Northern Arapaho Groundwater Level II Study Master Plan

Prepared for the Wyoming Water Development Commission & Northern Arapaho Utilities

Prepared by

October 2009
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CHAPTER I

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The focus of this Northern Arapaho Groundwater Study is to give the Ethete portion of the Northern Arapaho Utilities (NAU) a Water Master Plan to guide meeting future potable water supply and delivery demands. This study identifies improvements that are necessary for the Ethete area water system to meet demands for the next twenty years. The necessary improvements are prioritized based on the evaluation conducted in this planning process. Currently, the Ethete area’s water system has numerous deficiencies when evaluated against generally accepted industry standards.

The discussion that follows will provide an understanding of the current and future demands being placed on the system and how those demands impact each system component. From that understanding, a prioritized tabulation of needed improvements was developed.

The current water source for the Ethete area is the Little Wind River. All of the water is treated at the water treatment plant located west of Ethete. Despite treatment, the water quality is not acceptable during high runoff times. Forest fires in 2003 on the Little Wind River watershed caused excessive vegetation loss and resulting erosion. Since then rainstorm events produced muddy water. That condition is starting to improve now some five years later. Trying to treat this water to meet EPA drinking water standards is difficult and results in very short filter run cycles and significantly reduced production capacity.

In 2003, NAU experienced a critical shortage of water for the Ethete system. At the time, the region was in the fourth year of a drought cycle. This drought had decreased the flow rate in the Little Wind River. Throughout the summer, stream flow was so diminished that there were periods of time when only minimal flows were available to divert to the treatment plant. The Ethete system, which serves four schools, the tribal headquarters, a commercial area, and residential customers, was only able to meet basic in-home demands. Very little water remained for fire suppression and irrigation. During that same year, a major forest fire occurred on a nearby mountain watershed of the Little Wind River. Stream flows during spring runoff and rains carried such a high amount of ash and mud that it severely restricted the water treatment plan’s filtration capacity.

Because of the surface water shortage in 2003, the Northern Arapaho Tribe requested that the Wyoming Water Development Commission explore groundwater resources that might meet the system’s needs. Four potential well sites were explored. Northern Arapaho Utilities elected to proceed with drilling a deep well into the Madison Formation. That exploration well proved unsuccessful as explained in Chapter V. Subsequently Wind River Formation and the Little Wind River alluvium were explored. Both of these exploratory efforts were successful.
After reviewing the comparative advantages of these two sources the Northern Arapaho Utilities Board concluded that using the alluvial wells for additional supply is the most feasible source that can put in service for the Northern Arapaho Utilities Ethete system. The balance of this master planning effort focused on assessing the condition and capacity of the transmission, treatment, storage and distribution components of the system. The result of this evaluation is that there are several improvements that the system needs to meet commonly accepted standards. Needed capital improvements include the following:

- develop and put into service the alluvial wells
- transport the well water to the treatment plant
- upgrade the plant’s undersized pumps and enhance its operation equipment
- Replace undersized lines throughout the water system
- Replace the system’s failed pressure reducing valves
- Loop existing water lines within the system

The opinion of probable project cost for all recommended improvements totals $9,102,110.00. This includes engineering services, construction, permitting, fees, easement acquisition, and contingencies. The projects are proposed to be funded through a combination of grants and loans provided by the agencies who historically have had programs directed to potable water projects and the reservation people. These are Wyoming Water Development Commission (WWDC), USDA/RDA and the Indian Health Service. Other funding agencies may be approached if funds are available. Under the conceptual funding plan, WWDC would provide funding for the construction of the water source development (in this case the well field, transmission lines, and storage facility. The balance of the improvements would be funded by the Indian Health Service (IHS), USDA Rural Development (RDA) of the tribe themselves.

The project is considered to have minimal impacts on the environment or wildlife. The proposed transmission line is near the Little Wind River, requiring care to minimize or eliminate contamination, erosion, and degradation to surface waters. The transmission lines will cross sagebrush rangeland, and willow and cottonwood riparian community, interspersed with an understory of grasses adjacent to the river. Most of the remaining lands have previously been disturbed through agricultural and development activities and, therefore, the project will have little impact on the natural environment.

In the course of this master planning effort, the following conclusions and recommendations have been reached.

**Conclusions**

**Population and Potable Water Demand**

- The service population of the Ethete area system is forecast to grow from its present population of 1,610 to 2,530 people by the year 2025.
- Water demands in the year 2025 will grow to 886 million gallons per year without conservation measures
• Water demands will grow to an estimated 556 million gallons annually if conservation measures are put in force.
• The per capita water consumption is nearly 50% higher than normal usage rates.
• Northern Arapaho Utilities Ethete system will require additional supply to meet its future demands regardless of whether conservation measures are implemented.

Evaluation of Existing System

• The system serves an area of 26 square miles with 37 mile of piping.
• The raw water transmission line SDR-21 (thin-wall) pipe is prone to breakage.
• The treatment plant is taxed during periods of high runoff because of the erosive condition of the Little Wind River watershed.
• The treatment plant has adequate filtration capacity to meet future demands.
• The treatment plants pumps can pump water to the system at only half the rate the plant can produce.
• The system’s storage capacity is adequate to meet future demands.
• Much of the system has inadequate fire flow capacity.
• Much of the system offers no fire protection.
• Many lines are mismatched to their delivery demand.
• The distribution system contains a large percentage substandard piping.
• The distribution system’s pressure management system has failed.
• The lack of fire hydrants makes line flushing difficult.
• The system is not metered, rendering water conservation and usage accounting ineffective.
• Multiple homes are often served from a single service tap making payment enforcement impossible.
• Northern Arapaho Utilities’ current system is not sufficient to meet the long term needs of the Ethete water users.
• Northern Arapaho Utilities (NAU) has done much in recent years to automate its system, thereby improving its reliability.

Operations and Management

• Because of lack of planning coordination and communication, Northern Arapaho Utilities is frequently “caught off guard” by demands for water service created by projects developed by other tribal entities.
• The system is chronically understaffed.
• The system operators’ compensation package is not competitive with surrounding communities.
• NAU has a difficult time hiring and retaining certified operators and turnover is frequent.
• NAU has frequently missed IHS project funding opportunities because of incomplete and untimely funding application submittals.
• Under its present structure, the director is called upon to fill more roles than can be effectively handled by one person.
• Operators are provided little incentive and limited opportunity to obtain certification.
• The system does not perform at optimum levels because of deferred maintenance and under-trained operators.
• Under its present management structure, NAU does not have the autonomy to fill its mission.
• NAU and the Northern Arapaho Business Council find that each is stymied by the other.

Financial Findings

• NAU’s system is not financially self-supporting.
• NAU is constrained in making itself financially self-supporting because of the income status on a large percentage of its subscribers.
• There opportunities for improvements in both revenues and reduction of expenses.

Recommendations

There are a large number of specific recommendations for needed improvement to the system contained in Chapter IV, not all of which are here stated. The following is a summary of the major improvement recommendations.

System Infrastructure

• Permit, drill and develop the recommended alluvial well field as Ethete’s source water.
• Replace the portion of the raw water transmission line that will remain active with the alluvial well field.
• Increase the high service pumping capacity to 1,000 gpm.
• Clean, sandblast, and repaint the storage tanks.
• Install security fencing around the tanks.
• Upgrade the tank access road to serve under all weather conditions.
• Leave the Plunkett Road Tank off-line.
• Replace the under-sized lines as recommended in Chapter IV.
• Replace the failed pressure reducing valves.
• Loop lines in the Ethete community and on major distribution lines to provide system redundancy, improve fire protection, and system redundancy.
• Conduct a leak detection program.
• Install meters and backflow preventors on all services.
• Provide a service connection for each system user/account and discontinue daisy-chaining of services.

Operations and Management

• Concentrate future development to areas within the current service boundary.
• Limit service to structures built at an elevation of no higher than 5,580 feet.
• Work with the BIA to stop the practice of granting home sites in isolated areas without water service necessitating more waterline construction.
• Standardize all system valves and hydrants to a single manufacturer.
• Use only AWWA C-900 PVC pipe for future replacement and expansions.
• Implement the management recommendations given at the end of Chapter VII.

Financial

• Apply to the Water Development Commission for Level III funding for the alluvial well field, and needed transmission line, and finished water transmission improvements
• Enter into the IHS on-line SDS system all improvement project detailed in this Master Plan and aggressively seek that source of funding.
• Apply to USDA Rural Development for funding to implement projects in sequence of their priority ranking.
• Incrementally adjust rates with the objective of having the system become financially self supporting.
CHAPTER II

SERVICE AREA AND WATER DEMANDS

Introduction

The Ethete community of the Wind River Indian Reservation is located in central Wyoming. The reservation is home to both the Northern Arapaho and Eastern Shoshone tribes. The nearest municipalities to Ethete include Lander, which is approximately fifteen miles southeast, and Riverton, approximately twenty-five miles east.

Ethete, Wyoming is located approximately six miles east of the flank of the Wind River Mountains at Fort Washakie and one half mile south of the Little Wind River. The area consists of high plains desert transected by streams flowing generally northeast off the Wind River Mountain Range. The terrain between streams is rolling plains, sloping from the mountain flank easterly, to the Little Wind River and its confluence with the Big Wind River near Riverton. The area surrounding Ethete is irrigated agricultural land which is predominately pasture and some forage and grain cropping.

Northern Arapaho Utilities (NAU) operates and maintains the water and sewer utilities for the Northern Arapaho Tribe. The Northern Arapaho water utility has two independent systems, each with its own production, storage, transmission, and distribution. The Ethete system serves the
central portion of the reservation. The Arapahoe system serves the eastern portion near Riverton, Wyoming. This report focuses on the Ethete service area and accompanying demand.

**Water System Overview**

The Ethete portion of the Northern Arapaho Utilities water system starts at an intake on the Little Wind River and extends two miles east to the Ethete treatment plant. From the treatment plant, the distribution system extends another 1½ miles east to the community of Ethete, located in the north central portion of the water system’s service area. From Ethete, the distribution system spans an area of approximately four miles east to west and eight miles north to south. Wyoming Highway 132 and Mill Creek Road bound it on the west. It is bounded on the north by the Little Wind River and on the east and south by Plunkett Road. Service has only recently been extended north of the Little Wind River at Ethete to the Little Wind River Casino approximately ½ mile north of Ethete. Figure II-2 gives an overview of the system and its service area.

**Figure II-2 Ethete Water Distribution System Boundary Map**

The water distribution system serves the Ethete commercial area consisting of a convenience store, restaurant, casino, Blue Sky Hall, the Northern Arapaho Tribal Headquarters/Tribal College, St. Michael’s Mission, other public buildings, and the Wyoming Indian Middle School.
The system also serves Wyoming Indian High School, Wyoming Indian Elementary School, Mill Creek Housing, and scattered rural housing.

Included in this water system is the diversion on the Little Wind River, the raw water transmission line mentioned previously, the treatment plant, storage transmission lines, three steel water storage tanks, and approximately 37 miles of waterline.

James Gores and Associates conducted a field count of services on the Ethete system and found 378 service connections. However, there are only 334 billed water accounts on the system. Not all services that are connected to the system are being billed.

Population Forecasts

For this report, a twenty-year planning horizon extending through the year 2025 was used to forecast water service demand in the Ethete area. Population forecasts are based on:

- history of enrollment in School District No. 14, which covers the Ethete area,
- Fremont County and Wind River Reservation population history and population projections by various entities,
- current number of households in the Ethete area,
- estimated population in the Ethete area,
- Arapaho Tribe enrollment statistics, and
- projected population over the next 20 years for the Ethete area.

The following tables show populations in Fremont County, Wyoming, the Wind River Indian Reservation, Wyoming, and enrollment data for the Northern Arapaho Tribe.

Table II-1: Historical Population Data for Fremont County, Wyoming

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
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<tbody>
<tr>
<td>1960</td>
<td>26,168</td>
</tr>
<tr>
<td>1970</td>
<td>28,352</td>
</tr>
<tr>
<td>1980</td>
<td>38,992</td>
</tr>
<tr>
<td>1990</td>
<td>33,662</td>
</tr>
<tr>
<td>2000</td>
<td>35,804</td>
</tr>
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</table>

*Data from the U.S. Census per the Wyoming Department of Administration and Information, Economic Analysis Division

Table II-2: Historical Population Data for Wind River Indian Reservation, Wyoming

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>21,851</td>
</tr>
<tr>
<td>2000</td>
<td>23,250</td>
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</table>

*Data from the U.S. Census per the Wyoming Department of Administration and Information, Economic Analysis Division
Table II-3: Historical Enrollment Data for the Northern Arapaho Tribe

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Arapaho Enrollment</th>
<th>Estimated Ethete Area Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>899</td>
<td>284</td>
</tr>
<tr>
<td>1970</td>
<td>2,044</td>
<td>646</td>
</tr>
<tr>
<td>1980</td>
<td>3,637</td>
<td>1,149</td>
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<tr>
<td>1990</td>
<td>5,202</td>
<td>1,644</td>
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<tr>
<td>2000</td>
<td>6,812</td>
<td>2,153</td>
</tr>
<tr>
<td>2009</td>
<td>8,893</td>
<td>2,810</td>
</tr>
</tbody>
</table>

*Data from the Arapaho Enrollment Office, August 2004

There is little published data that agrees on the number of people per residence as applied to the Northern Arapaho Tribe. Those reported in the February 2003 Preliminary Engineering Report by HKM, including the U.S. Census estimates, indicate 3.96 persons per house. The USBR found 4.0, the WIND2 study 3.99, with a later supplement stating 5.67 people per home. All estimated population numbers by these groups ranged between 2,178 and 2,200 people for the 2003 population. Other undocumented estimates claim up to 12 persons per household. Published forecasts of annual population growth rates likewise vary widely. The annual growth rate reported by the U.S. Census is 0.87%, the USBR 1.76%, and the Indian Health Services 3.28%. None of these rates correlate with Northern Arapaho Tribe enrollment trends. Criteria for enrollment eligibility influence this figure disproportionately to the general population.

Table II-4: Household Occupancy and Growth Rates Reported in Past Studies

<table>
<thead>
<tr>
<th>Data Source</th>
<th>People per Household</th>
<th>Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000 U.S. Census</td>
<td>3.96</td>
<td>0.87</td>
</tr>
<tr>
<td>U.S. Bureau of Reclamation, 1996</td>
<td>4.0</td>
<td>1.76</td>
</tr>
<tr>
<td>WIND 2 Study, 1998</td>
<td>3.99</td>
<td>n/a</td>
</tr>
<tr>
<td>WIND 2 Study Supplement</td>
<td>5.67</td>
<td>n/a</td>
</tr>
<tr>
<td>Indian Health Service</td>
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<td>3.28</td>
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Given such a wide variance in estimated growth rates, James Gores and Associates investigated historic school student population numbers because that age group is a source of population increases. Fremont County School District No. 14 encapsulates the Ethete service area. The enrollment in District No.14 over the past 20 years has been level to slightly declining. This either indicates a low population growth rate or out-migration of students to other districts. Lander school district enrollment data shows that their Native American student count has varied by less than 1% over the past 20 years. During the 2008-2009 school year there were 68 District No. 14 students attending Lander schools. Riverton School District reported a similarly static enrollment trend in Native American students, though none are kept specific to District No. 14. No verifiable data has been found to suggest that an unusual or increasing proportion of Ethete area children are attending out-of-district schools. No more students are going to neighboring schools than has occurred in past years.
In conclusion, there is no verifiable data that suggests the Ethete area population is growing at a rate higher than the rest of Fremont County. Both historical data and the best documented population forecasts indicate that the population growth rate of 0.95 percent, which has been determined by the State of Wyoming for Fremont County, is a reasonable rate to use for forecasting population growth for the Ethete service area.

**Ethete Water System Service Population Forecast**

Both Northern Arapaho Utilities and High Plains Power track the number of residences served in the Ethete area. For NAU this includes both homes on the central water system and homes on private wells. There is a good correlation between these records and High Plains Power’s records. High Plains Power indicates 534 homes while NAU shows 543 homes. To estimate the Ethete area population, a somewhat generous 4.2 people per dwelling and 550 dwellings was used. This yields an estimated total population of 2,310 people living in the service area. This estimate was agreed upon by NAU and the Wyoming Water Development Commission (WWDC) in 2004.

This does not give an estimate of the future service population for the Ethete water system because a significant number of residents are serviced by private wells. By actual field count, James Gores and Associates found that those served by the water system total:

- 367 homes,
- 3 commercial establishments,
- 4 public schools including the Tribal College,
- Tribal Headquarters and two complexes housing other tribal offices, and
- 3 churches

The ratio of the 367 homes on the system to the 550 total homes in the area was used to illustrate that 67% of the homes are being served by the central water system. It is important to note that NAU is responsible for water supply to all enrolled tribal members, regardless of whether they are on the central system or not.

There are two factors that affect the number of people who will be served by the central water system as area population increases. The first is the growth rate in the area. The second is the percentage of people living in the area who are on the central water system as the population grows. To forecast the influence that these two factors will have on the Ethete system, the two assumptions had to be made for these two factors.

There is not any data to suggest that the area has, or will in the future, grow at a rate significantly different from the rest of Fremont County. Because having service from a central water system is a major convenience over owning and maintaining a private well, it is logical that as population increases and new homes are built, the percentage of area homes served by the system will increase.

To facilitate water use projections it was first assumed that the Ethete annual growth rate will be 0.95% per year, the same as forecast for Fremont County by the State of Wyoming. The second
assumption is that the percentage of the area population served by the system will grow from 67% in 2009 to 90% by the year 2025.

Using a base population of 2,310 in 2004, the forecasted Ethete area population and the population served by the water system are shown in Table II-5 below:

### Table II-5: Forecast Population Data for the Ethete Area (2005-2025)

<table>
<thead>
<tr>
<th>Year from 2004</th>
<th>Area Population</th>
<th>Service Population at 0.95% Growth Rate</th>
<th>Service Population Progression</th>
<th>Percent of Area Population Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st 2005 2006</td>
<td>2,332 2,354</td>
<td>1,560 1,580</td>
<td>1,587 1,624</td>
<td>67% 67%</td>
</tr>
<tr>
<td>2nd 2007 2008</td>
<td>2,376 2,399</td>
<td>1,590 1,610</td>
<td>1,662 1,702</td>
<td>67% 67%</td>
</tr>
<tr>
<td>3rd 2009 2010</td>
<td>2,422 2,445</td>
<td>1,620 1,640</td>
<td>1,742 1,660</td>
<td>67% 68%</td>
</tr>
<tr>
<td>4th 2011 2012</td>
<td>2,468 2,492</td>
<td>1,660 1,670</td>
<td>1,770 1,690</td>
<td>69% 71%</td>
</tr>
<tr>
<td>5th 2013 2014</td>
<td>2,515 2,539</td>
<td>1,690 1,700</td>
<td>1,810 1,880</td>
<td>72% 74%</td>
</tr>
<tr>
<td>6th 2015 2016</td>
<td>2,563 2,588</td>
<td>1,720 1,740</td>
<td>1,920 1,990</td>
<td>75% 77%</td>
</tr>
<tr>
<td>7th 2017 2018</td>
<td>2,612 2,637</td>
<td>1,750 1,770</td>
<td>2,040 2,080</td>
<td>78% 79%</td>
</tr>
<tr>
<td>8th 2019 2020</td>
<td>2,662 2,687</td>
<td>1,790 1,800</td>
<td>2,160 2,200</td>
<td>81% 82%</td>
</tr>
<tr>
<td>9th 2021 2022</td>
<td>2,713 2,739</td>
<td>1,820 1,840</td>
<td>2,280 2,330</td>
<td>84% 85%</td>
</tr>
<tr>
<td>10th 2023 2024</td>
<td>2,765 2,791</td>
<td>1,860 1,870</td>
<td>2,400 2,460</td>
<td>87% 88%</td>
</tr>
<tr>
<td>11th 2025 2016</td>
<td>2,817 2,817</td>
<td>1,890 1,890</td>
<td>2,530 2,530</td>
<td>90%</td>
</tr>
</tbody>
</table>

*Data based on projections from information from the Wyoming Department of Administration and Information, Economic Analysis Division

Using the State of Wyoming Department of Administration and Information, Economic Analysis Division, forecasted growth rates result in an estimated population of approximately 2,800 people in the Ethete area in the year 2025.

**Study Area Water Demand Forecast**

The Northern Arapaho Utilities water system does not have metering of individual services. This is for a variety of reasons, some of which include lack of funding to install meters and certain treaty interpretations. The production meter at the water treatment plant is the only meter
on the Ethete system. Records for production have been kept by hand since the present plant was put into service approximately ten years ago.

The records are reasonably complete, but are highly inconsistent. This renders the data of such poor quality that sound information cannot be extracted. For example, backwash water discharged plus water discharged to the distribution system for the last half of 2008 equals more water than the inflow meter shows coming into the plant. The plant cannot be creating water, so one or more of the meters has to be inaccurate or the meter reading was incorrectly recorded. This condition persisted through 2008. Making the best extrapolation of the available data shows the usage rates discussed below.

As discussed previously, the Ethete area water distribution system currently serves approximately 67% of the area’s population. That is estimated to grow to 90% of the area population by the year 2025 as shown in Table II-5. Historical water usage on the system based on the production records from the water treatment plant equates to the figures shown in Table II-6 below.

### Table II-6: Historic Water Use

<table>
<thead>
<tr>
<th>Community</th>
<th>Year</th>
<th>Service Population</th>
<th>Total Annual Use</th>
<th>3-Month Summer Use</th>
<th>Average Annual gpcd</th>
<th>Average Summer gpcd</th>
<th>Estimated Maximum Day gpcd (Avg. day x 2.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethete</td>
<td>2002</td>
<td>1,540</td>
<td>183.60</td>
<td>64.39</td>
<td>327</td>
<td>465</td>
<td>818</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>1,550</td>
<td>195.60</td>
<td>70.92</td>
<td>346</td>
<td>508</td>
<td>865</td>
</tr>
<tr>
<td></td>
<td>2008</td>
<td>1,610</td>
<td>205.40</td>
<td>71.80</td>
<td>349</td>
<td>495</td>
<td>873</td>
</tr>
<tr>
<td><strong>LOCAL SYSTEMS COMPARISONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverton</td>
<td>2008</td>
<td>10,032</td>
<td>745.00</td>
<td>275.64</td>
<td>203</td>
<td>305</td>
<td>339 (Actual)</td>
</tr>
<tr>
<td>Lander</td>
<td>2008</td>
<td>7,264</td>
<td>623.70</td>
<td>240.00</td>
<td>235</td>
<td>367</td>
<td>826 (Actual)</td>
</tr>
<tr>
<td>Ft. Washakie</td>
<td>2009</td>
<td>2870</td>
<td>224.20</td>
<td>98.20</td>
<td>214</td>
<td>384</td>
<td>535 (est.)</td>
</tr>
</tbody>
</table>

The above table shows that the average daily demand on the Ethete system is nearly 350 gallons per capita per day (gpcd). This water use rate is 60% higher than other local area systems.

Using population projections by the State of Wyoming Department of Administration and Information, Economic Analysis Division and the assumption that 90% of the area population will be served on the central system, the Ethete service population will reach approximately 2,530 people by the year 2025, an increase of 980 people over 2004. With this increase in service population and no water conservation, the water demand for the Ethete area could increase to 323 million gallons annually versus today’s use of 205 million gallons.

Based on NAU cost accounting, total water costs amounted to $1.36 per thousand gallons in 2007 for the Ethete system, $278,657 for the 205,400,000 gallons produced.

The Ethete system has a higher than normal usage rate, in part because it is not metered. If use were metered, Ethete’s consumption would likely mirror those achieved in Riverton, Lander and the Fort Washakie system, in the range of 220 gpcd. This may result in total annual consumption
of 203 million gallons for the year 2025, versus an expected 323 million gallons without conservation based on 2009 consumption levels. This would result in an annual savings of 120 million gallons and a cost savings of $162,000 annually at 2009 costs. Assuming inflation will average 3% per year through the year 2025, the projected cost savings will be approximately $260,000 at that time, or $102.77 for each user per year. Assuming four persons per household, and a self-supporting system, that equates to a savings of approximately $34 per month per household.

Changes in the usage rates of the magnitude discussed above do not significantly affect the sizing of distribution lines. Because of that fact, it also does not significantly influence construction costs for the distribution system. A 60% increase in usage, however, does significantly affect the cost of the treatment plant and its operation costs.

The following demand forecasts have been prepared to calculate average user rates for the residents of the study area. In Table II-7, usages “without conservation” are based on average past consumption of 350 gallons per person per day (gpcd) annual use and 500 gpcd summer use. “With conservation” usage rates are estimated to be 220 gpcd annual use and 340 gpcd summer use.

### Table II-7: Ethete System Future Water Demand Forecasts

<table>
<thead>
<tr>
<th>Year</th>
<th>Service Population</th>
<th>Without Conservation</th>
<th>With Conservation</th>
<th>Avg./Day Water Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average Day</td>
<td>Avg. Summer Day</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>1610</td>
<td>564</td>
<td>805</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>1783</td>
<td>624</td>
<td>892</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>2003</td>
<td>705</td>
<td>1002</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>2251</td>
<td>789</td>
<td>1125</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td>2530</td>
<td>886</td>
<td>1265</td>
<td></td>
</tr>
</tbody>
</table>

Table II-7 shows that the average, summer-day demand in the year 2025, assuming 20 hours per day production, will be approximately 1050 gpm without conservation and 760 gpm with conservation.
CHAPTER III

INVENTORY & EVALUATION OF THE EXISTING ETHETE AREA SYSTEM

Introduction

The water system serving the Ethete area is operated and maintained for the Northern Arapaho Tribe by Northern Arapaho Utilities (NAU). The Ethete system serves the western portion of the Northern Arapaho Tribe’s service area. As discussed in the introduction and overview of Chapter II, the system serves an area of approximately 26 square miles and 334 billed accounts.

The Ethete water system is the outgrowth of an unplanned and piecemealed effort to deliver water to the reservation residents in the area. The Indian Health Service built the system as federal funding was made available on a sporadic basis. Much of the design and construction was inferior. The pipe materials that were used were substandard more often than not. Operation and maintenance since the system’s inception has been marginal. The result is a system that is in need of significant improvements to provide a level of service meeting commonly accepted standards.

Portions of the existing water transmission and distribution system are undersized. Many of the water lines are undersized and constructed of materials that, when compared to current pipe technologies, are inferior. The undersized lines are primarily asbestos cement lines installed in the 1960’s. Others include 2-inch PVC lines installed in the 1980’s. The 6-inch lines on 17-Mile Road, Trosper Lane, and Plunkett Road are 1980’s vintage SDR-21 PVC pipe. That pipe material is very delicate and not as durable as current C900 DR18 water pipe.

Water Supply

The current water source for the Ethete area is the Little Wind River. The Little Wind River in the drought years of 2003 through 2007 often ran so low that it was difficult to divert enough water to meet demand. Additionally, the 2003 forest fires in the upper portion of the drainage burned off much of the protective vegetation. This resulted in extensive erosion with each rainfall. This caused the turbidity of the Little Wind River to become so high that the Ethete water plant was shut down because the filters clogged quickly making it unproductive to continue filtration operations. This further complicated the system’s inadequate water supply.

Intake

A diversion dam on the Little Wind River directs river water to an intake structure built in 1996. The structure is comprised of a boulder diversion dam that spans the river and channels water to the inlet structure and the structure’s bar screen as shown in Figure III-1. An inlet pipe carries water to the nearby diversion box. This grate-covered open box allows for the collection and removal of debris and sediment. A shear gate was installed to cut off flow to the

Figure III-1 Boulder Diversion Dam on the Little Wind River for Ethete Intake
transmission line leading to the plant. The raw water is gravity fed through the 2.1 mile 12-inch SDR-21 PVC transmission line to the treatment plant. Although no written record was found indicating the type of pipe used to construct this line, the operation staff reports that it is constructed of “gravity sewer pipe”, also known as thin-walled PVC. They report that breaks on the line have been a frequent occurrence.

**Treatment Plant**

This section provides an overview of the plant and its capacity. An exhaustive evaluation is beyond the scope of this project. Evaluations of plant components, their state of repair, and what repairs or upgrades are needed to match state of the art equipment, are all beyond what is presented here.

The current treatment plant was constructed in 1999, to replace the original and inadequate filter plant. The plant is located on Ethete Road approximately 1½ miles west of the intersection of Wyoming Highway 132 and Ethete Road. The plant is a Trident model 1 ½ TR210A (Reference Number 52000616).

The raw water influent line has an inflow meter that is read and recorded twice daily. Turbidity is sampled through a port on the inlet line and then tested. Turbidity tests are generally conducted and recorded twice daily.

The raw water is injected with Aqua Hawk® D2707 coagulant. The injection of this coagulant to the raw water is controlled by an Aquaritrol® solid state controller based on a signal from the effluent turbidity meter. This device continually monitors effluent water quality and adjusts the flocculent dosage accordingly.

The plant uses a conventional treatment process. It uses upflow adsorption media clarifiers, which mixes, flocculates, and removes flocculated particles. The clarifier media consists of polyethylene beads contained against a screen. The flocculated particles are removed by adsorption to the clarifier media. Once the solids have accumulated, the bed is flushed with air and raw water up through the clarifier.

The clarified water then runs through a mixed media filter. These filters contain anthracite coal, silica sand, and garnets. The filtration occurs because media pore spaces at the bottom of the filter are smaller that those at the top, creating a sieve-like extraction of unwanted particles including silts, and most importantly, disease causing pathogens. This process is shown in Figure III-2.

The plant has four filters rated at 400 gpm each, for a total potential output of 1600 gpm. Assuming twenty hours per day production, this equates to 1.92 million gallons per day (mgd). The plant operators reported in the summer of 2009 that they were using only three filters and operating them at 320 gpm. This equates to 1.15 mgd for
twenty hours of operation. In Chapter II, Table II-7 shows the estimated average summer demand to be about 0.8 mgd. This table also shows the 2025 estimated demand to be 0.9 mgd with conservation and 1.3 mgd without conservation. These estimates and the design production capacity of the plant show that the existing plant has a capacity of nearly double the forecast demand.

An under drain system is located at the bottom of the unit which allows for uniform collection of the filtered water over the entire bed area. This system allows for backwashing to clean the filter. The under drain is designed so that the filter media can be placed directly over the collection apparatus.

The effluent water is monitored with a turbidity meter on the outlet of each of the four filters. The system monitors the turbidity of the filtered effluent water and prints the results every 15 minutes. The units are set to backwash at timed intervals. Plant controls can accommodate automatic backwash when head loss through the filters reaches a defined point.

Gas chlorination is injected into the filtered effluent water as it is piped into a 150,000 gallon clearwell beneath the plant. Properly operated, the plant can continually produce water meeting EPA standards.

The treated water is then pumped from the clearwell and metered through a 12-inch transmission line to the distribution and storage system. Two pumps are available to move water from the plant to the storage tanks.

- One pump is rated at 400 gallons-per-minute (gpm) capacity at 300-feet Total Dynamic Head (TDH) and is driven by a 40 horsepower motor.
- The second pump is fitted with a 30 horsepower motor and is rated at 400 gpm at 234-feet TDH.

Neither pump is matched to the system head. The pumps running together are even less matched to the operating conditions. The large pump is throttling, pushing back, the output of the smaller one.

Modeling shows that these two pumps running together have a capacity of 850
gpm because the new 12” transmission line, which replaced a 6” line, to the tanks produces a lower system head.

With all four filters operating, the plant produces 1,600 gpm. **The filters can produce water at nearly twice the rate that it can be pumped to the tanks.** This inequality needs to be corrected. Currently, there are two spare clearwell pump locations at the plant.

The SCADA system monitors the tank levels and turns the pumps on when the tank level drops to an elevation set by the operators. The normal low level set point will start Pump Number 1. Pump Number 2 will activate if the level continues to drop. High and low water level alarms in the tank will notify the operators of the corresponding problem.

The SCADA system is web based and can be monitored and adjusted by the operators from any internet terminal. This feature was added to the system in the past year. It enhances reliability of the system and allows the operators to be more efficient.

Other improvements, that when added to the plant would make its operation more reliable and provide the operators with better information with which to guide operations include:

- installing an inflow meter that is tied into the SCADA system,
- installing an inflow turbidimeter linked to the SCADA system,
- having on hand an inventory of spare actuators, and other frequently failing parts without which the plant cannot function properly,
- an overhead crane that makes it possible to safely remove the static mixer, clearwell pumps and other heavy components for maintenance,
- purchasing an internet capable laptop computer that would permit the operators to check and adjust plant functions when they are off site.

**Transmission System**

The transmission lines on the Ethete system, as identified for purposes of this report, are:

1. 12-inch PVC raw water plant feed line from the river intake to the plant,
2. 8-inch and 10-inch PVC transmission lines from the tanks to Blue Sky Highway (Wyoming 132) at Wyoming Indian High School, and
3. parallel 6-inch and 10-inch transmission lines from the High School north to the Ethete Road intersection.

**Raw Water Transmission Line**

The raw water transmission line extends approximately 11,000 feet from the intake structure to the treatment plant. It is a “thin-wall” 12-inch PVC constructed in 1996. The system operator’s report that this line is quite fragile and has had numerous repairs required. The entire route is in river alluvial cobble rock. The operators report it to be marginally bedded. Breaks are commonly caused by large rock in contact with the pipe surface. The operators believe that normal ground shifts cause the pipe to break. The continuous breaks make the line a maintenance nuisance and result in unreliable delivery to the plant and thus the system. This line needs to be replaced to ensure system reliability.
**Finished Water Transmission**

As previously mentioned, the treated water is pumped from the clearwell through a 12-inch transmission line to the water storage tanks one mile southeast of the plant and one mile south of Ethete. The transmission line was upgraded from a 6-inch to a 12-inch PVC line three years ago to help sustain storage during high demand. This upgrade has significantly helped; it yielded a 30-foot reduction in head loss between the plant and the tanks and increased flow capacity to the tanks by a factor of four.

The transmission system between the plant and the tank was found to be adequate for present and future needs. The transmission lines from the tanks to the High School and from there into the center of the community (the intersection of Ethete Road and Wyoming 132) are also adequate to meet present and future fire flow demands with the recommendations in the next chapter.

**STORAGE SYSTEM**

**Main Storage**

Currently, the Ethete area has 1,850,000 gallons of storage capacity. This capacity is adequate to meet estimated service requirements through the planning period. The three welded steel tanks comprising this storage volume are all in sound structural condition. All three tanks are interconnected with piping. The individual tank volumes are 100,000 gallons, 250,000 gallons, and 1,500,000 gallons. These tanks were constructed in 1960, 1976, and 1985, respectively.

The interior paint in the 1.5 million gallon tank has failed and is peeling off in large sheets. This style of coating system was common in the 1980’s and is no longer used because of its short service life.

The two smaller tanks are in sound structural condition. There is no record of when these two tanks were last painted. The NAU director stated that he knows the tanks have not been painted in the past twenty years. Based on an on-site inspection of the tanks in the summer of 2009, it is evident that the tank exteriors need to be repainted for proper scheduled maintenance. The interior paint on these two tanks however, appeared to be in good condition.

The foundations of all three tanks consist of a gravel foundation pad confined by a steel ring as opposed to more conventional concrete foundation ring walls.

There is no security fencing around any of these tanks. All three tanks are readily accessible to the public. The tanks have all been defaced with graffiti. One of the tanks currently hosts a private wireless internet equipment installation. The internet equipment building is in a chain link fenced enclosure which is locked, preventing access to the tanks access ladder. This prevents access to the tank by NAU Operators, unless prior arrangements are made with the internet company. The lack of site security of all three tanks is a concern. The access ladders to all three tanks were security locked at the time of the on-site inspection.

The tanks are accessed by a two-track dirt road which is impassible when it is wet or snow covered. To adequately access the tanks an all weather access road needs to be built.

There is not any reliable daily information that can be extracted from present records for estimating storage volumes. However, by using recognized storage sizing procedures, a recommended storage volume can be determined. This procedure is based on:

1. fire demand, plus
2. emergency storage of one average day’s consumption, plus
3. equalization storage, the volume consumed over a 6-hour period of peak flow conditions.
Further, it is assumed:
1. maximum day demand is equal to 2.5 times average day consumption and that
2. peak hour demand is equal to 1.75 times maximum day demand and that
3. peak rate duration is for 6 hours.
Based on that criteria, and further assuming that NAU implements conservation measures, the required storage volume is 1.45 million gallons. Thus, the system’s present storage capacity of 1.85 million gallons is more than adequate through the year 2025.

Plunkett Tank

The system has an additional 250,000 gallon welded steel storage tank located off of the south end of Plunkett Road. It was taken out of service approximately twenty years ago, very shortly after construction, because of a leak resulting from a ripped floor panel resulting from a foundation failure. Great expense along with an uncertain outcome prohibits the reinstatement of this tank.

The operating elevation is reported to be the same as the main three tanks. Based on the modeling of the system this tank provides little benefit to the system. Adding the tank back onto the system would increase fire flow availability to Mill Creek housing from 500 gpm to the ISO’s recommended minimum of 750 gpm. The system, as is, provides 500 gpm. It would, likewise, provide a similar increase in fire flow to the sparsely scattered residents on the southern portion of Plunkett Road.
Distribution System

A significant portion of the distribution system is substandard. Construction of the Ethete water system began in the early 1960’s. The waterlines consisted of 3-inch, 4-inch, and 6-inch asbestos cement pipe. Over the years, the Ethete distribution system has been upgraded and expanded to include almost 200,000 linear feet of waterlines. Currently, the system is comprised of several different sizes and types of pipe material, including asbestos cement, polyvinyl chloride, and polyethylene. The variety of pipe sizes and materials makes maintenance of the system difficult.

The distribution lines branch off the transmission lines from the tank. Two dead-end 6-inch lines serve the Wyoming Indian High School. These lines provide inadequate fire protection for the school.

The southern portion of the system, south of 17-Mile Road is 6-inch SDR-21 PVC. Hydrants installed on this portion of the system are only flushing hydrants fabricated from 2-inch galvanized pipe and are fitted with an end cap that must be removed with a pipe wrench. These units are marginal as flushing hydrants. They are not suitable as fire hydrants or for filling rural fire tanker trucks. There are only 46 services on the 12 miles of line south of 17-Mile Road.

Pressure Reducing Valve Stations and Air Relief Valves

Six pressure reducing valves are located on the distribution system at elevations 5420' +/- and 5320' +/-.

In a 2009 on-site review of the PRV stations that could be located, all, except one, were found to be flooded. The operations staff does not have information on when these stations were last maintained. In their present state, these stations present a health threat should the lines experience a vacuum condition and allow some of the standing water into the distribution system. Northern Arapaho personnel indicated that the PRV stations are not working. As a result, distribution system pressures are likely well in excess of recommended ranges.

No construction or record drawings of the system’s PRV stations are known to exist. Without this information, the plumbing of the main PRV station near Wyoming Indian High School is not understood. Whether this PRV can operate properly is unknown. In the summer of 2009, both the inlet and outlet pressure gauges registered 90 psi, indicating that this PRV is not functioning. There is no companion PRV station on the lines from the plant. The operational status of the other PRV’s on the system is also unknown. Based on available information and mapped locations of the existing PRV’s, it is not possible to manage system pressures.

There are air relief valves on the system. There is no record to their maintenance. It is believed by the operators that few if any of them are operational.

The PRV stations, air relief valves, and main line valves are well marked with blue concrete filled PVC or concrete bollards on the system south of 17-Mile Road, which is very helpful to operations. The balance of the system is not well marked.
Ethete Area

The area surrounding the Ethete community is served by a variety of distribution waterlines consisting mainly of AC pipe. The lines north of Ethete Road serve the Ethete Housing and the Little Wind River Casino. Currently, a 4-inch AC line feeds water north to the new 8-inch PVC line serving the Little Wind River Casino north one mile from Ethete. A dead-end, 6-inch PVC line serves Lone Bear Lane.

The immediate Ethete area hosts the Northern Arapaho Tribal offices, tribal college, housing office, convenience store, middle school, Blue Sky Hall, St. Michael’s Mission, St. Joseph’s Church, and several other public facilities. There are several deficiencies in this part of the system as noted in the Analysis discussion later in this chapter.

Plunkett, Trosper, and Mill Creek Road Areas

The distribution system south and east of Ethete is served by 6-inch SDR-21 PVC. In the late 1970’s, a loop was constructed east to Plunkett Road and back on 17-Mile Road to Ethete. In the early 1980’s, a loop was constructed on Plunkett Road, Trosper Road, and Mill Creek Road. This loop was tied into 17-Mile Road and Blue Sky Highway. The major portions of the system are looped, with the exception of Trosper Lane and Yellow Calf Road. Trosper Lane lacks approximately three-quarters mile to extend east to Plunkett Road. Yellow Calf Road lacks approximately one mile of line to loop south into 17-Mile Road.
The Trosper Road line once extended from Mill Creek Road to Plunkett Road. It is reported by system operators that the Trosper Road line was drilled through in several locations on the eastern one-third of this line when the power line was installed parallel to the road. This main was valved off and never repaired.

The southern portion of the Plunkett Road line, east of Mill Creek Road, crossed terrain that rises to an elevation of 5540 feet. This is only 60 feet below the elevation of the tanks. In this area, under the best of conditions, water pressure is near 35 psi. During periods of high use on the system, pressure could drop below 20 psi. This is inadequate pressure to offer reliable service.

The recent widening of Plunkett Road has buried several main line valves along the west side of the road. It is obvious that this widening was not coordinated with NAU. The buried valves need to be relocated and raised so they are accessible to the operators.

An inventory of pipe diameter, material, and length is illustrated in Table III-1:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Material</th>
<th>Length (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>Plant intake thin-wall PVC</td>
<td>11,497</td>
</tr>
<tr>
<td>12&quot;</td>
<td>PVC C-900</td>
<td>9,274</td>
</tr>
<tr>
<td>10&quot;</td>
<td>PVC C-900</td>
<td>7,003</td>
</tr>
<tr>
<td>8&quot;</td>
<td>PVC C-900</td>
<td>12,272</td>
</tr>
<tr>
<td>6&quot;</td>
<td>PVC C-900</td>
<td>10,698</td>
</tr>
<tr>
<td>6&quot;</td>
<td>AC</td>
<td>10,647</td>
</tr>
<tr>
<td>6&quot;</td>
<td>IPS-PVC</td>
<td>116,636</td>
</tr>
<tr>
<td>4&quot;</td>
<td>AC</td>
<td>4,429</td>
</tr>
<tr>
<td>4&quot;</td>
<td>IPS-PVC</td>
<td>1,875</td>
</tr>
<tr>
<td>3&quot;</td>
<td>PVC</td>
<td>4,760</td>
</tr>
<tr>
<td>2&quot;</td>
<td>PVC</td>
<td>3,780</td>
</tr>
<tr>
<td>2&quot;</td>
<td>PE</td>
<td>2,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>194,871</td>
</tr>
</tbody>
</table>

Fire Protection

There are 50 fire hydrants in the Ethete system, all of which are flushed and inspected annually. NAU reports that ten of the 50 fire hydrants need to be replaced. There are several different types of fire hydrants throughout the system. Operation and maintenance of the hydrants is unnecessarily complicated because it is necessary to have an inventory of replacement parts for the many different brands of hydrants.

On the portion of the system served by 2-inch mains, the fire hydrants are fed by 2-inch lines with curb stop valves. This seriously undersized configuration is a threat to public safety. The water main valves are quarter-turn curb stop valves, and the valve risers consist of PVC pipe.

The Insurance Services Office (ISO) has developed guidelines for determining fire protection capacities on public water systems and for assessing fire risk. Fire risk is based on exposure factors including building materials, square footage, building height, distance between adjacent building structures, and whether a fire suppression sprinkler system is used in the building.

According to ISO guidelines, the Wyoming Indian High School requires the largest fire flow in the Ethete area. Flow must be provided at a rate of 3,500 gpm for a three hour duration, which results in a
storage requirement of 630,000 gallons. The current storage tanks for Ethete easily meet that requirement.

However, even though storage is sufficient, the Ethete distribution system cannot provide adequate fire protection flow rates to the High School or to the majority of facilities in the most densely developed areas. The sections of the system most affected by this lack of distribution capability are Fremont County School District No. 14 facilities, Wind River Tribal College, convenience store, Little Wind River Casino, Blue Sky Hall, Mill Creek Housing, and Ethete Housing north across Ethete Road from the tribal offices. An analysis of the needed fire flow for each area is shown below.

Analysis

WaterCAD 6.5 was used to model the Ethete water distribution system and analyze fire suppression capabilities at specific locations around the Ethete area. These locations were selected based on building size and/or population density. Their required fire flows were calculated using ISO guidelines and are shown below.

**Wyoming Indian High School**

Currently, the Wyoming Indian High School is supplied by two 6-inch diameter PVC stub-outs. The northern line has an available fire flow of 1,795 gpm, while the southern line supports 1,830 gpm. These lines combined provide the needed fire flow capacity of 3,500 gpm. However, they are not currently looped and individually they are insufficient.

**Wyoming Indian Elementary School**

There is conflicting information regarding how the Wyoming Indian Elementary School is supplied. Northern Arapaho Utilities states the school is on the central Ethete system, but Dan Hudson, Superintendent for Fremont County School District No. 14, believes that the school’s small 25,000 gallon tank is filled from the NAU system and that the school operates off that tank. Under ISO guidelines, the School requires a 3,000 gpm fire flow. Because of the school’s high elevation and the 6” line supplying it only 270 gpm can be delivered from the central system. Modeling shows that even with a much larger line, 12-inch versus the current 6-inch, the system could not deliver recommended fire protection. There is no easy solution to this deficiency. The least costly solution would be for the school to install, on the main line, a fire pump station that could be activated in the event of a fire.

**Wyoming Indian Middle School**

The Wyoming Indian Middle School is currently supplied by a 3-inch diameter PVC line. This line can only deliver a fire flow of 560 gpm, while the needed fire flow capacity is 2,500 gpm.

**Tribal Office Facilities and Wind River Tribal College**

Much like the Middle School, the Wind River Tribal College is fed by a 3-inch diameter line that only produces a 575 gpm fire flow. ISO regulations require a flow of 2,000 gpm for fire suppression.
Ethete Convenience Store

The Ethete convenience store is currently fed by a 4-inch diameter asbestos cement line that provides a fire flow of 970 gpm. The recommended fire flow capacity for this area is 1,750 gpm.

St. Michaels’ Mission

The line serving the St. Michael Mission is a dead-end 6-inch PVC. It delivers adequate fire flow but is not looped to another part of the system.

Tribal Housing Office Facilities

Theses offices are located directly west of the Ethete convenience store and are supplied by a 6-inch diameter asbestos cement line. This line is only able to deliver an 855 gpm fire flow, while the required fire fighting capacity is 2,000 gpm.

Little Wind River Casino

This new casino is located north of the Little Wind River, one mile from Ethete proper. It is fed by a 4-inch diameter asbestos cement line for approximately one-third of a mile. This line ties into a newly constructed 8-inch PVC line that extends across the river to the casino. This line can only support a fire flow of 290 gpm, but the casino requires a 2,500 gpm fire flow.

Blue Sky Hall

Blue Sky Hall is fed by a 4-inch diameter asbestos cement line that currently provides 1,005 gpm for fire flow. ISO regulations require a fire flow of 1,750 gpm for a building of this size and type.

Ethete Housing

The subdivision located within Ethete feeds off of a 6-inch asbestos cement line and 2-inch polyethylene service lines. Portions of this area can support adequate fire flow, but the regions supplied by the 2-inch lines can only receive between 170 and 270 gpm. ISO requires 750 gpm for houses of this proximity.

Mill Creek Housing

Mill Creek Housing is northwest of the intersection of 17-Mile Road and Plunkett Road. It is supplied by a 6-inch diameter thin-walled PVC line. Current fire flow throughout the subdivision is approximately 530 gpm. Due to the close proximity of the houses, ISO recommends a flow of 750 gpm.

<table>
<thead>
<tr>
<th>Table III-2: Existing Fire Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Ethete Store and Casino</td>
</tr>
<tr>
<td>Tribal Facilities</td>
</tr>
<tr>
<td>High School South</td>
</tr>
<tr>
<td>High School North</td>
</tr>
<tr>
<td>Mission West</td>
</tr>
<tr>
<td>Mission East</td>
</tr>
<tr>
<td>Wind River Casino</td>
</tr>
<tr>
<td>Tribal College</td>
</tr>
<tr>
<td>Junior High School</td>
</tr>
<tr>
<td>Mill Creek Housing</td>
</tr>
<tr>
<td>Elementary School</td>
</tr>
<tr>
<td>Blue Sky Hall</td>
</tr>
</tbody>
</table>

Currently, each of these areas suffers substandard fire flow due to undersized distribution lines. Strategic improvements were modeled for the system in an attempt to predict solutions for these deficiencies. These improvements are detailed in the
recommendations in Chapter IV. A summarized table of existing fire flow conditions at major locations in the Ethete system is shown in Table III-2.

**Water Production and Usage Metering**

The only meter on the system is the plant production meter on the clearwell discharge line. The system’s services are not metered. As a result, there is no usage control. Without metering, it is impossible to gauge how water usage is occurring.

None of the services have backflow prevention. This presents an out-of-standard health risk to the system users. When service meters are installed backflow preventions should also be installed.

A large number of services are “daisy chained” with two or more services connected to a single service tap and curb stop. This practice renders NAU incapable of shutting off water for non-payment or emergency purposes. These services need to be separated with each service having its own service tap, curb stop, meter and backflow preventer.

**System Leakage Losses**

The present water consumption rates in the Ethete system can not be readily explained. The annual consumption rate of 350 gallons per person per day exceeds surrounding area system use by 140 gallons per person per day. In general, residences on the system have small lawns or no lawns. The system does not support any large public parks. Fire suppression and other uses are not significantly higher than on other systems. There is no indication that household uses are above those found in other communities.

A large portion of the system is in rocky, river alluvium soils. This soil type prevents leaks from reaching the surface which makes them difficult to detect. Without consumption metering there is not a way to determine system losses or unauthorized uses. This, coupled with the general state of repair of the system, strongly suggests that there could be significant undiscovered system leaks.

The neighboring Shoshone Water Distribution System, also built by the I.H.S., had a similarly high per capita usage rate. By conducting a series of three annual leak detection programs, they have successfully found and corrected leaks amounting to 220,000 gallons per day. For example, several services were found where the curb stop was left on after a mobile home or other structure was removed from a site. It is believed that a leak detection effort on the Ethete system will result in similar lost water savings.
CHAPTER IV

SYSTEM DEFICIENCIES AND RECOMMENDED SOLUTIONS

Introduction

As identified in Chapter III, there are a number of deficiencies in the current Ethete potable water system. Several of these are identified in the Recommendations paragraph following the discussion of each topic. Those recommendations are reiterated in Chapter I. In this chapter deficiencies will be discussed in detail along with applicable alternative solutions followed by recommended solutions to address each of the identified needs. This information is presented in the same sequence in which the system operates:
1. Water Supply Source,
2. Raw Water Transmission,
3. Treatment,
4. Finished Water Transmission,
5. Storage,
6. Distribution, and
7. Consumption.

The present system deficiencies prevent the NAU from delivering the level of service they and the Northern Arapaho Business Council desire. The system deficiencies can be overcome.

To improve the system and its performance, however, will require a considerable and persistent effort. It will also require several years of dedication to the improvement goals detailed in this Master Plan. The Business Council and NAU will need to partner, as a team, making water utility maintenance and improvements a serious and consistent priority. It will also require a consistent performance of the NAU staff in seeking funding, implementing projects, and reporting in a timely manner as required by the various funding agencies’ programs. These issues have all contributed to the state of the present system.

Water Source

In the drought years of 2003 and following, Northern Arapaho Utilities has experienced serious difficulties meeting water demands. That has been due to two factors:
- reduced stream flow, and
- heavy erosion of the watershed due to vegetation loss in the forest fires of 2003.

At times the stream flow became so muddy that the plant filters clogged so quickly and had to be cleaned so frequently that water production was diminished to the point that even household demand was difficult to meet. Since 2003 the watershed has begun to recover somewhat. The intensity and duration of high turbidity flow in the Little Wind River has lessened.

The focus of this Master Plan has been to find a reliable groundwater source that could either augment or replace the present surface water supply from the Little Wind River. The groundwater exploration program, which was very extensive, is described in detail in the companion volumes of this report. A very brief summary of efforts is given below.

The first groundwater exploration attempted a well in the Madison Formation on the south nose of the Sage Creek anticline. That exploration failed to find a suitable water supply as discussed in the Chapter V.
In a continuation of exploration efforts, two previously undiscovered potable groundwater sources were found through the exploration portion of the work in this study. Those are:

1. the Wind River Formation test well located northeast of Ethete on the bench between the Big and Little Wind Rivers, and
2. the alluvial groundwater immediately north of the Ft. Washakie Elementary School.

Either of these sources could be developed to adequately supply the projected needs of the Ethete area system. The Northern Arapaho Utilities Board has elected to pursue the development of the alluvial source because of the ease with which it can be developed and delivered to the existing water treatment plant. It has yet to be determined, but with future testing, the EPA may classify this source to be a groundwater source and not “groundwater under the influence of surface water”. If so, only chlorination treatment would be necessary. This could be a very significant cost and operational savings to NAU.

Discussed in detail in Chapter V, four potential well sites were explored for additional water supply. These included the Wind River Mountain Flank, the Sage Creek Anticline, the Little Wind River Alluvium, and the Wind River Formation. After much discussion of each potential site, the Sage Creek Anticline, west of Wyoming Indian Elementary School at Mill Creek, was selected for the proposed test well. It showed geological potential to produce good quality water. This site was also the closest site to the existing water system. A deep well had never been attempted in the area of the selected site.

Drilling commenced on the Sage Creek Anticline Test Well on October 19, 2006 using a Midway 2250 rotary drilling rig. This rig drilled to a depth of 2,383 feet below ground level (bgl). At that point, the contractor assembled a George E. Failing Stratmaster 100 rotary rig. Total depth was reached at 4,026 feet bgl on March 8, 2007. A summary of well drilling and the results of water tests can be found in Chapter V.

Drilling commenced on the Wind River Formation in September 2008, by DC Drilling. A summary of this well drilling can also be found in Chapter V. This well produced approximately 250 gpm. The water has slightly more radionuclides than allowed in EPA drinking water standards. The water is also slightly high in iron and manganese. To meet EPA standards, the water would have to be treated with a commonly available treatment process. To provide the amount of water needed for Ethete at least one, and probably two, more wells would be required. The well site is also quite distant from the nearest power source and is three miles from the nearest point of connection to the Ethete system. The pipeline would cross allotted land and would have to cross the Little Wind River to reach the Ethete system. An all-weather access to the site will require construction of approximately 6.2 miles of gravel road. (See Figure IV-2).
FIGURE IV-2
WIND RIVER TEST WELL ROUTE
LAND OWNERSHIP
The Little Wind River Alluvium was drilled in the fall of 2008 and in the spring of 2009. It was discovered that a viable water supply for the Ethete system can be developed from this source. A summary of results for this drilling effort is also given in Chapter V. A well field in the area can produce the amount of water needed for the Ethete area. A 2½-mile transmission line from this well field to the present plant raw water transmission line would be required. This line would cross tribal land to reach the highway right-of-way, which it could follow to the existing line. The site is readily accessible by vehicle and power is near-by. (See Figure IV-3).
FIGURE IV-3
ALLUVIAL TEST WELL ROUTE
LAND OWNERSHIP
Recommendations

It is recommended that Northern Arapaho Utilities pursue development of the Little Wind River Alluvial Formation in the vicinity of the Fort Washakie Elementary School because of its ease of being delivered to the Ethete system and its comparatively lower cost.
Existing Source Diversion Structure

The system’s Little Wind River diversion and river bank intake structure consists of a boulder diversion dam and a conventional intake fitted with a trash rack. It receives water through a 12-inch intake pipe that leads to a concrete settling box. This baffled structure traps sand and larger sediment before the water is sent to the treatment plant. The favorable location of the intake allows little sediment to enter the system. The operators report finding that, in most cases, cleaning this box only once a year is adequate. Its tight quarters make it hard to clean using a backhoe without damaging the concrete. The structure is adequately serving its intended purpose at this time.

The sedimentation box is secured with chain link fencing. The fencing is in need of some minor repair but yet is sound enough to prevent entry by unauthorized persons.

![Figure IV-5: Little Wind River, Intake Structure, and Sedimentation Box](image)

Recommendations

The existing intake box is reported to be performing adequately. No improvement to the diversion structure or the intake structure is recommended since these facilities will most likely be abandoned once the alluvial well field is put in service.

Raw Water Transmission to Treatment Plant

Raw Water Transmission

From the sediment box the flow is carried by a 12-inch thin-wall (SDR 41) PVC transmission line to the treatment plant. As noted in Chapter III, this line is a thin-wall pipe with a history of breaks.

The raw water transmission line from the intake to the treatment plant was constructed in 1996. The material used for the transmission line is 12-inch thin-wall SDR 41, PVC pipe, rated at 100 psi. The design drawings show the line sloped at 0.3 percent. As discussed in Chapter III, Northern Arapaho Utilities has repaired this line several times in several locations in its relatively short service life. This condition threatens the reliability of the system and is a nuisance to the operators. It renders the entire system unreliable.
Recommendations

It is recommended that the portion of this line that parallels Ethete Road be replaced with AWWA C-900 PVC pipe with a minimum capacity of 1.3 million gallons per day (mgd).

The portion of this line between the diversion structure and the highway may be abandoned once the recommended alluvial well field is in service. NAU may wish to keep the ability to bring water to the plant from the river diversion structure. If so, this portion of the line can just be taken out of service rather than formally abandoned.

Treatment Plant

Inflow System

The raw water influent line has an inflow meter that is read and recorded twice daily. The data could be collected by the SCADA system. The meter has proven to be inaccurate. It is our suspicion that the meter is mounted too close to upstream and downstream pipe bends to meet manufacturer’s criteria.

Raw water is sampled through a port on the inlet line and tested for turbidity in the plant laboratory. Turbidity tests are generally conducted and recorded twice daily.

Figure IV-6: Raw Water Influent Pipe

Recommendations

1. Upgrade the raw water inflow meter to be electronically read and recorded by the plant’s SCADA system on a preset schedule.
2. Install a raw water turbidimeter that is automatically read by the SCADA system. These turbidity readings could be used by the operators to provide flocculation dosage information,
shut down the filters when water is extremely turbid, and to compile an influent water quality history for assisting future operation.

**Plant Piping and Mechanical Equipment**

This master plan did not involve a thorough piece-by-piece evaluation/testing of the plant equipment and piping. Through interviews with the operators and from all visual inspections, this equipment is in good operational condition.

The operators pointed out that the plant is not equipped with a crane to lift heavy equipment from its installed location. This includes the wet well pumps and motors, large diameter valves, and the static mixer (which weighs approximately 800 pounds and is mounted 10 feet above the operating floor). Having to handle this equipment by hand is dangerous.

- **Recommendations:**
  
  It is recommended that an overhead trolley crane be installed in the plant to allow safe handling of heavy components.

**Filters**

As discussed in Chapter III, the plant is a Trident conventional plant with four filters having a capacity of 400 gpm each, for a total capacity of 1600 gpm.

The raw water enters the four individual Trident Water Treatment Systems. The filtration is a two-step process consisting of the flocculation clarifier followed by the multi-media filter. The finished water effluent is monitored with turbidity meters that will initiate an automatic backwash if finished water reaches 0.05 Nephlometric Turbidity Units (NTU). The EPA limit for turbidity is 0.3 NTU. Harold Little Bear, Northern Arapaho Utilities chief operator, keeps the produced water turbidity at 0.1 NTU or less. The plant typically operates at 0.003 NTU.

The flocculation clarifier and filter units are set to be backwashed at timed intervals. The plant controls could be set to backwash on filter head, according to Mr. Little Bear. This would reduce the amount of produced water used for backwashing.

**Recommendations**

It is recommended that the filter backwash be set to automatically backwash based on filter head instead of the preset filter run time as is currently being practiced. This would reduce the amount of finished water used and wasted as backwashing water used. This change would allow the plant to operate at optimum efficiency by not backwashing filters until it is necessary.
Clearwell

The filter effluent is chlorinated as it drops into the 150,000 gallon clearwell beneath the plant. The clearwell has high and low alarms that are integrated into the SCADA system. These controls prevent the filters from overflowing the clearwell and shut off the high service pumps before they draw the clearwell so low that the pumps run dry and are damaged.

The clearwell provides a detention time of 6.3 hours at average day use on 564,000 gallons per day. By implementing water conservation with demand planned at 860,000 gallons per day the current clearwell will provide 3.5 hours detention time. This exceeds the 2.0 hours required by DEQ regulations. The present clearwell capacity is adequate through the planning period of year 2025.

High Service Pumps

The treated water is pumped from the clearwell through a short section of 8-inch and then a 12-inch transmission line to the distribution and storage system. As discussed in Chapter III, the high service pump system is a 30 hp, six-stage pump, and a 40 hp eight-stage pump in parallel. The rating curves for these two pumps show:

- Pump Number 1 is a Gould Model DWT, 9-inch with 8 stages. It is driven by a 40 horsepower motor, and is rated at a 400 gallons-per-minute (gpm) capacity at 300-feet Total Dynamic Head (TDH).
- Pump Number 2 is a Gould Model DWT, 9-inch with 6 stages. It is driven by a 30 horsepower motor, and is rated at a 400 gpm capacity at 234-feet TDH.

These two pumps are mismatched. Neither is operating at the head conditions of its selected operating point given previously. Because the new 12-inch transmission line to the tanks reduces the required pumping pressure, these two pumps running together have a combined capacity of 850 gpm. This is roughly only half the capacity of the plant. With all four filters operating, the plant produces 1,600 gpm. Obviously, the plant can produce nearly twice the water that it can pump to the system with the present pumps. The Ethete system’s forecast maximum summer day demand at the year 2025 is expected to be 1,000 gpm over a 20 hour day. The existing pumps are mismatched to both the system head curve and system demand.

There are two spare clearwell pump locations plumbed in the plant piping. This offers a wide range of opportunities for matching pump capacity to plant production. Plant production can range from 400 to 1600 gpm, in 400 gpm increments, depending on the number of filters being run.

The system model shows that running alone, the existing 40 horsepower unit will produce 530 gpm against the system head of 238-feet and operate at 83% efficiency. The existing 30 horsepower pump will produce 410 gpm at the system head of 235-feet and operate at 85% efficiency. Two 40 horsepower
pumps, identical to the existing one, running in parallel will produce 1,000 gpm against the system head of 261-feet and operate at 80 % efficiency.

**Recommendations**

It is recommended that both pumps be replaced with two identical 8 stage pumps matched to the present system head conditions and producing 1000 gpm when both are running. The 40 horsepower motor can remain in use. The 30 horsepower motor will need to be replaced with a 50 horsepower motor. Pump efficiency could be significantly improved upon by better matching the pump performance to the system head.

The 1000 gpm capacity would match the Ethete area’s supply needs through the year 2025. That rate would still be 600 gpm less than the full production capacity of the plant. It is further recommended that this be done when the existing 30 horsepower pump is changed out.

If future demand significantly exceeds projections, a third pump could be installed in one of the two spare locations and allow the higher demand to be met.

**SCADA System**

The SCADA system automatically records finished water turbidity every 15 minutes. That data is stored in the system for a three-year historical record.

High service pumps are controlled from the tank level through the SCADA system. All on/off set points can be adjusted either at the plant control panel or remotely through the internet. During periods of low demand, only one pump operates. If the tank level falls below the first “pump on” set point, the second pump comes on and additional plant filters are also brought into production.

The SCADA system’s tank level control is equipped with the customary control and alarm conditions:

- low clearwell cutoff,
- clearwell overflow,
- pump start,
- pump stop,
- high and low tank levels, and
- plant start/stop.

Alarm conditions notify the operators of the corresponding problem. If the plant is unattended, the SCADA system automatically dials a sequence of designated phone numbers until an operator responds.

The SCADA system is web based and can be monitored and adjusted by the operators from any internet terminal. This is a feature added to the system in the past year. It significantly enhances reliability of the system and allows the operators to be more efficient with their time. As of July 2009 none of the plant operators had a home computer with internet connection capabilities. This compromises the benefit of the SCADA system’s remote monitoring feature.

**Recommendations**

It is recommended that NAU purchase a laptop computer with internet capability assigned to the plant that can be taken home by the operator on call so that the plant operation can be monitored and adjusted remotely if needed.
Operationally Critical Spare Parts

The operators report that they frequently have to shut down the plant for periods ranging from one day to several days while they await the arrival of a key controller, valve actuator or other failed part that is required to allow the plant to operate, because they do not have on hand commonly failing parts. When this occurs, the plant and entire system is in operational failure.

Recommendation

It is recommended that NAU maintain a minimum inventory of one replacement part for each of the expendable, commonly failing plant parts. This simple change will significantly improve the plant and system's operational integrity.

Storage

Currently, the Ethete system has 1.85 million gallons of storage. This is comprised of three welded steel tanks having capacities of 1,500,000 gallons, 250,000 gallons, and 100,000 gallons. All modeling of the system demands shows that this storage volume exceeds needed capacity.

All three tanks show coating deterioration as noted in Chapter III. The 250,000 gallon tank has a privately owned wireless internet service antenna mounted on it, accompanied by an equipment building. This unit has security fencing that blocks access to the tank ladder.

Security fencing has not been provided around the tanks. They are very visible to and accessible to the public. The access ladders are securely locked, however.

The access road to the tanks is marginal. It is a “two track” requiring four-wheel drive to access the site, especially in winter months and in wet conditions.

The privately owned wireless internet service equipment mounted on the small tank is a conflicting use of the storage tank. Because of the way the equipment is secured, it blocks access to the ladder on the tank. This is an inappropriate arrangement and conflicts with NAU’s ability and need to serve its customers.

Plunkett Road Tank

Modeling shows that having the Plunkett Tank on line will improve fire flow to Mill Creek Housing nearly as much as extending the Yellow Calf Road Line to 17-Mile Road and would be less expensive. In spite of this economic advantage, it is recommended that this tank remain out of service for the following reasons:

- The southern end of the system serves fewer than 50 taps.
- The water stored in this tank would get very little circulation, become stagnant, and generate taste and odor complaints.
- Because of its remote location on the system, its filling and draining may lag that of the main tanks and cause operational complaints.
- The system has functioned adequately for the past 20 years with this tank off-line.

**Recommendations**

1. Drain, inspect, and structurally refurbish ladders, center supports, and corroded spots in all three tanks as needed to maintain their integrity.
2. Repaint the exterior and interior of all three tanks.
3. Leave the Plunkett Tank off the system, as it provides little benefit and is too costly to repair.
4. Install security fence around all three tanks.
5. Upgrade the tank access road to an all-weather graveled surface.
6. Remove the private wireless internet facility from the 0.25 MG tank.

**Finished Water Transmission**

As discussed in Chapter III, the finished transmission system has adequate capacity and would function significantly better in fire flow delivery if the two parallel lines at Highway 132 were joined together east of the tanks at Wyoming Highway 132, Blue Sky Highway.

**Recommendation**

Connect the 10-inch and 8-inch lines together, as stated above, as this will significantly improve fire protection capabilities and add flexibility to the system’s water delivery capabilities.

**Distribution Metering and Backflow Protection**

The Ethete system is not metered, as is mentioned in Chapter III. Also, the individual services do not have a backflow device on them to protect the system from contamination.

Metering is the only way to effectively regulate use and to fairly charge for the usage. Without metering, NAU cannot determine whether there are unusual levels of water leakage from the system. It is the opinion of the authors of this report that substantial leakage is occurring in the system, as discussed in the end of Chapter III. Having meters on the system would improve revenues to the NAU, help conserve water, and would give NAU valuable water management information regarding possible leak volumes and usage patterns.

It is known that some services are “daisy-chained” together – more than one user or home connected to the same service line. This condition makes administration of water use impossible as NAU can not turn off service to a single user who is not paying their bill without also turning off service to a paying user.

A potential health threat exists because none of the services have backflow protection devices on them. This is of particular concern on the Ethete system because some residents water livestock from their service. If a vacuum were to occur on the system due to a system break or a fire pump drawing on the system, a garden hose left in a horse trough, for example, could suck contaminated water back into the main system, resulting in a public health threat. In most current day urban systems, this would constitute a code violation. This health threat needs to be addressed on the Ethete system.
Recommendations

1. It is strongly recommended that NAU install meters on all services on the system. It is recognized that this will be a major undertaking. The benefits will heavily outweigh both the costs and the political resistance that is expected.
2. Require, along with meters, that each water use on the system have a backflow prevention device.
3. Separate all daisy-chained services so that each service is controlled with its own shut-off valve.

Distribution Piping

The current distribution system for the Ethete area is comprised of several sizes and types of pipe material. These are detailed in Chapter III. There are several distribution lines within the system that are smaller than 6-inches in diameter, the minimum size recognized by industry standards for municipal systems.

The different pipe materials within the system are comprised of Asbestos Cement (AC), Poly Vinyl Chloride, “thin-wall” SDR 41 PVC, and Polyethylene (PE). There may be additional materials used and not recorded.

Based on the inventory of the system, over three miles of the system’s distribution lines are undersized. Several of the lines are mismatched to demand and create system bottlenecks. In other locations lines are not looped, again creating flow delivery constraints, especially under fire demand conditions.

Based on modeling of the system as discussed in Chapter III, several distribution system line upgrade improvements were identified. The balance of this section gives recommendations based on those identified needs. Each is accompanied by a sketch showing a section of the distribution system and the recommended pipe changes or additions.

The legend below applies to all eight (8) of the system segment sketches in the balance of this chapter. Each segment sketch depicts the recommended line replacement or addition determined to be needed based on the results of the system modeling.

Recommendations

A prioritized list of recommendations for distribution improvements is given below. These include improvements that will upgrade the undersized lines to current minimum standards and will make appreciable improvements in fire flow.

The legend applies to all eight of the system segment sketches in the balance of this chapter. Each segment sketch depicts the recommended line replacement or addition determined to be necessary based on system modeling. These sketches are not drawn to scale, but rather are conceptual renderings for the reader’s benefit.
LEGEND

- 12 INCH DIA PIPE
- 10 INCH DIA PIPE
- 8 INCH DIA PIPE
- 6 INCH DIA PIPE
- PROPOSED 10 INCH DIA PIPE
- PROPOSED 8 INCH DIA PIPE
- PROPOSED 6 INCH DIA PIPE

Water Treatment Plant to Wyoming Highway 132 (Blue Sky Highway)

1. Upgrade all 4-inch and 6-inch asbestos cement lines along Ethete Road to 6-inch PVC. This will provide a fire flow of 2,750 gpm to Blue Sky Hall.

   Figure IV-10: Ethete Road Recommendations

Wyoming Indian Middle School, Wind River Tribal College, and St. Michael’s Mission

1. Upgrade the 3-inch PVC dead-end lines to the Middle School and to the Tribal College with 6-inch PVC lines and loop them together with a 6-inch PVC line.
2. Loop the 6-inch PVC stub-outs at St. Michaels Mission with a 6-inch PVC line, and connect this loop to the Middle School and Tribal College loop with 6-inch PVC.

These improvements will allow for a fire flow of 3,050 gpm at the Middle School, 3,400 gpm at the Tribal College, and 3,550 gpm to the mission complex.
Ethete Housing and Little Wind River Casino

1. Replace all 6-inch asbestos cement and 2-inch polyethylene lines in the Ethete housing area with 6-inch PVC.
2. Replace the 4-inch asbestos cement line running parallel with Blue Sky Highway (WY 132) north of Ethete Road to the Casino with 8-inch PVC.
3. As shown below, construct a 6-inch PVC loop to the northern end of the proposed 6-inch PVC upgrade line in Willow Street to the proposed 8-inch line upgrade in Blue Sky Highway north of Ethete Road.
These improvements will increase the fire flow for the new Little Wind Casino to 1,700 gpm.

**Wyoming Indian High School Vicinity**

1. Loop the two existing dead-end 6-inch PVC lines with an 8-inch PVC line.
2. Connect the 8-inch and 10-inch PVC transmission lines coming from the storage tanks. Make this connection in the area of the High School. (These changes will provide a fire flow of 3,300 gpm to the High School.)
3. Upgrade the northern 6-inch dead-end line to recommended 8-inch PVC to achieve a fire flow of over 4,000 gpm for the High School.

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*Figure IV-12 Ethete Subdivision and Casino Recommendations*
Ethete Store and Tribal Facilities at the Ethete Junction

1. Upgrade to 6-inch PVC the 4-inch and 6-inch asbestos cement lines now supplying the convenience store/casino and Tribal Facilities and tie it into the line west of this complex.
2. Upgrade to 6-inch PVC the 4-inch asbestos cement line immediately west of the tribal offices which runs perpendicular to and south from Ethete Road.

These improvements will allow meeting the recommended fire flow of 3,350 gpm to the surrounding facilities.
System Additions

The three system additions listed below are recommended looping on the existing system that will result in significant improvements in fire flow delivery, circulation of flow, and better system reliability through redundancy in the event of line breaks.

The Trosper Lane line reconnection is simply the repair or replacement of a line which was broken (drilled through) with the installation of the overhead power line that parallels the eastern part of this road.

Recommendations

1. Yellow Calf Road Loop
   I. Extend a 6-inch PVC east from Lone Bear Lane to the 6-inch PVC distribution line on Yellow Calf Road.
   II. Extend the 6-inch PVC line that parallels the west side of Yellow Calf Road south of Ethete Road to 17-Mile Road.

Figure IV-15 Yellow Calf Road Loop
The additions on Yellow Calf Road will significantly improve fire flow delivery to Mill Creek Housing and improve system circulation.

2. **Trosper Lane Loop**
   Connect the existing 6-inch PVC line under Trosper Lane to the existing 6-inch PVC line under Plunkett Road.

   This reconnection will return the distribution system to its original configuration and integrity. It will improve system circulation and redundancy.

3. **Mill Creek Housing**
   I. If the Yellow Calf Road loop is constructed, the fire flow for Mill Creek Housing will be approximately 765 gpm.
   II. If the Trosper Lane loop is constructed, Mill Creek Housing will receive approximately 530 gpm fire flow.
   III. If both the Yellow Calf Road loop and the Trosper Lane loop are constructed, the fire flow to Mill Creek Housing will be 735 gpm.

   These improved fire flows can be compared with the existing fire flows inventoried in the Analysis section of Chapter III.

**Distribution Pressure Control**

Currently the system has no functional pressure control. As noted in Chapter III, the pressure reducing stations on the system are in a state of neglect and complete functional disarray. Several are flooded with groundwater or from system leaks. Based on the few pressure measurements made on the system it was determined that none are functioning.

**Recommendations**

1. It is recommended that all of the pressure reducing stations be reconstructed with the exception of the one near Wyoming Indian High School. Install the pressure reducing stations at the location and elevations shown in the system pressure zone map. Making this improvement will provide adequate pressure within recommended operating levels of 40 to 80 psi.

2. The 48-inch cast iron cover on the PRV vault near the high school is too heavy for one person to move and get access to the station. This impedes operation and necessary maintenance. It is recommended that this cover be replaced with a lockable Bilco hatch.
Distribution Leak Detection

As discussed in the preceding chapter, by all standard measures the Ethete system uses over a third more water than is normal for the base population. Some of that excessive use can be attributed to the system not being metered. Even with that consideration the per capita deliveries are well in excess of normal ranges. It is suspicioned that a significant amount of water is being lost through system leaks or unauthorized uses. As discussed in Chapter II water loss and excess consumption in the Ethete system is costing the system approximately $160,000 dollars per year.

Recommendations

1. Conduct a leak detection program covering all lines in the system.

Other Water Distribution System Recommendations

The Ethete system could operate with greater efficiency and serve future demands at lower cost if a few policy changes were implemented, especially by limiting any further geographical expansion of service. Standardization of the system materials will significantly enhance operation efficiency and allow faster and more effective repair of the system when failures occur. In that vein the following are made:

1. Replace the fabricated flushing pipes with fire hydrants.
2. Use only AWWA C-900 PVC minimum 6-inch diameter pipe for all new and replacement lines
3. Standardize all water system valves and hydrants to a single brand such as Muller or Waterous.
4. Concentrate future development in areas where the system is already available and fire protection is adequate.
5. Work with the BIA to stop their practice of issuing home sites as this creates disconnected areas of concentrated development that, through time, turn into villages demanding central systems.
6. Limit future expansion of the system to areas that have at least 10 services per mile.
7. Provide service only to customers on the south end of Plunkett Road who are at elevation of 5,580 or lower. This is the highest elevation that will provide 20 psi service pressure.
CHAPTER V

GROUNDWATER ALTERNATIVES

Introduction

An initial geohydrological investigation of the Ethete area identified four potential aquifers that may realistically be capable of providing the Northern Arapahoe with a groundwater source. These four aquifers are the Little Wind River Alluvium, the Tertiary Wind River and Ft. Union Formations, the Tensleep Formation, and the Madison Formation. These four aquifers were combined into three potential groundwater alternative sites: Alternative #1 – Madison Aquifer Site; Alternative #2 – Tertiary Aquifers Site; and Alternative #3 – Alluvial Aquifer Site. These proposed alternative sites are shown in Figure V-1. After identifying the potential groundwater sources, exploration and/or development sites were proposed for each of the alternatives and costs associated with developing each of these potential sources of groundwater were developed and presented to the Wyoming Water Development Commission Project Manager and representatives from the Northern Arapahoe Tribe for their input and selection of a preferred alternative for exploring the potential of developing a groundwater supply source. The technical memorandums which summarize the geohydrologic investigation and the aquifer development costs are presented as appendices in the separate report that describes the groundwater investigation work that was performed as part of this Northern Arapaho Groundwater Project.

The costs of each groundwater-supply option were addressed from two perspectives: 1) the exploration cost, i.e. what it would take to evaluate the alternative as a future part of the Ethete water system; and 2) the development and operation costs to actually construct the facilities necessary to bring the alternative on line. The exploration program costs for each alternative were based on one well, designed to allow production of 350 gpm, if possible, delivered into the Ethete water system. The development program costs were based on sufficient wells to meet the projected design demand.

Test well sites selected for these four aquifers were based upon trying to minimize the distance from the existing Ethete water system while staying within the general target areas identified during the hydrogeologic review. One other option that was incorporated into the overall ranking of the proposed groundwater alternatives was the benefit to a regional Ethete/Arapahoe system rather than just the Ethete system. The remainder of this section describes the results of the exploration phase for each of the three alternatives investigated.
ALTERNATIVE NO. 1 – MADISON AQUIFER (Paleozoic)

A meeting was held December 1, 2004, at the Arapaho Tribal Headquarters to review the geohydrologic information and the estimated cost to develop, operate, and maintain each of the groundwater sources and to discuss the options with representatives of the Northern Arapaho Tribe and the Water Development Commission. It was decided at that meeting to initially conduct a test drilling effort on the Sage Creek Anticline immediately southeast of Ethete. (Figure V-2)

Access to the site was procured and specifications were developed for the well. Bids were received on October 17, 2005. The Northern Arapaho Madison Test Well was designed to be drilled to a total depth of approximately 4,050 feet and fully penetrate the Mississippian Madison Formation.

Only one bid was received from Layne-Western Company in the amount of $1,640,514.00 for the base bid and $1,807,674.00 for the base bid plus the alternate for completing the well in the Tensleep Formation. The bid was rejected because the amount of the bid greatly exceeded the amount budgeted for the well. Additional funds were sought because the amount budgeted in 2004 was not going to be sufficient to drill the well with rapidly rising drilling costs.

The well was re-bid in 2006. A pre-bid meeting was held at the Wind River Tribal College at the Arapaho Tribal Headquarters on May 4, 2006. Four drilling firms were present for the pre-bid meeting and bids were received on May 17, 2006 at the offices of James Gores and Associates. Two bids were received from D.C. Drilling Company of Lusk, Wyoming in the amount of $818,088.80 and Layne-Western Company of Aurora, Colorado in the amount $1,096,930.00. The project was awarded to D.C. Drilling Company. A Notice to Proceed was issued to D.C. Drilling Company on June 9, 2006.

Test Well Drilling and Construction

The drilling of the Northern Arapaho Paleozoic Test Well, Wyoming State Engineer Permit No. U.W. 181057, was initiated on October 19, 2006 and drilling was terminated on March 8, 2007. The contractor encountered numerous obstacles during the drilling of this well. After setting surface casing to 50 feet below ground level, a 14¾-inch diameter borehole was then advanced to a depth of 374 feet below.
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ground level (bgl) inside of which 374 feet of 10¾-inch O.D., 40.5 lb/ft, J-55 steel casing was set and cemented in place. A 9½-inch diameter borehole was drilled to 1,369 feet bgl using a hammer bit. At 1,369 feet, due to excessive production of groundwater, the use of the hammer bit was discontinued and the borehole was advanced using an 8¾-inch button bit and a mud system. The 8¾-inch borehole was advanced to a depth of 2,383 feet bgl. At this depth, the drill string became differentially stuck in the borehole. Attempts to free the drill string were unsuccessful so a wireline subcontractor was called in to perform a free point survey to determine the depth at which the drill string was differentially stuck. The free point survey indicated that the drill pipe was stuck between 400 and 500 feet. After rigging down the wireline subcontractor, the contractor used air to unload the fluid from the borehole and was successful in freeing up the drill string.

The contractor advanced the 8¾-inch diameter borehole from 2,383 feet bgl to 3,599 feet bgl where the geologist on site interpreted that the top of the Madison had been reached and the well was geophysically logged. After reviewing the geophysical log, it was determined that the geologist on site had misinterpreted a limestone sequence in the Amsden Formation as the top of the Madison Formation. The contractor was informed that he would need to continue drilling the 8¾-inch diameter borehole. While trying to run a density log on the well, the logging truck motor on the cable spool malfunctioned. After repairing the motor, it was determined that the logging tool was stuck in the borehole. The contractor fabricated a side door fishing tool and then picked up 14 joints of 3½-inch drill pipe and tripped into the borehole to attempt to retrieve the logging tool. The drill pipe with side door tool was slipped over the logging tool wire. While trying to retrieve the logging tool, the side door tool cut the logging tool cable. A wireline fishing tool was delivered to the drill site and used to retrieve the logging tool. It required three days to fish and retrieve the logging tool and severed cable.

The contractor continued drilling the 8¾-inch borehole from 3,599 feet bgl to a total depth of 4,026 feet bgl. They reached this depth on January 27, 2007. At this depth, the drilling assembly became stuck in the borehole. The contractor was able to work the drill string free. However, when freeing the drilling assembly, the kelly was bent along with several joints of drill pipe. Drilling was discontinued for over a week while the contractor straightened out the kelly and bent sections of the drill pipe. On February 8, 2007, the contractor began working the drill string back into the borehole. While working the bit back to bottom, at a depth of 3,850 bgl, on February 10, 2007, the bit bound up and the driller could not advance it beyond this point. They worked for several days to adjust the drilling fluid properties to allow them to work past this troublesome spot. However, they were unsuccessful. On February 12, 2007, a cementing subcontractor (Sanjel) arrived on site and placed a balanced cement plug with 150 sacks (164 cubic feet) of Type A cement with calcium chloride accelerator and cellophane flakes in an attempt to stabilize the borehole sidewall which was sloughing in behind the bit, causing it to bind. The cement plug was placed from approximately 3,550 feet to 3,830 feet bgl. After spotting the plug and rigging down the cementers, the contractor tripped back into the borehole to drill through the cement plug in order to advance the 8¾-inch borehole. Because of the difficulty that the contractor was having in the lower portion of the well, the contractor surmised that the borehole had deviated farther from plumb. The contractor had performed two deviation surveys prior to this time. The first was taken at a depth of 374 feet below ground level and it recorded a deviation of 1°. The second measurement was taken at a depth of 2,100 feet and the deviation was 3°. The contractor attempted to drill the remaining section of the borehole with a mud motor in an attempt to control the deviation of the borehole, however, after drilling approximately 40 feet of the cement plug (3,550 feet to 3,590 feet bgl) the drilling assembly became stuck in the borehole. The contractor was able to free the drilling assembly after working with it for two days (February 15-16, 2007). The drill string was freed by unloading the drilling fluid with air as was done previously. The contractor requested that casing be set to this depth before trying to advance the borehole. This request was granted.
On February 21 and 22, 2007, the contractor re-entered the borehole without the mud motor and stabilizer joint and cleaned out and conditioned the borehole to a depth of 3,610 feet bgl and then set and cemented in place 7-inch, J-55, 23 lb/ft steel casing to a depth of 3,588.5 feet bgl. The casing was set in a tapered liner/hanger at a depth of 350 feet bgl that had been welded in the 10¾-inch casing. After the cement had sufficiently cured, the contractor switched over to a slim-hole bottom-hole assembly (6¾-inch button bit and 3½-inch drill pipe). The well was re-entered and drilling began to remove the cement plug and clean out the 8¾-inch borehole in order to continue drilling the well to the Madison Formation. With the bit at a depth of 3,990 feet bgl, the driller became stuck in the borehole. A free point survey was conducted and it was determined that the drill string was stuck at approximately the top of the 4th drill collar or at a depth of approximately 3,870 feet below ground level. The drill string was shot off at the top of the 4th drill collar on March 5, 2007 leaving behind in the borehole a 6¾-inch button bit, bit sub and four sections of drill collars. On March 6 and 7, 2007, the contractor attempted to retrieve the drill collars and bit by running in a wash-over pipe. The driller was unable to wash over the collars. It is believed that the lower section of the drill string was “key-seated” and that the wash-over pipe was running down along side of the drill collars instead of over the top of the collars. Key-seated is a term used to describe when the drill string is pushed over into a smaller, cut section, of the borehole that was formed by the drill pipe rubbing or wearing a smaller, parallel borehole along one side of the original borehole. Drilling of the Paleozoic Test Well was terminated on March 8, 2007.

Due to the difficulties in retrieving the lost drill string, it was decided to abbreviate the well drilling program and to complete the Northern Arapaho Test Well in the Tensleep Formation. On March 13, 2007 Goodwell Incorporated arrived on site and ran a Cement Bond Log and Gamma Ray-Neutron-Caliper log. The Gamma Ray-Neutron log was run to a depth of 3,795 feet below ground level. After logging the well, Goodwell set a bridge plug at a depth of 3,570 feet bgl and perforated the casing across the Tensleep Sandstone at depths of:

- 3,195 – 3,215 feet bgl,
- 3,230 – 3,280 feet bgl,
- 3,385 – 3,415 feet bgl, and at
- 3,485 – 3,495 feet bgl with 23 gram jets (a total of 110 shots).

The perforated zones were determined after reviewing the neutron porosity log and picking the sections of the Tensleep with the highest porosity. The construction of the Arapaho Test Well is shown on Figure V-3.
16 INCH SURFACE CASING SET TO A DEPTH OF 50 FEET WITH WALL THICKNESS OF 0.25 INCHES

14 3/4-INCH BOREHOLE TO A DEPTH OF 374 FEET BELOW GROUND SURFACE

10¼ INCH O.D., 40.5 LB/FT, API J-55 STEEL CASING SET AT APPROX. 374 FEET BGL

TAPERED STEEL LINER/HANGER SET AT 350 FEET BGL

9½-INCH DIA. BOREHOLE TO 1,369 FEET BGL

8½-INCH DIA. BOREHOLE TO 4,026 FEET BGL

7-INCH O.D., 23 LB/FT, API J-55 CASING SET FROM 350 FEET BGL TO 3,588.5 FEET BGL

NEAT CEMENT GROUT

PERFORATIONS (23 GRAM JETS) FROM: 3195’ - 3215’ 3230’ - 3280’ 3385’ - 3415’ 3485’ - 3495’

6¼-INCH BOTTOM HOLE ASSEMBLY STUCK IN BOREHOLE FROM APPROXIMATELY 3,870 FEET BGL TO 3,990 FEET BGL - CONSISTS OF 6¼-INCH BIT, BIT SUB AND FOUR 4-INCH DRILL COLLARS

8¾ INCH DIA. BOREHOLE AT WELL TD AT 4,026 FEET BGL

Figure V-3: Madison Test Well As-Built Diagram
Test Well Development

After the well was cased and perforated, it was then air developed with 950 cubic feet per minute (CFM) through the 2½-inch drill stem from a depth of 1,000 feet. During the course of development, there was very little back pressure on the compressors, indicating that the casing was being blown free of water to the bottom of the drill stem. Estimated production was about 50 to 70 gpm. Initially, the water quality was very poor with conductivity measurements as high as 12,500 Ωmhos/cm (~8400 mg/l total dissolved solids), probably due to drilling fluid being developed from the formations. By the end of the air development, 22.75 hours spread over 3 days, the conductivity dropped to 880 Ωmhos/cm (~590 mg/l TDS), which indicates fairly good water quality. The U.S. Environmental Protection Agency recommends a maximum of 500 mg/l of total dissolved solids. A sample was gathered and sent to Energy Laboratories for analysis.

As indicated, the air development took place over three days. By the end of the first day’s air development, the conductivity dropped to 1,883 Ωmhos/cm (~1250 mg/l TDS). At commencement of air development the next morning, the initial conductivity was measured at 4,550 Ωmhos/cm (~3,050 mg/l TDS), but by the end of the day, the conductivity had dropped to 989 Ωmhos/cm (~660 mg/l TDS). On the final morning, the conductivity started at 4,978 Ωmhos/cm and rapidly dropped to 882 Ωmhos/cm (~590 mg/l TDS) at which point the laboratory samples were taken. This high conductivity at each startup of air development indicates there is a leak from higher in the well, i.e., when the compressors are turned off, the water from the leak flows in on top of the water produced from the Tensleep Formation.

Well Testing

After the water quality analyses were received, it was noted that the water was very similar to that flowing at the Washakie Plunge which reportedly has high radionuclides in the water. The samples taken from the Tensleep Formation in the exploration well were not initially analyzed for radionuclides. In an attempt to get a sample from the well, a small ½-horsepower pump was installed in the well and the well was pumped. Unfortunately, the well pumped off at 3.3 gallons per minute at a depth of 200 feet. A larger 1½-horsepower pump was installed and the well was pumped for 24 hours. At the end of 24 hours, the well was producing 5 gallons per minute from a depth of 287.2 feet (213 feet of drawdown from the static water level of 74.35 feet). There was no distinguishable drop in conductivity over the period.

Slightly more than one casing volume was pumped from the well during this short test. The lack of change in conductivity over the 5-gpm pump test indicates that leakage water was not simply sitting on top of the Tensleep water, but instead had forced Tensleep water (the 880 Ωmhos/cm water at the end of development) from the casing. This indicates that the Tensleep water level is lower than the 74 feet measured for the static water level in the well.

The lowest reasonable static water level in the Tensleep Formation is somewhat more than the elevation of the Washakie Hot Springs, a surface discharge point for the Paleozoic aquifer system, at 5,470-ft elevation. This elevation is equivalent to a depth of 300 feet at the well site. If the Tensleep static water level was at 300 feet, no Tensleep water was being produced during the 5 gpm pumping, but leakage of about 5 gpm is sufficient to build up 226 feet of head against the Tensleep aquifer (difference of static water level of 74 feet and assumed static water level of 300 feet in the Tensleep Formation). Based on previous experience with injection of produced coal bed methane water into the Fort Union Formation near Gillette, injection specific capacities are typically 70-75 percent of production capacities. Thus, the above-scenario indicates a Tensleep specific capacity of only 0.030 gallons per foot of drawdown.
specific capacity on the order of 0.03 gpm/ft would not provide the target production of 200 or 300 gallons per minute. The pumping levels would be in excess of the bottom of the Tensleep Formation. The water sample analyzed from the Tensleep Aquifer came back non-detect for Radium 226.

Summary

In summary, based on the pumping data collected, it did not appear that the Tensleep Formation would be a viable aquifer in Ethete area. Even assuming production similar to other Tensleep Formation wells in the area, the pumping level would have been extremely deep and the operating costs very high. A single well or a couple of Tensleep wells in the test well area would also not alleviate the immediate needs of the tribe, much less the anticipated future needs. Finally, the quality of water from this well is marginal and not as good as other Tensleep wells in the area.

It was also noted that the faults encountered when drilling the test well appeared to be filled with debris and no lost circulation conditions were encountered when the test well was drilled through these faults and the Tensleep Formation. It is, therefore, likely that these faults are also filled with debris as they extend through the Madison Formation. Due to the inability to complete the Madison Test Well in the Madison Formation, the production potential of the Madison is unknown. However, based on the lack of fracturing observed in the overlying formations and the generally poor production from the Madison Formation in other wells in the area (most located on the north flank of the Wind River Range), it is unlikely that this formation will yield the quantities of water desired to meet the current and projected Ethete system demands. Based on the lack of productivity from the Tensleep Aquifer and the poor water quality, it was recommended the groundwater investigation focus on other aquifers that appear to have a better development potential and the potential for resolving the water shortage in the area.

On November 9, 2007, a coiled tubing unit was brought in and the well was filled with cement from the bridge plug to a depth of 350 feet.

ALTERNATIVE NO. 2 – TERTIARY AQUIFERs

Based on the results of the Paleozoic test well, the Northern Arapaho requested that their project funds with the Wyoming Water Development Commission be expanded to allow them to investigate the feasibility of developing the Wind River and/or Ft. Union Aquifers in the area. The location for the Wind River Test Well was selected based on maintaining a relatively short distance to tie the well into the existing Ethete water supply system while still being capable of intercepting an optimum saturated thickness of the Wind River Formation. The final location of the test well was placed in the SW¼, NE¼ of Section 19, Township 1 North, and Range 2 East of the Wind River Meridian (See Figure V-4).

From the existing well control in the area, it was determined that a well drilled to a depth of approximately 1,300 feet would fully penetrate the Wind River Formation. The depth to the Ft. Union Formation at the test well is estimated to be approximately 1,600 feet below ground level. Due to the poor production and poor water quality from the Ft. Union Formation in the Hudson Well (WWDC – Hudson Water Supply Project), it was assumed that these qualities would not improve in the Arapaho Wind River Test Well location which is located further from the recharge area than that of the Hudson test well. Therefore, the Ft. Union Formation was not a target aquifer in the Wind River Test Well.

Once clearance was approved for access to the drill site, the project was let for bid. A total of four bids were received. These were from D.C. Drilling Company of Lusk, Wyoming in the amount of $371,873.00, Nucor, Inc. of Riverton, Wyoming in the amount of $439,580.00, Sargent Drilling from
Broken Bow, Nebraska in the amount of $807,351.00 and Range Drilling from Riverton, Wyoming in the amount $391,072.60. The project was awarded to D.C. Drilling Company. A Notice to Proceed was issued to D.C. Drilling Company on September 17, 2008.

Test Well Drilling and Construction

The drilling of the Ethete Wind River Test Well, Wyoming State Engineer’s Permit No. U.W. 188694, was initiated on September 19, 2008 using a Midway 2250 rotary drilling rig. After surface casing was set and cemented in place to a depth of 54 feet bgl, a 12⅛-inch diameter borehole was advanced to a total depth of 1,300 feet bgl using a light bentonite mud drilling fluid. It required approximately 4 days to drill the 1,246 feet of 12⅛-inch borehole.

After conditioning the borehole, the geophysical logging subcontractor, Strata Data from Casper, Wyoming, ran two suites of logs: the first a resistivity, gamma and SP log and the second a gamma-gamma density log and caliper log. From the geophysical logs the depth and length of screened sections were determined. This information was delivered to the contractor so that he could start constructing the production liner. On October 3, 2008, the contractor ran in approximately 1,205 feet of 8⅝-inch O.D., 0.322 wall, ASTM A53 Grade B steel casing (1,055 feet) and 8-inch pipe size stainless steel screen (150 feet). The casing (steel cap) was landed at a depth of 1,203 feet below ground level. Shale baskets were installed on top of each screened section to prevent the migration of fines down the annular space and into the screened intervals.

The casing was cemented in place on the following day. Prior to placing the casing, the contractor installed a float collar in the casing string at a depth of 417 feet bgl. Above the float collar, at a depth of approximately 415.5 feet bgl, three holes were drilled in the steel casing. Below the float collar, two cement baskets were attached to the outside of the casing string. The depths of these two cement baskets were 423 feet bgl and 439 feet bgl. During the cementing operations there were good returns of cement to the surface with an estimated 15 bbls of cement being displaced to the mud pits. The construction of the Wind River Test Well is shown on Figure V-5.
Well Development

After allowing the cement to cure for several days, the well development program was begun. Initial development efforts consisted of jetting the screens. Each screen section was jetted for approximately 2 to 3 minutes per foot of screen. The well did not take a lot of water during the jetting operation. After tripping out the jetting tool, the contractor ran in their 3½-inch drill pipe to a depth of 400 feet bgl and began air-lifting the well. The production at this depth was approximately 25 gpm. After air-lifting from this depth for approximately two hours, the contractor lowered the drill pipe to 500 feet bgl and air-lifted from this depth. At this depth, the production increased to approximately 60 gpm. Air development on the well was continued for approximately 19½ hours with periods of shut down to allow the well to recover and also to surge the well. After approximately 21½ hours of air development, the water was clear and would remain clear after shutting down the development and/or surging the well. The production from the well also did not increase significantly through the air-development efforts (remained approximately 60 to 70 gpm); therefore, it was decided to terminate the well development and prepare to pump test the well.

![Figure V-5: Wind River Test Well As-Built Diagram](image-url)
Well Testing

It was originally anticipated that the Wind River Test Well would be capable of producing over 200 gpm. This was based upon the available well data in the area and production history of the Wind River Aquifer in the Wind River Basin. However, based upon the lack of production during the air-development efforts, it was decided to modify the required test pump from one capable of delivering 300 gpm from a pumping depth of 700 feet to one capable of delivering 100 gpm from this same depth.

On October 20, 2008, the contractor installed the test pump and checked the pump rotation. The step test was initiated on October 21, 2008. The step test consisted of pumping the well at different rates for a period of approximately 40 minutes and measuring the total drawdown experienced in the well through each step. To ensure that casing storage effects were not a factor, discharge was continued until the well started to stabilize. A static water level of 345.78 feet bgl was recorded prior to starting the step test. The pumping rate for the first step was approximately 20 gpm. A total of 7 steps were conducted. The subsequent discharge rates were 40 gpm, 60 gpm, 80 gpm, 100 gpm, 120 gpm and 130 gpm. Table III-1 is a summation of the step test. The results of the step test indicate that the well is operating at a fairly high efficiency.

From the step test data, it was apparent that the well was capable of producing in excess of 130 gpm. However, because the test pump could not maintain a discharge rate of greater than 120 gpm for the duration of the long term test, the discharge rate for the long-term test was set at 120 gpm. The constant rate drawdown test was initiated at the conclusion of the last step in the step test without allowing the well to recover. The drawdown test was conducted for a total period of time of 73.3 hours. The drawdown at the conclusion of the constant rate test was 78.3 feet. The transmissivity calculated from the slope of the drawdown data at the conclusion of the test is approximately 63,600 gpd/ft. At the conclusion of the test, the well had essentially reached a point of equilibrium where the inflow from the contributing area of the aquifer was equal to the discharge from the well. The transmissivity of the aquifer in the early time is approximately equal to 4,000 gpd/ft. Following the drawdown test, recovery was monitored for another 22-hour period (98% recovered). The analysis from the recovery data indicated a transmissivity value of 7,900 gpd/ft, which is slightly higher than the transmissivity calculated from the drawdown data.

With the approval of the WWDC Project Manager, it was decided to perform a second long term test on the Northern Arapaho Wind River Test Well in January of 2009. The reasons for performing this second test were two-fold. First, because the aquifer was not significantly stressed during the initial constant rate test, the second test was performed at a higher discharge rate to better quantify the long-term production potential of the aquifer. The second purpose was to see if the radionuclide levels in the well would be lowered when pumped at a higher discharge rate.

The second constant rate test was run for 72 hours from January 12, 2009 through January 15, 2009. The pumping rate for this second test averaged 254 gpm. The discharge was adjusted throughout the test to try to maintain the discharge rate at 250 gpm. The average discharge rate was based on the total volume of water pumped as recorded by the flowmeter divided by the length of the test. The drawdown at the end of the constant rate test was approximately 136 feet. The transmissivity calculated from the slope of the drawdown data at the conclusion of the test is approximately 11,200 gpd/ft. This indicates that at this

<table>
<thead>
<tr>
<th>Table V-1: Step Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pumping Rate (gpm)</strong></td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>60</td>
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<tr>
<td>80</td>
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<tr>
<td>100</td>
</tr>
<tr>
<td>120</td>
</tr>
<tr>
<td>130</td>
</tr>
</tbody>
</table>
discharge rate the aquifer had not reached a state of near equilibrium as it had during the initial test at the lower discharge rate. The transmissivity of the aquifer in the early time is approximately equal to 4,060 gpd/ft which is in good agreement with the result from the initial drawdown test.

Recovery data was collected following the termination of the drawdown test for a period of 210 minutes at which time the well had recovered to within 7 feet of the initial static water level (95% recovery). The transmissivity calculated from this test is approximately 4,100 gpd/ft which is in good agreement with the transmissivity calculated from the early data in the drawdown test.

From a production standpoint, the Wind River Aquifer is a viable groundwater source for the Northern Arapaho Tribe in the Ethete area. In order to meet the anticipated demands of the Ethete water supply system, a total production of approximately 1,050 gpm will be required. To meet this demand, a total of four Wind River Aquifer wells will be required.

Water Quality

Water samples were collected near the conclusion of each of the long term constant drawdown tests and submitted to an EPA certified laboratory for analysis. In addition, the temperature, conductivity and pH of the water were monitored throughout each of the aquifer tests performed. The water temperature rises steadily from approximately 19.3°C (66.7°F) at the beginning of the test to a temperature of 21.9°C (71.4°F) at the conclusion of the test. The conductivity and the pH of the discharged water remains fairly constant over the length of aquifer test. The pH ranged from 7.68 to 7.97 while the conductivity ranged from 745 to 758 micromhos per centimeter. The field recorded conductivity and pH values are in close agreement with the laboratory results (pH of 7.65 and conductivity of 800 micromhos/cm).

At the onset of this project, the quality of water produced from the Wind River Aquifer was one of the major uncertainties associated with the potential for developing this groundwater source. The quality of the groundwater from the Wind River Aquifer in the area of the Test Well was anticipated to be good, however, it is well documented that the quality of the water from the Wind River Aquifer is quite variable in the Wind River Basin. The quality of the water produced by the Wind River Test Well is generally very good. This water satisfies all of EPA’s Primary Drinking Water Standards with the exception of the radium level (Radium 226 plus Radium 228). The radium level is approximately 0.1 to 0.4 pCi/l above the standard. Additionally, the water meets most of the Secondary Drinking Water Standards except for iron, manganese, total dissolved solids (TDS) and turbidity. The turbidity level will drop with production from the well as the fines are slowly removed from near the well screen. The TDS is just slightly above the MCL of 500 mg/l and, therefore, should not present any taste or odor problems. The iron and
manganese levels are well above the MCL (approximately one order of magnitude above the MCL) and could present taste and staining problems.

**Conceptual Well Field Design and Cost Estimate**

As reported earlier, a total of four wells, each producing approximately 300 gpm, will be required to meet the projected summer time demand of 1,050 gpm. In order to maintain a similar well design as that of the Test Well, the wells in the well field will be aligned along the strike of the Wind River Formation as shown in Figure V-6. The wells will be spaced approximately 1,500 feet apart to minimize interference between the wells. One conceptual layout for the Wind River Well Field is shown in Figure V-7. This includes 6-inch and 8-inch collection lines to bring the water to the treatment facility where the radionuclides, iron and manganese will be removed. The treated water would then be stored in the small buried concrete storage tank prior to being conveyed to the Ethete residents.

Costs for the proposed treatment facility were based on a hydrous manganese oxide (HMO) treatment process which would consist of a long horizontal pressure vessel (35’ by 10’ diameter) that would be capable of treating the design flow of 1,050 gpm. The pressure vessel would consist of 4 cells which would provide flexibility in the operation of the system. The effluent from the treatment facility would be stored in a small buried concrete tank. Due to the remote location, the buried tank allows provides better protection against vandalism and compromising the integrity of the systems water quality and dependability.

The well completion design, for each of the four wells, would consist of a pitless adapter with a submersible pump and motor, 4-inch drop pipe, pump cable and associated appurtenances. Discharge from the wells would be conveyed through a buried meter vault, again to minimize the potential for vandalism, and into the collection pipeline system. The control buildings would be small pre-fabricated concrete buildings that would house the pump control and telemetry equipment. For convenience, remote readouts for the flow meters in the meter vaults could be installed in the control building.

The estimated cost to construct the Wind River Well Field for the Ethete water system has been tabulated in Table V-2.
### TABLE V-2
Northern Arapaho Wind River Well Field
Preliminary Opinion of Probable Project Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization, Bonds, and Insurance*</td>
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<td>LS</td>
<td>$230,000.00</td>
<td>$230,000.00</td>
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<td>2</td>
<td>Drill, Construct, Develop &amp; Test Wells</td>
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<td>EA</td>
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<tr>
<td>4</td>
<td>Furnish &amp; Install Pitless Adaptor</td>
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<td>EA</td>
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<td>5</td>
<td>Furnish &amp; Install Pumps &amp; Wiring**</td>
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<td>EA</td>
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<td>7</td>
<td>8-inch Collection Piping</td>
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Subtotal of Construction Costs $5,912,000.00

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**Total Construction Costs** $6,798,800.00

### Non Construction Costs

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<td>21</td>
<td>Engineering Construction Monitoring</td>
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<td>Legal and Administrative</td>
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<td>23</td>
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<td>24</td>
<td>Right-of-Way Acquisition</td>
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**Total Non Construction Costs** $1,538,040.00

**TOTAL ESTIMATED PROJECT COST** $8,336,840.00

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<td>33% of Level II Well Cost</td>
<td>1 EA $93,802.50</td>
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* 5 Percent of Estimated costs
** Includes pumps, motors, control panels, conduit and wire from control building.
*** 20% of Pipeline Cost
Summary

The Ethete Wind River Tertiary Well yields an acceptable quantity of marginal quality groundwater. The aquifer test results indicate that the aquifer in the area of the test well is capable of meeting the projected demands of the Ethete system and would, therefore, be a viable water supply option. However, due to slightly elevated levels of radium in the water, prior to being delivered to the water users, the groundwater will need to be treated to remove or lower the radium to levels below EPA’s Maximum Contaminant Level (MCL). The costs presented in this section were based on the implementation of a hydrous manganese oxide (HMO) treatment process where a controlled dosage of manganese oxide solution is added to the raw water supply. The radium will absorb to the HMO particles which are then filtered out. The HMO is later backwashed out of the filter media which prevents an accumulation of the radium in the filter media. One other benefit to the HMO system is that it will remove the iron and manganese from the water, which are also at levels above EPA’s Secondary Drinking Water Standards.

Although the Wind River Aquifer meets the production needs of the Ethete system, the remoteness of the well field area, the need to treat the water, and the associated cost to develop this groundwater supply may make this alternative less attractive to the Northern Arapaho Tribe.

ALTERNATIVE NO. 3 – ALLUVIAL AQUIFERS

Due to the high radionuclide levels encountered in the Wind River Test Well, it was decided to investigate the potential of the alluvial aquifer utilizing the limited budget remaining. The Little Wind River Alluvium was identified early in the project as a prospective alternative to diverting water from the Little Wind River and treating it through the Ethete water treatment plant. The alluvium was attractive because it was fairly thick (>30 feet), and from studies conducted by the U.S. Geological Survey (USGS Water Supply Paper 1576-I by McGreevy, et.al.), the water quality is also quite good downstream of Fort Washakie. The water quality, however, deteriorates very rapidly downstream of the Washakie Hot Springs. Therefore, any potential for alluvial development lies downstream of Fort Washakie and upstream of the hot springs.

A test site was targeted north of the Ft. Washakie Elementary School. This area was chosen for the following reasons: 1) it is situated between Fort Washakie and Washakie Hot Springs; 2) the land is owned by the tribes which made it easier to get access; and 3) it appeared to have the best potential for yield and water quality.

Alluvial Well Drilling Program

Two drilling programs were conducted during the course of investigating the Little Wind River Alluvium. The first wells were situated adjacent to the Little Wind River with the idea of getting stream bed infiltration from the Little Wind River. Four sites were initially targeted in the bends of the Little Wind River (see Figure V-8). The two targeted sites to the east were situated off of tribal lands which made access difficult and time consuming to obtain. The two sites to the west are situated on tribal lands and permits were sought and obtained to drill alluvial test wells at this location.

The rig was mobilized in November and the two sites were drilled. The water level was found at a depth of 6 feet in the west well, but the Cody shale was encountered at a depth of 16 feet which indicated only about 10 feet of saturated alluvium. The hole was backfilled and the rig was moved to the second location east of the westernmost well. The water level was encountered at 5 feet, but the Cody Shale was encountered at depth of 13.5 which only allows for 8.5 feet of thickness. This well was also backfilled.
and the drilling rig was released from the site. The location of these two test sites are shown as Well No. 1 and Well No. 2 on Figure V-9.

Because of the lack of alluvium found at these first two sites it was decided to drill a second set of borings to the south. Permission to drill the two new alluvial wells was received on April 6, 2009 so drilling commenced as soon as possible to avoid the problems with flood irrigation in the area. Each well was cased and screened with 4-inch galvanized casing and 15 feet of 30-slot stainless steel screen.

The No. 3 Well was drilled to a depth of 32 feet and had a saturated thickness of about 23 feet. Accompanying this well were a 2-inch diameter observation well situated 14.9 feet to the south and a 2-inch observation well situated 19.8 feet to the west. The No. 4 Well was drilled to a depth of 28.5 feet and had a saturated thickness of about 22.5 feet. Accompanying this well were a 2-inch diameter observation well situated 19.45 feet to the north and a 2-inch observation well situated 29.35 feet to the east.

The No. 3 and No. 4 Wells were developed using surge blocks and a bailer for about 4 to 5 hours after each well was drilled. The accompanying observation wells were developed using a small 2-inch pump which was occasionally raised and lowered to create a surging effect. Each of the observation wells was developed for about 3 hours. The No. 4 Well had some fill in after the surging and bailing operations and an air compressor was brought in to blow the debris out of the bottom of the well. Aside from this operation, none of the wells were air developed.

Aquifer Testing

Testing commenced as soon as the wells were developed. Because the irrigation season was about to begin, the wells had to be drilled, developed and tested in a very short period of time. This did not allow for long-term pump tests of the wells, but due to the low pumping rate and the aquifer properties, extended pumping tests probably would not have yielded significantly more information than the brief pumping tests that were conducted.

The No. 3 Well was pump tested twice. At 20 gallons per minute (gpm) only about 1.5 feet of drawdown was realized in the No. 3 Well. A larger pump was installed in the well and the well was pumped dry in about one minute. So, the original pump was installed in the well and a second test was conducted. This pump test was conducted for about 5½ hours at 22 gallons per minute and 2.07 feet of drawdown was realized at the end of the test. The results of these aquifer tests indicate a transmissivity in the 32,000 to
39,000 gpd/ft range and storage coefficients ranging from 0.02 to 0.03. The storage coefficient indicates a leaky aquifer.

The No. 4 Well was test pumped for a period of 7 hours at a rate of 22 gpm. A total of 5.06 feet of drawdown was measured in the pumping well at the conclusion of the test. Only 0.33 feet of drawdown was measured in the east observation well 29.35 feet away from the production well and 0.36 feet of drawdown was measured 19.45 feet away in the north observation well. The high amount of drawdown in the production well is due to either lack of development or turbulent losses entering the well. Because irrigation was scheduled to commence on May 1, only a minimal amount of development could take place prior to testing and if the drawdown is due to turbulent losses, these will be reduced with larger diameter production casing and screen.

The analysis of this pump test indicates a range of transmissivities from 10,600 gpd/ft to 36,000 gpd/ft and a storage coefficient of 0.0035 to 0.006. The lower storage coefficients are reflective a stronger confining layer in this area and the lower transmissivity is probably due to changes in the composition of the aquifer making it less permeable than the area around the No. 3 Well.

**Water Quality**

Because it was anticipated that the water from alluvial wells would be treated at the water treatment plant, only cursory water analyses were conducted. The major anions and cations were analyzed along with iron and total dissolved solids; the pH and conductivity were measured. The overall water quality from the two wells is excellent. There is a noticeable improvement in water quality in the No. 3 Well, but the water quality from the No. 4 well is still very good. Both Test Well No. 1 and Test Well No. 2 were plugged and abandoned by filling the borehole with the auger cuttings. Test Well No. 3 and Test Well No. 4, and their associated monitoring wells, were capped using either PVC caps or rubber sealing monitoring well plugs.

![Figure V-9: Little Wind River Alluvial Test Well Sites](image)
CONCLUSIONS

From the brief drilling and testing conducted in the Little Wind River Alluvium, the area appears to be an ideal target for development of groundwater for Northern Arapaho Utilities. Turbidity has been a severe problem during different times of the year which has reduced the treatment capacity of the water treatment plant. To alleviate this problem, water can be pumped from the Little Wind River Alluvium and run through the water treatment plant in lieu of diverting all of the water from the Little Wind River.

The silt cap over the alluvium helps to keep potential contamination directly from the surface and is probably functioning as the leaky confining layer. It is possible that wells in this area may be classified as groundwater not under the influence of surface water, but it will take development and a substantial amount of monitoring to verify this.

An analytical model was developed using the Theis equation and it was found that with a transmissivity of 30,000 gpd/ft and a storage coefficient of 0.006, a 6-well, well field with approximately 1,000 foot spacing could theoretically produce 700 gpm or 1 million gallons per day without pumping off. This would de-water the entire saturated thickness and is probably not feasible. Because there always seems to be one or two wells that are inoperable at any given time, it is recommended that a 9-well, well field be installed. This will allow the flexibility of pumping different wells and managing the resource should severe interference be encountered. A 9-well, well field with the capability of producing 100 gallons per minute each was modeled using a transmissivity of 30,000 and storage coefficient of 0.006. Theoretically the well field could be pumped at the maximum rate for 6 months without pumping off. However, the drawdown approaches the maximum saturated thickness. At a combined pumping rate of 700 gpm, there is sufficient saturated thickness to sustain this pumping rate for 6 months. Therefore, a 9-well, well field will be required to achieve a combined pumping rate of 700 gallons per minute.
Recommendations

The two small-diameter alluvial test wells should be further tested to confirm the aquifer’s parameters and the water quality at different times of the year. Initially, a 9-well, well field should be installed with 1,000 foot spacing. A conceptual layout of a 9-well, well field is shown on Figure V-10. Prior to drilling the wells, each potential site should be drilled and the saturated alluvial thickness confirmed. The data obtained from this drilling program will help avoid drilling and completing wells in areas with limited potential and also provide information to properly design the full sized production wells in terms of sizing and placement of the well screens.

Figure V-10: Proposed Little Wind River Alluvial Well Field

Cost Estimates

Table V-4 shows the estimated costs to develop an alluvial well field east of Fort Washakie. In addition to the wells, collection and transmission piping, this estimate includes the cost of roadways between the wells and telemetry to monitor and control the wells from the water treatment plant. It was assumed that the cost of bringing in power would be minimal since most of the pumps will likely be operating on single phase power.
TABLE V-4
Northern Arapaho Alluvial Well Field
Preliminary Opinion of Probable Project Costs

**FINAL COST ESTIMATES**

**PROJECT:** WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II  
**Date:** 9/10/2009

**Raw Water Source Development**

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<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
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</thead>
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<tr>
<td>Acquisition of Access and Rights of Way</td>
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**Cost of Project Components**

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<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
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<td>4</td>
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<td>$10,000.00</td>
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<td>5</td>
<td>Furnish &amp; Install Pumps &amp; Wiring</td>
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<td>EA</td>
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<td>6</td>
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**Construction Cost Subtotal #1**  
$1,840,500.00

**Engineering Costs = Subtotal #1 x 10%**  
$184,050.00

**Subtotal #2**  
$2,024,550.00

**Contingency = Subtotal #2 x 15%**  
$303,682.50

**Construction Cost Subtotal**  
$2,328,232.50

**Project Cost Total**  
$2,579,100.00
CHAPTER VI

COST ESTIMATES OF PROJECT FINANCING

INTRODUCTION

This chapter presents the Preliminary Opinions of Probable Project Costs for the conceptual recommendations presented in Chapter IV. The cost estimates are presented here in the same order as the conceptual recommendations in Chapter IV. Where applicable, the recommended improvements area is shown in a diagram following its cost estimate.

Raw Water Source Development

The water source selected by the NAU Board is the Little Wind River Alluvium north and west of the Fort Washakie Elementary School. The total estimated cost of developing this supply and tying it into the existing raw water transmission line to the plant is $3,069,800. By contrast, developing the Wind River Formation deep well field would be $7,870,000.

The alluvial well field development project will include:
- permitting through BIA for right-of-way and with state and tribal water engineers offices,
- drilling and development of the well field,
- power extension to the wells,
- access road system to the wells,
- produced water collection,
- transmission line right-of-way, and
- extending the water transmission from the existing raw water transmission line west to the wellfield.

Right-of-way permits will have to be obtained through BIA for the wellfield, its access roads, power supply, and collection system. This process must include the preparation of an environmental assessment. The Permitting and Mitigation line item of each cost estimate in this chapter includes the added costs for Environmental Assessments where necessary. Applications must be filed with the Wyoming State Engineer’s Office and the Tribal Water Engineer’s Office for permits.
FINAL COST ESTIMATES

PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II

Date: 9/10/2009

.Raw Water Source Development

Preparation of Final Designs and Specifications $196,350.00
Permitting and Mitigation $12,000.00
Legal and Administrative Fees $10,000.00
Acquisition of Access and Rights-of-Way $8,000.00
TERO Fees 2% $39,270.00

Cost of Project Components

<table>
<thead>
<tr>
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<th>Description</th>
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<th>Unit</th>
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<th>Estimated Cost</th>
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<td>LS</td>
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<td>$5,000.00</td>
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<tr>
<td>3</td>
<td>Drill, Develop &amp; Test Wells</td>
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<td>EA</td>
<td>$35,000.00</td>
<td>$315,000.00</td>
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<tr>
<td>4</td>
<td>Furnish &amp; Install Pitless Adaptor</td>
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<td>EA</td>
<td>$10,000.00</td>
<td>$90,000.00</td>
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<tr>
<td>5</td>
<td>Furnish &amp; Install Pumps &amp; Wiring</td>
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<td>EA</td>
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<tr>
<td>6</td>
<td>Collection Piping</td>
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<td>7</td>
<td>Access Roads</td>
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<td>LF</td>
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<td>$165,000.00</td>
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<td>8</td>
<td>Power Extension, Including ROW</td>
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<td>LF</td>
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<td>9</td>
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<td>Well Meters and Meter Pits</td>
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<td>11</td>
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<td>12</td>
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<td>LF</td>
<td>$60.00</td>
<td>$738,000.00</td>
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</table>

Construction Cost Subtotal #1 $1,963,500.00

Engineering Costs = Subtotal #1 x 10% $196,350.00

Subtotal #2 $2,159,850.00

Contingency = Subtotal #2 x 15% $323,977.50

Construction Cost Subtotal $2,483,827.50

Project Cost Total $2,749,400.00
Raw Water Transmission to Treatment Plant

As discussed in Chapter IV, the 11,500' raw water transmission line from the diversion structure to the treatment plant is constructed of thin wall (SDR 41) PVC. It has had an inordinate number of breaks for its age. When it fails, the entire system is left with no incoming water supply. NAU has had to rely entirely on the water stored in the tanks while repairs are made. This line’s tendency to break renders the whole system unreliable.

Once the alluvial well field is developed as the source for the system, only the 5,200 feet of this line that parallels Ethete Road will remain in service and need to be replaced. The remaining portion, which runs west to the diversion on the Little Wind River, can be abandoned once the new well field is in service.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

**Date: 9/10/2009**

**Raw Water Transmission to Treatment Plant**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
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<td>LS</td>
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<td>$25,000.00</td>
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<td>2</td>
<td>12&quot; PVC Pipe</td>
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<td>LF</td>
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<td>$312,000.00</td>
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<tr>
<td>3</td>
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<td>$2,900.00</td>
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Construction Cost Subtotal #1: $344,900.00
Engineering Costs = Subtotal #1 x 10%: $34,490.00
Subtotal #2: $379,390.00
Contingency = Subtotal #2 x 15%: $56,908.50

Construction Cost Subtotal: $436,298.50

Project Cost Total: $490,700.00
Treatment Plant and SCADA System

The water treatment plant needs to have some minor improvements made to it. Those include:

- installing a raw water turbidimeter and tying it in to the SCADA system,
- installing a new raw water inflow meter and tying it into the SCADA system,
- installing a flow meter on each of the four filter units with SCADA interface,
- purchasing a laptop computer for operators to access the SCADA system,
- installing an overhead hoist,
- replacing the two existing pumps with two 8 stage pumps matched to the system curve that will together produce 1000 gpm,
- replacing the 30 horsepower clearwell pump with a 50 horsepower pump and motor, and
- building an inventory of spare parts, such as blower actuator, transducers, and other parts which are not readily available and hinder the plant from operating at capacity if a failure occurs.

These improvements will bring the treatment plant’s pumping capacity up to a level equal to the output of three filters. This capacity will also equal forecast water requirements for the system through the year 2025 and allow the operators to more effectively run the plant.

For purposes of prioritizing projects, the pump replacement has been treated as a separate project in Chapter VIII. This is because replacing these high service pumps is a discrete activity and is of higher priority to the capacity integrity of delivering water than is the recommended SCADA and other miscellaneous treatment plant modifications.
## FINAL COST ESTIMATES

**PROJECT:** WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II  
**Date:** 9/10/2009

### Treatment Plant and SCADA System

Preparation of Final Designs and Specifications $7,560.00
Permitting and Mitigation -
Legal and Administrative Fees -
Acquisition of Access and Rights-of-Way -
TERO Fees 2% $1,512.00

**Cost of Project Components**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$6,900.00</td>
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<td>EA</td>
<td>$4,200.00</td>
<td>$4,200.00</td>
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<tr>
<td>3</td>
<td>12” Inflow Meter-Installed w/SCADA</td>
<td>1</td>
<td>EA</td>
<td>$6,500.00</td>
<td>$6,500.00</td>
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<tr>
<td>4</td>
<td>Filter Meters with SCADA Integration</td>
<td>4</td>
<td>EA</td>
<td>$2,800.00</td>
<td>$11,200.00</td>
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<tr>
<td>5</td>
<td>Lap Top Computer</td>
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<td>$1,500.00</td>
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<td>Overhead Hoist</td>
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<td>$2,500.00</td>
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**Construction Cost Subtotal #1** $75,600.00
**Engineering Costs = Subtotal #1 x 10%** $7,560.00
**Subtotal #2** $83,160.00
**Contingency = Subtotal #2 x 15%** $12,474.00

**Construction Cost Subtotal** $95,634.00
**Project Cost Total** $104,700.00
Storage Tanks

The storage tanks have adequate capacity to serve the expected population of the Ethete area through the year 2025. Maintenance and security deficiencies need to be addressed to bring the storage facilities up to current standards. Those include:

- drain, inspect, and structurally refurbished ladders, center supports, and corroded spots in all three tanks as needed to maintain their integrity,
- repaint the exterior and interior of all three tanks,
- install security fence around all three tanks,
- upgrade the tank access road to an all-weather graveled surface, and
- remove the private wireless internet facility from the 250,000 gallon tank.

FINAL COST ESTIMATES

PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II  
Date: 9/10/2009

Storage Tanks

Preparation of Final Designs and Specifications  $ 46,150.00
Permitting and Mitigation  $ 5,000.00
Legal and Administrative Fees  $ 2,500.00
Acquisition of Access and Rights-of-Way  $ 4,000.00
TERO Fees 2%  $ 9,230.00

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
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<tr>
<td>1</td>
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<td>2</td>
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<td>$4,000.00</td>
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<td>TN</td>
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Construction Cost Subtotal #1  $461,500.00
Engineering Costs = Subtotal #1 x 10%  $46,150.00
Subtotal #2  $507,650.00
Contingency = Subtotal #2 x 15%  $76,147.50

Construction Cost Subtotal  $583,797.50

Project Cost Total  $650,700.00
Finished Water Transmission

Connect the 10-inch and 8-inch lines together, as stated above, to significantly improve fire protection capabilities and add flexibility to the system’s water delivery capabilities.

### FINAL COST ESTIMATES

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

**Date: 9/10/2009**

**Finished Water Transmission**

- Preparation of Final Designs and Specifications $1,080.00
- Permitting and Mitigation $1,000.00
- Legal and Administrative Fees $2,000.00
- Acquisition of Access and Rights-of-Way $1,000.00
- TERO Fees 2% $216.00

**Cost of Project Components**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization, Bonds, and Insurance</td>
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<td>EA</td>
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<td>$1,800.00</td>
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<tr>
<td>4</td>
<td>8&quot; Gate Valve</td>
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<td>EA</td>
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<td>$1,400.00</td>
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<tr>
<td>5</td>
<td>8X10 Tee</td>
<td>2</td>
<td>EA</td>
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**Construction Cost Subtotal #1** $10,800.00

**Engineering Costs = Subtotal #1 x 10%** $1,080.00

**Subtotal #2** $11,880.00

**Contingency = Subtotal #2 x 15%** $1,782.00

**Construction Cost Subtotal** $13,662.00

**Project Cost Total** $19,000.00
Distribution Metering and Backflow Protection

The Ethete system is not metered. This situation leaves NAU without any means to enforce water conservation. None of the service lines are equipped with backflow prevention units. This is a potential health threat, as explained in Chapter IV. Further, there is an undetermined number of “daisy-chained” services on the system. This makes enforcement of payment for water bills impossible on those services. To solve these deficiencies it is recommended to:

- install meters on all services on the system,
- require, along with meters, that each water service on the system have a backflow prevention device, and
- separate all daisy-chained services so each service is controlled with its own shut off valve.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<th>Unit Price</th>
<th>Estimated Cost</th>
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</thead>
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<td>Permitting and Mitigation</td>
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<td></td>
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<tr>
<td>Legal and Administrative Fees</td>
<td></td>
<td></td>
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<tr>
<td>Acquisition of Access and Rights-of-Way</td>
<td></td>
<td></td>
<td></td>
<td>$2,500.00</td>
</tr>
<tr>
<td>TERO Fees 2%</td>
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<td></td>
<td></td>
<td>$16,770.00</td>
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Cost of Project Components

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<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization, Bonds, and Insurance</td>
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<td>$62,000.00</td>
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<td>In-home Meter Installed</td>
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<td>LF</td>
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</table>

Construction Cost Subtotal #1                      | $838,500.00
Engineering Costs = Subtotal #1 x 10%              | $83,850.00
Subtotal #2                                        | $922,350.00
Contingency = Subtotal #2 x 15%                    | $138,352.50

Construction Cost Subtotal                         | $1,060,702.50

**Project Cost Total**                             | $1,167,800.00
Distribution System Piping

There are several improvements that are needed in the Ethete distribution system. These have been grouped together into logical projects that are similar in nature and similar in benefit to the overall function of the system. The remainder of this chapter lists these projects and gives their expected costs.

Install Pressure Reducing Valves

Based on pressure readings made in the field investigation during this study, it was determined the pressure reducing stations are not functioning. Some are flooded with groundwater. The system operators report that none are operational. For purposes of this cost estimate, it is assumed that all of the PRV stations, with the exception on the one near the high school, need to be replaced.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

Date: 9/10/2009

Install Pressure Reducing Valves

Preparation of Final Designs and Specifications $ 16,850.00
Permitting and Mitigation $ 2,000.00
Legal and Administrative Fees $ -
Acquisition of Access and Rights-of-Way $ -
TERO Fees 2% $ 3,370.00

Cost of Project Components

<table>
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<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
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<th>Estimated Cost</th>
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<td>LS</td>
<td>$ 12,500.00</td>
<td>$ 12,500.00</td>
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<td>2</td>
<td>6&quot; PRV Station</td>
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<td>EA</td>
<td>$ 16,000.00</td>
<td>$ 128,000.00</td>
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<tr>
<td>3</td>
<td>8&quot; PRV Station</td>
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<td>EA</td>
<td>$ 18,000.00</td>
<td>$ 18,000.00</td>
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<td>4</td>
<td>Replace 10&quot; PRV in Existing Vault</td>
<td>1</td>
<td>EA</td>
<td>$ 10,000.00</td>
<td>$ 10,000.00</td>
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Construction Cost Subtotal #1 $ 168,500.00
Engineering Costs = Subtotal #1 x 10% $ 16,850.00
Subtotal #2 $ 185,350.00
Contingency = Subtotal #2 x 15% $ 27,802.50

Construction Cost Subtotal $ 213,152.50

Project Cost Total $ 235,400.00
Replace AC Pipe from Plant to Wyoming Highway 132

The two lines paralleling Ethete Road are reported to be 4-inch and 6-inch asbestos cement lines. The 4-inch line does not meet current standards for minimum line size. The 6-inch line is adequate, but asbestos cement pipe is no longer manufactured and is classified as a hazardous material. Therefore, it should also be replaced.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

**Date: 9/10/2009**

Replace AC Lines from Plant to Wyoming Highway 132

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation of Final Designs and Specifications</td>
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<tr>
<td>Permitting and Mitigation</td>
<td></td>
<td></td>
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<td>6,000.00</td>
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<td>Legal and Administrative Fees</td>
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<td>4,000.00</td>
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<td>Acquisition of Access and Rights-of-Way</td>
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<td>4,000.00</td>
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<tr>
<td>TERO Fees 2%</td>
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<td></td>
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<td>14,506.00</td>
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Cost of Project Components

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Construction Cost Subtotal #1: $725,300.00

Engineering Costs = Subtotal #1 x 10%: $72,530.00

Subtotal #2: $797,830.00

Contingency = Subtotal #2 x 15%: $119,674.50

Construction Cost Subtotal: $917,504.50

Project Cost Total: $1,018,500.00
Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael’s Mission

The lines serving these important buildings are presently 4-inch and smaller. There are not any fire hydrants or effective fire protection.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

*Date: 9/10/2009*

Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael’s Mission

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Cost of Project Components

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Construction Cost Subtotal #1 $160,700.00
Engineering Costs = Subtotal #1 x 10% $16,070.00
Subtotal #2 $176,770.00
Contingency = Subtotal #2 x 15% $26,515.50

Construction Cost Total $203,285.50

Project Cost Total $228,600.00
Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino

The residential distribution service lines serving the residential area on the north side of Ethete Road are all undersized, many of them only 2-inch lines. No fire protection is available. The southern portion of the line delivering water to the new Little Wind Casino is a 4-inch line feeding an 8-inch line. To offer adequate fire protection to the casino, this section of line needs to be replaced.

FINAL COST ESTIMATES

PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II Date: 9/10/2009

Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino

Preparation of Final Designs and Specifications $86,505.00
Permitting and Mitigation $8,000.00
Legal and Administrative Fees $2,000.00
Acquisition of Access and Rights-of-Way $6,000.00
TERO Fees 2% $17,301.00

Cost of Project Components

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Engineering Costs = Subtotal #1 x 10% $86,505.00
Subtotal #2 $951,555.00
Contingency = Subtotal #2 x 15% $142,733.25

Construction Cost Subtotal $1,094,288.25

Project Cost Total $1,214,100.00
Upgrade Lines Serving Ethete Housing and Little Wind Casino
Wyoming Indian High School Fire Protection

Presently, two dead-end 6-inch lines to the high school offer inadequate fire protection. To meet fire flow delivery standards, these lines need to be joined by an 8-inch line and at least one of the existing dead-ends needs to be upgraded to 8-inch PVC.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

**Wyoming Indian High School Fire Protection**

<table>
<thead>
<tr>
<th>Description</th>
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Engineering Costs = Subtotal #1 x 10%: $12,213.50
Subtotal #2: $134,348.50
Contingency = Subtotal #2 x 15%: $20,152.28

Construction Cost Subtotal: $154,500.78
Project Cost Total: $175,200.00
Improve Delivery Capacity in the Area of the Convenience Store and Tribal Offices

Most of the lines serving the Tribal Housing Office, head start, and the convenience store at Ethete are 4-inch lines. They provide inadequate fire protection. Two lines, for example, lack only 20-feet of being looped.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

Date: 9/10/2009

Improve Delivery Capacity in the Area of the Convenience Store and Tribal Offices

Preparation of Final Designs and Specifications $20,630.00
Permitting and Mitigation $4,000.00
Legal and Administrative Fees $2,000.00
Acquisition of Access and Rights-of-Way $2,000.00
TERO Fees 2% $4,126.00

Cost of Project Components

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<tr>
<th>Item No.</th>
<th>Description</th>
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Construction Cost Subtotal #1 $206,300.00
Engineering Costs = Subtotal #1 x 10% $20,630.00
Subtotal #2 $226,930.00
Contingency = Subtotal #2 x 15% $34,039.50

Construction Cost Subtotal $260,969.50
Project Cost Total $293,700.00
Yellow Calf Road Loops

Extending the 6-inch line on Yellow Calf Road south to 17-Mile Road will provide looping of a major segment of the Ethete system. The system model also shows that this looping will bring fire flow delivery to the Mill Creek housing project up to ISO recommended levels.

Extending the Lone Bear Lane line east to Yellow Calf Road will loop the northern end of Yellow Calf Road which is currently isolated. This loop, though, provides less benefit than does tying into the line on 17-Mile Road.

**FINAL COST ESTIMATES**

**PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

**Date: 9/10/2009**

Yellow Calf Road Loops

Preparation of Final Designs and Specifications $ 48,168.00
Permitting and Mitigation $ 8,400.00
Legal and Administrative Fees $ 2,000.00
Acquisition of Access and Rights-of-Way $ 6,000.00
TERO Fees 2% $ 9,633.60

Cost of Project Components

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<th>Description</th>
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<th>Unit</th>
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Engineering Costs = Subtotal #1 x 10% $48,168.00
Subtotal #2 $529,848.00
Contingency = Subtotal #2 x 15% $79,477.20

Construction Cost Subtotal $609,325.20

Project Cost Total $683,500.00
Yellowcalf Road Loops
Replace Damaged Line on the East Portion of Trosper Lane

As discussed in Chapter III, the eastern portion of the Trosper Lane line was rendered unserviceable several years ago when holes were drilled for power poles. The line has not been in service since this occurred.

FINAL COST ESTIMATES

PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II

<table>
<thead>
<tr>
<th>Description</th>
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Cost of Project Components

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Construction Cost Subtotal #1 $104,300.00
Engineering Costs = Subtotal #1 x 10% $10,430.00
Subtotal #2 $114,730.00
Contingency = Subtotal #2 x 15% $17,209.50

Construction Cost Subtotal $131,939.50
Project Cost Total $152,500.00
Implement Leak Detection Project

As discussed in Chapters II and III, the per capita usage rate on the Ethete system is well above normally expected ranges. Because there is not any metering on the system there is not any concrete evidence to suggest that there is significant loss from leaks. In contrast to surrounding communities, the Ethete residences do not characteristically have significant irrigated landscaping around their homes to account for the high summer usage rates. Also, winter usage is unusually high on a per capita basis, and the reason for that usage cannot be fully explained using standard consumption criteria. The Ft. Washakie system, similar to the Ethete system and also constructed through the IHS program, realized significant benefit by conducting a leak detection program. All comparison information indicates that the Ethete system has significant loss and that a leak detection program would pay for itself in water production savings.

It is recommended that the NAU budget $30,000 in 2010 to conduct a leak detection program and to evaluate its effectiveness.

Replace Blow-off Hydrants with Fire Hydrants

The lines south of 17-Mile Road are fitted with 2-inch blow-off hydrants that do not serve well for flushing the system and provide no fire protection options. They cannot effectively be used even to fill rural fire tankers responding to a rural fire.

It is recommended that these units be changed out to standard fire hydrants and that $35,000 be allocated for this work.

Plunkett Road Tank

Modeling shows that having the Plunkett Tank on-line will improve fire flow to Mill Creek Housing nearly as much as extending the Yellow Calf Road line to 17-Mile Road and would be less expensive. In spite of this economic advantage, it is recommended that this tank remain out of service for the following reasons:

- The southern end of the system serves fewer than 50 taps.
- The water stored in this tank would get very little circulation, become stagnant, and generate taste and odor complaints.
- Because of its remote location on the system, its filling and draining may lag that of the main tanks and cause operational complaints.
- The system has functioned adequately for the past 20 years with this tank off-line.

The cost estimate for the replacement of this tank is presented here for comparative information only. Plunkett Tank is not a recommended project and its cost is not incorporated into the overall total of projects costs.
NOT A RECOMMENDED PROJECT
FINAL COST ESTIMATES

PROJECT: WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II       Date: 9/10/2009

Plunkett Tank Replacement

<table>
<thead>
<tr>
<th>Description</th>
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<th>Unit Price</th>
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<td>Legal and Administrative Fees</td>
<td></td>
<td></td>
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<td>$ -</td>
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<tr>
<td>Acquisition of Access and Rights-of-Way</td>
<td></td>
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<tr>
<td>TERO Fees 2%</td>
<td></td>
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<td>$ 5,000.00</td>
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Cost of Project Components

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<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Unit Price</th>
<th>Estimated Cost</th>
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<td>LS</td>
<td>$10,000.00</td>
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<td>2</td>
<td>250,000 Gallon Tank, Including Appurtenances</td>
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<td>LS</td>
<td>$240,000.00</td>
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Construction Cost Subtotal #1 $250,000.00

Engineering Costs = Subtotal #1 x 10% $25,000.00

Subtotal #2 $275,000.00

Contingency = Subtotal #2 x 15% $41,250.00

Construction Cost Subtotal $316,250.00

Project Cost Total $350,300.00
## Final Cost Estimates

**WWDC NORTHERN ARAPAHO GROUNDWATER, LEVEL II**

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Preparation of Final Designs and Specifications</td>
<td>$652,877</td>
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<tr>
<td>Permitting and Mitigation</td>
<td>$68,400</td>
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<tr>
<td>Legal Fees</td>
<td>$32,500</td>
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<tr>
<td>Acquisition of Access and Rights-of-Way</td>
<td>$40,500</td>
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<tr>
<td>TERO Fees 2%</td>
<td>$130,575</td>
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**Cost of Project Components**

- **Raw Water Source Development**: $1,963,500
- **Raw Water Transmission to Treatment Plant**: $344,900
- **Treatment Plant and SCADA System**: $75,600
- **Storage Tanks**: $461,500
- **Finished Water Transmission**: $10,800
- **Distribution Metering and Backflow Protection**: $838,500
- **Install Pressure Reducing Valves**: $168,500
- **Replace AC Lines from Plant to Wyoming Highway 132**: $725,300
- **Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael’s Mission**: $160,700
- **Upgrade Lines Serving Ethete Area Housing and Little Wind Casino**: $865,050
- **Wyoming Indian High School Fire Protection**: $122,135
- **Improve Delivery Capacity - Convenience Store and Tribal Offices**: $206,300
- **Yellow Calf Road Loops**: $481,680
- **Replace Damaged Line on the East Portion of Trosper Lane**: $104,300

**Construction Cost Subtotal #1**: $6,528,765

**Engineering Costs = Subtotal #1 x 10%**: $652,877

**Subtotal #2**: $7,181,642

**Contingency = Subtotal #2 x 15%**: $1,077,246

**Construction Cost Subtotal**: $8,258,888

**Project Cost Total**: $9,183,740
CHAPTER VII

ETHETE SYSTEM OPERATION AND MAINTENANCE

Introduction

This chapter evaluates the operation and maintenance (O&M) of the Ethete portion of the Northern Arapaho Utilities (NAU) water distribution system. Many of the findings of this chapter apply not only to the Ethete system, but could be applied to all Northern Arapaho Utilities systems.

Until 2003 all pre-planning, planning, designing, bidding of construction, and contracting functions for the utility systems was handled by the U.S. Department of Health and Human Services, Indian Health Service (IHS). These functions were taken over by Northern Arapaho Utilities under the Indian Self-Determination and Education Assistance Act, P.L. 93-638 program authorized by congress. NAU now carries out those functions using their on-staff licensed engineer augmented occasionally by consulting engineering services. The staff engineer’s function is to aid in future planning and design to improve the system.

Because of its current management style, the Northern Arapaho Tribe has difficulties meeting water supply obligations to its members. Under its present mode of operation, it cannot achieve optimum performance in providing a safe, uninterrupted supply of potable water to the system’s users. Throughout this chapter, an evaluation of the current operation and maintenance is posed along with recommendations that offer improvements to the critical functions of system capacity, management, and funding.

Operation and Maintenance Guidance

The EPA has assembled a guide titled “Capacity Assessment and Planning Worksheets for Public Water Systems” tailored to the needs of small water systems. That set of guidelines is in the appendix of this report and is available on the EPA web site at http://www.epa.gov/region8/water/CapacityAssessmentAndPlanningWorksheets.pdf. Based on this guide, the operation and maintenance of the Ethete system involves critical interdependent activities which include:

- Technical Capacity – Can we get the job done?
  - Adequacy of Supply, Treatment, Storage, and Distribution
  - System Maintenance and Asset Management
  - Recordkeeping
  - Regulatory Compliance and Reporting
- Managerial Capacity – Who’s in charge?
  - Management Structure and Accountability
  - Staffing
  - Training
  - Compensation Management
- Financial Capacity – Can we pay for it?
  - Revenue Sufficiency
  - Fiscal Controls
  - Access to Needed Funds
These topics encapsulate the system evaluation and master planning effort involved in this Level II Study. The relevant Operation and Maintenance (O&M) aspects of Ethete’s water system are discussed in this chapter.

Technical Capacity

Technical capacity involves the water system’s physical attributes – water supply, transmission, treatment, storage, and distribution – and how those assets are being operated, maintained, improved, and expanded. In today’s environment, capacity also includes how well the system is complying with regulatory requirements.

Current Status

Knowing the current state of the system is essential in deciding what operation and maintenance advancements will give the greatest benefits. System maintenance and asset management are critical functions for the continued integrity of the system. Guiding these functions through a well-thought-out, comprehensive master plan can eliminate crisis management and reactionary decisions, thereby allowing staff to run the system rather than react to emergencies. To have a functional asset management system, five primary questions have to be answered on a continuing basis:

1. What is the current state of the capital assets (system)?
2. What is the required level of service/performance?
3. What is required to maintain desired performance?
4. What are the best “Operations and Maintenance” and “Capital Improvement” investment strategies?
5. What is the best long-term funding strategy?

A comprehensive master plan needs to be in place and actively followed to assure that necessary facilities are sufficient to meet current and future needs. That plan is presented in Chapter VI. At present, Northern Arapaho Utilities has no formal improvement plan or asset management program.

Adequacy of Supply, Treatment, Storage and Distribution

The physical components of the system, their adequacy, condition, identified deficiencies, and costs of alternative improvements were discussed in Chapters III, IV, and V. The reader is referred to those chapters for that information.

The Ethete system, as of 2009, has over 37 miles of pipeline covering an area of approximately twenty-six (26) square miles. It has three active steel storage tanks totaling 1.85 million gallons. There is one nonfunctional 250,000 gallon tank located on Plunkett Road that has been out of service for over twenty years due to a foundation failure shortly after its construction.

The Ethete system has approximately 380 service connections. This includes 356 homes, four (4) commercial establishments including a new casino, four (4) schools, three (3) churches, and five (5) public buildings.

The system is not metered. Lack of metering leaves NAU with no means of accounting for water use versus system losses. Also, without metering it is very difficult to implement water conservation. The system does not have backflow prevention on individual services, needed to protect public health by eliminating the possibility of back-siphoning into the system.
Chapters III, IV, V, and VII address the system’s technical capacity and the recommended improvements. Those are not repeated in this section.

**System Maintenance and Asset Management**

In general, the Ethete system has received only fair maintenance and asset management. The system is annually flushed. At the same time, valves and hydrants are inventoried as to their operational status.

System components often are left unrepaired, most notably pressure reducing valves, fire hydrant replacements, and air relief valves. As discussed in other chapters of this report, the system has not received attention to make relatively simple improvements such as installing short line loops and making small changes that would assist in system reliability. This is due in part to inadequate funding of the system caused partly by NAU’s reliance on IHS funding for nearly all system improvements. This is addressed further under the Financial Capacity assessment later in this chapter.

**System Security**

Homeland Security-type measures are relatively lax in some areas of the system. In general, however, the critical facilities are secured. The water treatment plant site is fenced along the highway and has a lockable gate. The north side of the site, facing the river, is not security fenced. The water treatment plant is always locked when the operators are not present. All of the tank access ladders and access hatches are padlocked. There is no security fencing of the tanks. While it is remote and somewhat difficult to find, the raw water intake is fully accessible to people and animals.

Challenges arise because operations personnel frequently do not have keys matching the locks. The chief operator has a key to the plant but not to the tanks. Assistant operators seem not to have keys to either.

NAU does not have a formal disaster recovery plan in place. The operators at present are charged with using their best judgment as to how to best respond to any given emergency. While that approach is fairly effective in a small system such as this, a forward-looking plan is needed. The plan needs to outline reporting and response roles, and responsibilities of all involved agencies such as NAU, law enforcement, and Indian Health Service. Most importantly, the operators must be trained in the protocol that such a plan would outline for disaster recovery/system failure response.

**Source Water Protection**

NAU has no formal source water protection plan. On a national basis, the Little Wind River is an uncommonly clean source. It does, though, flow past the community of Ft. Washakie which, because of human activity, could result in contamination. That community’s wastewater lagoon system is approximately two miles upstream of the Ethete water plant intake. Upstream agricultural activity also has the potential of causing contamination.

Once the system implements the recommended alluvial well field source, a Wellhead Protection Plan will have to be developed and implemented to assure the integrity of that new source.
**Recordkeeping**

Northern Arapaho Utilities is still attempting to gather records, especially mapping of their systems, from IHS records and other sources. Much of this information is either missing or cannot be located in NAU’s records. This situation makes some aspects of system operation and maintenance challenging. NAU has a goal of getting all system records into computer-based mapping. Progress toward that goal has been slow because of staffing issues.

Plans for the system are almost exclusively in the form of blueprint paper copies rolled up and stored in a wire frame plan rack at the NAU office. There are few if any reproducible plans on file. This leaves NAU vulnerable to having these valuable records accidentally lost or destroyed. As these records are located, NAU has been making digital scanned copies of the plans.

Water treatment plant plans and operational records are scattered between the plant and the NAU office. The plant’s operation and maintenance (O&M) manuals are located at the plant. Operational records and testing records are filed at the NAU office and generally are not kept at the plant. Without a complete set of records at the plant, the operators have no historical records to reference when adjusting chemical feed for changes in incoming water quality and other necessary operational activities.

**Regulatory Compliance and Reporting**

Accomplishing and reporting results of the testing required by the EPA has been sporadic over the operational history of the plant. This has resulted in NAU having to issue boil orders and other more severe EPA regulatory consequences. There has been a long history of operator turn-over at the plant, which is believed to be a contributing factor to lapses in regulatory compliance reporting.

As noted previously, these reports are kept on file at the NAU office, some 15-miles from the plant. This makes it difficult for the operators to refer back to prior years’ records of production and chemical feed adjustment in response to changes in water quality in the Little Wind River, which supplies the plant.

**Managerial Capacity**

**Overview**

Two operators handle all operations and maintenance of the Ethete water system. They are responsible for the operation and maintenance (O&M) of the river diversion facility, its 1½-mile transmission line to the treatment plant, the water treatment plant, 37-miles of distribution lines, and the storage system. Additionally, these same two operators are responsible for O&M of the Ethete area’s two wastewater systems consisting of the two collection systems, two pump stations, and two lagoon facilities. When repairs requiring excavation are needed, the construction crew, as opposed to the system operators, provides construction equipment with operators on an as-needed basis.

The director, Gerry Redman, is called upon to serve many roles in the aid of the system. He manages the operators, office staff, staff engineer, construction crews, weatherization crew, public works (carpentry and plumbing), handles planning system needs, and financing. He interfaces with the Utilities Board and the Tribal Business Council, making recommendations for staffing and system funding. He is responsible for meeting the audit requirements of the several federal programs that provide funds to the system. Finally, he serves as an operator when needed. This is more than should be expected from just one person.
The director and the administration staff review time cards to verify that staff time is being correctly charged to the various programs. Based on this data, the director estimates that the operations staff spends approximately 60% of their time on the water system and 40% of their time with the wastewater system.

In addition to the central water and wastewater systems, Northern Arapaho Utilities is responsible for maintaining the wells and septic systems for individual homes of enrolled tribal members scattered throughout the reservation. Because of their status as tribal members, Indian Health Service was charged with providing water and sewer service to individual homes off the central system. When NAU acquired the central system, they also had to assume responsibility for the individual homes.

Operation staff turnover with NAU has been chronic. This is a detriment to the system and its customers. NAU’s wage and benefit structure plays a role in turnover.

Management Structure and Accountability

Northern Arapaho Utilities has several outside influences that hinder it from following a preplanned, consistent, and efficient development and delivery of water service. Too many outside entities impact NAU’s efforts and in some cases thwart their objectives. First, the BIA has a program and procedure of issuing home sites. These are typically concentrated areas of contiguous “postage stamp” layouts of 2½-acre sites without regard to central utilities, utility easements, roads, or highway access. This practice raises havoc with the tribe’s efforts to develop an efficient and maintainable water system. As tribal members, these individuals are entitled to water and sewer provided by IHS for their home sites. The IHS will build a system, but operation and maintenance falls to NAU. This BIA practice, over time, creates isolated areas of dense housing that require central water to maintain public health. This practice leaves the NAU with no ability to direct its future or manage system costs.

Management of the system is complicated by the several federal programs that directly fund some of the system functions. Those programs provide earmarked funds for specific purposes, such as the staff engineer. Each program has specific expenditure criteria and attendant audit requirements. The expenditure of these federal program funds does not have to be approved by the Northern Arapaho Business Council.

In its management structure, the Arapaho Tribe has significant operational differences from state and local government. The General Council, which includes all enrolled members of voting age, has ultimate authority over all tribal governance, including the Business Council. By resolution, the General Council has authorized the Utilities Board to operate the utilities systems and to apply for grant funding from available sources.

Operation of the Ethete water system is directed by the Northern Arapaho Utilities Board, who acts as an advisory board to the Northern Arapaho Tribal Business Council. The director of Northern Arapaho Utilities, Gerry Redman, reports to the Utilities Board. Since the water system is not financially self-supporting, the NAU is dependent on the Business Council to approve the staffing and budget requests needed to properly operate the system. This is chronically under-funded. As it presently functions, this management structure thwarts the NAU’s objective of providing safe, reliable drinking water to its users.

In many cases, system additions are initiated by other tribal or government entities with little or no coordination or prior approval from NAU. Each entity carries out its own program with little, if any, coordination with the NAU. For example, the Business Council initiated a project to install a transmission line between the new Wind River Casino and the old 789 Casino/Smoke Shop. As further examples, the siting of the Little Wind Casino, the juvenile justice facility, the hotel for the Wind River Casino, and
tying St. Stephen’s School on to the Arapahoe system were all developed and implemented without coordination with NAU. It falls to NAU to meet these demands without the ability to plan for the system-wide impacts that these demands create. This is most prevalent in planning of housing projects. The same lack of coordination has occurred in the Northern Arapaho Business Council’s decisions in locating public services facilities, schools, the casino hotel, and similar facilities.

In its formal structure, the Utilities Board serves as a management board under the Northern Arapaho Business Council (NABC). System modifications and other major undertakings require the approval of the Utilities Board with Business Council oversight. The Utilities Board reviews the director’s requests prior to presentation to the NABC for authorization. As discussed in the previous paragraph, this formal structure is frequently not followed when managing the system and addressing its needs.

The director manages all day-to-day operations and personnel matters. In addition to these duties, the director is responsible for what the NAU terms “public works”, which include carpentry, plumbing, winterization, and similar work programs on individual homes.

Based on requests from the Utilities Board, the Business Council authorizes all capital projects, hiring of staff, salaries, salary adjustments, staff benefits, capital equipment expenditures, and all other major expenditures. The NABC also sets all water and sewer rates. Water and sewer revenues are retained in NAU’s bank account and used by NAU to fund repair supplies, accounts payable, and other similar expenses. Because the system is not financially self-supporting, salaries and funding of unbudgeted emergencies such as pump replacements are paid from the tribal general fund administered by the Business Council.

This management structure and its process for allocation of resources leaves the NAU with no autonomy with which to carry out the assignment given it by the Business Council, nor does it provide clear lines of authority for performance accountability. Added to this condition is the constant demand for unplanned service expansion which NAU is charged with meeting. Without delegating full responsibility to run its own program by managing service demands, optimizing revenues, and independently making its own hiring and firing decisions, NAU cannot be held accountable. The Business Council is dependent on NAU to provide utilities services and employment to tribal members. NAU has little ability to effectively meet objectives with the Business Council constraining how it carries out those duties, and in many cases adding to service demands without prior coordination. The result is that each entity, NAU and NABC, is stymied by the other.

Finally, NAU has no formal program of staff performance evaluation. Without a regular review of individual performance, staff is not held strictly accountable for achieving their assigned duties. Duties need to be framed in measurable terms such as percentage of time that equipment is fully operational, time taken to respond to an identified system problem, budget efficiency, punctuality, full days at work without unauthorized absence, and similar measures.

System Classification

Ethete’s water system is classified by the State of Wyoming as a Class III Operation. Classification of operation is based on accumulative score of points. These points are developed from two categories, size of population served and the complexity of treatment involved in the system. The basis for this scoring process can be found below:
Size

Population served 7,500 or less, or 1
Population served 7,501 or more 2

Treatment

Coagulation and/or sedimentation 2
Filtration other than diatomaceous earth 2
Diatomaceous earth filtration 3
Chemical precipitation softening 2
Calcium/sodium hypochlorite and/or fluoridation 1
Chlorine gas, ozonation, chlorine dioxide, ultraviolet systems 2
or onsite generation of hypochlorite
Membrane filtration, electrodialysis or reverse osmosis 6
Ion exchange 2

For purposes of plant classification, treatment facilities must be under the supervision of plant personnel.

CLASSIFICATION

Class IV 8 points or more
Class III 6 or 7 points
Class II 5 Points or fewer

Using the criteria above, Ethete’s water system scores as follows:

- Population of 2,310 1 point
- Coagulation 2 points
- Conventional Filtration 2 points
- Gas Chlorination 2 points
- System Total 7 points

Under Wyoming DEQ standards this shows that the plant operator needs to hold a Level III certification. On the reservation, neither DEQ nor EPA governs operator certification.

The Northern Arapaho Utilities staff assigned to the Ethete system consists of two operators, only one of whom holds current certification, and that as a Level I. If NAU were to follow Wyoming’s Department of Environmental Quality operator criteria, the chief operator should hold a Level III. The backup operator would be permitted to hold a Level II certification.

Under Wyoming DEQ criteria, an operator-in-training is an individual who has passed the Level I exam and is working towards meeting the experience and educational requirements followed by certification at Level I. Requirements for operators can be found in Chapter V, Section 10 of the State of Wyoming Department of Environmental Quality, Water Quality Division regulations.

Staffing

In June 2009, the total staff of NAU consisted of the director, one engineer, one accountant, three administrative staff, and four operators.
As noted above, the Ethete system is staffed by two operators, the chief plant operator and one assistant operator. The chief plant operator is Harold Little Bear, and Vincent (Sonny) Redman is the assistant operator. Although Mr. Little Bear once held certification, he does not currently hold an operator certification. He only recently returned to the operation profession after being in another career. Mr. Redman holds a Level I certification in distribution.

Under its sovereign nation status, the tribal water system and its operator certification does not come under state jurisdiction. EPA alone holds jurisdiction over water systems on Indian reservations and their authority is limited to water quality at the tap. The EPA does not regulate any aspect of the system operation, including operator certifications. Their only requirement is that water coming from the user’s tap meets the requirements of the Safe Drinking Water Act. The EPA sets no requirements for certification of operators or that certified operators must be hired to run the system. Nonetheless, NAU director Gerald Redman strives to hire certified staff and he encourages his staff to obtain their operator certification.

There are no widely recognized standard methods for determining the staffing requirements of a water system based on the number of services, miles of line in the system, complexity of treatment, or other parameters. Individual systems are far too variable in their characteristics and operation and maintenance demands for that type of staffing measurement to be meaningful. Nonetheless, there is no question that the Ethete system is understaffed. To provide adequate coverage for the plant alone, two treatment operators are needed. Additionally, the distribution system requires at least one additional operator certified at Level I.

**Training**

As a policy, NAU attempts to hire certified operators. They also have tribal enrollment as a hiring criteria. The available labor pool largely impedes NAU’s objective of hiring certified operators. The tribe’s salary and benefit structure also contribute to the difficulty of hiring certified staff. As a result, the operators have to gain certification after being employed.

The Northern Arapaho Business Council has to authorize requests for time off to attend certification training and continuing education classes as well as the associated registration and travel expenses. In past years, partly because of inadequate staffing levels, it has been very difficult for the NAU to provide their staff the time away from work and the funding to attend needed training. This results in few of the operators making a serious effort to pursue training. This, in turn, results in the system being less competently operated than would otherwise be the case. Inadequately trained operators can contribute to cost inefficiencies in any system. The tribe needs to commit to making time and funds available for their staff to gain certification. Certification should also be a condition for continued employment after a reasonable time after one’s hiring date.

Training opportunities are widely available. Not all training requires time or travel away from the workplace. The Wyoming Utility Operators Association offers continuing education training through their semiannual conventions. They also offer training to operators seeking certifications. On-site training can be arranged through organizations such as Rural and Tribal Environmental Solutions (RATES) [https://www.gsaadvantage.gov/ref_text/.../GS10F0257R_online.htm](https://www.gsaadvantage.gov/ref_text/.../GS10F0257R_online.htm), Wyoming Water Quality and Pollution Control Association (WWQPCA), Wyoming Association of Rural Water users (WAWRS), and others. Internet based training is also widely available through the American Water Works Association (AWWA) which offers free webinars, the EPA [www.epa.gov/ogwdw/tribal/training.html](http://www.epa.gov/ogwdw/tribal/training.html), and perhaps others. By attending one conference every other year, operators can receive sufficient continuing education credits to maintain certification.
Staff performance is substandard when compared to similar nearby water system operations. In the course of the evaluation, significant inconsistencies were noted in the recording of critical plant operation data. Other observations included the state of repair of some equipment and the lack of operator knowledge of equipment performance parameters. The turnover of operation staff, training deficiencies, and lack of a formal program for holding staff accountable for performance are all likely contributors to this situation.

At present, NAU has no Standard Operating Procedures in written form. This can result in staff being uncertain of what their responsibilities are, who is responsible for directing routine activities, and how they are to respond to system needs.

**Compensation Management**

The Tribal Business Council pays few benefits to NAU staff other than those required by law: FICA, FUTA, unemployment, and workers compensation. They pay only sick leave and time off for funerals. There is no coverage for health insurance, life insurance, or paid vacation. Salaries range between $12 and $20 per hour.

By comparison, operators in adjoining communities receive the following pay scale and benefits.

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<tr>
<th>CERTIFICATION LEVEL</th>
<th>LANDER Hourly Pay Rate</th>
<th>RIVERTON Hourly Pay Rate</th>
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</thead>
<tbody>
<tr>
<td>Level I</td>
<td>$14.34 to $20.44</td>
<td>$13.44 to $17.48</td>
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<tr>
<td>Level II</td>
<td>$16.18 to $23.06</td>
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<tr>
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<tr>
<td>Level IV</td>
<td>$18.29 to $26.11</td>
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**BENEFITS**

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<thead>
<tr>
<th></th>
<th>LANDER</th>
<th>RIVERTON</th>
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</thead>
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<tr>
<td>Retirement</td>
<td>11.25% Wyoming Retirement</td>
<td>11.25% Wyoming Retirement</td>
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<tr>
<td>Health Insurance</td>
<td>City pays 85% of both employee and family</td>
<td>City pays for employee, employee pays for dependents</td>
</tr>
<tr>
<td>Dental Insurance</td>
<td>Included in health plan</td>
<td>Paid by employee through supplemental policy</td>
</tr>
<tr>
<td>Vision Insurance</td>
<td>Included in health plan</td>
<td>Optional, paid by employee</td>
</tr>
<tr>
<td>Life Insurance</td>
<td>$15,000 paid by city</td>
<td>$15,000 paid by city</td>
</tr>
<tr>
<td>Vacation</td>
<td>8 hours per month with increases for tenure</td>
<td>8 hours per month with increases for tenure</td>
</tr>
<tr>
<td>Sick Leave</td>
<td>1 day per month</td>
<td>1 day per month</td>
</tr>
</tbody>
</table>

Neither NAU nor the tribe has a formal compensation management system in place. Compensation is managed on a discretionary basis as determined by the director. For the past 18 months, the Northern Arapaho Business Council has had a salary freeze in force.

The NAU would be better served to develop, and then administer, a formal step rate salary system set on specific experience, educational, and performance criteria. As shown above, NAU is currently at a competitive disadvantage in its offerings for salary and benefits. For NAU to become more effective, this condition needs to be corrected.
When considering time off required for training, continuing education, holidays, vacation, and sick leave, the plant cannot be adequately covered by one operator. The system needs to have at least one backup operator plus a minimum of one or two operators on the distribution system.

**Financial Performance**

**Revenue Sufficiency**

Currently, the Ethete water system is not self-supporting nor has it ever been. In 2008, the system had expenses of $275,772. Its billing was $118,081 and collected revenues were $98,117. This is a typical ratio of billing, collections, and expenses. As a result, NAU relies on funds appropriated by the Northern Arapaho Business Council to make up revenue shortfalls. Expenditures for 2007 and 2008 are nearly identical.

It would be difficult for NAU to make water service self-supporting on the Ethete system. A large percentage of the ratepayers are low income. There are practical limitations to what the tribe can do to improve revenues from the system. There is likely a larger range of opportunities to make the system more operationally and cost efficient. These include:

- improve the system automation which can reduce labor;
- motivate staff to be accountable for the system’s performance and reliability; and
- improve the system’s physical condition so that, with proper maintenance, it can perform reliably and efficiently.

NAU has traditionally not accounted on a system-by-system basis for revenues and expenses for its separate systems, Ethete and Arapahoe. While this does not change the total financial results of NAU’s combined water systems, it does not allow NAU to draw cost comparisons between the two systems and adjust rates to cover those differences.

NAU relies on both federal and tribal funding to carry out its mission. The level of federal funding allocated in any federal fiscal year varies widely. Supplemental funding from the Northern Arapahoe Tribal Business Council is allocated on local criteria. This includes availability of funds, council priorities as perceived from constituent input, and other changing factors. The result is that NAU has an inconsistent revenue stream that prevents implementation of a consistent program of maintenance and operations staffing essential to an efficiently operated system.

Because of NAU’s historical reliance on receiving program and project specific grant funding from federal agencies, many needs go unaddressed when that funding is not approved. This results in untimely response to critical system needs and delayed maintenance, which accumulate to a crisis level before response can be made. This, in turn, results in system inefficiencies and less than optimal reactive response to system needs.

**Fiscal Controls**

The NAU receives funding from at least seven federal programs as well as the Arapaho Business Council. Each of these funding sources has to be accounted for separately. Each has its specific program stipulations for allowed expenditures. Expenditures from each funding source have to be audited for meeting program stipulations.
In June 2009, the staff of NAU consisted of the director, one engineer, one accountant, three administrative staff, and four operators. Each of these people plays a role in verifying that expenditures are within program parameters.

The NAU has to meet federal audit requirements each federal fiscal year on each of the seven programs to be eligible for continued funding under those programs. This results in an unusually high level of accounting requirements as compared to Wyoming municipalities.

In recent past years, the Northern Arapaho Tribe has, at times, been ineligible for funding from some agencies because of audit deficiencies. The Rural Utilities Services (RUS) is one such agency.

**Access to Needed Funds**

Any system expenditures in excess of whatever federal program funds become available have to be funded through the Tribal Business Council. Their funding, too, is largely from highly variable federal sources. In general, federal funding is uniformly increased or decreased across all programs in any given federal fiscal year. Additionally, the timing of release of those funds can be inconsistent from year to year. This creates an uncertain funding environment for the council. That, added to changing local priorities, can result in further variability of funding that the council makes available to Northern Arapaho Utilities.

When appropriations for the federal budget are decreased, NAU commonly receives less funding from both its federal program sources and the Business Council. When federal allocations are increased the situation is reversed. This variability makes it even more difficult for NAU to have a consistent revenue stream with which to operate the system.

NAU has largely relied upon IHS for funding of any system needs above and beyond normal operation. Funding for most maintenance and all system improvements has traditionally been sought through Indian Health Service (IHS) which has two funding pools on which NAU relies:

1. the Sanitation Facilities Construction (SFC), which addresses capital projects through the Sanitary Deficiencies System (SDS) program, and
2. the normal housing program, which addresses water and sewer infrastructure for new housing projects through normal planning, design, and construction processes.

These are two separate and distinct purpose programs. When program funding is not granted, needs have gone unmet. NAU’s past requests for improvement funds have not been awarded by IHS in part due to lack of allocated funds, but also because NAU did not have their funding needs documented and submitted to IHS in the manner required.

The IHS program is quite complex compared to USDA, HUD, and similar federal funding sources. The funding application reporting process is lengthily and time critical. The Billings area office receives approximately $2,000,000 annually to distribute among eight (8) reservations and nine (9) tribes. According to the IHS Billing office staff, the Arapaho tribe has consistently failed, over many years, to receive funding because of lack of timely and complete funding submittals.

Because of criteria attached to federal funding sources, NAU often finds that funding sources that are available are incompatible to present needs. HIS, in particular, has a history of cutting requested project funding applications, and taking, in most cases, two years or longer to grant the requests in reduced amounts. In the ensuing time, needs grow and inflation erodes the already reduced request. When funding does arrive it is nearly always insufficient to meet project objectives.
Historically, the access to funds has been sporadic, underallocated for needs being addressed, and with stipulations attached to expenditure often mismatched to needs. This has resulted in a piecemeal water system, which has chronically deferred maintenance, and delivers unreliable service at a higher than average delivery cost.

**Operation and Maintenance Recommendations**

Based on the foregoing evaluation, it is recommended that NAU make the operation and maintenance improvements listed in the remainder of this chapter.

**Technical Capacity**

**System Maintenance and Asset Management**

1. Develop an on-going list of needed system repairs for each segment of the system such as:
   a. Distribution – fire hydrant, valves, checking/resetting pressure reducing valves, line repair and replacements for both short and long term needs.
   b. Storage tanks – inspection, cleaning, and painting
   c. Plant – equipment scheduled inspection and maintenance, equipment repairs and updating, meter calibrations, SCADA system calibration, repair and updating.

2. Use assistance and resources offered by Wyoming DEQ, Wyoming Rural Water, Midwest Assistance Program (MAP), IHS, BIA, EPA, and others to assist in assessments, operator training, and funding of improvements.

**System Security**

1. Fence the water storage tanks as recommended in Chapters IV and VIII.
2. Develop an emergency/disaster response plan and train all operators in that plan.

**Source Water Protection**

1. Develop a source water protection plan in conjunction with the reservation authorities having jurisdiction over watershed protection.
2. Upon starting to implement the alluvial well field source, develop and implement a Wellhead Protection Plan using EPA guidelines.

**Recordkeeping**

1. Develop a system for compiling and storing records regarding:
   2. Plant equipment routine maintenance schedules, repair needs and the date identified, the date identified, and type of equipment installed.
      a. Distribution and transmission system repair needs, their location, date identified, the date repaired, and type of equipment installed.
      b. Storage tanks inspection reports, repair needs, their location in the tank, date identified, date repaired, and type of equipment installed.
3. Electronically scan and store, in digital or microfilm format, all available existing paper mapping and plans for the system, including the raw water diversion and transmission system, the treatment plant, the operation manuals, the storage tanks, and the distribution system.
4. Require that NAU receive electronic record drawings of all future improvement projects and system extensions, whether initiated by Arapaho Housing, IHS, or locally.

**Regulatory Compliance and Reporting**
1. Assign a specific person who will be responsible for taking and reporting required sampling to the EPA, and keep that person’s training current in EPA requirements.
2. Maintain a full copy of testing and reporting records at the plant.
3. Compile and maintain, at the plant, a full set of engineering plans for the plant.
4. Develop and maintain a preventative maintenance program for all plant equipment.

Managerial Capacity

Management Structure and Accountability

1. It is recommended that the Northern Arapaho Business Council delegate to Northern Arapaho Utilities full authority and responsibility for the utilities system operations without Council oversight of staffing, training, and other routine decision-making, including the setting of rates.
2. The Northern Arapaho Business Council needs to work with the BIA to stop the practice of issuing home sites, as these areas, in time, become isolated areas of dense development requiring central utility systems. Effort needs to be concentrated on infilling areas that are currently developed. Although much of the land in presently developed areas is not tribal land, over time, it will be less expensive for the tribe to purchase land to develop than to construct more water lines further from the current system.
3. It is recommended that the NAU director delegate to specific department heads full responsibility for and authority to autonomously carry out assigned program objectives. This would permit the director to concentrate his efforts on the higher value activities of implementing organizational objectives and planning and implementing needed system improvements.
4. Develop and implement a formal system of employee performance evaluation and regularly evaluate their accomplishments of assigned duties.
5. Make duty assignments based on certification levels attained and other relevant personal skills.

Staffing

1. It is recommended that the Ethete system be staffed with at least a Level III plant operator, a Level II backup operator, and at least one Level I operator all having certification in water operation. The plant should be attended by the Level III operator or backup operator any time that it is in operation.
2. Hire only operators who hold recommended certification levels or who are capable and willing to obtain recommended certification within one year of date of hire.
3. Make certification a requirement for continued employment and include this requirement in staff performance evaluations.
4. Evaluate staffing needs in regards to accounting and administrative functions.

Training

1. Make training an organizational priority for all utility operators.
2. Provide operations staff paid time away from work which is needed to acquire and maintain recommended certification levels.
3. Develop written Standard Operation Procedures and train staff in those procedures.

Compensation Management

1. Develop and implement a salary and benefit program which is competitive with surrounding utility organizations.
2. Link compensation to certification levels, leadership, teamwork, and other relevant job skills.
Financial Performance

Revenue Sufficiency
1. Adopt a policy of incrementally moving the water system to a position of being financially self-supporting through both operating efficiency and improved revenues.

Fiscal Control
1. Continue to refine cost and revenue accounting so both costs and revenues from the two major water systems can be clearly identified, and informed decisions can be made that contribute to the goal of financial self-sufficiency.

Access to Needed Funds
1. It is recommended that NAU and the tribe aggressively pursue IHS federal program funds, along with other funding sources, to improve the system to the point that it is brought up to a state-of-the-art system, and can then be efficiently operated and maintained.

It is recommended that the Northern Arapaho Business Council take a team role in providing a consistent and adequate level of funding to NAU to result in a consistently safe and reliable water system to tribal members.
CHAPTER VIII

PRIORITIZED MASTER PLAN

Introduction

The prioritizing of the recommended improvements is the element of this master plan most subject to local adjustment. The prioritization given below is the author’s ranking in which the work projects should be initiated. This ranking was developed based on both the urgency of the system needs and the suggestions of Northern Arapaho Utilities. It is expected that this prioritization may be changed in the final report in response to local comment and preferences.

Implementing the recommended projects can not be realistically tied to incremental increases in demand because none are driven by forecast increases in demand. As a result no time line is proposed. The projects should be implemented in their priority sequence as funding is cultivated and made available. The recommended projects are listed in their recommended sequence of implementation and a brief description of each is given in the remainder of this chapter.

The information presented in this chapter is a summary of the recommendations contained in Chapters III, IV, and V. They are presented here in project priority ranking order, considering the criteria shown below. These criteria are ranked in the order shown from the most important to least important.

- Public safety – EPA drinking water standards and fire protection
- Standards compliance
- Meeting consumer needs/delivery capacity
- Revenue improvement
- System and operational efficiency
- Funding availability
- Operational flexibility/ease

These criteria may also be subject to change as a result of comments that may be received in the presentation of the draft report. A ranking matrix for each recommended improvement is included in the report appendix.

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Each of the projects was ranked on a scale of 0 to 3 for each header category, with 0 being lowest and 3 being highest. The higher the numerical sum, the higher the priority of the project. The resulting priorities are listed in Table VIII-1. A fuller description of each project is given in Chapter IV.

**Raw Water Source Development**

It is recommended that the Wind River Alluvial Well Field be developed as a future raw water source for the Ethete system. This will replace the surface water diversion from the Little Wind River. If microscopic particulate analysis (MPA) testing shows no surface water influence of this source, it may be possible for NAU to cease using the treatment plant and treat with chlorine only. It is too early in the process to make that determination at this time.

**Upgrade Lines Serving the Tribal Headquarters, Wyoming Indian Middle School, Wind River Tribal College, and St. Michael’s Mission**

It is recommended that the 3-inch PVC dead-end lines to the Junior High and Tribal College be replaced with and looped with 6-inch PVC line. Further, the 6-inch PVC stub-outs to the Mission should be looped together with 6-inch PVC and connected to the Tribal Headquarters line loop.

**Change Out the High Service Pumps in the Water Treatment Plant**

The water treatment plant can produce 1600 gpm. The plant’s two pumps can pump only 850 gpm. They bottleneck production. The current pumps are a 30 horsepower six stage pump and a 40 horsepower eight stage pump. These pumps operate at significantly different total dynamic heads (TDH), with the larger pump “pushing back” on the smaller one. Neither pump is correctly sized for its operating conditions. The pumps cannot handle the 1,000 gpm forecast demand.

It is recommended that the clearwell pumps be replaced with units that match the system head curve, and operate efficiently at the system total dynamic head.

**Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino**

Presently the lines serving the Ethete area housing are severely undersized 2-inch and 4-inch lines. They offer marginal domestic water service and no fire protection. It is recommended that all 4-inch AC, 6-inch AC and 2-inch polyethylene (PE) lines be replaced with 6-inch PVC.

It is recommended that the 4-inch AC line, running parallel with Blue Sky Highway north of Ethete Road as a feed line to the newly constructed Little Wind Casino, be upgraded to an 8-inch PVC, matching the balance of the line to this casino.

Further, it is recommended to loop the new 6-inch PVC line under Willow Street to the new 8-inch PVC line under Blue Sky Highway, with 6-inch PVC pipe.

**Wyoming Indian High School Fire Protection**

The two dead-end waterlines serving Wyoming Indian Highs School provide inadequate fire protection to this valuable facility. It is recommended that the two 6-inch PVC dead-end lines be looped with an 8-inch PVC line. It is also recommended to replace the northern 6-inch PVC dead-end line with 8-inch PVC pipe. This will achieve a fire flow of over 4,000 gpm, meeting recommended standards.
Raw Water Transmission Line to Treatment Plant

The raw water transmission line from the river intake to the treatment plant was constructed in 1996. The material used for the transmission line is 12-inch thin-wall SDR 21, PVC pipe, rated at 100 psi. This line has failed several times in several locations in its relatively short service life. When this line is out of service, the system receives no water and has to rely on storage.

The proposed alluvial well field and its accompanying transmission line would eliminate the need for the one-mile of line from the diversion structure east to the highway. It is recommended that the remaining 5,200 feet of line to the plant be replaced with a new line constructed using PVC meeting AWWA C-900 DR18 standards. It should have a capacity of 1.3 million gallons per day (mgd). A 12-inch diameter pipe would be adequate.

Interconnect The Two Finished Water Transmission Lines Near The High School

It is recommended that the 8-inch and 10-inch PVC transmission lines coming from the storage tanks and running parallel to Highway 132 be tied together. This will significantly increase delivery capacity to the Ethete community and the high school, particularly in meeting fire flow demands.

Distribution Metering and Backflow Protection

The system is not metered. This results in excess water consumption, and gives NAU no way to meaningfully gauge usage or account for produced water. It is recommended that meters be installed on all services, each service be equipped with a backflow prevention device, and each service be individually tapped to the distribution main with its own curb stop. This will give NAU a far better means of managing the system and water use.

Replace AC Lines Along Ethete Road Between The Water Treatment Plant and Wyoming Highway 132 (Blue Sky Highway)

The undersized Asbestos Cement (AC) lines along each side of Ethete road are some of the original lines installed in the 1960. AC pipe is no longer manufactured and is classified as a hazardous material for persons working on it. It is recommended that all 4-inch and 6-inch lines on Ethete Road be upgraded to 6-inch PVC.

Implement Leak Detection Project

It is recommended that a leak detection program be utilized to help determine the cause of unusually high water usage throughout the Ethete system.

Improve Delivery Capacity in the Area of the Convenience Store and Tribal Facilities

It is recommended that all the 4-inch and 6-inch AC lines serving the convenience store, and nearby tribal facilities be upgraded to 6-inch PVC and looped to the Ethete Road line to provide system circulation and adequate fire protection. At present the fire flow offered by the system is substandard.

Yellow Calf Road Loops

It is recommended that the 6-inch PVC line on Lone Bear Lane be extended east to Yellow Calf Road. Further, it is recommended that line paralleling with Yellow Calf Road be extended south to 17-Mile Road. This would loop two major dead lines. It would allow recommended fire flow volumes to be
delivered to Mill Creek Housing, would give system redundancy in the event of line break on 17-Mile Road or Highway 132, and would significantly increase system circulation.

**Install Pressure Reducing Valves**

The existing pressure reducing valves (PRV) on the system are not operating. Most have not been maintained for years. It is recommended that replacement PRV’s be installed at the elevations shown on the system’s pressure zone map.

**Water Treatment Plant Controls Upgrade**

The recommended improvements in treatment plant recording and testing equipment will not be needed if the recommenced alluvial well field is put in service. If it takes more than two years to get the well field in service, it is recommended that the suggested improvements be made to the treatment plant as they will significantly improve the operator’s ability to manage the plant and produce water of consistent quality.

**Inflow**

The raw water influent line has an inflow meter that is inaccurate and is not tied into the SCADA system. It is thought that this meter is not installed in accordance with the manufacturer’s recommendations.

It is recommended that the raw water inflow meter be upgraded to be electronically read and recorded by the plant’s SCADA system.

It is recommended that a raw water turbidity meter be placed on the influent line to automatically record the turbidity on a preset schedule. The turbidity meter needs to be tied into the plant SCADA system to record and trend data. This input could then be used by the operators to provide flocculation dosage information and to compile an influent water quality history for assisting future operation.

**Filters**

The raw water enters the four individual Trident Water Treatment Systems. The flocculation clarifier and filter units are set to be flushed and backwashed at timed intervals. This process likely consumes more backwash water than is necessary.

It is recommended that the clarifier and filters be set up to automatically backwash based on filter head.

**Replace Damaged Line on the East Portion of Trosper Lane**

The existing line under Trosper Lane has been punctured by installation of power poles some years ago. The line was simply valved-off. It is recommended that the damaged portion of this 6-inch PVC line under Trosper Lane be replaced and reconnected to the existing 6-inch PVC line on Plunkett Road.

**Storage Tanks**

Currently, the Ethete area storage is made up of three tanks – 1,500,000 gallon, 250,000 gallon, and 100,000 gallon units. There are no records to indicate that any of these tanks have been repainted since they were put into service. The newest tank is approaching 30 years old. The 100,000 gallon tank and the 250,000 gallon storage tank have faded exterior paint and show surface rusting. The 1,500,000 gallon tank has a faded exterior and minor surface rusting. The interior coating of this tank is pealing off in large sheets and is rusting.
It is recommended that all three of these tanks be cleaned, sand blasted and repainted inside and out. It is also recommended that an 8-foot security fence be placed around the 1,500,000 gallon tank, and a separate 8-foot security fence be placed around the 250,000 and 100,000 gallon tanks.

**Managerial Recommendations**

Chapter VII discusses several operation, maintenance, and management recommendations. If implemented, those changes will help NAU to operate more proficiently and economically.
CHAPTER IX

ENVIRONMENTAL REPORT

Introduction

James Gores and Associates, under contract with the Wyoming Water Development Commission (WWDC), has conducted this Level II water supply master plan for the Northern Arapaho Utilities (NAU), Ethete System, Wyoming. The report 1) investigates additional water supply sources, 2) evaluates the water transmission, storage, and distribution system serving the rural Ethete area, and 3) prioritizes needed improvements to NAU’s Ethete water system. The project area is located in Fremont County, Wyoming as shown in Figure II-1.

Location

Ethete, Wyoming is located on the Wind River Indian Reservation in Fremont County, Wyoming on Wyoming Highway 132 approximately one mile south of the Little Wind River. The nearest communities include Fort Washakie (4 miles west), Lander (15 miles southwest), and Riverton (25 miles east). This area is at the eastern base of the Wind River Mountains.

The area has been inhabited since the mid-1800’s by the Wind River’s two tribes, the Northern Arapaho and the Eastern Shoshone Indians. Present day land use in the surrounding area is a combination of irrigated agriculture, livestock grazing, and rural residential. The terrain is high desert sagebrush grassland plains extending eastward from the base of the Wind River Mountains. The mountain flank, six miles to the west, rises abruptly from these plains into a sub-alpine and progressing to an alpine environment along the continental divide. The Wind River Mountains hold the largest concentration of remnant glaciers in the lower 48 states. Numerous eastward flowing streams head at the continental divide. These streams provide the source of water for local agricultural and municipal uses.

The Ethete portion of the Northern Arapaho Utilities water system extends from the intake on the Little Wind River approximately 3 miles west of the Ethete community, and 2 miles west of the treatment plant, east to Plunkett Road, and south to the storage tank near Mill Creek Road. Included in this water system are three storage tanks and the water treatment plant.

Existing System

The current water source for the NAU Ethete system is the Little Wind River. An intake on the Little Wind River transmits the raw water two miles east to the Ethete treatment plant. All of the water is treated at the plant. The water treatment plant is located approximately one mile west of Ethete off of Ethete Road. It currently treats all potable water for the NAU Ethete system and produces a peak day average of 770,830 gallons for the summer months. The water transmission line delivers the treated water to three storage tanks located one mile southwest of Ethete. The distribution system spans an area from one mile west to four miles east of Ethete. The system is bounded by Plunkett Road on the east and south, and the Little Wind River on the north for seven miles in the north-south direction. The distribution system consists of approximately 37 miles of water lines serving 367 homes, three businesses, four schools, and three tribal office complexes.
## Purpose and Need for the Project

The three-fold purpose of the project is to: 1) locate and add additional water supply sources, 2) evaluate the water delivery system for the rural NAU Ethete system service area boundaries and 3) update the system mapping and modeling of the existing NAU Ethete water system.

The need for this project is to evaluate the deficiencies and recommend improvement alternatives to the following:

- Water supply sources,
- Water transmission,
- Water treatment capacity,
- Water storage,
- Water distribution,
- System operation and maintenance,
- Selecting and prioritizing improvements,
- Cost estimates for selected improvements,
- Financing options for improvements,
- Environmental considerations.

During the course of this study funded by the Wyoming Water Development Commission, wells were successfully drilled at two locations to serve the Ethete system. A Wind River Formation test well was drilled approximately 2¼ miles northeast of the Ethete community. Alluvial wells were drilled west of Ethete just north of the Fort Washakie School. Both test well fields proved to offer a reliable quantity of water with little treatment necessary to meet Safe Drinking Water Standards.

## Alternatives

The alternatives that were studied in this project were:

1. Develop the alluvial well field to the west of the Ethete community.
2. Develop the Wind River Well Field to the northeast of the Ethete community.
3. Do nothing.

Alternative No. 1, “Developing the Alluvial Well Field to the West of the Ethete Community,” would involve installation of approximately 2-miles of newly constructed waterlines. This alternative would also involve replacement of transmission and distribution pipelines. This alternative would alleviate the water shortages during drought conditions and would address system deficiencies.

Alternative No. 2, “Developing the Wind River Well Field to the Northeast of the Ethete Community,” would involve installation of approximately 2.5 miles of new transmission pipeline. Transmission and distribution pipelines that are currently undersized and constructed of obsolete materials would be replaced during the project. This alternative would alleviate the water shortages during drought conditions and would also address the system deficiencies.

Alternative No. 3, “Do Nothing,” does not alleviate the water shortages that occur during drought conditions. It puts the human population who rely in the system for drinking water at elevated health risk.
Additionally, transmission and distribution capacity deficiencies are not addressed. As a result, this alternative was not considered for further study.

It was decided to pursue the alluvial well field as the preferred alternative. This option supplies the necessary quantity of water with the lowest lifetime operating costs.

**Affected Environment/Environmental Consequences**

**Land Use**

Rural housing developments, businesses, schools, and agriculture are the primary land uses in the project area. Livestock grazing is the principal agricultural use on the uplands.

The majority of the proposed project will be constructed on previously disturbed lands. To the greatest extent possible, the facilities will be located in transportation and utility corridors within existing easements of rights-of-way. A pipeline connecting the Wind River well field northeast of Ethete will traverse southwesterly across sage brush range land and the Little Wind River to tie into the existing system. To connect the alluvial well field, a transmission line will traverse the Little Wind River bottom to the existing water system intake.

**Environmental Consequences**

Under the preferred alternative, installation of the new waterlines will cause temporary disturbance to vegetation, soil and transportation. No permanent impacts to soil and vegetation are expected. Disturbed areas will be returned to their previous condition after construction of all of the facilities is completed. Soils in the project area are classified as glacial gravel deposits to fine silty loams on floodplains and river terraces. Vegetation in the project area consists of sagebrush, willow and cottonwood trees interspersed with an under story of grasses, sedges and rushes adjacent to the river. Upland areas are dominated by various species of grasses and forbs. There are no important farmlands, prime forest, rangelands, or formally classified high-value agricultural lands within the project area. The project will not directly affect current land use. The US Natural Resource Conservation Service responded on June 18, 2008, that the project will not adversely affect any conditions of the Farmlands Protection Act.

**Mitigation**

Reclamation of disturbed areas with native plant species adapted to the site will begin as soon as possible following construction to reduce the possibility of erosion, invasion of noxious weeds, and to replace vegetation impacted by construction. Appropriate erosion controls will be used and maintained in effective operating condition during construction. The US Army Corps of Engineers indicated in their email response of December 4, 2008, that the work will fall under the existing Nationwide Permit 12 for utility line activities. The US Army Corps will require preconstruction notification so that they may obtain certification from EPA that the project is acceptable under Section 401 of the Clean Water Act.
**Floodplains**

**Affected Environment**

The affected environment includes the floodplain associated with the Little Wind River and its tributaries in the project area.

**Environmental Consequences**

According to the FEMA National Flood Insurance Program Community Panel Number 5600801225-A, the transmission line from the proposed well site will cross through the 100-year floodplain of the Little Wind River and its tributaries. Under the Preferred Alternative, activities within the floodplain would be limited to installation of buried water transmission main. Stream crossings of the pipeline would be accomplished by either directional drilling or cut and cover (trenching, bedding, installing pipe and covering) that would restore the ground surface to the existing elevation. The activities most likely qualify for authorization under Nationwide Permit (NWP) 12 as defined in Part III of the *Federal Register* published on March 9, 2000 (Volume 65, No. 47) as noted in letter from the US Army Corps dated December 4, 2008.

**Mitigation**

Any excess material excavated during construction will not be placed within the floodplain. Proper erosion control methods will be observed within the floodplain. Disturbed areas within the floodplain will be reclaimed and returned to their pre-construction condition.

**Wetlands**

**Affected Environment**

No wetlands present within the project area will be permanently affected by the proposed project. Wetlands in the project area exist as narrow fringes adjacent to the Little Wind River.

**Environmental Consequences**

Wetlands may be temporarily disturbed during construction of the new water line. However, directional drilling under these features or avoiding them entirely during construction is often more efficient and less costly than trenching and mitigation. If the Preferred Alternative is constructed, no permanent impacts to wetlands or riparian habitats will occur. The U.S. Army Corps of Engineers (ACOE) regulates the placement of dredged and fill material into wetlands and other waters of the United States. The activities most likely qualify for authorization under Nationwide Permit (NWP) 12 as defined in Part III of the Federal Register published on March 9, 2000 (Volume 65, No. 47). Authorization under NWP 12 assumes full compliance with the permit conditions. Exhibit 6.2 and 6.4.

Wetlands are afforded protection under Section 404 of the Clean Water Act and Executive Order 11988 (floodplain management). This is addressed in the letter from the US Army Corps dated December 4, 2008.
Mitigation

All activities undertaken to construct the project must comply with the General Conditions described in NWP 12 fact sheet. If wetlands are to be destroyed or degraded by the proposed project, the project area will be inventoried. Specific actions will be outlined to avoid, minimize and compensate all unavoidable wetland impacts. Best Management Practices (BMPs) should be implemented within the project area. All disturbed areas will be reseeded with riparian vegetation native to the area. The appendix contains a November 26, 2008 letter from the US Fish and Wildlife addressing the wetland issues.

Cultural Resources

Affected Environment

The affected environment includes the proposed well site, pipeline route, rural properties adjacent to the pipeline route, the Town of Ethete and all areas of surface disturbance and appropriate buffer areas around ground disturbance activities. The majority of the project area has previously been disturbed.

Environmental Consequences

Historical/Prehistoric Resources

The proposed project is located mostly in previously disturbed areas and the probability of locating surface archeological or historic manifestations is low. A letter from the Wyoming State Historic Preservation Office November 3, 2008 indicates that a cultural resources survey has not been conducted in the area of potential effect. Prior to construction, a professional cultural resources firm qualified under the Secretary of the Interior’s Professional Qualification Standards (48 FR 22716, Sept. 1983), should be hired to conduct a cultural resources survey according to 36 CFR Part 800. The Area of Potential Effect (APE) will need to be defined and then evaluated for the need to conduct a more intensive survey and determine mitigation requirements. The Northern Arapaho and the Eastern Shoshone Tribal Historic Preservation Officers will be consulted with regard to this project. The Wyoming State Historic Preservation Office and both Tribal Historic Preservation Offices will review and comment on the cultural resource report.

Visual Aesthetics

There are no visually sensitive areas in the project area. Some minor short-term visual impacts will result from ground disturbance associated with construction; however, successful reclamation and repairing of disturbed areas will remove these visual impacts.

Mitigation

A cultural resources survey will be conducted to determine historical and archaeological resources in the project area and APE. If any undocumented archeological/cultural resources are uncovered during construction, work in the area will halt immediately and the Northern Arapaho and the Eastern Shoshone Tribal Historic Preservation Officers must be contacted. Work in the area may not resume until the materials have been evaluated and adequate measures for their protection or collection have been taken. All disturbed areas will be reclaimed using native vegetation as soon as practical following construction.
**Biological Resources**

**Affected Environment**

The affected environment includes vegetation and wildlife within or adjacent to the project area.

**Environmental Consequences**

*Threatened and Endangered Species*

Threatened, endangered, and proposed species that may occur in Fremont County include the bald eagle, whooping crane, black footed ferret, and mountain plover. The project is not likely to adversely affect any of the terrestrial threatened or endangered animals and plants occurring in Fremont County. Protective measures for migratory birds will be addressed in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and Executive Order 13186. The US Fish and Wildlife addresses this issue in their letter dated November 26, 2008.

*Fish and Wildlife Resources*

On a scale of 1 to 5, with one being the best, the Little Wind River within the project area is classified as a Class 4 trout stream. This classification means that the Little Wind River is low biomass trout water with a fishery that may be locally important, but generally incapable of sustaining substantial fishing pressure (WGFD 1991).

Riparian habitats are used by many species of wildlife including migratory songbirds, deer, waterfowl, small mammals and game birds. Impacts to fish and wildlife are expected to be minimal. No significant impacts to wildlife are anticipated for any of the alternatives considered.

Protective measures for migratory birds will be in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, The Bald and Golden Eagle Protection Act (BGEPA) 16 U.S.C. 668, and Executive Order 13186.


*Vegetation*

The riparian vegetation adjacent to the Little Wind River and in the project area is dominated by plains cottonwood trees and Russian olive with an understory of several species of willow, grasses and forbs. Upland areas are grassland with a mixture of rabbitbrush, sagebrush, and forbs. Because of the sparse rainfall (Less than 7" annually) and clay soils that dominate Fremont County, much of the uplands are sparsely vegetated. Impacts to vegetation will be minimal where the construction of new wells and pipelines are planned. The total surface disturbance associated with the construction of these components will total less than one acre. The impacts to vegetation will be associated with construction of the new water lines.
Mitigation

Best Management Practices should be implemented within the project area. Specific actions will be outlined to avoid, minimize, and compensate all wetland impacts. All disturbances to stream banks will be reclaimed. All areas of disturbance, especially within the riparian zone, will be limited to the minimum area required to meet project objectives. The riparian areas of disturbance will be reclaimed and re-seeded with native plant species immediately following construction. Construction should occur during the winter to minimize any impacts to the Little Wind River and adjacent riparian areas.

Water Quality Issues

Affected Environment

The affected environment is that portion of the Little Wind River, its tributaries, and watershed within and downstream from the project area.

Environmental Consequences

There is minimal potential to impact water quality in the Little Wind River because the project components are located some distance from the mainstream channel. There is very minor potential for construction-related sediment-laden runoff or petroleum products to enter the drainage. Stream disturbances to the mainstem channel of the Little Wind River will not occur if any of the alternatives are selected. All equipment staging areas will be located at least 300 feet away from the Little Wind River to reduce the potential for fuel spills to enter the river. The US Army Corps will require preconstruction notification so that they may obtain certification from the EPA that the project is acceptable under Section 401 of the Clean Water Act. Best Management Practices should be implemented to prevent sediment-laden water from entering the drainage; minimal water quality impacts are expected.

Mitigation

Mitigation will include implementation of standard erosion control measures where practical, including: 1) sediment detention ponds intercepting discharges where construction related sediment-laden runoff will occur, 2) timely reclamation of disturbed areas, and 3) compliance with all pertinent permits. The EPA may require the following three Water Quality Division permits:

- A Temporary Discharge Permit is required for any discharges to “waters of the state.” These discharges are permitted under the National Pollution Discharge Elimination System (NPDES).
- If the project will result in clearing, grading, or otherwise disturbing five or more acres, a Storm Water Associated with Construction Activities permit will be required.
- Whenever a public water or waste system is constructed, installed or modified, a “Permit to Construct” is required. Adherence to required permits will minimize any impacts on water quality.

Coastal Resources

There are no coastal resources in the project area.
Airport Clear Zones

There are no airports within 25 miles.

Socio-Economic / Environmental Justice

Affected Environment

The affected environment includes the entire pipeline system, Ethete and all residents served by the NAU Ethete water supply system.

Environmental Consequences

All residents of Ethete and landowners along the pipeline route are potential beneficiaries of the proposed project. Improvements to the water supply will improve the quality of life for all residents served by the expanded NAU Ethete water supply system.

No known business or industrial expansion is expected as a result of the project. The project is authorized under the Water Development Program for the purpose of improving a sponsor’s water supply.

Environmental Justice Considerations

On February 11, 1994, President Clinton issued Executive Order 12989 requiring federal agencies to incorporate environmental justice considerations into the NEPA process. The purpose of this order was to ensure that low-income households, minority households, and minority businesses do not experience a disproportionate share of adverse environmental effects resulting from any given federal action.

The proposed action will not negatively affect a disproportionate amount of minority households, minority businesses, or low-income households. The proposed project will benefit all citizens of Ethete and the rural area served by the expanded water supply project.

The expanded water project is being constructed expressly for the benefit of a reservation community. As a result of the project, minority households and minority businesses should experience a significant increase in water quality as a secondary impact.

Mitigation

No mitigation is required for socio-economic or environmental justice issues in the proposed project area.

MISCELLANEOUS ISSUES

Affected Environment

The affected environment includes the project construction area and areas near Ethete.

Environmental Consequences

Air Quality
Air quality will be lowered slightly in the project area during construction due to dust and exhaust from construction equipment. These impacts should be short term, localized, and are dependent on weather conditions during the construction period. After construction, air quality is expected to return to pre-construction levels. The US Environmental Protection Agency has approved the State Implementation Plan for Wyoming. The State Implementation Plan has established the Wyoming Air Quality Standards and Regulations. Three sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the listed projects. These sections are WAQSR Chapter III, Section 2(f) regarding fugitive dust control, Chapter VI, regarding permitting, and Chapter X, Section 2 regarding open burning.

**Transportation**

The project area is traversed by State Highway WYO 132, north to south. Several BIA roads traverse the project area. During construction, traffic will be temporarily impacted on local roads by slightly increased volumes. The project will not have any permanent impacts on transportation.

**Noise**

Noise impacts in the project area will be temporary and will consist of increased noise levels associated with construction activities. Regular maintenance and upkeep of construction equipment will minimize noise impacts. After construction is complete, noise levels are expected to return to pre-construction levels.

**Solid Waste Management**

Solid waste resulting from the project is expected to consist of normal construction debris and must be disposed of in the approved landfill operated by the Northern Arapaho Tribe.

**Farmland Protection**

There are no lands protected under the Farmlands Protection Act of 1981.

**Mitigation**

Mitigation for temporary air quality impacts during construction will include: 1) spreading water on work areas and other areas of exposed soil to suppress fugitive dust emissions, 2) maintenance of construction equipment and heavy machinery to minimize exhaust emissions, and 3) re-vegetation of disturbed areas as soon as practical.

Public transportation will be protected through the usage of proper construction signage as per the Manual on Uniform Traffic Control Devices.

If construction work is conducted during normal working hours, noise impacts, especially to nearby residents, can be alleviated.

Solid waste accumulated as a result of the construction process must be contained in covered containers on site and removed to an approved landfill upon completion of the project.
Summary of Mitigation

**Land Use** – Reclamation of disturbed areas with native plant species adapted to the site will begin as soon as possible during and/or following construction to reduce the possibility of erosion and invasion of noxious weeds and to replace vegetation impacted by construction. Appropriate erosion, silt and runoff controls will be used and maintained in effective operating conditions during construction.

**Floodplains** – The work should fall under the existing Nationwide Permit 12 for Utility line activities. Materials excavated during the construction will not be placed within the floodplain. Proper erosion control methods will be observed within the floodplain. Disturbed areas within the floodplain will be reclaimed and returned to their pre-construction condition.

**Wetlands** – All activities undertaken to construct the project must comply with the General Conditions described in the attached NWP 12 fact sheet. If wetlands are to be destroyed or degraded by the proposed project, the project area will be inventoried. Specific actions will be outlined to avoid, minimize, and compensate for all wetland impacts. To further minimize temporary impacts to wetlands, all disturbed areas will be re-seeded with native wetland seed, and/or plants adapted to the site.

**Cultural Resources** – If any archeological/cultural resources are uncovered during construction, work in the area will halt immediately and the Northern Arapaho and Eastern Shoshone Tribal Historic Preservation Officers will be contacted. Any cultural resource survey must be reviewed by the State of Wyoming Historical Preservation Office as well as the Tribal Historic Preservation Offices. Work in the area may not resume until the materials have been evaluated and adequate measures for their protection or collection have been taken. To reduce impacts to aesthetics, all disturbed areas will be reclaimed using native vegetation as soon as practical following construction.

**Biological Resources** – Protective measures for migratory birds will be in accordance with the US Fish and Wildlife rules and regulations as addressed in their letter dated November 26, 2008. Best Management Practices will be used to prevent petroleum products and/or sediment-laden water from entering the Little Wind River. Fish passage will be maintained at all times during construction so as to not disturb spawning or other fish movements. Any disturbance to stream banks will be reclaimed. All areas of disturbance will be limited to the minimum area required to meet project objectives. The areas of disturbance will be reclaimed and re-seeded with native plant species immediately following construction.

**Water Quality Issues** – The US Army Corps will require preconstruction notification so that they may obtain certification from the EPA that the project is acceptable under Section 401 of the Clean Water Act. Mitigation will include implementation of standard erosion control measures where practical, including: 1) sediment detention ponds intercepting discharges where construction related sediment-laden runoff will occur, 2) timely reclamation of disturbed areas, and 3) compliance with all pertinent permits. According to the EPA Water Quality Division, three Water Quality Division permits may be required. A Temporary Discharge Permit is required for any discharges to “waters of the state.” These discharges are permitted under the National Pollution Discharge Elimination Systems (NPDES). If the project will result in clearing, grading, or otherwise disturbing five or more acres, a Storm Water Associated with Construction Activities permit will be required. Finally, any time a public water or waste water system is constructed, installed or modified, a “Permit to Construct” is required. While these would normally be required in the course of a construction project, because this project is located on a federally recognized reservation, these permits are not required.

**Air Quality Issues** – Fugitive dust will be regulated by the Wyoming Air Quality Standards and Regulations. If asbestos cement pipe is found in the distribution system, the pipe will be left in the ground and larger pipe will be installed at a reasonable offset to avoid breaking the pipe during removal.
**Socioeconomic/Environmental Justice Issues** – No mitigation measures are required for socioeconomic or environmental justice issues in the proposed project area.

**Miscellaneous Issues** – Mitigation for temporary air quality impacts during construction will include: 1) spreading water on work areas’ access roads, haul roads, gravel processing sites, and areas of exposed soil to suppress fugitive dust emissions, 2) maintenance of construction equipment and heavy machinery to minimize exhaust emissions, and 3) revegetation of disturbed areas as soon as practical. Public transportation will be protected through the usage of proper construction signage as per the Manual on Uniform Traffic Control Devices. Impacts from noise can be alleviated if construction work is performed during normal working hours. Solid waste accumulated as a result of the construction process must be contained in covered containers on-site and removed to an approved landfill upon completion of the project.

**CORRESPONDENCE AND COORDINATION**

Initial consultation letters requesting comments relating to environmental concerns related to the proposed project were sent to the state, federal, and local government agencies listed on the following pages. These letters and responses from the agencies can be found in *Appendix A*.

Of the ten agencies contacted, five responded with specific concerns that have been addressed in this document. Agencies not responding include the DEQ, BIA Superintendent, Wyoming Game & Fish, Wind River Environmental Council, and the City of Riverton. Each of these agencies was contacted by phone to determine if they intended to respond, and no further response was received.
Agencies that were notified of the project on October 21, 2008 and were requested to provide their input are listed below. Agencies that responded are shown in **Bold**.

Mr. George Gover, Superintendent  
Bureau of Indian Affairs  
PO Box 158  
Fort Washakie, WY 82514

**Ms. Claudia Nissley**  
Division of Cultural Resources  
**Wyoming State Historic Preservation Office**  
2301 Central Avenue  
Barrett Bldg, 3rd Floor  
Cheyenne, WY 82002

Mr. Steve Poitras  
USDA-NRCS  
PO Box 127  
Ft. Washakie, WY 82514

Mr. Dan Olsen, Administrator  
Air Quality Division  
Wyoming Department of Environmental Quality  
122 West 25th Street  
Cheyenne, WY 82002

**Mr. David Skates**  
U.S. Fish and Wildlife Service  
170 N. First Street  
Lander, WY 82520

**Mr. Brian T. Kelly, State Supervisor**  
U. S. Fish and Wildlife Service  
4000 Airport Parkway  
Cheyenne, WY 82001

Mr. Ken Schmidlin, Supervisor  
Wyoming Game and Fish Department  
260 Buena Vista Drive  
Lander, WY 82520

Mr. Don Aragon, Director  
Wind River Environmental Quality  
P. O. Box 217  
Ft. Washakie, WY 82514

**Mr. William Urbigkit, Airport Manager**  
City of Riverton  
P. O. Box 1700  
Riverton, WY 82501
CHAPTER X

PERMITTING REQUIREMENTS

Identifying Permits for Construction

Projects being constructed on the Wind River Indian Reservation require a different set of permitting requirements than similar projects located in the other areas of Wyoming. The Wind River Indian Reservation has unique jurisdictional factors. The Wyoming State Engineer’s Office, U.S. Environmental Protection Agency (EPA), U.S Bureau of Indian Affairs (BIA), Wind River Environmental Council, the Tribal Water Resource Board, the Tribal Historical Preservation Offices, and the utilities organization for each tribe all have authority over specific activities on the Wind River Indian Reservation.

For example, the tribal governments for the Northern Arapaho and Eastern Shoshone tribes have review and approval primacy on public utilities projects on the reservation rather than Wyoming DEQ. Nonetheless, the tribes approve the construction of public utility projects based on their compliance with Wyoming DEQ’s current standards.

The Wyoming State Engineer’s Office has authority over beneficial use of groundwater. Any new wells will need to be permitted through the Wyoming State Engineer’s Office. The Tribal Water Resource Board requires well construction and well completion permits as well as a driller’s license for the contractor constructing the well.

The U.S. Environmental Protection Agency requests that Northern Arapaho Utilities submit the Master Plan, along with any new waterline or well construction plans and specifications, to review for compliance with the Clean Water Act. The EPA needs to be advised of any new drinking water sources. A standard form has been developed for this process.

Northern Arapaho Utilities will review, approve, and submit to the Tribal Water Resource Board for approval, any construction plans involving the use of additional water resources or construction of waterlines.

There are two different methods of approval for historical and cultural resources on the Wind River Indian Reservation.

- The Northern Arapaho Utilities, through its consultant, can perform a historical and cultural resource survey on projects less than five acres. The Wyoming State Historical Preservation Office will review the survey for historical and cultural resources. This report will be submitted to the Tribal Historical Preservation Offices for a 30-day review.

- For projects greater than five acres, the BIA must perform the historical and cultural resource study through their Billings, MT office. It will then be reviewed by the Tribal Historical Preservation Offices and the Wyoming State Historical Preservation Office.

The Bureau of Indian Affairs must approve the overall project right-of-way (ROW) easements prior to construction.
Electrical power will be required for the wells. High Plains Power will obtain transmission rights-of-way for their lines. Northern Arapaho Utilities will identify these proposed rights-of-way and provide the power company with associated mapping.

**Easement Procurement**

Right-of-ways will be required for the planned well sites and water collection lines from the wells. Likewise, ROW will be required for the transmission line to the treatment plant or distribution system. This permitting process can take up to a year or more to complete.

There are three categories of property on the reservation: tribal trust, allotted, and private deeded, each requiring its own easement permitting process. Easements on private lands require no BIA permitting. Allotted lands are those that are in private ownership by tribal members who are heirs to the original tribal person to whom the land parcel was allotted. In most cases these lands have a large number of persons who hold interest in the property. The other two land classifications require BIA permitting. Tribal trust lands are held jointly by the two tribes and are administered by the BIA. The permitting process through the Bureau of Indian Affairs on the Wind River Indian Reservation includes the following steps:

1. Northern Arapaho Utilities is to obtain the land ownership information from the Bureau of Indian Affairs Realty office for the proposed easement route(s).

2. Northern Arapaho Utilities will apply using BIA forms for a “Permission to Survey” on Indian Trust Lands. Upon receipt of thePermission to Survey and Easement Permit application, the BIA will request it be added as an agenda item for the Joint Tribal Business Council (JBC). JBC will then review the permit applications and take action on it. The BIA will then approve or deny the permit accordingly. Once Permission to Survey is granted, a land surveyor can conduct the field surveying needed to prepare a legal description of the proposed easement and the accompanying easement permits for each trust land or Tribal parcel. An appraisal is required of each parcel for final approval of the easement permit. A corridor map must be attached to the permits showing the proposed waterline easement across each parcel.

3. For required easements that cross allotment lands, the Northern Arapaho Utilities must obtain the signatures of a minimum of 50% of the individual allotees on the Permission to Survey and Easement Permits. Upon receipt of the Permission to Survey and Easement Permit application, the BIA will request the application be added as an agenda item for the Joint Tribal Business Council (JBC). JBC will then review the permit applications and take action. An appraisal is required of each parcel for final approval of the easement permit. The BIA recommends obtaining signatures on both the Permission to Survey and Easement Permit to reduce the time in obtaining the appropriate permits.

Before any surface disturbance can take place, a cultural resources inventory must be made and obtained through BIA. There are two different methods of approval for historical and cultural resources on the Wind River Indian Reservation as was described on page 1 of this chapter.

Portions of the proposed project include upgrades to the existing water distribution system. Northern Arapaho Utilities will propose using the existing right-of-way easements for this construction. The Northern Arapaho Utilities have very few existing waterline easements. The Bureau of Indian Affairs recommends applying for new easements on each waterline project. A cultural clearance will be performed on these easements similar to new easements as discussed above. Approval for these projects will need to be acquired from BIA and the Joint Tribal Business Councils.
CHAPTER XI

SYSTEM ECONOMIC ANALYSIS AND PROJECT FINANCING

Introduction

This chapter covers the economic status of the Northern Arapaho Utilities Ethete system and how its economic status compares to other similar systems. Also discussed are the water rates that the system would have to charge to become self supporting.

The financing of proposed improvements is discussed in this chapter as well. Because the system is on a reservation and serves primarily a Native American population, funding sources are available that are not otherwise available. There are also some state sources for which the system does not qualify.

System Economic Analysis

The Ethete portion of the Northern Arapaho Utilities water system provides potable water service to:

- 367 homes
- Four businesses
- Four schools
- Four churches
- Five public buildings; Tribal headquarters, Blue Sky Hall, and three tribal office complexes.

There are a total of 384 total services. Of these, 334 are billed on a monthly basis. Total billing in 2007 was $118,081 or an average of $29.46 per month. Some services are not billed for various reasons set by the Northern Arapaho Business Council.

The estimated service as of 2009 is 1,620 people. This population made up of Tribal and non-tribal individuals.

As described in Chapter III, the water system is comprised of 37 miles of pipe spread over a 26 square mile service area. It uses a conventional water treatment plant to treat water from the Little Wind River. This is a large expanse of system as compared to its service population. Because of its size and complexity, this is a costly system to operate and maintain on a per customer basis. This is an expensive system to support on a per customer basis.

The system is in poor operational condition due to a combination of marginal construction quality and minimal maintenance investment.

Northern Arapaho Utilities Water Rates

Northern Arapaho Utilities has the following water rates:

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Monthly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Water</td>
<td>$17.00</td>
</tr>
<tr>
<td>Non-enrolled Water</td>
<td>$21.00</td>
</tr>
<tr>
<td>Senior Water</td>
<td>$11.00</td>
</tr>
<tr>
<td>Non-enrolled Water Senior</td>
<td>$13.00</td>
</tr>
</tbody>
</table>

Other subscribers, such as schools and businesses are billed and individually agreed rate.
These rates are comparable to other reservations. They are lower than rates in surrounding off-reservation communities.

Currently, the Ethete water system is not self-supporting, nor has it ever been. In 2008, the system had expenses of $275,772. Its billing was $118,081 and collected revenues were $98,117. Fiscal year 2007 had very similar results. This is a typical ratio of billing, collections, and expenses. As a result, NAU relies on funds from the Northern Arapaho Business Council to make up revenue shortfall. This is comparable to other reservation systems.

**Water Rates of Other Reservation Systems**

Rates for nearby communities and other reservation systems are as given below.

*Shoshone Utilities, Ft. Washakie, WY.*

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Monthly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrolled Shoshone</td>
<td>$20.00</td>
</tr>
<tr>
<td>Other Tribe</td>
<td>$23.00</td>
</tr>
<tr>
<td>Non-enrolled</td>
<td>$23.00</td>
</tr>
</tbody>
</table>

This system in not metered and charges only a flat rate. The service population is reported to be 2,870. System billings are $230,000 with collections of $212,000. the system is not self-supporting.

*Northern Cheyenne Utilities Commission, Lame Deer, MT*

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Monthly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential water and sewer combined</td>
<td>$48/mo.</td>
</tr>
</tbody>
</table>

The system serves 520 residential and 90 commercial accounts. It has a service population of approximately 2,600. It reported 2007 revenues of $303,923 and expenses of $400,000. The system is not self-supporting.

*Gila River Indian Community, Sacaton, AZ*

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>$0.50/1000</td>
</tr>
<tr>
<td>Commercial</td>
<td>$0.075/1000</td>
</tr>
<tr>
<td>Seniors</td>
<td>$5.00/mo. flat rate</td>
</tr>
</tbody>
</table>

The system serves approximately 10,000 people and has 2,850 connections, 2,000 of which are metered. It reports annual billing of $65,000, collections of $510,000 with total operating expenses of $1,500,000. The system is not self-supporting.

*Nez Perce Tribe, Lapwai, ID*

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Monthly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>$27.00/mo. for first 1,000 gal and $1.50/1000 thereafter</td>
</tr>
</tbody>
</table>

The system serves 134 connections, has 134 services, and serves a population of 536 people. They report billing of $88,440 per year. The system is not self-supporting and relies on an $80,000 annual subsidy from the tribe to offset non-payment.
**Mid-Dakota Water Development District**

<table>
<thead>
<tr>
<th>Rate Classification</th>
<th>Minimum</th>
<th>1st Tier/1000 gal</th>
<th>2nd Tier/1st 20,000</th>
<th>3rd Tier/1st 23K</th>
<th>3rd Tier/over 33K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Household</td>
<td>$34.90/mo</td>
<td>$3.50/1st 10,000</td>
<td>$3.50/to 23K</td>
<td>$5.25 over 33K</td>
<td></td>
</tr>
<tr>
<td>Municipal</td>
<td>$18.50/mo</td>
<td>$3.50/1st 20,000</td>
<td></td>
<td>$5.25 over 20K</td>
<td></td>
</tr>
</tbody>
</table>

This system serves 30,000 people, many of whom are Native American, in 18 municipalities and 2,350 rural taps. It has 2,340 miles of distribution and 89 miles of main line, 10 tanks and a 9 MGD water treatment plant. The system was set up and funded by a specific act of congress. The self supporting status of this system was not determined.

**Rates Needed To Support System with Present Assistance**

Based on NAU cost accounting, total water costs amounted to $1.36 per thousand gallons in 2007 for the Ethete system, $278,657 for the 205,400,000 gallons produced. The cost per thousand gallons in 2008 is virtually identical.

Using the present 384 services, the average water bill per service would be $725.67 per year, equating to $60.47 per month. This is comparable to water rates in local municipalities. This rate only covers basis operation and maintenance. The rate will have to be much higher to cover the cost of retiring the debt that likely will be required to bring the system up to accepted standards.

**Ability to Pay**

Many of the system subscribers fall in poverty level category for annual family income levels. As a result, there are practical limitations to what the tribe can do to improve revenues from the system. This is evident in the delinquency rates on billings discussed earlier. Some of these difficulties are related to NAU’s collection policies and the inability to enforce collection through physically shutting off service for non-payment. Still, there is some room for rate adjustments and revenue improvement including:

- General rate adjustment
- Billing all system connections including tribal facilities
- Rigorously enforcing collections

These efforts will be more effective if accompanied with an accompanying rate payer education program.

NAU relies on both federal and tribal funding to carry out its mission. Federal funding has been sporadic at best. The level of funding allocated in any federal fiscal year varies widely. Supplemental funding from the Northern Arapaho Tribal Business Council is allocated on local criteria. This includes availability of funds, council priorities as perceived from constituent input, and other changing factors. The result is that NAU has an inconsistent revenue stream that thwarts efforts to implement a consistent program of maintenance and staffing of operations essential to an efficiently operated system.

**Financing Planned Improvement Projects**

Northern Arapaho Utilities has relied almost entirely on federal funding for capital improvements since its inception. This is representative of reservation systems. The Indian Health Service has been tasked by the U.S. Congress with that assignment. As discussed above, this funding source has a history of being sporadic depending on the policy of the federal administration during any given administration. It is assumed that the IHS will continue to be the primary source of funding for future capital improvement for NAU’s system.
In the past, it has been common that the funding cycle is protracted to the extent that once projects receive the requested funding the amount received has been eroded by cost escalations, budget cuts or both. By the time funding is received, it is insufficient to achieve the planned project. This situation, coupled with substandard maintenance of the system, has contributed significantly to the piecemeal, inferior quality system that NAU now has.

The available sources of project funding for Northern Arapaho Utilities capital projects have been identified to include:

- Indian Health Service – Sanitary Facilities Construction Program
- Wyoming Water Development Commission
- USDA – Rural Development
- Arapaho Tribal Funding

Other sources, such as EPA, are available on a special projects or special legislation basis (i.e. ARRA/Stimulus Funding) but are not known to be available on an on-going basis.

**Funding Of Prioritized Projects**

It is recommended that the following Project Financing table be used as a guideline for seeking for the prioritized projects as listed. All of the recommended projects are eligible for funding through the IHS and the Rural Development (R.D.) office of USDA.

The Billings area office of the IHS receives only $2,000,000 dollars annually to distribute among nine tribes on eight reservations. In reality the IHS will provide only marginal financial help to the overall need for $9,000,000 dollars of need on the Ethete system. The principal advantage of this funding source is that there is no required funding match.

All of the recommended projects also qualify for funding by the RD branch of USDA. This funding source offers only a 30% grant accompanied by 70% loan. The Wind River Reservation’s income level makes the tribe eligible to receive the “poverty” interest rate of 2.625%. Paying off the required loan amounts would be a heavy burden for the NAU.

For qualifying projects, which is limited to
- water source development,
- water transmission, and
- storage,

the Wyoming Water Development commission offers 67% grant, 33% loan funding. Terms of the loan are a 4% interest rate for 20 years. However, the State’s Attorney General has determined that the Northern Arapaho Tribe is ineligible for water development loans because of their sovereign nation status.

Table XI-1 shows the projects in their priority ranking for the conceptual project financing plan. The grant and loan amounts that may be available through the funding agencies for each project are shown.
## Project Financing

<table>
<thead>
<tr>
<th>Project Priority Ranking</th>
<th>Project Description</th>
<th>Total Project Cost</th>
<th>WWDC 67% Grant</th>
<th>33% Tribal Appropriation</th>
<th>30% Grant</th>
<th>70% Loan</th>
<th>2.625%, 20-Year Annual Payment</th>
<th>Direct Funding 100%</th>
<th>Tribal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raw Water Source Development</td>
<td>$2,749,400.00</td>
<td>$1,842,098</td>
<td>$907,302</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael’s Mission</td>
<td>$228,600.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>WTP High Service Pumps</td>
<td>$22,200.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino</td>
<td>$1,214,100.00</td>
<td></td>
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<td>$1,214,100</td>
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<td>5</td>
<td>Wyoming Indian High School Fire Protection</td>
<td>$175,200.00</td>
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<td>$52,560</td>
<td>$122,640</td>
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<td>6</td>
<td>Raw Water Transmission to Treatment Plant</td>
<td>$490,700.00</td>
<td>$328,769</td>
<td>$161,931</td>
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<td>7</td>
<td>Finished Water Transmission</td>
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<td>$6,270</td>
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<td>8</td>
<td>Distribution Metering and Backflow Protection</td>
<td>$1,167,800.00</td>
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<td>$1,167,800</td>
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<td>9</td>
<td>Replace AC Pipe from Plant to WY Hwy 132</td>
<td>$1,018,500.00</td>
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<td>$305,550</td>
<td>$712,950</td>
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<td>10</td>
<td>Implement Leak Detection Project</td>
<td>$37,950.00</td>
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<td>11</td>
<td>Improve Delivery Capacity in the Area of the Convenience Store and Tribal Offices</td>
<td>$293,700.00</td>
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<td>12</td>
<td>Yellow Calf Road Loops</td>
<td>$683,500.00</td>
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<td>$205,050</td>
<td>$478,450</td>
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<td>13</td>
<td>Install Pressure Reducing Valves</td>
<td>$235,400.00</td>
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<td>$235,400</td>
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<td>WTP Control Upgrades</td>
<td>$82,500.00</td>
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<td>15</td>
<td>Replace Damaged Line on the East Portion of Trosper Lane</td>
<td>$152,500.00</td>
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<td>Storage Tanks</td>
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<td>$195,210</td>
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<td>Replace Blow-Off Hydrants with Fire Hydrants</td>
<td>$44,275.00</td>
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<td>$35,000</td>
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<td>18</td>
<td>Managerial Recommendations</td>
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<td>19</td>
<td>Total Project</td>
<td>$9,266,025.00</td>
<td>$2,183,597</td>
<td>$1,075,503</td>
<td>$833,610</td>
<td>$1,945,090</td>
<td>(126,547)</td>
<td>$2,911,000</td>
<td>$307,950</td>
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</table>

Table XI-1 Project Financing

Northern Arapaho Groundwater Level II Study

Chapter XI - Page 5
Loan Funding Impact On Water Rates

At present the NAU system has 384 services and a service population of 1610 people. Assuming that same ratio prevails to the year 2025, the system would have 602 services for its forecast population of 2530 people. The rate impacts discussed in the balance of this chapter are based on those assumed figures.

As discussed earlier in this chapter NAU’s water rates average approximately the NAU would need revenues of $ 60.47 per month per service to cover present operation and maintenance costs only. When the cost of financing the recommended improvements is added monthly rate increase appreciably. Each $10,000 of annual loan repayment requires a rate increase of $2.17 per month per service to cover loan repayment.

Water Rates Using Current Financial Assistance

To retire the debt load conceptually shown in the Project Financial table would require a monthly rate increase on $44.63. When added to the $60.47 required to cover current operation and maintenance, water rates would have to be $105 per month if the system is to be self supporting with currently available financial assistance. This rate is well beyond what the ratepayers can afford at their income levels. No current figures are known to be available for median income on the Wind River Indian Reservation.

Table XI-2 shows the water rate increase that would be required to repay the loan on each prioritized project using currently available loan packages. It is clear that NAU ratepayers will be benefited from any assistance they can receive from IHS.
It is difficult to accurately predict the revenue required for NAU’s Ethete system to be fully self supporting with no outside income. In a self supporting scenario, the system revenues will have to pay operation, maintenance, and obsolescence replacement. The life cycle cost of each major system component must be estimated to determine obsolescence replacement costs on an annual basis.

After spreading the annual system obsolescence cost of approximately $900,000 equally among all 384 services, the monthly water rate would be on the order of $200 per month for a fully supporting system.
Equivalent Dwelling Unit

The Ethete system consumed 205,400,000 gallons of water in 2008. There are 367 homes on the system. Since the system is not metered the assumption was made that 80% of that use, 164,320,000 gallons, was residential use. That equates to 447,740 gallons of residential use per household. Dividing the 205 million gallons by the 447,740 gallons per residence per year, yields 458,000 gallons per year per household as an Equivalent Dwelling Unit (EDU).
October 21, 2008

Mr. Ed LoneFight, Superintendent
Bureau of Indian Affairs
P.O. Box 158
Ft. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. LoneFight:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ½, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

The construction involves drilling two wells in the river alluvium and constructing a water line to the existing plant diversion. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- We are requesting your comments on soil suitability, erosion concerns, and consideration in relation to the project’s proposed well construction sites.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Steve Poitras
USDA-NRCS
P.O. Box 127
Ft. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Poitras:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system's delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Farmlands protected under the Farmlands Protection Act of 1981, and regulations at 7 CFR Part 658 or other laws and regulations protecting farmlands.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab
Enclosures
October 27, 2008

Mr. Vern Stelter, Habitat Protection Coordinator  
Wyoming Game and Fish Department  
5400 Bishop Boulevard  
Cheyenne, Wyoming 82009

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Schmidlin:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 27, 2008  

Mr. Vern Stelter, Habitat Protection Coordinator  
Wyoming Game and Fish Department  
5400 Bishop Boulevard  
Cheyenne, Wyoming 82009

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Schmidlin:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

The construction involves drilling two wells in the river alluvium and constructing a water line to the existing plant diversion. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

   Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Annette Bayer for James Gores

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Brian T. Kelly, State Supervisor
U.S. Fish and Wildlife Service
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Kelly:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼ of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Coastal zones protected under the Coastal Barrier Resources Act of 1982 (U.S.C. 3501 et.seq.) or other laws or regulations.

Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

Rivers protected under the Wild Scenic Rivers Act of 1968, as amended, (U.S.C. 1271 et.seq.) or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Brian T. Kelly, State Supervisor
U.S. Fish and Wildlife Service
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Kelly:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

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Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

Ann Batten for Jim Gores

JG:ab
Enclosures
October 27, 2008

U.S. Army Corps of Engineers
Mr. Thomas B. Johnson
2232 Dell Range Boulevard, Suite 210
Cheyenne, Wyoming  82009-4942

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Johnson:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Wetlands protected under Executive Order 11990, Protection of Wetlands.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 27, 2008

U.S. Army Corps of Engineers
Mr. Thomas B. Johnson
2232 Dell Range Boulevard, Suite 210
Cheyenne, Wyoming 82009-4942

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Johnson:

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Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
Agencies that were notified of the project on October 22, 2008 and were requested to provide their input are listed below. Agencies that responded are shown in Bold.

Mr. Ed LoneFight, Superintendent
Bureau of Indian Affairs
P.O. Box 158
Ft. Washakie, Wyoming 82514
Phone: 332-7810

Ms. Sara Needles
Wyoming State Historic Preservation Office
Division of Cultural Resources
2301 Central Avenue
Barrett Building, 3rd Floor
Cheyenne, Wyoming 82002
Phone: 777-7697

Mr. Steve Husted
USDA-NRCS
P.O. Box 127
Ft. Washakie, Wyoming 82514
Phone: 332-9636

Mr. David A. Finley, Administrator
Wyoming Department of Environmental Quality
Air Quality Division
122 West 25th Street
Cheyenne, Wyoming 82002
Phone: 77-7391

Ms. Lorrie Connell, Administrator
U.S. Fish and Wildlife Service
170 North First Street
Lander, Wyoming 82520
Phone: 332-2159

Mr. Brian T. Kelly, State Supervisor
U.S. Fish and Wildlife Service
4000 Airport Parkway
Cheyenne, Wyoming 82001
Phone: 772-2374

Mr. Ken Schmidlin, Supervisor
Wyoming Game And Fish Department
260 Buena Vista Drive
Lander, Wyoming 82520
Phone: 332-2688

Mr. Don Aragon, Director
Wind River Environmental Quality
P.O. Box 217
Ft. Washakie, Wyoming 82514
Phone: 332-3164

Mr. William Urbigkit, Airport Manger
City of Riverton
816 North Federal Boulevard
Riverton, Wyoming
Phone: 856-2227

U.S. Army Corps of Engineers
Mr. Thomas B. Johnson
2232 Dell Range Blvd., Suite 210
Cheyenne, WY 82009-4942
November 6, 2008

Mr. Reed Tidzump  
Eastern Shoshone  
Tribal Historic Preservation Officer  
P.O. Box 538  
Fort Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Tidzump:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Historic sites listed on the National Register of Historic Places or sites protected by the Protection and Enhancement of the Natural Environment Act and Reservoir Salvage Act.

- Historic or Archaeological sites or data protected under the Preservation of Historical Data Act of 1974.

- Executive Order 11593, Protection and Enhancement of the Cultural Environment, or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
November 6, 2008

Ms. Jo Ann White
Northern Arapaho
Tribal Historic Preservation Officer
P.O. Box 1182
Fort Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan -- Alluvial Water Wells

Dear Ms. White:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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   Historic or Archaeological sites or data protected under the Preservation of Historical Data Act of 1974.

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Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab
Enclosures
November 6, 2008

Mr. Reed Tidzump
Eastern Shoshone
Tribal Historic Preservation Office
P.O. Box 538
Fort Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Tidzump:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Historic sites listed on the National Register of Historic Places or sites protected by the Protection and Enhancement of the Natural Environment Act and Reservoir Salvage Act.
- Historic or Archaeological sites or data protected under the Preservation of Historical Data Act of 1974.
- Executive Order 11593, Protection and Enhancement of the Cultural Environment, or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe's request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab

Enclosures
November 6, 2008

Ms. Jo Ann White  
Northern Arapaho  
Tribal Historic Preservation Officer  
P.O. Box 1182  
Fort Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Ms. White:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Historic sites listed on the National Register of Historic Places or sites protected by the Protection and Enhancement of the Natural Environment Act and Reservoir Salvage Act.

- Historic or Archaeological sites or data protected under the Preservation of Historical Data Act of 1974.

- Executive Order 11593, Protection and Enhancement of the Cultural Environment, or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe's request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. William Urbigkit, Airport Manager
City of Riverton
816 North Federal Boulevard
Riverton, Wyoming 82510

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Urbigkit:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1 S, R1 W, and SE ¼, SE ¼, of Sec. 34, T1N, R1 W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1 W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

The construction involves drilling two wells in the river alluvium and constructing a water line to the existing plant diversion. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:


Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab

Enclosures
October 21, 2008

Mr. Steve Poitras
USDA-NRCS
P. O. Box 127
Ft. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Poitras:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Farmlands protected under the Farmlands Protection Act of 1981, and regulations at 7 CFR Part 658 or other laws and regulations protecting farmlands.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Ms. Lorrie Connell, Administrator
U.S. Fish and Wildlife Service
170 North First Street
Lander, Wyoming 82520

RE: Northern Arapaho Utilities Water Master Plan -- Alluvial Water Wells

Dear Ms. Connell:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Wetlands protected under Executive Order 11990, Protection of Wetlands.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab

Enclosures
October 21, 2008

Mr. Brian T. Kelly, State Supervisor
U.S. Fish and Wildlife Service
4000 Airport Parkway
Cheyenne, Wyoming 82001

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Kelly:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Coastal zones protected under the Coastal Barrier Resources Act of 1982 (U.S.C. 3501 et.seq.) or other laws or regulations.

Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

Rivers protected under the Wild Scenic Rivers Act of 1968, as amended, (U.S.C. 1271 et.seq.) or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. David Finley, Administrator  
Wyoming Department of Environmental Quality  
Air Quality Division  
122 West 25th Street  
Cheyenne, Wyoming 82002

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Finley:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Environmental Quality protected under the Clean Air Act of 1970, as amended, (42 U.S.C. 7401-7642), EPA regulations at 40 C.F.R Part (S) 50, 51, 52, and 61, or other laws or regulations protecting air quality.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab  
Enclosures
October 21, 2008

Mr. Ken Schmidlin, Supervisor  
Wyoming Game and Fish Department  
260 Buena Vista Drive  
Lander, Wyoming  82520

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Schmidlin:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

   Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab

Enclosures
October 21, 2008

Mr. Don Aragon, Director
Wind River Environmental Quality
P. O. Box 217
Ft. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Mr. Aragon:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Flood plain management or protection under the Flood Disaster Protection Act of 1973 (42 U.S.C. 4001 et seq.) and implementing regulations, the National Flood Insurance Program (44 CFR 59-75), the Executive Order 11988 and HUD Procedure for Flood Plain Management (42 CFR 26951).
- Water quality protected under the Federal Water Pollution Control Act, as amended (42 U.S.C. 300f-300j10), EPA regulations at 40 CFR Parts 100-149 or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Ms. Sara Needles  
Wyoming State Historic Preservation Office  
Division of Cultural Resources  
2301 Central Avenue  
Barrett Building, 3rd Floor  
Cheyenne, Wyoming 82002

RE: Northern Arapaho Utilities Water Master Plan – Alluvial Water Wells

Dear Ms. Needles:

The Northern Arapaho Tribe is in the process of obtaining funding to construct an improved water source by means of alluvial wells. Funding is also being sought for upgrading the existing water transmission and distribution system.

As shown on the attached map, the proposed alluvial wells are located in Fremont County, NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, Wind River Meridian, Wyoming. The proposed transmission line begins at the wells and proceeds through Sections 3, 2, and 35 ending at the SE ¼, Sec. 35 T1N, R1W, WRM, at the present water treatment plant diversion structure. An inset shows the Ethete community and the proposed waterline work. New water lines are shown in red on the map.

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Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

Enclosures
October 21, 2008

Mr. Ed LoneFight, Superintendent
Bureau of Indian Affairs
P.O. Box 158
Ft. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. LoneFight:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

We are requesting your comments on soil suitability, erosion concerns, and consideration in relation to the project’s proposed well construction site.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. William Urbigkit, Airport Manager
City of Riverton
816 North Federal Boulevard
Riverton, Wyoming 82510

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Urbigkit:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

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Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab

Enclosures
October 21, 2008

Ms. Lorrie Connell, Administrator
U.S. Fish and Wildlife Service
170 North First Street
Lander, Wyoming 82520

RE: Northern Arapaho Utilities Water Master Plan — Water Well

Dear Ms. Connell:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

Wetlands protected under Executive Order 11990, Protection of Wetlands.

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Brian T. Kelly, State Supervisor
U.S. Fish and Wildlife Service
4000 Airport Parkway
Cheyenne, Wyoming 82001

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Kelly:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

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There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Coastal zones protected under the Coastal Barrier Resources Act of 1982 (U.S.C. 3501 et.seq.) or other laws or regulations.

- Endangered species or critical habitat protected under the Endangered Species Act of 1983, as amended, (16 U.S.C. 1541-1543) or other laws or regulations.

- Rivers protected under the Wild Scenic Rivers Act of 1968, as amended, (U.S.C. 1271 et.seq.) or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe's request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. David Finley, Administrator
Wyoming Department of Environmental Quality
Air Quality Division
122 West 25th Street
Cheyenne, Wyoming 82002

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Finley:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

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Environmental Quality protected under the Clean Air Act of 1970, as amended, (42 U.S.C. 7401-7642), EPA regulations at 40 CFT Part (S) 50, 51, 52, and 61, or other laws or regulations protecting air quality.
Mr. David Finley  
Wyoming Department of Environmental Quality  
October 21, 2008

Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Ken Schmidlin, Supervisor
Wyoming Game and Fish Department
260 Buena Vista Drive
Lander, Wyoming 82520

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Schmidlin:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

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Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Mr. Don Aragon, Director
Wind River Environmental Quality
P. O. Box 217
Pt. Washakie, Wyoming 82514

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Mr. Aragon:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:


Flood plain management or protection under the Flood Disaster Protection Act of 1973 (42 U.S.C. 4001 et seq.) and implementing regulations, the National Flood Insurance Program (44 CFR 59-75), the Executive Order 11988 and HUD Procedure for Flood Plain Management (42 CFR 26951).

Water quality protected under the Federal Water Pollution Control Act, as amended (42 U.S.C. 300f-300j10), EPA regulations at 40 CFR Parts 100-149 or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe’s request.

Sincerely,

[Signature]

Jim Gores, P.E.

JG:ab
Enclosures
October 21, 2008

Ms. Sara Needles  
Wyoming State Historic Preservation Office  
Division of Cultural Resources  
2301 Central Avenue  
Barrett Building, 3rd Floor  
Cheyenne, Wyoming 82002

RE: Northern Arapaho Utilities Water Master Plan – Water Well

Dear Ms. Needles:

The Northern Arapaho Tribe is in the process of obtaining funding to construct additional water sources for its Ethete system by means of a deep Wind River Formation well. Funding is also being sought for upgrading the existing water delivery and distribution system.

As shown on the attached map, the proposed well is located in Fremont County, SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, Wyoming. The proposed transmission line begins at the well and proceeds through Sections 19, 30, 25, and 36 ending at the SW ¼, Sec 36, T1N, R2E, WRM, as shown on the attached map. An inset shows the Ethete community and the proposed waterline work shown as the red lines on this map.

The construction involves drilling a well and constructing water transmission line to the existing water distribution system. Additional water system improvements are slated for the area surrounding Ethete. Construction involves excavating and laying new water lines to improve the water system’s delivery and fire protection capabilities. The majority of the water lines will follow existing water lines and/or public roadways.

There are no known environmental impacts for this proposed action and it appears that it will not adversely affect any quality of the human or natural environment, specifically the following:

- Historic sites listed on the National Register of Historic Places or sites protected by the Protection and Enhancement of the Natural Environment Act and Reservoir Salvage Act.
- Historic or Archaeological sites or data protected under the Preservation of Historical Data Act of 1974.
- Executive Order 11593, Protection and Enhancement of the Cultural Environment, or other laws or regulations.
Please review the area for the proposed construction activity and provide your written response as soon as possible, as the Northern Arapaho Tribe must have the Environmental Assessment completed by December 1, 2008 to apply for needed federal assistance.

Thank you for your assistance and consideration of the Northern Arapaho Tribe's request.

Sincerely,

Jim Gores, P.E.

JG:ab
Enclosures
November 3, 2008

Jim Gores
James Gores and Associates
111 N. 3rd E.
Riverton, WY 82501

Re: Northern Arapaho Utilities Master Plan-Alluvial Water Wells (SHPO File # 1108JPL004)

Dear Mr. Gores:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

A search of our records shows that a cultural resource survey has not been conducted in the area of potential effect. Following 36 CFR Part 800, and prior to any ground disturbing activities, we recommend the lead Federal agency (if this does indeed become a Federal undertaking) carry out appropriate efforts necessary for identification of historic properties, which may include a file search, background research, consultation, consideration of visual effects, sample field investigations or field survey. The identification efforts must be conducted by a consultant meeting the Secretary of the Interior’s Professional Qualification Standards (48 FR 22716, Sept. 1983). A report detailing the results of these efforts must be provided to SHPO staff for our review and comment.

Additionally, Jo Ann White (Northern Arapaho Tribal Historic Preservation Officer), and Reed Tidzump of the Eastern Shoshone tribe should be consulted with regarding this project.

We have enclosed a copy of a cultural resource consultants list for your use. Please refer to SHPO project control number #1108JPL004 on any future correspondence dealing with this project. If you have any questions, please contact John Laughlin at 307-777-3424.

Sincerely,

John P. Laughlin
Archaeologist/Senior Historic Preservation Specialist
November 3, 2008

Jim Gores
James Gores and Associates
111 N. 3rd E.
Riverton, WY 82501

Re: Northern Arapaho Utilities Master Plan-Water Well (SHPO File # 1108JPL005)

Dear Mr. Gores:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

A search of our records shows that a cultural resource survey has not been conducted in the area of potential effect. Following 36 CFR Part 800, and prior to any ground disturbing activities, we recommend the lead Federal agency (if this does indeed become a Federal undertaking) carry out appropriate efforts necessary for identification of historic properties, which may include a file search, background research, consultation, consideration of visual effects, sample field investigations or field survey. The identification efforts must be conducted by a consultant meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983). A report detailing the results of these efforts must be provided to SHPO staff for our review and comment.

Additionally, Jo Ann White (Northern Arapaho Tribal Historic Preservation Officer), and Reed Tidzump of the Eastern Shoshone tribe should be consulted with regarding this project.

We have enclosed a copy of a cultural resource consultants list for your use. Please refer to SHPO project control number #1108JPL005 on any future correspondence dealing with this project. If you have any questions, please contact John Laughlin at 307-777-3424.

Sincerely,

John P. Laughlin
Archaeologist/Senior Historic Preservation Specialist
The Wyoming State Historic Preservation Office (SHPO) does not permit or license consultants and makes no endorsement of any particular consultant.
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November 3, 2008

James Gores & Assoc.
111 N. 3rd E.
Riverton, WY 82501

Dear Mr. Gores,

This letter is in response to your request for wetland information related to the construction of 3 test water wells and 2 water lines in the Ethete area. The sites were visited on October 30th. The test well east of Ethete near Mule Butte has been drilled and capped. The following are our comments related to the proposed projects:

Based on the National Wetland Inventory maps, it appears that the project west of Ethete near Washakie Hot Springs would traverse 1,350 feet of seasonally flooded freshwater forest/shrub wetlands and 1,000 to 2,000 feet of seasonally and semi-permanently flooded emergent wetlands. The range for the emergent wetlands is based on the waterlines that were assumed to run from the test wells to the end of the waterline as indicated by your map. Based on the size of the disturbance for the test well east of Ethete (~ 1ac), the test wells west of Ethete could potentially disturb 2 acres of seasonally flooded emergent wetlands. The proposed waterline route for the test well located east of Ethete would traverse 90 feet of river, 200 feet of seasonally flooded freshwater shrub wetlands and 190 feet of temporarily flooded emergent wetlands.

Since these estimates may exceed the Nationwide Permit levels of ½ acre of disturbance, if you have not done so we recommend that you contact the US Army Corps of Engineers Wyoming Permit office at (307) 772-2300, FAX: (307) 772-2920. Mailing address of 2232 Dell Range Boulevard, Suite 210, Cheyenne, Wyoming 82009-4942. They can further assist you in your needs.

Both project areas provide potential habitat for the threatened Ute ladies-tresses orchid. Currently, this plant has not been found on the Wind River Reservation. We recommend that routes be surveyed by a certified botanist prior to waterline installation and drilling of the 2 test wells west of Ethete.

Additionally, we recommend that the disturbed uplands related to the test well locations and waterline routes be reseeded with a native grass and forb mix to minimize the encroachment of noxious weeds. Thank you for the opportunity to provide input into this project.

Sincerely,

Pat Hnilicka
Fish and Wildlife Biologist

Cc: Dave Skates, file
Mr. Gore

In response to the Northern Arapahoe Utilities Water Master Plan and the proposed wells as shown on the maps you provided, there are no soils that fall under the Farmland Protection Act. Installing the well and pipeline will not adversely affect any conditions of the Farmlands Protection Act.

If you have any questions or please call Steve at 332-9636.

Sincerely,

Steve Poitras
Ginger Denke

From: Wolken, Paige M NWO [Paige.Wolken@usace.army.mil]
Sent: Thursday, December 04, 2008 11:48 AM
To: mail@jamesgoresandassociates.com
Subject: Northern Arapaho Utilities Water Master Plan - Comments

Dear Mr. Gores:

Per our earlier conversation today and your original request for comment, received October 28, 2008, the proposed wells and water distribution system installation would likely fall under the existing Nationwide Permit 12 for Utility Line Activities. Because this proposed project occurs within the Reservation ("Indian Country") and is likely to cross the Little Wind River, a Pre-construction Notification will be required so that we may obtain certification from the Environmental Protection Agency that the project is acceptable under Section 401 of the Clean Water Act (CWA). Once we receive certification from EPA, we can verify the use of Nationwide Permit 12.

Please refer to the Nationwide Permits section of our website: https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm for specific information on:

1) Nationwide Permit 12, which also encompasses General and Regional Conditions, listed at the bottom of the website;
2) components of a Pre-Construction Notification (PCN), which should be submitted to the Corps when plans/designs are finalized; and
3) requirements of the EPA 401 Certification for Nationwide Permit 12, which should be addressed in the PCN.

Please feel free to contact me if you have questions or if you are unable to access these documents from our website. In future correspondence please on this project, please refer to file number 200540105.

Paige Wolken

Paige Wolken
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In Reply Refer To: 
ES-61411/W.22/WY09TA0035

NOV 2 6 2008

Mr. Jim Gores
James Gores and Associates
111 N. 3rd East
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Dear Mr. Gores:

Thank you for your letter and accompanying maps received in our office on October 29, 2008. The letter describes the Northern Arapaho Tribe’s effort to construct an improved water source for Ethete, Wyoming by creating two alluvial wells and constructing a water line to the existing water treatment plant diversion structure. The proposed wells will occur in NW ¼, NE ¼, of Sec. 3, T1S, R1W, and SE ¼, SE ¼, of Sec. 34, T1N, R1W, of the Wind River Meridian, in Fremont County, Wyoming. In addition to the well, an accompanying water transmission line will be constructed through sections 3, 2, and 35 ending at the SE ¼, Sec. 35, T1N, R1W, of the Wind River Meridian. Your letter states that project construction will involve drilling two wells in the river alluvium and constructing a water transmission line to the existing water treatment plant diversion structure. The majority of water lines will follow existing water lines and/or public roadways.

Your letter states, and Service agrees, that the project as described, will not adversely affect endangered species or designated critical habitat. However, the Service is providing you with the following protective measures for migratory birds in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and Executive Order 13186. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended, 16 U.S.C. 661 et seq, and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j.

Migratory Birds

The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs, except as permitted by regulations, and does not require intent to be proven. Section 703 of the MBTA states, “Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird...” The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald
Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

Sensitive Species

Mountain Plover: Although the Service has withdrawn the proposal to list the mountain plover (Charadrius montanus) and we will no longer be reviewing project impacts to this species under the Act, we continue to encourage conservation of this species as it remains protected under the MBTA. Measures to protect mountain plover from further decline include (1) avoidance of suitable habitat during the plover nesting season (April 10 through July 10), (2) prohibition of ground disturbing activities in prairie dog towns, and (3) prohibition of any permanent above ground structures that provide perches for avian predators or deter plovers from using preferred habitat. Suitable habitat for nesting mountain plovers includes grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns. We strongly encourage the development of protective measures with an assurance of implementation if mountain plovers are found within the project area.

Thank you for your efforts to ensure the conservation of threatened and endangered species, and migratory birds. If you have further questions regarding our comments or your responsibilities under the Act or other policies mentioned, please contact Travis Sanderson of my staff at the letterhead address or phone (307) 328-4333.

Sincerely,

Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc: FWS, Management Assistance Office, Lander, WY (D. Skates)
BLM, Statewide Listed Species Coordinator, Cheyenne, WY (C. Keefe)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
Mr. Jim Gores  
James Gores and Associates  
111 N. 3rd E.  
Riverton, Wyoming 82501  

Dear Mr. Gores:  

Thank you for your letter and accompanying maps received in our office on October 29, 2008. The letter describes the Northern Arapaho Tribe’s effort to construct additional water sources for Ethete by creating a new deep well in the Wind River Formation. The proposed well will occur in SE ¼, NE ¼, of Sec. 19, T1N, R2E, of the Wind River Meridian, in Fremont County, Wyoming. In addition to the well, an accompanying water transmission line will be constructed through sections 19, 30, 25, and 36, ending at the SW ¼, Sec. 36, T1N, R2E, of the Wind River Meridian. Your letter states that project construction will involve drilling a well and constructing a water transmission line to the existing water distribution system. The majority of water lines will follow existing water lines and/or public roadways.

Your letter states, and Service agrees, that the project as described, will not adversely affect endangered species or designated critical habitat. However, the Service is providing you with the following protective measures for migratory birds in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668, and Executive Order 13186. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended, 16 U.S.C. 661 et seq, and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j.

Migratory Birds  

The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs, except as permitted by regulations, and does not require intent to be proven. Section 703 of the MBTA states, “Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird...” The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald
devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

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Sincerely,

[Signature]

Brian T. Kelly
Field Supervisor
Wyoming Field Office

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