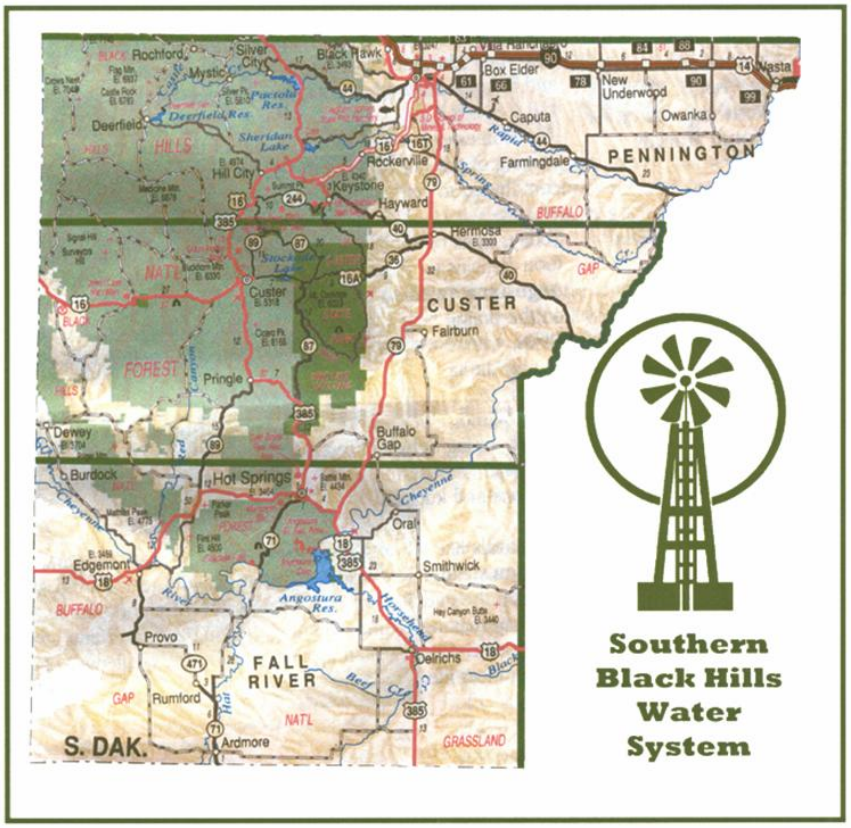
RECLAMATION

Managing Water in the West

Southern Black Hills Water System Appraisal Report

Rural Water Supply Program
Dakotas Area Office, Great Plains Region



U.S. Department of the Interior
Bureau of Reclamation
Bismarck, North Dakota

March 2011

Mission Statements

The U.S. Department of the Interior protects America‘s natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Southern Black Hills Appraisal Report

Rural Water Supply Program
Dakotas Area Office, Great Plains Region

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Acronyms and Abbreviations

AWWA	American Water Works Association
CFR	Code of Federal Regulations
D&S	Directives and Standards
EPA	U.S. Environmental Protection Agency
FOA	Funding Opportunity Announcement
gpd	gallons per day
gpm	gallons per minute
mg/L	milligrams per liter
mgy	million gallons per year
NEPA	National Environmental Protection Act
NHPA	National Historic Preservation Act
OM&R	operation, maintenance, and replacement
PER	*Preliminary Engineering Report (Volumes 1 and 2)* (SBH 2005V1 and see SBH 2005V2)
Program	Rural Water Supply Program
PRV	pressure reducing valve
PVC	polyvinyl chloride
Reclamation	Bureau of Reclamation
Rule	Rural Water Supply Program interim final rule, CFR 404
SBH	Southern Black Hills Water System, Inc. (sponsor)
SBHWS	Southern Black Hills Water System (project)
SCADA	Supervisory Control and Data Acquisition
SD	South Dakota
SDDENR	South Dakota Department of Environment and Natural Resources
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service

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1. About this Appraisal Report

1.1. Rural Water Supply Program

The Bureau of Reclamation's (Reclamation) Rural Water Supply Program (Program) addresses rural water needs in the Reclamation states.

Reclamation's Dakotas Area Office, Great Plains Regional Office, and the Technical Service Center prepared this report as required under Title I, Section 103 of the Reclamation Rural Water Supply Act of 2006 and Appraisal Criteria promulgated by the Secretary included in Reclamation's Rural Water Supply Program interim final rule (43 Code of Federal Regulations [CFR] 404, 2008) (Rule).

1.2. Purpose of the Appraisal Report

On June 30, 2010, the Southern Black Hills Water System, Inc. (SBH) requested Reclamation review of their *Preliminary Engineering Report* (*Volumes 1 and 2*) (PER) (SBH 2005V1 and SBH 2005V2) to determine if it met the requirements of a Feasibility Study under the Program. Reclamation‘s review determined that the report was not complete in several areas and was not ready for a technical review. SBH applied to the Program to correct the deficiencies as well as any comments resulting from a subsequent technical review so that Reclamation could prepare a Feasibility Report.

Reclamation reviewed the PER and addenda in accordance with Rule § 404.44 and Reclamation Manual Directives and Standards CMP TRMR-31. Note that the PER is under separate cover from this notebook. However, the additional materials from the sponsor are contained in this notebook under tabs A through K and referred to by that tab (i.e., SBH 2011_TabA through SBH 2011_TabK). Tab L contains the articles of incorporation for the SBH.

This Appraisal Report was developed for Reclamation‘s Great Plains Region (Michael J. Ryan, Regional Director) to determine whether it is appropriate to recommend that a Feasibility Study be conducted as described in the Reclamation Rural Water Supply Act of 2006 under the Rule.

This Appraisal Report is the first step to determine whether at least one viable alternative warrants a more detailed investigation through a Feasibility Study or to terminate the study. In addition, this report provides a determination of the sponsor's and projects' eligibility as defined in Rule § 404.2 Rural Water Supply

Project," Rule § 404.6 "Who is eligible to participate in the program," and Rule § 404.7 "What types of projects are eligible under the program." The program priorities as outlined in the Directives and Standards CMP TRMR-31 (Reclamation 2010 Manual) (D&S) will also be addressed as part of this Appraisal Report.

This Appraisal Report, containing Reclamation's findings, is based on information contained in the PER as well as addenda from the sponsor. Reclamation did not conduct direct investigations, such as site visits, to verify the information reported.

1.3. Report Authority

This Appraisal Report was conducted under the authority of the Reclamation Rural Water Supply Act of 2006 (Public Law 109-451).

1.4. Study Sponsors

The SBH was established in 2004 to supply drinking water to rural residents and businesses in Custer, Fall River, and Pennington Counties, South Dakota (SD). The SBH is a legally recognized nonprofit corporation and has a certificate of incorporation on file with the Office of the Secretary of State in the State of South Dakota. The South Dakota Codified Laws, chapter 47-22-4, provides the authority for the SBH to lawfully organize as a water management and delivery corporation. The board operates as a volunteer board, with representatives from major communities (i.e., the city of Hot Springs, the city of Custer, and the town of Hermosa), and for rural interests (i.e., the rural areas of Edgemont and Buffalo Gap), and for general overall area planning (i.e., the Custer County Planning Office and the Fall River Water System area).

2. Summary of Appraisal Investigation

The project, the Southern Black Hills Water System (SBHWS), is designed to provide a regional water supply and water delivery system for rural users, special use needs, and community needs for southern Pennington County (beginning approximately at Spring Creek Road and east to the Cheyenne River), all of Custer County, and all of Fall River County (figure 1).

2.1. Study Location

The study area is in southwestern South Dakota, generally within the political/geographical boundaries of Fall River County, Custer County, and

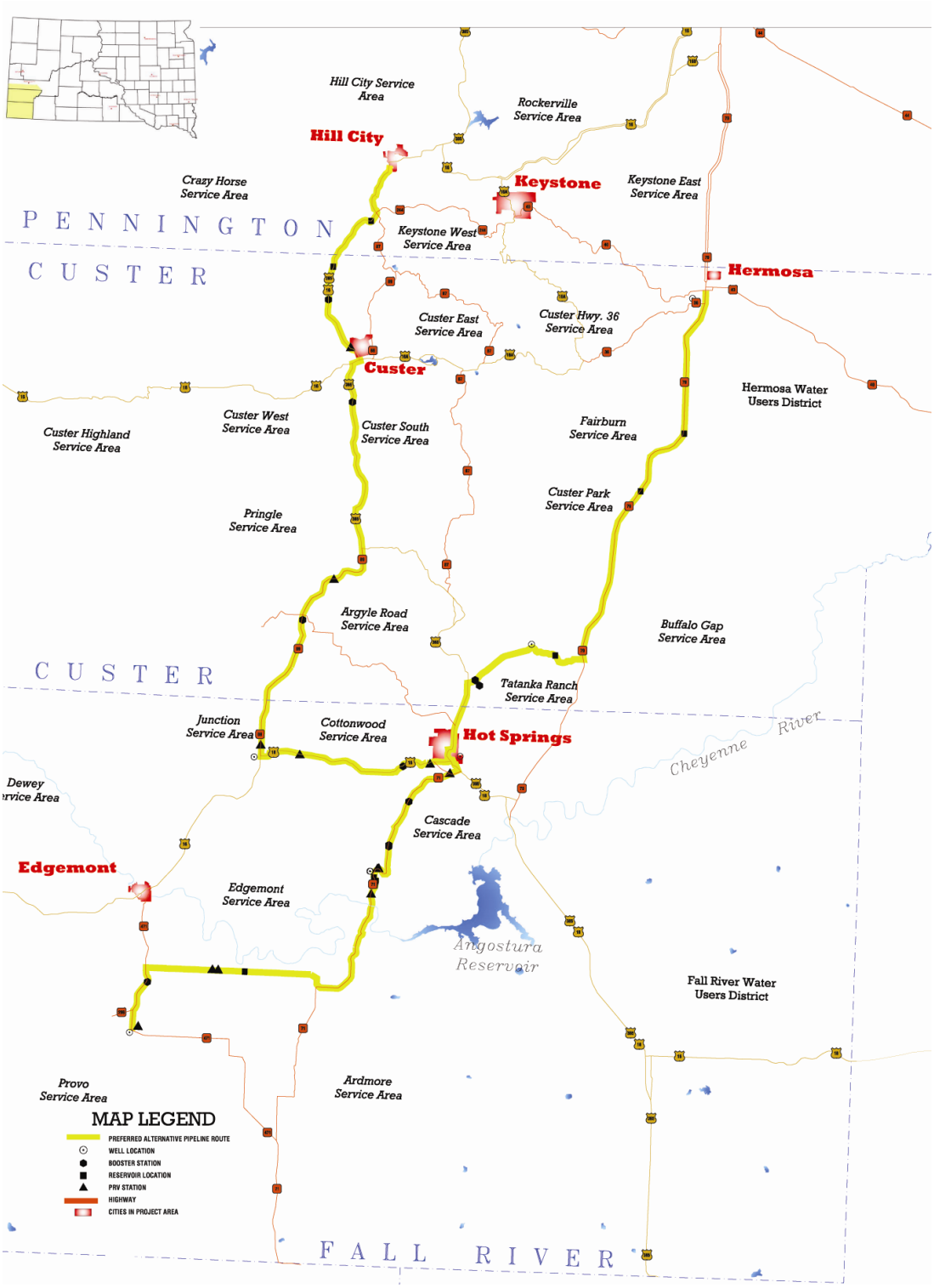

Figure1. General location map.

the southern portion of Pennington County (figure 1). The city of Rapid City is not a part of the SBHWS, either as a water user or as a water supplier.

2.1.1. Segments

The study area is divided into major segments to address the varying geography and water issues:

- **Hermosa Segment**. This segment ranges from an area near Hot Springs, SD, along State Highway 79 to an area around and including Hermosa, SD.

- **Custer Segment**. This segment ranges from an area near Hot Springs, SD, along U.S. Highway 18 and State Highway 89 to an area around and including Custer, SD.

- **Edgemont Segment**. This segment ranges from an area near Hot Springs, SD, along Highway 71, to the Cascade area and to the Edgemont/Provo, SD areas.

2.1.2. Service Areas

The study area also contains "service areas," groups of rural homes (either farms, ranches, or subdivisions) that can hydraulically be served from a common pump station or common reservoir from the SBHWS. Service areas are typically grouped by topography (nearly the same elevation to all users) or by geographic features (groups of users contained by rivers, highways, or high hills or wide open spaces) (see SBH 2005V1, pages 51, 65, and 81):

Fall River County:

- Cascade Service Area, south of Hot Springs, SD, along Highway 71 to approximately the Cheyenne River

- Ardmore Service Area, south of Hot Springs, SD, near and about the Ardmore, SD, area

- Cottonwood Service Area, west of Hot Springs, SD, along Highway 18 to near the Minnekahta Junction area

- Junction Service Area, west of the Cottonwood Service Area, along Highway 18 and north along Highway 89 toward Pringle, SD

- Edgemont Service Area, near and about Edgemont, SD

- Provo Service Area, near and about Provo, SD
- Dewey Service Area, near and about Dewey, SD

Custer County:

- Tatanka Ranch Service Area, north of Hot Springs, SD, along the west portion of the 7-11 road
- Buffalo Gap Service Area, near and about Buffalo Gap, SD
- Custer Park Service Area, between Highway 79 and Custer State Park at points near and about the southern portion of the Custer State Park wilderness loop
- Fairburn Service Area, near and about Fairburn, SD
- Custer Highway 36 Service Area, along Highway 36 from Highway 79
- Hermosa Service Area, near and about Hermosa, SD
- Argyle Road Service Area, along Highway 89 south of Pringle, SD
- Pringle Service Area, near and about Pringle, SD
- Custer South Service Area, along Highway 385 South of Custer
- Custer West Service Area, along Highway 16 West of Custer
- Custer East Service Area, along Highway 16A East west of Custer
- Custer Highlands Service Area, along Highway 16 near Jewell Cave
- Crazy Horse Service Area, along Highway 385 north near Jewell Cave

Pennington County:

- Hayward Service Area, from Hermosa, SD, west along Highway 40
- Spring Creek Road Service Area, west off Highway 79 along Spring Creek Road
- Rockerville Service Area along Highway 235 from Spring Creek Road to Keystone, SD

- Keystone Service Area near and about Keystone, SD
- Hill City Service Area near and about Hill City, SD

2.2. Study Area Description

The SBHWS area is unique in the State of South Dakota, home to the Black Hills and monuments such as Mount Rushmore.

2.2.1. Population

In part of the study area, the summer tourism and recreational industry in part of the area creates a very large influx of seasonal impacts on area water supplies and other resources, while other parts of the area generally are not affected by such tourism and recreation.

The largest communities of the area are Custer (population of 1,860 in 2000) and Hot Springs (population of 4,129 in 2000). Smaller communities within the area include Edgemont (population of 867 in 2000), Hermosa (population of 315 in 2000), Buffalo Gap (population of 164 in 2000), Keystone (population of 311 in 2000), and Hill City (population of 780 in 2000) (see SBH 2005V1, page 9).

- **Fall River County** had a steadily declining population (both in communities and rural areas) from 1960 to 1990 (see SBH 2005V1, page 39). Fall River county declined 2.8 percent from 2000 to 2009 (see SBH 2011_TabD, page 7).

- **Custer County** had only a slight decline in community population from 1960 to 2000 and a rapid rise in rural population in that same timeframe. Both community and rural growth occurred from 1990 to 2000 (see SBH 2005V1, page 39). In the years 2000 to 2009, Custer County grew by 8.9 percent in population (compared to a state growth rate of 7.6 percent) (see SBH 2011_TabD, page 7).

- **Pennington County** had growth in both communities and rural areas from 1960 to 2000 (see SBH 2005V1, page 35). Pennington County also grew from 2000 to 2009 at a rate of 13.9 percent (compared to the state growth rate of 7.6 percent) (see SBH 2011_TabD, page 7).

2.2.2. Economics

The main commerce and methods of livelihoods vary significantly over the area. Northern parts of the study area rely heavily on the impact of the Black Hills and the state and national parks to provide their economic base. Fall River County,

located in the southern portion of the project area, benefits from the tourism aspect of the Black Hills, but the county has traditionally also relied heavily upon a farming and ranching economic base (see SBH 2005V1, page 11).

The Black Hills get more than 2 million visitors each year. Major points of destination include the area‘s national forest, national grassland, and/or other Federal- or State-controlled lands, including several national and state park monuments, such as Mount Rushmore National Memorial, Custer State Park, Black Hills National Forest, Crazy Horse Memorial, Wind Cave National Park, George S. Mickelson Trail, and Jewell Cave National Monument (see SBH 2005V1, page 35).

2.2.3. Climate

The Black Hills region has relatively small amounts of continuous runoff and heavy runoff for limited periods during times of thaw or intense storms along with low precipitation and high rates of evapotranspiration. The amount of runoff and precipitation not only impacts the amount of surface water available in the reservoirs, rivers, and creeks, but also impacts the amount of groundwater recharge (see SBH 2005V1, page 100).

2.2.4. Vegetation and Wildlife

Most of the Black Hills is forested, and the forest structure and composition of the Black Hills National Forest has changed over the last century. The total acreage of ponderosa pine has increased, hardwoods such as aspen have declined, and there are fewer large-diameter stands of ponderosa pine and an abundance of small-diameter stands. The Black Hills supports a diverse population of animal species, with about 139 bird, 7 amphibian, 15 reptile, and 62 mammalian species (see SBH 2005V1, pages 35 - 36).

2.2.5. Hydrogeology

Water resources in the study area are influenced by an intricate hydrologic system that includes primary creeks and streams, alluvial aquifers, and other major aquifers located in identified geologic formations surrounding the Black Hills. The area includes very rugged rock formations, canyons and gulches, open grassland parks, streams, deep lakes, and caves. The uplift of the Black Hills and subsequent erosion of various formations have resulted in a concentric series of ridges and valleys encircling the Black Hills (see SBH 2005V1, pages 36 and 37).

Surface Water

Several regional bedrock aquifers and local aquifers have exposed outcrops that allow for surface water recharge at contacts with creeks and streams. Some of the surface waters within the study area include the Angostura Reservoir, Cheyenne River, Fall River, Battle Creek, French Creek, Pactola Reservoir, Deerfield Reservoir, Sheridan Lake, Rapid Creek, and Spring Creek. The amount of surface

water available within a given area depends on several factors, including precipitation, evaporation, topography, release from existing reservoirs, and existing usage. Continued periods of dry, hot weather that reduce precipitation and increase evaporation during the summer months can greatly reduce the ability to maintain the desired peak use capacity from a surface water source (see SBH 2011_TabA page 2).

Groundwater

Long-range water resource planning, including expanded use of aquifers, requires an understanding of physical aquifer characteristics, avenues, and mechanisms of aquifer recharge; demands on the resource; and existing and future patterns of water use. Alluvial aquifers exist along major streams and presently serve as water supplies for many communities and developments. Aquifers of local importance include the Deadwood and Minnekahta Formations, as well as alluvial deposits along major streams and facture zones in the Precambrian crystalline rocks (see SBH 2005V1, page 37).

2.3. Purpose and Need

2.3.1. Purpose

The SBHWS purpose is to supply a very dependable and steady long-term and well-defined source of water to the service area. This study is to develop and evaluate drinking water supply, treatment, and distribution system alternatives for the following study area described in section 2.1. (see SBH 2005V1, page 2).

2.3.2. Need

Rural residents do not have stable water supplies. Local water supplies are generally inaccessible to a single rural household user due to costs and uncertainty of locating the water. As a result, residents often rely on shallow and low-quality wells and low-producing wells, cisterns, and/or hauling water from nearby communities. For example, the SBH estimates that nearly two-thirds of all rural residents near Hot Springs, SD, either haul their household water from either Hot Springs or Custer, SD, rely primarily on cisterns, or use very low-quantity and low-quality producing shallow wells.

Many wells are in the range of 100 to 200 feet and attempt to draw water from fractured rock formations. Water, when found, is typically highly mineralized and very hard. Moreover, recent patterns of drought in this part of South Dakota have made the dependency on cisterns and shallow wells very uncertain.

Those who rely on hauled water typically purchase such water from an area community (such as Hot Springs, Edgemont, or Buffalo Gap). Hauling water can lead residents to not having adequate water for basic health and safety and water loss. Hauling water also introduces a possibility of water contamination to the

user and cross-connection contamination to the water supplier. Hauling water becomes expensive, as typically a dedicated vehicle (pick-up truck) with a large tank is used (see SBH 2005V1, page 76).

Rural communities also do not have stable water supplies. With the exception of the community of Hot Springs, SD, (which has an abundant water supply from the Fall River), the other communities use shallow or moderately deep groundwater wells. Those wells are often of low quality or of uncertain or low-production wells. For example, in the mid to late 2000s drought, wells in Custer were not sufficient to provide for the water needs of the community (particularly during the peak summer months), and water restrictions were routinely enacted.

2.3.3. Water Use

Table 1 shows the water use requirements in the study area. Note that the "special needs" category includes water use categories of livestock, area parks and recreational needs, non-transient non-community water systems (typically rural schools of the area), and transient non-community water systems (typically gas stations, rest areas, and campgrounds). All of these needs, although not domestic, require a good and safe water supply. Although the special needs are a significant part of the total water needs of the system, these types of needs are more sensitive to the cost of water issue than are the needs of the rural households and communities. It is expected that as the costs of water increases (as may be implemented by SBH under an inclining rate schedule) that the water use for a number of the special need users will correspondingly decrease.

2.3.4. Water Quality

Other areas are dealing with primary and secondary water quality issues (see SBH 2005V1, pages 100 -107). For example, the town of Edgemont has quality concerns with primary drinking water standards relative to some category(ies) of radionuclides (e.g., alpha particles that can result in increased risk of cancer). Edgemont has shown a test of 17 milligrams per liter (mg/L) on alpha particles, and the U.S. Environmental Protection Agency (EPA) limit is 15 mg/L. Also, other community water systems in Fall River County are dealing with high to very high levels of total dissolved solids, sulfates, hardness, and iron. Several have additional problems with high chlorides and sodium (see SBH 2005V1, page 47). Furthermore, tests in Wilhelm Well indicated an arsenic level of 0.012 mg/L, which exceeds the EPA maximum contaminant level of 0.010 mg/L. Users will have to abandon this source if it is not treated (see SBH 2011_TabA, page 5).

2.3.5. Potential Users

Nearly 1,000 potential users have demonstrated their desire and need for a regional water supply and distribution system by signing a "good intention form" and by paying a non-refundable "good intention fee" of $150. Although the SBH has not aggressively pursued such signups in areas other than near and around the

Table 1. Water use requirements in gallons per day (Table 3.5.3 (A) in SBH 2005V1, page 95).

		Domestic/Community/Special Needs (3)							
	Table	Current		Level 1		Level 2		Level 3	
Location/Category	Reference	Average	Peak	Average	Peak	Average	Peak	Average	Peak
Totals									
Community water system	3.4.1.3 (A)	1,670,900	4,177,250	2,536,100	6,340,250	2,950,620	7,377,300	3,439,940	8,599,850
Rural	3.4.2.3 (A)	1,118,740	2,796,850	1,665,440	4,163,600	1,901,480	4,753,700	2,191,000	5,477,500
Special needs (includes livestock, recreation, schools, campgrounds, etc.)	3.4.3.4 (A)	4,419,520	11,048,800	4,768,120	11,920,300	5,260,220	13,150,550	6,217,820	15,544,550
Totals		**7,209,160**	**18,022,900**	**8,969,660**	**22,424,150**	**10,112,320**	**25,281,550**	**11,848,760**	**29,621,900**

Hot Springs, SD, area and in areas between Hot Springs and Custer, SD (due to uncertainty of a funding and construction schedule of the project), there has been significant interest from the rural users in the area. A number of these users noted poor water, inability to find water, high costs of hauling water, etc. Of the users who signed the "good intentions" form, about 60 percent (611 users) indicated that they had no source of water, and 132 users indicated they were hauling water, with another 251 users indicating that they had wells they were dissatisfied with.

Many of the area communities, including Custer, Edgemont, Keystone, Hill City, Buffalo, and Hermosa have also expressed a desire to be a recipient of water from this system (SBH 2011_TabJ, pages 1-2).

2.4. Description of the Alternatives

2.4.1. No Action Alternative

The No Action Alternative reflects the probable project condition if Reclamation were not to become involved in this project.

Unmet Need

The No Action Alternative maintains the status quo of the area relative to the availability of water supply to rural residents and communities. Current conditions of such water supply, and the need for a project of some scope, have been discussed in section 2.3. Under a No Action Alternative, rural domestic/household water needs would continue to be met by hauling water, depending on cisterns, or using shallow wells (see SBH 2005V1, page 181).

Phase 1 Construction

Current planning and limited construction is occurring under funds provided by the State of South Dakota and by a U.S. Department of Agriculture (USDA) loan and grant. The ongoing construction, "Phase 1," includes a water source development contract (modifying an area well to be a community standard well), a water treatment facility (a facility that simply chlorinates the well water), a reservoir, and a pipeline distribution system to approximately 140 users north of Hot Springs, SD. The total cost of the noted facilities is approximately $5.4 million (including engineering, planning, and other related activities as well as construction costs) and is being funded by a 40-year, 3.25 percent USDA loan of $3,617,000 (80.3 percent) and grant loan of $900,000 (19.7 percent). The Phase 1 project also includes approximately $800,000 of funds from the State of South Dakota and approximately $100,000 of local contributions.

Future Phases

If Reclamation does not become involved in this project, the SBH would continue to apply and attempt to receive funding for this project over a series of small phases (not exceeding $5 to $6 million) until the entire project is completed.

Proceeding with such small phases would be necessary because of the limitation of available funds. The State of South Dakota would not be able to fund such an undertaking, and the project would apply for Federal funds under the USDA programs. Note that the USDA typically has approximately $3 to $5 million in any given year for funding for all applications of the entire State of South Dakota, and of that amount, only approximately 20 percent is available in the form of grant funds. Proceeding with small phases, assuming that funds can be obtained, would likely result in a total project build out time of nearly 25 to 30 years and would require some degree of continuous and uninterrupted funding (allowing for a low or reasonable price adjustment for the needed facilities). During all of this time, rural residents and communities of the area will continue to have the urgent and compelling need for a safe and dependable water supply as previously discussed.

These significant delays would mean significant cost increases to the project and might ultimately mean that the project is not achievable. To make meaningful progress, and not be consumed by the inflation rate of work and materials, the SBH would require a funding investment of between $10 to $15 million per year; that level of funding is only possible through a federally authorized project under Reclamation's Program.

2.4.2. Level of Service

The study projected levels of service based on the levels of water service provided. The Appraisal Investigation explains:

> . . . the challenge of projecting water needs and infrastructure sizing of this area lies not so much in defining current needs as it does in defining future needs. The future needs, as noted, are expected to be highly impacted by an addition of a rural water System as such water availability acts as a catalyst for rural property and rural subdivision growth.
>
> Most developing rural water system begin with a premise that water needs (especially future water needs) are important to be represented in a very liberal fashion; that is, inclusive of all potential needs to assure that infrastructure is not under designed or under constructed. Typically funding agencies, such as the [South Dakota Department of Environment and Natural Resources] SDDENR and the USDA, have structured their loan and grant programs in a fashion to discourage beginning systems from 'over building' based solely on a belief that eventual growth and need will occur. Funding has usually been based on the economic reality of the need to have repayment ability of the project by existing users of the System. Accordingly, only current and documented water needs are typically allowed relative to sizing the infrastructure of a System. By this method, the current users of such system are burdened only to an extent of debt on a system as needed to satisfy their needs; they are not burdened with a debt of a larger than needed system in the hope more need, and revenue, will materialize.

> In many past and on-going rural and regional systems, the rationale of building only for current documented needs has proven to be an error. It is the rule, rather than the exception, that rural water systems grow during and after initial construction. They grow based on a steadily increasing demand for water by the initial users (as area wells, which may have been used for supplemental water, go dry or fail) and by new users and demands being imposed on the System" (see SBH 2005V1, page 42).

The sponsor's ultimate water delivery requirements calculated under the SBHWS rely on the level of service desired. The various levels of service are:

- **Current** reflects area population/needs to year 2000

  Level 1 reflects expected area population/need growth to year 2050 (with no rural water system being introduced into area)

- **Level 2** reflects expected area population/need growth to year 2050 (with rural water system being introduced into area and resulting in a modest growth impact)

- **Level 3** reflects expected area population/need growth to year 2050 (with rural water system being introduced into area and resulting in a heavy growth impact) (see SBH 2005V1, page 93)

2.4.3. Water Supply Source

A range of water supply sources were considered as alternatives. Note that the most viable alternatives would combine the two viable sources (developing groundwater and purchasing water).

Develop Groundwater

The ability of the SBH Water System to obtain water rights for groundwater should not be an issue. Discussions with the SDDENR indicated that enough unappropriated water from the Madison and Minnelusa aquifers is available to supply stated needs (see SBH 2005V1, page 109 and SBH 2011, _Tab A, page 4).

The SBH will likely select several groundwater sources to provide water to the system.

Purchase Water from an Existing Entity

Potential sources include:

- **Fall River County**: Provo/Provo Township, city of Edgemont, and city of Hot Springs

- **Custer County**: City of Hermosa and Hermosa Water Users District
- **Pennington County**: City of Keystone

Currently, the most likely source being considered is to purchase water from the City of Hot Springs. The water purchased from the city could serve the Custer Segment as well as portions or all of the Edgemont Segment (see SBH 2005V1, pages 113 and 125).

There may also be some ability to interconnect with area community water systems, such as the Fall River Water Users District and the Hermosa Water Users District, for supplemental water in those times of higher water needs. The SBH is engaged in ongoing discussions with various communities on this issue (see SBH 2011_TabB, pages 10 - 11).

Develop Surface Water—Considered but Eliminated

Surface water is not considered a potential source for the SBHWS for the following reasons:

1. **Lack of surface rights**. The SBH analyzed the possible use of surface water in the service area, but found no available surface water rights to meet the needs of the system. The major surface water bodies of the area are Fall River, Cheyenne River, Beaver Creek, and Lake Angostura. The three rivers or streams noted are completely allocated, and the State is issuing no further permits to those bodies of water (Appendix 2, pg 4). Lake Angostura is a Reclamation reservoir, which is fully appropriated to the Angostura Irrigation District. In 1990, the U.S. Forest Service (USFS) applied to the State Water Rights Office for 50 acre-feet of water upstream of Lake Angostura. The USFS was denied the water right due to the lack of water needed to meet the demands of the Angostura Irrigation District. In 1989, the Angostura Irrigation District only received 50 percent of the water needed to irrigate their lands. Again in 1990, the district only received 60 percent of the water needed to irrigate their lands.

2. **Water quality issues**. Surface water treatment plants are required to meet all the surface water regulations, including particle (turbidity) removal and disinfection/inactivation of microorganisms. The construction of a water treatment plant will add capital costs to the project as well as increase the operation and maintenance of the system. While the treatment plant would be designed to comply with current pending surface water regulations, future regulations could impact the operation of the surface water treatment plant.

3. **Drought conditions**. Droughts could reduce reliability of surface water supplies (see SBH 2005V1, page 108, SBH 2011_TabA page 2, and SBH 2011_TabJ. Page 4).

Develop Nontraditional Supplies—Considered but Eliminated

No nontraditional supply sources would be of sufficient quality or sufficient quantity to supply this proposed project. Nontraditional sources might typically include capture and reuse of community storm water, household grey water, or irrigation system return flows, but in this part of South Dakota, no such large users of water are in the project area (see SBH 2011_TabA, page 5).

2.4.4. Treatment

Some raw water quality parameters (iron and manganese, arsenic, radionuclides such as radium, gross alpha, beta particles, and uranium) may require constructing a water treatment plant (see SBH 2005V1, page 126).

2.4.5. Infrastructure

All of the potential alternatives would employ a similar delivery structure, using the considerations discussed in this subsection.

Flow Rate and Delivery Requirements

System transmission flow is designed to meet the 550 gallons per day (gpd) need for SBHWS users. Additionally, that flow rate is modified with a Level 2 factor to accommodate the anticipation of large rural growth in the SBHWS area (see SBH 2005V1, page 117). The transmission flow is defined as the flow rate that must be supplied to a given storage facility to meet the peak-day demand. Pumping stations and transmission pipelines are typically designed to deliver the transmission flows over a 24-hour period. With a design of 550 gpd and system losses of 30 percent, the required transmission flow is 0.50 gallon per minute (gpm) per service unit[1] (see SBH 2005V1, page 118).

System Pressures

The design of this alternative will maintain 25 pounds per square inch minimum pressure level to each user under peak flow conditions; however, a majority of the users will exceed this minimum (see SBH 2005V1, page 120).

Growth and Expansion Allowance

Alternatives are designed to be flexible enough to address future uncertainties of growth and expansion within the area. Improvements are as incremental and complimentary to each other as possible and are planned to be implemented in phases. Existing facilities will be kept in operation to the greatest extent and longest time period as practical (see SBH 2005V1, page 121).

[1] A service unit is meant to represent a user of 550 gpd (or 16,500 gallons of water per month) (see SBH 2005V1, page 117).

Storage

Storage facilities are envisioned to be provided by either elevated tanks or by above-grade standpipes (tanks with a greater height than diameter) or reservoirs (tanks with a greater diameter than height). In some locations, buried concrete reservoirs can be considered (see SBH 2005V1, page 129).

Total required storage of each tank will be the sum of peak equalization storage, reserve storage, and operational storage. Peak and reserve storage capacity (without operational storage capacity) will be 1,375 gallons (275 gallons peak plus 1,100 gallons reserve) per service unit (see SBH 2005V1, page 126). Tanks are most cost effective when constructed to standard American Water Works Association (AWWA) capacities and dimensions. Therefore, the required volumes will be increased to the next larger standard size (see SBH 2005V1, page 128).

Pipelines

Pipelines constitute a major element and cost of the total water delivery system, primarily from the long distances between the various users and the distant location of the water source. Transporting water over these long distances also has a significant effect on pumping facilities due to the friction losses in the pipeline itself (see SBH 2005V1, page 131).

Pipe material under consideration includes:

- Polyvinyl chloride (PVC) pipe (per ASTM D2241)
- Ductile iron pipe (per AWWA C150/C151)
- Welded steel pipe (per AWWA C200)
- Polyethylene pipe (per ASTM F714) (see SBH 2005V1, page 134)

Pump Stations

The system would use gravity storage whenever feasible (see SBH 2005V1, page 148). In some instances, where a " pocket" of users is located at a higher elevation area than a gravity storage tank, a variable speed pump station may be the most feasible way to provide the required pressure (see SBH 2005V1, page 149).

Power and Telemetry

Single-phase 120-volt power would be required at all storage tank and buried prefabricated steel control valve, master meter, and Type 1 pressure reducing valve (PRV) locations. Three-phase 240-volt power would be required for large pump stations (see SBH 2005V1, page 150).

Telemetry controls would be provided at the pump stations, storage tanks, and master meters. The controls would allow the operator to set points for starting and stopping of the pumps at each pump station based upon levels of the water storage tank, which the pump station supplies (see SBH 2005V1, page 151).

The central control system would provide monitoring, data logging, and supervisory control of the various remote facilities. Communication between the central control room and the various remote facilities would be provided by the system (see SBH 2005V1, page 152).

The system is also proposing the use of satellite meter reading technology. The technology is currently being piloted with a couple rural water systems in South Dakota by a local South Dakota business (see SBH 2011_TabJ).

Appurtenances

For the pipeline system to function properly and efficiently and to allow operational maintenance and flexibility, various pipeline appurtenances would be an integral part of the facility (see SBH 2005V1, page 155).

2.4.6. Non-Structural Alternatives

Non-structural solutions included:

- Water conservation (e.g. area-wide water conservation measures, system-wide metering, or leak detection surveys)
- Water use policies (e.g., zoning or planning activities that may limit or prohibit rural residential growth)
- Inclining water rate tables

However, non-structural solutions would not provide the water needed for the area. A structural solution is needed first to provide the water to area uses. Non-structural elements can be examined and implemented into the system as part of a structural solution (see SBH 2011_TabJ, page 11).

The SBH has adopted policies and procedures for the system that encourage water conservation and controlled use of the water sources. Such measures include a requirement for all users of the system (including livestock or pasture use) to be metered and for selected users to be restricted to limited flows (typically the livestock and pasture users) (see SBH 2011_TabB, pages 10 - 11).

Additionally, the system has structured a water rate schedule that does not encourage or reward large water users (i.e., the rate is not a declining rate schedule). If water becomes limited due to excess use or other conditions, converting their proposed water rate to an inclining rate schedule that would charge more per 1,000 gallons to the larger users of the system, with lower rates being offered to the lower water users of the system is built into the alternatives (see SBH 2011_TabB, pages 10 - 11 and SBH 2011_TabH).

2.5. Public Involvement

SBH has conducted a series of meetings with area landowners and potential users of this proposed system. As discussed in section 2.3.2, almost a thousand individuals have signed forms and paid fees to indicate their interest. Agencies contacted are listed in figure 2.

Agency or Other Association	Contact	Title
Black Hills National Forest Hell Canyon RD	Michael Lloyd	District Ranger
Black Hills National Forest	Craig Bobzien	Forest Supervisor
Bureau of Land Management, Belle Fourche	Marian Atkins	Field Manager
Custer County Planning Department	Mike McMahon	County Planner
Custer County Highway Department	John Culberson	Superintendent
Fall River County Highway Department	Ron Seiler	Superintendent
Natural Resources Conservation Service	Kory Bossert	NRCS District Conservationist
South Dakota DENR	David Ryan	Natural Resources Engineering Director
SD Game, Fish and Parks	Doug Backlund	Wildlife Biologist
SD Geological Survey	Derric Iles	State Geologist
South Dakota State Historical Society	Jay D. Vogt	State Historic Preservation Officer
U.S. Army Corps of Engineers Omaha District	Larry Janis	Chief
USDA Rural Development	David Adrian	Rural Development Manager
U.S. Environmental Protection Agency, Denver Regional Office	Tracy Eagle	Director of the Groundwater Unit
U.S. Fish and Wildlife Service	Peter Gober	Mountain-Prairie Region Supervisor
US Geol. Survey, Water Resources	Larry Putnam	Ground Water Specialist
Wind Cave National Park	Linda Stoll	Superintendent
Wind Cave National Park	Rod Horrocks	Physical Scientist
Cheyenne River Sioux Tribe	Albert LeBeau	Tribal Historic Preservation Officer (THPO)
Crow Creek Sioux Tribe	Lester Thompson, Jr.	Tribal Chairman
Flandreau Santee Sioux Tribe	Sam Allen	Economic Development
Flandreau Santee Sioux Tribe	Clifford Allen	
Lower Brule Sioux Tribe	Scott Jones	Cultural Resources
Oglala Sioux Tribe	Johnson Holy Rock	Fifth Member
Rosebud Sioux Tribe	Russell Eagle Bear	THPO
Sisseton/Wahpeton Sioux Tribe	Frank Jackson	THPO
Standing Rock Sioux Tribe	Tim Mentz	THPO
Yankton Sioux Tribe	Robert Cournoyer	Tribal Chairman

Figure 2. List of agency contacts (from SBH 2011_TabK).

3. Reclamation's Findings

This section summarizes Reclamation's findings on how the proposed project meets eligibility requirements and the requirements of Rule § 404.44. Reclamation found that the items required under the Rule and Funding Opportunity Agreement (FOA) were addressed in SBH's PER and addenda and met appraisal criteria. The study took into consideration the total size, cost, and complexity of the proposed rural water project. The sponsors performed due diligence within the analysis, and the quality of data was not compromised.

3.1. Sponsor Eligibility

Under the Rule § 404.6, the non-Federal project sponsor (Southern Black Hills Water System, Inc.) is eligible for consideration under the Rural Water Program. The non-Federal project sponsor has a current certificate of incorporation on file with Office of the Secretary of State for the State of South Dakota (South Dakota 2011_TabL). The System is listed as a nonprofit corporation and meets the requirements of the Rule § 404.6 part (c) as an entity created under state law that has water management or water delivery authority. The South Dakota Codified Laws, chapter 47-22-4, provides the authority for the SBH to lawfully organize as a water management and delivery corporation.

3.2. Project Eligibility

The project is eligible for consideration under the Rule § 404.7. The project meets the definition of a rural water supply project under the Rule § 404.2, the project is designed to serve a community or groups of communities, each of which has a current population of not more than 50,000 inhabitants, which may include Indian Tribes and Tribal organizations, dispersed home sites, or rural areas with domestic, municipal, and industrial water including incidental noncommercial livestock watering and noncommercial irrigation of vegetation. The project includes the construction or installation of new rural water supply infrastructure and facilities as well as the inter-connection of existing rural water supply infrastructure and facilities currently serving individual communities, dispersed home sites, rural area, or Tribes.

The sponsor's alternatives do not envision any major impoundments or any infrastructure or facilities not allowed by the Rule § 404.10.

The proposed project is located in South Dakota, which is a Reclamation Act state.

3.3. Purpose and Need

3.3.1. Purpose

Reclamation found that the project‘s objectives and purpose as defined in the Summary of Appraisal Investigation are properly defined and adequate. Reclamation found that the proposed design parameters are appropriately sized at the appraisal level for the purposes discussed in section 2.4.

3.3.2. Need

The sponsor does present an urgent and compelling water supply need not currently met by other programs as described in section 2.3.

3.4. Alternative Evaluation

3.4.1. Reasonable Range

Reclamation found that a reasonable range of alternatives (structural or non-structural) has been formulated and evaluated as required under Rule § 404.44 [a].

Water Sources

While the water delivery routes were basically the same for all sources discussed, the sponsors looked at a range of source waters: surface water, groundwater, or the option to purchase water from an existing system. Surface water sources were eliminated due to the lack of available non-appropriated sources (see section 2.4.3). Gray water and low-quality water sources were also evaluated, but these alternatives were eliminated as they pose ~~–t~~oo much of a technical, financial, and logistical challenge” (see SBH 2011_TabJ, page 10).

Nonstructural Elements

A completely non-structural solution was eliminated as it would not meet the demand. A structural solution was determined to be the only solution that could meet the needVof the system. However, a range of nonstructural actions (including water conservation) is incorporated as part of all the structural alternatives analyzed. See section 2.4.6 for a description of these actions.

3.4.2. At Least One Viable Alternative

The sponsors have alternatives that are viable enough to move to the Feasibility Study phase—based on the sponsor‘s purpose and need to acquire, treat, and supply water to meet the needs of the service area through the year 2050.

The recommendation for further study of one or more alternatives is clearly supported by the analysis in the Appraisal Investigation as required under Rule § 404.44[b]. The study indicates a viable alternative that meets the requirements of the program and should be studied further in feasibility. Reclamation determined that, from an engineering standpoint, the sponsor met this Reclamation-wide appraisal standard as outlined in Reclamation Manual, Design Data Collection Guidelines, Chapter 2 – Appraisal Investigations (Reclamation 2007). A preferred pipe routing design with alternative level of service would convey product water from the source to users. Levels of service would vary according to the extent of the water connecting network and then by what growth the service may create (see SBH 2005V1, pages 41 and 44).

3.4.3. No Action Alternative

A No Action Alternative has been defined. Note that some features are under construction in "Phase 1" as discussed in the description of the No Action Alternative in section 2.4.1. Reclamation will not cost share previously constructed facilities or facilities currently under contract to be constructed.

3.4.4. Water Supply

Reclamation found that the proposed alternatives would meet the defined need. Based on information presented by sponsor, the water supply sources for the preferred alternative have sufficient probability to meet system requirements. Based on yields of some existing wells in the project area (e.g., the well at Hot Springs can yield 1,000-1,300 gpm), the water supply aquifers targeted could meet the proposed system demands. Several sites may need to be examined for each proposed well to identify adequate yield. There is potential flexibility in the number of wells that may need to be developed to attain desired system yield. Project costs may increase to meet those needs, and these cost increases would need to be addressed at feasibility level. The ability of the SBH to obtain water rights for groundwater should be not an issue (see SBH 2005V1, page 109).

3.4.5. Environmental

Reclamation found that there are no identifiable "showstoppers" relative to environmental issues (e.g., critical habitats, listed species, or cultural resources). The investigation identified the state or federally listed threatened or endangered species of the area and provided a discussion on possible impacts (see SBH 2001_TabB, pages 7-9). The project does not pose an increased threat to the listed species. The SBH will comply with the National Environmental Protection Act (NEPA), National Historic Preservation Act (NHPA), and all other required local, state, and national laws, regulations, Executive orders, and public policies.

The sponsor has indicated that groundwater within the project area also is critical to supplying various springs in the area. Impacts to the groundwater supply by this project could produce impairments to the springs. This would be analyzed further at a feasibility level.

3.4.6. Design and Costs

Reclamation found that the alternatives are technically viable from an engineering standpoint and from an engineering cost estimate standpoint. The distribution system for treated water conforms to Reclamation-wide appraisal standards as outlined in Reclamation Manual, Design Data Collection Guidelines, Chapter 2 – Appraisal Investigations (Reclamation 2007).

Reclamation did not perform a complete independent cost estimate, but reviewed the sponsor‘s cost estimates for infrastructure and operations, maintenance, and replacement (OM&R). The sponsor provided updated cost estimates, which Reclamation spot-checked and found to be reasonable. The adjusted total for the project is about $120 million. Updated cost estimates are provided in SBH 2011_TabF.

Reclamation found that estimates of water supply costs were adequate for an appraisal level. Note that) HGHUDOIXQGVIRUpurchasing water supplIHVIs not proposed for Federal loan guarantees under the Rural Water Supply Program.

3.4.7. Economic and Financial

Reclamation found that the project is economically and financially viable. The future water rates provided are within EPA s threshold of affordability, although the rates are relatively high on a regional basis.

3.4.8. Alternative Evaluation

Table 2 summarizes Reclamation s findings on the proposed range of alternatives related to the evaluation of alternatives for the requirements of Rule § 404.44 [c].

Table 2. Reclamation's findings for alternative evaluation

Evaluation criteria	Citation	Reclamation's findings
Has sufficient water supplies and water rights, including all practicable water sources such as lower quality waters, non-potable waters, and water-reuse-based water supplies	Rule § 404.44 (c) (1)	A possible range of population growth was examined for several distinct groups of the service area. These groups included community water systems, rural water users, and special users (schools, rest stops, campgrounds, gas stations, other recreational facilities, and livestock). The proposed alternatives have identified sufficient groundwater water rights to meet the projected demands (see section 2.4.3). In addition, the SBH currently has applications with the State Water Management Board (which are summarized in SBH 2011_Tab A) and list adequate water availability, which is monitored by the board. The sponsor's proposed alternatives are targeting bedrock aquifers and the existing community well supply as a composite supply source. Based on yields of some existing wells in the project area, the water supply aquifers targeted are likely capable of meeting the proposed system demands. There is nothing to indicate that adequate wells could not be developed for the preferred alternative. If an acceptable well cannot be developed in one area, then there is potential to move to another area for development. Most likely, this will increase project costs. Several sites may need to be examined for each proposed well to identify adequate yield. Surface water and lower quality waters were considered, but eliminated as sources, see section 2.4.3.
Has positive effect on health and safety	Rule § 404.44 (c) (2)	The proposed alternatives will address health and safety issues and meet all Federal and State water quality standards. Alternative sources to meet Level 2 projections are derived from wells and/or existing community sources. Some treatment may be required for some well sources.

Table 2. Reclamation's findings for alternative evaluation

Evaluation criteria	Citation	Reclamation's findings
Will meet water demand, including future needs	Rule § 404.44 (c) (3)	Future water supply needs were considered in the investigation. The system's proposed alternative is designed to meet the projected population demand. The sponsor presented an inventory of well yields for current wells in target source aquifers. Wells could yield greater than 500 gpm, but it is expected that the likely range would be 25-250 gpm. The source aquifers are highly variable in local yield. Aquifers are considered bedrock aquifers and can occur at considerable depth. Aquifer recharge is typically in zones where formations are exposed at surface. Average demands for preferred alternative segments range from 251 to 970 gpm (based on "estimated average million gallons per year [mgy] served" presented in tables 8.2.1[a], 8.2.2[a], and 8.2.3[a]) (in SBH 2005V1, pages 247 - 253). It will likely take multiple wells to meet the target demands, although careful planning could result in a few high yield wells. The aquifers have the potential to provide adequate quantity and quality to meet system demands.
Provides environmental benefits	Rule § 404.44 (c) (4)	There is discussion of environmental benefits of providing better quality water and reduced demand from private wells.
Provides source water protection	Rule § 404.44 (c) (4)	The future water supply is adequately protected. Developing a water system to service a regional area presents opportunities for enhancing the protection of water supplies. Federal and state regulations may come into play, which will require tighter control of water quality monitoring (see SBH 2005V1, page 100). The source water supply will be protected based on requirements of the agency that oversees water systems, the SDDENR. The SDDENR requires all groundwater systems to have a source water protection plan on file. The opportunity for development of well head protection plan(s) becomes more prominent with the proposed action. The sponsor also notes that state water rights laws will provide legal basis for protecting the project's water supply from infringement by future junior appropriators.

Table 2. Reclamation's findings for alternative evaluation

Evaluation criteria	Citation	Reclamation's findings
Applies a regional or watershed perspective	Rule § 404.44 (c) (5)	The project will address water quantity and quality shortfalls currently being felt by the existing community, rural, and individual water systems. The system will supply multiple water demands throughout the southern Black Hills Region. Proposed alternatives may be hydraulically tied into the existing water system of the community of Hot Springs as a source supply. Water will be supplied to multiple service areas, which may have existing water systems. The new supply may replace or supplement those existing supplies. The PER states: "Due to the extreme variability in water quality and quantity within the formations discussed previously, the possibility of purchasing water from an existing source with a known quality of water is likely to occur at various locations within the system (see SBH 2005V1, page 293)."
Promotes benefits in the region	Rule § 404.44 (c) (5)	The benefits of a regional water system include resolving of health concerns to the public or by relying on shallow aquifer wells. Other benefits of a regional water system include protection to the environment, especially to the water resources and water aquifers of the area. The system, as a public water supply system within the State of South Dakota, would be subject to regulatory constraints and compliance that private wells would not be subject to (see SBH 2011_TabA, page 5).
Implements an integrated water resources management approach	Rule § 404.44 (c) (6)	The proposed project does advocate an integrated approach to water resources management. The system describes administrative actions to promote water conservation, cooperative efforts with existing systems to support each other with inter-connections, as well as following the proper state permitting process for groundwater to ensure the protection of the groundwater supply.

Table 2. Reclamation's findings for alternative evaluation

Evaluation criteria	Citation	Reclamation's findings
Enhances water management flexibility	Rule § 404.44 (c) (7)	The system enhances water management flexibility by promoting the cooperation among other rural water and community systems within the defined service area. The system also proposes management flexibility through the use of multiple wells throughout the system.
Provides for local control of water supplies and, where applicable, encouraging participation in water banking and markets	Rule § 404.44 (c) (7)	The project allows for local control of water supplies, but water banking is not considered an option, as the system needs a very dependable and steady long-term and well-defined source of water such as a rural or regional water system (see SBH 2011_TabA, page 33).
Promotes long-term protection of water supplies	Rule § 404.44 (c) (8)	Developing a water system to service a regional area (rather than relying on many smaller, undocumented, unregulated, and untested facilities) presents opportunities for enhancing the protection of water supplies. Federal and state regulations may come into play, which will require tighter control of water quality monitoring (see SBH 2011_TabA, page 6).
Includes preliminary cost estimates that are reasonable and supported	Rule § 404.44 (c) (9)	See SBH 2011_TabD for updated cost estimates that: • Provided current pricing and methods • Added in construction contingencies (35 percent) and design contingencies (15 percent) • Added in mobilization costs (at roughly 2 to 4 percent of subtotal cost, depending on alternative) Reclamation found that this approach is reasonable. The updated costs to furnish ductile iron and PVC pipe were spot checked for reasonableness, and the unit prices to furnish and install work appear reasonable. Source development costs (wells) were spot-checked for reasonableness, and costs appear reasonable.

Table 2. Reclamation's findings for alternative evaluation

Evaluation criteria	Citation	Reclamation's findings
Is cost-effective and generates national net economic benefits (P&Gs)[1]	Rule § 404.44 (c) (10)	The benefits are described quantitatively in the sense that future demands (at different assumed levels of service) are identified and the cost of meeting those demands are estimated (cost effectiveness). The need to meet these demands is described qualitatively. This is acceptable at the appraisal level. Environmental benefits are also discussed in SBH 2011_TabB.
Ability to pay 100 percent of OM&R	Rule § 404.44 (c) (11)	Yes, the study indicates that the sponsor will be able to pay 100 percent of OM&R. Water cost after the first 2,000 gallons per month is established at $4.00 per thousand (see SBH 2011_TabE). The estimated cost per 1,000 gallons for the preferred alternative indicates affordability/ability to pay at the appraisal level.

[1] Principles and Guidelines, Water Resources Council 1983.

3.5. Other Appraisal Investigation Requirements

Reclamation found that the sponsor adequately addressed the requirements under Rule §404.44 (c) that Reclamation deems appropriate and that are outlined in the FOA Section V. See sponsor statements on program priorities. The Application Review Committee will review these requirements. Table 3 summarizes applicant statements for administrative program requirements.

3.6. Recommendations

As required under Rule §404.45 and D&S CMP TRMR-31 Section 11, Reclamation has determined that it is appropriate to proceed to a Feasibility Study based on the criteria in Rule § 404.13 and Rule § 404.44.

Reclamation will work with the sponsor to ensure that the Feasibility Study conforms to all Reclamation requirements for planning and environmental compliance studies at the feasibility level (See Principles and Guidelines and D&S CMP TRMR-31Section 12.C). If information regarding economic and financial feasibility changes, then study assumptions and participation may need to be revisited. In particular, the Feasibility Study should address the issues discussed in this section.

Table 3. Other appraisal investigation requirements

Administration program requirements	Reclamation Findings
Minimize or reduce energy use	This project would rely upon conventional power sources. Variable Frequency Drives on all pumps in the system would allow the system to conserve energy by using the most current industry standard power control equipment available (see SBH 2011_TabA, page 6).
Minimize or reduce water consumption	All service connections would be metered and billed accordingly to promote water conservation and reduce consumption. In addition, master meters will help in leak detection. Consolidating water sources (and eliminating the need for thousands of private wells or water sources) will promote conservation through pricing and other institutional methods. The SBH has adopted policies and procedures for the system that encourage water conservation and controlled use of the water sources. Such measures include a requirement of all users of the system (including livestock or pasture use) to be metered and for selected users to be restricted to limited flows (typically livestock and pasture users). The system will use appropriate Supervisory Control and Data Acquisition (SCADA) controls to assist in the efficient filling and monitoring of tanks and pump operations. While the SBHWS will allow system users to use water for yards, the price structure makes significant irrigation use prohibitively expensive. The SBH will convert their proposed water rate to an inclining rate schedule that would charge more per 1,000 gallons to the larger users of the system (see SBH 2011_TabB, page 11 and SBH 2011_TabH).
Use renewable energy	Renewable energy may be considered at two potential booster stations (Junction Booster Station and Custer South Booster Station). The options were analyzed with regard to the concern of obtaining social and environmental approvals, labor and industry interest, and a cost comparison of options. While the prospects of renewable energy are promising, there are many complications to overcome to implement renewable energy. Most notable would be the scenic obstruction wind turbines would impose on the area known for its scenic beauty. The mostly likely power alternative is conventional power (see SBHWS 2011_TabA, pages 2 - 6).

Table 3. Other appraisal investigation requirements

Administration program requirements	Reclamation Findings
Provide environmental benefits	Decreasing the need and demand for numerous shallow aquifer wells would provide environmental benefits. For example, such shallow wells are often located in proximity to landowner drain fields, which increase the chances for groundwater pollution and adverse health conditions (see SBHWS 2010_TabG, page 3). The preferred alternative will conform to all environmental requirements (e.g., NEPA and NHPA) to protect the area's natural resources, including water and air quality (see SBH 2011_TabA, page 7).
Reduce impacts to critical habitat for federally listed threatened and endangered species	The SBH did an appraisal-level analysis of possible impacts on state and federally listed species and determined that the system would not pose and increase threat to those species. In addition, at the feasibility level, the SBH will provide an analysis of possible impacts on state and federally listed species during the NEPA process. It is anticipated that the preferred alternative would not have any adverse impact on such listed species (see SBHWS 2011_TabA, pages 7- 11).
Provides innovative technologies	**Satellite meter reading technology**. This technology is currently being piloted in the state by a business in South Dakota. The system would save operator time lost to driving large distances to read meters. Also, the technology would provide up-to-minute meter information which could help in faster leak detection. **SCADA technology.** This technology is also being piloted in the state by a business in South Dakota. The major benefit of this technology is it bypasses the hurdle of traditional telemetry, the requirement of line-of-sight, required for the system sites to communicate with each other. This would be a major benefit to rural water systems in avoiding possible loss of system control due to the nature of varied terrain in the study area. **Hydropowered generators**. These generators would be installed in water lines at PRVs. These in-line generators at the PRV stations could create adequate electricity to power the telemetry at each community where a PRV is required.
Provides creative administrative or cooperative solutions	**Region-wide administration**. The SBH is itself an innovative approach to regional water planning, as it incorporates several community water systems and interests in one non-profit entity. **Planning**. While low water quality issues involve technical solutions, the system also faces low water quantity concerns. Those issues may be addressed by both technical and non-technical solutions. A low water quantity can be offset, to some degree, by the proper planning and construction of additional or larger water storage reservoirs (i.e., tanks) (see SBH 2011_TabB, page 10).

3.6.1. Consultation and Cooperation

- Meet all public involvement and stakeholder participation requirements in NEPA to define need, repayment capability and willingness, and identify local issues.

- Work with cost-share partners to determine individual cost-share needs and financial needs.

3.6.2. No Action Alternative

- Develop the No Action Alternative to feasibility levels in accordance with D&S CMP TRMR-31 Section 12.D.1. Estimate the No Action Alternative (i.e., without Reclamation action) by projecting current conditions, resource trends, and probable actions by others through a period of time commensurate with the anticipated lifespan of the action alternatives. See <http://www.usbr.gov/pmts/economics/guide/step6.html>.

- Analyze the No Action Alternative to address how demand and current/future water supplies may be affected by outside influences, including potential climate change.

- Define the planning objectives and constraints then determine the effectiveness of No Action to address those objectives. If No Action is unacceptable, use the planning objectives to drive alternative development and analysis.

3.6.3. Alternative Formulation

- Analyze populations, demands by sector, and current infrastructure to a feasibility level of detail before proceeding to feasibility-level designs.

- Examine multiple configurations of the basic components of the SBHWS, including all investigations to a feasibility level of detail. For example, a field review of the sites selected for the pump stations would be needed to assure that such sites are suitable or available. Power companies need to be contacted and informed of the preliminary pump station locations. Perform further review and coordination for each service area.

- Perform further analysis on the possible use of innovative technologies and non-structural actions discussed in the study. The technologies that Reclamation found most promising include satellite meter reading, a satellite SCADA system, and PRV stations equipped with hydropowered generators. These will be analyzed at a feasibility level. Additional investigation of innovative technologies for addressing challenges associated with gray water and low-quality water sources is recommended.

3.6.4. Construction and OM&R Cost Estimates

- Use current costs and assumptions for construction and OM&R for each alternative configuration and provide feasibility-level details for these cost estimates.

- Address risks and uncertainties for both construction and OM&R for all alternatives considered at the feasibility stage.

3.6.5. Water Supply

- Update and clarify costs for water supplies (including purchased water) at a feasibility level.

- Analyze alternative sources and locations in increasing levels of detail until the preferred plan is identified and is analyzed at the feasibility level of detail.

3.6.6. Environmental

- Address the potential for alternatives to adversely affect groundwater contributions to streams and springs in the area for environmental impacts and impacts to those who stay on private wells.

- Analyze whether some private wells would suspend use and, if so, how that may affect the project area, water use, groundwater levels, streams, riparian habitat, and wetlands.

- Issues of concern as the proposal moves forward would be avoiding wetlands, avoiding unintentional take of migratory birds, determining the need for Endangered Species Act consultation, addressing potential climate change, and minimizing effects to cultural resources and Indian Trust Assets.

4. References

Bureau of Reclamation. See Reclamation.

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