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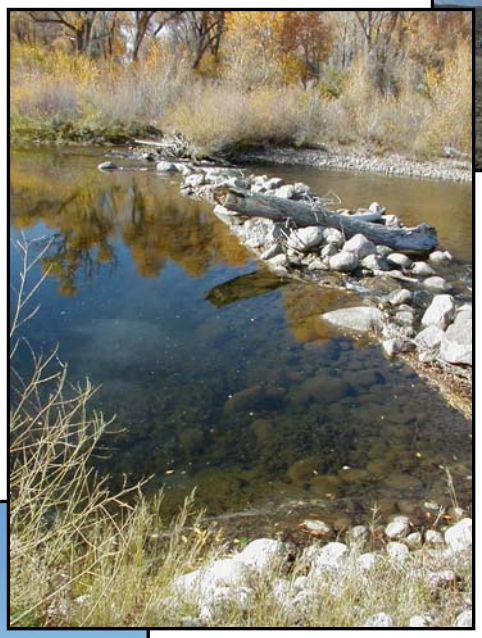
Northern Arapaho Groundwater Level II Study Master Plan Executive Summary



Prepared for the Wyoming Water Development Commission & Northern Arapaho Utilities

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Executive Summary

1. Introduction

Northern Arapaho Utilities (NAU) was experiencing severe water shortages in the summer drought of 2003. That same summer forest fires burned a large portion of the Little Wind River watershed from which NAU diverted and treated its water supply runoff the Ethete portion of the reservation. The vegetation loss resulted in highly erosive soil conditions in the watershed. Consequently, summer thunderstorms produced excessively muddy runoff which significantly hampered treatment of the water. That condition, coupled with the reduced flow, severely constrained the ability of NAU to meet water demands.

The NAU serves a population of approximately 1,610 people in the Ethete area. 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 other municipalities include Lander, which is approximately 15 miles southeast, and Riverton, approximately 25 miles east.

Ethete, Wyoming is located approximately six miles east of the flank of the Wind River Mountains and 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.

2. Authorization and Purpose

The Northern Arapaho Tribe passed a resolution on August if 2003 requesting the Wyoming Water Development Commission (WWDC) to include funding in the Omnibus Water Bill to explore for a groundwater source to serve the Ethete area system. The Wyoming Legislature, in 2004 authorized the Wyoming Water Development Commission (WWDC) to initiate a groundwater exploration and system master plan for the Northern Arapaho Tribe. The WWDC subsequently commissioned James Gores and Associates to complete a test well siting and construction on behalf of the project sponsor Northern Arapaho Utilities (NAU).

The purpose of the project is to:

- Perform geologic and hydrologic identify potential groundwater sources and determine their viability as an area potable water supply
- Identify potential test well sites, drill, complete, and develop and test potential water supply wells
- Prepare a conceptual design of a well field and transmission line to the system
- Compile a Level II Master Plan for the NAU Ethete system identifying system improvements.

James Gores and Associates has completed the Level II project in accordance with their contract with the WWDC.

3. History and Background

With a deteriorated watershed and drought conditions the NAU was struggling to meet basic potable water demands. The surface water from the Little Wind River was increasingly unreliable. Additionally it was becoming increasingly problematic to treat to EPA quality standards. The NAU, if possible, wanted to secure a reliable source of groundwater for the Ethete system.

In mid-2004 James Gores and Associates began work on the groundwater exploration and master planning program for the WWDC. Wester-Wetstein and Hinkley Consulting conducted extensive literature review and on site hydrogeologic reconnaissance. With the assistance of these two firms the sponsor, NAU, was given four (4) potential groundwater aquifers to explore. These four aquifers are 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.

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.

The NAU chose to explore the Madison Formation on the south end of the Sage Creek Anticline. After permitting was accomplished through the Bureau of Indian Affairs (BIA) the well drilling began in October 2006 and concluded March 2007. The well was drilled to a depth of 4026 feet. The complex geology and resulting unstable borehole created serious complications for the drilling contractor. In the end this exploratory effort was unsuccessful in finding a suitable source of groundwater.

The tribe subsequently applied for a continuation of the project, which the Wyoming Legislature funded in 2007. That request was funded. With the available budget the NAU selected exploring their second and third choice locations, the Wind River Formation and the little Wind River alluvium. Those two exploratory drilling efforts were successful in discovering sources of groundwater adequate to meet the forecast needs of the Ethete system.

The Wind River exploration site is located on the remote bench between the Big and Little Wind Rivers. After obtaining BIA permitting for the Wind River Formation test well drilling on began in mid-September 2008 and concluded in early October. That well was drilled to a depth of 1203 feet. After casing and development that well produced approximately 250 gpm.

Water quality, while good, failed to meet EPA drinking water standards for Radium, being 0.4 (pCi/l) above EPA's Primary Drinking Water Standards of 4.0 pCi/l. It is also out of standard for iron and manganese. Because of these out of standard constituents treatment of the water will be necessary to meet the EPA potable drinking water standards.

Four wells of approximately 250 gpm capacity would need to be developed to meet the Ethete's system's demands for the year 2025. Because the site is quite remote, extending power, upgrading the access road and tying the wells into the Ethete system would all be expensive. Tying the well field in to the NAU system would require some 7.3 miles of 14" pipeline. The cost to develop this supply source is estimated to be nearly $8,468,000.

The third option, the Little Wind River Alluvium, again after BIA permitting, was test drilled in April of 2009. Two shallow test wells were drilled with an auger rig. Production testing showed that the formation could produce sufficient water to meet the forecast Ethete area demands. Water quality testing showed the water meeting EPA drinking water standards. Development and implementation of the source is estimated to cost $2,750,000.

Upon completion of drilling and testing of these two groundwater sources James Gores and Associates and Wester-Wetstein made a presentation to the Northern Arapaho Utilities Board giving the results of this phase of the exploration. **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. That would allow This could be a significant cost and operational savings to NAU.

Conclusions

The NAU system has been constructed through the Indian Health Service (IHS) in the years since the 1960's. That program has resulted in a piecemeal, substandard system that has since received marginal maintenance. Many components of the system are dilapidated or significantly summer from deficient maintenance.

This system has 37 miles of line in serving 26 square miles

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

<u>Population and Potable Water Demand</u>

- 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 till grow to an estimates 556 million gallons annually if conservation measures are put in force.
- The per capita water consumption is nearly 50% above standard usage rates.
- Northern Arapaho Utilities Ethete system will require additional supply to meet its future demands regardless of whether conservation measures are implemented.

<u>Evaluation of Existing System</u>

- The raw water transmission line is constructed of SDR-21 (thin-wall) PVC pipe is prone to breakage.

- The treatment plant is taxed during periods of high runoff because of the erosive soil 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 serves an area of 26 square miles with 37 mile of piping.
- 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.

<u>Operations and Management</u>

- 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

- The NAU currently charges modest water rates averaging $29.00 per month.
- Annual user rate revenues are $118,080 per year and operation and maintenance expenses are $275,780
- 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

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 4.
- 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 in the Operations chapter in the report.

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.

Environmental

- There are few environmental concerns associated with the proposed improvement because most of the area of construction has been previously disturbed.

Funding Of Prioritized Projects

The IHS has historically been the principal source of funding to the NAU system. The Project Financing table offers a conceptual funding plan for the recommended system improvements which total $9,000,000.

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Project Financing

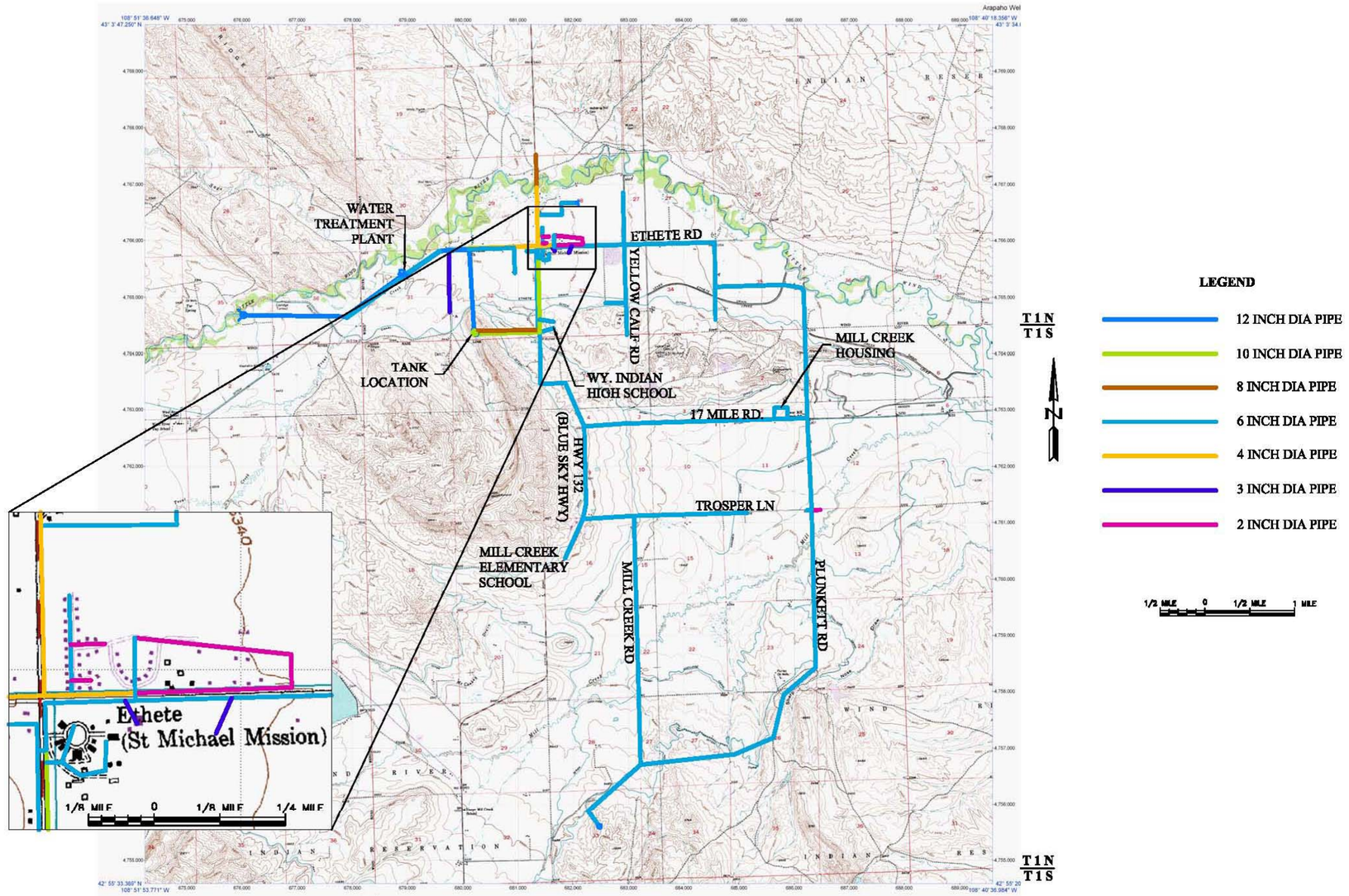
			Funding Source						
					RDA			IHS	Tribal
Project Priority Ranking	**Project Description**	**Total Project Cost**	**WWDC 67% Grant**	**33% Tribal Appropriation**	**30% Grant**	**70% Loan**	**2.625%, 20-year Annual Payment**	**Direct Funding 100%**	**Tribal**
1	Raw Water Source Development	**$ 2,749,400.00**	$ 1,842,098	$ 907,302					
2	Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael's Mission	**$ 228,600.00**			$ 68,580	$ 160,020	$ (10,411)		
3	WTP High Service Pumps	**$ 22,200.00**			$ 6,660	$ 15,540	$ (1,011)		
4	Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino	**$ 1,214,100.00**						$ 1,214,100	
5	Wyoming Indian High School Fire Protection	**$ 175,200.00**			$ 52,560	$ 122,640	$ (7,979)		
6	Raw Water Transmission to Treatment Plant	**$ 490,700.00**	$ 328,769	$ 161,931					
7	Finished Water Transmission	**$ 19,000.00**	$ 12,730	$ 6,270					
8	Distribution Metering and Backflow Protection	**$ 1,167,800.00**						$ 1,167,800	
9	Replace AC Pipe from Plant to WY Hwy 132	**$ 1,018,500.00**			$ 305,550	$ 712,950	$ (46,384)		
10	Implement Leak Detection Project	**$ 37,950.00**							$ 37,950
11	Improve Delivery Capacity in the Area of the Convenience Store and Tribal Offices	**$ 293,700.00**						$ 293,700	
12	Yellow Calf Road Loops	**$ 683,500.00**			$ 205,050	$ 478,450	$ (31,128)		
13	Install Pressure Reducing Valves	**$ 235,400.00**						$ 235,400	
14	WTP Control Upgrades	**$ 82,500.00**							$ 82,500
15	Replace Damaged Line on the East Portion of Trosper Lane	**$ 152,500.00**							$ 152,500
16	Storage Tanks	**$ 650,700.00**			$ 195,210	$ 455,490	$ (29,634)		
17	Replace Blow-Off Hydrants with Fire Hydrants	**$ 44,275.00**							$ 35,000
19	Managerial Recommendations	**0**							
20	**Total Project**	**$ 9,266,025.00**	$ 2,183,597	$ 1,075,503	$ 833,610	$ 1,945,090	$ (126,547)	$ 2,911,000	$ 307,950

Debt service will be challenging for NAU to fund from user charges. As earlier stated the majority of the system subscribers are in low income brackets. The required monthly user charge required to serve debt for each incremental improvement is shown in table titled Rate Increases Required to Support Project Loans. For the system to be truly self supporting water rates would be on the order of $200 per month.

WWDC - Northern Arapaho Groundwater Level II Study

Rate Increases Required to Support Project Loans

		RDA	
Project Priority Ranking	**Project Description**	**2.625%, 20-year Annual Payment**	**Required Loan Payment per Service**
1	Raw Water Source Development		$ 14.49
2	Upgrade Lines Serving Tribal Headquarters, Tribal College, Middle School and St. Michael's Mission	$ 10,411	$ 2.26
3	WTP High Service Pumps	$ 1,011	$ 0.22
4	Upgrade Lines Serving the Ethete Area Housing and Little Wind Casino		
5	Wyoming Indian High School Fire Protection	$ 7,979	$ 1.73
6	Raw Water Transmission to Treatment Plant		$ 2.59
7	Finished Water Transmission		$ 0.10
8	Distribution Metering and Backflow Protection		
9	Replace AC Pipe from Plant to WY Hwy 132	$ 46,384	$ 110.07
10	Implement Leak Detection Project		
11	Improve Delivery Capacity in the Area of the Convenience Store and Tribal Offices		
12	Yellow Calf Road Loops	$ 31,128	$ 6.75
13	Install Pressure Reducing Valves		
14	WTP Control Upgrades		
15	Replace Damaged Line on the East Portion of Trosper Lane		
16	Storage Tanks	$ 29,634	$ 6.43
17	Replace Blow-Off Hydrants with Fire Hydrants		
19	Managerial Recommendations		
20	**Total Project**		$ 44.63



ETHETE WATER SYSTEM MAP