



# PAVILLION AREA WATER SUPPLY LEVEL I STUDY



## FINAL REPORT EXECUTIVE SUMMARY

FOR THE  
WYOMING WATER DEVELOPMENT COMMISSION



OCTOBER 2011

*Gores*  
*James & Associates*  
RIVERTON, WYOMING

# EXECUTIVE SUMMARY

## PAVILLION AREA WATER SUPPLY LEVEL I STUDY

Submitted to:

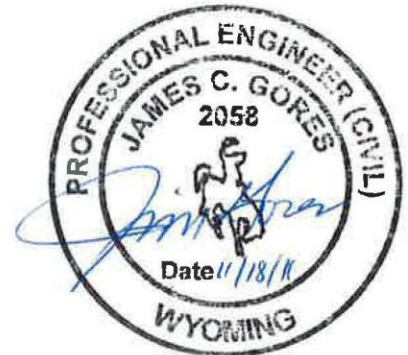
STATE OF WYOMING  
WATER DEVELOPMENT COMMISSION  
6920 Yellowtail Road  
Cheyenne, Wyoming 82002

Prepared by:



Civil Engineering  
Consultants

111 North 3<sup>rd</sup> Street East  
Riverton, Wyoming 82501  
(307) 856-2444



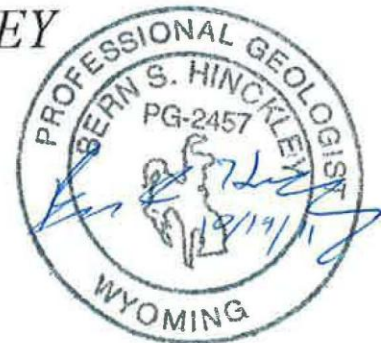
In Association with:



&

*HINCKLEY*  
CONSULTING

OCTOBER 2011



## EXECUTIVE SUMMARY

### Introduction

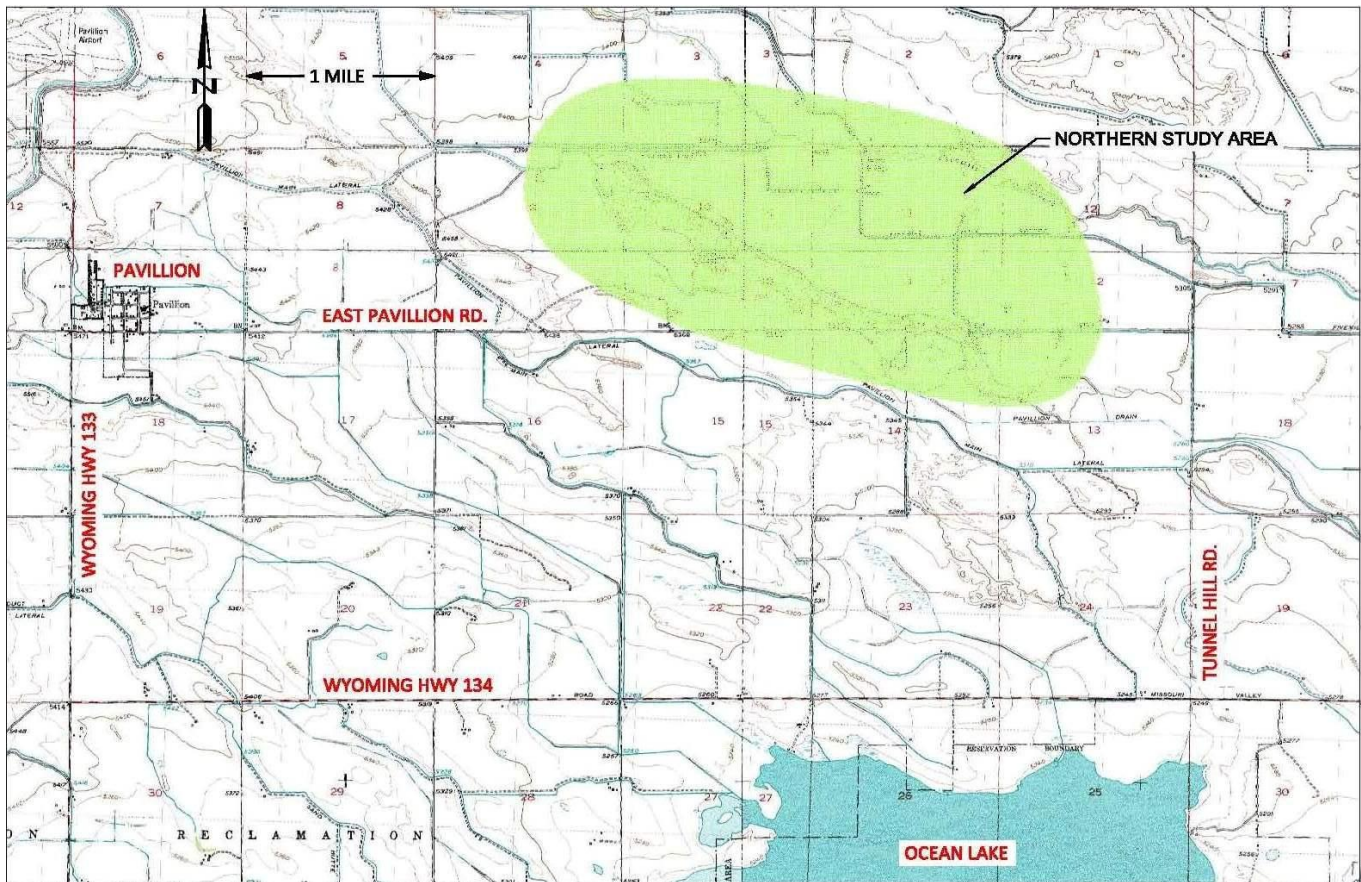
The Town of Pavillion, Wyoming, established in the early 1900's, is a small, rural, agricultural community in north central Fremont County, Wyoming. It served as a work camp for the Department of Interior Bureau of Reclamation when the Bureau was constructing the Midvale Irrigation Project between the 1920's and the 1950's.

Immediately following World War II, several thousand acres of uncultivated land was offered to returning veterans by allotment drawing on the Midvale project. The economic capabilities of most of those who were starting a farm usually dictated getting a well drilled for as little money as possible. Water could reliably be had from wells in the area. Some of the area produced suitable water for home use. In other areas, particularly north and east of the Town of Pavillion, getting a domestic well with good water was always an uncertain venture. Most wells produced marginal quality water at best.

Development of natural gas began in the area northeast of Town in the 1960's. The Pavillion gas field was further developed in the 1980's by a succession of owners/operators. In recent years, the gas field owner has applied techniques to stimulate production including hydraulic fracturing (fracking). Some nearby residents have voiced concerns that the fracking operations have led to a noticeable decline in the quality of water produced from their private domestic wells. The situation has attracted wide-spread media attention.

### Authorization and Purpose

In August 2010, the EPA advised the rural residents living in the area east of Pavillion not to drink water from their private domestic wells. In late 2010, the State of Wyoming commissioned this study to identify alternative solutions to the dilemma of locating suitable domestic water for those rural residents in the Pavillion area. **The charge of this investigation is not to determine reasons for the area's groundwater quality concerns, but rather, to give the rural Pavillion residents workable alternatives for a drinking water supply that they might find more palatable.** This study was charged to evaluate the substantial amount data already produced by EPA and others, rather than to do additional water testing or drilling of test wells.



**Rural Pavillion Northern Study Area**

### **Findings and Conclusions of the Level I Study**

Based on the analysis of the existing data, and augmented by a few additional water tests, the following results were drawn:

1. In spite of its undesirable taste and odor, the water produced from nearly all of the area's private wells does meet EPA drinking water standards.
2. The Town of Pavillion's water supply meets all primary drinking water standards.
3. There is no economical solution to the rural study area's drinking water challenges.
4. The Town of Pavillion's wells have adequate production capacity to supply the study area's forecast domestic water demands over the 30 year planning horizon.
5. The wellhead configuration of the Town's oldest well (No. 1) no longer meets DEQ standards.
6. The Town of Pavillion's storage, transmission, and distribution system is in sound condition.
7. With a modern SCADA system, better matching of pumps to well capacity, and consolidation of its storage, Pavillion's system could operate much more efficiently.

### **Recommendations**

The following recommendations are offered to the **rural residents** of the Pavillion area:

1. Rural residents are encouraged to explore forming a water service district. Forming a district can make the resulting area eligible for public funding of a drinking water improvement project.
2. Come to a local consensus as to which of the alternatives presented in this study is most favored by those who may wish to be served, should an alternative be implemented.
3. When the area residents come to a consensus on both forming a district and on which alternative they wish to pursue, they need to inform the Wyoming Water Development Commission (WWDC) of their decision. The newly-formed district could then apply to the WWDC for a water development project to be included in the agency's 2012 funding request to the Wyoming legislature. To be considered by the 2012 legislature, that request must be submitted to the WWDC by September 15, 2011.

The following recommendations are offered to the **Town of Pavillion**:

1. Convert the Well No. 1 wellhead to a pitless configuration.
2. In conjunction with eliminating the No. 1 well pit, it is recommended that both Wells 1 and 4 be piped directly to the small hill tank.
3. It is recommended that the current mechanical electrical system be replaced with a current technology SCADA system with its control center to be located at the Town shop.
4. Install pumps in Wells No. 6 and 8 that match the production capacity of each well. This would increase the Town's water production capacity by approximately 100 gpm.
5. Remove the standpipe tank once it is taken out of service.

### **Study Area Population and Demand Forecast**

#### 1. Town of Pavillion Service Population and Demand

The Town of Pavillion is located in the north-central part of Fremont County, Wyoming. The Town has a 2010 reported population of 231 people. The Town hosts the local school district. It gathers students from a very large geographic area, in excess of 1,200 square miles. The school's student and staff population of 488 is over twice the population of the Town.

#### 2. Rural Area Population and Demand

For purposes of this study, it is being assumed that there is an average of three (3) people per residence in the rural service area. The demand forecasts are based on the 20 residences in the northern study area, assuming an 80 gallons per person per day usage. This use rate assumes the house water use consists only of drinking, cooking, bathing, and laundry uses. The present rural study area demand is approximately 4,800 gallons per day.

#### 3. Demand Forecast Range

Pavillion's school population creates a unique water demand demographic. Because of that unique demand configuration, three (3) major population segments were quantified to arrive at a valid demand forecast for the Town. These are:

- a. Demand generated by Town residents, including those students and staff who live in Town,
- b. The demand generated by the out-of-town residents who work at or attend Pavillion’s school and finally,
- c. The rural Pavillion residents to whom water service may be extended should the Town serve as a supply for a central water system extended to serve the out-of-town area of poor groundwater.

				<b>Average Daily Water Demand Forecast</b>			
Year	Town Population	Out of Town School Population	Out of Town Residence Services	Town Residents	Out of Town School Attendees	Out of Town Residential	Total Daily
2010	231	319	20	18,480	3,828	4,800	27,108
2020	259	358	22	20,719	4,292	5,381	30,392
2030	290	401	25	23,228	4,812	6,033	34,073
2040	326	450	28	26,042	5,394	6,764	38,201

In summary, the forecast demand in the year 2040 for the Town of Pavillion, itself, is expected to be approximately 32,000 gallons per day.

The demand for the conceptual Rural Pavillion Northern Study Area is forecast in 2040 to be about 6,800 gallons per day.

### **Area Water Resources Inventory**

This study explored the following water resources issues of concern in the Pavillion area.

1. Area Geology and Its Groundwater Resources
2. Area Surface Water Resources
3. Quality of Area Water Resources
4. Water Rights Considerations

The area water wells all draw from the Wind River aquifer. This is a highly discontinuous interbedding of clays and sands that resulted from material being eroded from the adjacent Wind River and Owl Creek Mountain Ranges and being subsequently redeposited in the basin. It was determined that in the Pavillion area the local geology does not foster the same levels of water quantity or quality as it does in the Riverton and Shoshoni areas. The Pavillion area wells generally produce lower quality water and at significantly lower levels, 20 to 30 gpm versus 200 gpm.

Surface water resources were explored as a possible supply alternative. Surface water needs to be treated to meet EPA drinking water standards. The cost of building, operating and maintaining a plant is prohibitive for the number of customers involved, making surface water an impractical source.

The quality of both surface and ground water was thoroughly explored. The area surface water all originates from the Wind River. It is a routine but costly matter to treat it to EPA standards. Groundwater quality varies significantly in the study area. There is no locality nor drilling depth that can be identified that consistently produces palatable water. Nearly all of the area groundwater meets EPA's primary drinking water standards for public water supplies. The water often has an objectionable taste and odor.

Both groundwater and surface water rights were found to be readily available for the quantity needed for the forecast demands.

## **Town of Pavillion System Evaluation**

### Water Supply

The Town of Pavillion has completed eight municipal water supply wells since 1950. The newer wells were completed in 1986 and 1987. The final well, No. 8, was added in 1995. The five Pavillion wells that are currently active are Nos. 1, 4, 6, 7, and 8. They all yield modest production of palatable water, meeting EPA standards.

### Transmission System

The lines that convey water from the Town wells to the storage tanks form the systems transmission lines. Computer modeling of the system shows these lines to have adequate capacity. They all are constructed of modern materials and are in sound condition.

### Storage System

Pavillion's water storage system consists of three interconnected tanks. The combined capacity of these tanks slightly exceeds the Town's current storage demands when compared to industry criteria.

Water transmission and storage for the Town of Pavillion are unnecessarily complex making operation cumbersome and inefficient. Storage totals 295,700 gallons.

### Distribution System

The majority of the existing distribution system was constructed in the 1980's and consists mostly of 6-inch PVC pipe. It is in sound condition and well maintained.

### System Service Capacity

Modeling of the transmission and distribution system shows that the system has adequate delivery capacity for projected demands.

Favorable improvements in delivery capacity and circulation could be gained by looping the dead end line on Center Avenue. Fire flow and delivery redundancy could be enhanced by looping a distribution line from the tank to a point just east of the school complex.

Overall, the Pavillion water system is in sound, operating condition. The five in-service wells have the capacity to meet current and future demand with acceptable water quality. The system as a whole is capable of supplying demand and fire flow rates without lowering system pressures to unsafe levels. Finally, static pressure throughout the system is satisfactory if not ideal.

### Pavillion's System Deficiencies

Pavillion's system, while in sound condition, does have deficiencies that need to be addressed. Those are:

1. Well No. 1, constructed in the 1950's, has a well pit construction, common at the time. To meet current standards this pit needs to be eliminated and the well fitted with a modern pitless adapter.
2. The water production system is inordinately complex and unreliable. Separate control systems manage two separate groups of wells, each of which pump to different tanks. All water from wells 6, 7, and 8 is pumped twice to get it to the main tank. Water produced by wells 1 and 4 is pumped three times. This is inefficient.
3. With three tanks in service, the stand pipe tank serves no viable purpose other than to store water that is then pumped to a higher tank. Using only the single large tank, the system can provide adequate storage to meet forecast demand through the year 2040.
4. The control system for the wells and tanks is outdated and cumbersome and results in inefficient operation. The controls do not allow the Town to optimize either production or water quality delivered to the Town.
5. The installed well pumps are not sized to match the production capacity of their respective wells. The Town is losing both production capacity and the ability to blend water from the wells in a way that would deliver the best quality water to its residents. This results in suboptimum production and requires unnecessary power expense.

Correcting the deficiencies described above can be achieved with minor changes to the Town's water system as described in the recommendations above.

### **Solution Alternatives for Rural Area**

There is no identified opportunity to develop replacement wells in the conceptual rural service area northeast of Pavillion. The five most feasible alternatives for the rural area residents are:

- Treating the private well water that is locally available,
- Piping water from the Town of Pavillion to rural users,
- A separate well in a location that produces acceptable groundwater quality, then pipe water to the rural users,
- Installing individual cisterns and hauling water, or
- Treating and piping surface water from Ocean Lake or another local surface source.

All of the alternatives are expensive as compared to water supplied by a municipal system.



## Estimated Costs

The table below shows total construction costs and the resulting monthly debt retirement under the currently most favorable funding options, plus the cost of system operation and maintenance.

Alternative	Cost to Serve 20 Homes	Monthly Water Bill
Pavillion Source Central System	\$1,865,550	\$715
Well Source Central System	\$1,800,125	\$680
Water Treatment Plant & Central System	\$2,927,000	\$1,225
Private Treatment for 20 Homes	\$300,000	\$175
Cisterns for 20 Homes	\$382,800	\$250

## Selecting a Preferred Alternative

An alternatives matrix was used to rank all five alternatives developed for a rural area water supply. The three most favorable alternatives, as ranked through the matrix shown below, are:

1. Individual private cisterns,
2. Individual private well treatment systems, and
3. Water piped from the Town of Pavillion.

The alternatives matrix given below shows each alternative's ranking for each of the criteria listed across the top of the matrix table.

For clarity, the five alternatives were ranked for each criterion on a score of 1 to 5 with 1 being best. In the total score, **the lower the numerical score, the better the alternative** was ranked. In assigning the score for each criterion, each alternative was ranked against each other alternative. For example, ranking how each alternative compared under the criteria for system operator, the water treatment plant scored a 5 because of the requirement of employing a state certified Level II operator, while the Town of Pavillion supply option scored a 3, and the well-supplied system was ranked a 4. That is because a Level II operator is required for the plant (quite complex), a Level I operator is required to operate the well along with its distribution system (less complex) and operating a distribution system, even least complex of the piped central systems. Finally, operating an individual cistern is less complex than operating an individual treatment system.

<b>Alternative</b>	<b>Water Quality</b>	<b>Reliability</b>	<b>Construction Cost</b>	<b>O &amp; M Cost</b>	<b>Household Cost/Year</b>	<b>Grant Eligibility</b>	<b>Local Cost</b>	<b>Operator Class</b>	<b>EPA Regulatory Compliance</b>	<b>Water Rights</b>	<b>System Life</b>	<b>Total</b>
Pavillion Source Central System	2	1	4	3	4	1	2	2	3	2	1	<b>25</b>
Well Source Central System	3	2	3	4	3	1	1	3	4	4	2	<b>30</b>
Water Treatment Plant & Central System	4	4	5	5	5	2	5	5	5	5	4	<b>49</b>
Private Treatment for 20 Homes	5	5	1	1	2	5	4	1	2	3	5	<b>34</b>
Cisterns for 20 Homes	1	3	2	2	1	1	5	1	1	1	3	<b>21</b>

Numerical Ranking: 1 - Best 5 - Worst among alternatives presented