HAWK SPRINGS WATER SUPPLY PROJECT
EXECUTIVE SUMMARY
MARCH, 1996
WYOMING WATER DEVELOPMENT COMMISSION

ALTERNATIVE NO.1

ALTERNATIVE NO.2

ALTERNATIVE NO.3

ALTERNATIVE NO.4

IN ASSOCIATION WITH:
Lidstone & Anderson Inc.
HAWK SPRINGS WATER SUPPLY PROJECT

HAWK SPRINGS, WYOMING

EXECUTIVE SUMMARY

PREPARED FOR:

WYOMING WATER DEVELOPMENT COMMISSION
HERSCHLER BUILDING
122 W. 25TH STREET
CHEYENNE, WY 82002

PREPARED BY:

BRS, inc.
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Broomfield, CO 80038-1104

&
1225 Market Street
Riverton, Wyoming 82501

and

Lidstone & Anderson, Inc.
736 Whalers Way, F-200
Fort Collins, CO 80525

March, 1996
PROFESSIONAL CERTIFICATION

I, Douglas L. Beahm, President of BRS inc., a Wyoming Corporation, hereby certify that the professional services required for the Hawk Springs Water Supply Project, Level II, were performed by me or under my direction and that I am a Professional Engineer licensed in Wyoming as required by the provisions of W.S. 33-29-105 through W.S. 33-29-113. IN WITNESS WHEREOF, I have hereunder set my hand and affixed my seal.

By: Douglas L. Beahm, P.E. #5499
President, BRS inc.

I further certify that I am a Professional Geologist licensed as required by the provisions of W.S. 33-41-101 through W.S. 33-41-121, and that all geological work performed in relation to the Hawk Springs Water Supply Project, Level II, was performed by me or under my direction. IN WITNESS WHEREOF, I have hereunder set my hand and affixed my seal.

By: Douglas L. Beahm, P.G. #1341
President, BRS inc.
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Introduction

The Hawk Springs Water Supply Project is a Level II study, funded by the Wyoming Water Development Commission (WWDC). No previous studies have been completed for this project. Hawk Springs is an unincorporated community located along Wyoming Highway 85 in Goshen County, Wyoming, 27 miles south of Torrington and 14 miles north of La Grange. Currently residents obtain their water from individual small capacity wells, the majority of which are completed in the Cretaceous Lance Formation. Water quality from this source is poor with elevated levels of TDS, sodium, and bicarbonate (Table 1 - Existing Conditions Water Quality Hawk Springs). Unfortunately, current residents with individual wells have little choice but to rely on the Lance as a water source. In addition, without a community sewage disposal system, the potential for individual well contamination from septic systems is very high. Thus, the need for the Hawk Springs Water Supply Project based on public health is high.

The Hawk Springs Water and Sewer District (District) has been formed to provide a funding mechanism for the establishment of a community water supply and a wastewater treatment system. Although the District’s Articles of Incorporation identify a service area boundary, the population and/or number of taps, who might participate in the project, remains uncertain. For comparative purposes, the cost alternative discussions within this report are based on providing service to 35 taps. This number of taps is consistent with existing conditions, assuming a reasonable level of community support, and is consistent with water demand and growth estimates. If the District cannot provide service to at least 30 to 35 taps, the project may not be feasible based on per user costs. In addition, due to the high capital costs and limited number of users, a combination of grants and loans from various sources, including WDC, Farm Loan Board (FLB), Rural Economic and Community Development (RECD), and Goshen County would be necessary to make the system affordable to the users. Even with the most favorable combination of grants and loans, the per tap costs would exceed rates of surrounding communities.

This investigation has identified four main water supply alternatives, as depicted on the cover:

**Alternative No. 1 (Preferred) -** Develop a deep ground water supply via 3 production wells in the Arikaree Formation, approximately 12 miles west of Hawk Springs.

**Alternative No. 2 -** Develop a surface water source near Hawk Springs within the Horse Creek drainage either via 4 alluvial wells (Alternative No. 2A), or an infiltration gallery (Alternative No. 2B).

**Alternative No. 3 -** Develop a deep alluvial well field, consisting of 3 alluvial wells, near Hawk Springs Reservoir, approximately 8.5 miles southeast of Hawk Springs.

**Alternative No. 4 -** Connect to the existing water system of the Town of La Grange and construct a 14 mile long transmission line.
TABLE 1 - EXISTING CONDITIONS WATER QUALITY HAWK SPRINGS. ¹

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<th>Sample ID</th>
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Drinking Water Secondary Standards

TDS = 500 mg/L USEPA, 1989; 1,000 mg/L WHO, 1984
Sodium = 20 mg/L USEPA, 1980 recommended; 200 mg/L WHO, 1984

Notes: 1. Current community water supply consists of individual water wells, completed in Cretaceous Lance Formation.

2. No laboratory analysis; TDS calculated from field conductivity (EC).
Project Setting

Hawk Springs is located within the Goshen Hole Lowland of the Denver-Julesberg Basin. In the immediate vicinity of Hawk Springs surface geologic exposures include the Quaternary alluvium associated with the Horse Creek drainage system and Cretaceous Lance Formation. The Cretaceous Age units have a total thickness of approximately 7,500 feet. Within the Cretaceous, only minor aquifers may be expected, and water quality is generally poor. The Goshen Hole is bounded by exposures of Tertiary Arikaree, Brule, and Chadron Formations. The Arikaree Formation is an erosionally resistant unit which form cliffs west and south of Hawk Springs. The Arikaree is a major aquifer while the Brule has locally discontinuous major aquifers and the Chadron has locally discontinuous minor aquifers. The exposed thickness of Tertiary strata, west of Hawk Springs is approximately 600 feet.

The surface elevation at Hawk Springs is approximately 4,380 feet with little topographic relief in the immediate vicinity. To the west and south, corresponding with the outcrop of the Arikaree Formation, the topography rises abruptly to form elevated plateaus at approximately 5,100 feet (MSL).

Land ownership consists of private land interspersed with areas of state-owned land. Surface rights to all state lands in the vicinity of Hawk Springs are leased to local landowners. Public easements exist along state highways and some county roads. Land ownership and access may limit water supply and transmission alternatives for the town of Hawk Springs.

Service Area - Water Demand

Since Hawk Springs is an unincorporated town, little official population data or population statistics are available. The community has no common water or sewer utility, hence no predetermined service area, number of taps nor quantified water demand. The service area for this “District” will ultimately be established based on local interest, dictated by cost and system practicality.

In accordance with WWDC guidelines, the design life of the facility is 30 years. To determine project economics and “ability to pay”, it is also essential to make a realistic appraisal of the existing and future growth within the community. The State of Wyoming, Division of Research and Statistics estimates that the current 1994 population of Hawk Springs is 48 persons. Based on data from the adjacent small towns, Yoder and La Grange, the future 30-year growth of the Hawk Springs Water District may range from 95 to 122 persons.

For design purposes, populations of 75 and 120 persons were assumed for current and future conditions, respectively. On this basis, total annual usage could range from 3.9 to 6.2 million gallons per year. Peak one hour demand (without fire flows) would range from 44 to 59 gpm. The resulting minimum recommended storage requirement for the Hawk Springs system is 42,595 gallons, or for practical purposes 50,000 gallons.
Fire flow requirements are typically rated-system capacity to ensure compliance with minimum fire insurance requirements. For a community like Hawk Springs, minimum fire flow requirements to provide “insurance-level” fire protection would require a system capacity, which can provide approximately 1,000 gpm for two consecutive hours. Given the limitations of water production and the project economics of the population (user) base, the above fire flow demand was not a design consideration. However the system is capable of delivering 150 gpm to a single hydrant with no other system demand. Hawk Springs currently has a volunteer fire department with a pumper truck and supply well. Although the new system can fill a 500 gallon truck in less than 5 minutes, the project team recommends that the Hawk Springs Fire District not abandon their current dedicated well.

Potential Water Supply Sources

To be viable, potential water supply sources must yield the quantity of water needed to meet the demand of the service area and provide adequate water quality to meet primary drinking water standards, with additional consideration given to secondary drinking water standards.

Both surface and ground water alternatives were evaluated against water quantity and quality criteria. During Phase 1 of the project, a water quality data collection program was completed which included sampling existing wells completed in a variety of aquifers. The sampling program also included Horse Creek and Hawk Springs Reservoir as potential surface water sources. Based on the field sampling and laboratory analysis program, significant variability in water quality was identified between sources. The major water quality concerns in the local area are total dissolved solids (TDS) and sodium (Na). Figure 1 shows that the concentrations of these parameters vary with potential water sources.

EPA primary standards, which are prescribed based upon human health considerations and must be met by public water systems, were met in nearly every sample. However, the water’s ability to meet secondary standards was highly variable depending on the source. Although public water supplies can exceed secondary standards, such standards are important reflections of water acceptability, including taste, suitability for uses such as washing clothes, corrosion of plumbing, and certain health impacts. Based on the water quality information presented on Figure 1, the Brule, Arikaree and Horse Creek water sources were worthy of consideration based on water quality. The Chadron Formation was eliminated from further consideration based on overall water quality versus the distance from town. The Lance Formation did not meet minimum water quality standards.

In addition to these physical factors (water quantity and quality), several institutional and regulatory issues play significant roles in the selection of a water source. Regardless of the quality of the water, different types of sources require different levels of treatment. If the source involves surface water or ground water that is directly connected to a surface water source, Surface Water Treatment Rules (SWTR) apply and filtration and disinfection are required. On the other hand, a source involving only deep ground water can be utilized with much more lenient regulatory requirements, which may involve only disinfection.
HAWK SPRINGS AREA SAMPLES
WATER QUALITY COMPARISON BASED ON SOURCE

Secondary Standards
1. TDS - 1000 ppm, WHO, 1984
2. Sodium - 200 mg/l, WHO, 1984
3. TDS - 500 ppm, USEPA, 1989
4. Sodium - 20 mg/l, USEPA, 1980

Conductivity (umhos)
Sodium (mg/l)
TDS (ppm)

FIGURE 1
Easements, Environmental Issues, and Permits

When this project proceeds to construction, the Hawk Springs Water District will be required to obtain certain easements and access in the construction areas. In order to avoid possible conflicts with private landowners, to the extent possible, the water supply and distribution systems were located within existing easements and rights-of-way.

A detailed study of potential environmental impacts would be required prior to any construction. Important land resources which may be affected by the project would include stream crossings, flood plains and wetlands, historic and archaeological resources, and endangered species/critical habitats. If federally funded, an environmental assessment (EA) would need to be approved by the involved Federal, State, and County agencies prior to any construction activities.

A summary of the most significant permits and clearances required follows:

1. The U.S. Army Corps of Engineers will require a 404 or Nationwide Permit for any live water crossing and any work within Horse Creek.

2. The Wyoming DEQ/WQD will require a Permit to Construct for all transmission, storage, distribution, and treatment facilities and a Storm Water Discharge Permit (NPDES).

3. The U.S. Environmental Protection Agency will determine the applicability of the Surface Water Treatment Rule.

4. The Wyoming State Historic Preservation Office will need to be contacted for cultural clearance prior to any construction.

5. The Wyoming Fish and Game Department will need to be contacted for clearance relative to Threatened and Endangered species prior to any construction.

6. The State Engineer will require UW5 permits for all wells. Water rights will be adjudicated before the State Board of Control. For any surface water rights, the District shall address the status with the State Engineer.

7. The Wyoming State Department of Highways will require permits for work within easements and highway bores.

8. Goshen County will require permits to construct within county road easements.

9. The Union Pacific Railroad Company must consent to boring under their right-of-way.

10. The United State Air Force must be contacted for location and clearance to cross missile cables.
Water Supply Alternatives

**Alternative No. 1 (Preferred)** - Develop a deep ground water supply via 3 production wells completed in the Arikaree Formation, approximately 12 miles west of Hawk Springs. The wells would be approximately 250 feet deep. Based on the project testing program, this source could meet the long term water demand. The completion of the final production wells will confirm final yield estimates. The Arikaree water source meets EPA primary and secondary drinking water standards, and offers the best water quality of any identified alternative. The deep ground water alternative would be gravity-fed and has the advantages of minimal operation and maintenance costs. Regulatory requirements and constraints would be minimal, and compliance with water treatment regulations would require relatively little investment in time and cost. This alternative has the best potential to serve the highest number of water users by including additional users along the water supply transmission line. The main disadvantage of this alternative is the high capital cost associated with a lengthy transmission line and the potential for impact of adjacent area water rights. A commitment to provide an adequate volume of livestock water may be an integral part of this development option.

**Project Costs, Alternative No. 1**: Capital costs are estimated at 2.15 million dollars. Assuming 35 taps and the best-case funding scenario, the total per tap cost is estimated at $31.68 per month.

**Alternative No. 2** - Develop a surface water source near Hawk Springs within the Horse Creek drainage. The potential for this source to meet the water demand is high, however, obtaining the water rights could be difficult. This water source would meet EPA primary drinking water standards but would exceed certain secondary standards. The potential for water supply contamination of a shallow alluvial water source are high, and water treatment including filtration and disinfection would be required. The disadvantages of this alternative include high operation and maintenance (O&M) costs, as well as, higher level operator certification associated with filtration water treatment requirements. Regulatory requirements and constraints would be greater than the deep ground water alternative, and permitting issues including compliance with the Surface Water Treatment Rule (SWTR) and water rights regulation within the North Platte Basin must also be addressed. Two methods of developing this water source have been evaluated. Either alternative would have substantially lower capital costs than Alternative No. 1, but much higher O&M costs.

Alternative No. 2A - Develop the surface water source via 4 shallow alluvial wells. The water quality from the alluvial wells (Alternative No. 2A) would be marginal exceeding secondary standards for TDS and Sodium.

Alternative No. 2B - Develop the surface water source via an infiltration gallery under Horse Creek. The water quality from an infiltration gallery would be more acceptable than the alluvial wells but would still exceed secondary standards for sodium.

Of these two alternatives, Alternative 2B, surface water infiltration gallery, is recommended based on costs, ease of construction, and improved water quality.
Project Costs, Alternative 2: (Assuming 35 taps, and the best-case funding scenario.)

Alternative No. 2A: Capital costs are estimated at 0.82 million dollars, and per tap costs are estimated at $44.84 per month.

Alternative No. 2B: Capital costs are estimated at 0.78 million dollars, and per tap costs are estimated at $44.26 per month.

Alternative No. 3 - Develop an alluvial well field, consisting of 3 deep alluvial wells, near the Hawk Springs Reservoir. The wells would be located near the west side of the reservoir. Based on existing well data, the wells would be completed to a depth of approximately 150 feet. The potential for this source to meet future water demand is high. Water rights at Hawk Springs Reservoir are controversial and obtaining the water rights may be a difficult process. Based upon data from the reservoir, the water quality would be similar to Alternative 2A, meeting EPA primary drinking water standards, but exceeding secondary standards for TDS and sodium. For the purposes of preparing costs, it is assumed that these deep alluvial wells would be exempt from the EPA rules pertaining to ground water under the influence of surface water. However, if this source were ruled to be under the influence of surface water, compliance costs would substantially impact the viability of this alternative. Water rights regulation within the North Platte drainage basin must also be addressed. This alternative entails high capital costs due to a lengthy transmission line, and moderate O&M costs. Elevated storage and a booster pump station would be required.

Project Costs, Alternative No. 3: Capital costs are estimated 1.86 million dollars. Assuming 35 taps, and the best-case funding scenario, the per tap costs are estimated at $32.37 per month.

Alternative No. 4 - Connect to the existing water system in the Town of La Grange, and construct a lengthy transmission line to the Town of Hawk Springs. The potential for this source to meet the water demands is high provided an agreement on rates and supply can be reached between the two communities. Field water quality measurements indicate that this water source would meet EPA standards. La Grange does not treat or chlorinate their ground water supply. Should EPA initiate regulation of this source, the cost of water treatment would be applied to all users. This alternative offers minimal maintenance costs, yet very high capital costs. The Town of La Grange would have to agree with the project, and would require a fee for the use of the water from their system. The current base fee charged to La Grange residents is $7.90 per month, per tap.

Project Costs, Alternative No. 4: Capital costs are estimated at 1.94 million dollars. Assuming 35 taps, and the best-case funding scenario, the per tap costs are estimated at $36.53 per month.
Capital and Operating Costs

Table 2 provides a cost comparison of the water supply alternatives assuming the most optimistic funding scenario which entails financing participation from four different sources:

- Wyoming Water Development Commission, 67% grant water supply system.
- Farm Loan Board, 50% grant water distribution system.
- Goshen County, 50% grant water distribution system.
- Rural Economic and Community Development, 75% grant all remaining costs and a 5%, 30-year loan on remaining debt.

Major Capital Cost components include:

1. Lengthy transmission lines (6") for alternatives 1, 3, and 4.
2. Well field construction for alternatives 1, 2A, and 3.
3. Storage for all alternatives at 50,000 gallons, elevated for alternatives 2, 3, and 4.
4. Water treatment (SWTR) for alternatives 2A, 2B and possibly 3.
5. Distribution systems (6") mains, metered service for all alternatives.

Major Operating and Maintenance Cost components include:

1. Power and pump maintenance costs for all alternatives. The lowest power costs are for alternatives 1 and 4.
2. Water quality testing for all alternatives. Alternatives 2A and 2B would have the greatest water sampling and testing requirements due SWTR.
3. General system maintenance required for all alternatives.

As shown on Table 2, the per tap costs range from $31.68 to $44.84 per month assuming the most favorable combination of funding and 35 taps. If funding were available from only WDC and RECD, the per tap costs for the preferred alternative would rise to $45.49 per month for the preferred alternative. Without RECD funding per tap costs would exceed $100.00 per month for all alternatives. Per tap costs are also sensitive to the number of users. At fifteen or fewer taps the per tap costs exceed $75.00 per month. At fifty taps the per month costs approach $20.00 per month. However, given the high capital cost for potential water supply systems and the limited population of the District, even with the most favorable funding mechanisms and a high level of community support, the per user costs for the District will exceed those of nearby communities.
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Conclusions

The basic geologic setting of Hawk Springs limits the water supply alternatives for the District. The Lance Formation which underlies Hawk Springs can be expected to yield poor quality water with very high TDS, sodium and bicarbonate. Data from existing wells in Hawk Springs and the vicinity clearly show that the Lance Formation is not a suitable water supply source for a community water supply. However, the cost of any reasonable water supply system will be high in comparison to the ability to pay and/or number of users. Under the most favorable conditions members of the District will pay rates which exceed those of neighboring communities such as Yoder and La Grange. For the project to proceed to Level III, it is critical that all potential users within the District support the project and that funding, grant/loan, be available from at least WDC and RECD.

Table 3 provides a summary of the water supply alternatives based on costs (capital and user), water quality, water rights issues, and the potential to meet demand. All alternatives will meet current and anticipated future demand provided that necessary water rights and supply agreements can be reached. Water rights issues are significant for any alternative which uses surface water and/or alluvial water potentially related to the Horse Creek drainage. All sources will provide water quality which meets primary EPA drinking water standards. However, only Alternative 1 and perhaps Alternative 4 would meet all EPA Primary and Secondary standards.

Assuming favorable funding and community support, the preferred alternative is Alternative 1, which would provide water from deep ground water wells in the Arikaree Formation, 12 miles west of Hawk Springs. This alternative is among the lower cost alternatives to the user and provides the best water quality with least maintenance obligations. However, if either the funding or level of community support is not available, a project based on this source can not be readily scaled back, since the bulk of the costs are related to the lengthy transmission line. If the project must be scaled back due to lack of funding support and/or lack of community support, the next best alternative is Alternative 2B, development of a surface water infiltration gallery with a surface water treatment facility. Such a facility can be sized to demand and unfavorable O&M costs can be partially offset by use of volunteer labor. Some 89% of the estimated per tap, per month costs of the Alternative 2B water supply and treatment system is related to operating and maintenance costs. These costs are dominantly labor, power, and supplies for the water treatment, and such costs are sensitive to the quantity of water treated. In contrast, 72% of the estimated per tap, per month costs of the Alternative 1 water supply system is related to repayment of debt on capital. Thus, variation in demand would not greatly impact the monthly operating costs of the Alternative 1 system.
### TABLE 3 - SUMMARY COMPARISON OF ALTERNATIVES

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>POTENTIAL TO MEET DEMAND</th>
<th>WATER RIGHTS ISSUES</th>
<th>WATER QUALITY</th>
<th>CAPITAL COSTS</th>
<th>USER COSTS</th>
<th>TOTAL SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt. No. 1 (Groundwater)</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Alt. No. 2A (Alluvial Wells)</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>10</td>
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<tr>
<td>Alt No. 2B (Infiltration Gallery)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Alt No. 3 (Hawk Springs) (Reservoir)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Alt. No. 4 (La Grange)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>

**TABLE KEY:**

- **(Potential to Meet Demand)**
  - 1 = LOW
  - 2 = MODERATE
  - 3 = HIGH
  - 4 = VERY HIGH

- **(Water Rights and Quality)**
  - 1 = POOR
  - 2 = MARGINAL
  - 3 = GOOD
  - 4 = VERY GOOD

- **(Capital and User Costs)**
  - 1 = VERY HIGH
  - 2 = HIGH
  - 3 = MODERATE
  - 4 = LOW