FINAL
FEASIBILITY
STUDY

EVANSVILLE - CASPER
WATER SYSTEM

For
Town of Evansville
Natrona County, Wyoming

July 1986

HOWARD NEEDLES TAMMEN & BERGENDOFF HNTB
July 10, 1986

Ms. Cindy Sommers - Director
Growth Management Planning
TOWN OF EVANSVILLE
P.O. Drawer 158
Evansville, WY 83636

Dear Ms. Sommers:

HNTB is pleased to submit this Feasibility Study for the Evansville-Casper Water System Improvements. The results of this study have been compared to the costs of the alternatives presented in the 1986 Water Development Program Report prepared by HNTB. HNTB's recommendation is to proceed with the test well at the Smith Creek site to determine the water availability. This alternative has the best possible financing program available through the Wyoming Water Development Commission and the lowest annual operation and maintenance costs. The annual cost to Evansville for the Smith Creek Alternative is approximately 50 percent less expensive than the other alternatives.

We appreciate your cooperation and guidance during the project. Please contact us if we can be of further assistance.

Sincerely,

HOWARD NEEDLES TAMMEN & BERGENDOFF

RANDY L. FULTZ, P.E.
SENIOR ENGINEER

RLF/bj

Enc.
FEASIBILITY STUDY

Prepared For

TOWN OF EVANSVILLE

NATRONA COUNTY, WYOMING

EVANSVILLE-CASPER

WATER SYSTEM

JULY 1986

HOWARD NEEDLES TAMMEN & BERGENDOFF
ARCHITECTS, ENGINEERS, PLANNERS
# Table Of Contents

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purpose</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Background</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Objectives</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Goals</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Summary of Findings</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>EXISTING CONDITIONS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Evansville Water Supply</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Evansville Water Treatment Plant</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Evansville Water Distribution System</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Casper Water Distribution System</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>FLOW PROJECTIONS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Evansville Water Demands</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>ALTERNATIVE ANALYSIS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Water Supply Alternatives</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Casper System Alternative Analysis</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Evansville System Alternative Analysis</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Cost Estimates</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>RECOMMENDATIONS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evansville-Casper Water System</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Evansville Water Development Program</td>
<td>35</td>
</tr>
</tbody>
</table>

APPENDIX

A. Natrona County Health Department Letter - Abe Knapp A-1
B. Casper BPU Letter - Dave Engels B-1
FEASIBILITY STUDY
EVANSVILLE-CASPER WATER SYSTEM

List Of Figures

Figure 2-1 Vicinity Map 11
Figure 4-1 Alternative 1 Improvements For Existing Demands 23
Figure 4-2 Alternative 2 Improvements For Existing Plus YID Demands 25
Figure 4-3 Alternative 3 Improvements for Future Demands 27

List Of Tables

Table 1-1 Summary of Alternatives And Flow Requirements 6
Table 3-1 Upper Zone Water Demands 17
Table 4-1 Casper-Evansville Water Supply Alternatives 20
Table 4-2 Improvement Costs To Casper 31
Table 4-3 Improvement Costs To Evansville 33
Table 4-4 Casper-Evansville Water System Connection Cost Comparison Summary for Costs to Evansville 34
Table 5-1 Water Supply Alternative Cost Comparison Summary 36
CHAPTER 1
INTRODUCTION

PURPOSE

The purpose of this report is to determine the feasibility of satisfying the Town of Evansville's future water requirements by connecting to the Casper water system. Alternatives will be evaluated to satisfy Evansville's existing and future demands to the year 2010.

BACKGROUND

On January 18, 1983, the Town of Evansville entered into a contract with HNTB to perform preliminary and final design of the improvements necessary to provide water service and wastewater collection facilities to the Yellowstone Improvement District (YID). The 1983 HNTB report entitled Water Distribution and Wastewater Collection Systems concluded that the Town needed additional water supplies and improved water treatment facilities to serve the YID.

Following the results of this report, the Town entered into an agreement with Sargent Irrigation Company to determine the feasibility of a groundwater exploration program along the Laramie range. The results of this report entitled Location and Development of Groundwater Resources for the Town of Evansville, dated August 1983 and amended July 1984, presented favorable findings for groundwater development at the Smith Creek site. In November 1984, Black and Veatch completed a study entitled Water Treatment Plant Intake Improvements which developed a water treatment plant improvement program and confirmed the need for additional water supply.

HNTB was authorized in March 1985 to prepare a preliminary design report for the evaluation of alternative water supply sources. The May 1985 HNTB report entitled Water Development Program identified the following feasible sources:
• Casper Water System
• Elkhorn Creek
• Smith Creek Well
• Deer Creek Reservoir

Of these sources, the Smith Creek site appeared to be the most favorable given the available information. The reliability of Elkhorn Creek to supply sufficient water is questionable, as is the construction schedule for the Deer Creek Reservoir. The Wyoming Land Commission requested that the Town of Evansville investigate in further detail the potential for connecting to the Casper water system before commencing with test drilling at the Smith Creek well site.

As a result, in November 1985 HNTB was authorized by the Town of Evansville to prepare a preliminary design report for the evaluation of connecting the Evansville water supply system to the City of Casper.

OBJECTIVES

The objectives of this study are to determine the feasibility of connecting the Evansville water system to the Casper system. This will require a long-term water supply agreement to be made between both entities. The cost-effectiveness of connecting to the Casper system will be compared to the other water supply alternatives identified in the Water Development Program report (HNTB, 1985). Following this comparison recommendations will be made for Evansville's water development program.

GOALS

The goal of this study is to determine whether connecting Evansville water system to Caspers' system will provide the most cost-effective long-term water supply.
SUMMARY OF FINDINGS

The procedure followed and results of the investigation are summarized below for each chapter of this report.

Chapter 2 - Existing Conditions

1) The 1986 population of Evansville is approximately 2,300. The existing water service area includes the Town of Evansville, Elkhorn Mobile Home Park, Little America Refinery offices, and a few neighboring industrial lots.

2) The Town's 1978 North Platte River appropriation is so junior that the water right could be restricted 75 out of 100 years with strict enforcement from the State Engineer's office.

3) The location of the Evansville water treatment plant (WTP) intake is subject to poor water quality as a result of the Casper wastewater treatment plant (WWPT) discharge, stormwater discharges and Amoco pipelines located immediately upstream.

4) The actual capacity of the Evansville WTP is considerably lower than the nominal design capacity of 1 mgd. The Wyoming DEQ has indicated that the Town's water right should be improved, and that the intake be moved out of the discharge plume of the Casper WWTP before large sums are spent upgrading the Evansville WTP.

5) The Evansville water system consists of two pressure zones. The lower zone consists of the original Town of Evansville boundaries and is supplied from the Lathrop Road Standpipe. The upper zone has a small existing water demand from Elkhorn Mobile Home Park and several industrial water users.

6) The overflow elevation of the 1.5 million gallon (MG) Lathrop Road Standpipe is 5259.5.
7) The existing 0.475 MG water storage reservoir on Scott Hill has an overflow elevation of approximately 5300.0. The structural integrity of the reservoir is questionable. Immediate improvements are necessary to it to insure satisfactory health and safety conditions at the site.

8) There are approximately 744 existing residential and commercial/industrial water taps in the Evansville system. An additional 30 taps can be expected with the YID.

Chapter 3 - Water Demand Projections

1) The lower pressure zone is assumed to be fully developed.

2) Existing maximum day water demand in the lower pressure zone is estimated to be 760 gpm.

3) A fire demand of 1000 gpm can be supplied in the lower zone. The Casper connection to the lower zone must be capable of satisfying only the peak day demand of 760 gpm.

4) The Yellowstone Improvement District will be part of the upper zone. The "initially developed" upper zone would include water demands from the mobile home park, and Yellowstone Improvement District (YID). The "fully developed" upper zone will include the above areas, plus Elkhorn Industrial Park, Brookhurst Subdivision, and the industrial area just west of the Husky station.

5) Existing maximum day water demand in the upper pressure zone from the Elkhorn Mobile Home Park is approximately 160 gpm.

6) The peak day demand in the "initially developed" upper zone (Elkhorn Mobile Home Park plus YID) is estimated to be 705 gpm.

7) The peak day demand of the "fully developed" upper zone is estimated to be 1575 gpm.
8) The peak fire demand of 1825 gpm from the YID is at the Husky Truck Stop.

9) If storage is provided at Scott Hill, the Casper connection to the upper zone must be capable of providing peak day demands.

10) If storage is not provided on Scott Hill, the Casper connection to the upper zone must be capable of providing peak day plus fire demands. A summary of flow requirements is presented in Table 1-1.

Chapter 4 - Alternative Analysis

The cost effectiveness of satisfying Evansville's existing and future demands is developed in this chapter. Improvements necessary to satisfy Evansville's needs without storage in the upper zone (abandon existing Scott Hill Reservoir) are also evaluated.

1) Casper must procure additional water supplies to satisfy Evansville's water demands. The proposed Deer Creek Reservoir will satisfy this need.

2) The peak day demands plus fire flow requirements were greater than the peak hour flows thereby controlling necessary pipe sizes.

3) The major improvements required for the various alternatives are listed below:

Alternative 1 - Existing Evansville Demands

Alternative 1A - The improvements for this Alternative assumes storage facilities at Scott Hill and requirements for existing peak day demand.

- City Reservoir altitude valve.
- Two pressure reducing stations for the upper and lower pressure zones.
TABLE 1-1

SUMMARY OF ALTERNATIVES AND FLOW REQUIREMENTS

<table>
<thead>
<tr>
<th>ALTERNATIVE 1 - EXISTING PEAK DAY DEMAND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A - With Storage in Upper Zone for Fire Protection</td>
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<tr>
<td>1B - Without Storage in Upper Zone for Fire Protection</td>
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<table>
<thead>
<tr>
<th>ALTERNATIVE 2 - PEAK DAY DEMAND WITH YID</th>
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<tbody>
<tr>
<td>2A - With Storage for Fire Protection in Upper Zone</td>
</tr>
<tr>
<td>2B - Without Storage for Fire Protection in Upper Zone</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE 3 - PEAK DAY DEMAND WITH FULL DEVELOPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A - With Storage for Fire Protection in Upper Zone</td>
</tr>
<tr>
<td>3B - Without Storage for Fire Protection in Upper Zone</td>
</tr>
</tbody>
</table>
• 1000 LF of 12-inch water main
• 5000 LF of 8-inch water main
• Scott Hill Reservoir Improvements

**Alternative 1B** - Existing peak day demand without storage at Scott Hill. The existing Scott Hill tank will be abandoned. The same pipeline improvements are necessary as presented for Alternative 1A.

**Alternative 2 - Existing Evansville Demands Plus YID**

**Alternative 2A** - Peak day demands with initial development of the upper zone, with storage at Scott Hill.

• Same improvements as Alternative 1A

**Alternative 2B** - Peak day demand with initial development of the upper zone, without storage at Scott Hill.

• 4600 LF of 12-inch water main
• 2200 LF of 16-inch water main

**Alternative 3 - Future Evansville Demands**

**Alternative 3A** - Peak day demand with full development of the upper zone with storage at Scott Hill.

• Same pipeline and Scott Hill Reservoir improvements as Alternative 2B

**Alternative 3B** - Peak day demand with full development of the upper zone without storage at Scott Hill.

• Same improvements as Alternative 3A.
4) The 0.475 MG Scott Hill Reservoir has adequate capacity to satisfy the future storage requirements in the upper zone of 330,000 gallons for fire protection.

5) An 18-inch main is necessary in the YID from Scott Hill to Hat Six Road to satisfy flow and pressure requirements in the upper zone without a booster pumping station. During peak day demand with an 1825 gpm fire demand at the Husky Truck Stop, the lowest pressure in the upper zone would be about 40 psi.

6) Unless there is a large unforeseen increase in water demand in the Casper system near the connection with Evansville, or in the Evansville system itself, there will be no booster pump station required to deliver water to the upper zone.

7) During peak day demand with a 1000 gpm fire demand at a remote location in the lower zone, the lowest pressure in the lower zone will be about 48 psi.

8) The total tap fee to be charged by Casper BPU for existing services is estimated to be $775,000 and $805,000 with the YID.

9) Casper BPU has tentatively agreed to pay for the following improvements:

- 50% of the improvements to the City Reservoir for an altitude valve.
- 4600 LF of 12-inch water main required in Alternatives 2B, 3A, and 3B.
- 2200 LF of 16-inch water main required in Alternatives 2B, 3A, and 3B.
- The "long-range" improvements to the City Reservoir described in Report on the City Reservoir Modifications for the Board of Public Utilities, Casper, Wyoming; Black & Veatch, July 20, 1983.
10) The total capital costs to both the Casper BPU and the Town of Evansville are shown below for the various alternatives:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Improvements To Casper</th>
<th>Improvements To Evansville</th>
<th>Evansville Cost ($/1000 Gallons)</th>
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<tr>
<td>1A</td>
<td>$66,100</td>
<td>$1,435,000</td>
<td>1.67</td>
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<tr>
<td>1B</td>
<td>66,100</td>
<td>$1,382,100</td>
<td>1.66</td>
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<td>2A</td>
<td>66,100</td>
<td>$1,465,300</td>
<td>1.56</td>
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<tr>
<td>2B</td>
<td>415,300</td>
<td>$1,678,200</td>
<td>1.61</td>
</tr>
<tr>
<td>3A</td>
<td>415,300</td>
<td>$1,731,100</td>
<td>1.63</td>
</tr>
<tr>
<td>3B</td>
<td>415,300</td>
<td>$1,678,200</td>
<td>1.61</td>
</tr>
</tbody>
</table>

11) The revised cost of water for the WWDC Smith Creek Alternative presented in the Water Development Program Report based on a 75 percent grant and 4 percent loan for 25 years is $0.65/1000 gallons.

Chapter 5 - Recommendations

1) The preferred Evansville-Casper Water System is Alternative 2A.

2) It is recommended the WWDC Smith Creek test well be drilled to determine the safe long-term water yield before a water development program is recommended for Evansville.
Chapter 2
EXISTING CONDITIONS
CHAPTER 2

EXISTING CONDITIONS

GENERAL

Evansville is located on the North Platte River downstream from the Casper Wastewater Treatment Plant (WWTP) outfall, the Amoco Oil Refinery, and the City of Casper as shown on Figure 2-1. The Town is about one mile downstream from the Casper WWTP and immediately upstream from the point where Elkhorn Creek enters the river from the south. Evansville's 1980 Census population was 2,652. The 1986 population is approximately 2,300. The existing service area includes the Town of Evansville, Elkhorn Mobile Home Park, Little America Refinery offices and a few neighboring industrial lots.

EVANSVILLE WATER SUPPLY

As presented in the Water Development Program Report, the Town's present 3.12 cfs (2 MGD) North Platte River appropriation with a 1978 priority is so junior that the water right could be restricted 75 out of 100 years. Whether or not the State Engineer will so severely restrict the Town is open to question. An optimistic water supply condition with less severe regulation would restrict the water right 25 out of 100 years.

A damage suit by downstream appropriators against the Town is conceivable if the Town utilizes the North Platte River water indiscriminately during a drought condition when the Town's rights are out of priority, and downstream senior water rights are calling for water. Therefore, a more secure water supply source is necessary.
EVANSVILLE WATER TREATMENT PLANT

The water treatment plant was originally rated to treat 700 gpm (1 mgd) at nominal capacity and 1,400 gpm (2 mgd) at peak capacity. Actual capacities that the plant can sustain are considerably lower. One primary problem is due to the large volume of sand which enters the river intake and is pumped to the flocculation facilities in the water treatment plant. Another problem is the heavy loading of fine clay sediments from the North Platte River during spring runoffs and flash floods from the Shirley Rim and Bates Creek area. Also, the outfall of the Casper WWTP is approximately one mile upstream from the Evansville WTP intake, as are several large storm drains.

A detailed discussion of the Evansville WTP and recommended improvements is provided in the Preliminary Design Report for Water Treatment Plant Intake Improvements, Evansville, Wyoming, 1984 prepared by Black & Veatch Engineers. The review comments of the report from the Department of Environmental Quality (DEQ) indicate the Town's water rights priority situation should be improved before large sums are spent to improve the water treatment plant. They have also indicated that it will be essential that the intake be moved out of the Casper WWTP effluent plume. Even if the intake is moved a mile upstream of the Casper WWTP, the desirability of the intake location is still questionable. Deterioration of water quality through the City of Casper has the potential to be severe due to spills of hazardous materials, pipeline breaks, stormwater discharges, etc.

EVANSVILLE WATER DISTRIBUTION SYSTEM

Lower Zone

The Evansville water system consists of two pressure zones. The lower zone comprises the original Town of Evansville boundary and is supplied from the 1.5 million gallon (MG) Lathrop Road Standpipe. The steel standpipe was constructed in 1978. The reservoir has an overflow elevation of 5259.5 feet. The lower zone service area is delineated on Figure 2-1.
Upper Zone

The upper zone serves the Elkhorn Mobile Home Park and several industrial water users such as Wyoming Machinery and Little America Refinery. The upper pressure zone is controlled by the 0.475 MG Scott Hill Reservoir, which has an overflow elevation of approximately 5300.0 feet. The reservoir initially provided storage to the Town before the Lathrop Road Standpipe was built. The existing system can satisfy the 1000 gpm fire flow requirements for residential reasons. The Scott Hill Reservoir is presently filled by manually opening a valve in a line to the lower zone, closing a valve to isolate the Lathrop Road Reservoir and pumping water up to the Scott Hill Reservoir from the Evansville WTP. When the Scott Hill Reservoir is being filled, pressure in the lower zone is about 20 psi higher than normal.

A field inspection of the Scott Hill Reservoir was performed as part of this study with Natrona County Health Department personnel to identify necessary improvements needed to satisfy their concerns expressed in a letter contained in Appendix A. The 0.475 MG reservoir was approximately 25 percent drawn down at that time. Visual inspection of the concrete sidewalls did not indicate severe cracking. No spalding was evident. Deficiencies noted included:

- No level controls to indicate volume of water available.
- Missing manway cover allowing entry of dirt, debris, and birds.
- Ventilation hood dismantled from roof allowing entry of debris.
- No seal between side walls and metal roofing allowing dirt to be blown in.
- Chlorine building wall knocked down and no repairs made.
- Valve pits poorly covered and leaking water from the reservoir into it.
- Algae growing on bottom of concrete reservoir.
- Large cottonwood tree growing immediately adjacent to reservoir threatening structural integrity of sidewalls.
Continued use of this reservoir will require these items to be addressed. Beer bottles and other debris were plainly visible on the bottom of the reservoir. It is recommended the cottonwood be cut down so the concrete sidewalls are not damaged by root intrusion. Severe water losses may already be experienced. Once improvements have been made the tank should be drained, cleaned up and disinfected. At this time the structural integrity of the tank should be examined closer. A PVC liner may be necessary to reduce water losses. It is recommended this work be performed at the earliest possible date.

The upper zone will also serve the Yellowstone Improvement District (YID) and future development to the Town of Evansville.

**Existing Water Taps**

The Town of Evansville will be charged a tap fee by Casper BPU for each service in the Evansville water system upon connecting to the Casper system. A preliminary review of Evansville records indicates that there are a total of approximately 744 water services on the Evansville water system. Of these 744 services, there appear to be two 2-inch services, four 1-1/2 inch services, and eight 1-inch services. It is assumed that the remaining 730 services are 3/4 inch. There are also some larger taps that are used for fire protection, but Casper BPU has indicated that there will be no charge for these.

**CASPER WATER DISTRIBUTION SYSTEM**

The Evansville system will be served off the Casper Pressure Zone 1. The overflow elevation is 5335.0. The Pratt Tank and City Reservoir are the storage facilities that will serve Evansville's peak demands. As presented in the City Reservoir Piping Modifications Report, it is not possible at the present time to fill the Pratt Tanks because the City Reservoir overflows before the Pratt Tanks can be filled. The recommended short-range improvement to the City Reservoir required placement of an electrically operated butterfly or altitude valve to maximize the use of available storage of both the Pratt Tanks and City Reservoir.
CHAPTER 3

FLOW PROJECTIONS

GENERAL

Flow projections for this study were developed utilizing information presented in the Preliminary Design Report for the Yellowstone Improvement District, 1983 prepared by HNTB. The flow projections presented in the YID report developed water demand projections based on existing land development patterns, actual inventory and analysis of individual lots, review of existing water consumption rates, and anticipated development based on an understanding of the Casper area.

The Casper system must be capable of satisfying the peak daily flows since several peak days may occur consecutively. This was a necessary assumption made in the Water Development Program report since Evansville's North Platte water rights may be out of priority 25 out of every 100 years even with an optimistic regulation scenario.

EVANSVILLE WATER DEMANDS

The water demands were divided between the two pressure zones. The lower zone serves the original Town of Evansville boundaries. Fire flows in the lower zone are limited to 1000 gpm. Fire protection at the Shilo Inn will not be provided.

The upper zone presently serves the Elkhorn Mobile Home Park. Peak demands are satisfied through the 0.475 MG Scott Hill Reservoir. The existing fire flow requirements of 1000gpm can be satisfied. The Yellowstone Improvement District (YID) will also be served off the upper zone.
Lower Zone Water Demands

Existing maximum day water demand in the lower zone of the Evansville water system was estimated to be 760 gallons per minute (see Yellowstone Improvement District - Preliminary Design Report, HNTB, May 1983). The lower zone is assumed to be fully developed, therefore future peak day demands are not expected to change significantly.

Computer modeling indicated the lower zone pipelines and storage facilities are adequately sized to satisfy 1000 gpm fire flows for residential areas at a minimum pressure of 20 psi. With the Lathrop Road standpipe, it will only be necessary for Casper to satisfy the peak day demand. The water demands from the lower zone will be only 760 gpm.

Upper Zone Water Demands

Existing and future water requirements for the upper zone of the Evansville water system were also presented in the Yellowstone Improvement District Report. The existing peak day demand in the upper zone is 160 gpm, mainly from the Elkhorn Mobile Home Park. If the upper zone were extended to Hat Six Road to include the proposed YID, the initial peak day demand is estimated to be 705 gpm. Future development to the upper zone was assumed to include expansion of Elkhorn Mobile Home Park, the Elkhorn Industrial Park, Brookhurst Subdivision, and Brooks/Hat Six Industrial Park. Peak day demand for the fully developed upper zone is estimated to be 1575 gpm.

In addition to the peak day demand, provisions for fire protection must be allowed for. The most critical point in the upper zone in terms of fire demand is at the Husky Truck Stop. According to Insurance Service Offices (ISO) criteria, a fire demand of 1825 gpm must be satisfied.

Water requirements through the Casper connection to the upper zone for the various conditions are presented in Table 3-1.
TABLE 3-1

UPPER ZONE WATER DEMANDS

<table>
<thead>
<tr>
<th>FLOW CONDITION</th>
<th>PEAK DAY DEMAND (GPM)</th>
<th>FIRE DEMAND (GPM)</th>
<th>TOTAL DEMAND (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Existing with Storage for Fire Protection</td>
<td>160</td>
<td>--</td>
<td>160</td>
</tr>
<tr>
<td>• Existing without Storage for Fire Protection</td>
<td>160</td>
<td>1000</td>
<td>1160</td>
</tr>
<tr>
<td>• Initial Development with Storage for Fire Protection</td>
<td>705</td>
<td>--</td>
<td>705</td>
</tr>
<tr>
<td>• Initial Development without Storage for Fire Protection</td>
<td>705</td>
<td>1825</td>
<td>2530</td>
</tr>
<tr>
<td>• Full Development with Storage for Fire Protection</td>
<td>1575</td>
<td>--</td>
<td>1575</td>
</tr>
<tr>
<td>• Full Development without Storage for Fire Protection</td>
<td>1575</td>
<td>1825</td>
<td>3400</td>
</tr>
</tbody>
</table>
Water Demand Summary

The demands in both the upper and lower zones must be considered simultaneously. Necessary improvements depend on whether the connection is designed to provide for: existing demands only; existing demands with the YID; and whether the Scott Hill storage facilities are incorporated into the upper zone. The water supply alternatives are developed for each scenario with and without storage facilities at the Scott Hill Reservoir. This assumption was made should the structural integrity of the reservoir be more serious than anticipated.
CHAPTER 4

ALTERNATIVE ANALYSIS

GENERAL

This chapter develops alternatives, determines necessary improvements to satisfy pressure requirements, and identifies costs.

WATER SUPPLY ALTERNATIVES

The necessary improvements to the Casper and Evansville distribution system were developed to serve three scenarios: the existing service area; existing service area with the proposed Yellowstone Improvement District (YID); and future full development. Each of these three conditions were evaluated with and without storage at the Scott Hill Reservoir site. It will be necessary to drain the reservoir and perform a field inspection to determine the structural integrity of the reservoir, and leakage losses to determine whether a lining is needed in the tank. If a new storage facility is needed, the cost-effectiveness of improvements necessary to satisfy peak day plus fire demands can be compared to the cost of improvements to satisfy peak day demands with a new storage facility.

The alternatives and corresponding flow requirements are presented in Table 4-1.

CASPER SYSTEM ALTERNATIVE ANALYSIS

Necessary improvements to the Casper water system were determined by Black & Veatch through their computer modeling program. B&V was provided with the flow requirements for the various alternatives. For each alternative, pipe sizes were adjusted in the computer model of the Casper system until adequate pressures were available. Based on the available pressures to the Evansville system, a computer analysis was made of the Evansville system to satisfy pressure requirements at the given flows.
TABLE 4-1

CASPER-EVANSVILLE
WATER SUPPLY ALTERNATIVES

<table>
<thead>
<tr>
<th>ALTERNATIVE 1 - EXISTING PEAK DAY DEMAND</th>
<th>LOWER ZONE (gpm)</th>
<th>UPPER ZONE (gpm)</th>
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</thead>
<tbody>
<tr>
<td>1A - With Storage in Upper Zone for Fire Protection</td>
<td>760</td>
<td>160</td>
</tr>
<tr>
<td>1B - Without Storage in Upper Zone for Fire Protection</td>
<td>760</td>
<td>1160</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE 2 - PEAK DAY DEMAND WITH YID</th>
<th>LOWER ZONE (gpm)</th>
<th>UPPER ZONE (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A - With Storage for Fire Protection in Upper Zone</td>
<td>760</td>
<td>705</td>
</tr>
<tr>
<td>2B - Without Storage for Fire Protection in Upper Zone</td>
<td>760</td>
<td>2530</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTERNATIVE 3 - PEAK DAY DEMAND WITH FULL DEVELOPMENT</th>
<th>LOWER ZONE (gpm)</th>
<th>UPPER ZONE (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A - With Storage for Fire Protection in Upper Zone</td>
<td>760</td>
<td>1575</td>
</tr>
<tr>
<td>3B - Without Storage for Fire Protection in Upper Zone</td>
<td>760</td>
<td>3400</td>
</tr>
</tbody>
</table>
The improvements discussed below are necessary to satisfy the hydraulic conditions to maintain adequate pressures for the various flow conditions. The Casper BPU has indicated that a continuous water supply cannot be guaranteed until a commitment to construct the Deer Creek Reservoir can be made (see 4/14/86 letter from Dave Engels in Appendix B). BPU has indicated that approximately a 10 percent increase in water rates can be expected after construction of the Deer Creek Reservoir.

The upper and lower zones of the Evansville water system will receive their supply from the Casper system at separate points. This will eliminate the need for the Evansville WTP and the manual operation necessary to fill the Scott Hill Reservoir tank. The connection point for the lower zone will be near the Shilo Inn at the intersection of Curtis Street and Yellowstone Highway. The upper zone will be connected to the Casper system by constructing a main from Second Street east of Curtis Street to Scott Hill. The improvements necessary to make these two connections are dictated by the flow conditions for each alternative discussed below. The costs necessary to satisfy peak day plus fire demands through the abandonment of the Scott Hill Reservoir are also investigated.

Pressure reducing valves will be required into both the upper and lower zones since the overflow elevation in the Casper Pressure Zone 1 of 5335.0 will exceed the overflow elevation of both the Lathrop Road tank (5259.5 feet) and the Scott Hill tank (5300.0 feet). The B&V model indicated that as growth continues there is some question regarding the ability to satisfy the long-range water demand to the upper zone at elevation 5300.0 without a booster pump, but will not have difficulty satisfying it at 5296.0. A check on the pressures in the Evansville system for future conditions indicated an overflow elevation of 5296.0 will still satisfy Evansville needs at peak day plus fire demands.
Alternative 1 Improvements

The Alternative 1 improvements are necessary to satisfy the existing water demands in the Evansville system. Although B&V was not able to perform a computer run for this condition, an engineering judgement was made to determine the improvements to satisfy existing demands only. If the Town elected to connect under this scenario, this computer run should be performed by B&V.

Alternative 1A - This alternative considers the improvements required with storage provided at Scott Hill for fire protection in the upper zone. If the Scott Hill Reservoir is utilized, it is recommended the following improvements be performed at the site:

• Install level controls to indicate storage volume thereby eliminating daily manual operation requirements.
• Install manway and ventilation hood on roof.
• Provide sealant between sidewalls and steel roof.
• Drain reservoir at convenient time to determine structural integrity and degree of leakage. Clean debris from bottom of reservoir.
• Eliminate water leak to valve pit and provide concrete cover with access hatch.
• Cut down large cottonwood tree adjacent to reservoir.

Depending on the structural integrity and the leakage from the tank, it is believed a liner may be necessary and has been included in the cost estimates. The Alternative 1A improvements are listed below and shown graphically in Figure 4-1. In the list below, the improvements are grouped into those required to supply the upper zone, lower zone, and both zones.

Lower Zone

• 8-inch water main in Curtis Street, from Legion Lane to Yellowstone Highway (2200 LF).
• 8-inch water main in Yellowstone Highway, from Curtis Street west to existing Casper water system (2800 LF).
• Pressure reducing valve at Yellowstone and Curtis.
LEGEND

--- EXISTING SERVICE BOUNDARY
ALTERNATIVE 1A & 1B
( w/ and w/o Storage at Scott Hill )

FIGURE 4-1
ALTERNATIVE 1
IMPROVEMENTS FOR EXISTING DEMANDS
Upper Zone

- 12-inch main from Second Street to Scott Hill (1000 LF).
- Pressure reducing valve at Scott Hill.
- Scott Hill Reservoir improvements.

Both Zones

- Altitude valve at City Reservoir.

Alternative 1B - This alternative considers the improvements required if no storage is provided at Scott Hill for fire protection in the upper zone. Without the Scott Hill Reservoir, the Casper system will need to satisfy the peak day plus fire demand at the Elkhorn Mobile Home Park. It is believed the 12-inch pipeline from Second Street to Scott Hill will maintain adequate pressures in Scott Hill during fire conditions. Therefore, the same pipeline improvements listed above for Alternative 1A are necessary for Alternative 1B. The reservoir improvements will not be included.

Abandonment of the Scott Hill Reservoir will leave the Elkhorn Mobile Home Park without any operating storage and will be a consideration for future development.

Alternative 2 Improvements

The Alternative 2 improvements are necessary to satisfy the existing water demands plus the Yellowstone Improvement District (YID).

Alternative 2A - This alternative considers the improvements required with storage provided at Scott Hill for fire protection in the upper zone. The recommended improvements for Alternative 2A are identical to those presented for Alternative 1A listed above, and are shown in Figure 4-2. The reason the improvements are the same is because the demands in the lower zone are unchanged and the peak day demand with the YID did not require an increase in the 12-inch connection to the Scott Hill Reservoir.
LEGEND

EXISTING SERVICE BOUNDARY

ALTERNATIVE 2A (w/ Storage at Scott Hill)

ALTERNATIVE 2B (w/o Storage at Scott Hill)

NOTE: Pipeline improvements for 2A also necessary for 2B.

FIGURE 4-2
ALTERNATIVE 2
IMPROVEMENTS FOR EXISTING
PLUS YID DEMANDS
Based on Insurance Services Office (ISO) criteria, the necessary storage must be able to satisfy the maximum fire flow requirement of 1825 gpm at the Husky Truck Stop for a duration of 2 hours. This translates into a storage capacity of 220,000 gallons. If a safety factor of 1.5 is introduced to account for operating storage and drawdown during peak demands, the necessary storage capacity on Scott Hill is 330,000 gallons. Therefore, the existing 475,000 gallon Scott Hill Reservoir has adequate capacity to satisfy the storage requirements.

Alternative 2B - This alternative considers the improvements for the same service area as Alternative 2A (existing service area plus YID). However, fire demands must be supplied through the Casper system since storage at Scott Hill would not be utilized. The pipeline improvements necessary for Alternative 2A are also needed for this alternative plus the following:

- 16-inch main from 12th and Payne to 5th and Payne (2200 LF).
- Parallel 12-inch main from Swanton and Wind River to 2nd and Wind River; and from 2nd and Wind River to 2nd and Walsh (2200 LF).
- Parallel 12-inch main from 2nd and Walsh to Scott Hill (2400 LF).

No additional improvements are needed in the lower zone.

Without storage at Scott Hill, no operating storage will be available and the distribution system will be more susceptible to water hammer and surge conditions. This could present a serious problem if a fire hydrant was quickly closed on the east end of the YID.

Alternative 3 Improvements

The Alternative 3 improvements are necessary to supply the water demand in the Evansville system with full development of the upper zone.

Alternative 3A - This scenario considers the improvements required with storage at Scott Hill for fire protection in the upper zone for future conditions. The pipeline improvements required are identical to those for Alternative 2B listed above. The Scott Hill Reservoir improvements are also included. These improvements are graphically shown in Figure 4-3.
LEGEND

EXISTING SERVICE BOUNDARY

ALTERNATIVE 3A & 3B

( w/ and w/o Storage at Scott Hill )

FIGURE 4-3

ALTERNATIVE 3

IMPROVEMENTS FOR

FUTURE DEMANDS
Alternative 3B - This scenario considers the improvements required for full development of the upper zone, if no storage is provided at Scott Hill for fire protection for future conditions. The pipeline improvements are the same as those presented above for Alternative 3A. No improvements are included at the Scott Hill Reservoir. The same concerns expressed for Alternative 2B regarding water hammer and surge conditions are a factor for Alternative 3B.

Alternatives 3A and 3B also require "long-range" improvements to the Casper system that are described in Report On The City Reservoir Piping Modifications For The Board Of Public Utilities, Casper, Wyoming, (Black & Veatch, July 20, 1983); and 1982 Update, Master Plan For Water Facilities For Board Of Public Utilities, Casper, Wyoming, (Black & Veatch, 1982). However, since these long-range improvements are required whether or not Evansville is connected to the Casper system, they will not be discussed further in this report.

EVANSVILLE SYSTEM ALTERNATIVE ANALYSIS

After the required improvements to the Casper system were determined by B&V, the adequacy of the Evansville system was analyzed by HNTB given the available pressures at the two connection points.

Lower Pressure Zone

The lower pressure zone was modeled to see if adequate pressures could be maintained. Since the lower zone is assumed to be fully developed, the flow condition analyzed was peak day demand with a fire demand of 1000 gpm at the most remote location in the lower zone.

The system was modeled assuming a pressure reducing valve (PRV) will be installed at the Casper connection near the intersection of Curtis and Yellowstone, so that the pressure gradient downstream of the PRV will be the same as at the Lathrop Road Tank. This pressure gradient was assumed to be 5252.0 feet, which is 7.5 feet below the overflow elevation of the
Lathrop Road Tank. This allows for the operating storage to be partially depleted during peak periods. This translates into a water pressure of 48.5 psi on the downstream side of the PRV.

The results of the computer model indicate that at peak day demand with a 1000 gpm fire demand at a remote location in the lower zone, the pressure will not drop below 48 psi anywhere in the system. The design pressure for this flow condition is 20 psi. Therefore, adequate pressures will be available in the entire system.

**Upper Pressure Zone**

The upper pressure zone of the Evansville water system was modeled to see if adequate pressures can be maintained for the various alternatives. A pressure gradient of 5296.0 was assumed at the Scott Hill Reservoir. This was the elevation B&V indicated all future flow conditions could be satisfied.

Pipe sizes were adjusted in the computer model to serve the proposed YID until adequate pressures were maintained throughout the system. The results indicate that the delivery pressure gradient of 5296.0 feet will be sufficient if an 18-inch main were provided from the Scott Hill Reservoir east to Hat Six Road near the Husky Truck Stop. The pressures at the Husky Truck Stop for various flow conditions are shown below.

- **Initial Development of Upper Zone**
  - Peak Day Demand + 1825 gpm fire flow at Husky 41 psi
  - Peak hour demand 63 psi

- **Full Development of Upper Zone**
  - Peak Day Demand + 1825 gpm fire flow at Husky 41 psi
  - Peak hour demand 52 psi

The above results indicate that adequate pressures will be maintained during future conditions.
COST ESTIMATES

The cost estimates have been tentatively divided into Casper and Evansville improvements following discussions with both entities.

Casper Costs

The Casper BPU has indicated a willingness to share 50 percent of the cost of the altitude valve at the City Reservoir. The cost of this improvement has been estimated by the Casper BPU at $100,000. The Casper BPU will also pay the costs of the "short-range" improvements listed in the 1982 Update, Master Plan for Water Facilities for Board of Public Utilities, Casper, Wyoming (Black & Veatch, November 1982) that are also necessary to make the connection to Evansville.

Alternatives 2B and 3B require 2200 LF of 16-inch main in Payne Avenue from 12th to 5th Street, and 2200 LF of 12-inch main in Wind River Avenue from Swanton Avenue to Second Street and in Second Street from Wind River Avenue to Walsh Drive.

The estimated costs to Casper BPU for the improvements necessary for the various water requirement alternatives are shown in Table 4-2.

Evansville Costs

A tap fee will be charged to Evansville by the Casper BPU for each existing tap on the Evansville water system. The BPU has indicated that the tap fee charged will be the same as that charged to customers within the Casper city limits. As discussed in Chapter 2 Existing Conditions, there are approximately 744 such taps. There are several large taps used for fire protection only, and BPU has indicated there will be no charge for these.
<table>
<thead>
<tr>
<th></th>
<th>LOWER ZONE</th>
<th>UNIT PRICE</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• City Reservoir Improvements</td>
<td>$25,000 LS(1)</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td></td>
<td>• 16-inch PVC in Payne Avenue (2200 LF)</td>
<td>$45/LF</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>99,000</td>
<td>99,000</td>
<td>99,000</td>
</tr>
<tr>
<td></td>
<td>• 12-inch PVC in Wind River Ave. &amp; 2nd (2200 LF)</td>
<td>$35/LF</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>77,000</td>
<td>77,000</td>
<td>77,000</td>
</tr>
<tr>
<td></td>
<td>• Street Restoration (4400 LF)</td>
<td>$20/LF</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>88,000</td>
<td>88,000</td>
<td>88,000</td>
</tr>
<tr>
<td><strong>SUBTOTAL</strong></td>
<td></td>
<td>$50,000</td>
<td>$50,000</td>
<td>$50,000</td>
<td>$314,000</td>
<td>$314,000</td>
<td>$314,000</td>
<td>$314,000</td>
</tr>
<tr>
<td><strong>Contingency (15%)</strong></td>
<td></td>
<td>7,500</td>
<td>7,500</td>
<td>7,500</td>
<td>47,100</td>
<td>47,100</td>
<td>47,100</td>
<td>47,100</td>
</tr>
<tr>
<td><strong>Construction Cost</strong></td>
<td></td>
<td>$57,500</td>
<td>$59,500</td>
<td>$57,500</td>
<td>$361,100</td>
<td>$361,100</td>
<td>$361,100</td>
<td>$361,100</td>
</tr>
<tr>
<td><strong>Engineering and Administration (15%)</strong></td>
<td></td>
<td>8,600</td>
<td>8,600</td>
<td>8,600</td>
<td>54,200</td>
<td>54,200</td>
<td>54,200</td>
<td>54,200</td>
</tr>
<tr>
<td><strong>PROJECT COST TO CASPER BPU</strong></td>
<td></td>
<td>$66,100</td>
<td>$66,100</td>
<td>$66,100</td>
<td>$415,300</td>
<td>$415,300</td>
<td>$415,300</td>
<td>$415,300</td>
</tr>
</tbody>
</table>

(1) Assumes 50% cost sharing between Casper and Evansville for estimated $100,000 City Reservoir Improvements. These costs are split equally between the upper and lower zones.
Using the estimated number of water taps of various sizes and the Casper BPU tap fees, the total tap fee to be charged to Evansville is estimated below:

<table>
<thead>
<tr>
<th>Service Line Size</th>
<th>No.</th>
<th>X</th>
<th>Tap Fee Each</th>
<th>Tap Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 inch</td>
<td>730</td>
<td>$1,101</td>
<td></td>
<td>$737,300</td>
</tr>
<tr>
<td>1 inch</td>
<td>8</td>
<td>$1,690</td>
<td></td>
<td>13,520</td>
</tr>
<tr>
<td>1-1/2 inch</td>
<td>4</td>
<td>$3,360</td>
<td></td>
<td>13,440</td>
</tr>
<tr>
<td>2 inch</td>
<td>2</td>
<td>$5,385</td>
<td></td>
<td>10,770</td>
</tr>
<tr>
<td></td>
<td>744</td>
<td></td>
<td></td>
<td>$775,030</td>
</tr>
</tbody>
</table>

With the proposed YID it is estimated 30 additional taps will be made and a fee of approximately $30,300 will be charged for initial taps. The total Evansville tap fee will be approximately $805,330. The tap fee presently is not a grant eligible item for Farm Loan Board grant applications. However, a variance may be justifiable.

The estimated costs to the Town of Evansville for the improvements necessary for the various alternatives are shown in Table 4-3. A cost comparison summary for the various alternatives is shown in Table 4-4. Alternative 2A has the least cost per 1,000 gallons for both Casper and Evansville improvements. Alternative 1 has the highest cost per 1,000 gallons since the costs are not shared with the proposed YID.
<table>
<thead>
<tr>
<th>EVANSVILLE IMPROVEMENTS</th>
<th>UNIT PRICE</th>
<th>1A</th>
<th>1B</th>
<th>2A</th>
<th>2B</th>
<th>3A</th>
<th>3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWER ZONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• City Reservoir Improvements</td>
<td>$25,000 LS$</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>• 8-inch PVC in Curtis St. (2200 LF)</td>
<td>$35/LF</td>
<td>77,000</td>
<td>77,000</td>
<td>77,000</td>
<td>77,000</td>
<td>77,000</td>
<td>77,000</td>
</tr>
<tr>
<td>• 8-inch PVC in Yellowstone (2800 LF)</td>
<td>$35/LF</td>
<td>98,000</td>
<td>98,000</td>
<td>98,000</td>
<td>98,000</td>
<td>98,000</td>
<td>98,000</td>
</tr>
<tr>
<td>• Street Restoration (2200 LF)</td>
<td>$20/LF</td>
<td>44,000</td>
<td>44,000</td>
<td>44,000</td>
<td>44,000</td>
<td>44,000</td>
<td>44,000</td>
</tr>
<tr>
<td>• PRV and Vault (1 ea.)</td>
<td>$25,000 LS</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>• Flow Meter and Vault (1 ea.)</td>
<td>$35,000 LS</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
</tr>
<tr>
<td>• Railroad Crossing (100 LF)</td>
<td>$200/LF</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>• Connection to Evansville (1 ea.)</td>
<td>$10,000 LS</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>UPPER ZONE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• City Reservoir Improvements</td>
<td>$25,000 LS</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>• 12-inch PVC from 2nd to Scott Hill (1000 LF)</td>
<td>$30/LF</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
<td>30,000</td>
</tr>
<tr>
<td>• Scott Hill Reservoir Improvements</td>
<td>$40,000 LS</td>
<td>40,000</td>
<td>---</td>
<td>40,000</td>
<td>---</td>
<td>40,000</td>
<td>---</td>
</tr>
<tr>
<td>• PRV and Vault (1 ea.)</td>
<td>$25,000 LS</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>• Flow Meter and Vault (1 ea.)</td>
<td>$35,000 LS</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
<td>35,000</td>
</tr>
<tr>
<td>• Connection to Evansville (1 ea.)</td>
<td>$10,000 LS</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>• 12-inch PVC in 2nd St. (2150 LF)</td>
<td>$40/LF</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>86,000</td>
<td>86,000</td>
<td>86,000</td>
</tr>
<tr>
<td>• 12-inch PVC from Curtis to Scott Hill (2400 LF)</td>
<td>$30/LF</td>
<td>---</td>
<td>---</td>
<td>72,000</td>
<td>72,000</td>
<td>72,000</td>
<td>72,000</td>
</tr>
<tr>
<td>• Street Restoration (2150 LF)</td>
<td>$20/LF</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>43,000</td>
<td>43,000</td>
<td>43,000</td>
</tr>
<tr>
<td>SUBTOTAL</td>
<td></td>
<td>$499,000</td>
<td>$459,000</td>
<td>$499,000</td>
<td>$660,000</td>
<td>$700,000</td>
<td>$660,000</td>
</tr>
<tr>
<td>Contingency (15%)</td>
<td></td>
<td>74,900</td>
<td>68,900</td>
<td>74,900</td>
<td>99,000</td>
<td>105,000</td>
<td>99,000</td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$573,900</td>
<td>$527,900</td>
<td>$573,900</td>
<td>$759,000</td>
<td>$805,000</td>
<td>$759,000</td>
<td></td>
</tr>
<tr>
<td>Engineering and Administration (15%)</td>
<td>86,100</td>
<td>79,200</td>
<td>86,100</td>
<td>113,900</td>
<td>120,800</td>
<td>113,900</td>
<td></td>
</tr>
<tr>
<td>PROJECT COST TO TOWN OF EVANSVILLE</td>
<td>$660,000</td>
<td>$567,100</td>
<td>$660,000</td>
<td>$872,900</td>
<td>$925,800</td>
<td>$872,900</td>
<td></td>
</tr>
</tbody>
</table>

(1) Assumes 50% cost sharing between Casper and Evansville for estimated $100,000 City Reservoir Improvements. These costs are split equally between the upper and lower zones.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>PROJECT COST ($)</th>
<th>GRANT ELIGIBLE PORTION ($)</th>
<th>FINANCED PORTION ($)</th>
<th>PAY BACK PERIOD (YRS)</th>
<th>PERCENT FINANCING (%)</th>
<th>INITIAL ANNUAL PROJECT COST ($)</th>
<th>ANNUAL O&amp;M ($)</th>
<th>INITIAL TOTAL ANNUAL COST ($/1000 GAL.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTERNATIVE 1A</td>
<td>Connection Cost 660,000</td>
<td>330,000</td>
<td>330,000</td>
<td>25</td>
<td>8.5</td>
<td>32,200</td>
<td>107,900</td>
<td>164,600 (1)</td>
</tr>
<tr>
<td></td>
<td>Tap Fee 775,000</td>
<td>0</td>
<td>775,000</td>
<td>25</td>
<td>8.5</td>
<td>75,700</td>
<td>746</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,435,000</td>
<td>330,600</td>
<td>1,105,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTERNATIVE 1B</td>
<td>Connection Cost 607,100</td>
<td>303,600</td>
<td>303,600</td>
<td>25</td>
<td>8.5</td>
<td>29,700</td>
<td>105,400</td>
<td>164,600 (1)</td>
</tr>
<tr>
<td></td>
<td>Tap Fee 775,000</td>
<td>0</td>
<td>775,000</td>
<td>25</td>
<td>8.5</td>
<td>75,700</td>
<td>746</td>
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<tr>
<td>TOTAL</td>
<td>1,382,100</td>
<td>303,600</td>
<td>1,078,600</td>
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<td>Connection Cost 660,000</td>
<td>330,000</td>
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<td>25</td>
<td>8.5</td>
<td>32,200</td>
<td>110,900</td>
<td>202,800 (2)</td>
</tr>
<tr>
<td></td>
<td>Tap Fee 805,300</td>
<td>0</td>
<td>805,300</td>
<td>25</td>
<td>8.5</td>
<td>78,700</td>
<td>746</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,465,300</td>
<td>330,000</td>
<td>1,135,300</td>
<td></td>
<td></td>
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<td>ALTERNATIVE 2B</td>
<td>Connection Cost 872,900</td>
<td>436,500</td>
<td>436,500</td>
<td>25</td>
<td>8.5</td>
<td>42,700</td>
<td>121,400</td>
<td>202,800 (2)</td>
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<td>Tap Fee 805,300</td>
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<td>78,700</td>
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<tr>
<td>TOTAL</td>
<td>1,678,200</td>
<td>436,500</td>
<td>1,241,800</td>
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<td>ALTERNATIVE 3A</td>
<td>Connection Cost 925,800</td>
<td>462,900</td>
<td>462,900</td>
<td>25</td>
<td>8.5</td>
<td>45,200</td>
<td>123,900</td>
<td>202,800 (2)</td>
</tr>
<tr>
<td></td>
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<td>0</td>
<td>805,300</td>
<td>25</td>
<td>8.5</td>
<td>78,700</td>
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<tr>
<td>TOTAL</td>
<td>1,731,100</td>
<td>462,900</td>
<td>1,268,200</td>
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<td>Connection Cost 872,900</td>
<td>436,500</td>
<td>436,500</td>
<td>25</td>
<td>8.5</td>
<td>42,700</td>
<td>121,400</td>
<td>202,800 (2)</td>
</tr>
<tr>
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<td>Tap Fee 805,300</td>
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<td>25</td>
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<td>78,700</td>
<td>746</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,678,200</td>
<td>436,500</td>
<td>1,241,800</td>
<td></td>
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</tr>
</tbody>
</table>

(1) Existing Average Day Demand = 310 gpm = 446,400 gal/day x $1.01/1000 gal = $451/day = $164,600/YR.

(2) Average Day Demand with Yellowstone Improvement District = 550,000 gal/day x $1.01/1000 gal = $556/day = $202,800/YR.
CHAPTER 5

RECOMMENDATIONS

EVANSVILLE-CASPER WATER SYSTEM

The preferred Evansville-Casper Water System Alternative is Alternative 2A. Alternative 2A will be capable of providing Evansville's water requirements with the Yellowstone Improvement District. It is strongly recommended that the Scott Hill Reservoir be upgraded and inspected for structural integrity.

It can be seen from Table 4-1 that the project cost to Casper is also kept to a minimum in Alternative 2A. If storage facilities are maintained at Scott Hill, Casper can defer the pipeline improvements along Payne and Wind River Avenue until future growth dictates their need.

Also, inspection of Evansville costs presented in Table 4-2 indicates that Alternative 2A allows the water main improvements along Second Street to be delayed until growth in the upper zone dictates their placement. Given the uncertainty involved in predicting the growth of the upper zone, it is recommended the water main improvements be undertaken only as they become necessary. It should be noted that reconstruction of Second Street was completed two years ago and it therefore may not be publicly acceptable to make additional improvements so soon.

EVANSVILLE WATER DEVELOPMENT PROGRAM

A cost summary of water supply alternatives previously evaluated in the Water Development Program Report and the preferred Evansville-Casper Water System - Alternative 2A is presented in Table 5-1. These alternatives comprise the most feasible alternatives that will satisfy Evansville's water needs with the Yellowstone Improvement District and the Department of Environmental Quality concerns regarding the effluent plume of the Casper Wastewater Treatment Plant.
<table>
<thead>
<tr>
<th>ALTERNATIVE WATER DEVELOPMENT PROGRAM</th>
<th>PROJECT COST ($ )</th>
<th>ELIGIBLE COST PORTION ($)</th>
<th>FINANCED COST PORTION ($)</th>
<th>PAY BACK PERIOD (YEARS)</th>
<th>PERCENT FINANCING (%)</th>
<th>INITIAL ANNUAL COST ($/YR)</th>
<th>ANNUAL O&amp;M ($/YR)</th>
<th>INITIAL TOTAL ANNUAL COST ($/YR)</th>
<th>1000 GAL</th>
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<tr>
<td>ELKHORN CREEK WATER SUPPLY</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>W/INTAKE ABOVE CASPER WWTP</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Raw Water Transmission</td>
<td>3,098,000</td>
<td>1,549,000</td>
<td>1,549,000</td>
<td>25</td>
<td>4.0</td>
<td>72,200</td>
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<td>163,700</td>
<td>$1.63</td>
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<tr>
<td>Treatment Plant</td>
<td>1,553,000</td>
<td>776,500</td>
<td>776,500</td>
<td>25</td>
<td>8.5</td>
<td>75,900</td>
<td></td>
<td>163,000</td>
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</tr>
<tr>
<td>Casper Tap Fee</td>
<td>160,000</td>
<td>0</td>
<td>160,000</td>
<td>25</td>
<td>8.5</td>
<td>15,600</td>
<td></td>
<td>326,700</td>
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<td>TOTAL</td>
<td>$4,811,000</td>
<td>$2,325,500</td>
<td>$2,565,500</td>
<td></td>
<td></td>
<td>$163,700</td>
<td></td>
<td></td>
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<td>WWDC SMITH CREEK WATER SUPPLY</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Raw Water Transmission</td>
<td>4,654,000</td>
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<td>22,500</td>
<td>25</td>
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<td>2,200</td>
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<td>60,500</td>
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<td>Treatment Plant</td>
<td>33,000(2)</td>
<td>16,500</td>
<td>16,500</td>
<td>25</td>
<td>8.5</td>
<td>1,600</td>
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<td>$4,687,000</td>
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<tr>
<td>DEER CREEK RESERVOIR WATER SUPPLY</td>
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<td></td>
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<td>W/INTAKE ABOVE CASPER WWTP</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Raw Water Storage</td>
<td>2,251,000</td>
<td>1,294,300(3)</td>
<td>956,700</td>
<td>50</td>
<td>4.0</td>
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<td>131,100</td>
<td>$1.31(4)</td>
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<td>4.0</td>
<td>25,600</td>
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<td>36,800</td>
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<td>Treatment Plant</td>
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<td>25</td>
<td>8.5</td>
<td>36,800</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Casper Connection</td>
<td>175,000</td>
<td>87,500</td>
<td>87,500</td>
<td>25</td>
<td>8.5</td>
<td>8,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casper Tap Fee</td>
<td>160,000</td>
<td>0</td>
<td>160,000</td>
<td>25</td>
<td>8.5</td>
<td>15,600</td>
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<tr>
<td>TOTAL</td>
<td>$4,119,000</td>
<td>$2,158,300</td>
<td>$1,960,700</td>
<td></td>
<td></td>
<td>$131,100</td>
<td></td>
<td>263,100</td>
<td>$1.31(4)</td>
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<tr>
<td>EVANSVILLE-CASPER WATER SYSTEM</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection Cost</td>
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<td>330,000</td>
<td>25</td>
<td>8.5</td>
<td>32,200</td>
<td></td>
<td>313,700</td>
<td>$1.56</td>
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<td>Tap Fee</td>
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<td>805,000</td>
<td>25</td>
<td>8.5</td>
<td>78,700</td>
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<tr>
<td>TOTAL</td>
<td>$1,465,300</td>
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<td></td>
<td></td>
<td>$110,900</td>
<td></td>
<td>313,700</td>
<td>$1.56</td>
</tr>
</tbody>
</table>

(1) WWDC grant for groundwater exploration.
(2) Chlorination Facilities project cost.
(3) Assumes 57.5% WWDC grant for Deer Creek Reservoir.
(4) Equivalent cost if Deer Creek project paid for in 25 years with 4% financing.
Cost revisions have been made to the Elkhorn Creek, WWDC Smith Creek and Deer Creek Water Supply Alternatives subsequent to their development in the Water Development Program Report - May 1985. Conversations with the Wyoming Water Development Commission (WWDC) staff indicate that new construction for raw water transmission systems to the point of treatment are grant eligible at 75 percent grant/25 percent loan at 4 percent interest and rehabilitation work is grant eligible at only 50 percent grant/50 percent loan at 4 percent. Therefore, based on conversations with the WWDC staff it is HNTB's best judgement that the 75/25 grant-loan mix should apply to the 14 miles of 12-inch WWDC Smith Creek raw water pipeline costs and 2.1 miles of 18-inch raw water pipeline for the Deer Creek Alternative since this is entirely new construction.

The 50/50 grant loan mix will apply to the Elkhorn Creek raw water supply cost since replacement of existing transmission main will be necessary.

Also included in the WWDC Smith Creek Alternative was a fee of $7.50/acre-foot of water to the Wyoming Land Board for groundwater from state land. This cost is equivalent to approximately $0.02/1000 gallons.

These revisions changed the costs as follows: water supply costs for the Elkhorn Creek Alternative were reduced from $2.02/1000 gallons to $1.63/1000 gallons; WWDC Smith Creek Alternative cost was reduced from $1.37/1000 gallons to $0.67/1000 gallons; and Deer Creek Alternative cost reduced from $1.46/1000 gallons to $1.31/1000 gallons.

Previously the grant/loan assumptions assumed Farm Loan Board (FLB) financing at 50 grant/50 percent loan at 8.5 percent over 25 years. Alternatives dependent on FLB financing may not prove feasible in the future due to the limited amount of FLB money available. Ample WWDC funds should remain available for the Smith Creek Alternative.

Since the WWDC Smith Creek Alternative has a significantly lower cost, it is recommended the Town have the test well drilled to determine the long-term yield of the well. Once this has been accomplished the alternatives can all be compared on an equal basis. Without the test well and determination of the safe yield the alternatives cannot be compared on an equal basis.
APPENDIX

A. Natrona County Health Department Letter from Abe Knapp.

B. Casper BPU letter from Dave Engels.
March 29, 1985

Honorable Mayor Anthony
P.O. Drawer 158
Evansville, WY 82636

Honorable Mayor Anthony,

On Monday, March 25, 1985, I received a complaint that the water in the Scott Hills and East Hills Trailer Park was very turbid. Two members of the family have been sick with stomach cramps and diarrhea.

A water sample collected from the area on Monday and checked at the Evansville Plant had an NTU of 4.0. A water sample collected by myself from the East Hills Trailer Park and tested in our laboratory resulted with less than one coliform and 63 non-coliforms.

Upon investigation for the cause of the turbidity, I found the condition of your Scott Hills reservoir to be appalling. It appears that no repair to the vandalism that occurred last March 1984 has been done. Deficiencies noted were as follows:

1. Manway Cover is missing allowing entry of dirt, debris, and birds.
2. No seal between side walls and metal roofing allows dirt to be blown in.
3. Chlorine building wall knocked down and no repairs have been made.
4. Valve pits poorly covered and flooded.
5. Algae growing on bottom of concrete reservoir.

It is my understanding that treated water from the plant is pumped into this reservoir. Considering the condition of the reservoir, it seems to be inappropriate to store treated water in the Scott Hill Reservoir.
It has also been brought to my attention that you are considering the use of Elk Horn Creek and the Country Club Reservoir as a source of water. Upon investigating the condition of this reservoir, I find it is also in very poor condition and is not protected. The concrete walls on this reservoir are crumbling and the lock on the gate needs replaced. The valve boxes are also in a poor state of repair.

Before this reservoir could be used, repairs need to be made, turbidity measurements will be required daily, chlorination must be installed and D.E.Q. construction/modification permits must be obtained. I would like to inspect the source on Casper Mountain before this supply is used. It appears that this could be a prime source for giardia contamination and I would highly recommend not using this source without treatment.

RECOMMENDATIONS

Scott Hills Reservoir:

1. Install steel manway cover on reservoir opening with block.

2. Seal openings between roof and side walls of reservoir cover.

3. Repair chlorine building and chlorination system.

4. Clean up and repair valve pits and install steel covers with locks.

5. Drain tank, clean up and disinfect after above repairs are made.

I would like to set up a meeting with you and your operators at your convenience to discuss these problems.

Please feel free to call me at 235-9316 if you have any questions.

Sincerely yours,

Detmer R. "Abe" Knapp, P.E.
Water Quality Engineer

DK:ae

CC: Maurice Boyd, Public Works Director
    Cindy Sommers, Director of Growth Management Planning, Evansville
    Leroy Feusner, D.E.Q.
    Mark Alston, E.P.A.
    Mike Burke, County Civil Counselor
April 14, 1986

Ms. Cindy Sommers  
Director of Growth Planning  
Town of Evansville  
P.O. Drawer 158  
Evansville, Wyoming 82636

Re: Evansville Water Connection

Dear Cindy:

We have received the January 27, 1986 letter and attachments from Black & Veatch concerning the feasibility of an Evansville water connection. Based upon this information and our understanding that Evansville wants to be supplied maximum day demands not including fire flow, it will be my recommendation to our Board that the following improvements would have to be constructed prior to receipt of water service.

<table>
<thead>
<tr>
<th>SHORT-RANGE IMPROVEMENT</th>
<th>PERCENTAGE OF COST PAID BY EVANSVILLE</th>
<th>PERCENTAGE OF COST PAID BY CASPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. City Reservoir Short-Range Improvements*</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2. Pressure-Reducing Station and Connection at Scott Hill</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>3. 8&quot; Main from Wyoming Blvd. and Legion Lane north to</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Wyoming Blvd. and Yellowstone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 8&quot; Main from Wyoming Blvd. and Yellowstone west to</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>existing 8&quot; on Yellowstone (near Becker Oldsmobile)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Pressure-Reducing Station at Wyoming Blvd. and Yellowstone</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
LONG-RANGE IMPROVEMENT | PERCENTAGE OF COST PAID BY EVANSVILLE | PERCENTAGE OF COST PAID BY CASPER
--- | --- | ---
6. Abandon improvement #2, replace with a pressure-reducing station and low head pump station at 2nd and Wyoming Blvd., and install parallel 8" main from 2nd and Wyoming Blvd. to Scott Hill | 100 |  
7. City Reservoir Low Head Pumping Station* | 50 | 50 |
8. 16" Main from 12th to 5th on Payne* | 100 |  
9. 12" Main from Swanton and Wind River to 2nd and Walsh* | 100 |  
10. Parallel 12" Main from 2nd and Walsh to 2nd and Wyoming Blvd. | 100 |  

*denotes in Casper BPU Master Plan

You will note that, with the exception of the City Reservoir short- and long-range improvements, Evansville is to pay for only those improvements not identified in the Casper BPU Master Plan. We are proposing that the City Reservoir improvement costs be shared.

Evansville should also realize that full connection charges would probably have to be assessed, as year-round service would be provided. It may be possible, however, to require connection charges at inside-city as opposed to outside-city amounts (which are usually 150% inside-city).

Based upon the Board's existing commitments via water contracts to both existing and undeveloped City-annexed areas, as well as the North Platte Water Development Board's Water Supply Needs Assessment which states that Casper is in need of additional water at the present time, it will be my recommendation to our Board that it not agree to provide water to Evansville until an additional firm water supply is procured. Proposed Deer Creek Dam water could fulfill this need. An agreement is now being pursued for this water with the State of Wyoming.
Ms. Cindy Sommers  
Town of Evansville  
April 14, 1986
Page 3

Should you wish to pursue this proposal further, please advise.

Yours sincerely,

David Engels  
Utility Director

DE:lb

CC: John Donmyer  
Jim Nollenberger  
Wes McAllister