ft. to 600 ft.

Size: 8" Kind: Iron pipe from 600 ft. to 920 ft.

Size: Kind: from ft. to ft.

Perforated casing

Size: 4" Kind: Iron pipe from 0 ft. to 600 ft.

Size: Kind: from ft. to ft.

This well had 2 flows, one at 600 ft. Flowed about 300 gal per min until other well were dug in 1970, could be shut off by raising pipe 3 ft. near water 1944 hardness 1994 hardness.

**For wells constructed after May 24, 1969, Application Form(10,7),(994,995)
16. Was surface seal provided? Yes ☐ No ☐ To What Depth ☐ Material used: ☐
   Was well gravel packed? Yes ☐ No ☐

17. FLOWING WELL (Owner is responsible for installing control device on flowing well.)
   Does well flow? Yes ☐ No ☐
   Flow controlled by: Valve ☐ Cap ☐ Plug ☐ Does well leak around casing? Yes ☐ No ☐

18. LOG OF WELL—Clearly indicate first water bearing material and principal water bearing material.

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perfection of Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
<td>Red clay</td>
<td>Cemented</td>
<td>Surface Water</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>Red clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>792</td>
<td>Red clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>392</td>
<td>447</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>447</td>
<td>543</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>543</td>
<td>550</td>
<td>Sand stone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>550</td>
<td>593</td>
<td>Shale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>593</td>
<td>840</td>
<td>Sand stone</td>
<td></td>
<td></td>
<td>Small Flow Water Good</td>
</tr>
<tr>
<td>840</td>
<td>900</td>
<td>Sand stone</td>
<td></td>
<td></td>
<td>Abandoned</td>
</tr>
<tr>
<td>900</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. QUALITY OF WATER INFORMATION
   Was a chemical analysis made? Yes ☐ No ☐
   If so, please include a copy of the analysis with this form.
   If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
   Was a bacteriological analysis made? Yes ☐ No ☐
   If a domestic well, was the well disinfected by the driller? Yes ☐ No ☐

20. IF WELL IS TO BE ABANDONED, complete only Items 1 through 6, Item 10 and Item 18 (Log of Well) and state reason for abandonment below.
   It is the responsibility of the owner to properly plug or fill in the well in order to prevent contamination of ground water and to cover or cap the well at ground level.
   REMARKS: Pipe rusted out, small flow couldn’t be pulled. Water raised to only 6 feet, 1 horse motor less than 15 gal per min

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent: ____________________________  Date: ________________

Date of Receipt: JAN 12 1976  19  Date of Priority: JAN 12 1976  19

Coral Lacy

Date of Approval: JAN 19 1976  19  for State Engineer

31782
STATE OF WYOMING

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

for Domestic or Stock Watering Use Only

A preferred water right is given to such use when the yield or flow does not exceed .056 cubic feet per second or 25 gallons per minute. Domestic use refers to household use and the watering of lawns and gardens for family use, not to exceed one acre.

Permit No. U.W. 31784
Water Division No. 2 (C)
U.W. District Crook Co.

NAME OF WELL

Reinecke

NAME OF WELL

1. Owner Reinecke Ox Yoke Ranch
2. Address Reclab Wyo. 82212
3. Agent to receive correspondence E. H. Reinecke Reclab Wyo. 82212
4. Name & address of driller Merle R Brandy Belle Fourche SD 1979
5. Well is constructed on lands owned by Reinecke Ox Yoke Ranch (Obtaining of easement or right of way is the responsibility of the applicant. Include copy if land is privately owned and owner is not a co-applicant.)
6. Type of construction; Dug [] Drilled [X] Rotary [] Type of Rig
   Driven [] Jet [] Other

7. Use of Water—Domestic [] Stock []
8. Means of conveyance, distance and direction to point of use
   Pipe [X] pipe

9. Date started March 19 1963
10. Date completed April 16 1963 (including pump)
11. Date after completion when water was used April 17 1963

12. WELL DESCRIPTION
Total Depth 7880 ft
Depth to Water Level 2674 ft

13. TEST DATA
   Yield 8 gpm permanent flow tested well d 11 1962
   Drawdown None
   Length of Test

14. PUMP DATA
   Type None
   Power Source [X] Electric
   (Turbine, Centrifugal, etc.)
   Horsepower 8 1/2
   Amount of Water Being Used (Gallons per Minute)

15. CASING RECORD
   Plain Casing
   Size [X] 3 1/2 black pipe from 0 ft. to 843 ft.
   Size [X] 3 1/2 from ft. to ft.
   Size [X] 3 1/2 from ft. to ft.
   Perforated Casing
   Size [X] 3 1/2 from ft. to ft.
   Size [X] 3 1/2 from ft. to ft.
   Size [X] 3 1/2 from ft. to ft.

**For wells constructed after May 24, 1969, Application Form U.W. 5 must be submitted prior to construction.

31784

Permit No. U.W. Book No. 164 Page No. 7
16. Was surface seal provided?  Yes ☑ No ☐  To What Depth?  Cement
Was well gravel packed?  Yes ☑ No ☐

17. FLOWING WELL (Owner is responsible for installing control device on flowing well.)
Flow controlled by: Valve ☑ Cap ☐ Plug ☐  Does well leak around casing?  Yes ☑ No ☐

18. LOG OF WELL—Clearly indicate first water bearing material and principal water bearing material.

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<th>Indicate Water Bearing Formation</th>
<th>Indicate Perf Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4</td>
<td>Surface</td>
<td>Cemented</td>
<td>53 gal water</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>13</td>
<td>Red siltstone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>16</td>
<td>Steamed clay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>31</td>
<td>Hard red siltstone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>133</td>
<td>White siltstone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>133</td>
<td>137</td>
<td>Pink siltstone</td>
<td></td>
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<tr>
<td>137</td>
<td>285</td>
<td>Red siltstone</td>
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<td>285</td>
<td>341</td>
<td>Red very sandy shale</td>
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<tr>
<td>341</td>
<td>391</td>
<td>Light flinty gray limestone</td>
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<td></td>
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<td>446</td>
<td>Limestone</td>
<td></td>
<td></td>
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<tr>
<td>446</td>
<td>538</td>
<td>Sand hard, Sand hard</td>
<td></td>
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<tr>
<td>538</td>
<td>711</td>
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<td>Hard</td>
<td></td>
<td></td>
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<tr>
<td>843</td>
<td>897</td>
<td>Pink &amp; white Sand, Purple Sand</td>
<td></td>
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<tr>
<td>897</td>
<td>879</td>
<td>White Sand</td>
<td>Flow water</td>
<td>Flow Artesian</td>
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<tr>
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<td>Pink, purple, White Sand</td>
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<td>901</td>
<td>White Limestone</td>
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<td>limestone</td>
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<td>971</td>
<td>1000</td>
<td>White &amp; Pink Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. QUALITY OF WATER INFORMATION
Was a chemical analysis made?  Yes ☑ No ☐
If so, please include a copy of the analysis with this form.
If not, do you consider the water as:  Good ☐ Acceptable ☑ Poor ☐ Unusable ☑
Was a bacteriological analysis made?  Yes ☑ No ☐
If a domestic well, was the well disinfected by the driller?  Yes ☑ No ☐

20. IF WELL IS TO BE ABANDONED, complete only Items 1 through 6, Item 10 and Item 18 (Log of Well) and state reason for abandonment below.
It is the responsibility of the owner to properly plug or fill in the well in order to prevent contamination of ground water and to cover or cap the well at ground level.

REMARKS: Good drinking water 22.7 grains hardness per gal. Used with own pressure to house's live stock. Cement pumped in filling space outside of 4" casing.

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

[Signature]  [Date]

Date of Receipt:  JAN 2, 1976  Date of Priority:  JAN 12, 1976
Carol Lacy
Date of Approval:  JAN 17, 1976  for State Engineer
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF LOCATION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 35710
NAME OF WELL Mathews Artesian No. 1

1. NAME OF OWNER Harry E. and Edna R. Sager
2. ADDRESS P. O. Box 336, Beulah, Wyoming
3. USE OF WATER: Domestic ✔ Stock Watering ❌ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐
4. LOCATION OF WELL: NE ¼ NW ¼ of Section 29, T. 53 N., R. 60 W., of the 6th P.M. (or W.R.M.),
   Wyoming, being specifically
   170 ft. North and 2590 ft. East from the NW corner of Section 29, T. 53 N., R. 60 W.
   (Strike out words not needed).
5. TYPE OF CONSTRUCTION: Drilled ☒ Cable-tool ☐ Dug ☐ Driven ☐ Jetted ☐
6. CONSTRUCTION: Total Depth 910 ft. Depth to Water Level Flowing ft.
   a. Casing Schedule
      New ☐ Used ☒
      7" diameter from 0 ft. to 910 ft.
      Material Lap-weld iron Gage
      ____________________________
      diameter from ft. to ft.
      Material __________ Gage __________
      ____________________________
      diameter from ft. to ft.
      Material __________ Gage __________
   b. Perforations: Type of perforator used
      ____________________________
      Size of perforations __________ inches by __________ inches.
      Number of perforations and depths where perforated:
      ____________________________
      ____________________________
   c. Was well screen installed? Yes ☐ No ☒
   d. Was well gravel packed? Yes ☐ No ☒ Size of gravel __________
   e. Was surface casing used? Yes ☐ No ☒ Was it cemented in place? Yes ☐ No ☐
7. NAME & ADDRESS OF DRILLER Jim and Kink Holwell - Osage, Wyoming 82723
8. DATE OF COMPLETION OF WELL (including pump installation) 1940
9. PUMP INFORMATION:
   Manufacturer: none
   Type: __________
   Source of power: __________ Horsepower: __________ Depth of Pump Setting: __________
   Amount of Water Being Pumped: __________ Gallons Per Minute.

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
10. **PUMP TEST:** Was a pump test made?  Yes ☐ No ☐

If so, by whom. ___________________________ Address _______________________________________

Yield: _______gal/min. with _______ foot drawdown after _______ hours.

Yield: _______gal/min. with _______ foot drawdown after _______ hours.

11. **FLOWING WELL:** (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______gal/min. Surface pressure is _______lb./sq. inch, or _______ feet of water.

The flow is controlled by: valve ☑ cap ☐ plug ☐

Does well leak around casing?  Yes ☐ No ☐

12. **LOG OF WELL:** Total depth drilled _______ feet.

Depth of completed well _______ feet. Diameter of well _______ inches.

Depth to first water bearing formation _______ feet.

Depth to principal water bearing formation Top _______ feet to Bottom _______ feet.

Ground Elevation, if known _______ feet.

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**QUALITY OF WATER INFORMATION:**

Was a chemical analysis made?  Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☑ Acceptable ☐ Poor ☐ Unable ☐
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the land and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for supplemental supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Township</th>
<th>Range</th>
<th>Sec.</th>
<th>NE1/4</th>
<th>NW1/4</th>
<th>SW1/4</th>
<th>SE1/4</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
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<td>NW1/4</td>
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<td>60</td>
<td>29</td>
<td>X</td>
<td>X</td>
<td>Stock</td>
<td>Domestic</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED

Original Supply__________ acres
Supplemental Supply__________ acres

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

![Map of Township 53 N., Range 60 W.](image)

Scale: 2" — 1 Mile

REMARKS:
- Well - piped to house and corrals
- Stock use - piped from domestic line to water tank in corral
- Domestic use - sprinklers used for lawn and garden and piped in dwelling for household use.
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 33406 NAME OF WELL: Reinecke

1. NAME OF OWNER: Reinecke, Ox Yoke Ranch
2. ADDRESS: Bearlake, WY.
   Zip Code: 82071
3. USE OF WATER: Domestic ☐ Stock Watering ☐ Irrigation ☑ Municipal ☐ Industrial ☐ Miscellaneous ☐
4. LOCATION OF WELL: (Bearing and Distance) Wyoming, being specifically
   or. ___ ft. North and ___ ft. East from the corner of Section ___ T. ___ N., R. ___ W.
   (Strike out words not needed).
5. TYPE OF CONSTRUCTION: Drilled ☑ Dug ☐ Driven ☐ Jetted ☐ Other ☐
   a. Casing Schedule: New ☐ Used ☐
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
   b. Perforations: Type of perforator used ______
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated: ______
      __________ perforations from ___ ft. to ___ feet.
      __________ perforations from ___ ft. to ___ feet.
   c. Was well screen installed? Yes ☑ No ☐
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
   d. Was well gravel packed? Yes ☑ No ☐ Size of gravel ______
   e. Was surface casing used? Yes ☐ No ☐ Was it cemented in place? Yes ☐ No ☐
7. NAME & ADDRESS OF DRILLER: ______
8. DATE OF COMPLETION OF WELL (including pump installation): 1912
9. PUMP INFORMATION: Manufacturer ______ Type: Jet ______
   Source of power: electric ______ Horsepower: 10 ______ Depth of Pump Setting: 10'
   Amount of Water Being Pumped: 750 _______ Gallons Per Minute.

Form U.W. 6
Mar. 7 1977
DECEIVED
STATE ENGINEER
CHEYENNE, WYOMING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

IF WELL IS TO BE ABANDONED, SEE ITEM 15, PAGE 4

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 33406 NAME OF WELL: Reinecke

1. NAME OF OWNER: Reinecke, Ox Yoke Ranch
2. ADDRESS: Bearlake, WY.
   Zip Code: 82071
3. USE OF WATER: Domestic ☐ Stock Watering ☐ Irrigation ☑ Municipal ☐ Industrial ☐ Miscellaneous ☐
4. LOCATION OF WELL: (Bearing and Distance) Wyoming, being specifically
   or. ___ ft. North and ___ ft. East from the corner of Section ___ T. ___ N., R. ___ W.
   (Strike out words not needed).
5. TYPE OF CONSTRUCTION: Drilled ☑ Dug ☐ Driven ☐ Jetted ☐ Other ☐
   a. Casing Schedule: New ☐ Used ☐
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
   b. Perforations: Type of perforator used ______
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated: ______
      __________ perforations from ___ ft. to ___ feet.
      __________ perforations from ___ ft. to ___ feet.
   c. Was well screen installed? Yes ☑ No ☐
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
   d. Was well gravel packed? Yes ☑ No ☐ Size of gravel ______
   e. Was surface casing used? Yes ☐ No ☐ Was it cemented in place? Yes ☐ No ☐
7. NAME & ADDRESS OF DRILLER: ______
8. DATE OF COMPLETION OF WELL (including pump installation): 1912
9. PUMP INFORMATION: Manufacturer ______ Type: Jet ______
   Source of power: electric ______ Horsepower: 10 ______ Depth of Pump Setting: 10'
   Amount of Water Being Pumped: 750 _______ Gallons Per Minute.

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Mar. 7 1977
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STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 33406 NAME OF WELL: Reinecke

1. NAME OF OWNER: Reinecke, Ox Yoke Ranch
2. ADDRESS: Bearlake, WY.
   Zip Code: 82071
3. USE OF WATER: Domestic ☐ Stock Watering ☐ Irrigation ☑ Municipal ☐ Industrial ☐ Miscellaneous ☐
4. LOCATION OF WELL: (Bearing and Distance) Wyoming, being specifically
   or. ___ ft. North and ___ ft. East from the corner of Section ___ T. ___ N., R. ___ W.
   (Strike out words not needed).
5. TYPE OF CONSTRUCTION: Drilled ☑ Dug ☐ Driven ☐ Jetted ☐ Other ☐
   a. Casing Schedule: New ☐ Used ☐
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
   b. Perforations: Type of perforator used ______
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated: ______
      __________ perforations from ___ ft. to ___ feet.
      __________ perforations from ___ ft. to ___ feet.
   c. Was well screen installed? Yes ☑ No ☐
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
   d. Was well gravel packed? Yes ☑ No ☐ Size of gravel ______
   e. Was surface casing used? Yes ☐ No ☐ Was it cemented in place? Yes ☐ No ☐
7. NAME & ADDRESS OF DRILLER: ______
8. DATE OF COMPLETION OF WELL (including pump installation): 1912
9. PUMP INFORMATION: Manufacturer ______ Type: Jet ______
   Source of power: electric ______ Horsepower: 10 ______ Depth of Pump Setting: 10'
   Amount of Water Being Pumped: 750 _______ Gallons Per Minute.

Form U.W. 6
Mar. 7 1977
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CHEYENNE, WYOMING

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IF WELL IS TO BE ABANDONED, SEE ITEM 15, PAGE 4

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 33406 NAME OF WELL: Reinecke

1. NAME OF OWNER: Reinecke, Ox Yoke Ranch
2. ADDRESS: Bearlake, WY.
   Zip Code: 82071
3. USE OF WATER: Domestic ☐ Stock Watering ☐ Irrigation ☑ Municipal ☐ Industrial ☐ Miscellaneous ☐
4. LOCATION OF WELL: (Bearing and Distance) Wyoming, being specifically
   or. ___ ft. North and ___ ft. East from the corner of Section ___ T. ___ N., R. ___ W.
   (Strike out words not needed).
5. TYPE OF CONSTRUCTION: Drilled ☑ Dug ☐ Driven ☐ Jetted ☐ Other ☐
   a. Casing Schedule: New ☐ Used ☐
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
      ______ diameter from ___ ft. to ___ ft. Material ______ Gage ______
   b. Perforations: Type of perforator used ______
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated: ______
      __________ perforations from ___ ft. to ___ feet.
      __________ perforations from ___ ft. to ___ feet.
   c. Was well screen installed? Yes ☑ No ☐
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
      Diameter: ______ slot size: ______ set from ___ feet to ___ feet.
   d. Was well gravel packed? Yes ☑ No ☐ Size of gravel ______
   e. Was surface casing used? Yes ☐ No ☐ Was it cemented in place? Yes ☐ No ☐
7. NAME & ADDRESS OF DRILLER: ______
8. DATE OF COMPLETION OF WELL (including pump installation): 1912
9. PUMP INFORMATION: Manufacturer ______ Type: Jet ______
   Source of power: electric ______ Horsepower: 10 ______ Depth of Pump Setting: 10'
   Amount of Water Being Pumped: 750 _______ Gallons Per Minute.
13. **TABULATION**

   a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

   (Give irrigable acreage in each legal subdivision. If proposed use is for supplemental supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

   b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th></th>
<th>Sec.</th>
<th>NE 1/4</th>
<th>NW 1/4</th>
<th>SW 1/4</th>
<th>SE 1/4</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>28</td>
<td>40</td>
<td>10</td>
<td></td>
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<td><strong>Total</strong> <strong>120</strong></td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF ACRES TO BE IRRIGATED** **120**

Original Supply **50** acres
Supplemental Supply **70** acres

14. **PLAT**

   a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plot certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

   b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

   c. A separate map may be submitted if the information required cannot be shown on this plat.

   **R. 60 W.**

   **R. 60 W.**

   **Scale: 2" = 1 Mile**

   **REMARKS:**

   [Diagram of plat with shaded area indicating irrigated land]
IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL ITEM 15, PAGE 4

NOTE: Do not fold this form, OR TYPEWRITER or PRINT NEATLY with black ink.

PERMIT NO. U.W. 58743 NAME OF WELL #5 (Five) Stoltz

1. NAME OF OWNER Gal Stoltz

2. ADDRESS Box 247 Brunah, wy Zip Code 82712

3. USE OF WATER: Domestic [ ] Stock Watering [ ] Irrigation [ ] Municipal [ ] Industrial [ ] Miscellaneous [ ]

4. LOCATION OF WELL: SE 1/4 W1/2 1/4 of Section 21, T. S3 N., R. G0 W., of the 8th P.M. (or W.R.M.), Wyoming, being specifically:

   1. Bearing and Distance:

   2. Strike out words not needed.

5. TYPE OF CONSTRUCTION: Drilled [ ] May 4 1800 [ ] Dug [ ] Driven [ ] Jetted [ ]

Other [ ]

6. CONSTRUCTION: Total Depth of Well ft. Depth to Static Water Level ______ ft.

   a. Casing Schedule: New [ ] Used [ ]

      Diameter from ______ ft. to ______ ft. Material ______ Gage ______

      Diameter from ______ ft. to ______ ft. Material ______ Gage ______

      Diameter from ______ ft. to ______ ft. Material ______ Gage ______

   b. Perforations: Type of perforator used Pressure grouted

      Size of perforations ______ inches by ______ inches. ______

      Number of perforations and depths where perforated:

      ______ perforations from ______ ft. to ______ feet.

      ______ perforations from ______ ft. to ______ feet.

   c. Was well screen installed? Yes [ ] No [ ]

      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.

      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.

   d. Was well gravel packed? Yes [ ] No [ ]

      Size of gravel ______

   e. Was surface casing used? Yes [ ] No [ ]

      Was it cemented in place? Yes [ ] No [ ]

7. NAME & ADDRESS OF DRILLER 

   8. DATE OF COMPLETION OF WELL (Including pump installation) Jan. 13 1981

9. PUMP INFORMATION: Manufacturer [ ]

   Source of power ______ Horsepower ______ Depth of Pump Setting ______

   Amount of Water Being Pumped ______ Gallons Per Minute. (For springs or flowing wells, see item 11.)
10. PUMP TEST: Was a pump test made? Yes ☑ No ☐ By

If so, by whom __________________________ Address __________________________
Yield: ________ gal/min. with ________ foot drawdown after ________ hours.
Yield: ________ gal/min. with ________ foot drawdown after ________ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).
   If well yields artesian flow, yield is ________ gal/min. Surface pressure is ________ lb/sq. inch, or ________ feet of water.
   The flow is controlled by: valve ☐ cap ☐ plug ☐
   Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled ________ feet.
   Depth of completed well ________ feet. Diameter of well ________ inches.
   Depth to first water bearing formation ________ feet.
   Depth to principal water bearing formation ________ feet to ________ feet.

   Ground Elevation, if known ________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>15-25</td>
<td>5204: Clay /2.7</td>
<td>G202</td>
<td>65' 8'stories</td>
<td></td>
</tr>
<tr>
<td>25-40</td>
<td>40-50</td>
<td>Red Rocks</td>
<td></td>
<td>64' 6'stories</td>
<td></td>
</tr>
<tr>
<td>50-60</td>
<td>60-70</td>
<td>Mixture of Limestone</td>
<td></td>
<td>63' 0'stories</td>
<td></td>
</tr>
<tr>
<td>70-75</td>
<td>75-80</td>
<td>4254: Clay</td>
<td></td>
<td>62' 5'stories</td>
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</tr>
<tr>
<td>80-85</td>
<td>85-90</td>
<td>Mixture of Limestone</td>
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<td>61' 6'stories</td>
<td></td>
</tr>
<tr>
<td>90-95</td>
<td>95-100</td>
<td>4254: Clay</td>
<td></td>
<td>60' 0'stories</td>
<td></td>
</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:
Was a chemical analysis made? Yes ☐ No ☐
If so, please include a copy of the analysis with this form.
If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
13. **TABULATION**

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the “Remarks” section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for additional supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the “Remarks” section under Item 14.

<table>
<thead>
<tr>
<th>Township</th>
<th>Range</th>
<th>Sec.</th>
<th>NE 1/4</th>
<th>NW 1/4</th>
<th>SW 1/4</th>
<th>SE 1/4</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF ACRES TO BE IRRIGATED**

Original Supply _______ acres

Additional Supply _______ acres

14. **PLAT**

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in “Remarks” section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

**Scale: 2" = 1 Mile**

REMARKS: Domestic and stock
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATE ENGINEER
Cheyenne, Wyo.

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
ITEM 15, PAGE 4

PERMIT NO. U.W. 64649 NAME OF WELL Good Water Well No. 1

1. NAME OF OWNER Joe Foss and Donna

2. ADDRESS 3rd Creek Road Beulah, WY 82712

3. USE OF WATER: Domestic x Stock Watering □ Irrigation □ Municipal □ Industrial □ Miscellaneous □

4. LOCATION OF WELL: NW 1/4 SE 1/4 of Section 7, T. 52 N., R. 60 W., of the 6th P.M. (or W.R.M.),

Wyoming, specifically

(Bearing and Distance)
or

(Bearing and Distance)

5. TYPE OF CONSTRUCTION: Drilled □ Mayfair 1000 Dug □ Driven □ Jetted □

Other □

6. CONSTRUCTION: Total Depth of Well 100 ft. Depth to Static Water Level 26 ft.

a. Casing Schedule New□ Used □

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Material</th>
<th>Gage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5\text{}</td>
<td>PVC</td>
<td>5/8</td>
</tr>
<tr>
<td>8\text{}</td>
<td>PVC</td>
<td>5/8</td>
</tr>
<tr>
<td>10\text{}</td>
<td>PVC</td>
<td>5/8</td>
</tr>
</tbody>
</table>

b. Perforations: Type of perforator used Pressure grouted to 80 ft.

Size of perforations ______ inches by ______ inches.

Number of perforations and depths where perforated:

_______ perforations from ______ ft. to ______ feet.

_______ perforations from ______ ft. to ______ feet.

_______ perforations from ______ ft. to ______ feet.

c. Was well screen installed? Yes □ No □

Diameter: ______ slot size: ______ set from ______ feet to ______ feet.

Diameter: ______ slot size: ______ set from ______ feet to ______ feet.

d. Was well gravel packed? Yes □ No □ Size of gravel

________

e. Was surface casing used? Yes □ No □ Was it cemented in place? Yes □ No □

7. NAME & ADDRESS OF DRILLER Graf Drilling Belle Fourche, SD

8. DATE OF COMPLETION OF WELL (including pump installation) Sept 22, 1983

9. PUMP INFORMATION: Manufacturer Grand Foss Type Sub.

Source of power 220 Horsepower 1/2 Depth of Pump Setting 80 Ft.

Amount of Water Being Pumped 2010 Gallons Per Minute. (For springs or flowing wells, see Item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☒

If so, by whom _______________________________ Address ________________________________

Yield: ___________ gal/min. with _________ foot drawdown after ________ hours.

Yield: ___________ gal/min. with _________ foot drawdown after ________ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______ gal/min. Surface pressure is _______ lb./sq. inch, or _______ feet of wa-

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled __________ feet.

Depth of completed well __________ feet. Diameter of well __________ inches.

Depth to first water bearing formation __________ feet.

Depth to principal water bearing formation. Top __________ feet to Bottom __________ feet.

Ground Elevation, if known ________________________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perf Casing Loc</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>74</td>
<td>Sand</td>
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<td>74</td>
<td>115</td>
<td>Sand and Gravel</td>
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<td>115</td>
<td>86</td>
<td>Hard Rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>100</td>
<td>Loose Fractured Rock</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:
Was a chemical analysis made? Yes ☐ No ☒

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☒ Acceptable ☐ Poor ☐ Unusable ☐
13. **TABULATION**

   a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

   (Give irrigable acreage in each legal subdivision. If proposed use is for additional supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

   b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Range</th>
<th>Sec.</th>
<th>NE¼</th>
<th>NW¼</th>
<th>SW¼</th>
<th>SE¼</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NE%</td>
<td>NW%</td>
<td>SW%</td>
<td>SE%</td>
<td>NE%</td>
</tr>
</tbody>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED

Original Supply ___________ acres

Additional Supply ___________ acres

14. **PLAT**

   a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

   b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

   c. A separate map may be submitted if the information required cannot be shown on this plat.

![Plat Diagram]

Scale: 2" = 1 Mile

REMARKS:

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STATE OF WYOMING
OFFICE OF THE STATE ENGINEER

IF WELL IS TO BE
ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
ITEM 15, PAGE 4

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 65671 NAME OF WELL Shoffstall No 1

1. NAME OF OWNER John S and Virginia A. Shoffstall

2. ADDRESS P.O. Box 21231 DENVER, CO 80221

3. USE OF WATER: Domestic ☐ Stock Watering ☐ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐

4. LOCATION OF WELL: NE ¼ of Section 13, T. 52 N., R. 61 W., of the 6th P.M. (or W.R.M.),
Wyoming, being specifically Olette County, Wyoming
or 150 ft. North and 250 ft. West from the SE corner of Section 13, T. 52 N., R. 61 W.
(Strike out words not needed).

5. TYPE OF CONSTRUCTION: Drilled ☐ Mayhew 1000 Dug ☐ Driven ☐ Jetted ☐
Other ☐

6. CONSTRUCTION: Total Depth of Well 580 ft. Depth to Static Water Level 475 ft.
   a. Casing Schedule New Used ☐
      5" diameter from ______ ft. to ______ ft. Material Iron Gage 15#
      ______ diameter from ______ ft. to ______ ft. Material ______ Gage ______
      ______ diameter from ______ ft. to ______ ft. Material ______ Gage ______
   b. Perforations: Type of perforator used None Pressure Grouted 40 sq ft per 5000 ft
      Size of perforations ______ inches by ______ inches. TWO DAYS DRILLED OUT
      Number of perforations and depths where perforated:
      ______ perforations from ______ ft. to ______ feet. (Type of Rig)
      ______ perforations from ______ ft. to ______ feet.
   c. Was well screen installed? Yes ☐ No ☐
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
   d. Was well gravel packed? Yes ☐ No ☐
      Size of gravel: ______
   e. Was surface casing used? Yes ☐ No ☐
      Was it cemented in place? Yes ☐ No ☐

7. NAME & ADDRESS OF DRILLER George Drilling 1834 E. Bellfort
     SPOKANE, WA 99204

8. DATE OF COMPLETION OF WELL (Including pump installation) Sept 22, 1984

9. PUMP INFORMATION: Manufacturer Valley Pump Type 5 HP 506
    Source of power 220 Volts Horsepower 5 Depth of Pump Setting 50 ft
    Amount of Water Being Pumped 2.0 Gallons Per Minute. (For springs or flowing wells, see item 11.)

Permit No. U.W. 65671
10. PUMP TEST: Was a pump test made? Yes ☑  No ☐

If so, by whom: [illegible]

Address: [illegible]

Yield: _______ gal/min. with _______ foot drawdown after _______ hours.

Yield: _______ gal/min. with _______ foot drawdown after _______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______ gal/min. Surface pressure is _______ lb/sq. inch, or _______ feet of water.

The flow is controlled by: valve ☐  cap ☐  plug ☐

Does well leak around casing? Yes ☐  No ☐


Depth of completed well: 580 feet. Diameter of well: 7/8 inches.

Depth to first water bearing formation: 480 feet.

Depth to principal water bearing formation: Top _______ feet to Bottom _______ feet.

Ground Elevation, if known: Lost circulation 20’ Drilled Blind

To 512’ Cemented Casing拿了

Circulation to 580’ with 4 1/2” Bit.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Drilled Blind</td>
<td>SET Casing in mudzone 512’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>512</td>
<td>Limestone, Red clay siltake</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:

Was a chemical analysis made? Yes ☑  No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☑  Acceptable ☐  Poor ☐  Unusable ☐
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for additional supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Township</th>
<th>Range</th>
<th>Sec.</th>
<th>NE¼</th>
<th>NW¼</th>
<th>SW¼</th>
<th>SE¼</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>NE%</td>
<td>NW%</td>
<td>SW%</td>
<td>SE%</td>
<td>NE%</td>
</tr>
</tbody>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED

Original Supply _______ acres

Additional Supply _______ acre

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

REMARKS:

- Well Site to 1000 ft, Well Site 200' North of South boundary line and midway between East & West boundary lines.
- Outside waterfront will be limited to flower beds only - Anticipated Area less than one (1) Acre.
### STATE OF WYOMING

**OFFICE OF THE STATE ENGINEER**

**STATEMENT OF COMPLETION AND DESCRIPTION OF WELL**

---

**PERMIT NO. U.W. 69963**

**NAME OF WELL**

**Price #1**

1. **NAME OF OWNER**
   - **John O. Price**

2. **ADDRESS**
   - 2341 RANCH Dr., Westminster, Co.
   - Zip Code: 80234

3. **USE OF WATER**
   - Domestic
   - Stock Watering
   - Irrigation
   - Municipal
   - Industrial
   - Miscellaneous

4. **LOCATION OF WELL**
   - **SW 1/4 NE 1/4** of Section 7, T. 52 N., R. 60 W., of the 6th P.M. (or W.R.M.), Wyoming, being specifically
   - (Bearing and Distance)
   - or _______ ft. North and _______ ft. East from the _______ corner of Section ________, T. _______, N., R. _______.

5. **TYPE OF CONSTRUCTION**
   - Drilled
   - Dug
   - Driven
   - Jetted

6. **CONSTRUCTION**
   - **Total Depth of Well** 158 ft. Depth to Static Water Level 112 ft.
   - **a. Casing Schedule**
     - **Used**
     - **New**
     - **9 3/8 in.** diameter from 0 ft. to 33 ft.
     - Material: **steel**
     - Gage: **1216 psi**
     - **7 5/8 in.** diameter from 33 ft. to 163 ft.
     - Material: **steel**
     - Gage: **1620 psi**
     - **Other**
   - **b. Perforations**
     - Size of perforations: _______ inches by _______ inches.
     - Number of perforations and depths where perforated:
       - _______ perforations from _______ ft. to _______ feet.
       - _______ perforations from _______ ft. to _______ feet.
   - **c. Was well screen installed?**
     - Yes ☐
     - No ☐
     - Diameter: _______ slot size: _______ set from _______ feet to _______ feet.
   - **d. Was well gravel packed?**
     - Yes ☐
     - No ☐
     - Size of gravel: _______.
   - **e. Was surface casing used?**
     - Yes ☐
     - No ☐
     - Was it cemented in place? Yes ☐
     - No ☐

7. **NAME & ADDRESS OF DRILLER**
   - **Giffin Drilling**
   - **Daze Wyo 82723**

8. **DATE OF COMPLETION OF WELL**
   - **June 26 - July 5, 1985**

9. **PUMP INFORMATION**
   - **Manufacturer**
   - **Type**
   - **Source of power**
     - **Elec.**
     - **REA**
   - **Horsepower**
     - 3/4
   - **Depth of Pump Setting**
     - 150
   - **Amount of Water Being Pumped**
     - 20 Gallons Per Minute. (For springs or flowing wells, see item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☒

If so, by whom __________________________ Address __________________________

Yield: ________ gal./min. with ________ foot drawdown after ________ hours.

Yield: ________ gal./min. with ________ foot drawdown after ________ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is ________ gal./min. Surface pressure is ________ lb./sq. inch, or ________ feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☒

12. LOG OF WELL: Total depth drilled ________ feet.

Depth of completed well ________ feet. Diameter of well ________ inches.

Depth to first water bearing formation ________ feet.

Depth to principal water bearing formation. Top ________ feet to Bottom ________ feet.

Ground Elevation, if known ________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforation</th>
<th>Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>22</td>
<td>Surface</td>
<td></td>
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<td>22</td>
<td>30</td>
<td>Aquifer Gravel</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>60</td>
<td>Glacial Lime, Med. Hy.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>60</td>
<td>75</td>
<td>Red Lime, V. Hy.</td>
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<td></td>
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<tr>
<td>75</td>
<td>100</td>
<td>Pink Lime, V. Hy.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>110</td>
<td>White Lime</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>110</td>
<td>Pink Lime</td>
<td>7 GPM</td>
<td>2X3X4</td>
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<td></td>
</tr>
<tr>
<td>110</td>
<td>120</td>
<td>Pink Lime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>135</td>
<td>Purple Shale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>149</td>
<td>White Lime with pink sandpaste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>161</td>
<td>Gray Silt</td>
<td>2X3X4</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>151</td>
<td>152</td>
<td>Red Lime, Very Hy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:
Was a chemical analysis made? Yes ☐ No ☒

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☒ Poor ☐ Unusable ☐
### STATE OF WYOMING
### OFFICE OF THE STATE ENGINEER

**IF WELL IS TO BE ABANDONED, SEE ITEM 15, PAGE 4**

**STATEMENT OF COMPLETION AND DESCRIPTION OF WELL**

- **PERMIT NO. U.W.**: 82153
- **NAME OF WELL**: Bewitched #1

1. **NAME OF OWNER**: Les and Karen Turgeon
2. **ADDRESS**: 230 W Ohio Ave., Spearfish, SD 57783
3. **USE OF WATER**: Domestic [X], Stock Watering [X], Irrigation [X], Municipal [X], Industrial [X], Miscellaneous [X]
4. **LOCATION OF WELL**: Section 15, T. 52 N., R. 61 W., of the 6th P.M. (or W.R.M.), Wyoming, being specifically (Bearing and Distance) 
   - 1760 ft. North, 300 ft. East from the NE corner of Section 15, T. 52 N., R. 61 W. (Strike out words not needed).
5. **TYPE OF CONSTRUCTION**: Drilled [X], Rotary [X], Dug [X], Driven [X], Jetted [X], Other [X]
6. **CONSTRUCTION**: Total Depth of Well 230 ft., Depth to Static Water Level 110 ft.
   - **a. Casing Schedule**
     - New [X], Used [X]
     - **diameter from** ft. to **160 ft.**
     - **Material**: PVC
     - **Gage**: 200#

   - **b. Perforations**: Type of perforator used
     - Size of perforations ______ inches by ______ inches.
     - Number of perforations and depths where perforated:
       - ______ perforations from ______ ft. to ______ feet.
       - ______ perforations from ______ ft. to ______ feet.

   - **c. Was well screen installed?** Yes [X], No [X]
     - Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
     - Diameter: ______ slot size: ______ set from ______ feet to ______ feet.

   - **d. Was well gravel packed?** Yes [X], No [X]
     - Size of gravel ______

   - **e. Was surface casing used?** Yes [X], No [X]
     - Was it cemented in place? Yes [X], No [X]

7. **NAME & ADDRESS OF DRILLER**: Teddy Ellingson, Spearfish, SD.
8. **DATE OF COMPLETION OF WELL (including pump installation)**: 9-8-90
9. **PUMP INFORMATION**: Manufacturer: Burkhardt Sub Type: Submersible
   - **Source of power**: Electric
   - **Horsepower**: 1/6 HP
   - **Depth of Pump Setting**: 156'
   - **Amount of Water Being Pumped**: 10 Gallons Per Minute.

---

**Permit No. U.W. 82153**
**Book No. 602**
**Page No. 54**
10. PUMP TEST: Was a pump test made? Yes □ No □
   If so, by whom ___________________________ Address ___________________________
   Yield: ________ gal./min. with ________ foot drawdown after ________ hours.
   Yield: ________ gal./min. with ________ foot drawdown after ________ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).
   If well yields artesian flow, yield is ________ gal./min. Surface pressure is ________ lb./sq. inch, or ________ feet of water.
   The flow is controlled by: valve □ cap □ plug □
   Does well leak around casing? Yes □ No □

12. LOG OF WELL: Total depth drilled ________ feet.
   Depth of completed well ________ feet. Diameter of well ________ inches.
   Depth to first water bearing formation ________ feet.
   Depth to principal water bearing formation. Top ________ feet to Bottom ________ feet.
   Ground Elevation, if known __________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforation Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-40</td>
<td>40</td>
<td>Brown Sand, Soil</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>40-80</td>
<td>80</td>
<td>Yellow Sand (Soft)</td>
<td></td>
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<tr>
<td>80-120</td>
<td>120</td>
<td>Pink Sand, Stone</td>
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<tr>
<td>120-135</td>
<td>135</td>
<td>Breccia, Pink</td>
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<tr>
<td>135-230</td>
<td>230</td>
<td>White to Pink, Lime Stone</td>
<td>120-230</td>
<td></td>
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</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:
   Was a chemical analysis made? Yes □ No □
   If so, please include a copy of the analysis with this form.
   If not, do you consider the water as: Good □ Acceptable □ Poor □ Unusable □
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for additional supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Range</th>
<th>Sec.</th>
<th>NE 1/4</th>
<th>NE 1/4</th>
<th>NW 1/4</th>
<th>NW 1/4</th>
<th>SW 1/4</th>
<th>SW 1/4</th>
<th>SE 1/4</th>
<th>SE 1/4</th>
<th>TOTALS</th>
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<tbody>
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<td>NE 1/4</td>
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</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED

Original Supply ______ acres
Additional Supply ______ acres

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

<table>
<thead>
<tr>
<th>R____ W.</th>
<th>R____ W.</th>
<th>Scale: 2&quot; = 1 Mile</th>
</tr>
</thead>
<tbody>
<tr>
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<td>T.____ N.</td>
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<td></td>
<td>T.____ N.</td>
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<td>X</td>
</tr>
</tbody>
</table>

REMARKS: 1760 North + 300 East of SW Corner
STATE OF WYOMING  
OFFICE OF THE STATE ENGINEER  
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

<table>
<thead>
<tr>
<th>PERMIT NO. U.W</th>
<th>NAME OF WELL</th>
<th>Smith Canyon #1</th>
</tr>
</thead>
</table>

1. NAME OF OWNER: Haisar Enterprise Inc.

2. ADDRESS: Rawlah, Wyo.  
Zip Code: 82712

3. USE OF WATER:  
- Domestic [ ]  
- Stock Watering [ ]  
- Irrigation [ ]  
- Municipal [ ]  
- Industrial [ ]  
- Miscellaneous [ ]

4. LOCATION OF WELL: NE ¹/₄ SW ¹/₄ of Section 17, T. 52 N., R. 60 W., of the 6th P.M. (or W.R.M.),  
Wyoming, being specifically  
(Bearing and Distance)  
or. _______ ft. North and _______ ft. East from the _______ corner of Section, T. _______, N., R. _______.  
(Strike out words not needed).

5. TYPE OF CONSTRUCTION: Drilled [ ]  
Cable Tool [ ]  
Dug [ ]  
Driven [ ]  
Jetted [ ]  
Other [ ]

6. CONSTRUCTION: Total Depth of Well _______ ft.  
Depth to Static Water Level _______ ft.

   a. Casing Schedule: New [ ]  
   Used [ ]

      8 in diameter from 0 ft. to 3½ ft. Material: steel  
      Gage: ________

   b. Perforations: Type of perforator used: None

      Size of perforations _______ inches by _______ inches.

      Number of perforations and depths where perforated:  
      _______ perforations from _______ ft. to _______ feet.
      _______ perforations from _______ ft. to _______ feet.

   c. Was well screen installed? Yes [ ]  No [ ]

      Diameter: _______ slot size: _______ set from _______ feet to _______ feet.

      Diameter: _______ slot size: _______ set from _______ feet to _______ feet.

   d. Was well gravel packed? Yes [ ]  No [ ]

      Size of gravel: _______.

   e. Was surface casing used? Yes [ ]  No [ ]

      Was it cemented in place? Yes [ ]  No [ ]

7. NAME & ADDRESS OF DRILLER: J.H. Holwell & Sons, Gage, Wyo. by Quintin Holwell

8. DATE OF COMPLETION OF WELL (including pump installation): Nov. 13, 1956

9. PUMP INFORMATION: Manufacturer _______  
Type _______  
Source of power _______  
Horsepower _______  
Depth of Pump Setting _______  
Amount of Water Being Pumped _______ Gallons Per Minute. (For springs or flowing wells, see item 11.)

Permit No. U.W. 82694  
Book No. 607  
Page No. 95
10. **PUMP TEST**: Was a pump test made? Yes ☐ No ☐

If so, by whom ___________________________ Address ___________________________

Yield: __________ gal./min. with _______ foot drawdown after _______ hours.

Yield: __________ gal./min. with _______ foot drawdown after _______ hours.

11. **FLOWING WELL** (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is __________ gal./min. Surface pressure is _______ lb./sq. inch, or _______ feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. **LOG OF WELL**: Total depth drilled _______ feet.

  Depth of completed well _______ feet. Diameter of well _______ inches.

  Depth to first water bearing formation _______ feet.

  Depth to principal water bearing formation Top _______ feet to Bottom _______ feet.

  Ground Elevation, if known _______ ft.

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforate Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>20</td>
<td>Surface</td>
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<td>80</td>
<td>90</td>
<td>Conglomerate Shale</td>
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<td>90</td>
<td>100</td>
<td>Red Sand</td>
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<td>130</td>
<td>140</td>
<td>Yellow sand</td>
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</tbody>
</table>

**QUALITY OF WATER INFORMATION**;

Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 16, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acres in each legal subdivision. If supplemental supply for lands with a right from another source, indicate the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Township</th>
<th>Range Sec.</th>
<th>NE 1/4</th>
<th>NW 1/4</th>
<th>SW 1/4</th>
<th>SE 1/4</th>
<th>TOTALS</th>
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<td>NWN1</td>
<td>SWN1</td>
<td>NTVN</td>
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</tbody>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED:_____

Original Supply:______ acres
Supplemental Supply:______ acres

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

```
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REMARKS:

```
STATE OF WYOMING  
OFFICE OF THE STATE ENGINEER  

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 82695  
NAME OF WELL  Sand Creek # 1

1. NAME OF OWNER  Halaar Enterprise Inc.

2. ADDRESS  Beulah, Wyo.  
Zip Code. 82712

3. USE OF WATER:  Domestic  Stock Watering  Irrigation  Municipal  Industrial  Miscellaneous

4. LOCATION OF WELL:  SW 1/4 NE 1/4 of Section 8, T. 52 N., R. 60 W., of the 6th P.M. (or W.R.M.),  
Wyoming, being specifically
(Bearing and Distance)

or_________ ft. North and _________ ft. East from the corner of Section, T____ N., R____ W.  
(Strike out words not needed).

5. TYPE OF CONSTRUCTION; Drilled  Cable Tool  Dug  Driven  Jetted  
Other

6. CONSTRUCTION; Total Depth of Well 185 ft.  
Depth to Static Water Level 10 ft.

   a. Casing Schedule  New  Used

      7 diameter from 0 ft. to 185 ft.  Material  steel  Gage

      diameter from ______ ft. to ______ ft.  Material  Gage

      diameter from ______ ft. to ______ ft.  Material  Gage

   b. Perforations:  Type of perforator used  Torton out

      Size of perforations   1/2 inches by 2 inches.

      Number of perforations and depths where perforated:

      10 perforations from 95 ft. to 100 feet.

      20 perforations from 125 ft. to 148 feet.

   c. Was well screen installed?  Yes  No

      Diameter:  ______ slot size:  ______ set from ______ feet to ______ feet.

      Diameter:  ______ slot size:  ______ set from ______ feet to ______ feet.

   d. Was well gravel packed?  Yes  No

   e. Was surface casing used?  Yes  No

   f. Was it cemented in place?  Yes  No

7. NAME & ADDRESS OF DRILLER  Gerald Shana  no address given

8. DATE OF COMPLETION OF WELL (including pump installation)  Apr 11 1950

9. PUMP INFORMATION:  Manufacturer.  Type  Pump Jack

      Source of power:  Electricity  Horsepower:  1/2  Depth of Pump Setting:  50

      Amount of Water Being Pumped:  5 Gallons Per Minute.  (For springs or flowing wells, see item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐

If so, by whom ____________________________ Address ____________________________

Yield: ______ gal/min. with ______ foot drawdown after ______ hours.
Yield: ______ gal/min. with ______ foot drawdown after ______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is ______ gal/min. Surface pressure is ______ lb./sq. inch, or ______ feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled ______ feet.

Depth of completed well ______ feet. Diameter of well ______ inches.

Depth to first water bearing formation ______ feet.

Depth to principal water bearing formation Top ______ feet to Bottom ______ feet.

Ground Elevation, if known ____________________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shotf, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perfora'te Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>38</td>
<td>Boulder &amp; Gravel sand</td>
<td></td>
<td></td>
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<td>74</td>
<td>Red sand, Soft shale</td>
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<tr>
<td>74</td>
<td>95</td>
<td>limestone</td>
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<td>185</td>
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<td>Limestone</td>
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</tbody>
</table>

QUALITY OF WATER INFORMATION;

Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for supplemental supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Range</th>
<th>Sec.</th>
<th>NE 1/4</th>
<th>NW 1/4</th>
<th>SW 1/4</th>
<th>SE 1/4</th>
<th>TOTALS</th>
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</tr>
</tbody>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED__________

Original Supply__________ acres
Supplemental Supply__________ acres

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For each use, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

Scale: 2" = 1 Mile

REMARKS:

________________________
________________________
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

PERMIT NO. U.W. 82696  NAME OF WELL  Hilton #1

1. NAME OF OWNER  Hailar Enterprise Inc.

2. ADDRESS  Boulay, Wyo.  Zip Code  82712

3. USE OF WATER: Domestic ☑  Stock Watering ☐  Irrigation ☐  Municipal ☐  Industrial ☐  Miscellaneous ☐

4. LOCATION OF WELL: SE 1/4  SE 1/4 of Section 9, T. 52 N., R. 60 W., of the 8th P.M. (or W.R.M.), Wyoming, being specifically

   or  ______ ft. North and ______ ft. East from the ______ corner of Section ______, T. ______ N., R. ______ W.
   (Strike out words not needed).

5. TYPE OF CONSTRUCTION: Drilled ☑  Cable tool ☐  Dug ☐  Driven ☐  Jetted ☐
   (Type of Rig)
   Other ☐

6. CONSTRUCTION: Total Depth of Well  173 ft.  Depth to Static Water Level  13 ft.
   a. Casing Schedule: New ☑  Used ☐
      7 diameter from 0 ft. to  86 ft.  Material  steel  Gage ______
      ______ diameter from ______ ft. to ______ ft.  Material ______  Gage ______
      ______ diameter from ______ ft. to ______ ft.  Material ______  Gage ______
   b. Perforations: Type of perforator used  Torch out
      Size of perforations  1/2 inches by 2 inches.
      Number of perforations and depths where perforated:
      ______ perforations from ______ ft. to ______ ft.
      ______ perforations from ______ ft. to ______ ft.
   c. Was well screen installed?  Yes ☑  No ☐
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
   d. Was well gravel packed?  Yes ☑  No ☐  Size of gravel  1 in
   e. Was surface casing used?  Yes ☑  No ☐  Was it cemented in place?  Yes ☑  No ☐

7. NAME & ADDRESS OF DRILLER  J.H. Holwell & Sons Osage Wyo.  by Gene Holwell

8. DATE OF COMPLETION OF WELL (including pump installation)  Nov. 1959

9. PUMP INFORMATION: Manufacturer: ______ Type ______
   Source of power  Stiphon  Horsepower ______ Depth of Pump Setting  20
   Amount of Water Being Pumped  10 Gallons Per Minute. (For springs or flowing wells, see item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐

If so, by whom: [Name] Address: [Address]

Yield: ______ gal./min. with ______ foot drawdown after ______ hours.

Yield: ______ gal./min. with ______ foot drawdown after ______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is ______ gal./min. Surface pressure is ______ lb./sq. inch, or ______ feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled ______ feet.

Depth of completed well ______ feet. Diameter of well ______ inches.

Depth to first water bearing formation ______ feet.

Depth to principal water bearing formation Top ______ feet to Bottom ______ feet.

Ground Elevation, if known: ______ ft

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shotf, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforate Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
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<td>125</td>
<td>165</td>
<td>Yellow sand</td>
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<td>165</td>
<td>173</td>
<td>Purple sand</td>
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</tbody>
</table>

QUALITY OF WATER INFORMATION:

Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
13. TABULATION

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the "Remarks" section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for supplemental supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the "Remarks" section under Item 14.

<table>
<thead>
<tr>
<th>Township</th>
<th>Range Sec.</th>
<th>NE1/4 NW1/4 SW1/4 SE1/4</th>
<th>NE1/4 NW1/4 SW1/4 SE1/4</th>
<th>NE1/4 NW1/4 SW1/4 SE1/4</th>
<th>NE1/4 NW1/4 SW1/4 SE1/4</th>
<th>NE1/4 NW1/4 SW1/4 SE1/4</th>
<th>TOTALS</th>
</tr>
</thead>
</table>

TOTAL NUMBER OF ACRES TO BE IRRIGATED

Original Supply ____________________ acres
Supplemental Supply ____________________ acres

14. PLAT

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in "Remarks" section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

Scale: 2" = 1 Mile

REMARKS:
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
ITEM 15, PAGE 4

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 84063 NAME OF WELL: TUF 42

1. NAME OF OWNER: TUF RANCHES

2. ADDRESS: P.O. Box 388, Beijing, WY Zip Code: 82042

3. USE OF WATER: Domestic X Stock Watering Stock Irrigation Municipal Industrial Miscellaneous

4. LOCATION OF WELL: NE 1/4 NE 1/4 of Section 27, T. 53 N., R. 61 W., of the 6th P.M. (or W.R.M.), Wyoming, being specifically (Bearing and Distance)
   or_______ ft. North and_______ ft. East from the_______ corner of Section______, T._______, R._______.
   (Strike out words not needed.)

5. TYPE OF CONSTRUCTION: Drilled X FORWARD ROTARY Dug □ Driven □ Jetted □
   Other

6. CONSTRUCTION: Total Depth of Well 900 ft. Depth to Static Water Level 90 ft.

   a. Casing Schedule New Used □
      5 1/2 diameter from 0 ft. to 560 ft. Material STEEL Gage 15
      ________ diameter from ________ ft. to ________ ft. Material ________ Gage ________
      ________ diameter from ________ ft. to ________ ft. Material ________ Gage ________

   b. Perforations: Type of perforator used None
      Size of perforations ________ inches by ________ inches.
      Number of perforations and depths where perforated:
      ________ perforations from ________ ft. to ________ feet.
      ________ perforations from ________ ft. to ________ feet.

   c. Was well screen installed? Yes □ No □
      Diameter: ________ slot size: ________ set from ________ feet to ________ feet.
      Diameter: ________ slot size: ________ set from ________ feet to ________ feet.

   d. Was well gravel packed? Yes □ No □
      Size of gravel ________

   e. Was surface casing used? Yes □ No □
      Was it cemented in place? Yes □ No □

7. NAME & ADDRESS OF DRILLER: GRAF DRILLING, BELLE FOURCHE

8. DATE OF COMPLETION OF WELL (including pump installation) 1/20/91

9. PUMP INFORMATION: Manufacturer: MYERS Type SUBMERSIBLE
   Source of power ________ Horsepower 1 1/2 Depth of Pump Setting 370
   Amount of Water Being Pumped 10 GPM Gallons Per Minute. (For springs or flowing wells, see Item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐
If so, by whom GRAF DRILLING Address BELLE FOURCHE, S.D.
Yield: 10 gal/min. with 10.0 foot drawdown after _______ hours.
Yield: _________gal/min. with _______ foot drawdown after _______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).
If well yields artesian flow, yield is _______ gal/min. Surface pressure is _______ lb/sq. inch, or _______ feet of water.
The flow is controlled by: valve ☐ cap ☐ plug ☐
Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled 900 _______ feet.
Depth of completed well 900 _______ feet. Diameter of well _______ inches.
Depth to first water bearing formation 545 _______ feet.
Depth to principal water bearing formation. Top 513 _______ feet to Bottom 900 _______ feet.
Ground Elevation, if known _______  

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>Remarks (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforat Casing Location</th>
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</thead>
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<tr>
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<td>500</td>
<td>545</td>
<td>APHINE</td>
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<td>545</td>
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<td>MINERALLA</td>
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<tr>
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<td>960</td>
<td>HARD FINE SAND</td>
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<td>PINK SAND ROCK</td>
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<tr>
<td>870</td>
<td>880</td>
<td>HARD DARK SAND</td>
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<td>880</td>
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<tr>
<td>890</td>
<td>20 GPM</td>
<td>20 GPM FROM BIT</td>
<td>WATER HAS GAS IN IT (DEAD GDS)</td>
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</tbody>
</table>

QUALITY OF WATER INFORMATION:
Was a chemical analysis made? Yes ☐ No ☐
If so, please include a copy of the analysis with this form.
If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL ITEM 15, PAGE 4

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 84743
NAME OF WELL Vore Well - Recharge

1. NAME OF OWNER Ron Vore

2. ADDRESS Box 306 Buena, Wy Zip Code 82712

3. USE OF WATER: Domestic ☑ Stock Watering ☑ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐

4. LOCATION OF WELL: NW 1/4 SE 1/4 of Section 26, T 53 N, R 61 W, of the 6th P.M. (or W.R.M.), Wyoming, being specifically ________________________ (Bearing and Distance)

or ______ ft. North and ______ ft. East from the ______ corner of Section _______, T. _______, R. ______ W.

5. TYPE OF CONSTRUCTION: Drilled ☑ Cable Tool ☐ Dug ☐ Driven ☐ Jetted ☐ Other ______________

6. CONSTRUCTION: Total Depth of Well 955 ft. Depth to Static Water Level 24 ft.

   a. Casing Schedule New ☑ Used ☐

   " diameter from 0 ft. to 830 ft. Material Steel Gage ☐

   " diameter from ______ ft. to ______ ft. Material ______ Gage ______

   " diameter from ______ ft. to ______ ft. Material ______ Gage ______

   b. Perforations: Type of perforator used ________________________

   Size of perforations 7 inches by 7 inches.

   Number of perforations and depths where perforated:

   ______ perforations from 775 ft. to 830 feet.

   ______ perforations from ______ ft. to ______ feet.

   c. Was well screen installed? Yes ☑ No ☐

   Diameter: _______ slot size: _______ set from _______ feet to _______ feet.

   Diameter: _______ slot size: _______ set from _______ feet to _______ feet.

   d. Was well gravel-packed? Yes ☑ No ☐

   Size of gravel ________________________

   e. Was surface casing used? Yes ☑ No ☐

   Was it cemented in place? Yes ☑ No ☐

7. NAME & ADDRESS OF DRILLER Unknown

8. DATE OF COMPLETION OF WELL (including pump installation) March 21, 1955

9. PUMP INFORMATION: Manufacturer Myers Type Jet

   Source of power Electric Horsepower ______ Depth of Pump Setting ______

   Amount of Water Being Pumped 7 Gallons Per Minute. (For springs or flowing wells, see item 11.)
10. **PUMP TEST:** Was a pump test made? Yes ☐  No ☒

If so, by whom ____________________________ Address ____________________________

Yield: _______ gal./min. with _______ foot drawdown after _______ hours.

Yield: _______ gal./min. with _______ foot drawdown after _______ hours.

11. **FLOWING WELL** (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______ gal./min. Surface pressure is _______ lb./sq. inch, or _______ feet of water.

The flow is controlled by: valve ☐  cap ☐  plug ☐

Does well leak around casing? Yes ☐  No ☐

12. **LOG OF WELL:** Total depth drilled _______ 855 _______ feet.

Depth of completed well _______ 830 _______ feet. Diameter of well _______ 8 _______ inches.

Depth to first water bearing formation _______ 555 _______ feet.

Depth to principal water bearing formation. Top _______ 555 _______ feet to Bottom _______ 830 _______ feet.

Ground Elevation, if known ____________________________

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
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<td>322</td>
<td>Minnecavo Limestone</td>
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<td>830</td>
<td>Minnecavo - Ls &amp; Ss. Red</td>
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<td>775-830</td>
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</table>

**QUALITY OF WATER INFORMATION:**

Was a chemical analysis made? Yes ☒  No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐  Acceptable ☐  Poor ☐  Unusable ☐
13. **TABULATION**

a. If for irrigation, the land proposed to be irrigated should be described in the following tabulation. Describe in the “Remarks” section, under Item 14, the means of conveying the water to the lands and the method of irrigation.

(Give irrigable acreage in each legal subdivision. If proposed use is for additional supply for lands with a right from another source, indicate in the tabulation the priority or permit number, the source of supply and the name of the ditch or other well.)

b. If not used for irrigation, show the area and point(s) of use and location of well in the tabulation below. Also describe the method of conveyance in the “Remarks” section under Item 14.

### TOTAL NUMBER OF ACRES TO BE IRRIGATED

<table>
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<tr>
<th>Range</th>
<th>Sec.</th>
<th>NE½</th>
<th>NW½</th>
<th>SW½</th>
<th>SE½</th>
<th>TOTALS</th>
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<td>SW½</td>
<td>SE½</td>
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<td>NE½</td>
<td>NW½</td>
<td>SW½</td>
<td>SE½</td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**

NE%  NEW  NWW  SW%  SWN  SEN

T. ___ N.

**TOTALS**

Original Supply _______ acres
Additional Supply _______ acres

14. **PLAT**

a. If the well is to be used for irrigation, industrial, miscellaneous or municipal use, show the location of the well on the plat below. For such uses, a plat certified by a licensed engineer or land surveyor is required to be submitted at the time the Proof of Appropriation and Beneficial Use of Ground Water is submitted.

b. For other uses, accurately show the well location, point of use or uses and describe method of conveyance of water to points of use on plat and in “Remarks” section below. Make certain location on plat agrees with written description.

c. A separate map may be submitted if the information required cannot be shown on this plat.

![Plat Diagram]

**REMARKS:**
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
ITEM 15, PAGE 4

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 05420
NAME OF WELL: COMON-2

1. NAME OF OWNER
   a) COMMISSIONER PUBLIC LANDS

2. ADDRESS
   i) WYOMING STATE ENGINEER'S OFFICE
   ii) HEERSCHEWER RD., N-E, CHEYENNE WY Zip Code: 82002

3. USE OF WATER: Domestic □ Stock Watering □ Irrigation □ Municipal □ Industrial □ Miscellaneous □

4. LOCATION OF WELL: 1/4 W1/4 T2 Sec. 16, T. 59 N., R. 60 W., of the 6th P.M. (or W.R.M.),
   Wyoming, being specifically__________________________
   (Bearing and Distance)
   or ___________ ft. North and ___________ ft. East
   from the corner of Section ___________ T. ___________ N R. ___________ W.
   (Strike out words not needed.)

5. TYPE OF CONSTRUCTION: Drilled □ Rotary □ Dug □ Driven □ Jetted □
   Other ________________

6. CONSTRUCTION: Total Depth of Well 1539 ft. Depth to Static Water Level 50 ft.
   a. Casing Schedule
      New □ Used □
      5/8" diameter from 0 ft. to 1469 ft. Material STEEL Gage 16.50 #
      ________ diameter from ________ ft. to ________ ft. Material ________ Gage ________
      ________ diameter from ________ ft. to ________ ft. Material ________ Gage ________
   b. Perforations: Type of perforator used None, OPEN HOLE COMPAT
      Size of perforations ________ inches by ________ inches.
      Number of perforations and depths where perforated:
      ________ perforations from ________ ft. to ________ feet.
      ________ perforations from ________ ft. to ________ feet.
   c. Was well screen installed? Yes □ No (X)
      Diameter: ________ slot size: ________ set from ________ feet to ________ feet.
      Diameter: ________ slot size: ________ set from ________ feet to ________ feet.
   d. Was well gravel packed? Yes □ No (X)
      Size of gravel ________
   e. Was surface casing used? Yes □ No (X)
      Was it cemented in place? Yes □ No (X)

7. NAME & ADDRESS OF DRILLER
   RUBY DRILLING

8. DATE OF COMPLETION OF WELL (including pump installation) JULY 31, 1991

9. PUMP INFORMATION: Manufacturer None Type
    Source of power ________ Horsepower ________ Depth of Pump Setting ________
    Amount of Water Being Pumped ________ Gallons Per Minute. (For springs or flowing wells, see item 11.)

Permit No. U.W. 05420 Book No. 635 Page No. 21
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐

If so, by whom Ruby DRILLING Address GILLETTE

Yield: 60 gal/min. with 0 foot drawdown after 4 hours.

Yield: __________ gal/min. with __________ foot drawdown after ______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is 60 gal/min. Surface pressure is 69 lb/sq. inch, or 159 feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled 1539 feet.

Depth of completed well 1539 feet. Diameter of well 7 3/8 inches.

Depth to first water bearing formation 1068 feet.

Depth to principal water bearing formation. Top 1480 feet to Bottom 1540 feet.

Ground Elevation, if known 3480'

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEE ATTACHED</td>
<td>SEE COPY OF GAMMA-SP-RESISTIVITY LOG IN 2-LOD FILE.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

QUALITY OF WATER INFORMATION:

Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unsuitable ☐
### Wyoming State Engineer's Office

**Madison Fm. Ground Water Assessment—Northeastern Wyoming**

**WELL NAME:** CCMOW-7  
**DATE:** 7-15-91  
**PERMIT NO:** U.W. 81908  
**N 1/4, 1/4, 1/4, SECTION 16, T. 48 N., R. 62 W.**

<table>
<thead>
<tr>
<th>BIT, RECORD</th>
<th>DRILLING RATE</th>
<th>MIN/FT</th>
<th>LITHOLOGY</th>
<th>DEPTH</th>
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**PAGE 1 OF 9**
Wyoming State Engineer's Office

Madison Fm. Ground Water Assessment-Northeastern Wyoming

WELL NAME DOCHOW-1, DATE 7-18-91, PERMIT NO. U.W. 854470
N 1/2 1/4 S 2 1/4, SECTION 16, T. 55, R. 60

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PAGE 8 OF 9
## OFFICIAL ANALYTICAL REPORT

**Sample:** Water  
**Date Collected:** October 30, 1991  
**Date Received:** November 6, 1991  
**Date Completed:** January 28, 1992

Ray Murphy  
State Engineer’s Office  
Herschler Bldg, 4 East  
Cheyenne, WY 82002

### Analytical Results

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---

I hereby certify that the above was analyzed by myself or my assistant.

[Signature]

Rost

[Signature]  
VICT. SUPERVISOR

[Signature]  
DIRECTOR
# STATE OF WYOMING
## OFFICE OF THE STATE ENGINEER
### IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL
#### ITEM 15, PAGE 4

<table>
<thead>
<tr>
<th>PERMIT NO. U.W.</th>
<th>NAME OF WELL</th>
<th>CONOM-2A</th>
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</thead>
</table>

1. **NAME OF OWNER**
   1) Wyoming State Engineer's Office
   2) Commissioner Public Lands

2. **ADDRESS**
   Herschler Bldg., 4-E Cheyenne, WY Zip Code 82002

3. **USE OF WATER**
   - Domestic
   - Stock Watering
   - Irrigation
   - Municipal
   - Industrial
   - Miscellaneous

4. **LOCATION OF WELL**
   - Wyoming, being specifically (Bearing and Distance)
   - or, _______ ft. North and _______ ft. East from the _______ corner of Section _______ T. _______ R. _______ W.
   - (Please note words not needed)

5. **TYPE OF CONSTRUCTION**
   - Drilled [ ] Rotary [ ]
   - Dug [ ] Driven [ ] Jetted [ ]
   - Other

6. **CONSTRUCTION**
   - Total Depth of Well: _______ ft. Depth to Static Water Level: _______ ft.
   - a. Casing Schedule
      - New [ ] Used [ ]
      - 6 1/2" diameter from _______ ft. to _______ ft. Material: STEEL Gage: A6.00#
      - _______ diameter from _______ ft. to _______ ft. Material: _______ Gage: _______
      - _______ diameter from _______ ft. to _______ ft. Material: _______ Gage: _______
   - b. Perforations
      - Size of perforations _______ inches by _______ inches.
      - Number of perforations and depths where perforated:
        - _______ perforations from _______ ft. to _______ feet.
        - _______ perforations from _______ ft. to _______ feet.
   - c. Was well screen installed? [ ] Yes [ ] No [ ]
      - Diameter: _______ slot size: _______ set from _______ foot to _______ foot.
      - Diameter: _______ slot size: _______ set from _______ foot to _______ foot.
   - d. Was well gravel packed? [ ] Yes [ ] No [ ]
      - Size of gravel: _______
   - e. Was surface casing used? [ ] Yes [ ] No [ ]
      - Was it cemented in place? Yes [ ] No [ ]

7. **NAME & ADDRESS OF DRILLER**
   - Baby Drilling Co.

8. **DATE OF COMPLETION OF WELL**
   - Including pump installation: Aug 9, 1991

9. **PUMP INFORMATION**
   - Manufacturer: [ ] New [ ] Type
   - Source of power: _______ Horsepower: _______ Depth of Pump Setting: _______ 
   - Amount of Water Being Pumped: _______ Gallons Per Minute. (For springs or flowing wells, see Item 11.)

---

Permit No. U.W. 85421 
Book No. 635 
Page No. 22
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐

If so, by whom _____________________________________________________ Address ________________________________________________________________

Yield: _______ gal./min. with _____ foot drawdown after ___ hours.

Yield: _______ gal./min. with _____ foot drawdown after ___ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______ gal./min. Surface pressure is ___ lb./sq. inch, or ___ feet of water.

The flow is controlled by: valve ☐ cap ☐ plug ☐

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled _____ feet.

Depth of completed well _____ feet. Diameter of well ___ inches.

Depth to first water bearing formation _____ feet.

Depth to principal water bearing formation. Top _____ feet to Bottom _____ feet.

Ground Elevation, if known ________________

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<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
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QUALITY OF WATER INFORMATION:

Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐
SAMPLE: WATER  
DATE COLLECTED: August 9, 1991  
DATE RECEIVED: November 6, 1991  
DATE COMPLETED: January 31, 1992  
WR: 85421  
Ray Murphy  

State Engineer's Office  
Herschler Bldg, 4 East  
Cheyenne, WY 82002  

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I hereby certify that the above was analyzed by myself or my assistant.
**STATE OF WYOMING**

**OFFICE OF THE STATE ENGINEER**

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL

ITEM 15, PAGE 4

---

**PERMIT NO. U.W.**

**NAME OF WELL.**

**NAME OF OWNER.** Wyo. State Engineer's Office

**ADDRESS.** HERSHEL BLDG., Cheyenne, WY

**ZIP CODE.** 82001

**USE OF WATER.** Domestic ☐ Stock Watering ☐ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐

**GROUND WATER ASSESSMENT.**

**LOCATION OF WELL.** SE 1/4 SE 1/4 of Section 18, T. 15 S., R. 61 W., of the 6th P.M. (or W.R.M.),

Wyoming, being specifically __________

(Bearing and Distance)

or. __________ ft. North and __________ ft. East from the __________ corner of Section __________, T. __________ N., R. __________ W.

Strike out words not needed.

**TYPE OF CONSTRUCTION.** Drilled ☐ Rotary ☐ Dug ☐ Driven ☐ Jetted ☐

Other __________

**CONSTRUCTION.**

1. **Casing Schedule.** New ☐ Used ☐

- 5 1/2 diameter from __________ ft. to __________ ft.
  - Material: STEEL Gage __________

- __________ diameter from __________ ft. to __________ ft.
  - Material: __________ Gage __________

- __________ diameter from __________ ft. to __________ ft.
  - Material: __________ Gage __________

2. **Perforations.** Type of perforator used: None. Well not completed.

Size of perforations __________ inches by __________ inches.

Number of perforations and depths where perforated:

- __________ perforations from __________ ft. to __________ feet.
- __________ perforations from __________ ft. to __________ feet.

3. **Well Screen Installed?**

- Yes ☐ No ☐

Diameter: __________ slot size: __________ set from __________ feet to __________ feet.

Diameter: __________ slot size: __________ set from __________ feet to __________ feet.

4. **Was gravel packed?**

- Yes ☐ No ☐

Size of gravel __________

5. **Was surface casing used?**

- Yes ☐ No ☐

Was it cemented in place? Yes ☐ No ☐

6. **NAME & ADDRESS OF DRILLER.** Ruby Drilling Co., Gillette, WY

7. **DATE OF COMPLETION OF WELL (including pump installation).** Aug. 19, 1991

8. **PUMP INFORMATION.**

- Manufacturer: None
  - Type: __________

Source of power __________ Horsepower __________ Depth of Pump Setting __________

Amount of Water Being Pumped __________ Gallons Per Minute. (For springs or flowing wells, see item 11.)

---

**Permit No. U.W.** 85805

**Book No.** 639

**Page No.** 6
10. PUMP TEST: Was a pump test made?  Yes ☐  No ☐

If so, by whom ___________________________________________ Address ________________________________

Yield: _______ gal./min. with _______ foot drawdown after _______ hours.

Yield: _______ gal./min. with _______ foot drawdown after _______ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is _______ gal./min. Surface pressure is _______ lb./sq. inch, or _______ feet of water.

The flow is controlled by: valve ☐  cap ☐  plug ☐

Does well leak around casing?  Yes ☐  No ☐

12. LOG OF WELL: Total depth drilled ________________ feet.

   Depth of completed well 867 feet. Diameter of well 1 1/8 inches.
   Depth to first water bearing formation 170 feet.
   Depth to principal water bearing formation. Top 825 feet to Bottom 867 feet.

Ground Elevation, if known 4000

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<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
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QUALITY OF WATER INFORMATION:

Was a chemical analysis made?  Yes ☐  No ☐

If so, please include a copy of the analysis with this form.

If not, do you consider the water as: Good ☐  Acceptable ☐  Poor ☐  Unusable ☐
# OFFICIAL ANALYTICAL REPORT

**SAMPLE:** WATER  
**DATE COLLECTED:** October 27, 1991  
**DATE RECEIVED:** November 6, 1991  
**DATE COMPLETED:** January 28, 1992  
**UW:** 85805  
Ray Murphy  
Simons  
CCMOW-5 MAD. FM.  
Cheyenne, WY 82002

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**Certification:**  
I hereby certify that the above was analyzed by myself or my assignee.

_______________________,  
SECT. SUPERVISOR  
_______________________,  
DIRECTOR
STATE OF WYOMING  
OFFICE OF THE STATE ENGINEER

IF WELL IS TO BE ABANDONED, SEE STATEMENT OF COMPLETION AND DESCRIPTION OF WELL  
ITEM 15, PAGE 4

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 85806  
NAME OF WELL: MON-5A

1. NAME OF OWNER: Wyo. State Engineer's Office

2. ADDRESS: 
   Herschler Blvd., Cheyenne, WY  
   Zip Code: 82008

3. USE OF WATER: Domestic □ Stock Watering □ Irrigation □ Municipal □ Industrial □ Miscellaneous □

4. LOCATION OF WELL: SE 1/4 of Section 32, T. 53 N., R. 61 W., of the 6th P.M. (or W.R.M.),
   Wyoming, being specifically
   _________________________________ (Bearing and Distance)
   or
   _______________________________ ft. North and _______________________________ ft. East
   from the __________________ corner of Section _____, T. _____ N., R. _____ W.
   (Strike out words not needed).

5. TYPE OF CONSTRUCTION: Drilled □ Rotary □ Dug □ Driven □ Jetted □
   Other _________________________________

6. CONSTRUCTION: Total Depth of Well 580 ft. Depth to Static Water Level 986 ft.
   a. Casing Schedule
      New □ Used ☑
      
      | Diameter | From   | To   |
      |----------|--------|------|
      | 5 1/2    | 0 ft.  | 460 ft. |
      | 4         | 460 ft.| 986 ft. |
      | Material  | Steel  | Gage  |
      | 5 1/2     | 0 ft.  | 460 ft. |
      | 4         | 460 ft.| 986 ft. |
      | Material  | Steel  | Gage  |
   
   b. Perforations: Type of perforator used: NONE, OPEN HOLE COMPL.
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated:
      ______ perforations from _______ ft. to _______ feet.
      ______ perforations from _______ ft. to _______ feet.
   
   c. Was well screen installed? Yes ☑ No □
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
      Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
   
   d. Was well gravel packed? Yes ☑ No □
      Size of gravel
   
   e. Was surface casing used? Yes ☑ No □
      Was it cemented in place? Yes ☑ No □

7. NAME & ADDRESS OF DRILLER: Ruby Drilling Co., Gillette, WY

8. DATE OF COMPLETION OF WELL (including pump installation): Aug. 25, 1991

9. PUMP INFORMATION: Manufacturer: NONE  
   Type
   Source of power
   Horsepower
   Depth of Pump Setting
   Amount of Water Being Pumped ______ Gallons Per Minute.
   (For springs or flowing wells, see item 11.)
10. PUMP TEST: Was a pump test made? Yes ☐ No ☐

If so, by whom ___________________________ Address ___________________________

Yield: ________ gal./min. with ________ foot drawdown after ________ hours.
Yield: ________ gal./min. with ________ foot drawdown after ________ hours.

11. FLOWING WELL (Owner is responsible for control of flowing well).

If well yields artesian flow, yield is ________ gal./min. Surface pressure is ________ lb./sq. inch, or ________ feet of water.

The flow is controlled by: valve □ cap □ plug □

Does well leak around casing? Yes ☐ No ☐

12. LOG OF WELL: Total depth drilled ________ feet.

Depth of completed well ________ feet. Diameter of well ________ inches.

Depth to first water bearing formation ________ feet.

Depth to principal water bearing formation. Top ________ feet to Bottom ________ feet.

Ground Elevation, if known ________

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<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture, Color</th>
<th>REMARKS (Cementing, Shutoff, Packing, etc.)</th>
<th>Indicate Water Bearing Formation</th>
<th>Indicate Perforated Casing Location</th>
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Quality of Water Information:
Was a chemical analysis made? Yes ☐ No ☐

If so, please include a copy of the analysis with this form.
If not, do you consider the water as: Good □ Acceptable □ Poor □ Unusable □
**OFFICIAL ANALYTICAL REPORT**

State Engineer's Office  
Herschler Bldg, 4 East  
Cheyenne, WY  82002

<table>
<thead>
<tr>
<th></th>
<th>meq/l</th>
<th>mg/l</th>
<th></th>
<th>meq/l</th>
<th>mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>26.95</td>
<td>540</td>
<td>Carbonate</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>Magnesium</td>
<td>5.60</td>
<td>68</td>
<td>Bicarbonate</td>
<td>2.54</td>
<td>150</td>
</tr>
<tr>
<td>Sodium</td>
<td>0.96</td>
<td>22</td>
<td>Sulfates</td>
<td>32.85</td>
<td>1600</td>
</tr>
<tr>
<td>Potassium</td>
<td>0.13</td>
<td>5.2</td>
<td>Chloride</td>
<td>0.15</td>
<td>5.3</td>
</tr>
<tr>
<td>Nitrate as N</td>
<td>0.01</td>
<td>&lt;0.2</td>
<td>Specific conductance</td>
<td>2510</td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td>1600</td>
<td></td>
<td>Iron</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Fluoride</td>
<td>0.7</td>
<td></td>
<td>pH (units)</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>0.07</td>
<td></td>
<td>ROE</td>
<td>2510</td>
<td></td>
</tr>
<tr>
<td>Silica</td>
<td>8.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I hereby certify that the above was analyzed by myself or my assistant.

[Signature]

SECT. SUPERVISOR

DIRECTOR
### STATE OF WYOMING
#### OFFICE OF THE STATE ENGINEER
**HERSCHLER BUILDING**
**CHEYENNE, WYOMING 82002**
(307) 777-6959

**STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING**

**NOTE:** Do not fold this form. Use typewriter or print neatly with black ink.

<table>
<thead>
<tr>
<th>PERMIT NO. U.W.</th>
<th>107964</th>
<th>NAME OF WELL (SPRING)</th>
<th>RYAN #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF OWNER</td>
<td>BRUCE AND GAYLE RYAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADDRESS</td>
<td>P.O. Box 72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>Laramie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>WY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zip Code</td>
<td>82070</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone Number</td>
<td>605-682-5959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USE OF WATER:</td>
<td>Domestic [X] Stock Watering [X] Irrigation [ ] Municipal [ ] Industrial [ ] Miscellaneous [ ]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPLAIN PROPOSED USE: (Example: One single family dwelling)</td>
<td>ONE SINGLE FAMILY DWELLING PLUS A FEW HOMES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOCATION OF WELL (SPRING):</td>
<td>NE 1/4 SW 1/4 of Section 13, T. 52 N., R. 61 W., of the 6th P.M. (or W.R.M),</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subdivision Name</td>
<td>Lot</td>
<td>Block</td>
<td></td>
</tr>
<tr>
<td>TYPE OF CONSTRUCTION: Drilled [X] Notary [ ] Dug [ ] Driven [ ] Other [ ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONSTRUCTION: Total Depth of Well/Spring</td>
<td>700 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth to Static Water Level</td>
<td>550 ft.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Diameter of borehole (Bit size)</td>
<td>7 1/4 inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Casing Schedule: New [X] Used [ ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 1/2 diameter from 0 ft. to 595 ft. Material STEEL Gage 15 LD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 1/2 diameter from 595 ft. to 700 ft. Material Gage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Was casing cemented: Yes [X] No [ ] Cemented Interval, From 0 feet to 595 feet.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Number of sacks of cement used</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Perforations: Type of perforator used</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of perforations inches by inches. Number of perforations and depths where perforated:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Was well screen installed: Yes [X] No [ ] Diameter: slot size: set from feet to feet.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Was well gravel packed? Yes [X] No [ ] Size of gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Was surface casing used: Yes [X] No [ ] Was it cemented in place? Yes [X] No [ ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAME &amp; ADDRESS OF DRILLING COMPANY</td>
<td>GRAF DRILLING 536 Box 2845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used)</td>
<td>4/28/98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUMP INFORMATION: Manufacturer</td>
<td>GRUNDfos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source of power</td>
<td>AEA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horsepower</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth of Pump Setting or intake</td>
<td>588</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Water Being Pumped</td>
<td>17 GALLONS PER MINUTE. (For Springs or flowing wells, see item 10.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Volumetric Gallons Used Per Calendar Year.</td>
<td>325,000 per permit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOWING WELL (Owner is responsible for control of flowing well). If well yields artesian flow, yield is <em>gal/min</em>. Surface pressure is _lb/sq: inch, or _feet of water. The flow is controlled by: valve [ ] cap [ ] plug [ ] Does well leak around casing? Yes [X] No [ ]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RECEIVED**
JUL 06 1998
STATE ENGINEER
Cheyenne, Wyo.
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☒ No ☐
If so, by whom [REDACTED] Address
Yield: 11 gal./min. with ______ foot drawdown after ______ hours.
Yield: ______ gal./min. with ______ foot drawdown after ______ hours.

13. LOG OF WELL: Total depth drilled 700 feet.
Depth of completed well 700 feet. Diameter of well 5½ inches.
Depth to first water bearing formation 680 feet.
Depth to principal water bearing formation. Top ______ feet to Bottom 700 feet.

Ground Elevation, if known ______

DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15</td>
<td>LIMESTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>120</td>
<td>OPEACH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>650</td>
<td>MIRILOOSA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650</td>
<td>700</td>
<td>LIMESTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. QUALITY OF WATER INFORMATION:
Does a chemical and/or bacteriological water quality analysis accompany this form? Yes ☐ No ☒
It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2964.)
If not, do you consider the water as: Good ☒ Acceptable ☐ Poor ☐ Unusable ☐

REMARKS:

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent [REDACTED] Date [REDACTED]

FOR STATE ENGINEER'S USE ONLY

Date of Receipt JUL 06 1998, 19 Date of Approval 8/6 1998
Date of Priority OCTOBER 27, 1997 19 for State Engineer
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BUILDING
CHEYENNE, WYOMING 82002
(307) 777-5959

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

PERMIT NO. U.W. 109669

NAME OF WELL (SPRING) REINHOLD #1

NAME OF OWNER EMMA C REINHOLD AND ERNEST S REINHOLD

ADDRESS PO Box 1361

USE OF WATER: Domestic ☑ Stock Watering ☑ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐
Explain proposed use (Example: One single family dwelling)

LOCATION OF WELL (SPRING): NW 1/4 of Section 20, T. 55 N., R. 66 W., of the 6th P.M. (or W.R.M.),
Subdivision Name ______________________ Lot ______ Block ______
If surveyed, bearing, distance and reference point:

TYPE OF CONSTRUCTION: Drilled ☑ Dug ☐ Driven ☐ Other ☐
Describe: 15 ft. Rotary (Type of Rig)

CONSTRUCTION: Total Depth of Well/Spring 600 ft.
Depth to Static Water Level 350 ft. (Below land surface)
a. Diameter of borehole (Bit size) 2 1/8 inches.
b. Casing Schedule New ☑ Used ☐
\[\text{Diameter: slot size: set from } 18''\text{ to } 580'' \text{ ft. Material } ] \text{ Gage ]}
\[\text{diameter from } \text{ ft. to } \text{ ft. Material } ] \text{ Gage ]}
c. Was casing cemented: Yes ☑ No ☐
Cemented Interval, From ______ ft. to ______ feet.
d. Number of sacks of cement used 95 type of cement 1-2

e. Perforations: Type of perforator used 47/8 open hole 580-600'
Size of perforations ______ by ______ inches.
Number of perforations and depths where perforated:
______ perforations from ______ ft. to ______ feet.
______ perforations from ______ ft. to ______ feet.
f. Was well screen installed? Yes ☑ No ☐
Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
g. Was well gravel packed? Yes ☑ No ☐
Size of gravel ______
h. Was surface casing used? Yes ☑ No ☐
Was it cemented in place? Yes ☑ No ☐

NAME & ADDRESS OF DRILLING COMPANY

DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used) 7-1-99

PUMP INFORMATION: Manufacturer Gould Type SUB
Source of power Electric Horsepower 3.6 Depth of Pump Setting or Intake 14 1/2 ft.
Amount of Water Being Pumped 10 Gallons Per Minute. (For Springs or flowing wells, see item 10.)
Total Volumetric Gallons Used Per Calendar Year.

FLOWING WELL (Owner is responsible for control of flowing well).
If well yields artesian flow, yield is _______ gal./min. Surface pressure is _____ lb./sq. inch, or ______ feet of water.
The flow is controlled by: valve ☑ cap ☐ plug ☐
Does well leak around casing? Yes ☑ No ☐

Permit No. U.W. 109669
Book No. 837 Page No. 120
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☐ No ☐
If so, by whom ______________ Address ___________________________
Yield: ______ gal./min. with ______ foot drawdown after ______ hours.
Yield: ______ gal./min. with ______ foot drawdown after ______ hours.

13. LOG OF WELL: Total depth drilled ______ feet.
    Depth of completed well ______ feet. Diameter of well ______ inches.
    Depth to first water bearing formation ______ feet.
    Depth to principal water bearing formation. Top ______ feet to Bottom ______ feet.
    Ground Elevation, if known ___________________________

DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shutoff)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7</td>
<td></td>
<td>Surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7-40</td>
<td></td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110-120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130-560</td>
<td></td>
<td>Sandstone</td>
<td>50</td>
<td>Madison</td>
<td>5-80</td>
</tr>
<tr>
<td>560-800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. QUALITY OF WATER INFORMATION:

Does a chemical and/or bacteriological water quality test accompany this form? Yes ☐ No ☐
It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐

REMARKS:

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent __________________________ Date 7-1-99, 1999

FOR STATE ENGINEER'S USE ONLY

JUL 07 1999
Date of Receipt __________________ Date of Approval ______________
Date of Priority ______________ Date of Priority ______________
Jeremy T. Hanley
for State Engineer
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHEL BUILDING
CHEYENNE, WYOMING 82002
(307) 777-5959

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

PERMIT NO. U.W. 110736
NAME OF WELL (SPRING) BUTTERFIELD #1

1. NAME OF OWNER
TED AND FLORENCE BUTTERFIELD

2. ADDRESS
1509 Cimarron

3. USE OF WATER:
Domestic [X] Stock Watering [ ] Irrigation [ ] Municipal [ ] Industrial [ ] Miscellaneous [ ]

4. LOCATION OF WELL (SPRING):
芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芻芼
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes [ ] No [X]
   If so, by whom ____________________________________________________________________________
   Address ___________________________________________________________________________________
   Yield: ___________ gal./min. with ___________ foot drawdown after ___________ hours.
   Yield: ___________ gal./min. with ___________ foot drawdown after ___________ hours.

13. LOG OF WELL: Total depth drilled ___________ feet.
   Depth of completed well ___________ feet. Diameter of well ___________ inches.
   Depth to first water bearing formation ___________ feet.
   Depth to principal water bearing formation. Top ___________ feet to Bottom ___________ feet.
   Ground Elevation, if known ___________________________________________________________________

DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shut-off)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
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14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes [ ] No [X]
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
   If not, do you consider the water as: Good [ ] Acceptable [X] Poor [ ] Unusable [ ]

REMARKS: ___________________________________________________________________________________

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent: ___________________________ Date: ___________ 19__

FOR STATE ENGINEER'S USE ONLY

Date of Receipt: _______________ Date of Approval: _______________

Date of Priority: _______________
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BUILDING
CHEYENNE, WYOMING 82002
(307) 777-9999

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 111107

1. NAME OF OWNER: THE ISLAND FAMILY TRUST / DANIEL P. ISLAND

2. ADDRESS: 1044 Tulane
   City: SPEARFISH
   State: SD
   Zip Code: 57783
   Phone No.: (605) 444-8925

3. USE OF WATER: Domestic [ ] Stock Watering [ ] Irrigation [ ] Municipal [ ] Industrial [ ] Miscellaneous [x]
   Monitor or Test [x] Coal Bed Methane [ ]
   Explain proposed use (Example: One single family dwelling)

4. LOCATION OF WELL (SPRING): SE 1/4 NW 1/4 of Section 25, T. 83 N., R. 60 W., of the 6th P.M. (or W.R.M.),
   Subdivision Name: BEULAHLAND ESTATES
   Lot: ______ Block: ______
   If surveyed, bearing, distance and reference point:

5. TYPE OF CONSTRUCTION: Drilled [x] AIR / MUD ROTARY [ ] Dug [ ] Driven [ ] Other [ ]
   Describe:

6. CONSTRUCTION: Total Depth of Well/Spring 1640 ft.
   Depth to Static Water Level FLOWNA ft. (Below land surface)
   a. Diameter of borehole (Bit size): 8 3/4 inches.
   b. Casing Schedule: New [x] Used [ ]
      7" diameter from 0 ft. to 130 ft.
      Material: STEEL
      Gage: .125"
      5.5" diameter from 130 ft. to 1260 ft.
      Material: STEEL
      Gage: .225"
   c. Was casing cemented: Yes [x] No [ ]
      Cemented Interval, From 0 feet to 1260 feet.
   d. Number of sacks of cement used: 250
   e. Perforations: Type of perforator used:
      Size of perforations ______ inches by ______ inches.
      Number of perforations and depths where perforated:
      ______ perforations from ______ ft. to ______ feet.
      ______ perforations from ______ ft. to ______ feet.
   f. Was well screen installed: Yes [x] No [ ]
      Diameter: ______ slot size: ______ set from ______ feet to ______.
      Diameter: ______ slot size: ______ set from ______ feet to ______.
   g. Was well gravel packed: Yes [x] No [ ]
      Size of gravel ______
   h. Was surface casing used: Yes [x] No [ ]
      Was it cemented in place? Yes [x] No [ ]

7. NAME & ADDRESS OF DRILLING COMPANY: TAYLOR DRILLING CO.
   3310 Commerce Rd.
   Rapid City, SD 57702

8. DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used): 9-25-98

9. PUMP INFORMATION: Manufacturer: NONE
   Source of power: ______ Horsepower: ______ Depth of Pump Setting or intake: ______
   Amount of Water Being Pumped: ______ Gallons Per Minute. (For Springs or flowing wells, see item 10.)
   Total Volumetric Gallons Used Per Calendar Year: ______

10. FLOWING WELL (Owner is responsible for control of flowing well).
    If well yields artesian flow, yield is ______ gal./min. Surface pressure is ______ lb./sq. inch, or ______ feet of water.
    The flow is controlled by: valve [x] cap [ ] plug [ ]
    Does well leak around casing? Yes [x] No [ ]

Permit No. U.W. 111107

SEE REVERSE SIDE
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes □ No □
   If so, by whom _______________ Address __________________________.
   Yield: ___________ gal./min. with _______ foot drawdown after _______ hours.
   Yield: ___________ gal./min. with _______ foot drawdown after _______ hours.

13. LOG OF WELL: Total depth drilled 1640 feet.
   Depth of completed well 1640 feet. Diameter of well 7 inches.
   Depth to first water bearing formation 1023 feet.
   Depth to principal water bearing formation. Top 1025 feet to Bottom 1605 feet.
   Ground Elevation, if known 3580'

DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shutoff)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
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<td>DOLomite LIGHT PURP. SILTY</td>
<td>ENGLEWOOD</td>
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</table>

14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes □ No □
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
   If not, do you consider the water as: Good □ Acceptable □ Poor □ Unusable □

REMARKS: REPORT FROM ENERGY LABORATORIES, INC., PO BOX 2470 RAPID CITY, SD 57709 FILED WITH FEB 22, 2000 FINDINGS

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent

Date

FOR STATE ENGINEER'S USE ONLY

Date of Receipt MAY 18, 2000 19
Date of Approval Sept. 20, 2000

Chief Engineer

Date of Priority June 24, 1998

I hereby certify that the foregoing statement was signed in my presence and sworn to before me by Daniel Island this 5 day of May 2000.

Notary Public

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
CHEYENNE, WYOMING 82002

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 23258
NAME OF WELL (SPRING) Matthews A

1. NAME OF OWNER Thomas P. Matthews, 1995 Trust

2. ADDRESS P.O. Box 2775, Buffalo
City Buffalo State WY Zip Code 82717 Phone No. 307-643-3126

3. USE OF WATER: Domestic Stock Watering Irrigation Municipal Industrial Miscellaneous

4. LOCATION OF WELL (SPRING): SE ¼ NE ¼ of Section 80, T. 53 N., R. 60 W., of the 6th P.M. (or W.R.M.), Subdivision Name __________ Lot _______ Block _______
If surveyed, bearing, distance and reference point: _______ _______ _______

5. TYPE OF CONSTRUCTION: Drilled __ Air Mud Rotary Dug Driven Other Describe: _______ _______

6. CONSTRUCTION: Total Depth of Well/Spring 700 ft.
Depth to Static Water Level 20 ft. (Below land surface)
a. Diameter of borehole (Bit size) 8 ½ inches.
b. Casing Schedule New Used
6" diameter from 0 ft. to 80 ft. Material Plastic (PVC) Gage 80
4 ½" diameter from 80 ft. to 560 ft. Material Plastic (PVC) Gage 80
c. Was casing cemented? Yes No Cemented Interval, From 0 feet to 80 feet.
d. Number of sacks of cement used 15 type of cement _______

e. Perforations: Type of perforator used None
Size of perforations _____ inches by _____ inches.
Number of perforations and depths where perforated:
_____ perforations from _____ ft. to _____ feet.
_____ perforations from _____ ft. to _____ feet.
f. Was well screen installed? Yes No Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
Diameter: ______ slot size: ______ set from ______ feet to ______ feet.
g. Was well gravel packed? Yes No Size of gravel _______
h. Was surface casing used? Yes No Was it cemented in place? Yes No

7. NAME & ADDRESS OF DRILLING COMPANY Matheson Drilling, Gillette

8. DATE OF COMPLETION OF WELL (INCLUDING PUMP INSTALLATION) OR SPRING (first used) 3/2000

9. PUMP INFORMATION: Manufacturer __________ Type __________
Source of power 230V Single Ph. Horsepower / Depth of Pump Setting or Intake 200'
Amount of Water Being Pumped 16,000 GPM Gallons Per Minute. (For Springs or flowing wells, see item 10.)
Total Volumetric Gallons Used Per Calendar Year. 350,000

10. FLOWING WELL OR SPRING (Owner is responsible for control of flowing well).
If well yields artesian flow or if spring, yield is _____ gal/min. Surface pressure is _____ lb/sq. inch, or _____ feet of water.
The flow is controlled by: valve cap plug Does well leak around casing? Yes No

Permit No. U.W. 23258 Book No. 92 Page No. 109

SEE REVERSE SIDE
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☐ No ☐
   If so, by whom: Matheson Drilling
   Address: 90 Box 193, Gillette, WY 82718
   Yield: _______ gal./min. with _______ foot drawdown after _______ hours.
   Yield: _______ gal./min. with _______ foot drawdown after _______ hours.

13. LOG OF WELL: Total depth drilled _______ feet.
   Depth of completed well _______ feet. Diameter of well _______ inches.
   Depth to first water bearing formation _______ feet.
   Depth to principal water bearing formation: Top _______ feet to Bottom _______ feet.

   Ground Elevation, if known _______

DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
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14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes ☐ No ☐
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
   If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐

REMARKS:

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

Signature of Owner or Authorized Agent

Date

FOR STATE ENGINEER'S USE ONLY

Permit No. U.W. 12258
Date of Approval January 29, 2002
Date of Receipt JAN 11 2002
Date of Priority January 24, 2002

Geological Society
Expires 3/1/2003
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BUILDING
CHEYENNE, WYOMING 82002
(307) 777-5959
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 125509
NAME OF WELL (SPRING) DETWEILLER #1

1. NAME OF OWNER GREG DETWEILLER

2. ADDRESS PO Box 191
City Beulah State Wyoming Zip Code 82712 Phone No.

3. USE OF WATER: Domestic Stock Watering Irrigation Municipal Industrial Miscellaneous

4. LOCATION OF WELL (SPRING): NE ¼ SW ¼ of Section 24, T. 53 N., R. 61 W., of the 6th P.M. (or W.R.M.), Subdivision Name Prairie Pines Estates Lot 3 Block

5. TYPE OF CONSTRUCTION: Drilled (Rotary mud) Dug □ Driven □ Other □ Describe:

6. CONSTRUCTION: Total Depth of Well/Spring 1582 ft.
Depth to Static Water Level 60 ft. (Below land surface)
a. Diameter of borehole (Bit size) 7 7/8 inches.
b. Casing Schedule New Used □
5 1/8 diameter from 0 ft. to 29 ft. Material steel Gage 24 #
5 1/2 diameter from 1 1/2 ft. to 1450 ft. Material steel Gage 15 1/2 #
c. Was casing cemented: Yes □ No □ Cemented Interval, From surface feet to 1420 feet.
d. Number of sacks of cement used 260 type of cement Class C portland Type T/II

e. Perforations: Type of perforator used
Size of perforations inches by inches.

Number of perforations and depths where perforated:
perforations from feet to feet,
perforations from feet to feet.
f. Was well screen installed? Yes □ No □
Diameter: slot size: set from feet to feet
Diameter: slot size: set from feet to feet.
g. Was well gravel packed? Yes □ No □ Size of gravel
h. Was surface casing used: Yes □ No □ Was it cemented in place? Yes □ No □

7. NAME & ADDRESS OF DRILLING COMPANY Weston Engineering, Inc. PO Box 260 Upton, WY 82730

8. DATE OF COMPLETION OF WELL (INCLUDING PUMP INSTALLATION) OR SPRING (FIRST USED) Dec. 9, 2000

9. PUMP INFORMATION: Manufacturer Goulds Type submersible
Source of power Powder River Horsepower 3 Depth of Pump Setting or Intake 300'
Amount of Water Being Pumped 18 Gallons Per Minute. (For Springs or flowing wells, see item 10.)
Total Volumetric Gallons Used Per Calendar Year. 2 acre/feet

10. FLOWING WELL OR SPRING (Owner is responsible for control of flowing well).
If well yields artesian flow or if spring, yield is gal/min. Surface pressure is lb/sq. inch, or feet of water.
The flow is controlled by: valve □ cap □ plug □
Does well leak around casing? Yes □ No □

Permit No. U.W. 125509 Book No. 943 Page No. 60
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☐ No ☐ Address ____________________________
Yield: _______ gal/min. with _______ foot drawdown after _______ hours.
Yield: _______ gal/min. with _______ foot drawdown after _______ hours.

13. LOG OF WELL: Total depth drilled _______ feet.
   Depth of completed well _______ feet. Diameter of well _______ inches.
   Depth to first water bearing formation _______ feet.
   Depth to principal water bearing formation. Top _______ feet to Bottom _______ feet.
   Ground Elevation, if known ____________________________

   DRILL CUTTINGS DESCRIPTION:

<table>
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<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shutoff)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
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<td>with red shale</td>
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<td>1,420</td>
<td>1,580</td>
<td>white &amp; purple limestone (fractured)</td>
<td></td>
<td>Madison</td>
<td>Open hole</td>
</tr>
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</table>

14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes ☐ No ☐
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)

   If not, do you consider the water as: Good ☐ Acceptable ☐ Poor ☐ Unusable ☐

   REMARKS:

   ____________________________

   Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

   ____________________________
   Signature of Owner or Authorized Agent

   ____________________________
   Date

   FOR STATE ENGINEER’S USE ONLY

   Date of Receipt _______ 5/29 _______ 2001
   Date of Approval _______ _______ 2001
   Date of Priority _______ 6/18/2000
STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BUILDING
CHEYENNE, WYOMING 82002
(307) 777-8153

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 133735
NAME OF WELL (SPRING) MATTHEWS #1

1. NAME OF OWNER
   THOMAS R. & THERESA D. MATTHEWS

2. ADDRESS
   PO Box 245, 206 Lower Redwater Creek Rd.
   City Cheyenne State WY Zip Code 82002 Phone No. 307-618-3127

3. USE OF WATER:
   Domestic [X] Stock Watering [ ] Irrigation [ ] Municipal [ ] Industrial [ ] Miscellaneous [ ]
   Monitor or Test [ ] Coal Bed Methane [ ] Explain proposed use (Example: One single family dwelling)

4. LOCATION OF WELL (SPRING):
   N W ¼ SW ¼ of Section 21, T. 53 N., R. 60 W., of the 6th P.M. (or W.R.M.),
   Subdivision Name [ ] Lot [ ] Block [ ]
   If surveyed, bearing, distance and reference point:

5. TYPE OF CONSTRUCTION:
   Drilled [X] Air Mud Rotary [ ] Dug [ ] Driven [ ] Other [ ]
   Describe:

6. CONSTRUCTION:
   Total Depth of Well/Spring 1745 ft.
   Depth to Static Water Level 120 ft. (Below land surface)
   a. Diameter of borehole (Bit size) 8 3/8 inches.
   b. Casing Schedule New [X] Used [ ]
      7 1/2 diameter from 0 ft. to 1375 ft. Material Steel Gage 23 PPF
      5 1/2 diameter from 1375 ft. to 1420 ft. Material Steel Gage 16.5 PPF
   c. Was casing cemented: Yes [X] No [ ]
      Cemented Interval, From 0 feet to 1420 feet.
   d. Number of sacks of cement used 370 type of cement Type I-II
   e. Perforations: Type of perforator used [ ]
      Size of perforations inches by inches.
      Number of perforations and depths where perforated:
      NA perforations from ft. to feet.
      NA perforations from ft. to feet.
   f. Was well screen installed? Yes [X] No [ ]
      Diameter: slot size: set from feet to feet.
      Diameter: slot size: set from feet to feet.
   g. Was well gravel packed? Yes [X] No [ ]
      Size of gravel
   h. Was surface casing used: Yes [X] No [ ]
      Was it cemented in place? Yes [X] No [ ]

7. NAME & ADDRESS OF DRILLING COMPANY
   Taylor Drilling 2310 Commerce Rd
   Rapid City SD 57702

8. DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used)
   5-21-01

9. PUMP INFORMATION:
   Manufacturer [ ] Type [ ]
   Horsepower [ ] Depth of Pump Setting or intake [ ]
   Amount of Water Being Pumped [ ] Gallons Per Minute. (For Springs or flowing wells, see item 10.)
   Total Volumetric Gallons Used Per Calendar Year. [ ]

10. FLOWING WELL OR SPRING
    (Owner is responsible for control of flowing well)
    If well yields artesian flow or if spring, yield is [ ] gal./min. Surface pressure is [ ] lb./sq. inch, or [ ] feet of water.
    The flow is controlled by: valve [ ] cap [ ] plug [ ]
    Does well leak around casing? Yes [ ] No [X]

Permit No. U.W. 133735

SEE REVERSE SIDE

Book No. 998 Page No. 36
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☐ No ☒
   If so, by whom ______ Address ______
   Yield: ______ gal./min. with ______ foot drawdown after ______ hours.
   Yield: ______ gal./min. with ______ foot drawdown after ______ hours.

13. LOG OF WELL: Total depth drilled ______ feet.
   Depth of completed well ______ feet. Diameter of well ______ inches.
   Depth to first water bearing formation ______ feet.
   Depth to principal water bearing formation. Top ______ feet to Bottom ______ feet.
   Ground Elevation, if known ______

**DRILL CUTTINGS DESCRIPTION:**

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shutoff)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.25</td>
<td>Red, siltstone</td>
<td>Spearfish</td>
<td>Madison</td>
<td>Open hole</td>
</tr>
<tr>
<td>6.25</td>
<td>9.68</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.68</td>
<td>13.60</td>
<td>Limestone</td>
<td></td>
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<td></td>
</tr>
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<td>13.60</td>
<td>17.45</td>
<td>Limestone + Dolomite</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes ☐ No ☒
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
   If not, do you consider the water as: Good ☒ Acceptable ☒ Poor ☒ Unusable ☒

**REMARKS:** Good water with some iron.

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

**Signature of Owner or Authorized Agent**

**Date**

**FOR STATE ENGINEER'S USE ONLY**

**Date of Receipt** JAN 10 2002, 20 __________ **Date of Approval** May 10, 2002, 20 __________

**Date of Priority** 4/9/2001, 20 __________ **for State Engineer**
STATE OF WYOMING  
OFFICE OF THE STATE ENGINEER  
HERSCHLER BUILDING  
CHEYENNE, WYOMING 82002  
(307) 777-6163  
STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

PERMIT NO. U.W. 142755  NAME OF WELL (SPRING) Enid Matthews II

1. NAME OF OWNER  Thomas R. & Theresa D. Matthews

2. ADDRESS  PO Box 275  206 Outer Redway Rd  Cheyenne, WY 82002

3. USE OF WATER: Domestic ☑ Stock Watering ☐ Irrigation ☐ Municipal ☐ Industrial ☐ Miscellaneous ☐ Other ☐

4. LOCATION OF WELL (SPRING): NW 1/4 SW 1/4 of Section 31, T. 53 N., R. 60 W., of the 6th P.M. (or W.R.M.),

5. TYPE OF CONSTRUCTION: Drilled ☑ Other ☐ Dyed ☐ Driven ☐ Other ☐

6. CONSTRUCTION: Total Depth of Well/Spring 174.5 ft.

7. Depth to Static Water Level 84.0 ft. (Below land surface)

8. Diameter of borehole (Bit size) 8 1/4 inches.

9. Casing Schedule New ☑ Used ☐

10. Was casing cemented? Yes ☑ No ☐

11. Number of sacks of cement used

12. Perforations: Type of perforator used

13. Pump Information: Manufacturer

14. DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used) 5/16/01

15. FLOWING WELL OR SPRING (Owner is responsible for control of flowing well).

16. Total Volumetric Gallons Used Per Calendar Year.

17. The flow is controlled by: valve cap plug

18. Does well leak around casing? Yes ☑ No ☐

19. SEE REVERSE SIDE
11. If spring, how was it constructed? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to qualify for a water right.)

12. PUMP TEST: Was a pump test made? Yes ☐ No ☑
   If so, by whom ___________ Address ___________
   Yield: ___________ gal./min. with ___________ foot drawdown after ___________ hours.
   Yield: ___________ gal./min. with ___________ foot drawdown after ___________ hours.

13. LOG OF WELL: Total depth drilled ___________ feet.
   Depth of completed well ___________ feet. Diameter of well ___________ inches.
   Depth to first water bearing formation ___________ feet.
   Depth to principal water bearing formation. Top ___________ feet to Bottom ___________ feet.
   Ground Elevation, if known ___________

   DRILL CUTTINGS DESCRIPTION:

<table>
<thead>
<tr>
<th>From Feet</th>
<th>To Feet</th>
<th>Material Type, Texture Color</th>
<th>Remarks (Cementing, Shutoff)</th>
<th>Indicate Water Bearing Formation &amp; Name</th>
<th>Indicate Perforated Casing Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

14. QUALITY OF WATER INFORMATION:
   Does a chemical and/or bacteriological water quality analysis accompany this form? Yes ☐ No ☑
   It is recommended that chemical and bacteriological water quality analyses be performed and that the report(s) be filed with the records of this well. (Contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984.)
   If not, do you consider the water as: Good ☑ Acceptable ☐ Poor ☐ Unusable ☐

   REMARKS:
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

   Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct and complete.

   Signature of Owner or Authorized Agent ____________________________
   Date _______ 20__

FOR STATE ENGINEER'S USE ONLY

Permit No. U.W. __________________________
Date of Receipt JAN 23 2002 20 ______
Date of Priority January 10, 2002

Date of Approval Feb. 19, 2002
__________________________
for State Engineer
APPENDIX E

SEO MONITORING WELL HYDROGRAPHS
APPENDIX F

BLE WELL
STEP TEST DATA
**BEULAH LEVEL I WATER SUPPLY STUDY**

**Beulah Land Estates Well**  
**Step-Test Drawdown Data**

**Date:** 8/20/03  
**Tested by:** Weston Engineering, Inc.: Upton, Wyoming  
**Supervised by:** Weston Engineering, Inc.: Laramie, Wyoming

**Pumping Equipment:**  
**Monitoring Equipment:**

**Discharge:** 10, 20, 25 gpm  
**Comments:**

<table>
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<th>Date</th>
<th>Time</th>
<th>Elapsed Time (min)</th>
<th>Drawdown (ft)</th>
<th>Comments</th>
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<td>0</td>
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<td>End Test</td>
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Date: 8/20/03
Tested by: Weston Engineering, Inc.: Laramie, Wyoming
Supervised by: Weston Engineering, Inc.: Laramie, Wyoming

Discharge:

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<tr>
<th>Date</th>
<th>Time</th>
<th>Elapsed Time (min)</th>
<th>Drawdown (ft)</th>
<th>Comments</th>
</tr>
</thead>
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<td>46.25</td>
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<td>28</td>
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</table>
APPENDIX G

WATER QUALITY RESULTS
LABORATORY ANALYTICAL REPORT

Client: Weston Engineering-Upton
Project: Beulah Water Study
Samp FRQ/Type: 
Lab ID: G03070240-001
Client Sample ID: Beulah Land Estates Well
Location:

<table>
<thead>
<tr>
<th>Analyses</th>
<th>Result</th>
<th>Units</th>
<th>Qualifiers</th>
<th>RL</th>
<th>QCL</th>
<th>Method</th>
<th>Analysis Date / By</th>
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<td><strong>MAJOR IONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bicarbonate as HCO3</td>
<td>262</td>
<td>mg/L</td>
<td>5</td>
<td></td>
<td>A2320 B</td>
<td>07/14/03 14:23 / jb</td>
<td></td>
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<tr>
<td>Carbonate as CO3</td>
<td>ND</td>
<td>mg/L</td>
<td>5</td>
<td></td>
<td>A2320 B</td>
<td>07/14/03 14:23 / jb</td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>1</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E300.0</td>
<td>07/14/03 21:43 / jb</td>
<td></td>
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<tr>
<td>Fluoride</td>
<td>0.7</td>
<td>mg/L</td>
<td>0.1</td>
<td></td>
<td>A4500-F C</td>
<td>07/17/03 13:15 / ddb</td>
<td></td>
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<tr>
<td>Nitrogen, Nitrate+Nitrite as N</td>
<td>0.24</td>
<td>mg/L</td>
<td>0.05</td>
<td>10</td>
<td>E353.2</td>
<td>07/16/03 14:56 / bs</td>
<td></td>
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<tr>
<td>Sulfate</td>
<td>276</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E300.0</td>
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</tr>
<tr>
<td>Calcium</td>
<td>100</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E200.7</td>
<td>07/17/03 07:22 / jw</td>
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<tr>
<td>Magnesium</td>
<td>48</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E200.7</td>
<td>07/17/03 07:22 / jw</td>
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</tr>
<tr>
<td>Potassium</td>
<td>2</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E200.7</td>
<td>07/17/03 07:22 / jw</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>4</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>E200.7</td>
<td>07/17/03 07:22 / jw</td>
<td></td>
</tr>
</tbody>
</table>

| **METALS, TOTAL**             |        |       |            |    |     |        |                    |
| Iron                          | ND     | mg/L  | 0.03       |    | E200.7 | 07/17/03 07:22 / jw |

| **NON-METALS**                |        |       |            |    |     |        |                    |
| Alkalinity, Total as CaCO3    | 215    | mg/L  | 5          |    | A2320 B | 07/14/03 14:23 / jb |
| Conductivity @ 25 C           | 864    | umhos/cm | 1    |    | A2510 B | 07/10/03 17:24 / akr |
| Hardness as CaCO3             | 460    | mg/L  | 10         |    | A2340 B | 07/18/03 08:20 / cw |
| pH                            | 7.26   | s.u.  | 0.01       |    | A4500-H B | 07/10/03 17:26 / akr |
| Sodium Adsorption Ratio (SAR) | ND     | unitless | 0.1    |    | Calculation | 07/18/03 08:20 / cw |
| Solids, Total Dissolved TDS @ 180 C | 617 | mg/L | 10         |    | A2540 C | 07/14/03 14:46 / qed |

| **DATA QUALITY**              |        |       |            |    |     |        |                    |
| A/C Balance                   | -0.07  | %     |            |    | A1030 E | 07/18/03 08:19 / cw |
| Anions                        | 10.2   | meq/L | 0.01       |    | A1030 E | 07/18/03 08:19 / cw |
| Cations                       | 9.37   | meq/L | 0.01       |    | A1030 E | 07/18/03 08:19 / cw |

| **BACTERIA**                  |        |       |            |    |     |        |                    |
| Bacteria, Iron                | Absent | col/ml |            |    | A9240 B | 07/10/03 15:00 / aaps |
| Bacteria, Sulfate Reducing    | ND     | col/ml | 1          |    | INDICATOR | 07/10/03 17:00 / tff |

---

Report Definitions:
- RL - Analyte reporting limit.
- QCL - Quality control limit.
- MCL - Maximum contaminant level.
- ND - Not detected at the reporting limit.

Chris Wilson
Project Manager
LABORATORY ANALYTICAL REPORT

Client:  Weston Engineering-Upton  
Project:  Beulah Water Study  
Lab ID:  G03070240-001  
Client Sample ID:  Beulah Land Estates Well  
Report Date:  08/07/03  
Collection Date:  07/10/03 11:30  
Received Date:  07/10/03 16:40  
Matrix:  AQUEOUS  
Sampled By:  Not Given

<table>
<thead>
<tr>
<th>Analyses</th>
<th>Result</th>
<th>Units</th>
<th>Safe/Unsafe</th>
<th>Qual</th>
<th>Method</th>
<th>Analysis Date / By</th>
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</thead>
<tbody>
<tr>
<td>Bacteria, E-Coli Coliform</td>
<td>Absent</td>
<td>P/A</td>
<td></td>
<td>SAFE</td>
<td>A9223 B</td>
<td>07/10/03 17:35 / mli</td>
</tr>
<tr>
<td>Bacteria, Total Coliform</td>
<td>Absent</td>
<td>P/A</td>
<td></td>
<td></td>
<td>A9223 B</td>
<td>07/10/03 17:35 / mli</td>
</tr>
</tbody>
</table>

Comments:  
The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.  
The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference:  
E - EPA / MCAWW Methodology  
A - Standard Methods 19th Ed.

Chris Wilson  
Project Manager
### TABLE 2

**MCNENNEY FISH HATCHERY WELL NO. 3**  
**WATER SAMPLE ANALYTICAL RESULTS**  
**AND COMPARISON WITH EPA DRINKING WATER STANDARDS**

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>EPA MAXIMUM CONTAMINANT LEVEL (MCL)</th>
<th>SAMPLE DATE</th>
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<tr>
<td><strong>(mg/l except as noted)</strong></td>
<td></td>
<td>2/13/00</td>
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<tr>
<td><strong>Primary EPA Parameters</strong></td>
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<td></td>
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<tr>
<td>Regulated Organic Chemicals</td>
<td>Various</td>
<td>NA</td>
</tr>
<tr>
<td>Microbiological</td>
<td>Various</td>
<td>NA</td>
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<tr>
<td>Antimony</td>
<td>0.006</td>
<td>&lt;0.001</td>
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<tr>
<td>Arsenic</td>
<td>0.05</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Barium</td>
<td>1.00</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.004</td>
<td>&lt;0.0016</td>
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<tr>
<td>Cadmium</td>
<td>0.005</td>
<td>0.02</td>
</tr>
<tr>
<td>Chromium (Total)</td>
<td>0.10</td>
<td>&lt;0.01</td>
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<tr>
<td>Cyanide</td>
<td>0.20</td>
<td>NA</td>
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<td>Fluoride</td>
<td>4</td>
<td>0.28</td>
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<td>Lead</td>
<td>0.05</td>
<td>&lt;0.10</td>
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<td>Mercury</td>
<td>0.002</td>
<td>0.017</td>
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<td>Nickel</td>
<td>0.1</td>
<td>&lt;0.04</td>
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<td>Nitrate (as N)</td>
<td>10</td>
<td>0.26</td>
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<tr>
<td>Nitrite (as N)</td>
<td></td>
<td>&lt;0.01</td>
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<tr>
<td>Selenium</td>
<td>0.35</td>
<td>0.01</td>
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<tr>
<td>Thallium</td>
<td>0.002</td>
<td>NA</td>
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<td>Turbidity</td>
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<tr>
<td>Uranium</td>
<td>0.02**</td>
<td>0.002</td>
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<td>Radon 222, pCi/l</td>
<td>300**</td>
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<td>Gross alpha, pCi/l</td>
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<td>&lt;3.0</td>
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<tr>
<td>Gross beta, pCi/l</td>
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<td>&lt;4</td>
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<tr>
<td>Temperature (°F)</td>
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<tr>
<td>pH (no units)</td>
<td>6.5-8.5</td>
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<td>Total Dissolved Solids</td>
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<td>Suspended Solids</td>
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<td>Alkalinity (CaCO3)</td>
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<td>180</td>
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<td>&lt;0.25</td>
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<tr>
<td>Calcium</td>
<td>NS</td>
<td>80</td>
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<td>CO2</td>
<td>NS</td>
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<td>Chloride</td>
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<td>NA</td>
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<td>Hydrogen Sulfide</td>
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<td>0.1</td>
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<td>Magnesium</td>
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<tr>
<td>Manganese</td>
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<td>&lt;0.03</td>
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<td>Ammonia (Distilled)</td>
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<td>&lt;0.05</td>
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<td>Phosphorous</td>
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<td>NA</td>
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<td>NS</td>
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<td>Silica</td>
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<td>&lt;1</td>
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<td>Sulfate</td>
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<td>130</td>
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<td>Vanadium</td>
<td>NS</td>
<td>&lt;1.0</td>
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<td>Zinc</td>
<td>5</td>
<td>0.03</td>
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</tbody>
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*NS = No Standard; NA = Not Analyzed; ND = Not Detected

---

*** = Proposed; Deferred = According to EPA, deferred status due to low health risk
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<tr>
<th>Site</th>
<th>Depth</th>
<th>Lab No.</th>
<th>Methodology</th>
<th>Analysis</th>
<th>Results</th>
<th>Units</th>
<th>Analyzed</th>
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**Water Analysis**

**South Culdesac**

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<th>Analysis</th>
<th>Results</th>
<th>Units</th>
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<tr>
<td>Std Meth 9223</td>
<td>Total Coliform</td>
<td>Absent</td>
<td>Bacteriologically safe at the time of sampling.</td>
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<tr>
<td>EPA 200.7</td>
<td>Calcium</td>
<td>95</td>
<td>mg/L ppm</td>
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<tr>
<td>EPA 200.7</td>
<td>Iron</td>
<td>0.03</td>
<td>mg/L ppm</td>
</tr>
<tr>
<td>EPA 200.7</td>
<td>Potassium</td>
<td>2</td>
<td>mg/L ppm</td>
</tr>
<tr>
<td>EPA 200.7</td>
<td>Magnesium</td>
<td>43</td>
<td>mg/L ppm</td>
</tr>
<tr>
<td>EPA 200.7</td>
<td>Sodium</td>
<td>2</td>
<td>mg/L ppm</td>
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<tr>
<td>EPA 310.1</td>
<td>Alkalinity</td>
<td>208</td>
<td>mg/L ppm</td>
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<td>SM 4500-Cl-B</td>
<td>Chloride</td>
<td>1</td>
<td>mg/L ppm</td>
</tr>
<tr>
<td>EPA 353.2</td>
<td>NO₃ as N</td>
<td>&lt;0.05</td>
<td>mg/L ppm</td>
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<td>EPA 353.2</td>
<td>NO₂ as N</td>
<td>0.25</td>
<td>mg/L ppm</td>
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<td>EPA 150.1</td>
<td>pH</td>
<td>7.61</td>
<td>Std. Units</td>
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<td>EPA 120.1</td>
<td>Conductivity</td>
<td>853</td>
<td>μmhos/cm</td>
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<td>EPA 375.4</td>
<td>Sulfates</td>
<td>321</td>
<td>mg/L ppm</td>
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<tr>
<td>EPA 160.1</td>
<td>Total Dissolved Solids</td>
<td>578</td>
<td>mg/L ppm</td>
</tr>
</tbody>
</table>

*Note: Coliform sample analyzed by JS on 01-31-00.*

L.J. Hansen

Laboratory Director

COMPLETE ENVIRONMENTAL ANALYTICAL SERVICES
# WATER ANALYSIS REPORT - Soda Butte Services

**Report Date:** 09-28-95  
**Sample ID:** Aladdin Water Project; AWD-1  
**Sample #:** 95-47578  
**Sample Date:** 08-29-95 @ 09:30 am

<table>
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<tr>
<th>Major Ion</th>
<th>Units</th>
<th>Results</th>
<th>Detection Limit</th>
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<tbody>
<tr>
<td>Calcium (Ca)</td>
<td>mg/l</td>
<td>1351</td>
<td>1.0</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>mg/l</td>
<td>61.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>mg/l</td>
<td>5.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>mg/l</td>
<td>2.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Carbonate (CO₃)</td>
<td>mg/l</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td>Bicarbonate (HCO₃⁻)</td>
<td>mg/l</td>
<td>228</td>
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</tr>
<tr>
<td>Sulphate (SO₄²⁻)</td>
<td>mg/l</td>
<td>383</td>
<td>1.0</td>
</tr>
<tr>
<td>Chloride (Cl⁻)</td>
<td>mg/l</td>
<td>2.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Nitrite (NO₂⁻) as N</td>
<td>mg/l</td>
<td>&lt;0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Nitrate (NO₃⁻) as N</td>
<td>mg/l</td>
<td>0.22</td>
<td>0.10</td>
</tr>
<tr>
<td>Fluoride (F⁻)</td>
<td>mg/l</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>Total Dissolved Solids @ 180°C (TDS)</td>
<td>mg/l</td>
<td>1871</td>
<td>1.0</td>
</tr>
<tr>
<td>Conductivity</td>
<td>μS/cm</td>
<td>825</td>
<td>0.50</td>
</tr>
<tr>
<td>Chloride (Cl⁻)</td>
<td>mg/l</td>
<td>&lt;0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>Color (color units)</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total Alkalinity; measured as CaCO₃</td>
<td>mg/l</td>
<td>187</td>
<td>1.0</td>
</tr>
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</table>

### Trace Metals

<table>
<thead>
<tr>
<th>Trace Metal</th>
<th>Units</th>
<th>Results</th>
<th>Detection Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic (As)</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Antimony (Sb)</td>
<td>mg/l</td>
<td>0.010</td>
<td>0.010</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>mg/l</td>
<td>&lt;0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>Lead (Pb)</td>
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### Iodometric

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### Alpha Activity

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### **Assurance Data**

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**TRIHALOMETHANES:**

|           | Bromodichloromethane   | 75-27-4 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Bromofor               | 75-25-2 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Chloroform             | 67-68-3 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Dibromochloromethane   | 124-48-1| ELC | 0.50    | n/a     | <0.50   | <0.50      |

**UNREGULATED CONSTITUENT:**

|           | Bromobenzene           | 108-96-1 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Bromochloromethane      | 74-97-5 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Bromoform              | 74-85-9 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Chloroform             | 67-68-3 | ELC | 0.50    | n/a     | <0.50   | <0.50      |
|           | Dibromochloromethane   | 124-48-1| ELC | 0.50    | n/a     | <0.50   | <0.50      |

Abbreviation descriptions appear on quality assurance page.
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Abbreviation descriptions appear on page 1.
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DRINKING WATER ANALYSIS REPORT - QUALITY ASSURANCE

Client: Soda Butte Services; Aladdin Water Project; AWD-1
Sample #: 95-47579
Report Date: 09-26-95

EPA METHOD 502.2 - VOLATILE ORGANIC COMPOUNDS - ANALYZED AT ELC

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EPA METHOD 504 - EDB & DBCP

Additional QA/QC data is available on file at ELC-Sandpoint

EPA METHOD 505 - PESTICIDES AND PCB'S

Additional QA/QC data is available on file at ELC-Billings

EPA METHOD 515.1 - HERBICIDES

Additional QA/QC data is available on file at ELC-Sandpoint

EPA METHOD 531.1 - CARBAMATE PESTICIDES

Additional QA/QC data is available on file at ELC-Billings

EPA METHOD 525.1 - PESTICIDES

Additional QA/QC data is available on file at ELC-Billings

EPA METHOD 547 - GLYPHOSATE

Additional QA/QC data is available on file at ELC-Rapid City

EPA METHOD 548 - ENDOTHALL

Additional QA/QC data is available on file at ELC-Billings

EPA METHOD 549 - DIQUAT

Additional QA/QC data is available on file at ELC-Billings

Results of all quality control samples were within acceptance limits.

FOOTNOTES AND ABBREVIATION DESCRIPTIONS

1 MDL = Method Detection Limit

2 MCL = Maximum Contaminant Level

3 ELI-B = Energy Laboratories, Inc. - Billings, MT

4 ELI-C = Energy Laboratories, Inc. - Casper, WY

5 ELI-RC = Energy Laboratories, Inc. - Rapid City, SD

Additional data is available on file at ELC-Billings, ELI-Billings, ELI-Casper, and ELI-Rapid City.
### OFFICIAL ANALYTICAL REPORT

Wyoming Department of Agriculture
Analytical Services

**SAMPLE:** WATER
DATE COLLECTED: August 9, 1991
DATE RECEIVED: November 6, 1991
DATE COMPLETED: January 31, 1992

Ray Murphy

**STATE ENGINEER'S OFFICE**
Herschler Bldg, 4 East
Cheyenne, WY 82002

#### Analysis Results

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I hereby certify that the above was analyzed by myself or my assistant.

[Signature]

[Position]

[Date]
### Official Analytical Report

**State Engineer's Office**  
Herschler Bldg, 4 East  
Cheyenne, WY 82002

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**SAMPLE:** Water  
**DATE COLLECTED:** October 30, 1991  
**DATE RECEIVED:** November 6, 1991  
**DATE COMPLETED:** January 28, 1992

Ray Murphy  
Supervisor, Director

Rust hereby certifies that the above was analyzed by myself or my assistant.

Sect. Supervisor

Director
**OFFICIAL ANALYTICAL REPORT**

State Engineer's Office  
Herschler Bldg, 4 East  
Cheyenne, WY 82002

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SAMPLE: WATER  
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DATE COMPLETED: January 28, 1992  

Ray Murphy  

I hereby certify that the above was analyzed by myself or my assistant.

[Signature]

SECT. SUPERVISOR

[Signature]

DIRECTOR
### OFFICIAL ANALYTICAL REPORT

**State Engineer's Office**  
Herschler Bldg, 4 East  
Cheyenne, WY 82002

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I hereby certify that the above was analyzed by myself or my assistant.

---

SECT. SUPERVISOR: [Signature]

DIRECTOR: [Signature]
APPENDIX H

CROOK COUNTY
LAND USE PLAN
1998 Land Use Plan for Crook County
(Succeeds and Replaces 1977 Crook County Land Use Plan)
Approved by Crook County Board of Commissioners on 11/4/98
(Amended on 12/4/02 to include Threatened & Endangered Species)
(Amended on 2/5/03 to include How the County Should Handle Potential Increases of Public Land)

INTRODUCTION - Plan Purpose

The purpose of this plan is to establish a process for Crook County to coordinate with federal and state agencies on their proposed actions that may potentially affect the management of private and public land, and natural resource use. Crook County will coordinate on the proposed actions so Crook County citizens may preserve their customs, culture, and economic stability while protecting and using their environment.

Through the land use planning process, Crook County commits itself to attempting to assure that all natural resource decisions affecting the County shall be guided by the principles of maintaining and revitalizing various uses of federally managed and state managed lands. The County also commits itself to the protection of private property rights and private property interests including investment backed expectations, protection of local historical custom and culture, protection of the traditional economic structures in the County which form the base for economic stability for the County, opening of new economic opportunities through reliance on open markets, and protection of the right of the enjoyment of the natural resources of the County by all citizens of the County and those communities utilizing those natural resources within the County. Crook County is convinced that resource and land use management decisions made in a coordinated manner between federal management agencies, state management agencies and county officials will not only firmly maintain and revitalize multiple use of federally and state managed lands in Crook County, but will enhance environmental quality throughout the County.

Federal law and regulations allow the County to fully participate as a cooperating agency in the federal and state planning process. (See Appendix A listing laws and regulations.)

The Crook County Board of Commissioners will hereinafter be referred to as the Board.

This New Land Use Plan has been developed to provide a baseline vision of what Crook County expects in terms of the effects of proposed governmental management activities on private, municipal, state and federal lands as well as the effects from proposed natural resource regulatory actions.
If any provision of the Plan shall be found invalid or unenforceable by a court of competent jurisdiction, the remaining provisions shall not be affected thereby, but shall remain in full force and effect.

CUSTOM, CULTURE AND ECONOMIC BASE OF CROOK COUNTY

The people of Crook County historically, traditionally and currently earn their livelihood from activities reliant upon the use of natural resources. The economy of the County has always been, and is today, dependent upon activities critically and economically related to ranching and farming, logging, mining and other natural resource related activities. Segments of Crook County’s economy are reliant upon the abundant natural resources occurring countywide. In addition, family and community traditions have developed around the economic and recreational use of the land.

Public land is managed by federal or state agencies, while use of private land can be impacted by federal or state regulatory agencies. Federal and state agencies may propose management actions and regulations that can impact and change Crook County’s custom, culture and economy. (See Appendix B for chart.)

When a transfer of land from private to public ownership is being considered within Crook County and the public entity and/or private landowner involved asks the Board to identify the County’s position on the potential transfer, the Board may use the following process by which to evaluate and issue a position on that proposed action. Through this step-by-step process, the Board can evaluate each situation according to its individual characteristics and issue a decision accordingly.

1. The Board gathers pertinent data:
   a. Existing classification of the land from the County Assessor;
   b. Current land use for the property (i.e. farming, development, timber, grazing, wasteland, etc.);
   c. Current amount of taxes paid on the property to the County;
   d. If possible, the proposed use of the land after transfer;
   e. Any potential income to the County from the public entity responsible for the land after the transfer occurs;
   f. What, if any, rights the public currently has in the property (i.e. rights-of-way, county roads, public utility easements, etc.).

2. The Board then solicits input from and provides information to:
   a. The parties directly affected by the proposed transfer (i.e. the sellers and the buyers of the lands as well as adjacent landowners);
   b. The general public – a public hearing should be held to make information on the proposed transfer available to all interested parties and to provide a public forum to discuss the proposed action;

   2
c. The Sheriff's Office and Fire Warden concerning potential impacts on public safety.

3. The Board considers the potential impact the proposed transfer will have on the general economy of the area. Good judgment and a clear understanding of local and state economic conditions will be necessary to reach any reasonable conclusion on this subject, as the impact will be difficult to quantify.

4. The Board issues a position statement concerning the proposed land transfer. This statement will, as specifically as possible, reference the information gathered and the input from the public and detail the reasoning behind the decision.

Given the amount of land currently held by the public in this County and State, it is advised that the Board adhere, as much as possible, to the concept of "no net gain" of public lands.

In recognition of the critical tie between the use of the private, federal and state natural resources and the economic stability of the County, the Board developed the land use planning process to serve as a guide to cooperate in the planning for federally and state managed lands as well as the consideration of the County in any federal or state natural resource regulations.

Again, the Board feels that this plan will be successfully implemented only with an on-going planning and review process that involves the citizens of Crook County.

**MULTIPLE USE/ECONOMIC USE OF FEDERAL, STATE AND PRIVATE LANDS AND COORDINATION WITH FEDERAL AND STATE AGENCIES**

The Board recognizes that federal law mandates multiple use of National Forests and Bureau of Land Management land. The Board positively supports continued multiple use for these lands and support the continued economic use of private and state lands.

The Board is concerned with the protection of the physical environment of Crook County and intends to offer comments, proposals or alternatives to proposed decisions which affect the environment. The Board intends to be involved in federal and state agency decisions which affect the environment.

The Board requests that, to the fullest extent required or permitted by law, all federal and state agencies shall, in all actions proposed that have the potential of affecting the use of land or natural resource in Crook County, do the following:
A. Meet with the Board to establish a process for such coordination, that may include joint planning, joint research and data collection, joint hearings or joint environmental assessments.

B. Analyze and consider the effects those actions will have on:
   - community stability;
   - maintenance of custom, culture and economic stability;
   - conservation and use of the environment and natural resources.

C. Coordinate with the Board, to the fullest extent possible, as a cooperating agency on any federal or state action or decision.

D. Allow the Board to modify or submit a viable alternative for consideration by the agency.

This coordination follows the procedure as described in Wyoming Statute 18-5-208. Coordination of planning efforts with federal agencies:

The board of county commissioners of a county which has officially adopted a comprehensive plan pursuant to W.S. 18-5-202(b) may participate in efforts to coordinate the plan with federal regional forest or other resource management plans as provided in the Federal Land Policy and Management Act of 1976 and federal regulations adopted pursuant to that act, including, but not limited to, Title 36, of the Code of Federal Regulations, part 219.7 and Title 43, of the Code of Federal Regulations, part 1610.3.

(See Appendix C for 36 CFR, Part 219.7, and 43 CFR, Part 1610.3.)

SPECIFIC GOALS FOR NATURAL RESOURCE USE

1. AGRICULTURE & LIVESTOCK GRAZING

Goal: Crook County will strive to promote the continuation of agriculture and livestock grazing as important, historic components of the County's economic and cultural base on both public and private land ownership.

Background:

Livestock production has occurred in Crook County for more than a century, and ranching has symbolized the County's economy, lifestyle and culture. A "ranch" consists of more than just the animals, a house and surrounding corrals and outbuildings. The concept of ranching, and therefore, the "ranch" includes the buildings, the homesite, the equipment, the livestock, the land, the forage resource, the water rights and all activities devoted to the ranching operation. Furthermore, these resources are very specific to agriculture production and are not easily adapted to alternative uses that can support the economic needs of rural families.
Crook County’s agricultural industry is evaluated in the context of cattle and sheep ranching. Hay production is typically part of most livestock operations in the County. In light of these operational characteristics, the combined description enables the calculation of a more accurate evaluation of ranching’s contribution to the Crook County economy. (See Appendix D for agricultural statistics.)

Reduction of AUMs on public land will have disastrous economic impact on individual ranches, and collectively on the County itself. Continued grazing use of federally and state managed land is vital if the livestock industry is to survive. The expectation for continuation of the livestock industry in the County is essential to support economic stability and to preserve the custom and culture of the citizens. In addition, livestock grazing can be used to benefit and enhance riparian areas and uplands.

Forage crops, hay, silage and feed grains are produced in Crook County comprising an integral part of the livestock industry.

Irrigated and intensive agriculture also provide a major contribution to the economic base of the County critical to the economic stability of the County. Productive watersheds must be maintained within the county as essential factors to preservation of irrigated agriculture.

The quality of economic life of Crook County as well as the scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values which are part of life in the County are enjoyed in part because of agricultural production.

Crook County is limited by severe winters, limited water quantities and low population when it comes to development of a non-agricultural economy.

Objectives:
Federal and state agencies shall, to the fullest extent allowed by federal law, notify the County of any actions or regulations which may impact agricultural or livestock production.

Crook County shall carefully evaluate all existing and proposed federal and state actions or regulations which could affect private property, private property interests, and investment backed expectations.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.
2. **AIR QUALITY**

**Goal:** Crook County will strive to monitor the available data to identify any potential conflict with federal law regarding the protection of air quality.

**Background:**
Crook County must comply with Class 2 Air Quality standards (See Appendix E for more information.)

There is an air quality monitoring station located at Devils Tower.

**Objectives:**
Crook County shall request that federal and state agencies notify the County of any proposed actions changing air quality standards in Crook County.

Crook County shall carefully evaluate all federal and state proposals, actions or regulations which could change standards for air quality over Crook County.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

3. **AIR SPACE**

**Goal:** Crook County will strive to maintain air access for emergency and operational activity over the County within current laws and regulations.

**Background:**
Crook County covers a vast area with many regions which are extremely remote and while they are accessible over land, travel is extremely slow. Any increased air space restrictions must be minimal in order to preserve civilian use for law enforcement, medical emergency, search and rescue, livestock management, and predator control measures. (See Appendix F for more information.)

**Objective:**
Federal and state agencies shall, to the fullest extent allowed by federal law, notify the County of any proposed actions changing restricted air space in Crook County.

Crook County shall review any proposals which would change air space standards over Crook County.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.
4. **CULTURAL**

**Goal:** Crook County will strive to maintain and share the story of its cultural history.

**Background:**
Several areas of ancient people petroglyphs and pictographs still can be seen in places, usually on sandstone cliffs, facing south.

They told of the cultural past of these nomadic ancient people, probably living several hundred years ago. Many sites may be open to vandalism and destruction because of the remote areas in which they are located.

Buffalo jumps tell us the story of the cultural past of these Ancient People. There are several jumps in Crook County, but the most significant site is the Vore Buffalo Jump. For over three hundred years, Plains Indian groups stampeded bison over the rim and into deep natural “sink holes”. The buffalo provided American Indians not only their primary food, but was the source of many other materials used in their culture.

When this area became settled by the first white settlers, schools became cultural sites both in the established towns and out in the country.

Devils Tower, established as our nation’s first National Monument in 1906, was the site for early cultural and social events and still is of great importance today.

Warren Peak and Cement Ridge, fire lookouts administered by the U.S. Forest Service, are also a part of this County’s developments.

Ranch A, Moses Annenberg’s hunting lodge, built around 1930, now owned by the State of Wyoming, is a learning center for the area.

The U.S. Air Force Radar Site on Warren Peak, built in the 1960’s, was the world’s first air transportable nuclear power plant. This highly sophisticated device was tested on Warren Peak for several years. It was removed at the end of the test period.

**Objectives:**
Crook County shall request that federal and state agencies, to the fullest extent allowed by federal law, notify the County of any actions which could potentially affect the County’s cultural resources.

Crook County shall carefully evaluate all federal and state actions or regulations which could affect the County’s cultural resources.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.
5. ENERGY & MINERAL RESOURCES

Goal: Crook County will strive to promote responsible mining and mineral exploration as an important, historic multiple use.

Background:
Energy and mineral resources provide the base for an important contribution to the economy of Crook County. Oil, gas and mineral industry payroll and expenditures for supplies are important to the economic stability of the County.

There are a variety of minerals extracted for commercial use in Crook County.

Bentonite is produced at Colony. A small coal mine was in operation at one time near Aladdin. The Hauber Uranium Mine, located north of Hulett, had been the state’s first uranium mine, and was owned by Homestake Mining Company. All of Crook County has potential for sizable uranium production. The Bear Lodge Mountains are also highly mineralized and potential exists for metals mining.

The Powder River Basin is an important oil, coal and uranium producing region. Oil production is primarily Cretaceous in age. Typical of this formation, oil and gas production is prolific when discovered but depletes quite rapidly. Coal and uranium are predominately produced from the Fort Union and White River formations. Along the contact between the Black Hills Uplift and the Powder River Basin are numerous outcroppings of granite, limestone, bentonite, and other minerals.

The Geological Survey of Wyoming lists many natural mineral occurrences in Crook County. (See Appendix G for the list of minerals.)

Objectives:
When action is considered regarding mining interests in Crook County, the restraints upon free market development imposed by statute or by agency rule shall be evaluated by the County.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

6. FOREST RESOURCES

Goal: Crook County will strive to maintain sustainable timber harvesting as an important, historic multiple use of federal lands and as an effective forest management tool on private and state land.
Background:
Historically, forest resources in Crook County have been used for mines and domestic use since the occupation of European settlers in the 1800’s. A significant portion of Crook County’s economy and tax base is based on the harvest and processing of timber from private, state and public lands.

The Bear Lodge and Moskee areas of Crook County contain the majority of commercial timber acreage. The USFS is the primary land manager of Crook County’s timber resources. Private, BLM, and state school lands make up the additional timber resource.

Crook County has a historical, cultural and economic relationship to timber management. The state has been actively managing its timber resources on state lands through commercial timber sales and pre-commercial treatment. Many private lands are being managed for both grazing and timber fiber production by local mills with the aid of the State Division of Forestry. (See Appendix H for more information.)

Objectives:
The County shall request that federal and state agencies, to the fullest extent allowed by federal law, notify the County of any actions affecting forest or timber resources or their use. Crook County shall carefully evaluate any federal and state actions or regulations which could affect forest or timber resources.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

Any vegetative treatment, prescribed burning, or public land set-aside shall be reviewed by Crook County.

7. PALEONTOLOGICAL RESOURCES

Goal: Crook County should strive to maintain the integrity and the opportunity to research its significant paleontological sites.

Background:
There are several sites in Crook County which contain significant fossilized remains. (See Appendix I for more information.)

The importance of future paleontological digs and subsequent findings are recognized by Crook County. However, the protection of such resources should not automatically supersede the best interests of Crook County nor its citizen’s rights.
Objectives:
Crook County shall request that federal and state agencies, to the fullest extent allowed by federal law, notify the County of any actions which could potentially affect the integrity of, or access to, County paleontological resources.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

8. PRIVATE PROPERTY

Goal: Crook County will strive to protect its citizens’ constitutional rights to private property including but not limited to water, mineral, surface and subsurface rights in its planning and actions.

Background:
Crook County recognizes its citizens’ inalienable, natural rights to private property, as defined and upheld by the United States Constitution.

People who live in Crook County are reliant upon the land and its productive use. Private ownership and the incentive provided by such ownership is the driving force which supports the livelihoods, culture, custom and economic stability of Crook County citizens.

Objectives:
Federal and state agencies shall, to the fullest extent allowed by federal law, notify the County of any actions affecting the existing use of or on private property or public lands.

Crook County shall evaluate and comment on federal and state actions or regulations which could affect private property, private property interests, and investment backed expectations.

Crook County shall plan for, and take positive action to ensure, that private property, private property interests and investment backed expectations are protected under the Fifth Amendment to the United States Constitution which prohibits the taking of private property for public use without just compensation.

9. RECREATIONAL USE

Goal: Crook County will strive to protect recreational opportunities compatible with local custom, culture and environmental stewardship within the constraints of private property rights.
Background:
Crook County offers a variety of recreational opportunities, many of which generate revenues for the local economy. (See Appendix J for list of recreational activities in the County.)

Recreationists enjoy access to activities on public lands in Crook County, but are expected to demonstrate ethical behavior which respects and helps maintain the sustainability of the County’s natural resources. There is no charge for some of these activities and, consequently, the costs to provide these services are picked up by all taxpayers.

Objectives:
Crook County shall request that the federal and state agencies, to the fullest extent allowed by federal law, notify the County of any actions affecting recreational opportunities in Crook County.

Crook County shall carefully evaluate any federal and state actions or regulations which could affect recreational use.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

The planning of recreational management areas, facilities and byways shall consider time and cost impacts on County services and provide for economic or other management mitigation of such impacts.

10. RIGHTS OF WAY

Goal: All planning efforts in Crook County should strive to seek to maintain historic rights to travel over federally and state managed lands wherever necessary in pursuit of mining, logging, livestock raising, and other historic uses.

Background:
Utility corridors have historically been very important in Crook County. Historically, the development of mining, logging, livestock grazing, ranching, and farming has required establishment of numerous rights of way over the federally and state managed lands. Continued use of these rights of way is essential to continuation of the associated commerce.

The potential exists for the County to assert its RS 2477 rights.

Objectives:
Crook County shall request that federal and state agencies, to the fullest extent allowed by federal law, notify the County of any actions which could potentially affect the historic rights to travel within Crook County.
Crook County shall carefully evaluate all federal and state actions, proposals or regulations which could affect the County’s historic rights to travel.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

Along with right to travel over these rights of way, any maintenance necessary to continue the historic use shall be allowed.

Historic travel routes that cross state or federal land are those that have been used for at least ten years. Appropriate historic travel routes may be identified under RS 2477.

11. **WATER RESOURCES**

**Goal:** Crook County will strive to protect the quality, quantity and use of surface and ground water.

**Background:**
Water quality and quantity in Crook County has determined where development has and will occur.

Crook County seeks to maintain the historic and economic use of water for agricultural irrigation and domestic use. (See Appendix K for more information.)

The State of Wyoming, Department of Environmental Quality maintains jurisdiction over water quality enhancement and protection from point source and non-point source pollution.

Crook County supports the present state laws and regulatory system administering the use and ownership of all surface and ground water within the State of Wyoming. Crook County recognizes that the protection and development of its water resources are essential to its short and long term environmental, economic and cultural viability.

**Objectives:**
Crook County shall, to the fullest extent allowed by federal law, be notified of all state, interstate, federal and international actions that have any impact on the water or use of water in Crook County, prior to such actions or planning processes being initiated.

Crook County shall comment on any proposed actions that affect water quality and quantity or use.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.
Water Quality:

A. Riparian Areas: The maintenance of the custom, culture, and economic stability of the County and private property rights and private property interests including investment backed expectations shall be considered of high importance in the application of any riparian area management plans, including Forest Service and Bureau of Land Management allotments or grazing plans, point source and non-point source pollution laws.

B. Wetlands: Crook County shall monitor and evaluate implementation of the “wetlands” provisions of the Clean Water Act by federal regulatory agencies when it affects the custom, culture or economic stability of Crook County residents.

C. Aquifers: Crook County requests that the Wyoming Department of Environmental Quality (WDEQ) work with the County to assure that minimal potable water is used for secondary oil recovery injection wells. Alternative methods shall be evaluated.

Water Quantity:

A. The protection and preservation of existing water rights and water uses within the County is of primary importance to the County’s economic and cultural well-being. Therefore, transfers or abandonment in water use shall be considered carefully in relationship to the history, traditions, culture and economics of Crook County.

B. Crook County recognizes existing water rights and promotes new development of water for agricultural, municipal, industrial, domestic, recreation and hydroelectric power purposes for future economic and cultural growth.

12. WILDERNESS and Other Set Aside Designations

Goal: Crook County will strive to have an active role in the decision-making process regarding Wilderness or other set aside designations within its borders.

Background:

The Wilderness Act of 1964, 16 U.S.C. § 1131-1136, created a National Wilderness Preservation System to be composed of federally managed lands designated by Congress as "wilderness areas." The Act defined Wilderness as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The definition stated that a wilderness thus was in "contrast with those areas where man and his own works dominate the landscape." See 16 U.S.C. § 1131 (c).

The Wyoming Wilderness Bill of 1984, Public Law 98-550, aimed "To designate certain national forest system lands in the State of Wyoming for inclusion in The National
Wilderness Preservation System, to release other forest lands for multiple use management, to withdraw designated wilderness areas in Wyoming from minerals activity, and for other purposes." Sand Creek area was considered for Wilderness but was released.

There are no designated Wilderness areas in Crook County.

Objectives:
Current Wilderness or set aside recommendations made by federal agencies shall be reviewed by the County in relation to the impacts on natural resource based industries, on the economic stability of the County, and on the custom and culture of the citizens of Crook County. This evaluation and subsequent recommendation from the County will be forwarded to Congress.

Should the recommendation be made by Congress not to designate an area as Wilderness or set aside, the area under consideration shall be released from further wilderness consideration.

13. WILDLIFE

Goal: Crook County will strive to encourage the Wyoming Game and Fish Department to maintain balanced wildlife populations for both consumptive and non-consumptive uses.

Background:
The Wyoming Game and Fish Department is the principle agency responsible for managing the wildlife resource in Crook County. Historically, white-tail deer and Merriam's wild turkey have been the species of interest for the hunting public in this area. However, over the past ten years white-tail deer, turkey as well as Pronghorn Antelope numbers have declined. Mule deer and rocky mountain elk numbers have remained relatively stable over the same time period. Two mountain lions have been killed in Crook County in the past ten years; there are no bears in the area. Populations of cottontail rabbit, squirrel, and sharp-tail and ruffed grouse are weather and habitat dependent; their present populations have minimal impact on the regional economy. (See Appendix L, #1 for more information.)

In Wyoming, the state legislature has assumed responsibility for wildlife caused damage on agricultural lands from those animals classified as big game, trophy game and game birds. Wildlife depredation is more prevalent when population numbers are high, particularly during drought or severe winter weather conditions. Additionally, the Game and Fish Department annually provides damage prevention materials to county landowners for protection of stored crops. (See Appendix L, #2 for more information.)

The legislature has classified coyotes, red foxes, jackrabbits, skunks, raccoons, porcupines and stray cats as predators. No claims are paid for predator caused damage, although the Game and Fish Department does contribute annually to the state predator
Objective:

Hunting activity, allowable harvests and Departmental feeding programs shall be coordinated with Crook County to achieve a balanced multiple use.

Crook County intends to provide additional information, comments or positions, via written or oral comments or through an additional alternative that should be considered by the appropriate agency.

Crook County requests that the Wyoming Game and Fish Department hold public hearings in local vicinities that represent affected landowners.

Crook County requests that the Wyoming Game and Fish Department incorporate County citizens’ public input early in the licensing decision-making process.

14. THREATENED AND ENDANGERED SPECIES

Goal: Crook County will strive to have an active role in the decision-making process regarding threatened and/or endangered species within its borders.

Background:

There is no resident wildlife or plant species classified as threatened or endangered in Crook County. Crook County is opposed to the recovery and/or re-introduction or introduction of, including designation of critical habitat for, any threatened or endangered species that will negatively affect the current custom, culture and economic stability of Crook County, public use, public access; and as to private property rights, may constitute a taking under the state and federal constitutions, laws and rules.

The purpose of the Endangered Species Act (ESA) of 1973 is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section . . ..”

Objectives:

Crook County shall request that federal and state agencies, to the fullest extent allowed by federal law, give actual notice to the County, at the earliest possible time, of the intent to consider or propose any conservation actions regarding specific species residing in or having critical habitat within Crook County.

In connection with any action related to threatened or endangered plant or animal species in Crook County, a federal or state agency shall:
Base the listing of a species on the best scientific and commercial data relating specifically to Crook County and not generalized over wider geographic area;

- List a species as threatened or endangered only after taking into account the efforts of Crook County to conserve the species;

- Only implement a recovery plan if it will provide for conservation of a species;

- In designating critical habitat, base the designation on the best scientific data available and, after taking into consideration economic impacts, exclude as critical habitat all impacted areas unless, based upon the best scientific and commercial data available, failure to designate would result in extinction of the species;

- Complete and forward to Crook County in a timely manner all documentation required by law when designating critical habitat;

- Consider and directly respond to comments submitted by Crook County;

- Not develop protective regulations or recovery plans if a Crook County plan is in place to effectively protect the species with Crook County;

- Protect the species through alternatives with the least impact on the custom, culture and economic stability and preservation and use of the environment of Crook County; and to the extent permitted by law, take appropriate mitigation measures adopted with the concurrent of the County to mitigate adequately any impact on custom, culture, economic stability, and protection and use of the environment, including any impact on public use and access and private property rights.

In accordance with State Statute 9-5-303, Crook County requests the attorney general prepare an assessment of takings for any state actions related to the Endangered Species Act in Crook County.

CONCLUSION

This Plan provides the formal outline of the planning process as it relates to the federally and state managed lands and federal and state regulation on private property. The implementation process of the Plan will be continual, and will require the Board to become involved with analysis and evaluation of all stages of the planning cycles followed by federal and state management agencies, including plan development, implementation and monitoring. There is currently no budget for Land Use Planning, and its effectiveness will depend on the commitment of volunteers.

Federal and state regulation action as well as management actions on federal and state lands should be carried out with integrity and in a manner reflecting accepted and applicable scientific knowledge and principles which support high expectations of success. Monitoring must provide applicable, relevant, accurate, and truthful data to unbiased scientific interpretation to guide plan amendments to assure sustained productivity of County resources for future generations.
Management plans, implementation actions and monitoring activities should adhere strictly to the laws of the United States, the State of Wyoming, Crook County, and all its municipalities.

APPENDICES TO THE PLAN

APPENDIX A - Introduction

List of Laws and Regulations that impact state and federal planning processes:
- Forest and Rangeland Renewable Resources Planning Act of 1974
- Forest Service Regulations
- Bureau of Land Management Regulations
- Endangered Species Act (ESA)
- Wild and Scenic Rivers Act
- Historic Preservation Act Regulations
- Clean Air Act
- Clean Water Act
- Rural Environmental Conservation Act
- Resource Conservation Act of 1981
- Presidential Executive Order 12866 - Regulatory Planning and Review (Sept. 30, 1993)
- Presidential Executive Order 12630 - Governmental Actions and Interference with Constitutionally Protected Property Rights (March 15, 1988)
- Federal Land Policy and Management Act (FLPMA)
- Federal Advisory Committee Act (FACA)
- Food and Agriculture Conservation Trade Act
- National Environmental Policy Act (NEPA)
- The Wilderness Act of 1964
- The Wyoming Wilderness Bill of 1984
- American Heritage Rivers Initiative

APPENDIX B - Custom, Culture and Economic Base of Crook County

There are 1,827,840 acres in Crook County.
- Source: Crook County Assessor’s Office.

Land Ownership in Crook County

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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<tr>
<td>Private</td>
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</tr>
<tr>
<td>Non-Private</td>
<td>21%</td>
</tr>
</tbody>
</table>

Breakdown of Non-Private Land

<table>
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<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Forest Service</td>
<td>8.7%</td>
</tr>
<tr>
<td>State of Wyoming</td>
<td>6.2%</td>
</tr>
</tbody>
</table>
Bureau of Land Management 4.8
Bureau of Reclamation 0.9
National Park Service <0.1
Cities <0.1
Wyoming Game & Fish <0.1
Crook County 0.1
School District <0.1
Water 0.6
Other 0.5
21.0%

-Source: Baseline data on agriculture and natural resources in Crook County provided by Gene Gade, UW Extension.

APPENDIX C - Multiple Use/Economic Use of Federal, State and Private Lands and Coordination with Federal and State Agencies

The following is Part 219.7, Title 36, of the Code of Federal Regulations:

219.7 Coordination with other public planning efforts.

(a) The responsible line officer shall coordinate regional and forest planning with the equivalent and related planning efforts of other Federal agencies, State and local governments, and Indian tribes.

(b) The responsible line officer shall give notice of the preparation of a land and resource management plan, along with a general schedule of anticipated planning actions, to the official or agency so designated by the affected State (including the Commonwealth of Puerto Rico). The same notice shall be mailed to all Tribal or Alaska Native leaders whose tribal lands or treaty rights are expected to be impacted and to the heads of units of government for the counties involved. These notices shall be issued simultaneously with the publication of the notice of intent to prepare an environmental impact statement required by NEPA procedures (40 CFR 1501.7).

(c) The responsible line officer shall review the planning and land use policies of other Federal agencies, State and local governments, and Indian tribes. The results of this review shall be displayed in the environmental impact statement for the plan (40 CFR 1502.16(c), 1506.2). The review shall include:

(1) Consideration of the objectives of other Federal, State and local governments, and Indian tribes, as expressed in their plans and policies;

(2) An assessment of the interrelated impacts of these plans and policies;

(3) A determination of how each Forest Service plan should deal with the impacts identified; and,

(4) Where conflicts with Forest Service planning are identified, consideration of alternatives of their resolution.

(d) In developing land and resource management plans, the responsible line officer shall meet with the designated State official (or designee) and representatives of other Federal agencies, local governments, and Indian tribal governments at the beginning of the planning process to develop procedures for coordination. As a minimum, such conferences shall also be held after public issues and management concerns have been identified and prior to recommending the preferred alternative. Such conferences may be held in conjunction with other public participation activities, if the opportunity for government officials to participate in the planning process is not thereby reduced.

(e) In developing the forest plan, the responsible line officer shall seek input from other Federal, State and local governments, and universities to help resolve management concerns in the planning process and to identify areas where additional research is needed. This input should be included in the discussion of the research needs of the designated forest planning area.

(f) A program of monitoring and evaluation shall be conducted that includes consideration of the effects of National Forest management on land, resources, and communities adjacent to or near the National Forest being planned and the effects upon National Forest management of activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments.
The following is Part 1610.3, Title 43, of the Code of Federal Regulations:

1610.3 Coordination with other Federal agencies, State and local governments, and Indian tribes.

Sec. 1610.3-1 Coordination of planning efforts

(a) In addition to the public involvement prescribed by Sec. 1610.2 of this title, the following coordination is to be accomplished with other Federal agencies, State and local governments, and Indian tribes. The objectives of the coordination are for the State Directors and District and Area Managers to keep apprised of non-Bureau of Land Management plans; assure that consideration is given to those plans that are germane in the development of resource management plans for public lands; assist in resolving, to the extent practicable, inconsistencies between Federal and non-Federal government plans; and provide for meaningful public involvement of other Federal agencies, State and local government officials, both elected and appointed, and Indian tribes in the development of resource management plans, including early public notice of proposed decisions which may have a significant impact on non-Federal lands.

(b) State Directors and District and Area Managers shall provide other Federal agencies, State and local governments, and Indian tribes opportunity to review, advice, and suggestion on issues and topics which may affect or influence other agency or other government programs. To facilitate coordination with State governments, State Directors should seek the policy advice of the Governor(s) on the timing, scope and coordination of plan components; definition of planning areas; scheduling of public involvement activities; and the multiple use opportunities and constraints on public lands. State Directors may seek written agreements with Governors or their designated representatives on processes and procedural topics such as exchanging information, providing advice and participation, and timeframes for receiving State government participation and review in a timely fashion. If an agreement is not reached, the State Director shall provide opportunity for Governor and State agency review, advice and suggestions on issues and topics that the State Director has reason to believe could affect or influence State government programs.

(c) In developing guidance to District Managers, in compliance with section 1611 of this title, the State Director shall:

(1) Ensure that it is as consistent as possible with existing officially adopted and approved resource related plans, policies or programs of other Federal agencies, State agencies, Indian tribes and local governments that may be affected, as prescribed by Sec. 1610.3-2 of this title,

(2) Identify areas where the proposed guidance is inconsistent with such policies, plans or programs and provide reasons why the inconsistencies exist and cannot be remedied, and

(3) Notify the other Federal agencies, State agencies, Indian tribes or local governments with whom consistency is not achieved and indicate any appropriate methods, procedures, actions and/or programs which the State Director believes may lead to resolution of such inconsistencies.

(d) A notice of intent to prepare, amend, or revise a resource management plan shall be submitted, consistent with State procedures for coordination of Federal activities, for circulation among State agencies. This notice shall also be submitted to Federal agencies, the heads of county boards, other local government units and Tribal Chairmen or Alaska Native Leaders that have requested such notices or that the responsible line manager has reason to believe would be concerned with the plan or amendment. These notices shall be issued simultaneously with the public notices required under Sec. 1610.2(b) of this title.

(e) Federal agencies, State and local governments and Indian tribes shall have the time period prescribed under Sec. 1610.2 of this title for review and comment on resource management plan proposals. Should they notify the District or Area Manager, in writing, of what they believe to be specific inconsistencies between the Bureau of Land Management resource management plan and their officially approved and adopted resources related plans, the resource management plan documentation shall show how those inconsistencies were addressed and, if possible, resolved.

(f) When an Advisory Council has been formed under section 309 of the Federal Land Policy and Management Act for the district in which the resource area is located, that council shall be informed and their views sought and considered throughout the resource management planning process.

Sec. 1610.3-2 Consistency requirements.
(a) Guidance and resource management plans and amendments to management framework plans shall be consistent with officially approved or adopted resource related plans, and the policies and programs contained therein, of other Federal agencies, State and local governments and Indian tribes, so long as the guidance and resource management plans are also consistent with the purposes, policies and programs of Federal laws and regulations applicable to public lands, including Federal and State pollution control laws as implemented by applicable Federal and State air, water, noise, and other pollution standards or implementation plans.

(b) In the absence of officially approved or adopted resource-related plans of other Federal agencies, State and local governments and Indian tribes, guidance and resource management plans shall, to the maximum extent practical, be consistent with officially approved and adopted resource related policies and programs of other Federal agencies, State and local governments and Indian tribes. Such consistency will be accomplished so long as the guidance and resource management plans are consistent with the policies, programs and provisions of Federal laws and regulations applicable to public lands, including, but not limited to, Federal and State pollution control laws as implemented by applicable Federal and State air, water, noise and other pollution standards or implementation plans.

(c) State Directors and District and Area Managers shall, to the extent practicable, keep apprised of State and local governmental and Indian tribal policies, plans, and programs, but they shall not be accountable for ensuring consistency if they have not been notified, in writing, by State and local governments or Indian tribes of an apparent inconsistency.

(d) Where State and local government policies, plans, and programs differ, those of the higher authority will normally be followed.

(e) Prior to the approval of a proposed resource management plan, or amendment to a management framework plan or resource management plan, the State Director shall submit to the Governor of the State(s) involved, the proposed plan or amendment and shall identify any know inconsistencies with State or local plans, policies or programs. The Governor(s) shall have 60 days in which to identify inconsistencies and provide recommendations in writing to the State Director. If the Governor(s) does not respond within the 60-day period, the plan or amendment shall be presumed to be consistent. If the written recommendation(s) of the Governor(s) recommend changes in the proposed plan or amendment which were not raised during the public participation process on that plan or amendment, the State Director shall provide the public with an opportunity to comment on the recommendation(s). If the State Director does not accept the recommendations of the Governor(s), the State Director shall notify the Governor(s) and the Governor(s) shall have 30 days in which to submit a written appeal to the Director of the Bureau of Land Management. The Director shall accept the recommendations of the Governor(s) if he/she determines that they provide for a reasonable balance between the national interest and the State’s interest. The Director shall communicate to the Governor(s) in writing and publish in the Federal Register the reasons for his/her determination to accept or reject such Governor’s recommendations.

APPENDIX D - Agriculture & Livestock Grazing

Agricultural Statistics for Crook County:
The primary contribution of agriculture to the revenue base of Crook County is through the collection of ad valorem taxes. Crook County assigns an assessed value to several classes of agricultural lands. This assessment includes varied assessment values for dry farm, irrigated lands, range, farmsteads, waste and bog lands, as well as related improvements. Crook County’s total assessed value in the 1997 abstract is $28,116,817.00. 1,376,959 acres of agricultural lands and related improvements shows an assessed value of $6,767,016.00.
-Source: Crook County Assessor’s Office.

-For Agricultural Statistics, see Wyoming Agricultural Statistics Service, 1997 Publication on file in the County Clerk’s Office.
- Also, see reports on file in the County Clerk’s Office, from Gene Gade, UW Extension Agency.

APPENDIX E - Air Quality
Information on air quality area classifications and standards can be obtained from the Wyoming Air Quality Regulations, a publication available through the Wyoming Department of Environmental Quality, Air Quality Division, 122 West 25th Street, Herschler Building, Cheyenne, WY 82002. A copy of the publication will remain on file in the office of the Crook County Clerk, Sundance, Wyoming.

APPENDIX F - Air Space
Currently, the Department of the Interior, Devils Tower National Monument, has a memorandum of understanding (MOU) with the US Air Force concerning overflights of the Tower. This MOU was signed with Colonel Shuebert, stationed at Ellsworth Air Force Base in 1995. The request for the MOU came from the Devils Tower National Monument Superintendent, who reported that the overflights were disruptive to visitors at the Monument.

The MOU states that there will be a reserved air space as defined by five (5) nautical and vertical air miles and followed by all Department of Defense personnel.

APPENDIX G - Energy & Mineral Resources
List of Minerals in Crook County

<table>
<thead>
<tr>
<th>Alum</th>
<th>Barite</th>
<th>Bentonite</th>
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</thead>
<tbody>
<tr>
<td>Calcite</td>
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<td>Columbite</td>
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<tr>
<td>Copper</td>
<td>Fluorite</td>
<td>Garnet</td>
</tr>
<tr>
<td>Gold</td>
<td>Gypsum</td>
<td>Iron-Pyrite</td>
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<tr>
<td>Lead</td>
<td>Limestone</td>
<td>Manganese</td>
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<tr>
<td>Nepheline-syenite</td>
<td>Oil and Gas</td>
<td>Quartz-agates</td>
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<tr>
<td>Tripolite</td>
<td>Silver</td>
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<td>Stone-marble</td>
<td>Titanite</td>
<td>Tourmaline</td>
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<tr>
<td>Uranium</td>
<td>Rare Earths</td>
<td>Vanadium</td>
</tr>
<tr>
<td>Zinc</td>
<td>Sand &amp; Gravel</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Crook County Land Use Plan, December 19, 1977, page 13.)

APPENDIX H - Timber Resources
The US Forest Service has a proposed harvest of 83.8 million board feet (MMBF) on the Black Hills National Forest. This has decreased 30% from the 1983 Forest Plan.
- Reference: Revised Forest Plan for the Black Hills National Forest and related EIS. See these documents, on file with the County Clerk, for further information.

APPENDIX I - Paleontological Resources
The Little Houston Quarry, part of the Jurassic Morrison Formation and located between Moorcroft and Sundance, has produced fossils of the prehistoric Camarasaurus. Fossils found at the Hawken Site, a buffalo jump located seven miles south of Sundance, suggest the existence of a sizable herd of now-extinct bison (*bison bison occidentalis*) from approximately 4400-4500 B.C. - Source: Crook County Museum, Sundance.

**APPENDIX J - Recreational Use**
Recreational activities in Crook County include, but are not limited to: hunting, fishing, four-wheeling, snowmobiling, rock climbing, spelunking, hiking, motor biking, camping, biking, golfing, snowshoeing, berry picking, sightseeing, bird- and wildlife-watching, picnicking, swimming, horseback riding, water- and snow-skiing, rock hounding, trapping, target shooting, rodeoing, and flying.

**APPENDIX K - Water Resources**
The largest portion of crops produced with irrigation in Crook County are alfalfa, grass and other hay and feed grains which are produced for the livestock industry.

Each year, millions of gallons of potable water is used for the secondary recovery of oil on private, state and federal lands. This water becomes unsuitable for human or livestock use.

**APPENDIX L - Wildlife**
#1 - Over the past ten years, white-tail deer numbers have declined from 40,000 to 20,000 head. At the same time, turkey numbers have also declined, from approximately 10,000 to 2,000 birds. Pronghorn Antelope have experienced a similar population decline. Consequently, county-wide revenue generated from hunter dollars has declined from $3.2 million in 1986 to $1.8 million in 1996.

Mule deer and rocky mountain elk numbers have remained relatively stable over the same time period with populations of 20,000 and 500, respectively.

#2 - The Wyoming Game and Fish Department reimbursed 13 area landowners greater than $160,000.00 during the drought year of 1989. Only one damage claim has been filed/paid each of the past two years in the county; $2,400.00 in 1995 and $2,840.00 in 1996. The Game and Fish Department provides approximately $20,000.00 annually in damage prevention materials to county landowners for protection of stored crops.

#3 - The Wyoming Game and Fish Department contributes more that $150,000.00 annually to the state predator control program.

-Source: Wyoming Game and Fish Department.

**APPENDIX M - Threatened and Endangered Species**
Definitions:
**Threatened** = the classification provided to an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

**Endangered** = the classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

**Conservation** = from section 3(3) of the Federal Endangered Species Act: “The terms ‘conserve,’ ‘conserving,’ and ‘conservation’ mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided under this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.”

**Critical habitat** = Specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the Federal Register.

**Habitat** = the location where a particular taxon of plant or animal lives and its surroundings (both living and nonliving) and includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.


**SOURCES**
References, including resources and sources, used in the development of the Draft 1997 Land Use Plan for Crook County:

- Interim Comprehensive Land Use and Management Plan for the Federally and State Managed Lands in Owyhee County - July, 1993
• Crook County Land Use Plan, Prepared by the Crook County Planning Commission with assistance from Tri-County Planning Office, Newcastle, Wyoming, Approved by the Board of County Commissioners of Crook County, December 19, 1977.
• Connie Tschetter, Crook County Clerk, Sundance, Wyoming.
• Gene Gade, University of Wyoming Extension Agency, Crook County Courthouse, Sundance, Wyoming.
• Board of Crook County Commissioners - Alan Roberts, Mark Semlek, Merle Clark, Don Roberts.
• Devils Tower Conservation District, Sundance, Wyoming.
• Joe Baron, Crook County Attorney, Sundance, Wyoming.
• Crook County Museum, Sundance, Wyoming.
• Crook County Land Use Planning and Zoning Commission -
  Members: Anita Fish, Chairperson
  Mary Flanderka, Vice-Chairperson
  Gerald Bunney
  Walt Marchant
  Gisele Robinson
  Sub-committee: Gary Allison
  Dan Boone
  Larry Goodson
  Sheryl Klocker
  Darlene Spiedel
  Linda Tokarczyk
  Darla West

*To access more information on land use planning in Crook County or more details on the County’s land use planning process, please contact the office of the County Clerk, P.O. Box 37, Sundance, WY 82729 - County Courthouse, Sundance, Wyoming - Phone: 307-283-1323.