EXECUTIVE SUMMARY

Kemmerer/Diamondville Joint Powers Water Board

Submitted to: Wyoming Water Development Commission

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I. INTRODUCTION

A. Authorization and Purpose
This Level II Report for the Kemmerer/Diamondville Joint Powers Water Board has been completed in accordance with a Contract between the Wyoming Water Development Commission and JFC Engineers & Surveyors of Rock Springs, Wyoming, and dated June 3, 2010. The purpose of this project was to complete a study and develop a refined plan after evaluating the existing supply and distribution systems, and reviewing the recommendations of the Level I Master Plan report produced by Forsgren and Associates in October 2009. Conceptual designs and cost estimates have been developed for the preferred alternatives.

B. Technical Team
The technical team assigned to this project consists of professional personnel from the following firms:

- JFC Engineers & Surveyors (JFC) Management/Prime Consultant
  Rock Springs, WY
- Hansen, Allen & Luce, Inc. (HAL) Water System Modeling

C. Study Area
Kemmerer and Diamondville are located in Lincoln County in southwest Wyoming. The study area includes the City of Kemmerer, the Town of Diamondville, and the surrounding areas. Kemmerer’s population in the 2010 census was 2,656, up five people from the 2000 census. Diamondville’s population in the 2010 census was 737 individuals, up by 22 people from the 2000 census.

D. Water System
The existing water system for Kemmerer/Diamondville is owned by the Kemmerer/Diamondville Joint Powers Water Board (KDJPB). The KDJPB is currently replacing the water treatment plant which is feeding the system. The treatment plant delivers water to the system by pumping water through a 24-inch diameter transmission line. The system consists of three different pressure zones. The Sorenson pumps feed water to the Green Hill Tank. Water from the Green Hill Tank is then fed into the upper-pressure and mid-pressure zones. Five PRVs regulate water from the upper zones into the lower zones and the Diamondville Tanks. Five tanks exist in the system with a total storage capacity of 4.6 million gallons. On the following pages, Figure 1-1 shows the Existing Water System Schematic; and Figure 2-1 illustrates the pressure zones within the existing water system.

E. Existing Water Production from Treatment Plant
Daily water production data was provided over the period of January 2009 through June 2010. The data was reviewed against the data provided in the Level I Report. Water production during this time period did not deviate significantly from that provided in the Level I Report. It was determined that peak demands and water production rates introduced in the Level I Report were reliable and would be further utilized in this study.
EXISTING WATER SYSTEM

FIGURE 2-1

LEGEND

Map is of Township 21 N
Range 116 W

Pipes
- 1-Inch
- 2-Inch
- 4-Inch
- 6-Inch
- 8-Inch
- 10-Inch
- 12-Inch
- 14-Inch
- 16-Inch
- 18-Inch
- 24-Inch

Tanks
- PRV-1
- PRV-2
- PRV-3
- PRV-4
- PRV-5

Pump Station
- Sorenson Pump Station

Intake & Treatment Plant
- Green Hill Tank
- Diamondville Tank

WYOMING WATER DEVELOPMENT COMMISSION
KEMMERER/DIAMONDVILLE LEVEL II STUDY
EXISTING WATER SYSTEM
F. **Level I Demand Information**

The following demand information was presented in the Level I Study and also incorporated into this study:

**Existing Demands:**
- Peak Summer Day Water Usage: 3,200,000 gpd
- Peak Summer Day Demand per Connection: 2,222 gpd
- Average Summer Day Water Usage: 1,300,000 gpd
- Average Summer Day Demand per Connection: 900 gpd
- Average Winter Day Water Usage: 720,000 gpd
- Average Winter Day Demand per Connection: 500 gpd
- Existing Connections: 1,440

**Future Demands:**
- Peak Summer Day Water Usage: 4,600,000 gpd
- Average Summer Day Water Usage: 1,800,000 gpd
- Average Winter Day Water Usage: 1,000,000 gpd
- Future Connections: 2,040

G. **Updated GIS Map for Existing System**

The data in the GIS map was updated to the most current information as provided by the survey, and other data provided by KDJPB staff. Elevations, demands, and piping changes were all updated.

II. **PROJECT FINDINGS**

A. **Existing System**

The computer model showed that the distribution system performs quite well in both existing and future scenarios. The primary system deficiencies are generally related to fire flow and low pressures in a few areas. The system performed very well during most fire flow scenarios due to the looping of the water lines. However, as discussed in the Level I Study, fire flows were not adequate on the street to the east of the Kemmerer High School (3rd Avenue).

B. **Extended Period Simulation**

The EPS evaluation provided the ability to run an extended fire flow scenario and determine pressures during that interval. Low pressures were identified in the system during these fire flow events. Areas of concern had low pressures during both normal operation and fire flows. These low pressure areas are along 3rd Avenue, the Upper Zone areas of Diamondville, and at Del Rio Drive. The 3rd Avenue and Del Rio Drive areas may be remedied by modifications to zones and PRV stations. However, those areas in the Upper Zone cannot increase pressures without the addition of a booster pump. As a rule of thumb, it is advised that new development not build above 6,900 feet to ensure pressures above 50 psi.

The EPS evaluation along with the survey information detailed why the Diamondville Tanks have not been operating optimally during the winter, and provided an alternative for the Upper
Diamondville area. The EPS evaluation also included reviewing all proposed improvements from the Level I Study along with the Sorenson Pump Stations capacity during peak day conditions. Specific recommendations along with capacity information is provided in the following improvements sections and shown in Figures 4-1 and 4-2 on the following page. Figure 4-1 details the overall system with improvements and new zone boundaries, while Figure 4-2 provides the proposed hydraulic grade schematic for the system. A portion of the evaluation also included the tank storage needs along with the Concrete Sorenson Tank roof repairs. These analyses are also discussed in the following sections.

C. **16" Northwest Water Line**

A new transmission line for the Northwest area was proposed in the Level I Study. This transmission line delivers water from the Green Hill/Upper Zone to the northwest area along Highway 30. The City in recent years has had many problems with breaks and believes the existing 12-inch diameter DIP line to be in very poor condition. The evaluation showed that for a peak demand along with a fire flow would not allow for pressures above 20 psi during an extended fire event. It is recommended that the existing 12-inch diameter line be upgraded to a 16-inch diameter line. A new 16-inch diameter line will have enough capacity for an additional 600 ERC (Equivalent Residential Connections) with the ability to provide sufficient fire flows for the area.

D. **18" Transmission Line from Treatment Plant**

A new transmission line from the Treatment Plant to the distribution system was discussed in the Level I Study. This imperative line would provide transmission from the Water Treatment Plant to the system. The existing line is a 24-inch diameter DIP line and reported to have maintenance issues in some sections, likely due to corrosive soils. The evaluation for this line provided that a smaller 18-inch inside diameter (ID) line would be adequate to provide peak demands to the system through build out. The velocity of an 18-inch ID line currently is 4.0 fps during peak day conditions. For comparison, the velocity in the existing 24-inch diameter line is only 2.2 fps. Should 600 connections be added to the system during the life of the 18-inch ID water line, it would increase the velocity to 4.8 fps. A new line would also provide much needed redundancy for the system.

E. **Extend Mid-Zone to 3rd Ave**

An evaluation was performed on the Level I recommendation of extending the Mid-Zone near 3rd Avenue. A fire flow test along with modeling indicated that the hydrant in front of the Kemmerer High School and the LDS Chapel would only flow 700 gpm at 18 psi. Modeling also presented low pressures in the area because it is too high in elevation to be in the lower zone. Low flows are realized in the area due to 6-inch diameter lines and dead-end lines. To remedy the low flow and low pressures, it is recommended that a new 10-inch diameter line be extended into the area from the Mid-Zone along 3rd Avenue, and a small length of 10-inch diameter line also be installed along Elk Street from 3rd Avenue to the alleyway allowing for a loop.
Phase 2
18" Transmission from Treatment Plant

Phase 1 Option 2
18" Transmission from Treatment Plant

Phase 1 Option 1
18" Transmission from Treatment Plant

New 16" Transmission Line to Northwest Area (Parallel Ex. 12" Line)

New 1 MG Green Hill Tank

New 8" Line

New 8" Line & PRV on Canyon Rd

Close Valves

Abandon Tank & Disconnect Transmission Lines at Nearest Connection

New 10" Lines to Increase Pressure

New PRV & Check Valve

Close Pipe

LEGEND

Tank
PRV
Lower Zone
Mid Zone
Upper Zone
New Diamondville Zone
Proposed Pipe Improvements
Existing Pipes
Proposed PRV
Proposed Tank

Map is of Township 21 N Range 116 W
The Mid-Zone would then be extended to 1st Avenue and Moose Street to improve pressures and fire flows by isolating valves. Also at the time of this report, the school district was planning to construct an 8-inch diameter line around the Kemmerer High School and connect to the fire hydrant mentioned above. This line has been modeled, is sized adequately, and would provide Mid-Zone pressures to the area.

F. Diamondville Upgrades

The KDJPB's staff expressed concern that the Diamondville Tanks did not operate in the winter during low demands causing maintenance and water quality concerns. It was also noted that even during the summer the tanks did not assist a great deal with equalization because the tanks experience minimal draw–down and filling movement. The Level I Study hypothesized that this was due to the 15 feet of difference between the overflow elevations and the hydraulic losses. However, the survey performed as part of this study detailed that the overflows are only 6 feet apart.

Utilizing the new survey information for the PRVs and the EPS model, it was determined that the PRV settings were too high and causing water to feed into the lower pressure zone at pressures higher than the tank elevations could produce. This ‘bleeding’ from the upper zone would cause the tanks to not cycle. This situation also would cause excessive pumping at the Sorenson Pump Station.

The evaluation utilizing the new survey data also revealed that pressures were low in the Upper Diamondville area. To remedy the low pressure, a new Upper Diamondville Zone is recommended. This new pressure zone would have its water source provided by the Upper Zone/Green Hill Tank through the existing PRV-4 on US Hwy. 30. The setting could be maintained between 70-80 psi and provide higher pressure to the water users within this zone.

The KDJPB staff has determined that the Diamondville Tanks will be decommissioned due to high maintenance costs and operational issues. The model provided recommended improvements to provide fire flow in the lower area of Diamondville once the tanks have been removed from the system. A new PRV/Check Valve Station will be needed on the existing line that runs between Frontier Street and Deal Alley. The existing line from Susie Avenue to Frontier Street will need to be closed in order to isolate the new Upper Diamondville Zone.

Another recommended improvement to assist with meeting Fire Flow Demands in the Lower Diamondville area is to connect the existing water line in Little Canyon Road to the main transmission line. To further assist with redundancy, it is recommended at some future date to complete the water looping in Canyon Road, with a PRV Station. It is also recommended that the Diamondville Tanks be decommissioned after the new Green Hill Tank is developed, due to the reduction in storage that will occur.
### Table 2.1 – Recommended PRV Settings with New Diamondville Zone

<table>
<thead>
<tr>
<th>PRV</th>
<th>Location</th>
<th>PRV Setting Out</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hwy 189 (Near Chevron)</td>
<td>60 psi</td>
<td>Provide flow to New Upper Diamondville Zone</td>
</tr>
<tr>
<td>2</td>
<td>Hwy 189 (Near Energy Inn)</td>
<td>-</td>
<td>Redundant not needed anymore.</td>
</tr>
<tr>
<td>3</td>
<td>Little Canyon Rd.</td>
<td>60 psi</td>
<td>Provide Fire Flow into Lower Zone</td>
</tr>
<tr>
<td>4</td>
<td>Lincoln Height &amp; Elk St.</td>
<td>70 psi</td>
<td>Provide Flow to Mid-Zone</td>
</tr>
<tr>
<td>5</td>
<td>Garnet &amp; Sorenson</td>
<td>60 psi</td>
<td>Provide Flow to Mid-Zone</td>
</tr>
<tr>
<td>6</td>
<td>Deal Alley</td>
<td>40 psi</td>
<td>Provide Fire Flow to Lower Diamondville</td>
</tr>
</tbody>
</table>

Leaving the Diamondville Tanks in operation was also studied but it was decided that the maintenance and operational issues were of greater concern.

### G. Sorenson Pump Station

An EPS evaluation was performed for the Sorenson Pump Station that solely delivers water to the Green Hill Tank/Upper Zone. KDJPB's staff was concerned about the capacity of the pump station should new growth occur. The evaluation provided that with the current three pumps that another 100 ERC could be provided to the system by utilizing only two of the pumps with the third as a backup. Beyond 100 ERC, it is recommended that the pump station add a fourth pump. The pump could be added to the redundant side of the pump station piping that is not currently in service. This evaluation also assumed that a new tank was built in the zone and could assist with peaking. As noted in the Level I Study, there is space for six pumps, but only three pumps are currently functioning.

### H. Green Hill/Upper Zone Tank Storage

The Level I Study recommended a new storage tank within the Upper Zone. The analysis above demonstrates that indeed the zone needs additional storage to meet both existing and future equalization and fire flow storage requirements. A 1.0 MG tank is recommended for the zone to best serve existing and future demands. An evaluation of possible locations for the new tank confirmed the best option is next to the existing Green Hill Tank as discussed in the Level I Study. This location provides the best dispersal of stored water to the Upper and Mid Zones along with the newly created Upper Diamondville Zone. Correspondence with the owner of the property, Chevron, is documented in the Geotechnical report.

### I. Sorenson 1.5 Tank Rehabilitation Analysis and Recommendation

The Level I Study identified that the existing Sorenson 1.5 MG Tank’s inverted pre-stressed, tee-roof deck is in need of repair. An investigational dive video revealed many sections of rebar showing and a large amount of concrete is spalling off the underside of the roof deck. A number of approaches were identified to rehabilitate the roof. This evaluation reviewed retrofitting with aluminum, fiberglass, and precast span deck. Costs for just the retrofit (not including demolition) ranged from $215,000 to $305,000. After evaluating the actual amount of water storage required in the system (as shown above), it was recommended that the KDJPB save the costs of the retrofit and place the money into a new tank for the Upper Zone. This new tank provides fire flow storage for all zones delivered through the PRVs. It was also determined that
the 1.5 MG tank was in excess of what the system really requires for storage, and the 2.0 MG
Sorenson Tank is more than adequate to meet existing and future storage requirements for the
zone. The new treatment plant also provides great redundancy should the 2.0MG need to be
taken out of service briefly. The model confirmed that with the treatment pumps and 1.5MG of
storage on Green Hill, the system would function normally.

III. SCHEDULE OF ACTIVITIES

Table 3.1 – Recommended System Improvement - Not Prioritized

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Hill 1 MG Tank</td>
</tr>
<tr>
<td>Diamondville Upgrade</td>
</tr>
<tr>
<td>16&quot; Northwest Waterline</td>
</tr>
<tr>
<td>3rd Avenue Mid-Zone Extension</td>
</tr>
<tr>
<td>18&quot; Redundant Line Option 1 – Phase 1</td>
</tr>
<tr>
<td>18&quot; Redundant Line Option 2 – Phase 1</td>
</tr>
<tr>
<td>18&quot; Redundant Line – Phase II</td>
</tr>
<tr>
<td>Sorenson Pump Station – Phase I</td>
</tr>
<tr>
<td>Sorenson Pump Station – Phase II</td>
</tr>
</tbody>
</table>

Table 3.2 – Estimated Project Costs

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Cost (Inclusive of Engineering and Contingency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green Hill 1 MG Tank</td>
<td>$1,512,040</td>
</tr>
<tr>
<td>2</td>
<td>Diamondville Upgrade</td>
<td>$380,810</td>
</tr>
<tr>
<td>3</td>
<td>16&quot; Northwest Waterline</td>
<td>$1,231,485</td>
</tr>
<tr>
<td>4</td>
<td>3rd Avenue Mid-Zone Extension</td>
<td>$172,715</td>
</tr>
<tr>
<td>5a</td>
<td>18&quot; Redundant Line Option 1 – Phase 1</td>
<td>$1,604,369</td>
</tr>
<tr>
<td>5b</td>
<td>18&quot; Redundant Line Option 2 – Phase 1</td>
<td>$1,339,350</td>
</tr>
<tr>
<td>6</td>
<td>18&quot; Redundant Line – Phase II</td>
<td>$1,843,863</td>
</tr>
<tr>
<td>7</td>
<td>Sorenson Pump Station – Phase I</td>
<td>$36,719</td>
</tr>
<tr>
<td>8</td>
<td>Sorenson Pump Station – Phase II</td>
<td>$64,964</td>
</tr>
</tbody>
</table>
## Table 3.3 – Project Funding / Rate Payer Impacts

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Estimated Project Cost</th>
<th>ASSUMED FUNDING SOURCE</th>
<th>Monthly Cost per Ratepayer (Based on 1,440 Current Users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green Hill 1 MG Tank</td>
<td>$1,512,040.00</td>
<td>WWDC Grant (67% New Construction – 50% Rehabilitation)</td>
<td>($28,855.67) $(1.67)</td>
</tr>
<tr>
<td>2</td>
<td>Diamondville Upgrade</td>
<td>$380,810.00</td>
<td>WWDC Loan (4%, 30-Year)</td>
<td>($7,267.35) $(0.42)</td>
</tr>
<tr>
<td>3</td>
<td>16&quot; Northwest Waterline</td>
<td>$1,231,485.00</td>
<td>50% SLB Grant</td>
<td>($23,501.58) $(1.36)</td>
</tr>
<tr>
<td>4</td>
<td>3rd Avenue Mid-Zone Extension</td>
<td>$172,715.00</td>
<td>SRF Loan (2.5%, 20-Year)</td>
<td>($5,539.59) $(0.32)</td>
</tr>
<tr>
<td>5a</td>
<td>18&quot; Redundant Line Option 1 – Phase I</td>
<td>$1,604,369.00</td>
<td>SRF Loan (2.5%, 20-Year)</td>
<td>($30,617.67) $(1.77)</td>
</tr>
<tr>
<td>5b</td>
<td>18&quot; Redundant Line Option 2 – Phase I</td>
<td>$1,339,350.00</td>
<td>WWDC Loan (4%, 30-Year)</td>
<td>($25,560.07) $(1.48)</td>
</tr>
<tr>
<td>6</td>
<td>18&quot; Redundant Line – Phase II</td>
<td>$1,843,863.00</td>
<td>WWDC Loan (4%, 30-Year)</td>
<td>($35,188.16) $(2.04)</td>
</tr>
<tr>
<td>7</td>
<td>Sorenson Pump Station Upgrades – Phase I</td>
<td>$36,719.00</td>
<td>FUNDED BY KDJPB</td>
<td>$ (2.12)</td>
</tr>
<tr>
<td>8</td>
<td>Sorenson Pump Station Upgrades – Phase II</td>
<td>$64,964.00</td>
<td>FUNDED BY KDJPB</td>
<td>$ (3.76)</td>
</tr>
<tr>
<td></td>
<td>TOTALS – OPTION 1</td>
<td>$6,846,965.00</td>
<td></td>
<td>$ (13.46)</td>
</tr>
<tr>
<td></td>
<td>TOTALS – OPTION 2</td>
<td>$6,581,946.00</td>
<td></td>
<td>$ (13.17)</td>
</tr>
</tbody>
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