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Executive Summary

GREYBULL WATER SUPPLY PROJECT

LEVEL II

Wyoming Water Development Commission

NELSON ENGINEERING
P.O. Box 1599 Jackson, Wyoming

November 1995

REGISTERED
Wyoming Utah Montana
Colorado Idaho

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CONSULTING ENGINEERS, SURVEYORS & PLANNERS

October 30,1995

95-083
FJG

Mike Purcell, Director
Wyoming Water Development Commission
Herschler Building
Cheyenne, Wyoming

Re: Executive Summary and Final Report for Town of Greybull
Level II-Feasibility Study

Dear Mr. Purcell:

We are hereby submitting the final documents completed as a result of this study. Please find enclosed the following:

1. Executive Summary - 35 copies
2. Final Report - 25 copies with one unbound reproducible
3. One Project Notebook containing project documentation generated during the course of study.
4. One 3.5" high density disk containing the written report

We anticipate WWDC and the Study Sponsor will find the information in the report beneficial in planning improvements to the communitys' water supply and transmission system.

We appreciate the opportunity to provide engineering services for a project of this importance to the State and the Greybull/Shell Valley area. It has been a pleasure working with John Jackson of WWDC and the Town of Greybull staff.

Sincerely,

Frank J. Grimes PE&LS
Project Manager

enc.

EXECUTIVE SUMMARY

GENERAL

The Town of Greybull is located in Big Horn County in north-central Wyoming at the intersection of Highway 20 and Highway 14. The climate in the project area is arid with an average precipitation of about 6.8 inches/year. The economy of the study area is generally agricultural and mining operations, particularly bentonite. The Burlington-Northern Railroad has a yard on the west side of Greybull. Tourism also plays a part in the local economy since Highway 20 is a main route to the east entrance of Yellowstone National Park.

WATER SUPPLY

The Town of Greybull, the community of Shell, and intervening rural users are all served by a common water supply system. At present, the sources of supply are both surface water and groundwater. The former source is Shell Creek, and the latter source(s) are Shell Valley No. 1 and No. 2 Wells. The Point of Diversion on Shell Creek is about three miles east of Shell and the Shell Valley Wells are situated about 3,000 feet southeast of the Community of Shell.

On December 9, 1993, the United States Environmental Protection Agency (EPA) issued a Notice of Violation (NOV) to the Town of Greybull. The NOV cited the water supply system for violation of the Surface Water Treatment Rule (SWTR). Essentially, EPA indicated the Town must comply with the SWTR and provided eighteen months for implementation. The Town has continued using Shell Creek water in combination with their groundwater supply, but has initiated a study effort to evaluate the various options available to them.

AUTHORIZATION

In an effort to conduct a thorough evaluation of their water supply options, the Town of Greybull sought assistance from the Wyoming Water Development Commission (WWDC).

In June 1995, the Wyoming Water Development Commission entered into an engineering services agreement with Nelson Engineering, Inc. of Jackson, Wyoming to provide professional engineering services for completion of a Level II Feasibility Study for the Greybull Water Supply Project.

SCOPE OF STUDY

The purpose of this Level II study is to ascertain the most cost-effective means of providing potable water for consumers served by the system. In order to meet that intent, two objectives have been identified:

A. Determine a feasible methodology for the Town to comply with provisions of the EPA Notice of Violation.

B. Verify the capability of the existing transmission line to convey the water required to meet future needs.

PROCEDURE

Nelson Engineering gathered all available information from the Greybull Town Hall concerning population, billing records, production records, as built construction drawings, maintenance records, and water rights. A survey of the major components allowed for the evaluation of the hydraulic capability of the transmission line. Past and present population data was examined and a future population projected. Water consumption and production data was tabulated, evaluated and projected for future water demand.

Current supply sources were evaluated for quality, stability, and quantity. Supply alternatives, including modifying existing sources and locating new sources, were examined for regulatory compliance, construction cost, and operation, maintenance, and repair costs. These sources include treating surface water through conventional means as well as new technologies and the addition of new ground water sources.

Operation of the transmission line, recorded pressures, and flow rates were examined to determine efficiency. Deficiencies in physical equipment, operating procedures, and policy were listed for presentation to the Town of Greybull and WWDC.

CONCEPTUAL DESIGN

The scope of work calls for conceptual design of project components previously selected from the Development Plan by the Town of Greybull and WWDC staff. Alternative delivery options and other elements of the development plan were reviewed with the Town and WWDC staff at a progress meeting on August 16, 1995. At that meeting, the Town requested the following items be selected for further study during Conceptual Design:

1) Water Delivery System - A new surface water treatment plant in combination with continued use of Shell Valley Well No's. 1 and 2.

2) Determine cost for leak detection survey of transmission pipeline.

3) Replace the Smith Valve with an appropriate control valve.

4) Replace the Whaley Valve with an appropriate control valve.

5) Inspect the air relief valves, vacuum breaker valves, and blowoff valves and identify ones needing replacement.

6) Design a new flowmeter installation at the chlorination vault east of Shell.

7) Design an aboveground flow meter vault prior to the inlet to the 1.0 MG water tank.

8) Design a telemetering system to collect and transmit operating data from along the transmission pipeline to the Town shop.

In addition, Nelson Engineering completed a refined cost estimate for another groundwater well because that option appeared the most cost effective, if not most desirable.

The reasons for pursuing a surface water treatment plant include the Town's desire to use Shell Creek water due to perceived better taste, the Town's desire to maintain water rights on Shell Creek water, and the fact that the transmission line is already in place from that location. WWDC noted during the August meeting that if the Town, after reviewing the conceptual design for a treatment plant, no longer felt that alternative was a viable option, they could apply for a groundwater exploration program.

REGULATORY CONSTRAINTS

According to the EPA's letter to the Town, dated December 9, 1993, the infiltration gallery collecting water near Shell Creek is under the direct influence of surface water in direct violation of SWTR. Thus, the Town has three options: 1) filter the water from Shell Creek; 2) meet the filtration avoidance criteria to remain unfiltered; or, 3) convert to another water supply source that is not under the direct influence of surface water. However, in any case, the water system would still be required to meet WDEQ regulations on capacity, storage, and redundancy as stated in WDEQ-WQD regulations, Chapter XII.

WATER SUPPLY

In twenty years, the projected maximum and average daily demands for the service area ares 1165 gpm and 465 gpm. The current wells have production capacities of 225 gpm (Shell Well No. 1) and 960 gpm (Shell Well No. 2). The two wells combined have enough capacity to meet future demand. However, WDEQ regulations require redundant sources so that demand can be met with the largest source inoperative. The regulations differ for surface water treatment plants and groundwater wells. If treatment plants are involved, the maximum daily demand must be supplied with the largest source inoperative (Shell Well No. 2). Thus a treatment plant must be designed for 950 gpm. If only groundwater is involved, the average daily demand must be supplied with the largest unit inoperative (Shell Well No. 2). Therefore, an additional well would only need to produce 250 gpm.

PROPOSED IMPROVEMENTS

During this study, Nelson Engineering determined that the following items need to be repaired or replaced in order for the transmission line to operate more efficiently.

Station	Item	Work	Cost
56+18	Air Valve	Replace	3,250
63+10	Air Valve	Replace	3,250
156+66	Air Valve	Replace	3,250
187+56	Smith Valve	Replace w/PRV	11,625
272+43	Blowoff	Repair	700
298+94	Air Valve	Replace	3,250
318+42	Air Valve	Replace	3,250

Station	Item	Work	Cost
355+57	Air Valve	Replace	3,250
404+66	Whaley Valve	Replace w/PRV	11,625
538+02	Air Valve	Replace	3,250
541+33	Air Valve	Replace	3,250
563+77	Air Valve	Replace	3,250
610+02	Air Valve	Replace	3,250
609+49	Lucas Valve	Install Low Flow PRV	7,000
778+75	Air Valve	New Valve	250
795+40	Air Valve	New Valve	250
865+20	Flow Meter @1.0 MG Tank	Replace	30,000
866+50	Air Valve	Replace	3,250
	Subtotal		$ 97,200

Also, due to the 17 mile distance between Town and the water sources, a telemetry system would aid in the operation of the system. The following is a list of locations that need to be monitored or automated, along with construction costs.

Location	Cost
Greybull Town Shop	$ 20,500
Greybull Tank	17,700
Lucas PRV	18,100
Whaley PRV	26,000
Smith PRV	18,100
Shell Wells	25,400
Subtotal	$125,800

During this study, discrepancies in usage versus production records, and hydraulic evaluation indicated possible leaks in the transmission line. A leak detection survey was attempted, however, the sound detection equipment was ineffective. A survey using more advanced technology, involving aerial photography, infrared and thermal enhancement photography is necessary. This survey is estimated to cost $27,000. The benefits are to isolate and fix leaks to conserve water and minimize operating costs.

ECONOMIC ANALYSIS/ABILITY TO PAY

Several Federal and State agencies are available to assist Greybull in the funding of this project.

Wyoming Water Development Commission - The Commission provides funding for design and construction of qualified types of water supply projects. Funding levels are as follows:

Transmission Line Rehabilitation	50% grant - 50% loan up to 30 years @ 4%
Surface Water Treatment Plant	not eligible
Groundwater Exploration Wells	75% up to $200,000 - 25% Community Match
Groundwater Well, Control Tank, Transmission Pipeline, Power Supply (via Level III program)	67% grant - 33% loan

Wyoming State Farm Loan Board (FLB) - Farm Loan Board's present policy is to offer 50% Grant-50% Loan at 7 1/4%. Grant funds are in high demand and shrinking supply, and desirable funding for this water treatment plant could take some time in materializing.

Rural Economic and Community Development (RE&CD) - RE&CD, formerly the Farmers Home Administration, presently offers grant and loan programs for water supply projects. The State funded programs are less costly for the Town of Greybull.

PROJECT COSTS

Estimated Level II and Level III project costs for the alternative projects as presently defined are illustrated below:

Final Cost Estimates - Surface Water Treatment Plant - Level III

Preparation of Final Designs and Specifications		$ 125,000
Permitting and Mitigation		1,000
Legal Fees		20,000
Acquisition of Access and ROW		10,000
Cost of Project Components:		
Leak Detection Survey	$ 27,000	
Transmission Line Rehab	97,200	
Telemetry System	125,800	
Water Treatment Plant	1,457,300	
Construction Cost Subtotal #1	$1,707,300	
Engineering Costs (CCS#1x10%)	170,730	
CCS#2	$1,878,030	
Contingency (CC#2x15%)	281,700	
Construction Cost Total		$2,159,730
Project Cost Total		$2,316,000(Rnd)

Cost Estimate Aquifer Test Well - Level II

1.	Meetings & results presentation	$ 9,500
2.	Geology, engineering, and permitting	24,000
3.	Consultant services during drilling	50,000
4.	Well construction sub-contract	310,000
5.	Aquifer flow testing	14,000
6.	Water quality testing	4,500
7.	Conceptual Design	2,000
	Estimated Level II Budget	$ 414,000

Final Cost Estimates - Groundwater Project - Level III

Preparation of Final Designs and Specifications			$ 49,000
Permitting and Mitigation			4,000
Legal Fees			1,000
Acquisition of Access and ROW			5,000
Cost of Project Components:			
Well (Completed in Level II)	$ ----		
Control Tank	35,000		
Wellhouse and Valving	42,000		
Power Extension	30,000		
Assume 1 Mile Pipeline	184,800		
Leak Detection Survey	27,000		
Transmission Line Rehab	97,200		
Telemetry System	125,800		
Construction Cost Subtotal #1	$541,800		
Engineering Costs (CCS#1x10%)	54,180		
CCS#2	$595,980		
Contingency (CC#2x15%)	89,400		
Construction Cost Total		$ 685,380	
Project Cost Total		$ 744,400	(Rnd)

Total Cost Estimate - Groundwater Option

Level II - Aquifer Test Well	$ 414,000
Level III - Groundwater Project	744,400
Total Project Cost	$1,158,400

Repayment Analysis

Surface Water Treatment Plant

Project Cost:	$2,316,000	
Components:		
Transmission Line	$ 351,390	50% - 50% WWDC
SWTP	1,964,610	50% - 50% FLB
Greybull's Portion:		
Transmission Line	$ 175,695	Annual Cost = $10,160
SWTP	982,305	Annual Cost = 81,158
	Annual Debt Retirement	$91,318

Groundwater Wells

Project Cost:	$1,158,400	
Components:		
Transmission Line	$ 351,390	50% - 50% WWDC
Level II	414,000	33% Drilling cost only
Level III	393,010	67% - 33% WWDC
Greybull's Portion:		
Transmission Line	$ 175,695	Annual Cost = $10,160
Level II	102,300	Annual Cost = 5,916
Level III	129,690	Annual Cost = 7,500
	Annual Debt Retirement	$23,576

An Annual Cost Analysis of both projects is illustrated as follows:

Alternative	Project Cost	Debt Retire.	OM&R	Annual Cost
SWTP	$2,316,000	$91,318	$88,840	$180,158
Groundwater Well	1,158,000	23,576	11,540	35,116

The Annual Costs translate to an estimated monthly cost for the 1185 users of $12.70/month and $2.47/month respectively.

As illustrated, the groundwater alternative is less initial cost and less annual cost.

CONCLUSIONS

As a result of the water system study, several conclusions can be drawn. They are:

1) Population of the service area is expected to experience limited growth.

2) Pre-determined pressure settings for transmission line control valves would optimize water conveyance.

3) Production records indicate excessive production of water.

4) Treated water is spilled from the 1.0 mg tank unnecessarily.

5) Mainline water meters are not in operating condition.

6) Hydraulic grade line evaluation indicates a leak(s) in the transmission line east of Shell.

7) Air valve vaults do not meet current WDEQ regulations.

8) Air Valves on the transmission line would benefit from a preventative maintenance program.

9) The transmission line can convey up to 1200 gpm at acceptable pressures.

10) The Smith and Whaley gate valves are inappropriately utilized.

11) The Shell Valley Well No's. 1 and 2 can sustain production of 225 gpm and 960 gpm for the next 30+ years.

12) Some services are poorly designed, forcing the Town to operate the water system inefficiently.

13) The Shell Tank is under utilized.

14) A 950 gpm Shell Creek water treatment plant is the most cost-effective alternative meeting local desires and State/ Federal regulations.

15) An additional artesian supply well developed in close proximity is the more cost-effective means of increasing the water supply and mitigating the EPA-NOV.

16) The favored funding for this project is via State agencies.

RECOMMENDATIONS

1) The Town needs to progress the water supply improvements in effort to mitigate the EPA Notice of Violation.

2) Greybull should apply to WWDC for a Level II project - aquifer test well at an estimated cost of $414,000.

3) Request a WWDC Level III project for funding of a leak detection survey, a telemetry system, recommended pipeline improvements, and new well appurtenances.

4) Adjust the controls on the 1.0 MG water tank to minimize spillage.

5) The Town should clarify with EPA their full responsibilities for potable water delivery to the rural services.

6) As operators of the water system, the Town should institute several policies regarding consumer hookups to the transmission system.

   A. The system will furnish water at pressure no less than 20 psi at the tap site, west of Sta. 110+00.
   B. East of Sta. 110+00, water shall be furnished, at pressure from 0 to 20 psi.
   C. All services shall include backflow prevention devices at the tap location.
   D. All service taps shall be inspected and approved by Town of Greybull personnel prior to service.

7) The services south of Shell dependent on a full Shell Tank should be replumbed to allow full use of the tank.

8) Review closely the proposed list of improvements in this report and carefully select and prioritize with input from your maintenance staff.

9) Accept the findings in this report and move forward with the supply project while improving on an active preventative maintenance program.