WATER & SEWER MASTER PLAN

FOR THE

TOWN OF TAOS, NEW MEXICO

SEPTEMBER 2015

SMA

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Civil/Environmental Scientists & Engineers

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Revision 1 - FINAL

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Abbreviations

afy	Acre-foot per year
AM	Asset Management
AWWA	American Water Works Association
BBER	Bureau of Business and Economics Research
CCTV	Closed Circuit Television
CDP	Census Designated Place
CIP	Capital Improvements Project
CPB	Construction Programs Bureau
DBS	Daniel B. Stephens & Associates, Inc.
DFA	Department of Finance and Administration
DWB	Drinking Water Bureau
EPA	Environmental Protection Agency
EPMDWCA	El Prado Mutual Domestic Water Consumers Association
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FY	Fiscal Year
gpcd	Gallons per capita per day
gpd	Gallons per day
gpm	Gallons per minute
H_2S	Hydrogen Sulfide
MCL	Maximum Contaminant Level
MDWCA	Mutual Domestic Water Consumers Association
mgd	Million gallons per day
MIOX	MIOX brand chlorination system
msl	mean sea level
NMED	New Mexico Environment Department
NMFA	New Mexico Finance Authority
NM OSE	New Mexico Office of the State Engineer
NRCS	National Resource Conservation Society
PER	Preliminary Engineering Report
ppb	Parts per billion
ppm	Parts per million
PRV	Pressure Reducing Valve
psi	Pounds per square inch
PZ	Pressure Zone
RD	Rural Development
RUS	Rural Utility Service
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SJ-C	San Juan-Chama Project
SMA	Souder, Miller & Associates
SWPPP	Storm Water Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
WSD	Water Sewer District
WTB	Water Trust Board

1. INTRODUCTION

The Town of Taos Water and Sewer Master Plan documents the existing water and sewer system facilities and identifies improvements for build-out over a 20 year planning period within the Town of Taos' (Town) service area. The water and sewer system analyses documented in this report identify existing deficiencies in the systems, confirm facility sizing, and recommend future improvements. Water production, transmission, and storage recommendations are based on an updated water supply assessment, demand considerations, and the condition of existing facilities. All recommendations for future water system infrastructure and use take into account the terms of the Abeyta Settlement.

The purpose and goals of the Town's Water and Wastewater Master Plan are as follows:

- Evaluate the adequacy of the existing water and wastewater systems
- Provide a plan for the orderly provision of required infrastructure improvements for future needs
- Develop improvement projects to correct existing deficiencies
- Maintain compliance with the Abeyta Settlement requirements regarding water rights and infrastructure development
- Establish preliminary cost estimates as a basis for updating the capital infrastructure program

The Town's Public Utilities Department water and sewer service area is, for the most part, aligned with the town's boundaries and is comprised of residential and commercial land uses. Water and sewer service is supplied to most residents and businesses within the town limits, and to several connections outside the town limits. To the north, Taos Pueblo and El Prado Water Sewer District (WSD) have bulk sewer connections with the Town. South of the town boundaries, El Valle de los Ranchos Water and Sewer District (which includes Llano Quemado Mutual Domestic Water Consumers Assocaition (MDWCA) and Rancho de Taos MDWCA), also has a bulk sewer connection. The Town also maintains emergency domestic water service agreements with Cañon MDWCA and El Prado WSD. The bulk water connections are metered and the bulk sewer connections are metered with the exception of El Valle, whose sewer fees are assessed based on the average household water usage. The Town boundaries and the water and sewer service areas are shown in Appendix A Exhibit 1 and Exhibit 2.

The Town of Taos' municipal water supply source is groundwater originating from two main sources: a well field in town consisting of seven wells drilled in a shallow aquifer system and three wells southwest of the town completed in a deep aquifer system. Within the 5.5 square mile boundary of town there are approximately 55 miles of waterline. There are four water storage tanks located both within and outside of the Town limits: only two function as true storage tanks. Appendix A Exhibit 3 shows the location of the existing wells, waterline and storage tanks.

Evaluation of the existing wastewater collection system and proposed improvements are based on forecasted system expansion or growth, the condition of the existing collection lines, and recognition of the need to extend sewer hook-up facilities in order to preserve future groundwater quality. Upgrades and improvements for the Taos Valley Regional Wastewater Treatment Facility were recently completed and are detailed in the *Taos Valley Regional Wastewater Treatment Facility Improvements, Town of Taos, New Mexico Planning Documents, October 2008.*

The Taos Valley Regional Wastewater Treatment Facility, which currently has the capacity to treat approximately 2.0 MGPD, is located southwest of the Town. There are a total of

approximately 60 miles of collection lines including those that extend beyond the Town limits. Appendix A Exhibit 4 is a map of the existing sewer system.

The Town's Water and Sewer Master plan will provide a basis for future planning and design of water and sewer system infrastructure over the next 20 years and serve as a guiding document for the Town's system improvements. For this reason, communication with water and wastewater customers is an essential aspect of the planning process and public input is important. The Town Council will present a summary of the plan to inform the public of the planned projects and to solicit input from customers. Area residents and businesses affected by the plan are encouraged to participate. Town council meetings are held on the 2nd and 4th Tuesday of every month.

Master Plan Authorization

Preparation of this Water and Sewer Master Plan was authorized by the Town of Taos in the form of a contract for professional services with Souder, Miller & Associates. Final approval of this Master Plan will be authorized by the Town Council.

2. POPULATIONS, SERVICE AREA AND SYSTEM DEMAND PROJECTIONS

A. Location

The Town of Taos is located in Taos County in north-central New Mexico at the intersection of US Highway 64 and NM State Road 68. Taos is about 73 miles north of Santa Fe. The Town boundaries are show in Appendix A Exhibit 2. The project planning area includes the water and sewer service areas as shown in Appendix A Exhibits 3 and 4, respectively.

Taos, with an elevation of almost 7,000 feet, is bounded on the south and east by the Carson National Forest which includes the Sangre de Cristo Range and the Taos Mountains. The mountains form a natural boundary for the town and the surrounding communities within the Taos Valley. The Town is located on the floodplains of the Rio Pueblo de Taos and Rio Fernando de Taos whose headwaters are in the nearby mountains, and which are both tributaries of the Rio Grande. The rivers enter the Rio Grande Gorge which is located west of the Town. To the north and northwest lies land owned by Taos Pueblo.

B. Population

According to the U.S. Census Bureau in 2013 the population of the Town of Taos was 5,731 people. Historically, the population growth in the town has been steady and moderate as shown in Table 1. In years past, the Town grew at a faster rate than Taos County but recently the rate of growth in the Taos Valley, which surrounds the Town, has been greater than that of the town itself. Predictions for growth in Taos County by the University of NM Bureau of Business and Economic Research (BBER) indicate that this trend is expected to continue.

Table 1: Historical Population Data

Town of Taos Historical Population Growth	
Year	Population
1900	1,225
1910	1,830
1920	1,832
1930	1,847
1940	1,864
1950	1,815
1960	2,163
1970	2,475
1980	3,369
1990	4,065
2000	4,700
2010	5,716
2013	5,731

Source: U.S. Census Bureau

C. Service Area

Currently, the Town of Taos Public Utilities Department provides water and sewer service to most residents and businesses within the Town limits, and to several bulk connections outside the Town limits. Bulk water service connections for emergency potable water include El Prado WSD and Cañon MDWCA. Sewer connections connect to the Town's collection system from Taos Pueblo, El Prado WSD and El Valle de los Ranchos WSD. Each of these connections are metered with the exception of El Valle's sewer connection, the fee of which is assessed by an

average household water usage. Appendix A, Exhibits 3 and 4 show the existing utility service area.

For planning purposes, the projected demand for utility services can be divided into two broad areas, one inside the town boundaries and one that includes adjacent communities in the Taos Valley interested in some type of interconnection for emergency potable water supply, excluding fire flow. The terms of any connection between the Town and a neighboring community must be agreed upon by the governing bodies of each respective party.

i. Town Proper

The first area under consideration encompasses the Taos town limits and can be described as having adequate water and sewer facility services. Currently, within the town limits, there exist 1,703 residential and 620 commercial water connections served by the town water system: the commercial sector uses the largest volume of water.

The wastewater treatment facility provides service to 1,718 residential and 654 commercial sewer connections inside the Town of Taos limits. Outside the town limits, Taos Pueblo, which has a metered sewer connection to the Taos collection system, has approximately 380 connections. El Prado has a metered sewer connection; however, the service to El Valle de los Ranchos is assessed based on an average household water usage. The difference between the number of water and sewer connection is due to the services within the unincorporated areas in Town and outside Town boundaries.

Within the Town boundaries, population growth will occur to accommodate urban development primarily through infill on undeveloped lots. Anticipated growth over the 20-year planning period within the Town is likely to consist of infill development within the town boundaries with the addition of new homes and businesses. Appendix A Exhibit 5 shows the anticipated locations of future infill. Redevelopment of existing businesses is also expected. Full build-out population will be influenced by zoning boundaries. Current zoning maps show the undeveloped areas as being zoned some form of residential or commercial zoning

Since the bulk connections with Taos Pueblo, El Prado and El Valle de los Ranchos act as large commercial connections, the population growth of these communities will only effect the Town by showing increased demand for these three connections. The sewer collection system and treatment facility will need to have the capacity to accommodate this growth.

ii. Community and Private Systems

Within the town limits there exist a number of small independent water systems that are not connected to the Town's water system but that are connected to the sewer system: five community water systems, three water systems that serve seasonal residences and eleven transient water systems (those that do not consistently serve the same people, i.e. mobile home parks or campsites) as listed on the website for the Environmental Protection Agency Safe Drinking Water Information System (EPA SDWIS). At some point in the 20 year planning period some, all, or none of these smaller water systems could become a part of the Taos water system, thus an increase in water system demand could occur without a change in the overall population of the town. Incorporation of all the systems would be included as part of a scenario for full build-out and would increase the number of people served by the system by approximately 2,365.

Additionally, many residents within the Town's boundaries receive water from domestic private wells; it is uncertain if or when homeowners might consider connection to the Town's water supply

system. Taos also owns several individual wells and test wells that are not part of the billed water system.

In recent years, the Town has annexed some areas located within the town and some properties that border the town's boundaries. One or two additional areas are still under consideration for annexation and could possibly be phased in over the coming years. These areas will be comprised primarily of rural residential and residential land use. A marginal increase in water usage and sewer connections can be expected from the annexations as residents in some areas have private wells and some already receive water and sewer service.

Taos is mandating hook-up to the town's sewer system to preserve water quality for the future, though the Town is not enforcing connection requirements for the water system. By 2035 the water and/or sewer service area could potentially increase by several hundred people (approximately 445) if the Ranchitos area was included in the Town's service area boundaries.

Water and wastewater Infrastructure Capital Improvement Plan (ICIP) projects listed for years 2016-2020 include construction of the Weimer Area Sewer System and Water System Improvements Phase 2, Camino del Medio Water Line, and the Airport Water Supply System (not connected).

iii. Neighboring MDWCAs and Water Sewer Districts

The second region under consideration consists of areas within Taos County that have expressed an interest in an extension of town services for either an emergency drinking water connection emergency or for possible future interconnection. The Town is surrounded by many smaller communities that have their own water systems, and the Town of Taos currently is connected to Cañon MDWCA and El Prado WSD and has agreements to provide emergency domestic potable water. The Town is currently working to provide the same agreement with Ranchos de Taos MDWCA.

In the case that the Town would provide domestic backup supply to surrounding communities, the Town's water system would supply water but would not be expanded for additional storage to meet the needs of the neighboring communities: the individual communities would utilize their current infrastructure with the Town's water. Other communities may be interested in combining and connecting private systems with the town's municipal system. Further study and discussion between the Town and neighboring communities will be required to determine if the Town would be able to provide fire flow capacities to the neighboring systems. The communities that could be considered as part of a regionalization effort or otherwise in need of emergency water supply are listed below:

- Ranchitos (Upper and Lower)
- El Valle de los Ranchos
- Los Cordovas (part of El Valle de los Ranchos)
- Ranchos de Taos (part of El Valle de los Ranchos)
- Talpa (part of El Valle de los Ranchos)
- Llano Quemado MDWCA (part of El Valle de los Ranchos)
- El Prado Water and Sanitation District

D. System Demands

Future population growth trends were completed by Southwest Planning and Marketing (SPM), as part of the 2008 *Taos Regional Water Plan* prepared by Daniel B. Stephens and Associates,

Inc. SPM is a 25 year-old Santa Fe firm that provides market research and planning and impact assessment studies. The projected population growth rates for the Central Sub Region, which includes the Town of Taos and other communities within the Taos Valley, are shown in Table 2.

Both high and low growth rate scenarios for the Central sub-region were developed by SPM. Both predictions show a continuously declining growth rate each decade but the high growth rate scenario indicates a decrease at a slower rate. It assumes that migration patterns into the Rocky Mountain areas that began in the 1980s will continue in the years to come.

The SPM report considers the high growth rate scenario, which projects that the town will grow at an annual average rate of 1.89%, more likely to be achieved. The higher annual growth rate predictions for the Central Sub Region and the Town of Taos will be used in this report.

Table 2: Growth Rates

Taos– Central Sub Region Annual Growth Rates				
	2010-2020	**2020-2030**	**2030-2040**	**2040-2050**
Projected Population Growth Rates-Low	1.37	1.00	0.71	0.54
Projected Population Growth Rates-High	2.13	1.54	1.58	1.11

Source: *Taos County Regional Water Plan Population Projections*, Southwest Planning and Marketing, May 2006

Table 3 shows the projected population growth rates, using the high growth rate scenarios for the Central sub region, were used to project growth in the *Town of Taos 40-year Water Development and Conservation Plan, June 2014* by Daniel B. Stephens and Associates.

Table 3: Population Predictions

Taos – Central Sub Region Population Predictions	
Year	High Growth Scenario
2000	4,700
2010	6,366
2013	5716 (actual)
2020	7,859
2030	9,157
2040	10,711
2050	11,961

Source: *Town of Taos 40-Year Water Development and Conservation Plan*, Daniel B. Stephens and Assoc., June 2014

E. System Projects/summary/conclusion and constraints

It is unlikely that the water and sewer service area boundaries will expand greatly or that the Town will extend utility services much further outside the existing service area during the 20 year planning period. The greatest demand on the water system will likely come from population growth within the Town as in-migration to the Rocky Mountain areas is still taking place. Other previously mentioned areas of growth such as incorporation of existing commercial systems and private wells will not be considered significant so they are not included in the growth projections for this report. It is difficult to predict whether or not the owners will abandon their water supply sources and connect to the Town's system. As the Town is surrounded by many small unincorporated communities, regionalization or interconnection with surrounding water systems may occur in the future but it's not likely to happen before 2035. Water service connections to

adjacent systems for emergencies are in the planning stages; hydraulic analyses would need to be completed.

Population projections and growth projections are the best method to approximate demand based on the known information and assumptions. Full build out – interconnection with the neighboring MDWCA's and Water Sewer Districts – were not included in the population projections and growth rates for this Master Plan. The associations and water/sewer districts are not anticipated to join the Taos water or sewer systems in the current planning period. A study will have to be done when any system connects to ensure the capacity and hydraulics for the systems work.

3. EXISTING WATER SYSTEM

The Town of Taos owns, maintains and operates the public water utility, which is managed by the Public Works Department. The Town solely utilizes groundwater sources for their water supply, and several of the wells pump directly into the water system, while several pump to storage tanks located around town. The Town disinfects the groundwater from each well, and treats individual wells as needed for various constituents. Storage is provided by two primary tanks located in the Weimer foothills and totaling 1.5 million gallons. The distribution system is made up of various pipe materials and sizes.

A. Water Rights

The Town is permitted to divert surface and groundwater under the Rio Grande Compact and the New Mexico Office of the State Engineer (NM OSE) administrative policy. Provisions of the Abeyta Settlement Agreement dictate certain current and future parameters the Town must follow regarding water use.

i. Rio Grande Compact and San Juan-Chama Project Permitted Water Rights

The water rights owned by the Town are located within the NM OSE declared Rio Grande groundwater basin. Most of the Town's municipal wells are located in the "In-Town" well field. Through the San Juan-Chama Project (SJ-C), the Town has an allocation of water rights to offset use of the water from the Rio Grande Basin. The Rio Pueblo wells are to the southwest of the town and specifically divert water from this allocation.

The Town's existing permitted water rights total 1856.52 acre-feet per year (afy). These water rights are held under various categories, including: vested Town wells, permitted Town wells, SJ-C Project allocation, permitted for the municipal system and miscellaneous permits. Table 4 is a summary table from the *40-Year Water Development and Conservation Plan* which shows the water rights permitted to each category.

Table 4. Existing Permitted Water Rights Summary

Water Rights Category	Diversion Amount (afy)	Consumptive Use (afy)
Town wells vested (RG-7339)	607	607
Town wells permitted (RG-7339)	310.28	310.28
San Juan-Chama Project allocation* (RG-37303 and RG-3769)	784	392
Permitted (RG-37303 and RG-3769)	98	98
Subtotal Municipal System	**1,799.28**	**1,407.28**
Miscellaneous Permits	58.243	57.243
Total Rights	**1856.52**	**1464.52**

*Contract allocation is reduced by 2 percent conveyance loss factor
Source: *Town of Taos 40-Year Water Development and Conservation Plan*, Daniel B. Stephens and Assoc., June 2014

ii. Abeyta Settlement Agreement

The Town's water rights are being adjudicated, as are all water rights in the Rio Pueblo de Taos and the Rio Hondo stream systems, in what is commonly referred to the Abeyta adjudication, a consolidation of lawsuits for pueblo and non-pueblo water rights claims. The Settlement Agreement has provisions for the Town which include stipulations for future water rights and

diversions, specified new well locations, shared operation, maintenance and replacement of a mitigation well. The Settlement Agreement limits use of current municipal supply wells and outlines requirements for those and future wells. The existing and future requirements for individual wells will be discussed further in Section 5, System Goals and Deficiencies.

For a more complete discussion on the Town's water rights, provisions of the Abeyta Settlement and the overall legal framework, see the *40-Year Water Development and Conservation Plan* (DBS, 2015).

B. Supply and Treatment

The Town currently has ten wells within the municipal water supply, though not all are in use. Table 5 is a summary of each well.

Table 5. Well Names and Locations

Well Name	Permit	Location	Status
1	RG-7339	In Town, Bedford St.	Online, Not in Use
2	RG-7339-s	In Town, Bedford St.	Online, Not in Use
3a, 3b	RG-7339-s2	In Town, Post Office	In Use
4	RG-7339-s3	In Town, Jack Denver	In Use
5	RG-7339-s4	In Town, Sierra Sports	In Use
6 / Howell	RG-7339-s5	In Town, Howell	Disconnected
7	RG-37303	Rio Pueblo	Disconnected
8	RG-37303-s3	Rio Pueblo	In Use
9	RG	Rio Pueblo	Not Completed

i. Wells 1 & 2

Wells 1 and 2 are the Town's oldest wells, located in town at the Bedford Street site, completed in 1935 and 1944. Well 1 is 175 ft in depth and produces approximately 135 gpm. Well 2 is 178 ft in depth and produces 220 gpm. The wells pump directly to the 200,000 gallon Bedford Tank. The wells are located in a single building, which also contains an administrative office, the water system Supervisory Control and Data Acquisition (SCADA) system, and a booster station for the Bedford Tank. The wells are disinfected by a MIOX brand chlorination system (MIOX), but it is out of service and must be repaired prior to the wells coming back online. The wells, disinfection and booster system are not currently in use because the Bedford Tank is currently offline.

ii. Wells 3a & 3b

Wells 3a and 3b are both located at the Post Office site, inside and outside of the well house behind the Post Office, respectively. Well 3a is 330 ft in depth and produces 220 gpm. Well 3b has the same depth and production. The wells are located approximately 30 ft apart, and are alternated since to help prevent interference with each other. This MIOX system is in need of service and replacement components are required. However, the Town's model of system is no longer manufactured. The wells are disinfected by a MIOX system and pump directly into the distribution system. A fluoride injection system is also located in the wellhouse.

iii. Well 4

Well 4 pumps directly into the distribution system. It is located at the Jack Denver site, along the Rio Fernando de Taos and near Tewa Street. The well disinfection is currently being accomplished by sodium hypochlorite dosing. Components of the MIOX system are in place, but the system was taken offline because it requires service and replacement parts which are no longer manufactured. The well was completed in 1967 to a depth of 300 ft and produces 225

gpm. The block wellhouse is in need of repair due to deterioration of the first row of block and cracking in the walls.

iv. **Well 5**

Well 5 is located at the Sierra Sports site south of the Plaza, and was completed in 1975. The well produces 370 gpm and was completed to a depth of 330 ft. The well pump is a turbine pump and has a backup gasoline generator, though it is not known what condition the generator is in. The well is one of the Town's main producers, and operates more than the other wells. The well is disinfected by a MIOX system, but the MIOX system is out of service and needs to be repaired or replaced.

v. **Well 6**

Well 6 was completed in 1973 to a depth of 503 ft. The well is offline as a result of the Abeyta Settlement. An emergency generator is located at the site, although its condition is not known. Through the Abeyta Settlement, diversion of water from this well will be offset by a new well at Kit Carson Park.

vi. **Well 7**

Well 7 is located south of town at the Rio Pueblo well site, and was completed in 1995 to a depth of 200 ft. The well produces 58 gpm, but has water quality issues due to sanding. For this reason, the well has been disconnected from the system. The wellhouse has not been demolished.

vii. **Well 8**

A deep well, constructed to divert water for the SJ-C Project allocation, Well 8 was completed to a depth of 2500 ft in 2000 and is able to produce 580 gpm. The water produced by the well contains arsenic above the maximum contaminant level (MCL), up to 20 parts per billion (ppb), and is treated at the nearby treatment facility and booster station on Los Cordovas Road. Disinfection takes place at the booster station with a MIOX system. The MIOX system requires service or replacement since parts are no longer available to service the model of the existing system.

The Arsenic Treatment Facility in Los Cordovas was built in 2004 and addresses the high levels of arsenic in the water produced by the well. The facility also disinfects the well water with a MIOX system, as noted above. The arsenic treatment capacity is 450 gpm. As an alternative to treating the water for arsenic, bypassing the treatment allows for the Well 8 water to be transferred directly to the 1 MG tank and blended with water from the in-town wells. This blending results in water below the MCL for arsenic and in compliance for use of consumption.

Although Well 8 has a backup power source, the arsenic facility does not: therefore, when there is a power outage, water from the Ro Pueblo site cannot be transferred to the 1 MG storage in Town.

viii. **Well 9**

Well 9 has not been completed, though efforts to being the well online have been attempted since it was drilled to 3180 ft in 2007. The well produces water with both sand and arsenic. Although attempts have been made to troubleshoot the well casing, water from the well won't be used without additional treatment for the sanding. The well produced fine sand and has not yet been completed. In 2010 a Muni-Pak pre-packed stainless steel well screen was installed to address this issue, but upon final review of the project, problems with the welds still allow sand to enter the well.

C. Storage

The Town water system has five water storage tanks throughout the system, though not all are in use. Table 6 lists the tank locations and status, and Table 7 lists the booster stations throughout the system.

Table 6. Water Storage Tanks

Tank	Location	Status
200,000 gallon	Bedford Street Site	Offline for rehabilitation
1 MG	Weimer Foothills	In Use
0.5 MG	Weimer Foothills	In Use
50,000 gallon	Los Cordovas	In Use
Elevated Tank	Post Office	Abandoned

Table 7. Booster Stations

Booster Station Location	Purpose
Bedford Site	Pressurize system with water from Bedford tank
1 MG Tank	Transfer water from 1 MG tank to 0.5 MG tank
Arsenic Facility	Transfer water from Rio Pueblo site to 1 MG tank

Effective water consumption and fire protection storage for the system is 1.5 MG and provided by the tanks in the Weimer Foothills area. The 200,000 and 50,000 gallon tanks require a booster system for the water to be available to the system for use.

Storage needs for the system are based on fire protection and consumptive use. The fire protection requirements for the system used for the storage analysis are to provide 2,000 gpm for two hours, or 240,000 gallons of storage. Consumptive use from the 2014 *40-Year Water Development and Conservation Plan* is assumed to remain at the current 70.5 gpcd, reflecting conservation efforts for system users. The 2007 *Water System Study* describes a required storage for the system of 2.5 MG. This number is derived from an average daily use, peaking and growth factors.

i. 200,000 Gallon Bedford Tank and Booster Station

The 200,000 gallon, welded steel tank at the Bedford site is supplied by Wells 1 and 2 directly. A booster station at the tank transfers water into the distribution system. The base elevation of the tank is 6961 ft mean sea level (msl), and the overflow of the tank is 6996 ft msl.

Currently, the tank is offline and in need of rehabilitation. The storage tank was repaired for leaks in 2013. The leakage worsened due to settling of the tank foundation once oversaturated. Current rehabilitation will examine repair and stabilization of the foundation, as well as consider replacement or relocation of the tank altogether. Because the tank is not online, Wells 1 and 2 are not currently in use.

The booster station at the Bedford location is used for pressuring the system with water from the Bedford tank in town, and to assist with flow demand for fire protection. The station consists of two 75 horsepower (HP) pumps.

ii. 1 MG Tank and Booster Station

Originally, the welded steel 1 MG Tank in the Weimer Foothills operated by “floating” on the system with water from the wells: the elevation of water in the tank matched the hydraulic grade

of the water system. The base of the tank is at 7082 ft msl, and the overflow is 7132 ft msl. In 2007 and 2008, the Town completed several phases of the Dedicated Fill Line project, which connected the wells from the Rio Pueblo site to the 1 MG tank through a new, dedicated 10-inch transmission line and connection to the tank. The tank is now filled from the Rio Pueblo wells directly, and continues to float on the system as supplied by the in-town wells.

At the 1 MG tank location, a booster station is located to transfer water into the 0.5 MG tank and the higher pressure zone.

iii. 0.5 MG Tank

The bolted steel 0.5 MG water storage tank is supplied by water from the 1 MG tank. The tank's base is 7256 ft msl and the overflow is 7298 ft msl. The tank has one inlet and outlet pipe, so it floats on the pressure zone created by the booster station at the 1 MG tank and feeds back into the pressure zone of the 1 MG tank. This issue is described in more detail in Section 5.

Although the tank was originally designed and constructed to be heightened to a capacity of 1 MG, the 2007 *Water System Study* recommends any additional storage in a different location in the town to assist with system hydraulics.

iv. 50,000 Gallon Tank and Booster Station

Water from Well 8 is transferred to the 50,000 gallon welded steel tank adjacent to the treatment facility. Water is then pumped into the dedicated fill line via the booster station also located in the treatment facility building. The base elevation of the tank is 6778 ft msl.

The booster station in the arsenic treatment facility has the two original 100 HP pumps and a newer variable frequency drive (VFD) pump system. The VFD unit replaced the original booster pumps in 2008, and is more efficiently operating to allow for blending to address the high arsenic levels, as well as matching the production of the existing and future wells.

As mentioned previously, there is no backup power supply at the arsenic facility. For this reason, if there is a power outage, water cannot be transferred from the Rio Pueblo site to the 1 MG tank in town.

v. Elevated Tank

The abandoned elevated storage tank at the Post Office site is no longer in use. Per the 2007 *Water System Study*, the tank should be considered for removal.

D. Distribution System and Pressure Zones

The Town of Taos water distribution system consists of a variety of pipe sizes, ranging from 2-inch to 12-inch, and a variety of pipe materials, including PVC, galvanized steel, HDPE and fiber-reinforced PVC. The distribution system is estimated to contain approximately 60 miles of pipeline, and the original piping in the system was installed as far back as the 1950s. The distribution system supplies potable water to residences and commercial users, as well as providing fire protection throughout the Town. The Town's GIS data is the only source of data about pipe locations existing in a single location. The Town does not have record drawings from all past projects, so there are unknowns within the system. The GIS Division works closely with system operators and updates information in the database each time information is found or verified in the field or provided with record drawings developed for recent projects.

There are three pressure zones in the system. The main pressure zone covers the majority of the Town, including the in-town well field and 1 MG tank. A second pressure zone includes the 0.5 MG tank and the Weimer Foothills area. Finally, a third pressure zone is located to the northwest of downtown. The infrastructure at the Rio Pueblo site operates at different pressures, but since the water is transferred to the 1 MG tank directly, it is not impacting pressures in the distribution system directly. However, there are an unknown amount of unidentified loops within the system that cause tank cycling and short circuit the pressure zones.

Both residential and commercial connections to the water system are metered, from sizes ¾-inch to 8-inch meters. The meters are maintained and read through the Utilities Department: billing is done through the Finance Department. There are two rate structures, for connections within the Town limits and connections outside of Town limits. The rate structure is tiered, with a base rate plus a tiered usage rate. A summary of the 2015 rate structure for water usage within the Town limits is shown in Table 8.

Table 8: 2015 Water Service Rates (Within Town Limits)

Residential	**Base Charge (up to 2000 gal per month)**	**Cost ($ per 1000 gal)**
	$ 10.70	
Tier 1: 2001 – 6000 gal		$ 3.87
Tier 2: 6001 – 12,000 gal		$ 5.81
Tier 3: over 12,000 gal		$ 7.74
Commercial		**Cost ($ per 1000 gal)**
¾"	$ 15.96	$ 3.87
1"	$ 31.92	$ 3.87
1 ½"	$ 63.84	$ 3.87
2"	$ 127.68	$ 3.87
3"	$ 191.52	$ 3.87
4"	$ 255.37	$ 3.87
6"	$ 510.73	$ 3.87
8"	$ 638.41	$ 3.87

E. Emergency Supply and Interconnections

Currently, there are emergency potable water supply connections to the El Prado WSD and Cañon MDWCA systems. There are communities surrounding the Town, as well as smaller unserved areas within the Town proper which may someday require an emergency water supply or interconnection with the Town depending on the state of their water supply wells and system infrastructure as discussed in Section 2, Populations, Service Area and System Demand Projections. Emergency water supply for these communities was not included in the population projections or growth rate considerations.

No additional interconnections between Taos and any of these systems are anticipated within the current planning period, therefor, these communities are not included in the population projections or growth rate considerations. However, if/when these communities connect to the Town's water system, they will already have existing water rights, wells, storage tanks and system piping and water services. The Town will be increasing the service area and population but the infrastructure will be in place so little change will occur to the Town's system. The Town will have to work the new infrastructure into the O&M and asset management plans if/when they are incorporated. The Town may be required to identify new water supply sources or transfer water rights to existing

Taos Wells to supply the new interconnections, based on the condition of the Associations wells. This will have to be determined prior to physical interconnection of the systems.

4. EXISTING SEWER SYSTEM

The Taos Valley Regional Wastewater Treatment Facility (WWTF) serves the Town of Taos proper, Taos Pueblo, El Prado and El Valle de Los Ranchos. Metered connections from the surrounding communities feed directly into the Town's collection system. Additionally, the sewer system serves several non-transient communities (e.g. Mobile home parks) which are not currently on the water system but have sewer hookups. The treatment plant treats an average of 1.2 MGD.

A regional map of the service area and a location map are located in Appendix A, Exhibit 4. The WWTF is located in the southwestern region of the service area, on a plot of land approximately 113 acres in size and owned by Town of Taos.

A. Collection System

The service area for the WWTF ranges in elevation from about 6,800 to 7,160 ft msl. The collection system generally follows the contours of the land, and flows west towards the treatment facility. There are approximately 60 miles of sewer pipeline throughout the collection system: the earliest parts of the system was installed in the mid-1970s.

Metered connections, including Taos Pueblo and El Prado WSD, monitor the flows from the neighboring communities which send their wastewater to the Taos Valley Regional WWTF: El Valle de los Ranchos does not have a metered connection, but the flows are assessed based on an average household usage rate.

B. Treatment

The construction of the original WWTF was completed in 1974 and consisted of an oxidation ditch and two clarifiers sized for a capacity of 400,000 GPD. A minor expansion in 1984 increased capacity to 1 MGD. In 1995, the facility underwent major upgrades to increase the capacity of the facility up to 2 MGD. Since this time operational upgrades included the installation of a grit chamber and ultraviolet (UV) disinfection. A major upgrade of the headworks took place in 2006. In 2011, the Town of Taos contracted with AUI, Inc. for a two-year, $10 million renovation of the facility. These upgrades included the installation of a membrane bioreactor (MBR) treatment system, the existing clarifiers were taken offline and the oxidation ditches were converted to aerated and anoxic-zoned basins. The facility operates at a much higher efficiency and produces a high quality effluent to meet current and future anticipated discharge permit requirements. Future buildout of the facility under the existing permit will increase capacity up to 2.5 MGD.

Currently, the WWTF treats just over 1.2 MGD on average year round. The typical seasonal fluctuation is offset by the high numbers of tourists in the area over the winter months. The system operates seven days per week. In 1992 the Town brought CH2MHill – OMI under contract to operate the facility and bring it into compliance, and the Town has maintained this relationship since that time.

C. Reclaimed Water

The MBR facility produces Class 1A effluent, which is capable of being used for many purposes. Once the effluent is disinfected by the UV system at the north end of the WWTF, it is disposed of by two different methods. First, water is discharged to an ephemeral arroyo which is a tributary

to the Rio Pueblo de Taos, which ultimately leads to the Rio Grande. This discharge is permitted under the National Pollution Discharge Elimination System (NPDES) Permit NM0024066. The parameters of the permit allow the flow to be continuous and are not limited to a flow rate as long as it is monitored and reported. Second, effluent from the WWTF is pumped to the Taos Country Club Golf Course, which utilizes it for irrigation. Commercial or private users may also haul reclaimed water for use. A pumping and metering station is located at the UV disinfection structure.

5. SYSTEM GOALS AND DEFICIENCIES

A. Water System

i. Water Rights

The goal of the Town is to have sufficient water rights for diversion from the Town's water resources to provide for sufficient water to consumers and users of the system. The Abeyta Settlement outlines the current state of the Town's water rights, as well as how they will be impacted in the future.

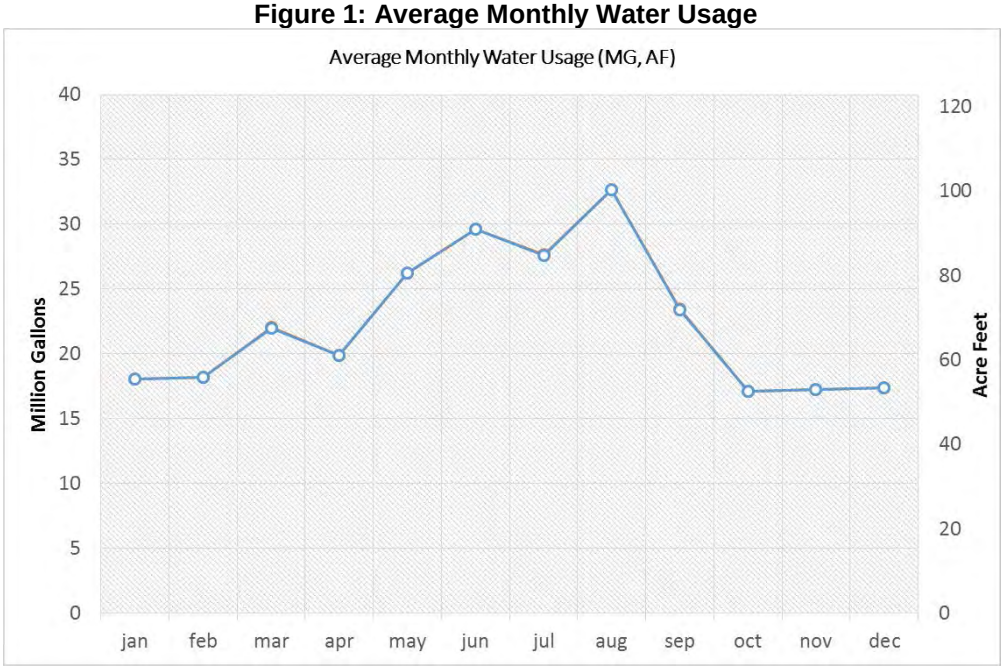
The Town does not currently have a method of tracking the transfer of water rights from new users or interconnections to neighboring associations. An approach to tracking this data should be implemented since the provisions of the Abeyta Settlement cap the Town's in-town water rights at 1,100 acre-feet/year, unless rights are transferred from new users connecting to the Town's system from outside the Town's limits.

ii. Supply and Treatment

a. General System Improvements

The primary goal of the Town is to provide sufficient water to users of the system which meets federal and state drinking water regulations. This may be accomplished utilizing existing infrastructure, as well as with the addition of new infrastructure. An extensive analysis of the Town's water use was completed in the *Town of Taos 40-Year Water Development and Conservation Plan* by DBS. A brief analysis for illustrative purposes combined well readings submitted monthly to the OSE. Figure 1 shows a monthly average water use from the five year period from 2010 to 2014.

Figure 1: Average Monthly Water Usage



The Abeyta Settlement has provisions for additional wells which will supplement the Town's water supply and which will help meet demand projections and maintain compliance with the Settlement as to where groundwater is diverted in the region. Four new wells are planned for the Settlement, as summarized in Table 9. The new wells will bring an estimated 1,750 gpm of well production to the system for consumptive use. DBS produced the *Town of Taos 40-Year Water Development and Conservation Plan* which outlines water use and breaks down residential and commercial use based on historical records and provides a projection of water use for the report planning period.

The Preliminary Engineering Report of 2014 from DBS describes each of these new wells and projects in more detail. The new well locations are identified in Appendix A Exhibit 3.

Table 9. New Wells Prescribed by the Abeyta Settlement

Well	Description	Anticipated Water Quality Issues
Bataan Well (Kit Carson Park)	Will offset diversion from Well 6 (Howell Well) which has been taken offline	None noted
Camino del Medio	Near Camino del Medio and Paseo del Canon West; Test well drilled	Arsenic, fluoride, pH
Mitigation Well C	Near Well 4; will recharge Rio Fernando de Taos	None noted
National Guard Well	South of Town near National Guard;	Arsenic
UNM – Klauer Campus Well	South of Town near UNM Klauer Campus	Arsenic
Rio Pueblo Well	Located near Well 8 and 9	Arsenic

Source: *Preliminary Engineering Design Report, Town of Taos, Mutual Benefit Projects under the Abeyta Settlement Agreement*, Daniel B. Stephens and Assoc., June 2014

Treatment of the wells within the Town's system to meet drinking water regulations include arsenic removal from Well 8 and disinfection for each of the wells. The arsenic treatment facility for Well 8 is not in currently in use, as the Town addresses arsenic levels in the water by blending with water from the in-town wells in the 1 MG tank. Since the arsenic treatment facility has not been in use for some time, bringing the system back online will require some maintenance, including the following:

- Verifying media is capable of performing (within it's useful life) and replacing it if need be
- Replenishing the carbon dioxide system for pH adjustment pre-treatment

In addition to bringing the system back online, it is anticipated that the new wells prescribed by the Abeyta Settlement at the National Guard, UNM Klauer Campus and the Rio Pueblo site will require arsenic treatment as well.

Each of the wells online in the system have a MIOX SAL-30 system installed for disinfection. The age of these systems vary, and none are currently is use because they are in need of service or repair: disinfection is currently being accomplished by sodium hypochlorite dosing. Because of the age of the systems, however, they will most likely have to be upgraded to a more modern MIOX or other disinfection system. If repair is possible, it will most likely include replacement of all the piping and filters on the system. The disinfection system on each well needs to be repaired or replaced to bring them online.

A more efficient system to operate the system wells, in addition to balancing the amount of water diverted from in-town and SJ-C wells, is a priority for the Town to implement prior to the wells

prescribed by the Settlement coming online. Monitoring well production and energy use at each of the well sites will allow the Town to make decisions to optimize water use from the various sources.

The SCADA system has been offline and is in need of replacement and upgrades in order to manage all the existing and future system components. The system, which is housed at the Bedford site, is in need of repair and upgrades. In order to bring the SCADA system online for use with each of the system components, SCADA improvements will need to be addressed at each site.

b. Wells 1 & 2 (Bedford)

In order to bring Wells 1 and 2 online, improvements to the Bedford site include piping improvements at the booster station and between the wells and tank, and rehabilitation of the storage tank to address leakages and settling of the foundation. The piping at the wellhouse and booster is in need of replacement to prevent any major catastrophic failures. Additionally, the electrical panel and components of the wellhouse are in need of repair.

c. Wells 3a, 3b (Post Office)

Wells 3a and 3b require minor improvements, including repair or replacement of the MIOX disinfection system, and minor repairs and upgrades to the piping in the wellhouse. The wells are currently in use and are good producers. Upgrades to the SCADA system will allow for more automated control and monitoring of the wells.

d. Well 4 (Jack Denver)

The Well 4 wellhouse is in need of structural improvements: the construction is concrete masonry unit and has some damage due to deterioration of the blocks and settling of the walls. The disinfection system has a MIOX system out of service and a sodium hypochlorite dosing system which is in use in lieu of the MIOX.

e. Well 5 (Sierra Sports)

The backup generator for Well 5 requires scheduled service, and its status is unknown. Disinfection improvements and upgrade to the SCADA system will bring the well back online as designed.

f. Well 6 (Howell)

Well 6 has not been in use recently: the Abeyta Settlement takes this well offline permanently. The well needs to be capped and abandoned, and the infrastructure can be demolished or salvaged. The backup generator at Well 6 will be relocated elsewhere in the system. The 2007 *Water System Study* advises moving the backup generator from Well 6 to the arsenic treatment facility. The size of the generator and its use at the treatment facility needs to be verified.

g. Well 7 (Rio Pueblo SJ-C)

Well 7 is a relatively shallow well in the Rio Pueblo well field. It is currently disconnected from the system due to sanding and poor production issues. There are no plans to bring Well 7 back online.

h. Well 8 (Rio Pueblo SJ-C)

Of the three wells at the Rio Pueblo site, Well 8 is the only one online and able to produce water for the Town. There is a backup generator at Well 8 which needs to be serviced: the working status of that generator is unknown. Because the water produced by Well 8 pumps into the 50,000 storage tank and is boosted into the system, a backup generator should be installed at the booster station and arsenic treatment facility so the system may be operated in the case of a power outage. Currently in the case of an outage, the standby generator at Well 8 would allow water to be pumped from the well, but the treatment facility and booster station would still not be able to treat water and pump it into town.

Although blending the water from Well 8 with the other wells in the system is addressing the elevated levels of arsenic in the system, the treatment facility must be brought online to be able to act as an adequate supply for the system. To bring the system online, media in the adsorption vessels must be replaced with fresh material if it is beyond the useful life of the material. A sample sent to a laboratory should be able to verify whether the media can perform. The carbon dioxide gas system, used for adjusting the pH of the raw water prior to treatment, should be replenished and brought back in to service. The MIOX system, similar to the other wells, needs to be brought online through service or replacement. The controls for the arsenic treatment equipment are standalone: by integrating the controls into the SCADA system, the Town would be able to monitor and to some extent control the system remotely.

In order to combine future infrastructure projects as a result of the Abeyta Settlement, any renovations to the existing facility should take into account potential future wells requiring treatment or boosting into town.

Currently, the 50,000 gallon tank provides storage after water from Well 8 is treated at the arsenic treatment facility. This water provides capacity for the booster pump to fill the 1 MG tank and minimizes the cycling frequency of the booster pumps. However, this tank is severely undersized and it requires 20 cycles from the 50,000 gallon tank to fill the 1 MG tank. This is extremely inefficient and causes excessive ware on the booster pumps from frequent cycling. The tank and booster pump capacity should be increased in order to fill the 1 MG tank quicker and reduce the ware on the booster pumps.

i. Well 9 (Rio Pueblo SJ-C)

Well 9 has not been completed and brought online due to sanding and issues with the screening and well construction. In 2010, the Town worked with the company which purchased the original well drilling company to repair the well. The well still produces sand, although the 2010 project included installation of new well screening. Per the original contract, the Town may be able to pursue damages from the well company to repair the defective portion of the well. One option to bring the well online includes rehabilitation of the casing and screens. Alternatively, the well could be abandoned and a replacement well drilled nearby.

iii. Storage

The 2007 *Water System Study* recommends a total storage capacity for the system of 2.5 MG, resulting in a 1 MG deficit in current storage. The report also discusses the location of potential storage: based on the system hydraulics, additional storage is recommended in the northern part of town to help balance the system. If additional storage is located in the northern part of town, a booster station will be required to pressurize the system, similar to the Bedford site. Land availability will determine if the additional storage will be located all in one location or split between

multiple locations. An updated system model will be beneficial for siting a new tank location and verifying the hydraulics of a new tank location and booster system.

a. 200,000 Gallon Bedford Tank and Booster Station

As noted previously, the 200,000 gallon tank at the Bedford site is in need of repair prior to bringing it back into service. The foundation must be structurally stabilized to prevent further settling and problems with the tank. Several alternative methods to complete this task are feasible, including rehabilitation of the subsurface while the tank is in place via pilings, temporarily moving the tank while the subsurface work is completed or even removing the tank altogether and construction a new tank once the subsurface is corrected. None of the options will be easily completed due to the site characteristics, specifically the proximity of the surrounding buildings, in some cases built against the tank wall itself.

The piping at the booster station, including the piping from Wells 1 and 2 to the tank, needs to be replaced for the system to be brought back online. Pitting has been observed in the aged piping. Replacing the cathodic protection on the storage tank will prevent this phenomenon from happening to the tank walls as well. Other improvements to the Bedford site include regular operations and maintenance for the facility. Site safety improvements include installation of a free fall cage for the ladder.

b. 1 MG Tank and Booster Station

The 1 MG water storage tank is in operable condition, but several issues will improve the security, operation and longevity of the tank. The cathodic protection needs to be inspected and serviced, and replaced if in poor condition. Site security and safety improvements include repair of the security fence and installation of a free fall cage on the tank access ladder.

c. 0.5 MG Tank

The 0.5 MG tank does not have major deficiencies, but similar to the 1 MG tank, improvements will help improve longevity and operational safety and security. The tank does not have cathodic protection, so installation of a cathodic protection system is an improvement that will extend the life of the tank. Site safety will be improved with the installation of a safety cage on the access ladder.

A correlation between the tank levels and booster station operation discussed in the 2007 *Water System Study* shows that the booster station is cycling water through the system. Water is pumped from the 1 MG tank to the 0.5 MG tank when called for. The water then enters the distribution system from the 0.5 MG tank and circulates through the distribution system back into the 1 MG tank. This phenomenon is caused by the looped nature of the distribution system, as well as multiple connections between the pressure zones. Additionally, the existing system has pressure reducing valves which may or may not be functioning to reduce pressure between pressure zones, or may be located incorrectly based on system looping and piping. The current water system improvements project is addressing this cycling between the pressure zones and tanks.

d. 50,000 Gallon Tank and Booster Station

The primary operational issue with the 50,000 gallon tank and booster station at the arsenic treatment facility is that they are undersized. The original booster station utilized two 100 HP pumps. The system was upgraded in 2008 with the installation of new pumps utilizing variable frequency drives (VFDs) which allow for blending as an option to reduce levels of arsenic in the

water delivered to the system from Well 8. The new pump system also reduces pressure surges in the transmission line from the booster station to the 1 MG tank.

As mentioned above, the tank is undersized for the current and future well production from the Rio Pueblo well site (SJ-C well field) south of Town. The existing tank needs to be filled and drained 20 times in order to fill the 1 MG tank. This requires the booster pumps to cycle on and off 20 times in order to fill the main Taos water storage tank. The existing 450 gpm booster pumps drain the 50,000 gallon tank in less than two hours. Then, Well 8 fills the tank at the same rate, since the arsenic treatment facility is sized for 450 gpm. This means the booster pumps cycle on and off every two hours. In addition to the frequent cycling of the 50,000 gallon tank and booster pumps when pumping to the 1 MG tank, the booster station and arsenic treatment facility cannot keep up with water being produced by the Well 8.

iv. Distribution System and Pressure Zones

One of the major deficiencies of the distribution system is the lack of accurate information about the system piping, including location, age and condition. Although the GIS Division has the largest compilation of information about the system, there are still many gaps or errors in the database. Record drawings and as-built information from past projects have not all been catalogued in the division's database, though the Town continues to incorporate information into the database as quickly as possible. The Public Works staff updates the GIS Division with information found or verified in the field through the course of regular system operation and maintenance, system breaks, or with utility construction projects or repairs.

The current pressure zones are not clearly defined, and connections between the zones without pressure control devices impact the hydraulics of the system. The water model developed in 2007 was not calibrated with field data. Additional work with the water system model should include calibration with field data, updating the definition of the pressure zones, updating the model with more accurate distribution piping information and updating system demands with current usage from meter readings. It is anticipated that when the boundaries of the pressure zones are redefined, new PRVs will be required in the system and existing PRVs may need to be relocated or modified.

Many of the fire hydrants in the water system do not meet acceptable access standards or condition. Problems with the fire hydrants include installation at incorrect heights (buried low or too high relative to breakaway flange and ground surface) and an insufficient cleared area around the hydrant. Photograph 1 shows an example of a fire hydrant incorrectly installed. Implementation of a scheduled fire hydrant maintenance program and coordination with the Fire Department will address hydrants that aren't properly installed and which need maintenance to come in to compliance.

Photograph 1: Example Fire Hydrant Condition

Meter accuracy, or lack thereof, can have extreme impacts to the Towns revenue. As water meters age they lose accuracy and begin to read a lower percentage of water than actually used by the consumer. Water meters should be replaced when the accuracy drops below ± 2.5%. Per American Water Works Association (AWWA) Standard C-700, water meters should be tested for accuracy per Table 10.

Table 10: Most Frequently Used Intervals Between Meter Tests

Meter Size (in)	Years Between Tests
1/2	10
5/8	10
3/4	8
1	6
1 - 1/2	4
2	4

Source: AWWA C-700

Improving accuracy in metering consumers in a water system will improve collection of water fees for maintaining the system, and will also allow the Town to examine water conservation practices by balancing water produced in the system with water consumed by comparing the well master meter usage versus the customer meter usage. Appropriate meters for each service will ensure the meter is able to read accurately for its use. For example, too large of a meter on a service connection may not register low flows accurately. Implementation of a scheduled program to analyze meter type and usage for service connections will help identify inefficiencies in the system.

Additionally, when all water supplies and service connections are metered, the Taos Public Works Department will be able to monitor and detect water losses within the distribution system much more effectively.

v. Emergency Supply and Interconnections

The Town has the capacity to add additional emergency potable water supply to the neighboring communities. This may require additional infrastructure to connect to the systems but that would be minimal and could be a joint project between the Town and neighboring community. The main challenge with connecting to the neighboring communities will be coming to an agreement on the conditions of the water supply sale.

Although the Town's water system borders several other community water systems, interconnections or regionalization may not be feasible for several reasons. Both the Town and the surrounding communities must agree on an interconnection, and politics may prevent this from occurring.

While the physical distance for systems to connect is not unreasonable, the elevations of surrounding communities may not allow for a gravity connection to supply sufficient pressures and flows to the particular communities in need. An updated and calibrated water system model will allow for a full analysis of how much water could potentially be supplied to the surrounding communities, ultimately determining the effectiveness of a capital expenditure for this purpose. A result of the analysis may call for one or more booster stations depending on the elevations and flows required. At this time the Town can only supply domestic potable water supply to the current emergency connections of Cañon MDWCA and El Prado WSD: any future connections completed prior to an updated water model would not be confirmed to be feasible.

vi. Operations

The Town's Public Works Department manages the operation and maintenance of the water and sewer systems. The Department currently has seven full-time staff operators for the water system and collection portion of the sewer system. Due to the lack of historical documentation of the water and sewer systems, the operators must learn the system based on experience. This results in gaps in knowledge of the system and between individual operators. The operators have a good amount of knowledge about where there have been problems with the system and what they have done to address it; however, there is little to no knowledge of system components that are nearing the end of their useful life which should be planned for replacement or rehabilitation.

Documented best practices will maintain high standards for system O&M activities. A revised operations plan, to account for system changes due to the Abeyta Settlement and other capital improvement projects will optimize system activity and allow the staff to implement and continue regular O&M practices. An updated emergency response plan will assist in risk management and prevention. Additional training for system operators will assist in creating more efficient and effective O&M activities to manage the system.

Formal documentation of information collected in the field and incorporation into the GIS Division's database will advance the overall collective knowledge of the staff and the GIS Division, as well as increase the accuracy of information. Currently there is no process to document repairs or service calls. Historical knowledge of O&M only exists within the operator's memory. Service tickets are created for service calls; however this goes over to the Financial Department and the Public Works Department cannot recall information from these tickets if needed in the future. More complete information will allow the operators to respond better to system outages, prepare for needed repairs and improve the ability to isolate specific portions of the system. Also, implementation of a comprehensive work order system is a useful way to track information about assets in the field, as well as material, equipment and costs needed for O&M activities.

The GIS Division can be the first point of contact for information about water system assets if the data transfer between operators in the field is consistent and validated prior to entry or updating of the database. With a solid base of information, the Town may implement an Asset Management (AM) Program to manage the water system. The AM Program will not only capture data about the system in an asset inventory, but also track work completed on the system and allow for analysis and trending of system O&M activities. AM will allow identification of critical

system assets, tracking level of service targets for system components, and assist in defining life cycle costs for use in budgeting capital and O&M improvements. Finally, the AM will allow for the creation of a long term funding program based on real system data and costs.

With the implementation of the Abeyta Settlement and the planned infrastructure improvements, the Town will begin to rely more heavily on Well 8 and the future Well 10 to relieve diversion from the in-town wells. Currently, the high levels of arsenic in the water produced by Well 8 are mitigated by blending in the 1.0 million gallon storage tank, and the arsenic facility is not used to treat all water produced by the well. As future water production increases from Well 8 and the future Well 10, blending will not sufficiently address the level of arsenic delivered to the drinking water system and the treatment facility will be used regularly. By utilizing this critical drinking water infrastructure (Well 8, Well 10, arsenic treatment facility) on a more regular basis, the Town of Taos will incur significantly higher electric utility expenses in the near future. The development of a solar PV system to offset the increased electric utility expense to operate this drinking water system infrastructure will significantly benefit the Town of Taos.

B. Sewer System

i. Collection System

Although the GIS Division has information regarding the sewer system, the accuracy of the data has not been verified. The sewer system can be more easily located than a water system because of manholes. A complete survey of the system should be completed to verify the system characteristics, including pipe location, material, size and slope. An assessment of the condition of sewer pipes using closed circuit television (CCTV) will allow for investigation into the condition of the pipes and service connections. CCTV will also reveal evidence of pipe flow depths, infiltration and exfiltration issues, root intrusion and any other obstructions in the lines. The actual extent of infiltration and exfiltration issues will not be known until a CCTV assessment is completed. An assessment of manholes will reveal any surcharging and condition of the actual manhole structure.

With anticipated growth primarily from infill, a system model should be completed to analyze the capacity of the system for current users as well as future growth. Since the system accepts wastewater from neighboring communities, the system should be analyzed for growth of those populations as well.

ii. Treatment

The most recent upgrades to the WWTF have included Phases 1 through 3 of the planned improvements from the 2009 *Taos Valley Regional Wastewater Treatment Facility Treatment Technology, Solids Handling & Reuse Alternatives Preliminary Engineering Report*, which upgraded the headworks and treatment process (as noted in Section 4.B). The treatment process itself does not require any upgrades, and is capable of handling projected growths for the 20-year planning period. The MBR system was construction with 16 treatment cassettes for a 2.0 MGD capacity: empty spaces and piping stubbed out will allow for another 4 cassettes and an increased capacity of 2.5 MGD when needed for future buildout. The remaining upgrades needed from the PER include removing structures no longer used in the current treatment process and upgrades to the biosolids processing facilities.

The previous planning documents for the WWTF have outlined Phase 4 to include the following improvements:

- Removal of fertilizer production equipment and upgrades to biosolids processing facility
- Upgrades to the existing Administration building and laboratory, including ADA compliance
- Upgrade the UV disinfection system, including enclosing the system by building a structure around the existing outlet channel
- Site work, including access roads and parking, and removing structures and equipment no longer used by the MBR process
- Improvements to electrical and SCADA
- Additional screening prior to MBR to prevent trash or debris entering the MBR units not captured by the headworks screen

The Phase 4 improvements to the WWTF should complete all necessary work at the treatment facility through the planning period. However, monitoring of the actual population growth and WWTF condition should periodically performed as part of the routine O&M. Towards the end of the planning period, if no issues are identified beforehand, another planning document should be prepared to assess the status and future needs of the WWTF for the next 20-year period.

The WWTF currently uses approximately 150,000KWH per month to power process and laboratory equipment, including pumps, blowers and ultraviolet disinfection equipment. With the recent upgrades in 2012, a PV array was installed on the roof of the facility, which is able to offset power consumption from Kit Carson by 79KW. Although the MBR upgrade increased the efficiency of some of this equipment, the Town still faces significant power costs to operate the system. Installation of an alternative energy source, specifically solar power, will help offset these costs.

iii. Reclaimed Water

The Phase I through III improvements to the WWTF outlined in the PER improved the effluent to Class IA. Class 1A effluent is capable of being used for many purposes, as shown in Table 11. Because the effluent being produced is of such high quality, it is an underutilized resource for the Town. Besides the use of the effluent at the treatment facility, the only other users of the resource are water used for construction, hauled by the truckload from the WWTF, and the Country Club's use of the effluent for irrigation.

Table 11: Approved Uses for Reclaimed Wastewater by Class (from NMED *Policy for the Above Ground Use of Reclaimed Domestic Wastewater*)

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. No setback limit to dwelling unit or occupied establishment. Backfill around potable water pipes Irrigation of food crops[1]
Class 1B	Impoundments (recreational or ornamental)
	Irrigation of parks, school yards, golf courses[2]
	Irrigation of urban landscaping[2]
	Snow making
	Street cleaning
	Toilet flushing
	Backfill around non-potable piping

Class 2	Concrete mixing
	Dust control
	Irrigation of fodder, fiber, and seed crops for milk-producing animals
	Irrigation of roadway median landscapes
	Irrigation of sod farms
	Livestock watering
	Soil compaction
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals
	Irrigation of forest trees (silviculture)
[1] Irrigation of food crops shall only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops. [2] If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 3 "Spray Irrigation" is required.	

At the time of the 2009 PER, the golf course used approximately 96 million gallons per year for irrigation. Based on an average of 1.2 MGD treated at the WWTF, approximately 80% of the effluent is available for other uses. The Town may be able to increase effluent use for haulers with more public education. Due to its location outside of Town, rates established for sale of the water will have to be considerate of the travel distance for water haulers. The Town has been approached by potential industrial users of the water as well. To minimize infrastructure, businesses will need to be located near the WWTF.

The 2009 Preliminary Engineering Report (PER) for the WWTF reviewed an effluent water system to transfer water in to Town for use as irrigation at various parks and municipal facilities. The infrastructure to construct the system will be significant, at least five to six miles of waterline, a booster station and storage tank.

6. WATER O&M IMPROVEMENTS AND ASSET MANAGEMENT PLAN

The Town is currently working to establish a new Operations & Maintenance Plan. This plan will be a base line for operations that will be reviewed and updated on a five year basis or as major changes to the water system take place. The O&M plan should include data management and tracking, such as well monitoring and utilization of a work order system which tracks maintenance equipment and costs.

A. Improvement #1: Asset Inventory & Asset Management Plan

i. Project Description and Design

The first component of implementing an AM Program is to establish an AM Policy to outline the context and implement procedures which will be used in AM planning. The policy will establish communication between Public Works and other town administration departments involved in management components of the infrastructure. The plan should outline administrative and operational procedures for managing the Towns water system components.

Typically, the next step to establishing an AM plan is to perform an Asset Inventory, including potholing existing utilities to identify location, diameter/size, material and condition. This information will provide a foundation for the AM Plan. This inventory will culminate with a report showing all water system components from pipes, valves and hydrants to pumps, wells, treatment facilities and tanks. The system components should be grouped into categories and analyzed with respect to condition and remaining life. The collected data from the inventory of the system will be used for additional projects, such as an updated water system model.

The Asset Inventory (AI) fits into the first of five core components of AM:

- Current State of the Assets
- Critical Assets
- Level of Service
- Life Cycle Cost
- Long Term Funding

The AM program will address each of these five components. Identification of the critical assets allows for prioritization of system improvements and emergency and risk planning. Level of Service goals allow the system to monitor performance and identify areas of potential improvement, as well as providing a mechanism for community/system user feedback. Life cycle costing presents costs associated with each component of an asset network, including capital costs, O&M costs, decommissioning and salvage costs. Finally, the Long Term Funding component of AM brings all the previously established information and goals together to outline potential capital improvement projects and an implementation schedule.

ii. Cost Estimates

The estimated cost for these improvements totals $493,335.00; a detailed breakdown of all costs are shown in Appendix B.

B. Alternative Energy to Offset Supply Energy Costs

i. Project Description and Design

The Rio Pueblo well site is an ideal location for a photovoltaic array, since the infrastructure components are grouped in close proximity. There will be three separate electric utility meters associated with the three drinking water system components (Wells 8, future Well 10, and the arsenic treatment facility), a proposed 500 kW solar PV system will be divided into three segments, each with a dedicated DC/AC inverters, transmission lines, and electrical components). The electrical motor load capacity for each of the municipal water supply wells is 150hp; running this motor for 10 hours per day will result in electrical usage of approximately 33,556 kWh per month. The electric load of the arsenic treatment facility will be somewhat less than the wells, as the facility's three booster pumps, each 50hp, will likely be operated less than 8 hours per day. The total monthly electrical demand from these three drinking water components (Wells 8 & 10, and the arsenic treatment facility) is estimated to be approximately 90,000 kWh.

For the purpose of conducting a 20-year life-cycle cost analysis for the 500kW aggregate size PV solar system, it was assumed that 200kW of solar PV capacity would be dedicated to each of the wells, and 100kW of solar PV capacity would be dedicated to the arsenic treatment facility. Based on preliminary estimates of power production and cost of electricity, it is estimated that there will be a savings of $24,000 annually for each of the wells and $13,000 annually for the 100kW system.

ii. Cost Estimates

The estimated cost for these improvements totals $2,000,000; a detailed breakdown of all costs are shown in Appendix B.

7. WATER SUPPLY IMPROVEMENTS

The proposed water supply improvements were developed based on the identified items in Section 5, System Goals and Deficiencies. The intent of the proposed improvements is to provide safe and reliable water supply for the Town of Taos and all connected associations. The improvements summarized below were identified to provide sufficient capacity for current and future use, redundancy, sustainability, acceptable treatment and disinfection per US EPA and NMED and ease of operation.

A. Supply Improvement #1: Abeyta Improvements

i. Project Description and Design

This proposed project includes extensive improvements to the water supply system as outlined in the *Preliminary Engineering Design Report Town of Taos Mutual Benefit Projects under the Abeyta Settlement Agreement* by Daniel B. Stephens & Associates, Inc. (DBS). This report identifies water supply projects for the Town, needed to comply with the terms of the Abeyta Settlement. The Abeyta Settlement limits the Town's use of in town Wells and identifies potential well sites on the south side of town. Funds are expected to be released for project implementation in 2017. The specific projects identified in the DBS report are listed below.

- Develop and connect University of New Mexico (UNM) Well
- Develop and connect National Guard Well
- Develop and connect Rio Pueblo Well
- Develop and connect Camino del Medio Well
- Drill new Well at Bataan Well site
- Drill new Mitigation Well at Well C site
- Construct arsenic treatment facility for the UNM and National Guard Wells
- Install arsenic treatment at the wellhead for the Camino del Medio Well

The UNM and National Guard Wells will flow to an arsenic treatment facility that will be boosted to the existing 50,000 gallon tank site where it will be connected after the existing treatment system and prior to the booster station. The existing booster station will pump the treated water from both treatment systems into the transmission lines and up to the storage tanks. This project will add redundancy to the arsenic treatment facility, necessary since these wells will be relied on heavily after the Abeyta Settlement is finalized and the funds are released to implement the projects. The new treatment facility near the UNM and National Guard Wells will include a 400,000 gallon water storage tank to allow for improved system capacity and efficiency.

The Rio Pueblo Well will be connected to the existing arsenic treatment facility for Well 8. This will require renovations to the existing treatment and booster station building to handle the increased supply.

The Camino del Medio Well will connect to the existing transmission line to the 1 MG storage tank. This well will required on site treatment for low levels of arsenic contamination. The well may also require a small booster station to fill the storage tank, depending on final well design.

The Bataan Well will replace the existing Kit Carson Well and replace the production no longer available from Well 6, or as available, whichever is less. It will include a new well, well house and connection to the system.

The Mitigation Well C will be drilled near the Well 4 site and discharge water into the Rio Fernando de Taos. The Abeyta Settlement requires that all parties provide water to the identified acequias.

ii. Cost Estimates

The total cost of the projects associated with the Abeyta Settlement are summarized in Table 12, below, and detailed in the DBS report.

Table 12: Abeyta Settlement Water Supply Cost Estimate

Description	Capital Cost ($)
UNM Well	$ 3,461,271
National Guard Well	$ 3,114,271
Arsenic Treatment Facility, including booster station and two miles of transmissions line to connect to existing treatment and booster station.	$ 4,818,667
Rio Pueblo Well	$ 2,806,284
Camino del Medio Well	$ 1,266,423
Bataan Well	$ 1,354,752
Mitigation Well C	$ 1,265,528
Total	**$ 18,087,622**

* See *Preliminary Engineering Design Report Town of Taos Mutual Benefit Projects under the Abeyta Settlement Agreement* by Daniel B. Stephens & Associates, Inc. for detailed cost breakdowns.

B. Supply Improvement #2: Well House Improvements & Rehabilitation

A planning and feasibility study should be prepared to determine the optimum operating schedule for all wells. Factors to consider should be energy costs and system efficiency. Currently Well 5 is the main producer, followed by Wells 3, 4 and 8; most other wells are used very rarely. Well 5 pumps directly into the system which increases system pressure surges and electrical costs from pumping. Well 8 requires arsenic treatment prior to distribution which adds electrical cost to the well production; however, it pumps directly to the 1 MG storage tank where the water is distributed and pressurized by gravity. The proposed planning and feasibility study will determine the most efficient usage of the wells to minimize costs, reduce demand on the aquifers and maximize system operation.

Water Supply Improvements i-v, below, are described individually to identify all improvements included with this proposed improvement project. Some of these improvements require high engineering costs relative to the low construction cost. To offset individual project management and administrative task costs, Section vi describes combined improvements i-v as the recommended improvement project. Completing all the different improvements will minimize professional services costs, optimizing financial efficiency.

i. Disinfection Alternatives

a. Project Description and Design

Due to the age of all the disinfection systems, it is recommended to replace the MIOX system in all wells. The current MIOX systems are outdated and replacement filters and other parts are no longer available. All the MIOX systems require service and some have been taken offline and replaced by a temporary sodium hypochlorite system fed by a peristaltic pump and solution tank. Additionally, several of the systems require replacement of failed piping between the MIOX system and the water distribution system. Therefore, all the existing MIOX systems should be removed and disposed of. A new system should be selected based on capital costs, O&M cost, ease of operations and risk of exposure to hazardous materials. There are many options for disinfection of a water source, the five most common are listed below.

Sodium Hypochlorite

- Pros:
  - Less hazardous than elemental chlorine
  - Fewer operator training requirements necessary than with elemental chlorine
  - Not as strictly regulated as elemental chlorine
  - Liquid form is easy to work with
- Cons:
  - Limited shelf-life
  - Potential to add inorganic byproducts like chlorate, chlorite, and bromate to water
  - Must be carefully stored as it can be corrosive to some materials
  - More expensive than elemental chlorine
  - OSHA requirements, ventilation, backup alarms, eye wash stations

Elemental Chlorine (Gas/ Liquid)

- Pros:
  - Least expensive of the various chlorine forms
  - Unlimited shelf-life
- Cons:
  - Special handling and operator training are required to handle hazardous gas such as elemental chlorine
  - Strictly regulated
  - OSHA requirements, ventilation, backup alarms, eye wash stations

Calcium Hypochlorite

- Pros:
  - More stable than sodium hypochlorite, which allows for longer shelf-life
  - Fewer operator training requirements necessary than elemental chlorine
  - Not as strictly regulated as elemental chlorine
- Cons:
  - More handling requirements may be required because it is a dry chemical
  - Chemical feeding may be complicated by solids that precipitate in solution
  - More expensive than elemental chlorine
  - Can pose a fire or explosive hazard if handled improperly
  - Potential to add inorganic byproducts like chlorate, chlorite, and bromate to water
  - OSHA requirements, ventilation, backup alarms, eye wash stations

On-site generation (MIOX)

- Pros:

  - Operators do not have to handle chlorine gas, liquid or dry (granules)
  - Longest shelf life, only salt required
- Cons:
  - More complex system
  - High quality salts required for efficient operation
  - Dangerous (flammable) hydrogen gas production
  - Addition of water softener adds to capital and O&M costs
  - Cell maintenance adds to O&M time and high replacement cost
  - Cells required to be periodically cleaned with hydrochloric acid

Due to the various difference in operations and cost between the alternatives, it is recommended that the Town prepare a Recommended Alternative Study or Design Memorandum to compare the differences in cost and operational requirements for the different disinfection technologies.

b. Cost Estimate

A cost for the selected disinfection alternative can be determined during the Design Memorandum. The Design Memorandum can be completed for $30,000; the construction cost will be determined in the Design Memo and shall vary based on well production and dosing rate.

ii. Wells 1 & 2 (Bedford)

a. Project Description and Design

The improvements for Wells 1 and 2 include demolishing the existing well house and replacing it in a new location to allow access to well heads for operations and maintenance. The well house should be a minimum of 15 feet from the well heads. Additionally, the project will remove and replace all existing 4-inch ductile iron pipe due to excessive age and evidence of pitting, corrosion and leakage. Based on the recommendation and selected disinfection technology resulting from the recommended Disinfection Design Memorandum, the project will also include replacement of the existing or installation of a new disinfection system and removal of the outdated MIOX disinfection system. Finally, it is recommended that the project include replacement and upgrading of all electrical components, tank level controls and incorporation of SCADA.

b. Cost Estimates

A summary of costs are shown in Table 13 below. A complete breakdown of the project costs are shown in Appendix B.

Table 13: Wells 1 & 2 Well House Improvements Summary

Construction Cost (including NMGRT)	$ 285,615.00
Professional Services Cost (including NMGRT)	$ 69,456.38
Total Project Cost (including NMGRT)	$ 355,071.38

iii. Wells 3a & 3b (Post Office)

a. Project Description and Design

This work will include modifications and improvements to the existing electrical; an evaluation for undersized and/or burnt out electrical components should be completed. All necessary

equipment should be replaced, including transformers. Coordination with Kit Carson shall be required.

Also, the security fence is damaged and should be repaired as part of the routine O&M. If the fence is not repaired before the proposed project begins, fence improvements can be included with this project.

b. Cost Estimates

A summary of costs are shown in Table 14 below. A complete breakdown of the project costs are shown in Appendix B.

Table 14: Wells 3a & 3b Well House Improvements Summary

Construction Cost (including NMGRT)	$ 51,930.00
Professional Services Cost (including NMGRT)	$ 28,561.50
Total Project Cost (including NMGRT)	$ 80,491.50

iv. Well 4 (Jack Denver)

a. Project Description and Design

The well house structure, constructed of pumice block, is beginning to determinate due to leaks in the MIOX disinfection system. The well house should be rehabilitated or replaced, depending on the condition of the structure when the project begins. For conservative purposes, the cost estimate below is based on replacing the existing well house building.

b. Cost Estimates

A summary of costs are shown in Table 15 below. A complete breakdown of the project costs are shown in Appendix B.

Table 15: Well 4 Well House Improvements Summary

Construction Cost (including NMGRT)	$ 214,211.25
Professional Services Cost (including NMGRT)	$ 59,719.50
Total Project Cost (including NMGRT)	$ 273,930.75

v. Well 5 (Sierra Sports)

a. Project Description and Design

The improvements needed at Well 5 consist of multiple well house improvements, including replacing the broken radio read master meter, adding a bypass line for improved O&M, and removing and replacing the broken oil reservoir for the turbine pump. Additionally the emergency generator status is unknown since the site doesn't have gasoline to run the generator. The generator needs to be tested, serviced, and possibly repaired. The project will include maintenance or replacement of the generator as necessary. Due to the age and inactivity of the generator, extensive maintenance or repair is anticipated for the generator. For conservative cost estimation purposes, replacement of the existing generator was used.

b. Cost Estimates

No professional service costs are associated with this improvement. A summary of costs are shown in Table 16 below. A complete breakdown of the project costs are shown in Appendix B.

Table 16: Well 5 Well House Improvements Summary

Construction Cost (including NMGRT)	$ 97,368.75

vi. Combined Well and Wellhouse Improvements

a. Project Description and Design

Part vi combines parts i-v to optimize the financial efficiency of the proposed improvements. Professional service costs for the Well House Improvements & Rehabilitation, Sections ii through v, can be minimized by combining the professional services into one contract and completing as a single project. This will optimize the bidding and closeout process for the improvements. If desired, the Disinfection Alternatives Design Memorandum could be broken out and completed prior to parts ii-v. This would not affect the savings in the professional services from combining the work since the Design Memorandum is a standalone report.

b. Cost Estimates

Revised costs for a combined project for wells 1 through 5 are shown in Table 17 below. A complete breakdown of the project costs are shown in Appendix B.

Table 17: Combined Well and Wellhouse Improvements Summary

Construction Cost (including NMGRT)	$ 649,125.00
Professional Services Cost (including NMGRT)	$ 183,053.25
Total Project Cost (including NMGRT)	$ 832,178.25

8. WATER STORAGE IMPROVEMENTS

All existing steel water storage tanks should be visually inspected annually for leaks, cracking in the coating, damaged cathodic protection, drain and overflow outlet, manways, ladder condition, site security and vandalism. Every five years the storage tanks should be inspected by a certified tank inspector. Although this cost is relatively minimal, this can be reduced by offsetting the tank inspections. For example, the 1 MG tank can be inspected on Year 3, 0.5 MG tank on Year 4, the 50,000 gallon tank on Year 5 and the Bedford tank on Year 6; after the first cycle of inspections, the tanks will continue to be inspected on a five year cycle.

A. Storage Improvement #1: Additional Storage for Fire Flow and System Growth

i. Project Description and Design

In the 2007 Water System Study, SMA described how the existing system lacks sufficient storage capacity to support fire suppression flows throughout the entire system. This is due to the lack of storage in the northern portion of the system and limited capacity of the distribution/transmission lines to move the necessary water to the northern portion of the system. An updated hydraulic model of the water system is needed to determine the capacity of the system to provide fire flow. Additionally, based on water usage and peaking factors at the time, it was shown that the water system did not have the recommended two days of storage capacity in case of an emergency. Based on annual water diversion records from the well data, peak day factors, a growth factor and a recommended two days storage, the Town needed an additional 1 million gallons of storage, for a total of 2.5 million gallons. This improvement looks at the worst case scenario based on the modeling outcome, which includes location and construction of a new 1 million gallon or two 500,000 gallon water storage tanks. The town is currently looking at multiple locations for a new ground-level water storage tank. After a tank location is identified, the alignment for the waterline to connect the tank to the system will be determined. If multiple sites are identified, the best site should be determined based on system hydraulics and the cost to connect to the existing system. Storage alternatives based on possible site locations are noted below.

- One 1 Million Gallon Water Storage Tank

This project would include construction of a 1 MG reinforced concrete or welded steel water storage tank on a site to be located by the Town prior to design. If the tank is constructed out of reinforced concrete, it could be partially buried to reduce the footprint and meet the Town structure height limits. The tank could have a 62-foot diameter and 45-foot height (first 10 feet buried) or 56-foot diameter and 55-foot height (first 20 feet buried); the cost to bury additional vertical feet of the tank will increase the capital costs. Waterline to connect the tank to the system will be minimal. Concrete tanks have higher capital costs but have a lower net present value when including the O&M costs over the 40 year life cycle since the tanks do not require routine coating nor maintenance. Additionally, concrete tanks have longer life spans than welded steel tanks.

If the best available tank location is adjacent to the existing 1 MG storage tank site, a new 12-inch transmission line should be installed that transfers water to the northern end of town for pressure stabilization with fire flow. This will consist of approximately 12,400 linear feet (LF) of new waterline along with the tank installation.

- Two 500,000 Gallon Welded Steel Water Storage Tanks

Depending on the size of the available property identified for these storage improvements and the potential to balance the fire suppression capacity in the north end of town, two 500,000 gallon

water storage tanks should be installed. One 500,000 gallon tank in the northern portion of town with a booster station will provide sufficient capacity for fire suppression. Additionally, another 500,000 gallon tank could be constructed next to the existing 1 million gallon tank (or at the same elevation) to provide sufficient storage capacity for full build out, fire suppression and emergency supply.

ii. Cost Estimates

As noted above, the costs estimated in this report for this improvement are based on the assumption that the hydraulic model will show that the current system cannot provide fire flow in portions of the Town. The outcome of the hydraulic modeling, recommended in Section 9.A., may significantly decrease the project cost. This cost estimate is based on the construction of one, 1MG water storage tank. A summary of costs are shown in Table 18 below. A complete breakdown of the project costs is shown in Appendix B.

Table 18: Additional Storage for Fire Flow and System Growth

Construction Cost (including NMGRT)	$ 2,290,113.00
Professional Services Cost (including NMGRT)	$ 445,299.75
Total Project Cost (including NMGRT)	$ 2,735,412.75

B. Storage Improvement #2: Additional Storage for Existing Arsenic Treatment and Booster Station Facility

i. Project Description and Design

This improvement project consists of replacing the existing 50,000 gallon welded steel water storage tank for at the existing arsenic treatment and booster station facility with a 500,000 gallon welded steel storage tank. The existing tank should be salvaged for scrap metal to reduce project costs. Additionally, the booster pumps should be replaced with larger 1,500 gpm pumps to reduce the time to fill the million gallon tank. This will allow Well 8 and the new Rio Pueblo, UNM and National Guard Wells to transfer half the storage for the million gallon tank in approximately 5.5 hours; the four wells would take 6.5 to 7.5 hours to fill the new tank. This storage tank will provide capacity to the existing water treatment facility and increase the system efficiency, along with providing additional system storage capacity with regards to fire suppression, daily demand and emergency supply.

ii. Cost Estimates

A summary of costs are shown in Table 19 below. A complete breakdown of the project costs is shown in Appendix B.

Table 19: Additional Storage for Existing Arsenic Treatment and Booster Station Facility Cost Estimate

Construction Cost (including NMGRT)	$ 1,346,804.55
Professional Services Cost (including NMGRT)	$ 173,965.50
Total Project Cost (including NMGRT)	$ 1,520,770.05

9. WATER DISTRIBUTION IMPROVEMENTS

A. Distribution Improvement #1: Pressure Zone and PRV Improvements

i. Project Description and Design

This project consists of revising and updating the system's hydraulic model with recent construction projects and current information from field inspections. The current model's accuracy is questionable due to many assumptions required because of unknown information. The unknown system components should be field verified as part of this project. Information from the AM Inventory and AM Plan will greatly help improve the accuracy of the modeling. There are many unknowns with the current water system, including valve locations, meter locations and the location of looped lines. Identifying the system unknowns and updating the water model will help identify the specific improvements identified in the following sections of this Master Plan. The hydraulic model will especially help with identifying the need for storage and distribution improvements. Once this model is completed, an analysis of the pressure zones should be completed.

Although, it appears that the system has three pressure zones, they are not clearly defined. This is due to the lack of knowledge regarding the aging system and location of looped lines. The first zone is supplied by the 0.5 million gallon storage tank and closed off by PRVs 1, 2 and 3. The second zone seems to consist of everything except a small section of homes on the northwest portion of Town. The third zone is identified by PRVs 4, 5, 6, 7 and 8. Based on observation of pressures in the field, it is unclear how well these pressure zones are actually maintained. Field observation indicates there may be tank cycling between zones which results in excessive pumping. Identifying the looped lines and installing PRVs accordingly on the looped lines will help with cycling and high system pressures in the northern portion of the system. Removal of unnecessary or redundant PRVs may be required to more clearly define the pressure zones as well. Additionally, the operators have identified some of the looped lines and closed those gate valves to prevent system cycling. This can prevent cycling if all the looped lines are closed, however, this removes the hydraulic and operational benefits from the looped lines. PRV's should be installed on these looped lines, as identified in the hydraulic model. Lastly, an altitude valve should be installed at the 1 million gallon storage tank for the tank level control from the in town wells.

ii. Cost Estimates

A summary of costs are shown in Table 20 below. A complete breakdown of the project costs is shown in Appendix B.

Table 20: Pressure Zone and PRV Improvements

Construction Cost (including NMGRT)	$ 639,388.13
Professional Services Cost (including NMGRT)	$ 142,807.50
Total Project Cost (including NMGRT)	$ 782,195.63

B. Distribution Improvement #2: Expansion to Future Service Area

i. Project Description and Design

Most of the future expansion will be infill to the existing system. This will only require service connections, covered by the Town ordinance. The only potential service area expansion that will

require system expansion is to combine with El Prado WSD and Ranchitos. The Town of Taos is capable of combining systems or regionalizing with these communities, at their request. All three communities would agree upon terms of the regionalization process and services provided. Since El Prado is already connected to the Taos water system for the emergency water supply connection, initial capital costs would be minimal. The Town's water system would have to be expanded to connect to Ranchitos. An analysis of the existing system components would be required to determine what improvements are required. Additionally, a model of changes to each of the systems' hydraulics and pressure zones would be required. All existing infrastructure could be utilized to maximize the water storage capacity for domestic and fire suppression us in El Prado and northern Taos. Improvements to the combined system would be determined in a future planning document. Water supply availability would have to be determined prior to the systems combining.

Due to the need to identify the condition of the existing system components and address the combined system hydraulics, this improvement project only considers completing the initial Preliminary Engineering Reports, Asset Inventories and Environmental Reports. These reports will outline the necessary improvements required to integrate these systems effectively and outline a plan to implement these improvements.

ii. Cost Estimates

A summary of costs are shown in Table 21 below. A complete breakdown of the project costs is shown in Appendix B. These costs only include the AI, PER and ER; the PER will outline the project costs associated with the improvements associated with combining the systems.

Table 21: Expansion to Future Service Area

Professional Services Cost (including NMGRT)	$ 162,281.25

C. Distribution Improvement #3: Replacement of Failing System Components

i. Project Description and Design

The full extent of the old, undersized and failing system waterlines will not be known until an extensive asset inventory and updated hydraulic model is completed. The Town has identified many areas in town where there are old waterlines that are undersized and failing which cause problems with low pressures and operations. A portion of these lines can be rehabilitated using a variety of trenchless rehabilitation technologies: however, some of these lines are also in difficult to reach locations and need to be relocated to improve O&M and/or are not in suitable condition for rehabilitation.

The method of rehabilitation will depend on the current condition of the pipe. The rehabilitation work will require very little disturbance to the roadways, although small access pits will be required for fittings and some service connections. Additionally, the Town should consider upgrading the residential and commercial meter reading to a fully integrated remote system where all meters (wells, residential, commercial and bulk services) transmit their data directly to the centralized SCADA computer. This will allow the operators more time to focus on issues with the water system and/or reduce the O&M budget.

ii. Cost Estimates

A summary of costs are shown in Table 22 below. A complete breakdown of the project costs is shown in Appendix B.

Table 22: Replacement of Failing System Components

Construction Cost (including NMGRT)	$ 15,472,976.25
Professional Services Cost (including NMGRT)	$ 2,583,517.50
Total Project Cost (including NMGRT)	$ 18,056,493.75

D. Distribution Improvement #4: New Dedicated Transmission Lines for In Town Wells

i. Project Description and Design

These proposed improvements include installation of new dedicated transmission lines from all in town wells (Wells 1, 2, 3, 4 and 5) to the nearest storage tank. This project will be dependent on the location of future storage tanks, still to be determined. Ideally, some (or all) of these wells would be connected to a new storage tank in the northern portion of the system. The two most likely options are to connect to a tank adjacent to the current Bedford site or tying in to the existing dedicated transmission line along Paseo del Cañon, from Well 8 to the 1 MG tank.

ii. Cost Estimates

Because of the number of possibilities with transmission line alignments from the wells, an accurate cost estimate is not possible. Provided below is rough estimate to connect Wells 1, 2, 3a, 3b, 4 and 5 to the existing transmission line to the 1 MG tank. Other potential options include connecting to a new storage tank adjacent to the existing Bedford site and the El Prado WSD tank. A summary of costs are shown in Table 23 below. A complete breakdown of the project costs is shown in Appendix B. Costs could decrease if the wells were connected to a new tank near the existing Bedford site but increase if connected to the El Prado tank.

Table 23: New Dedicated Transmission Lines for In Town Wells

Construction Cost (including NMGRT)	$ 2,765,110.22
Professional Services Cost (including NMGRT)	$ 519,300.00
Total Project Cost (including NMGRT)	$ 3,284,410.22

10. SEWER SYSTEM IMPROVEMENTS

A. Sewer System Improvements #1: Asset Inventory & Asset Management Plan

i. Project Description and Design

Similar to the water system Asset Inventory and Asset Management Plan, this work includes multiple phases, an AM Policy, an Asset Inventory and a report showing all sewer system components from pipes, lift station/pumps and treatment facilities. The system components should be grouped into categories and analyzed with respect to condition and remaining life. The collected data from the inventory of the system will be used for additional projects, such as an updated sewer system model.

The Asset Inventory fits into the first of five core components of AM:

- Current State of the Assets
- Critical Assets
- Level of Service
- Life Cycle Cost
- Long Term Funding

The AM program will address each of these five components. Identification of the critical assets allows for prioritization of system improvements and emergency and risk planning. Level of Service goals allow the system to monitor performance and identify areas of potential improvement, as well as providing a mechanism for community/system user feedback. Life cycle costing presents costs associated with each component of an asset network, including capital costs, O&M costs, decommissioning and salvage costs. Finally, the Long Term Funding component of AM brings all the previously established information and goals together to outline potential capital improvement projects and an implementation schedule.

The Asset Inventory will include collecting system information (re: pipes, manholes, lift stations and the treatment facility), utilizing record drawings, CCTV at selected locations throughout the Town and site inspections for approximately 30% of the system components. The inventory can be increased based on the outcome of the existing infrastructure conditions. The AM Plan should be used to prepare a system model to determine if the existing system has the capacity to meet current and future demand. This will outline how much of the system can be maintained with regular O&M and how much of the system needs to be replaced as part of a separate improvements project. Since the only anticipated future connections are by infill to the current system, the only anticipated future needs are to meet the increased waste water demand determined in the model.

The second phase of this work includes preparing an Asset Management Plan to utilize the information for planning projects and funding discussions.

ii. Cost Estimates

The estimated cost for these improvements totals $824,096.64; a detailed breakdown of all costs are shown in Appendix B

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11. COLLECTION SYSTEM IMPROVEMENTS

A. Collection Improvements #1: Replace Old, Undersized and Failing System Components

i. Project Description and Design

These improvements include replacing old, undersized and failing sewer collection lines, manholes and lift stations. The full extent of the rehabilitation work will not be known until an AI and AM Plan are completed. Out of the existing 60 miles of existing sewer line, the majority is anticipated to be rehabilitated by CIPP or pipe bursting, depending on the condition of the existing pipe. Much of the collection system may not need rehabilitation until the end of the planning period. A few sections of the system may be relocated into existing roads or easements to improve access for operations and maintenance. Some existing manholes may require new liners and coatings to repair damage from years of service and hydrogen sulfide (H_2S) exposure: this will be identified during the Asset Inventory. Depending on the results of the sewer model completed during the Asset Inventory & Asset Management Plan, some existing lines may need to be upsized for capacity, this will be considered during the existing system rehabilitation. Additionally, any lift station rehabilitation will be designed to meet all current and future demand.

ii. Cost Estimates

The costs for this proposed improvement assume needing to replace 15% of the existing sewer collection lines and rehabilitation of 10% of the existing sewer collection lines. The costs also include rehabilitation of 25% of the system's manholes. The actual scope of the project will not be determined until the AI is completed. A summary of costs are shown in Table 24 below. A complete breakdown of the project costs is shown in Appendix B.

Table 24: Replacement of Failing System Components

Construction Cost (including NMGRT)	$ 18,057,037.93
Professional Services Cost (including NMGRT)	$ 2,784,746.25
Total Project Cost (including NMGRT)	$ 20,841,784.18

12. TREATMENT SYSTEM IMPROVEMENTS

A. Treatment Improvements #1: Treatment Facility Improvements – Phase IV

i. Project Description and Design

The current waste water treatment plant was upgraded to an MBR, with construction completed in 2012. These proposed improvements consist of the Phase IV items from the *Taos Valley Regional Wastewater Treatment Facility Treatment Technology, Solids Handling & Reuse Alternatives Preliminary Engineering Report* (June 2009). The improvements include removal of fertilizer equipment and conversion to drive through building, upgrading the administration building to meet ADA standards and remove pump station, ultra-violet disinfection system upgrades, site work improvements to access roads, sidewalks, landscaping and parking lot, electrical and SCADA improvements.

An additional 500kW photovoltaic array will offset energy costs required to keep the treatment facility operating. Preliminary estimates show that this will produce approximately 90,000 kWh to assist in the energy consumption of the facility. The former land application site adjacent to the treatment facility will allow for close proximity and less infrastructure needed to complete the project. Additional details for the project alternative will be completed with the project specific planning and design phases.

ii. Cost Estimates

Table 25 summarizes the project costs, see Appendix B for a detailed cost breakdown.

Table 25: Project Costs

Construction Cost (including NMGRT)	$ 1,979,831.25
Professional Services Cost (including NMGRT)	$ 428,422.50
Total Project Cost	$ 2,408,253.75

The preliminary estimated project cost for the solar array is approximately $2,000,000. This project could be implemented separate from, or in coordination with improvements to the WWTF.

13. REUSE SYSTEM IMPROVEMENTS

A. Reclaimed Water Improvements #1: Land Application in New Locations

i. Project Description and Design

The reclaimed water reuse improvements are outlined in the *Taos Valley Regional Wastewater Treatment Facility Treatment Technology, Solids Handling & Reuse Alternatives* PER and considers disposal of reuse water at new locations in the region. Effluent water of Class 1A quality can be used for landscaping irrigation in city parks, school yards, highway medians, cemeteries and in residential areas (Metcalf & Eddy).

The Town provided locations of possible land use site in the service area in the PER. Details about reclaim use for irrigation in these areas are in Table 26.

Table 26: Reclaimed Waste Water Consumption Estimates

Location	Area	Utilization %[2]	Applied Area	Estimated Consumption[1]		
	ac			gpy	gpd	gpm
Eco-Park (Old)	23.399	75%	17.55	10,216,735	27,991	465
Eco-Park (New)	24.343	85%	20.69	12,046,103	33,003	548
Rodeo Grounds	8.735	10%	0.87	508,530	1,393	23
Filemon Sanchez Park	9.925	80%	7.94	4,622,470	12,664	210
Taos Middle School	34.806	60%	20.88	12,157,910	33,309	553
Taos High School	25.513	25%	6.38	3,713,258	10,173	169
Fred Baca Park	11.778	100%	11.78	6,856,857	18,786	312
Kit Carson Park	20.252	90%	18.23	10,611,187	29,072	483
Taos Elementary School	6.901	20%	1.38	803,518	2,201	37
Gravel Pit[3]	20.214	10%	2.02	1,176,809	3,224	54
Residential Subdivision	38	10%	3.80	2,212,265	6,061	101
Total	223.866		111.52	64,925,641	177,878	2,955

[1] 1595 gallons per acre per day
[2] Estimated percent of area that is landscaped
[3] Estimates for dust control, not landscaping

Reclaimed water could be used at the gravel pit, new and old eco-park, Filemon Sanchez Park, rodeo grounds, Fred Baca Park, and Taos Middle School.

Due to the flow rates required at each site, irrigation should be scheduled at each site to occur at different times to minimize head losses through the distribution system and maintain adequate pressures.

An additional feature of this alternative is the potential future expansion and upgrade to a reclaim system which serves residential, commercial, and industrial use.

ii. Cost Estimates

The cost from the PER for this improvement was $3,262,000. A detailed breakdown of this cost is shown in the PER.

B. Reclaimed Water Improvements #2: Groundwater Recharge

i. Description

This improvement project involves the transfer of reclaim water from the Facility back to the source aquifer. This method of disposal is beneficial in areas of water scarcity where aquifer drawdown and production are of concern, or areas where groundwater pumping has resulted in reduced surface water flows, as is the case for Taos.

One technique of groundwater recharge is to use a large unlined basin, also called a spreading basin, to allow water to seep down through the earth and back into the aquifer. In order for a spreading basin to work geologically, there can be no impermeable layers above water bearing zones. Another method to recharge groundwater is to use direct injection wells. The use of reclaimed wastewater for aquifer injection and recharge has become more prevalent with the advent of treatment systems capable of providing a very high quality of effluent. This reuse alternative is more common in Arizona, Florida and Texas.

The PER included a preliminary investigation into the geohydrology of the region and determined both methods of recharge would be feasible. A study should be completed to determine which method is the most beneficial to the Town prior to implementation of reuse improvements. A more extensive study will be necessary to identify possible locations for this alternative and the feasibility of utilizing this alternative in those locations. Permits for aquifer recharge are required from both the Office of the State Engineer (OSE) and NMED, and reclaim quality and monitoring procedures must meet New Mexico standards and regulations.

ii. Cost Estimates

The cost from the PER for this improvement was $5,554,000. A detailed breakdown of this cost is shown in the PER.

14. PROJECT PRIORITIES AND PLANNING

This section summarizes the recommended improvement projects for the Town's water and sewer system based on the findings of this Master Plan. The projects were ranked according to priorities involving capacity, reliability, or rehabilitation for the existing system as well as health and safety, compliance, operational efficiency and affordability.

A. Project Prioritization & Affordability

The prioritization discussion utilizes general groupings of system components as shown in Table 27. These general classifications allow the discussion of specific CIPs in the context of the general focus of the Town's system improvements in the short term and long term time frames.

Table 27: Prioritization Groups

Water System Groups	Sewer System Groups
Supply	Collection System
Distribution	Treatment
Storage	Reclaimed Water
Operations and Management	

The prioritization examined six categories, as follows:

- Health and Safety – Improvements necessary to maintain health and safety of system users
- Compliance – Improvements necessary to maintain compliance with water and wastewater regulations, as well as legal obligations of the Abeyta Settlement
- Level of Service and Reliability – Improvements which maintain Level of Service delivered to users, and overall system reliability
- Life Cycle Cost, Operational Efficiency and Sustainability – Improvements which reduce overall Life Cycle Cost and increase operational efficiency and sustainability of the system
- Affordability – Overall project costs and ability of the Town to afford the improvements; availability of funding for the project and anticipated funding for the project
- Criticality – Overall importance of improvements, including overall Consequence of Failure and Probability of Failure (higher score represents higher risk)

The rankings were classified as 1 through 5 (low to high) based on need for improvements, criticality of the improvements and how much of an impact the improvements will have on the Town. Table 28 shows the rankings for each of the groupings in the water system, and Table 30 shows the sewer system groupings. A discussion of the ranking follows each table.

Table 28: Water System Project Prioritization

		Water System Improvement #1		Water Supply Improvement #1		Water Supply Improvement #2		Water Storage Improvements #1		Water Storage Improvements #2		Water Distribution Improvements #1		Water Distribution Improvements #2		Water Distribution Improvements #3		Water Distribution Improvements #4	
		Water AI & AM Plan		Abeyta Improvements		Well House Improvements & Rehabilitation		Add Storage for Fire Flow & System Growth		Add Storage for Arsenic Treatment &		Pressure Zone & PRV Improvements		System Expansion		Replacement of Failing Components		Dedicated Transmission Lines	
Category	Multiplier	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score
Health and Safety	5	2	10	5	25	4	20	5	25	3	15	3	15	3	15	4	20	1	5
Compliance	5	5	25	5	25	5	25	1	5	1	5	1	5	1	5	1	5	1	5
Level of Service / Reliability	3	4	12	4	12	4	12	3	9	5	15	5	15	3	9	4	12	4	12
Life Cycle Cost / Operational Efficiency / Sustainability	3	3	9	3	9	4	12	3	9	5	15	4	12	4	12	3	9	3	9
Affordability	3	5	15	5	15	3	9	2	6	3	9	3	9	4	12	2	6	3	9
Criticality	4	3	12	2	8	5	20	3	12	3	12	4	16	2	8	4	16	2	8
Total Score			**83**		**94**		**98**		**66**		**71**		**72**		**61**		**68**		**48**

The Supply improvements ranked high for Health and Safety because of the treatment and disinfection which is vital to water delivered to users. Compliance is High for Supply as well, mostly due to the legal obligations surrounding the Abeyta Settlement, as well as meeting regulatory requirements prescribed by drinking water standards. Level of Service and Life Cycle Cost rank Medium primarily because of redundancy within the supply components. Affordability for the Supply improvements ranks High because the improvements prescribed by the Abeyta Settlement will be funded by the Settlement. Overall the Criticality of the Supply improvements rank as Medium: although the improvements are important, the projects defined by the Settlement are likely to occur.

The Distribution system is ranked high for Level of Service and Reliability due to the age and condition of components. Isolating portions of the system during outages is troublesome, delaying repairs. The age of portions of the distribution system also impact the Life Cycle Cost because they will need to be replaced as they near the end of their useful life. Replacement of piping will allow the operators to retain accurate knowledge or the system, which will improve the ability to isolate sections of the system more efficiently. Distribution ranks low for affordability since improvements need not take place all at once if a management system is implemented to replace portions of the system on a regular basis. Compliance and overall Criticality of the Distribution rank Low and Low / Medium because although there are important improvements necessary for the system, they are not immediate.

Storage ranks Low for Compliance and Level of Service because the proposed projects are not immediately needed and there is redundancy in storage, as well as other parts of the system, which allow the importance of the projects to reduce. The Medium / High rank for Health and Safety include considerations of fire protection, which will be impacted by improvements. Life Cycle Cost and Affordability are Medium: even though they do have an impact on the system, the storage is passively managed and the supply portion of the system offsets some of the need for redundancy in storage.

Operations and Management of the system ranks between Medium and High for each category because of its importance in all aspects of the system. Operations has a direct impact on maintaining regulatory Compliance and ensuring Health and Safety in the system. Similarly, the Reliability of the system and Level of Service provided to customers is impacted by how effectively the system is managed. Life Cycle Cost, Operational Efficiency and Sustainability are highly impacted by the investment into the O&M activities and Operators on staff. Relative to other improvements, the cost is lower, but the impact is higher. Finally, the Criticality of Operations is high because of the impact on all other components of the system.

The overall project prioritization for water projects is shown in Table 29.

Table 29: Water Project Prioritization

Project	Score
Well House Improvements & Rehabilitation	98
Abeyta Improvements*	94
Water AI & AM Plan	83
Pressure Zone & PRV Improvements	72
Add Storage for Arsenic Treatment & Booster Station	71
Replacement of Failing Components	68
Add Storage for Fire Flow & System Growth	66
System Expansion	61
Dedicated Transmission Lines	48

Table 30: Sewer System Project Prioritization

	Sewer System Improvement #1		Sewer Collection Improvements #1		Sewer Treatment Improvements #1		Reclaimed Water Improvements #1		Reclaimed Water Improvements #2	
	SewerAI & AM Plan		Replace Old, Undersized & Failing		Treatment Facility Improvements - Phase IV		Land Applications		Groundwater Recharge	
Category	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score	Rating (1-5)	Score
Health and Safety	2	10	4	20	3	15	1	5	1	5
Compliance	5	25	3	15	3	15	1	5	1	5
Level of Service / Reliability	4	12	4	12	5	15	3	9	3	9
Life Cycle Cost / Operational Efficiency / Sustainability	3	9	4	12	5	15	3	9	3	9
Affordability	5	15	2	6	4	12	2	6	2	6
Criticality	3	12	4	16	3	12	1	4	1	4
Total Score		**83**		**81**		**84**		**38**		**38**

Collection system improvements rank medium for Health and Safety and Compliance because the existing system has capacity and is effective. Affordability and Criticality are low and medium because of the lower impact to they have on the system as a whole. Level of Service and Life Cycle Cost rank as Medium because the system is effective, but investigation into the condition of the system may lead to the need for additional infrastructure improvements.

Treatment ranks Low for Health and Safety because the recent MBR upgrade to the WWTF provides high quality effluent and the proposed improvements increase efficiency of the treatment process without impacting the quality of treatment. A High ranking for Life Cycle Cost, Operational Efficiency and Sustainability signifies that the system is complex with many different components

which need continual O&M attention. A Medium rank for Compliance signifies the importance of meeting water quality standards and the monitoring of the treatment process. The Level of Service, Affordability and Criticality rank Medium because the improvements will assist the overall treatment process with efficiency and reduce downtime.

Development of Reclaimed water use in the Town ranked Low for the most part because it is not a major priority for the Town. If development of an effluent reuse system in Town occurs, there will be significant costs to the infrastructure, including piping, a booster station and storage.

The overall project prioritization for sewer projects is shown in Table 31.

Table 31: Sewer Project Prioritization

Project	Score
Treatment Facility Improvements - Phase IV	84
Sewer AI & AM Plan	83
Replace Old, Undersized & Failing Components	81
Land Applications	38
Groundwater Recharge	38

B. Funding Availability

i. Income

The Town's Utility Fund consists of four separate funds listed below. Two of the funds are specific to either water or wastewater funding while the other two include both water and wastewater financial information.

- Fund 61 – Water/Wastewater Revenue Fund
- Fund 62 – Water Enterprise Fund
- Fund 63 – Wastewater Enterprise Fund
- Fund 81 – Utility Improvements Fund (water and wastewater)
- Fund 164 – Water & Sewer Asset Management Fund

a. Fund 61 – Water/Wastewater Revenue Fund

The Water/Wastewater Revenue Fund tracks financial activities associated with both water and sewer services. Fund 61 includes water and sewer usage fees, connection charges, and other miscellaneous items related to collection and banking fees. In addition to service and connection fees, Fund 61 also receives a percentage of the Town's third and fourth quarter gross receipts tax.

Portions of this fund are subsequently transferred to Funds 62, 63, and 81 as well as to other funds associated with revenue bonds. Currently, required amounts for maintenance of other funds are transferred as needed.

b. Fund 62 – Water Enterprise Fund and Fund 63 – Wastewater Enterprise Fund

The Water and Wastewater Enterprise Funds track financial activities associated only with water and wastewater operations and maintenance and the employees connected with these departments. All income in these two funds is derived from line item transfers from the previously mentioned Fund 61 – Water/Wastewater Fund.

c. Fund 81 – Utility Improvement Fund

The Utility Improvement Fund tracks financial activities associated with both water and wastewater; this fund handles capital improvements for the town of Taos Utility Department. The main sources of revenue (or cash flowing in) for this fund are line item transfers from Fund 61 and proceeds from loans, grants, and bonds. Water and wastewater system projects related to expansion or improvement of the existing system or planning processes are supported financially through this fund.

An analysis of the water and utility section of Fund 61 shows that water sales and sewer service fees represent the most significant portion of the revenues. Gross receipts taxes represent additional revenue. Other significant amounts can be attributed to connection fees, liquid waste disposal fees (from septic tanks) and investment income.

d. Fund 164 – Asset Management Fund

The Town's Public Utilities Department invests 1% of their revenue (approx. $300,000) towards the Water and Wastewater Asset Management Fund for work towards an Asset Management Inventory and Plan.

ii. Potential Funding Sources

Increased revenue for Fund 61 (and subsequently Fund 81) will be necessary to fund the proposed projects listed in the Master Plan. Most projects will require a planning period during which a Feasibility Study or PER or evaluation is completed before a major capital investment takes place or a construction project begins. Some possible revenue sources are listed below. Projects and tasks which fir within O&M for the system may be funded out of Fund 164, the Asset Management Fund.

a. Increased Monthly User Charges for Water and Sewer and O&M

Monthly water and wastewater charges consist of a fixed service charge and a consumption/flow charge based upon metered use. The Rate Study from 2008 explored and recommended comprehensive rate reviews and implementation. A review of the rates and connection charges should occur annually.

System O&M costs are anticipated to be offset initially by capital improvements: newer equipment and system components will offset maintenance requirements of older components. The Operations staff, currently at seven full-time employees, will incorporate the responsibilities for the new system components into their regular routine. Increases in electrical costs are intended to be offset by renewable energy solutions, such as the proposed solar arrays at the Rio Pueblo well site and the WWTF. The payback period on the two arrays at 500kWh is anticipated at approximately 8 years each.

b. Debt Financing/Borrowing Options

Meeting the future costs for infrastructure improvements in Taos will also create a need for continued debt financing which is most often in the grant/loan format. New loans may be generated for portions of the projected improvement projects. It is anticipated that future funding for the water and wastewater system projects could be in the form of a grant/loan package. Funding applications will likely be divided into sections for a planning phase and a construction phase. Possible sources of infrastructure funding include both state and federal funding:

- New Mexico State Legislature
- New Mexico Water Trust Board Fund
- New Mexico Finance Authority (NMFA)
- New Mexico Environment Department (NMED)
- Community Development Block Grants (CDBG)
- U.S. Department of Agriculture Rural Development
- U.S Environmental Protection Agency

Other expenses associated with this fund consist of annual debt service which includes principal and interest payments on various revenue bonds and loans Table 32 shows the existing Schedule of Outstanding Bonds related to water and wastewater that has been incurred by the Town.

Table 32: Town of Taos- 2015-2016 Schedule of Outstanding Bonds

Fund	Water and Sewer Improvements	Amount of Original Issue	Budget Requirements	Term/Debt Service Schedule End Date
67	NMED-Clean Water State Revolving Loan Fund	$1,200,000	$60,000	20 years / 2033
67	NMFA Water Trust Board Loan	$730,000	$37,980	20 years / 2029
67	NMFA Water Trust Board Loan	$197,390	$10,134	20 years / 2033
68	Series 2001A Water and Sewer Revenue Bonds (NMFA)	$950,391	$69,489	20 years / 2021
71	Series 2000A Water and Sewer Revenue Bonds (USDA-RUS)	$250,000	$14,550	40 years / 2040
73	Series 1993A Water and Sewer Revenue Bonds (USDA-FHA)	$635,600	$40,459	30 years / 2033
74	Series 1993B Water and Sewer Revenue Bonds (USDA-FHA)	$123,000	$7,950	30 years / 2033
77	Series 1995 Utility Revenue Bonds (USDA-FMHA)	$1,315,000	$77,686	40 years / 2035
79	Series 1998B Water and Sewer Revenue Bonds (USDA-RUS)	$475,000	$26,905	40 years / 2040

C. Project Phasing & Costs

The overall cost of each improvement is summarize in Table 33, below.

Table 33: Project Cost Summary

	Improvement Project	Cost
6A.	Water System O&M Improvements & Asset Management Plan	$ 493,335.00
7A.	Abeyta Settlement Projects	$ 18,087,622.00
7B.	Well House Improvements & Rehabilitation	$ 659,511.00
8A.	Additional Storage for Fire Flow and System Growth	$ 2,519,903.25
8B.	Additional Storage for Existing Arsenic Treatment and Booster Station Facility	$ 1,520,770.05
9A.	Pressure Zone and PRV Improvements	$ 782,195.63
9B.	Expansion to Future Service Area	$ 108,187.50
9C.	Replacement of Failing System Components	$ 18,056,493.75

9D.	New Dedicated Transmission Lines for In-Town Wells	$ 3,284,410.22
10A.	Sewer System Asset Inventory & Asset Management Plan	$ 824,096.64
11A.	Replace Old, Undersized and Failing System Components	$ 20,841,784.18
12A.	Treatment Facility Improvements - Phase IV	$ 2,408,253.75
13A.	Land Application in New Locations	$ 3,262,000.00
13B.	Groundwater Recharge	$ 5,554,000.00
Total Improvement Costs		**$ 78,402,562.97**

Based on the prioritization and criticality of projects, it is recommended improvement projects be phased as shown in the Implementation Schedule, Table 34. Included in this phasing are additional planning efforts that will assist in the further definition of projects. For instance, development of the calibrated water system model will assist identifying specific areas in the system for improvement.

Table 34: Implementation Schedule

	Improvement Project	Phase (5-Year Period)
6A.	Water System O&M Improvements & Asset Management Plan	2015-2020
7A.	Abeyta Improvements	2015-2020, 2020-2025
7B.	Well House Improvements & Rehabilitation	2015-2020
8A.	Additional Storage for Fire Flow and System Growth	2030-2035
8B.	Additional Storage for Existing Arsenic Treatment and Booster Station Facility	2020-2025
9A.	Pressure Zone and PRV Improvements	2015-2020
9B.	Expansion to Future Service Area	2030-2035
9C.	Replacement of Failing System Components	2020-2025, 2025-2030
9D.	New Dedicated Transmission Lines for In-Town Wells	2025-2030
10A.	Sewer System Asset Inventory & Asset Management Plan	2015-2020
11A.	Replace Old, Undersized and Failing System Components	2020-2025, 2025-2030
12A.	Treatment Facility Improvements - Phase IV	2015-2020
13A.	Land Application in New Locations	2030-2035
13B.	Groundwater Recharge	2030-2035

Phase 2015-2020:
The first phase of the improvements is designed to identify the water and waste water system unknowns and address major deficiencies. These projects will greatly improve system efficiency, health and safety concerns, water conservation and O&M. Additionally, the Abeyta Settlement Improvements are anticipated to receive funding and will be ready to begin design and construction at that time.

Phase 2020-2025:
The second phase of this planning period will utilize the information identified in the planning completed in the first phase to further improve system efficiency, water conservation, sewer infiltration/exfiltration and O&M.

Phase 2025-2030:
The third phase will continue to rehabilitate and upgrade the existing water distribution system and sewer collection system. Additionally, new transmission lines will connect the in Town wells to a water storage tank to increase system efficiency, reduce pressure surges and line breaks in the distribution system and improve O&M.

Phase 2030-2035:
The final phase of this planning period will address the additional storage need, this project may be moved up pending the results of the updated water system model. Lastly, land applications for waste water reuse and groundwater recharge improvements shall be implemented. These projects are scheduled last due to the limited need for the improvements. However, if the drought or commercial demand cause a greater need for these improvements, the schedule can be revised.

15. CONCLUSIONS AND RECOMMENDATIONS

The Town of Taos provides important water and sewer services for residences, commercial users and neighbors to the Town, and those services utilize, in some cases, aging and failing components. The forward-thinking efforts to utilize the system to full potential and account for future growth of the service areas shows the commitment to continuing to offer these services. Maintaining the efficient operation of the systems will keep O&M costs down while providing the services with Health and Safety as a priority.

In order to strategically implement capital projects and continued investment to the infrastructure, it is recommended the Town complete several other project-specific planning efforts to optimize project implementation. The first planning project recommended is to implement an Asset Management Program. Such a program will allow the Town to fully understand the infrastructure, including location, age and condition. With that information, the Town will be able to prioritize needed projects in the system and understand the true cost to improvements and operating the system. Finally, the Town will be able to prioritize Capital Improvement Projects and leverage various funding sources to implement those projects.

Additional recommended planning efforts which will impact and help specify further improvements include updating the water model and creating a sewer model for use in analyzing each systems' capacities and future service capabilities. Updating the water model will address the questions surrounding location of additional storage in the system, redefining the pressure zones and overall capacity for future connections. The sewer model will investigate capacity of the system and future growth from infill.

Capital improvements to the water system in the future should not only improve existing components and create new capacities, but also complement future projects which will be completed as part of the Abeyta Settlement. Leveraging the projects and funding sources will allow for the most beneficial use of the respective funding sources.

References

American Water Works Association

Daniel B. Stephens & Associates, Inc., “Preliminary Engineering Design Report Town of Taos Mutual Benefit Projects under the Abeyta Settlement Agreement”

Daniel B. Stephens & Associates, Inc., “Town of Taos 40-Year Water Development and Conservation Plan”

Town of Taos, “(Re)vision 2020”

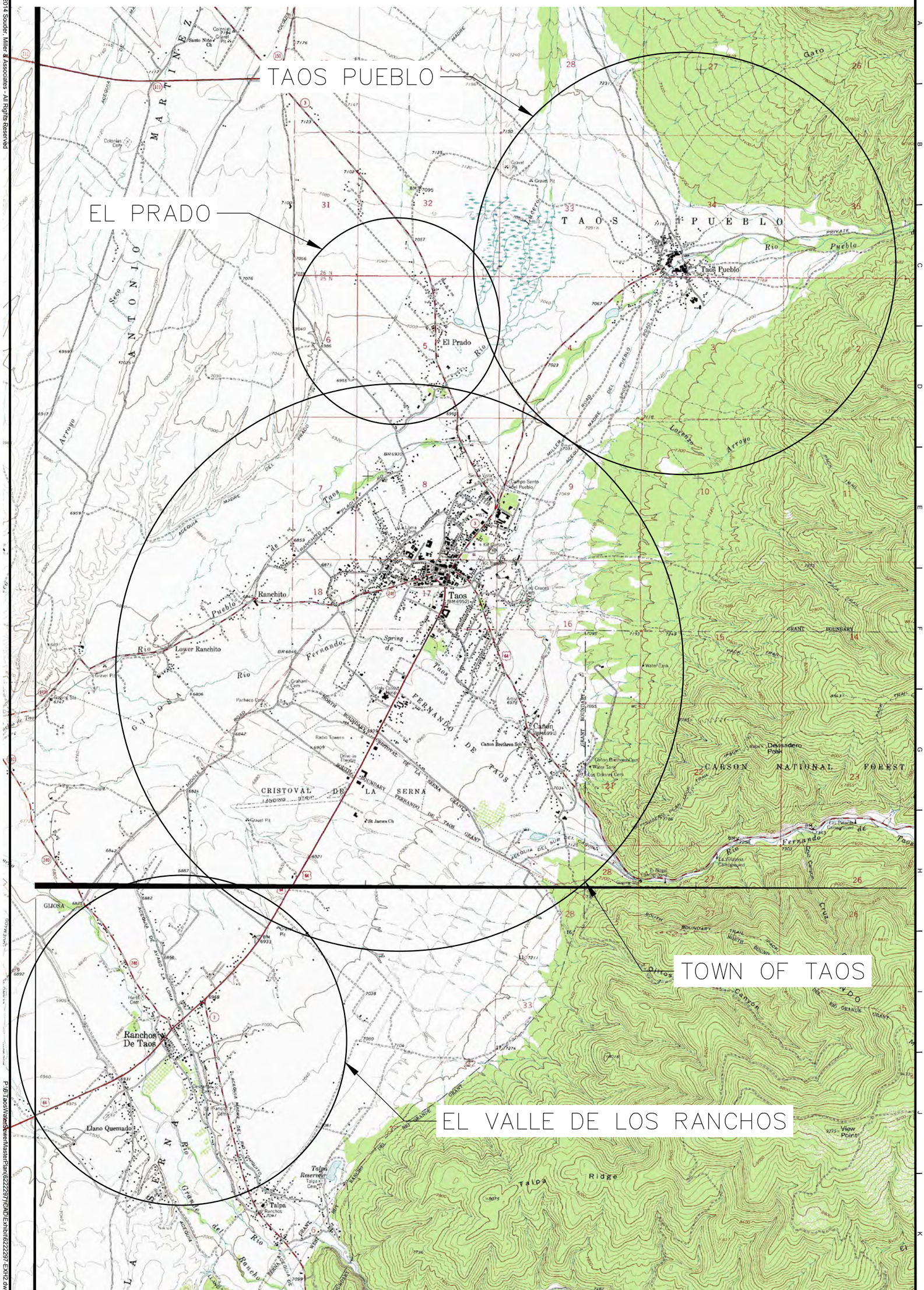
Souder, Miller & Associates, “Taos Valley Regional Wastewater Treatment Facility Treatment Technology, Solids Handling & Reuse Alternatives Preliminary Engineering Report”

Souder, Miller & Associates, “Town of Taos Water System Study”

APPENDIX A

Maps & Exhibits

Exhibit 1. Location Map
Exhibit 2. Town Boundaries and Service Area
Exhibit 3. Existing Water System Components
Exhibit 4. Sewer System Map
Exhibit 5. Population Infill/growth
Exhibit 6. Water Distribution System,
Exhibit 7. Water System Schematic
Exhibit 8. Rio Pueblo Well Site and Arsenic Treatment Facility
Exhibit 9. Abeyta Settlement Wells
Exhibit 10. Proposed Water System Components
Exhibit 11. Proposed Water System Schematic
Exhibit 12. Wastewater Treatment Facility Phase 4 Improvements
Exhibit 13. Effluent Reuse



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TOWN OF TAOS — TAOS COUNTY, NM

WATER / SEWER MASTER PLAN
REGIONAL MAP

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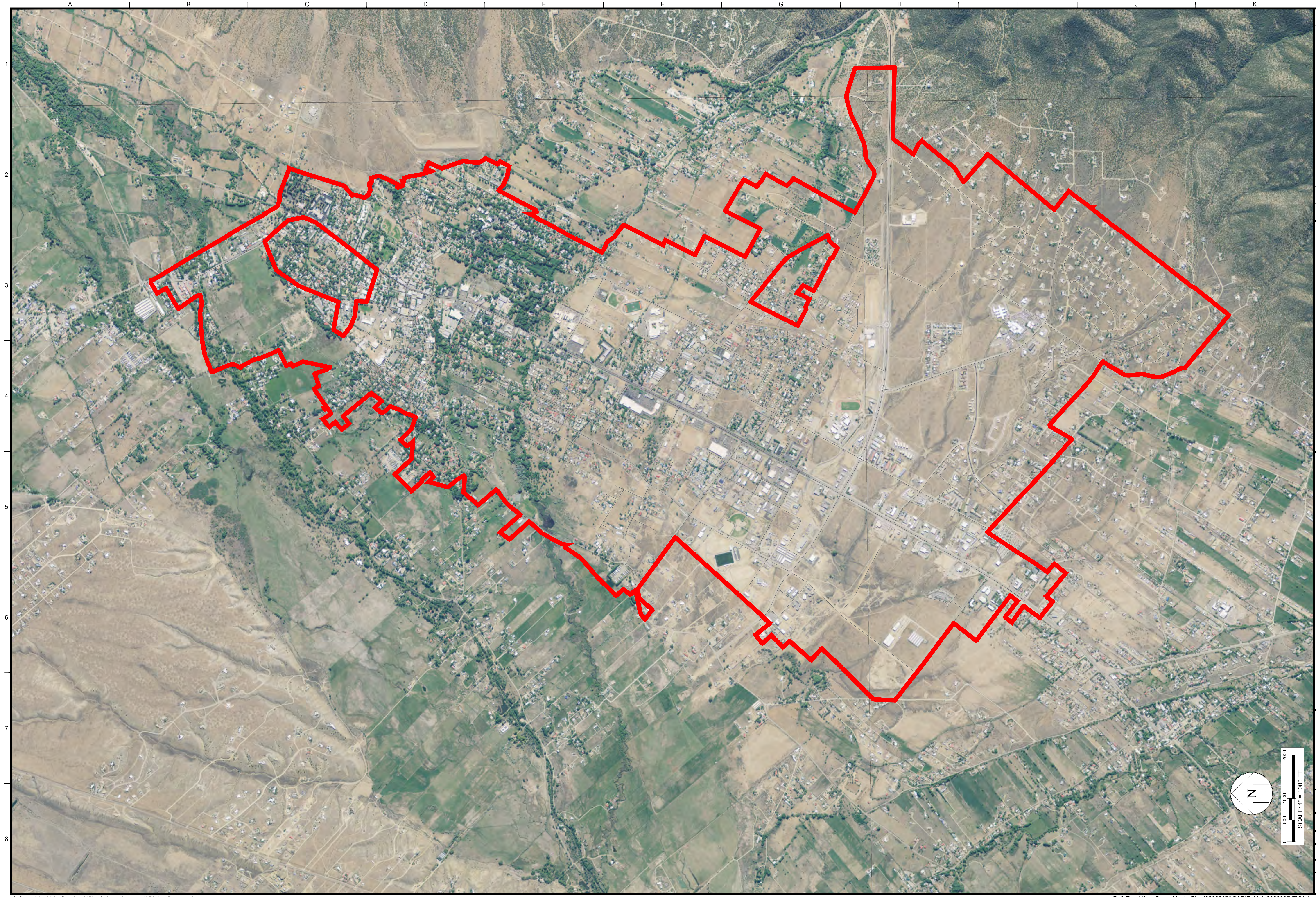

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TOWN OF TAOS — TAOS COUNTY, NM

WATER / SEWER MASTER PLAN
TOWN BOUNDARIES 2013

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Project No: 6222297

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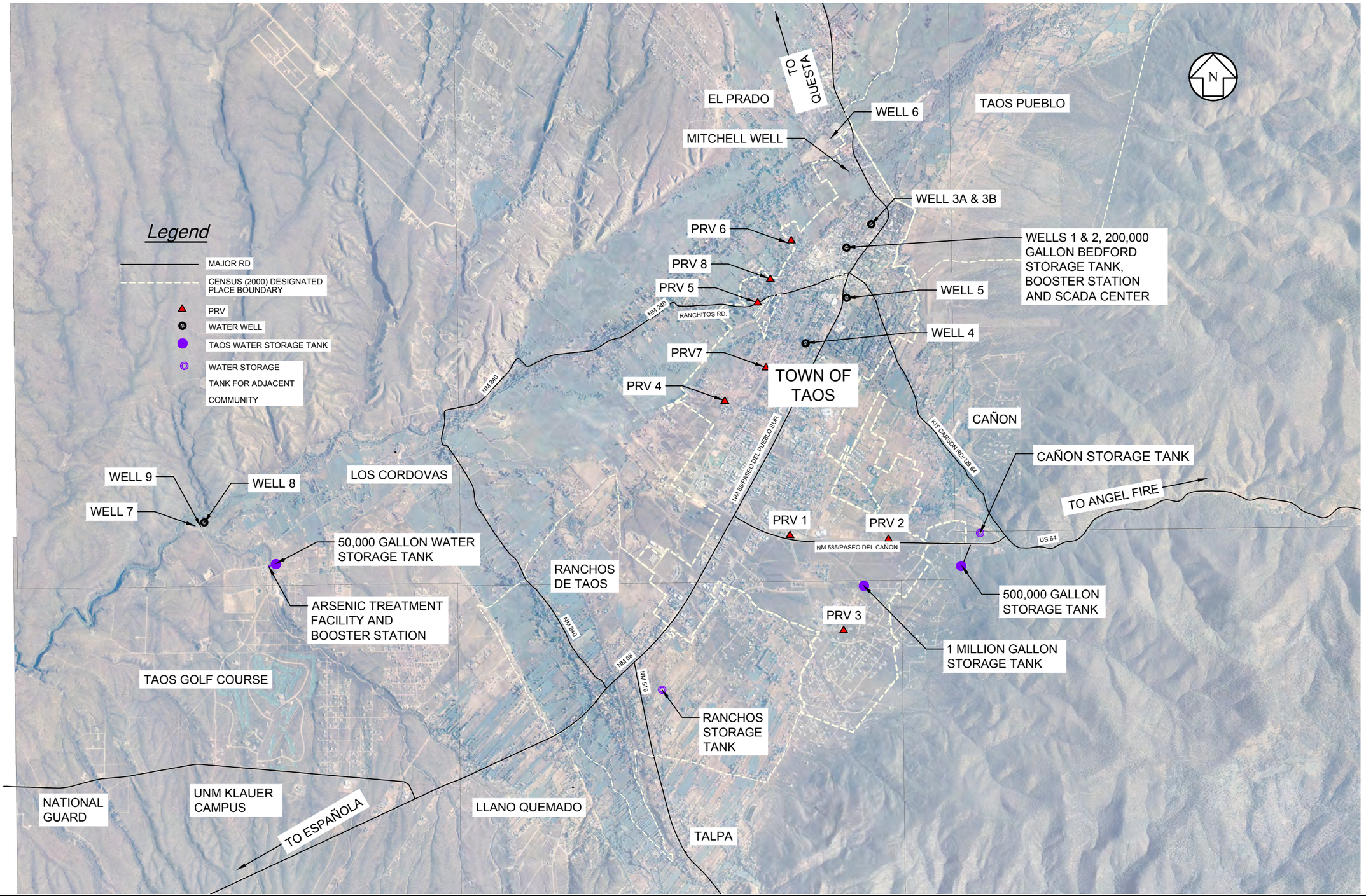

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TOWN OF TAOS
TAOS COUNTY, NM

TOWN OF TAOS
WATER & SEWER MASTER PLAN
EXISTING WATER SYSTEM COMPONENTS

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Project No: 6222297
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TAOS COUNTY, NM

WATER / SEWER MASTER PLAN
SEWER SYSTEM MAP

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Sheet: EX 4

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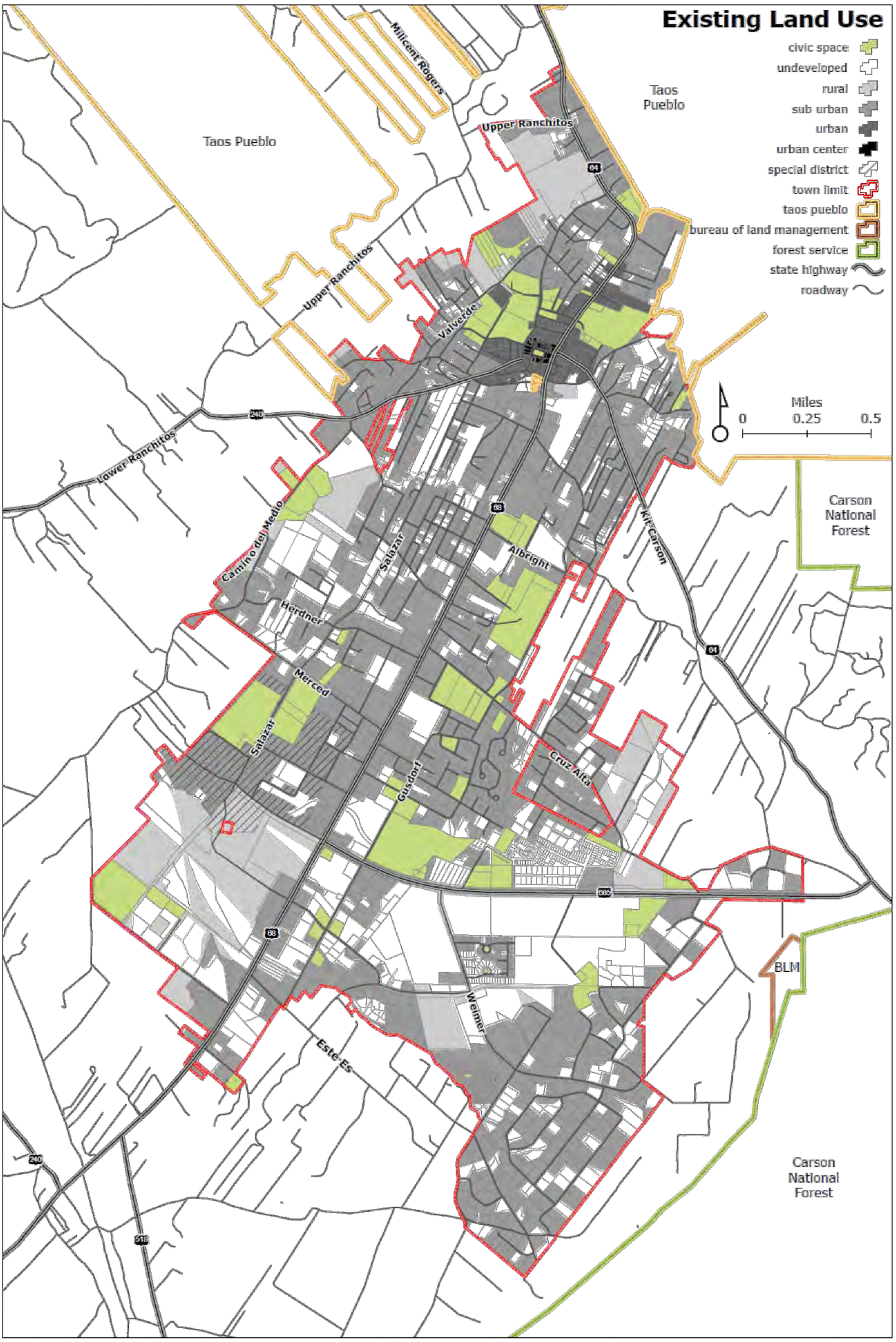
Map #7 – Undeveloped Parcels and Infill Opportunities



MAP #7 FROM (RE)VISION 2020 – LAND USE ELEMENT

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Project No. 622297	WATER / SEWER MASTER PLAN UNDEVELOPED LAND USE		
Scale: Horiz. Vert.			
Date: JUNE 2015			
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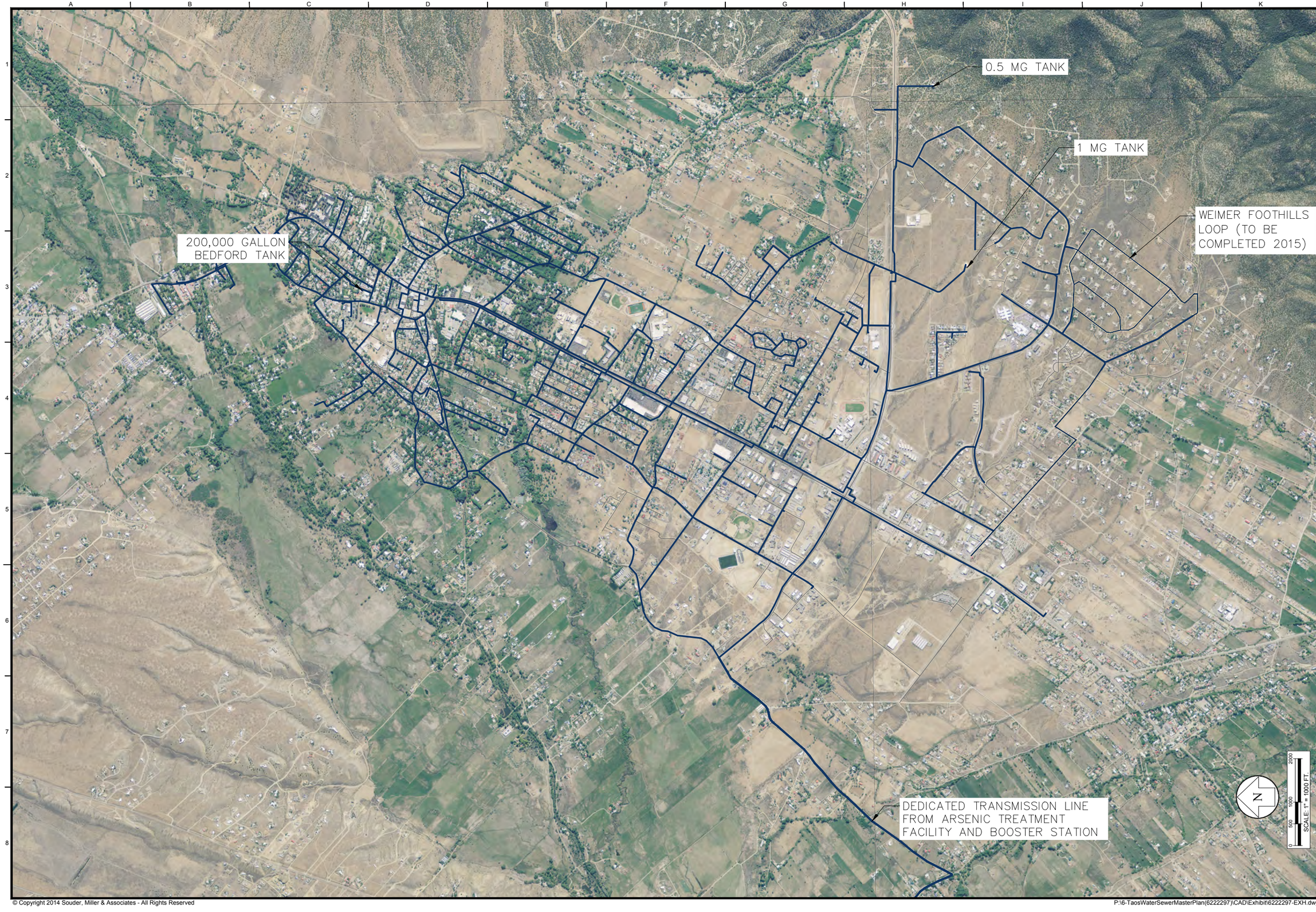

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WATER / SEWER MASTER PLAN
WATER DISTRIBUTION SYSTEM

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Project No: 6222297
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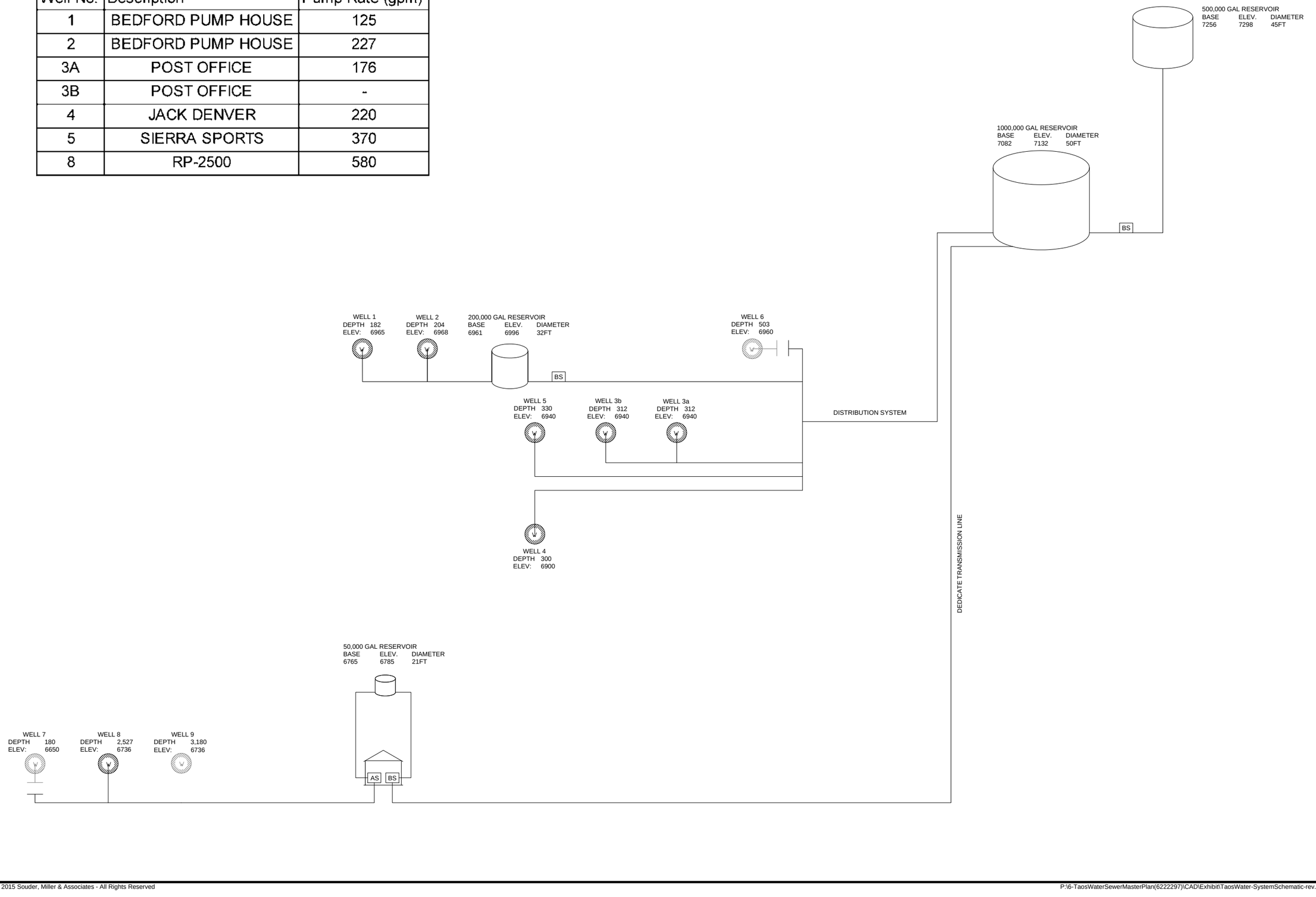
Well No.	Description	Pump Rate (gpm)
1	BEDFORD PUMP HOUSE	125
2	BEDFORD PUMP HOUSE	227
3A	POST OFFICE	176
3B	POST OFFICE	-
4	JACK DENVER	220
5	SIERRA SPORTS	370
8	RP-2500	580



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TAOS COUNTY, NM

TOWN OF TAOS

TOWN OF TAOS
WATER & SEWER MASTER PLAN
EXISTING WATER SYSTEM SCHEMATIC

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Project No: 6222297

Sheet: EX 7

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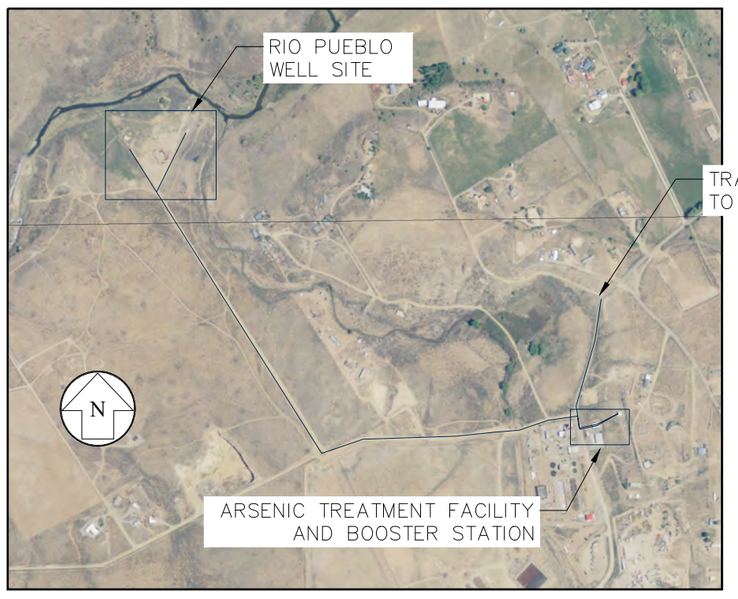
RIO PUEBLO WELL SITE

1" = 100'



AREA MAP

1" = 500'

ARSENIC TREATMENT FACILITY

1" = 50'

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WATER / SEWER MASTER PLAN
RIO PUEBLO WELL SITE AND
ARSENIC TREATMENT FACILITY

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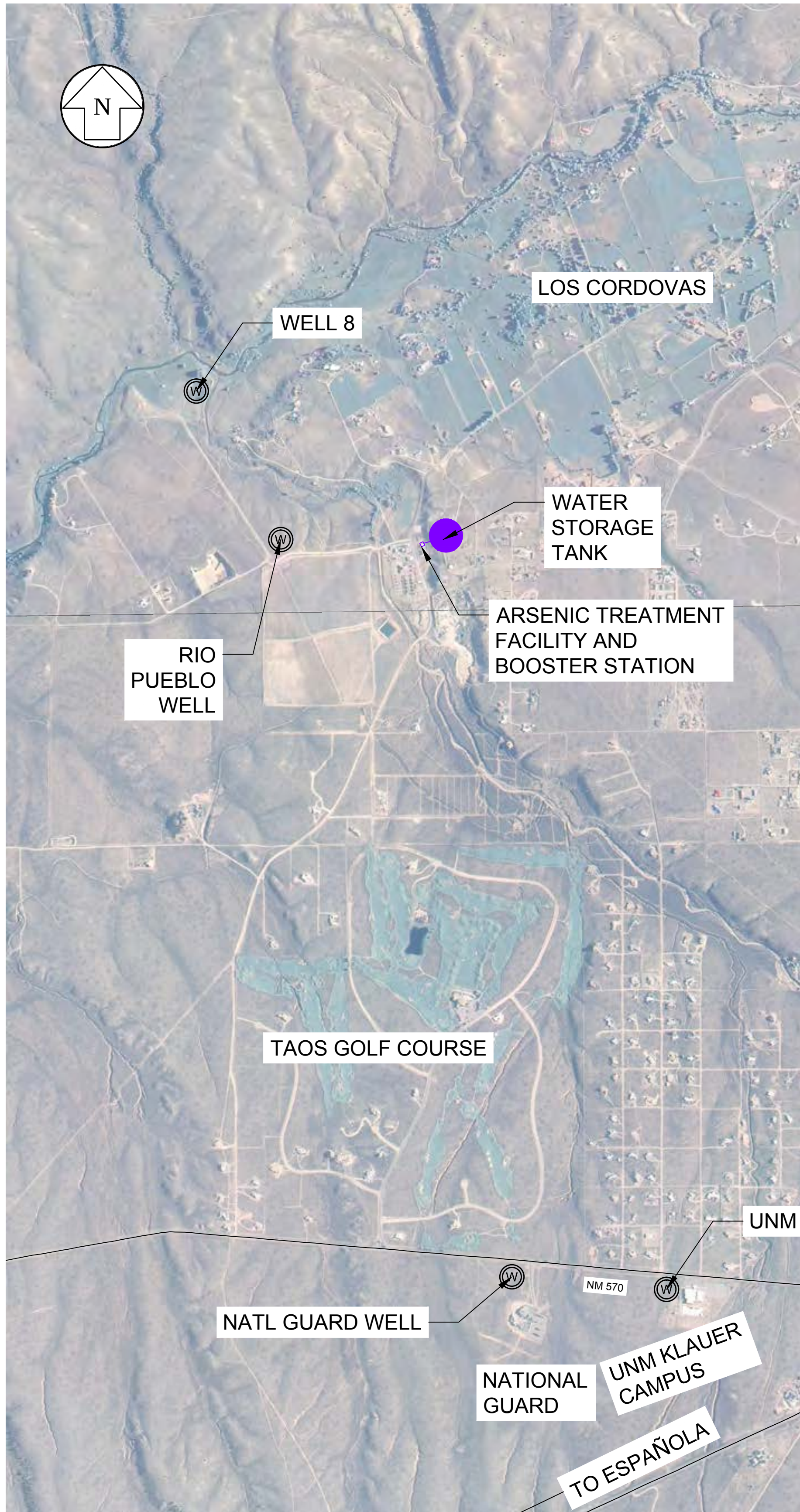

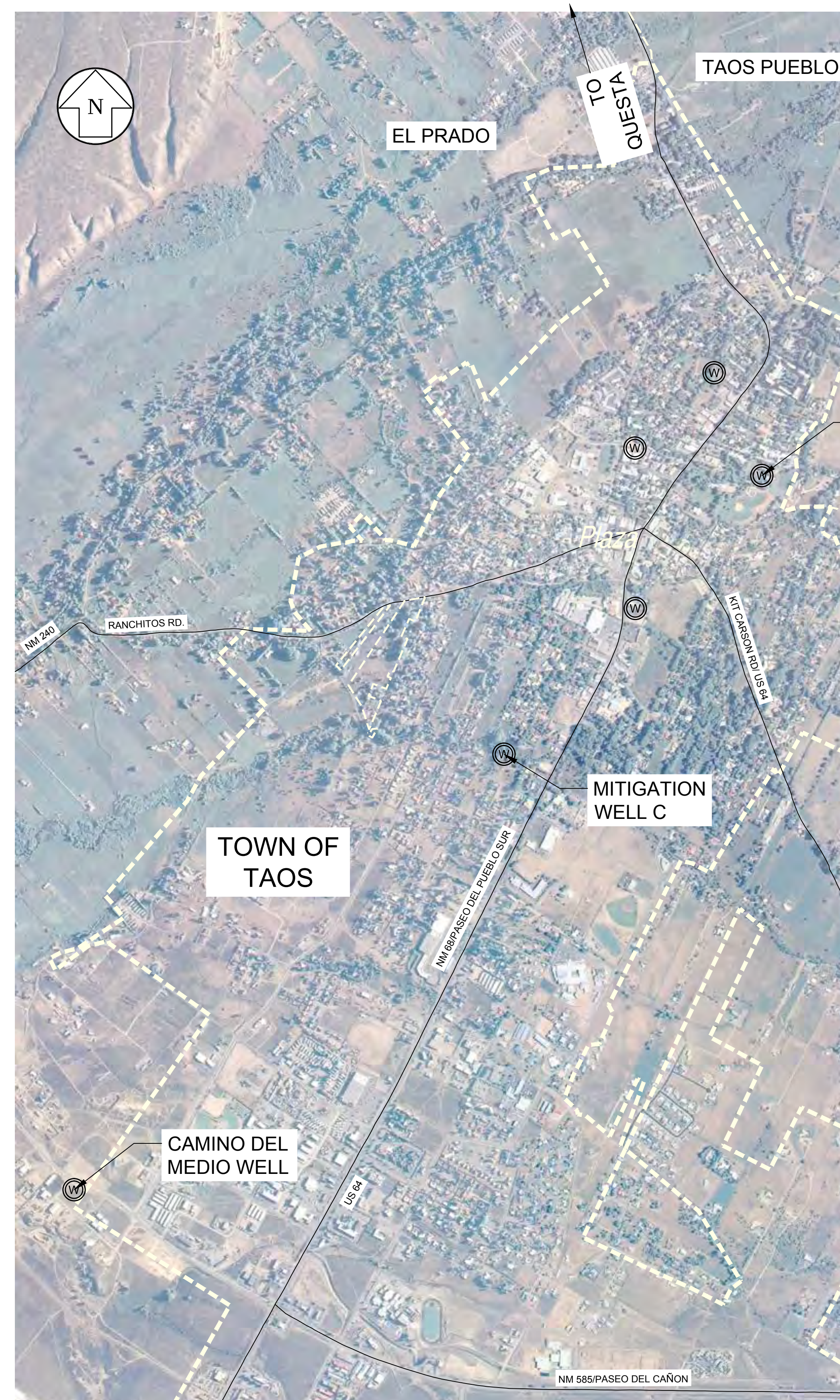

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TOWN OF TAOS

TOWN OF TAOS
WATER & SEWER MASTER PLAN
ABEYTA SETTLEMENT WELLS

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Project No: 6222297

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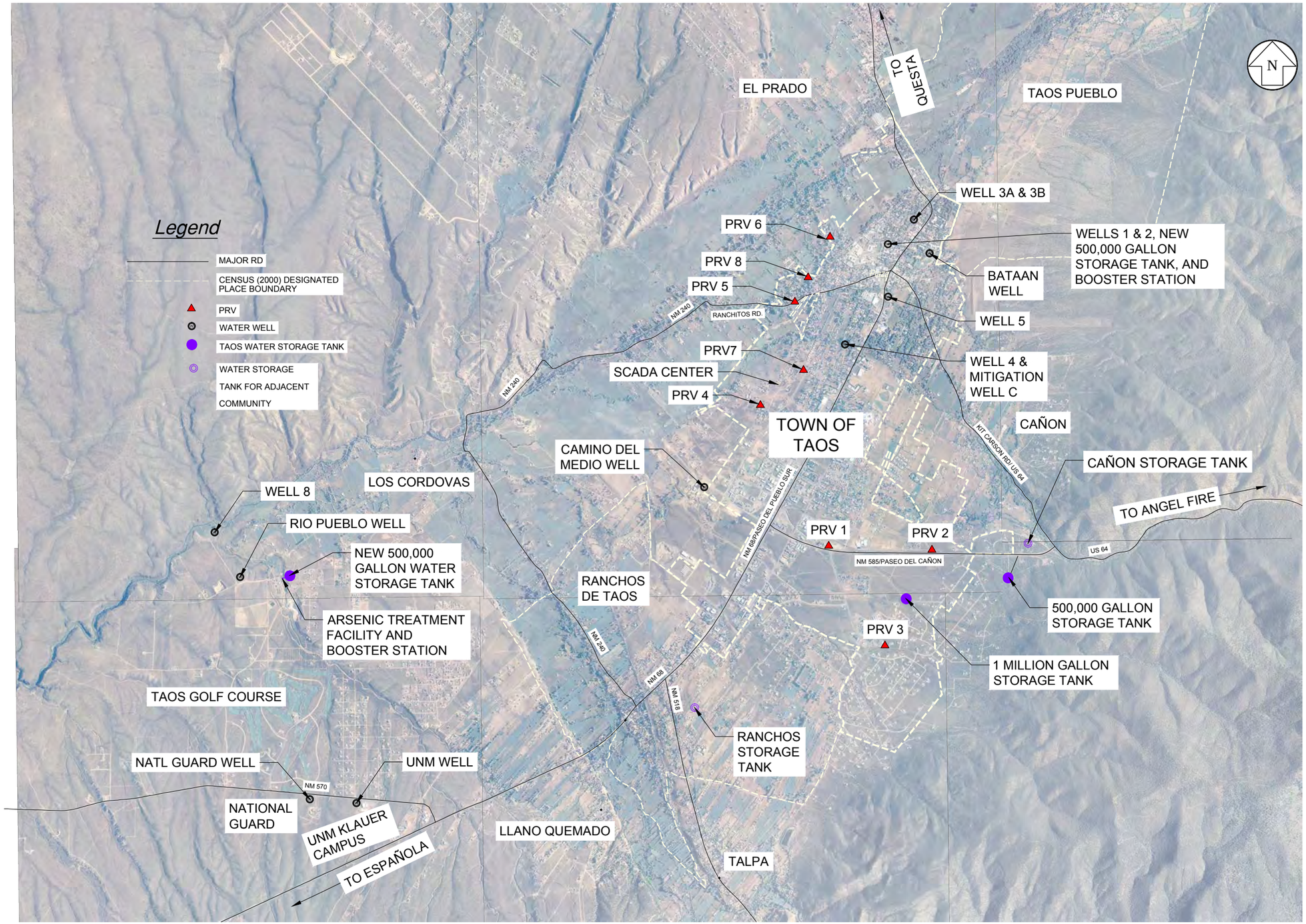

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TOWN OF TAOS

TOWN OF TAOS
WATER & SEWER MASTER PLAN
PROPOSED WATER SYSTEM COMPONENTS

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Project No: 6222297
Sheet: EX 10

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Well No.	Description	Pump Rate (gpm)
1	BEDFORD PUMP HOUSE	125
2	BEDFORD PUMP HOUSE	227
3A	POST OFFICE	176
3B	POST OFFICE	-
4	JACK DENVER	220
5	SIERRA SPORTS	370
8	RP-2500	580
-	BATAAN WELL	-
-	CAMINO DEL MEDIO	-
-	UNM/KLAUER WELL	300-500
-	NATL GUARD WELL	300-500
-	RIO PUEBLO WELL	300-500

NOTE:
UNM/NATL GUARD WELL CONNECTION TO EXISTING SYSTEM WILL BE DETERMINED BY ANALYSIS OF SYSTEM HYDRAULICS. SCHEMATIC SHOWN BASED ON DBS PER WELL IMPROVEMENTS

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WATER & SEWER MASTER PLAN
PROPOSED WATER SYSTEM SCHEMATIC

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Project No: 6222297
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TAOS COUNTY, NM

WATER / SEWER MASTER PLAN
WWTF PHASE 4 IMPROVEMENTS

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Project No: 6222297
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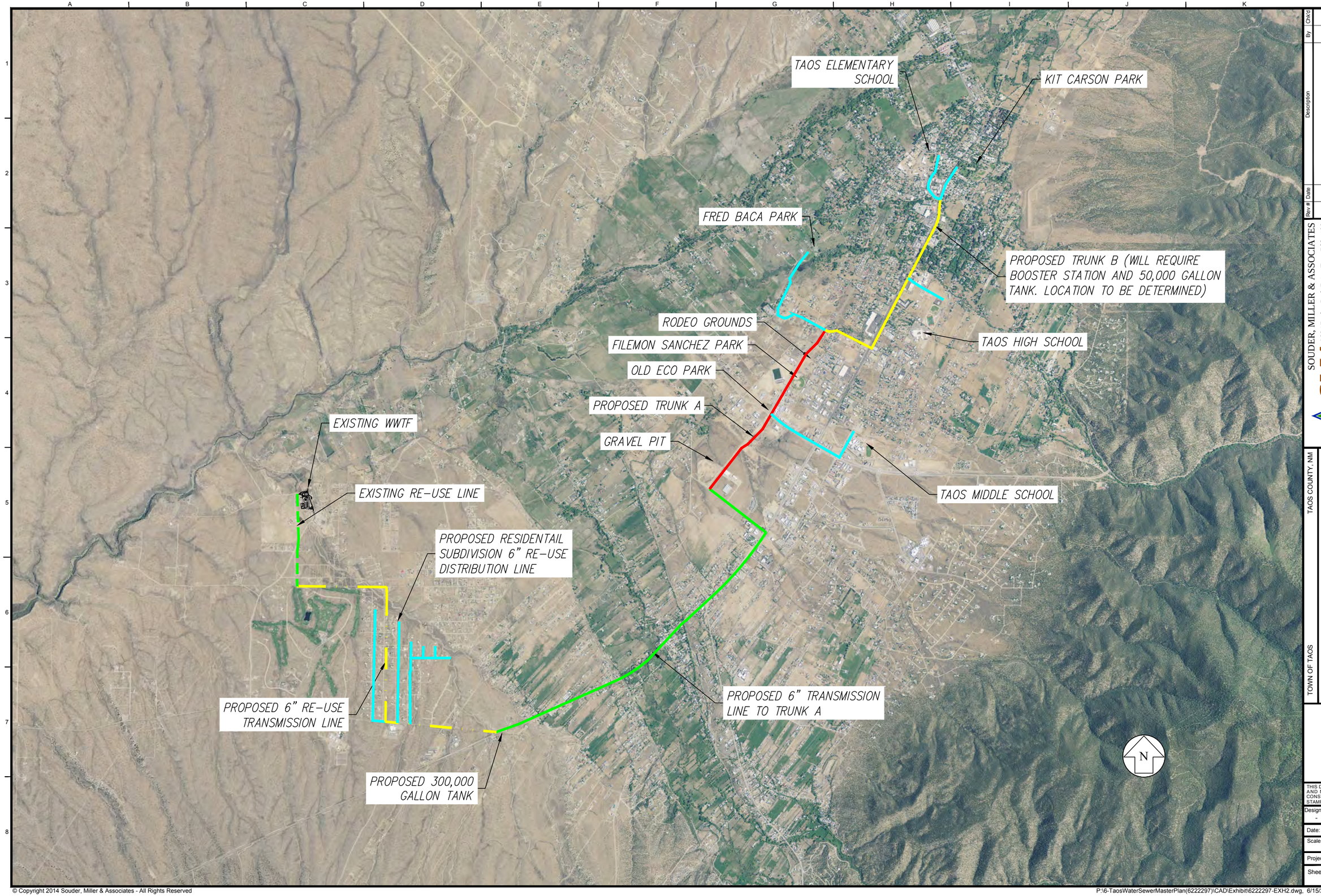

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TAOS COUNTY, NM

WATER / SEWER MASTER PLAN
EFFLUENT REUSE MAP

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Project No: 6222297
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APPENDIX B

Cost Estimates

Town of Taos

O&M Improvements & Asset Management Plan

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Asset Inventory Data Collection (75% of existing infrastructure)	LS	1	$ 160,000.00	$ 160,000.00
2	Potholing (25% of existing infrastructure)	LS	1	$ 160,000.00	$ 160,000.00
3	Asset Inventory Data Processing	LS	1	$ 40,000.00	$ 40,000.00
4	Asset Management Plan	LS	1	$ 20,000.00	$ 20,000.00
				Subtotal	$ 380,000.00
			20%	Contingency	$ 76,000.00
			NMGRT	8.1875%	$ 37,335.00
				Total	**$ 493,335.00**

Town of Taos

Well House Improvements & Rehabilitation

Construction Costs

Wells 1 & 2

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Demolish existing well house, including foundation, all labor and equipment	LS	1	$ 40,000.00	$ 40,000.00
2	Construct new well house, including foundation, piping, disinfection system, all labor, equipment and materials, CIP	LS	1	$ 120,000.00	$ 120,000.00
3	Well head improvements, including new pitless adapter and surface completion, including all labor, materials and equipment, CIP	LS	1	$ 15,000.00	$ 15,000.00
4	Replace and upgrade electrical components, including all labor and materials, CIP	LS	1	$ 30,000.00	$ 30,000.00
5	Material Testing Allowance	Allow	1	$ 15,000.00	$ 15,000.00
Wells 3a & 3b					
6	Replace and upgrade electrical components, including coordination with Kit Carson, all labor and materials, CIP	LS	1	$ 40,000.00	$ 40,000.00
Wells 4					
7	Demolish existing well house, including foundation, all labor and equipment	LS	1	$ 30,000.00	$ 30,000.00
8	Construct new well house, including foundation, piping, disinfection system, all labor, equipment and materials, CIP	LS	1	$ 90,000.00	$ 90,000.00
9	Replace and upgrade electrical components, including all labor and materials, CIP	LS	1	$ 30,000.00	$ 30,000.00
10	Material Testing Allowance	Allow	1	$ 15,000.00	$ 15,000.00
Wells 5					
11	Replace broken radio read master meter and add bypass line, CIP	EA	1	$ 25,000.00	$ 25,000.00
12	Replace broken oil reservoir for turbine pump, CIP	LS	1	$ 20,000.00	$ 20,000.00
13	Troubleshoot emergency generator and return to service, CIP	LS	1	$ 30,000.00	$ 30,000.00
				Subtotal	$ 500,000.00
			20%	Contingency	$ 100,000.00
			NMGRT	8.1875%	$ 49,125.00
				Total	**$ 649,125.00**

Professional Services Costs

Disinfection Design Memorandum

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Design Memorandum	LS	1	$ 30,000.00	$ 30,000.00
Wells 1 & 2					
Item No.	**Description**	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL PRICE**
1	Preliminary Design	LS	1	$ 15,000.00	$ 15,000.00
2	Final Design	LS	1	$ 7,500.00	$ 7,500.00
3	Construction Administration	LS	1	$ 4,000.00	$ 4,000.00
4	Resident Project Representative	LS	1	$ 16,000.00	$ 16,000.00
Wells 3a & 3b					
5	Project Design	LS	1	$ 5,000.00	$ 5,000.00
6	Construction Administration	LS	1	$ 2,500.00	$ 2,500.00
7	Resident Project Representative	LS	1	$ 8,000.00	$ 8,000.00
Wells 4					
8	Preliminary Design	LS	1	$ 10,000.00	$ 10,000.00
9	Final Design	LS	1	$ 5,000.00	$ 5,000.00
10	Construction Administration	LS	1	$ 4,000.00	$ 4,000.00
11	Resident Project Representative	LS	1	$ 16,000.00	$ 16,000.00
Wells 5					
12	N/A				
Bidding & Closeout					
13	Bidding Administration	LS	1	$ 10,000.00	$ 10,000.00
14	Closeout (Record Drawings+O&M Manual)	LS	1	$ 8,000.00	$ 8,000.00
				Subtotal	$ 141,000.00
			20%	Contingency	$ 28,200.00
			NMGRT	8.1875%	$ 13,853.25
				Total	**$ 183,053.25**

Total Project Costs (w/o NMGRT)	**$ 641,000.00**
Total Project Costs (w/ NMGRT)	**$ 832,178.25**

Town of Taos

Well House Improvements & Rehabilitation

Disinfection Design Memorandum

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Design Memorandum	LS	1	$ 30,000.00	$ 30,000.00

Wells 1 & 2

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Demolish existing well house, including foundation, all labor and equipment	LS	1	$ 40,000.00	$ 40,000.00
2	Construct new well house, including foundation, piping, disinfection system, all labor, equipment and materials, CIP	LS	1	$ 120,000.00	$ 120,000.00
3	Well head improvements, including new pitless adapter and surface completion, including all labor, materials and equipment, CIP	LS	1	$ 15,000.00	$ 15,000.00
4	Replace and upgrade electrical components, including all labor and materials, CIP	LS	1	$ 30,000.00	$ 30,000.00
5	Material Testing Allowance	Allow	1	$ 15,000.00	$ 15,000.00
				Subtotal	$ 220,000.00
			20%	Contingency	$ 44,000.00
			NMGRT	8.1875%	$ 21,615.00
				Total	**$ 285,615.00**

Wells 1 & 2

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 15,000.00	$ 15,000.00
2	Final Design	LS	1	$ 7,500.00	$ 7,500.00
3	Bidding Administration	LS	1	$ 5,000.00	$ 5,000.00
4	Construction Administration	LS	1	$ 4,000.00	$ 4,000.00
5	Resident Project Representative	LS	1	$ 16,000.00	$ 16,000.00
6	Closeout (Record Drawings+O&M Manual)	LS	1	$ 6,000.00	$ 6,000.00
				Subtotal	$ 53,500.00
			20%	Contingency	$ 10,700.00
			NMGRT	8.1875%	$ 5,256.38
				Total	**$ 69,456.38**

Total Project Costs (w/o NMGRT) $ 273,500.00

Total Project Costs (w/ NMGRT) $ 355,071.38

Wells 3a & 3b

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
4	Replace and upgrade electrical components, including coordination with Kit Carson, all labor and materials, CIP	LS	1	$ 40,000.00	$ 40,000.00
				Subtotal	$ 40,000.00
			20%	Contingency	$ 8,000.00
			NMGRT	8.1875%	$ 3,930.00
				Total	**$ 51,930.00**

Wells 3a & 3b

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Project Design	LS	1	$ 5,000.00	$ 5,000.00
3	Bidding Administration	LS	1	$ 2,500.00	$ 2,500.00
4	Construction Administration	LS	1	$ 2,500.00	$ 2,500.00
5	Resident Project Representative	LS	1	$ 8,000.00	$ 8,000.00

6	Closeout (Record Drawings+O&M Manual)	LS	1	$ 4,000.00	$ 4,000.00
				Subtotal	$ 22,000.00
			20%	Contingency	$ 4,400.00
			NMGRT	8.1875%	$ 2,161.50
				Total	**$ 28,561.50**

Total Project Costs (w/o NMGRT) $ 62,000.00
Total Project Costs (w/ NMGRT) $ 80,491.50

Wells 4

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Demolish existing well house, including foundation, all labor and equipment	LS	1	$ 30,000.00	$ 30,000.00
2	Construct new well house, including foundation, piping, disinfection system, all labor, equipment and materials, CIP	LS	1	$ 90,000.00	$ 90,000.00
4	Replace and upgrade electrical components, including all labor and materials, CIP	LS	1	$ 30,000.00	$ 30,000.00
9	Material Testing Allowance	Allow	1	$ 15,000.00	$ 15,000.00
				Subtotal	$ 165,000.00
			20%	Contingency	$ 33,000.00
			NMGRT	8.1875%	$ 16,211.25
				Total	**$ 214,211.25**

Wells 4

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 10,000.00	$ 10,000.00
2	Final Design	LS	1	$ 5,000.00	$ 5,000.00
3	Bidding Administration	LS	1	$ 5,000.00	$ 5,000.00
4	Construction Administration	LS	1	$ 4,000.00	$ 4,000.00
5	Resident Project Representative	LS	1	$ 16,000.00	$ 16,000.00
6	Closeout (Record Drawings+O&M Manual)	LS	1	$ 6,000.00	$ 6,000.00
				Subtotal	$ 46,000.00
			20%	Contingency	$ 9,200.00
			NMGRT	8.1875%	$ 4,519.50
				Total	**$ 59,719.50**

Total Project Costs (w/o NMGRT) $ 211,000.00
Total Project Costs (w/ NMGRT) $ 273,930.75

Wells 5

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Replace broken radio read master meter and add bypass line, CIP	EA	1	$ 25,000.00	$ 25,000.00
2	Replace broken oil reservoir for turbine pump, CIP	LS	1	$ 20,000.00	$ 20,000.00
3	Troubleshoot emergency generator and return to service, CIP	LS	1	$ 30,000.00	$ 30,000.00
				Subtotal	$ 75,000.00
			20%	Contingency	$ 15,000.00
			NMGRT	8.1875%	$ 7,368.75
				Total	**$ 97,368.75**

Wells 5

Professional Services Costs (N/A)

Town of Taos

Additional Storage for Fire Flow and System Growth

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Tank site clearing, grubbing, stripping, grading, and drainage, including removal and disposal of material, erosion control and site restoration	LS	1	$ 20,000.00	$ 20,000.00
2	Prepare concrete tank foundation, including all labor, material and framework, CIP	LS	1	$ 30,000.00	$ 30,000.00
3	Construct new 1,000,000 gallon reinforced concrete (or welded steel) water storage tank, including interior/extieror coating, inlet, outlet and overflow piping to approximately 5-feet outside of foundation, CIP	LS	1	$ 1,500,000.00	$ 1,500,000.00
4	Furnish and install new 12-inch C900 PVC DR18, including all fittings, material, labor, joint restraints, warning tape, tracer wire, trenching, bedding and site restoration, CIP	LF	200	$ 75.00	$ 15,000.00
5	Furnish and install 12-inch gate valve in cast iron valve box, CIP	EA	1	$ 4,000.00	$ 4,000.00
6	Furnish and install new 8-inch C900 PVC DR18, including all fittings, material, labor, joint restraints, warning tape, tracer wire, trenching, bedding and site restoration, CIP	LF	200	$ 50.00	$ 10,000.00
7	Furnish and install 8-inch gate valve in cast iron valve box, CIP	EA	1	$ 2,000.00	$ 2,000.00
8	Locate and connect to existing 12-inch waterline, CIP	EA	1	$ 3,500.00	$ 3,500.00
9	Locate and connect to existing 8-inch waterline, CIP	EA	1	$ 2,000.00	$ 2,000.00
10	Electrical, cathodic protection, tank level control and SCADA installation and incorporation with existing infrastructure	LS	1	$ 50,000.00	$ 50,000.00
11	Land acquisition	LS	1	$ 100,000.00	$ 100,000.00
12	Traffic Control	LS	1	$ 15,000.00	$ 7,500.00
13	Material Testing Allowance	Allow	1	$ 20,000.00	$ 20,000.00
				Subtotal	$ 1,764,000.00
				20% Contingency	$ 352,800.00
				NMGRT 8.1875%	$ 173,313.00
				Total	**$ 2,290,113.00**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 80,000.00	$ 80,000.00
2	Final Design	LS	1	$ 40,000.00	$ 40,000.00
3	Bidding Administration	LS	1	$ 10,000.00	$ 10,000.00
4	Construction Administration	LS	1	$ 75,000.00	$ 75,000.00
5	Resident Project Representative	LS	1	$ 130,000.00	$ 130,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 8,000.00	$ 8,000.00
				Subtotal	$ 343,000.00
				20% Contingency	$ 68,600.00
				NMGRT 8.1875%	$ 33,699.75
				Total	**$ 445,299.75**

Total Project Costs (w/o NMGRT) $ 2,107,000.00

Total Project Costs (w/ NMGRT) $ 2,735,412.75

Town of Taos

Additional Storage for Existing Arsenic Treatment and Booster Station Facility

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Tank site clearing, grubbing, stripping, grading, and drainage, including removal and disposal of material, erosion control and site restoration	LS	1	$ 20,000.00	$ 20,000.00
2	Prepare concrete tank foundation, including all labor, material and framework, CIP	LS	1	$ 30,000.00	$ 30,000.00
3	Construct new 500,000 gallon welded steel water storage tank, including interior/extieror coating, foundation, inlet, outlet and overflow piping to approximately 5-feet outside of foundation, CIP	LS	1	$ 750,000.00	$ 750,000.00
4	Furnish and install new 6-inch C900 PVC DR18, including all fittings, material, labor, joint restraints, warning tape, tracer wire, trenching, bedding and site restoration, CIP	LF	400	$ 40.00	$ 16,000.00
5	Furnish and install 6-inch gate valve in cast iron valve box, CIP	EA	2	$ 1,200.00	$ 2,400.00
6	Locate and connect to existing 6-inch waterline, CIP	EA	2	$ 2,000.00	$ 4,000.00
7	Furnish and install new 1,500 gpm skid mounted duplex pump booster pump system, including all material and labor, CIP	EA	2	$ 75,000.00	$ 150,000.00
8	Electrical, cathodic protection, tank level control and SCADA installation and incorporation with existing infrastructure	LS	1	$ 50,000.00	$ 50,000.00
9	Material Testing Allowance	Allow	1	$ 15,000.00	$ 15,000.00
				Subtotal	$ 1,037,400.00
			20%	Contingency	$ 207,480.00
			NMGRT	8.1875%	$ 101,924.55
				Total	**$ 1,346,804.55**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 40,000.00	$ 40,000.00
2	Final Design	LS	1	$ 20,000.00	$ 20,000.00
3	Bidding Administration	LS	1	$ 6,000.00	$ 6,000.00
4	Construction Administration	LS	1	$ 60,000.00	$ 60,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 8,000.00	$ 8,000.00
				Subtotal	$ 134,000.00
			20%	Contingency	$ 26,800.00
			NMGRT	8.1875%	$ 13,165.50
				Total	**$ 173,965.50**

PROJECT TOTAL $ 1,520,770.05

Town of Taos
Pressure Zone and PRV Improvements

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Furnish and install new PRV station on existing waterline, including concrete vault, bypass line, all materials and labor, CIP	EA	5	$ 50,000.00	$ 250,000.00
2	Remove and replace existing PRV station on existing waterline (salvage existing vault and materials to Owner), including concrete vault, bypass line, all materials and labor, CIP	EA	2	$ 65,000.00	$ 130,000.00
3	Remove existing PRV station on existing waterline (salvage existing vault and materials to Owner) and connect with strait piping, including concrete vault, bypass line, all materials and labor, CIP	EA	1	$ 35,000.00	$ 35,000.00
5	Update hydraulic model	LS	1	$ 50,000.00	$ 50,000.00
10	Traffic Control	LS	1	$ 35,000.00	$ 7,500.00
11	Material Testing Allowance	Allow	1	$ 20,000.00	$ 20,000.00
				Subtotal	$ 492,500.00
			20%	Contingency	$ 98,500.00
			NMGRT	8.1875%	$ 48,388.13
				Total	**$ 639,388.13**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Update Hydraulic Model, including field inspection and verification	LS	1	$ 25,000.00	$ 25,000.00
2	Project Design	LS	1	$ 15,000.00	$ 15,000.00
3	Bidding Administration	LS	1	$ 8,000.00	$ 8,000.00
4	Construction Administration	LS	1	$ 24,000.00	$ 24,000.00
5	Resident Project Representative	LS	1	$ 32,000.00	$ 32,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 6,000.00	$ 6,000.00
				Subtotal	$ 110,000.00
			20%	Contingency	$ 22,000.00
			NMGRT	8.1875%	$ 10,807.50
				Total	**$ 142,807.50**

Total Project Costs (w/o NMGRT) $ 602,500.00

Total Project Costs (w/ NMGRT) $ 782,195.63

Town of Taos					
Expansion to Future Service Area					
Professional Services Costs					
Item No.	**Description**	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL PRICE**
1	Asset Inventory	LS	1	$ 50,000.00	$ 50,000.00
2	Preliminary Engineering Report and Environmental Report	LS	1	$ 100,000.00	$ 100,000.00
				Subtotal	$ 150,000.00
				NMGRT 8.1875%	$ 12,281.25
				Total	**$ 162,281.25**

Town of Taos

Replacement of Failing System Components

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Furnish and install new 6, 8, 10 and 12-inch waterline (PVC and DIP as required), including all fittings, joint restraints, tracer wire, warning tape, appurtenances, trenching, bedding, site restoation, labor and materials, CIP	LF	29,000	$ 75.00	$ 2,175,000.00
2	Rehabilitate existing 6, 8, 10 and 12-inch waterline (PVC and DIP as required), including all site preparation, excavation, service re-connections, site restoration, labor and materials, CIP	LF	29,000	$ 100.00	$ 2,900,000.00
3	Remove and replace existing gate valves and fire hydrants, CIP	EA	580	$ 7,500.00	$ 4,350,000.00
4	Upgrade radio read metering and SCADA system, including well monitoring	LS	1	$ 75,000.00	$ 75,000.00
5	Remove and replace existing asphalt, curb and gutter, CIP	SY	19,333	$ 115.00	$ 2,223,333.33
6	Traffic Control	LS	1	$ 75,000.00	$ 75,000.00
7	Material Testing Allowance	Allow	1	$ 120,000.00	$ 120,000.00
				Subtotal	$ 11,918,333.33
			20%	Contingency	$ 2,383,666.67
			NMGRT	8.1875%	$ 1,170,976.25
				Total	**$ 15,472,976.25**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 300,000.00	$ 300,000.00
2	Final Design	LS	1	$ 150,000.00	$ 150,000.00
3	Bidding Administration	LS	1	$ 20,000.00	$ 20,000.00
4	Construction Administration	LS	1	$ 600,000.00	$ 600,000.00
5	Resident Project Representative	LS	1	$ 800,000.00	$ 800,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 120,000.00	$ 120,000.00
				Subtotal	$ 1,990,000.00
			20%	Contingency	$ 398,000.00
			NMGRT	8.1875%	$ 195,517.50
				Total	**$ 2,583,517.50**

Total Project Costs (w/o NMGRT) $ 13,908,333.33

Total Project Costs (w/ NMGRT) $ 18,056,493.75

Town of Taos

New Dedicated Transmission Lines for In-Town Wells

Construction Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Furnish and install new 6-inch waterline (PVC and DIP as required), including all fittings, joint restraints, tracer wire, warning tape, appurtenances, trenching, bedding, site restoration, labor and materials, CIP	LF	15,750	$ 45.00	$ 708,750.00
2	Furnish and install new gate valves and combination air/vacuum valves, CIP	EA	20	$ 5,000.00	$ 100,000.00
3	Remove and replace existing asphalt, curb and gutter, CIP	SY	10,500	$ 115.00	$ 1,207,500.00
4	Surveyed as-builts	LF	15,750	$ 1.50	$ 23,625.00
5	Traffic Control	LS	1	$ 30,000.00	$ 30,000.00
6	Material Testing Allowance	Allow	1	$ 60,000.00	$ 60,000.00
				Subtotal	$ 2,129,875.00
			20%	Contingency	$ 425,975.00
			NMGRT	8.1875%	$ 209,260.22
				Total	**$ 2,765,110.22**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 60,000.00	$ 60,000.00
2	Final Design	LS	1	$ 30,000.00	$ 30,000.00
3	Bidding Administration	LS	1	$ 10,000.00	$ 10,000.00
4	Construction Administration	LS	1	$ 90,000.00	$ 90,000.00
5	Resident Project Representative	LS	1	$ 180,000.00	$ 180,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 30,000.00	$ 30,000.00
				Subtotal	$ 400,000.00
			20%	Contingency	$ 80,000.00
			NMGRT	8.1875%	$ 39,300.00
				Total	**$ 519,300.00**

Total Project Costs (w/o NMGRT) $ 2,529,875.00

Total Project Costs (w/ NMGRT) $ 3,284,410.22

Town of Taos					
Asset Inventory & Asset Management Plan					
Professional Services Costs					
Item No.	**Description**	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL PRICE**
1	Asset Inventory Data Collection & CCTV (40% of existing infrastructure)	LF	71,970	$ 7.50	$ 539,775.00
2	Asset Inventory Data Processing	LS	1	$ 50,000.00	$ 50,000.00
3	Asset Management Plan	LS	1	$ 45,000.00	$ 45,000.00
				Subtotal	$ 634,775.00
			20%	Contingency	$ 126,955.00
			NMGRT	8.1875%	$ 62,366.64
				Total	**$ 824,096.64**

Town of Taos

Replace Old, Undersized and Failing System Components

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Furnish and install new 8-inch through 24-inch	LF	35,985	$ 140.00	$ 5,037,900.00
2	Reiline existing 8-inch through 24-inch sewer with Cured-In-Place Pipe (CIPP) lining and reconnect service lines to main, including all labor, materials, equipment, pre-installation inspection and preparation, post installation inspection, video record and site restoration, CIP	LF	17,993	$ 150.00	$ 2,698,875.00
3	Replace existing sewer with 8-inch through 24-inch HDPE pipe by jack and bore installation, including all material, labor, equipment, pre-construction cleaning, excavation, service reconnections, backfill and site restoration, CIP	LF	17,993	$ 160.00	$ 2,878,800.00
4	Rehabilitate existing manhole with protective liner coating, including all labor, materials, equipment, surface preparation, application of liner material and site restoration, CIP	EA	267.25	$ 600.00	$ 160,350.00
5	Remove and replace existing asphalt, curb and gutter, CIP	SY	23,990	$ 115.00	$ 2,758,850.00
6	Construction stacking & surveyed as-builts	LF	35,985.00	$ 1.50	$ 53,977.50
7	Bypass pumping	LS	1.00	$ 50,000.00	$ 50,000.00
8	Traffic control	LS	1	$ 120,000.00	$ 120,000.00
9	Material testing allowance	LS	1	$ 150,000.00	$ 150,000.00
				Subtotal	$ 13,908,752.50
				20% Contingency	$ 2,781,750.50
				NMGRT 8.1875%	$ 1,366,534.93
				Total	**$ 18,057,037.93**

Professional Services Costs

Item No.	Description	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	Preliminary Design	LS	1	$ 400,000.00	$ 400,000.00
2	Final Design	LS	1	$ 200,000.00	$ 200,000.00
3	Bidding Administration	LS	1	$ 15,000.00	$ 15,000.00
4	Construction Administration	LS	1	$ 250,000.00	$ 250,000.00
5	Resident Project Representative	LS	1	$ 1,200,000.00	$ 1,200,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 80,000.00	$ 80,000.00
				Subtotal	$ 2,145,000.00
				20% Contingency	$ 429,000.00
				NMGRT 8.1875%	$ 210,746.25
				Total	**$ 2,784,746.25**

Total Project Costs (w/o NMGRT) $ 16,053,752.50

Total Project Costs (w/ NMGRT) $ 20,841,784.18

Annual Cost per Year (over 5 years) $ 4,168,356.84

Town of Taos					
Treatment Facility Improvements - Phase IV					
Professional Services Costs					
Item No.	**Description**	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL PRICE**
1	Remove fertilizer equipment, convert to drive through building	LS	1	$500,000	$ 500,000.00
2	Move lab, upgrade Admin to ADA, remove pump station	LS	1	$250,000	$ 250,000.00
3	UV upgrade: add wall, enclose UV area	LS	1	$200,000	$ 200,000.00
5	Site Work, access roads, sidewalks, landscape	LS	1	$250,000	$ 250,000.00
6	Electrical and Control SCADA	LS	1	$190,000	$ 190,000.00
7	Parking Lot - MBR Building (Bid Alt 2 2010)	LS	1	$80,000	$ 80,000.00
8	Headworks Site Grading and Security improvements	LS	1	$55,000	$ 55,000.00
				Subtotal	$ 1,525,000.00
			20%	Contingency	$ 305,000.00
			NMGRT	8.1875%	$ 149,831.25
				Total	**$ 1,979,831.25**

Professional Services Costs					
Item No.	**Description**	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL PRICE**
1	Design (8%)	LS	1	$ 135,000.00	$ 135,000.00
2	Construction Management (6%)	LS	1	$ 100,000.00	$ 100,000.00
3	Additional Prof Services (geotechnical, mapping, structural evaluation, RPR, etc) (5%)	LS	1	$ 80,000.00	$ 80,000.00
5	Closeout (Record Drawings+O&M Manual)	LS	1	$ 15,000.00	$ 15,000.00
				Subtotal	$ 330,000.00
			20%	Contingency	$ 66,000.00
			NMGRT	8.1875%	$ 32,422.50
				Total	**$ 428,422.50**

Total Project Costs (w/o NMGRT)	**$ 1,855,000.00**
Total Project Costs (w/ NMGRT)	**$ 2,408,253.75**