ENGINEER'S AND GEOLOGIST'S CERTIFICATE

WE HEREBY CERTIFY, THAT WE HAVE PREPARED OR DIRECTLY SUPERVISED THE PREPARATION OF THESE REPORTS, AND THAT WE ARE DULY REGISTERED PROFESSIONALS IN THE STATE OF WYOMING.

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CHEYENNE/LARAMIE COUNTY
WATER SERVICE AREA LEVEL II STUDY

EXECUTIVE SUMMARY

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The 2006 Wyoming Legislature appropriated funds to the Wyoming Water Development Commission (WWDC) for a Level II Water Supply Master Plan Study sponsored by the Laramie County Commissioners. WWDC selected AVI Professional Corporation (AVI) to develop the Master Plan. The Level II study addresses water supply options for the Archer Special Use District (ASUD) (Volume I) and the framework water transmission system to serve projected development in the East Cheyenne area (Volume II). Refer to Figure 1, Proposed Phase 1 and Phase 2 Potable Transmission Lines for East Cheyenne, at the end of this document for a map of the study area.

Laramie County purchased the 875-acre Archer Research and Experiment Station from the University of Wyoming in 2004 and plans to develop the property for county facilities, a motocross track, shooting range, and private business or industrial sites.

Volume I presents the results of evaluating two supply sources and three alternative system configurations to meet water demand in the ASUD. Preliminary designs and cost opinions were developed for planning purposes and to support budgeting for future construction.
DEVELOPMENT PLANS AND WATER DEMAND

The County plans to develop the Archer property in two phases as outlined in its Master Land Use Plan. Phase I earmarks 235 acres for construction of the following County facilities: County Fair Complex, Conservation District, Administration Office, Department of Public Works, Fire and EMT Facility, Weed and Pest, and Coroner’s Office. Phase I also includes 133 acres for a motocross track and 92 acres for a public shooting park operated by non-profit organizations. 308 acres of the Archer property is set aside for Phase II development by private business and industry. Over 100 acres remain available for additional County facilities or other uses.

Phase I water demand at the ASUD is driven by two factors:

1. Fire Flows. The County Fire Marshal requires the water system to deliver 3,500 gallons per minute (gpm) for two hours while retaining 20 pounds per square inch (psi) of residual system pressure.

2. Potable Use. Demand for potable water will be highest during the operation of the County Fair. 62,000 gallons per day (gpd) will be required for potable purposes, requiring the system to deliver 43 gallons per minute (gpm). The system is master planned to meet a peak demand of 103 gpm.

Water system components were developed and sized to accommodate these Phase I maximum demands. Two alternative water supply sources were considered for the ASUD:

1. Development of on-site ground water resources.

2. Connection to the Cheyenne Board of Public Utilities (BOPU) system.
GROUND WATER EVALUATION

AVI's review of available geologic information and well records from the Wyoming State Engineer's Office indicated that the Tertiary or High Plains Aquifer is capable of supplying sufficient quantities of good quality water to meet projected demands at the ASUD. AVI conducted a test-drilling program to confirm aquifer productivity.

Four criteria were used to select test well locations: (1) the wells should not conflict with the other planned uses for the Archer property; (2) the wells should explore the area geology and aquifers; (3) the wells should be near the first planned development; and, (4) the wells should be sited for cost-effective construction of future transmission lines.

AQUIFER TEST RESULTS, AQUIFER IMPACT ANALYSIS, AND WATER QUALITY

Based on AVI's analysis of aquifer productivity and on water quality test results, ground water is a viable option to meet projected demands at the ASUD.

Pump tests and estimates of aquifer characteristics indicate that minor declines in ground water levels are expected if new wells are put into production. If annual water use is 12,000,000 gallons per year, the water level decline in the Tertiary aquifer is estimated to be less than 2.5 inches at 1,000 feet from the well sites after 40 years of production. A conservative estimate of the distance from the new wells to the ASUD property boundary is about 1000 feet.

Water samples were collected during pump tests and sent to a laboratory for analysis. Samples were tested for constituents that might be expected in water produced from the High Plains Aquifer. In addition, a second sample was collected from the 600 well and tested for all constituents required by WWDC including inorganics, organics (pesticides, volatiles, and synthetics), micro-biologicals, radiologicals, and secondary constituents. Test results confirmed that water from all wells is acceptable for a public water supply.
When the suitability of ground water was verified, AVI evaluated three alternative water systems to meet projected demands at the ASUD.

SYSTEM DEVELOPMENT ALTERNATIVES

A. Alternative A: Groundwater. This alternative is construction of a stand-alone, dual potable and nonpotable water system supplied by wells and supported by on-site storage. A dual potable and non-potable system is required in this alternative to address water quality issues. In a single system sized to meet fire flow requirements at ASUD, demand is insufficient to circulate water and maintain quality in the storage tanks and transmission mains. A separate system with transmission mains designed to accommodate only potable demands will be managed to address stagnation and other water quality issues. The nonpotable system will be sized to deliver untreated water to meet fire flow requirements and provide a supply for irrigation and other nonpotable uses.

B. Alternative B: Water from BOPU. This alternative is the construction of a single transmission and distribution system inside the ASUD and two water mains from the BOPU system. The single internal pipeline system will provide water to meet both potable and non-potable demands, including fire flows. This alternative will require the County and City of Cheyenne to execute a User Water Service Agreement describing the conditions of water sale and delivery. The BOPU could provide water through master meters at the connection of transmission lines to the internal system. Alternatively, BOPU could agree to own and operate the internal system and provide water through to points of use through individual meters.

C. Alternative C: Groundwater and BOPU. This alternative is the construction of the Alternative A self-contained system to serve initial Phase 1 development, and a BOPU transmission main constructed when the anticipated commercial and industrial development occurs. At the time the BOPU line is extended to the
ASUD, the City and County could agree to tie the potable system to the BOPU supply. The non-potable system components would be left in place to meet fire flow demands.

SYSTEM CONSTRUCTION COST OPINIONS

Construction cost opinions are based on detailed conceptual designs for each alternative and include all components such as lines, valves, tees, hydrants, controls, plugs, pumps, reducers, and tanks necessary for each alternative to operate. These cost opinions are conservative and can be used by the County and WWDC to select a preferred alternative and make decisions about project financing. Cost opinions include engineering expenditures for preparation of final plans and specifications and for construction management. Contractor costs such as such as performance bond, testing, utility locates or potholing, and mobilization are included in the opinions to give a comprehensive approximation of construction costs. System development fees and tap fees are incorporated where estimates of such fees can be made and are based on BOPU’s 2008 fee schedule.

Construction cost opinions for the three alternatives evaluated in this report are summarized in the table below. All cost opinions for construction and O&M are in 2008 dollars.

<table>
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<th>ALTERNATIVE</th>
<th>COMPONENTS AND DESCRIPTION</th>
<th>TOTAL ESTIMATED COST</th>
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<td>Alternative A</td>
<td>Dual potable/non-potable distribution system, wells, and storage</td>
<td>$7,969,641.61</td>
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<td>Alternative B</td>
<td>Dual transmission lines from BOPU, single distribution system</td>
<td>$8,335,405 - $9,495,100</td>
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<tr>
<td>Alternative C</td>
<td>Alternative A components plus future single BOPU main line</td>
<td>$10,104,825.26</td>
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Cost opinions for Alternative B will vary depending on final system configuration, the conditions of User Water Services Agreement between the County and BOPU, and the tap fees and water system development fees assessed by BOPU.
SYSTEM OPERATIONS AND MAINTENANCE COSTS

Opinions of operation and maintenance costs were calculated assuming annual water use at the ASUD of 12,000,000 gallons. Initial annual O&M costs for Alternatives A and C will be identical at approximately $171,000. Alternative B O&M costs are estimated to be about $189,000. When the BOPU transmission main is built, Alternative C costs may be reduced to approximately $142,000. O&M costs will escalate as expenditures for power, salaries, water purchase, and other items escalate due to inflation and increases in BOPU water rates.

Final O&M costs for all alternatives will depend on factors unknown at this study level, including actual water use, pump horsepower and run times, power demands for pump stations and hydropneumatic tanks, and other costs. Estimates of operation and maintenance costs at this study level are similar for each alternative and may not be a major factor in selecting a preferred alternative.

VOLUME II: EAST CHEYENNE

STUDY AREA AND DEMAND PROJECTIONS

The region addressed in this volume of the Cheyenne/Laramie County Water Service Area Level II Study encompasses approximately 11,500 acres east of Cheyenne in Laramie County, north and south of the Interstate 80 corridor between the Campstool and Archer interchanges.

The purpose of this portion of the study was to predict water demand when the East Cheyenne area is fully developed and to prepare conceptual designs for a framework water transmission system to meet that demand.

Average day demand at build-out for the East Cheyenne area was calculated to be 1.6 million gallons per day (MGD), with a peak day demand of 4 million gallons. The peak day demand is about 10% of BOPU’s present raw water supply. The 2003 Water and
Wastewater Master Plans identified other areas contiguous to the BOPU service area where future growth is anticipated. See Figure 2, Development Areas, at the end of this section. When growth occurs in these areas, residential and commercial users will be in competition with the East Cheyenne area for the limited resources available from BOPU.

SUPPLY SOURCES AND ASSUMPTIONS

This report assumes that existing BOPU facilities are a potential source to meet projected water demands in the East Cheyenne area. However, BOPU’s first priority is its obligation to provide water to existing customers, including F. E. Warren Air Force Base (AFB), the South Cheyenne Water and Sewer District, and individual commercial, industrial, and residential users in the BOPU service area. If water is provided to development in the East Cheyenne area, the extension of service is subject to BOPU policies and design criteria governing infrastructure specifications.

More importantly, any future expansion of the BOPU service area is contingent upon the availability of sufficient raw water to meet current and anticipated needs in the existing service area and the capacity of the BOPU treatment, storage, and transmission facilities to deliver water to meet future demands.

CONCEPTUAL DESIGNS AND COST OPINIONS

A framework of water transmission lines was modeled based on projected development and water demands. With the exception of the 16” transmission main from the Campstool Interchange to the ASUD, the network consists of 12” transmission mains laid out on section lines and appropriate alignments to allow modeling of the system to serve anticipated growth. Lines were sized to provide fire flows for existing and proposed development. All current BOPU policies and design criteria were incorporated into conceptual designs. Smaller 8” lines will be needed within developments to provide service to individual properties. Cost opinions for these smaller lines are not provided in
this report. System components eligible for WWDC funding are identified, although private developers will probably assume the cost of extending the water system to serve new commercial or residential developments.

The study assumed that development of the proposed transmission lines will occur in the two phases described below.

A. Phase 1.

Phase 1 was designed primarily to provide water supply to the ASUD, but also has the capacity to service commercial development along the East Pershing Boulevard and I-80 Corridor and future residential development along the HR Ranch Road. The transmission lines in Phase 1 are identical to the lines described in Alternative B in Volume I of this study.

Phase 1 of East Cheyenne (and Alternative B for the ASUD) will consist of two transmission lines from the existing BOPU service area. One transmission line will connect near the intersection of East Pershing Boulevard and Whitney Road. This line will follow the East Pershing alignment to the I-80 corridor, then along the corridor entering the ASUD at its northwest corner near the existing Motocross track. The second transmission line will originate at the Campstool Road and I-80 interchange, then follow the HR Ranch Road to a point south of the ASUD and enter the District at the south end of the Archer Parkway.

The East Pershing/I-80 line will require 14,250 linear feet (lf) of 12” line, the HR Ranch Road alignment requires 22,300 lf of 16” line. Cost opinion for Phase 1 is $5,529,449.
B. Phase 2

Phase 2 was designed to complete the water transmission main network required to serve the entire East Cheyenne area. This system is likely to be constructed incrementally as development occurs. However, for purposes of this study, the entire build-out framework system was modeled and cost opinions provided.

Phase 2 encompasses two pressure zones to match existing zones within the BOPU service area. The portion of Phase 2 located south of the I-80 corridor comprises approximately 5,500 acres and is an extension of the Sun Valley pressure zone described in the Cheyenne Water Master Plan. This zone will be fed from the 16” BOPU line at I-80 and Campstool Road.

The service area located north of I-80 is an extension of the City Main pressure Zone and encompasses approximately 6,000 acres. Three connection locations in addition to the Campstool Interchange were modeled to simulate the build-out condition. Modeling assumed that matching line sizes and adequate water were available at the model nodes. Modeling was based on the connections depicted in Figure 1 at the end of this document.

Internal connections within the Phase 2 layout and connections with Phase 1 transmission lines will provide system looping, supply redundancy, and required fire flows. Construction of Phase 2 will require 167,000 lf of DIP Class 52 or PVC C 900 - C-905 DR14. The Phase 2 cost opinion is $18,277,015.

Refer to the Figure 1, Proposed Phase 1 and Phase 2 Potable Transmission Lines for East Cheyenne at the end of this report the map depicting system configuration for Phases 1 and 2.