November 2021

Preliminary Engineering Report
Water System Performance Improvements 2

City of Truth or Consequences, New Mexico

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Preliminary Engineering Report
Water System Performance Improvements 2
City of Truth or Consequences, New Mexico

Project No. 20-600-211-00

I, Mark A. Nasi, certify that I am a Licensed Professional Engineer, NMPE# 13076, and that this report was prepared by me or under my direction.

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11/30/2021

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1 PROJECT PLANNING

1.1 Overview

The City of Truth or Consequences (T or C) is in need of replacements to the water distribution system due to deterioration. Approximately 57% of the existing system is over 50-years old and has high system pressures with transient events that have led to extensive line breakages, which make operation and maintenance continuous and costly. Although the City has multiple wells, they are unable to move water between zones when a break or booster station failure occurs, creating a lack of system redundancy. **The Preliminary Engineering Report (PER) investigates the viability of fifteen water system alternatives to meet the demands of current and future water needs, within the area defined in Figure 7 by increasing the water supply redundancy, controlling the water pressure problems, and addressing the aging water distribution system.**

The City's water system has six supply wells all located at the southwest end of the system. . The system also has two booster stations, one designated as the "Cook St." booster station, and the other designated as the "Morgan St." booster station. Water coming out from the south part of the city is stored and boosted from the "Cook St." Facility to the "Morgan St" Facility, a second boost from "Morgan St." Facility to the Upper tanks on Cemetery road is needed to feed the entire water system. Based on the existing water system design, there is a current lack of redundancy of water supply for the northern area; given the case of either the Cook St. booster station or Morgan St. booster station fails. No treatment of the water is done beyond chlorine disinfection, as it is not necessary for these wells. The City's distribution system is in poor condition including water meters and fire hydrants that are in need of immediate replacement in several areas. The city also operates a small water system at the airport that is not chlorinated, pressure tanks are not functioning, and historical buildings are in need of drastic repair, along with the well head is not being properly protected.

This report was prepared in accordance with the requirements of USDA Rural Utilities Service Bulletin 1780-2, "Preliminary Engineering Reports for the Water and Waste Disposal Program" (4/4/13). The report addresses the City of T or C water distribution system.

1.2 Location

The City of Truth or Consequences (T or C), shown in **Figure 1** is in Sierra County in the southwestern part of New Mexico (NM), about 75 miles northwest of Las Cruces. T or C is the center of governmental and commercial activity in Sierra County. T or C is located at Latitude 33º8'1" N and Longitude 107º15'10" W. The City is at an elevation of 4,242 feet above mean sea level. The most populated nearby NM cities include Las Cruces (75 miles to the southeast) and Socorro (75 miles to the northeast).

The Village of Williamsburg neighbors to the Westside of T or C, and the City of T or C's water system serves the Village of Williamsburg. The southern, developed portion of T or C contains the entirety of the existing water system. Most of the northern portion of the T or C system included within the City Limits was recently acquired through annexation in 2003 and 2008. Additionally, the existing Municipal Airport Water System located near Truth or Consequences, was added under jurisdiction of the T or C Water Utility in 2018.

Figure 1: Vicinity Map

2 EXISTING CONDITIONS SUMMARY

2.1 Environmental Resources Present

An Environmental Report has not been prepared for this project. An Environmental Report will be completed at a future date contingent upon the specific funding agency requirements for the final project scope and selected final project alternative. This section of the Preliminary Engineering Report (PER) presents the required assessments of the "environmental resources present" in the study area. Important land resources surrounding and within the City include National Forest Land, Farmland, Stream crossings, and Cultural Resources. As the water system is already existing, no impact on any of the before mentioned environmental resources is present. Important water resources within the City's existing service area include floodplain associated with the Rio Grande. Below is a brief summary of the environmental resources present.

2.1.1 Farmland

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Resource Report (**Appendix 1**), approximately 69% of the soil composition within the City and surrounding area is classified as "Not Prime Farmland" and 26% is classified as "Farmland of Statewide Importance". Although only 26% of soils in the area are considered favorable for farming purposes, the proposed improvements are focused within already developed areas replacing existing infrastructure. Therefore, no impacts to farmland are anticipated by the proposed improvements. See **Exhibit 101** in **Appendix 1** for the USGS land cover map.

2.1.2 Forest Land

The City of Truth or Consequences is located more than 10 miles away from any forest lands, with the Cibola National Forrest being the closest roughly 20 miles north-west of the project. On the opposite side about a mile east, sits the Elephant Butte Reservoir State Park, directly south, adjacent to Williamsburg, is the Caballo Lake State Park. These lands are not directly impacted by the recommended improvements to the project area. Any other monuments or forests are greater than 20 miles away in any direction. See **Exhibit 103** in **Appendix 1** for the US forest service map.

2.1.3 Historic and Cultural Resources

Few historic sites were identified within or near the project area as listed in the New Mexico Historic Preservation Division (NMHPD) as shown on **Exhibit 104.** Direct impacts to historic built environment resources are not anticipated if low vibratory equipment is used near eligible or listed properties. Visual impacts are not anticipated due to the nature of the project being subsurface. Several archeological sites have been identified outside and adjacent to the project area, LA 1119, LA 49016, LA49030, LA50548, LA517, Chambers Canyon Site (LA 49028), Horse Island Site (LA48996), Kettle Top Butte Site (LA48995), Longbottom Canyon Site (LA49033), Monticello Point Archeological District, Palomas Narrows North (LA38755), and Palomas Narrows South (LA49007). These archeological sites are not available in the state database and further research is recommended, which may include a site update. The proposed improvements recommended by this PER will take place within previously disturbed areas and existing public rights-of-way and will have no effect on these properties.

2.1.4 Range Land

According to USGS, there are public lands in the T or C area used for ranching, grazing, mining, hunting, and fishing. The land use for this project in Truth or Consequences is residential, therefore there will be no negative impacts to any rangeland from recommended improvements to the project area. See **Exhibits** (**101-102**) in **Appendix 1** for the USGS land cover map.

2.1.5 Wetlands and Flood Plains

According to the Federal Emergency Management Agency's (FEMA) National Flood Hazard Layer (NFHL), significant areas of Truth or Consequences are within Zone A and AE (**Appendix 1- Exhibits 105 -106**). Zone A is designated as an area with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. This is due to the Rio Grande flowing through the southern and eastern end of the City. Erosion and sediment control plans will be set strictly in place to prevent construction activities from affecting the nearby Rio Grande.

2.1.6 Endangered Species

The ecological findings derived by the Biota Information System of New Mexico (BISON-M), provide a list of possible endangered and threatened species present in Sierra County. This list consists of 25 species, (See **Appendix 1**). According the U.S. Fish and Wildlife IPaC Resource list, the area of disturbance for any proposed construction for the City of Truth or Consequences does not contain any critical habitats. As the water system is already existing in developed areas, no impact is anticipated on any of these species or areas listed. Both lists are included in **Appendix 1**.

2.2 Impact on Surrounding Areas

2.2.1 Air Quality

Construction phase services would have a minor, temporary impact on local air quality. This would be mostly attributable to fugitive particulate matter ($PM_{2.5}$, PM_{10}) emissions resulting from the following activities:

- Construction and excavation activities such as grading and trenching.
- Dust track-out onto existing paved roads from construction areas.
- Processing and/or stockpiling of materials on-site prior to their use in the construction process.

During permanent operations, no anticipated source of significant air emissions would result. Due to the nature of the project, and since there are no new permanent stationary points of air emissions associated with the planned project activities, adverse air quality is not anticipated for the proposed improvements described herein. Emissions from project construction are anticipated to be minimal and would not jeopardize ambient air quality standards for any of the criteria pollutants. In addition, due to the topography and distance from the project site to the City proper, the prevailing wind directions and the minimal air emissions anticipated, there are no air impacts anticipated to adjacent property land receptors. Mitigation of construction phase particulate emissions is proposed below.

- Standard management practices for dust abatement is recommended to include water spray and/or moisture addition within proposed grading and/or trenching areas, periodic watering of stockpiles, moisture addition for aggregate processing equipment, and control of vehicle track out of dust and/or mud from non-paved onto paved areas.
- Alternatively, periodic sweeping and/or washing of areas subject to track out can be implemented. In addition, transport trucks carrying import or export soils and/or construction debris materials should be covered with a tarp.

2.2.2 Noise

Noise levels during construction will be intermittent and the result of construction equipment. To mitigate effects of noise levels, construction will take place during normal daytime hours. Once construction is completed, no additional noise levels are anticipated. If required, appropriate sound attenuation will be recommended to mitigate noise levels. Noise levels from proposed alternatives are expected to remain at current levels.

2.3 Population Trends

Table 1 below provides the 1970 thru 2010 US Census data for the City of Truth or Consequences as well as Sierra County. 2016 and 2018 data for both County and City are taken from annual population estimates also provided by the US Census due to census 2020 is in current development. **Figure 2** is a graphic representation of **Table 1** with projected populations from 2011 thru 2018.

Table 1: Population Data

Year of Census	T or C [1]	Sierra County [1]
1970	6,221	9,912
1980	5,219	8,454
1990	4,656	7,189
2000	7,289	13,270
2010	6,942	12,030
2016	6,444	11,191
2018	6,278	10,968

[1] Source: U.S .Census.

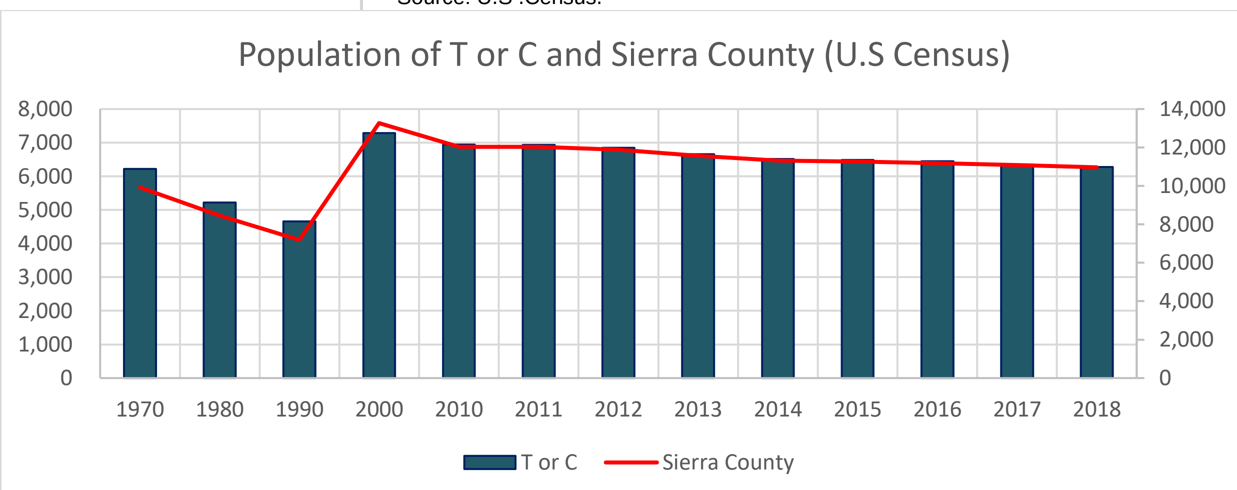

Figure 2 Population Data T or C and Sierra County

According to the US Census, the population of T or C grew from 6,221 people in the year 1970 to 7,289 people in the year 2000. Over this 30-year period, T or C's annual percent growth rate was approximately 0.33%. Growth experienced during this period can be attributed primarily to a large number of retirees that moved to the area. The 2010 Census originally reported the population of T or C as 7,289 but was revised in September 2010 to report the July 1, 2009 population as 6,942. For both T or C and Williamsburg, The decline in the recorded population during the decade can most likely be attributed to several factors: 1) Overall negative economic state of the nation in the second half of the decade, 2) downturn in the local economy caused by drought conditions in recent years and a related decrease in recreational tourist opportunities, and 3) the demographics of the two communities, where almost 30% of the population over 65 years of age.

The potential overall growth of Sierra County and its impact on the Project Planning Area also needs to be considered. As of July 1, 2010, the communities of T or C, Williamsburg, and Elephant Butte, which is located less than a mile northeast of T or C, made up 70% of the Sierra County population. It is reasonable to assume that the future growth rate of the communities in the Project Planning Area will be similar to the overall projected growth rate of Sierra County. The projected populations and growth rates of Sierra County for the years of 2010 to 2040 as determined by the Bureau of Business and Economic Research (BBER), are contained below in **Table 2.**

Table 2: Projected Population of Sierra County (BBER)

Year	*2010	*2015	2020	2030	2040
Population	11,988	12,020	12,048	12,218	12,737

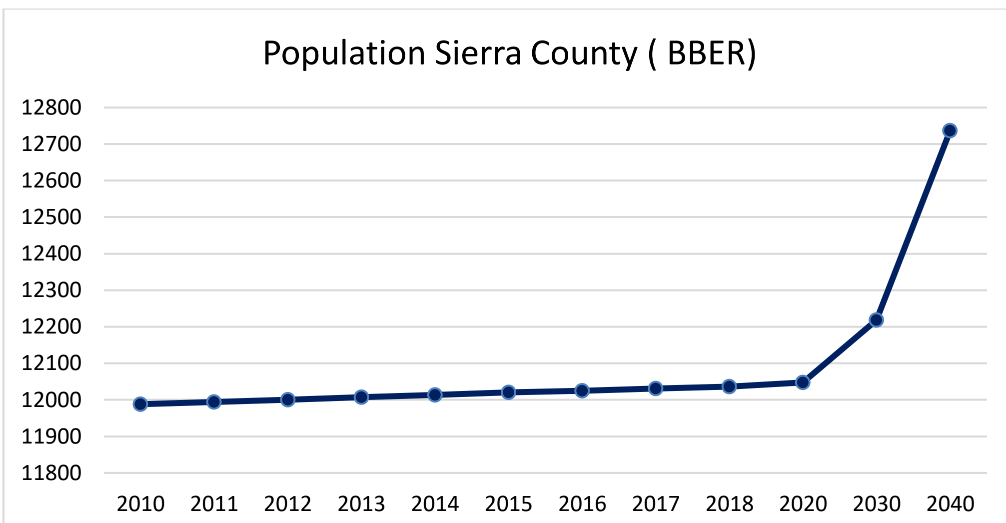

Figure 3: Projected Population of Sierra County (BBER)

Table 3: Projected Population of Sierra County and New Mexico (BBER)

Geographic Area	2005-2010	2010-2015	2015-2020	2020-2025	2025-2030	2030-2040
New Mexico	1.87	1.72	1.5	1.28	1.13	1.04
Sierra County	0.17	0.27	0.23	1.00	0.39	4.07

As **Table 1**, **Table 2**, and **Figure 3** indicate, the more recent projections on population growth from 2010 for the communities in the Project Planning Area are less aggressive than the projections from just a few years earlier. As shown in **Table 3**, the highest projected annual growth rate for Sierra County, over the next 25 years, is 4.07 %, occurring from 2030-2040. T or C itself experienced 1.61% average annual growth in the 1990s, an annual growth rate more than 2.5 times greater than what is currently projected for Sierra County, and is similar to what is currently projected For the State of New Mexico as a whole. Evidently, there is a wide range of population projections that have been made over the last ten years for Sierra County and the T or C area. Taking into account the available population data, three growth scenarios for the Project Planning Area through the year 2040 have been determined for comparison. Each of the growth scenarios represents growth of communities in the Project Planning Area at an average annual growth rate. The growth scenarios are as follows:

1. Linear Growth Scenario: Growth at an average annual rate of 0.033%. This scenario represents the growth in the Project Planning Area that would be expected to occur if future growth follows the pattern of what is projected for Sierra County for the period of 1970-2000 by the US Census.

2. **Low Growth Scenario** Growth at an average annual rate of 0.23%. This scenario represents the growth in the Project Planning Area that would be expected to occur if future growth follows the pattern of what is projected for Sierra County for the period of 2015-2020 by BBER.

3. **High Growth Scenario** Growth at an average annual rate of 1%. This scenario represents the growth in the Project Planning Area that would be expected to occur if future growth follows the pattern of what is projected for Sierra County for the period of 2020-2025 by BBER.

The population data for these growth scenarios and are shown in **Table 4** and in **Figure 4**. All of the population growth scenarios start with a total population for the Project Planning Area of 6,372 in 2010, which is based on the populations of T or C and Williamsburg reported July 1, 2010 by the US Census (see **Table 1**).

Table 4: Growth Projection Scenarios for Project Planning Area

Year	Linear Growth Scenario (0.033% Annual Growth)	Low Growth Scenario (0.23% Annual Growth)	High Growth Scenario (1.0% Annual Growth)
2010	6,953	7,022	7,289
2015	6,965	7,102	7,636
2020	6,976	7,181	7,983
2025	6,988	7,261	8,330
2030	6,999	7,341	8,678
2035	7,011	7,421	9,025
2040	7,022	7,501	9,372

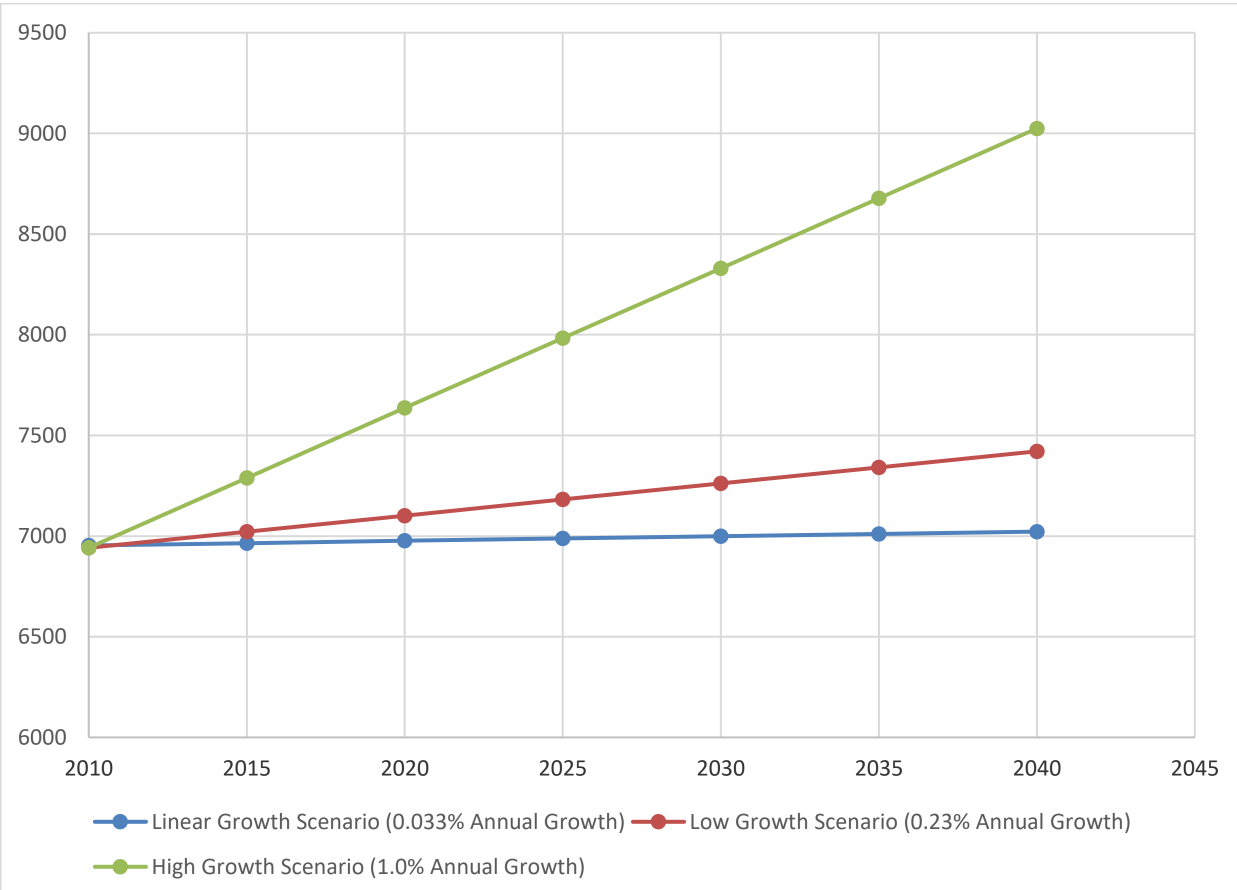

Figure 4: Growth Projection Scenarios for Project Planning Area

Comparison of the growth scenarios shows a very large difference between the High Growth and the Linear Growth scenarios. There is a risk that use of either one of these scenarios to predict future growth could result in significant over-sizing or under-sizing of new infrastructure, which must be avoided. Although recent population data suggests a decline in the future, BBER is projecting positive growth.

According to T or C officials and the current T or C Comprehensive Plan (2004), there are 4 areas where growth is expected in T or C and Williamsburg. The locations of these areas are in general agreement with a map of expected, future land use presented in the T or C Comprehensive Plan. None of the expected development is currently on-going or "on the books" to be done in the near future. All of these growth areas will generate water demand from the existing system. The identified growth areas are shown on **Figure 5** and are as follows:

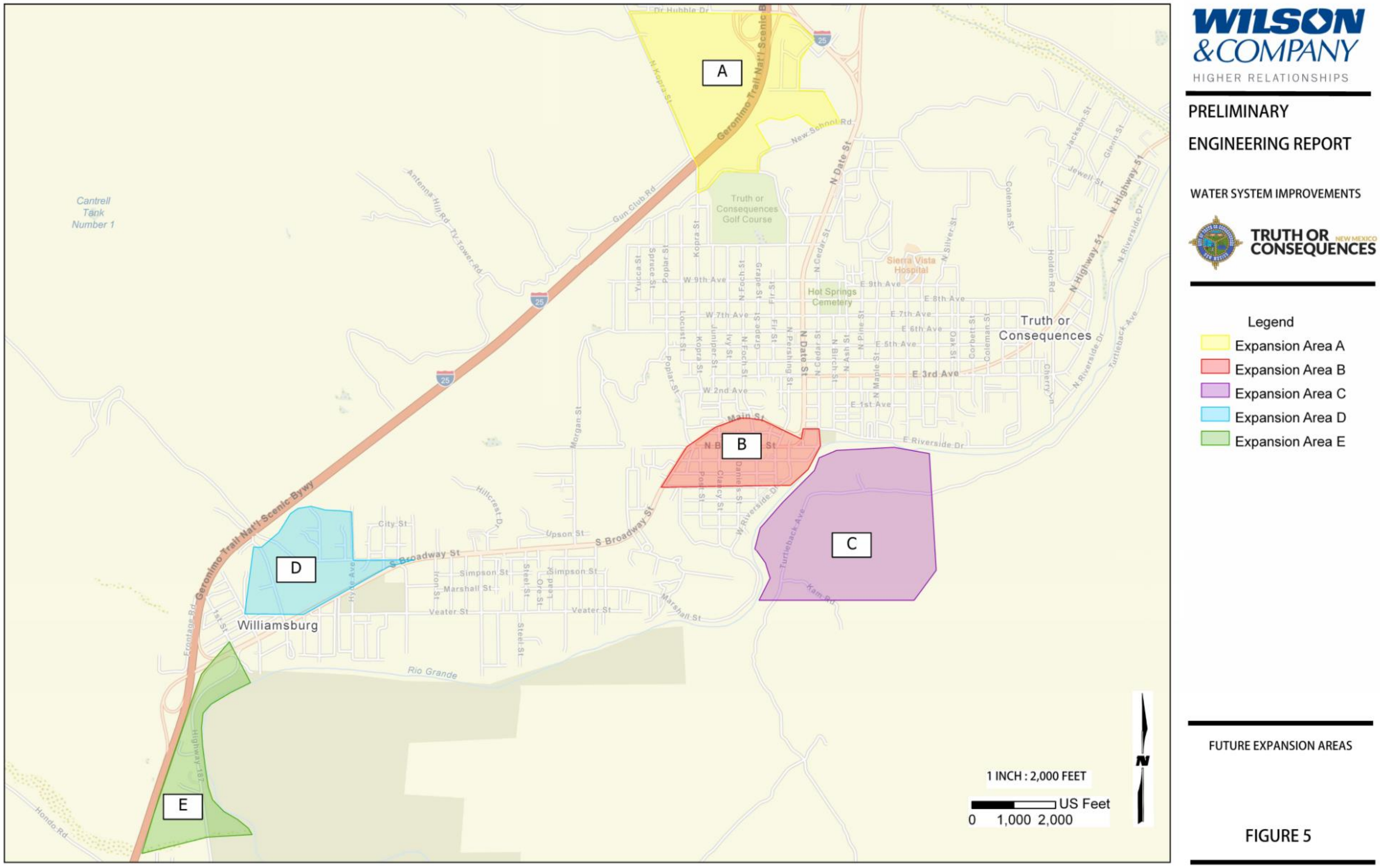

Figure 5: Identified Growth Area

a) In the area west of N. Date Street, in the vicinity of I-25, behind the Wal-Mart complex, there are preliminary plans for construction of a new hotel with approximately 115 rooms.
b) In the vicinity of Turtleback Avenue (east of West Riverside Dr. and south of East Riverside Rd. across the Rio Grande), preliminary plans are in place for a new housing development. Preliminary site utility design/layout has been implemented, but no construction has occurred or is imminent.
c) Development of a Business/Industrial Park along Broadway in the area south of Cook St. Is discussed in the 2004 T or C Comprehensive Plan.
d) In the area to the south of Williamsburg near I-25 and highway 187 along the Rio Grande, the 2004 T or C Comprehensive Plan discusses future development of this area.

Based on our understanding from T or C governance utilities officials, and the planned growth area discussed above, use of a 1% average annual growth rate seems most appropriate to predict future growth of the communities in the Project Planning Area. Application of the 1% average annual growth rate will result in a practical design for new water system improvements that also incorporate the short-term realities of economic growth. Therefore, for the purposes of planning improvements to the T or C water system, the High Growth Scenario of 1% average annual growth until the year 2040 will be used to project population growth in the Project Planning Area. As shown in **Table 4** and **Figure 4**, the resulting projected population of the Project Planning Area in 2040 is approximately 9,372.

The anticipated equivalent dwelling units anticipated for the next 20 years are as shown in **Table 5.**

Table 5: Equivalent Dwelling Units

Year	Residential Connections	Commercial Connections	Daily Demand (GPD)	Residential GPD	EDUs
2021	2,741	540	839,877	212	3,962
2023	2,824	556	865,326	212	4,082
2025	2,939	568	900,462	212	4,247
2030	3,151	596	965,417	212	4,554
2040	3,658	659	1,120,819	212	5,287

2.4 Community Engagement

The City of *T or C* has an established community involvement process built into the basic workings of the overall City management. City infrastructure issues, including those of the Water System, are routinely discussed in two public forums, the Public Utility Advisory Board (PUAB) Meetings and the City Commission Meetings. The PUAB Meetings occur once a month and the City Commission Meetings occur twice a month. The City will give public notice and hold a public meeting to inform the citizens about the project in accordance with the requirements of RD Instruction 1780.

3 EXISTING FACILITIES

3.1 Water System Overview & History

The distribution pipe network of the existing City's water system has components that date back to at least the 1930s, as evidenced by Work Projects Administration (WPA) emblems associated with waterline infrastructure around the City. The components of the distribution system were put in incrementally from the 1930s through the 2000s as the City expanded. Overall, many of the components that make up the Water System are old (more than 50 years in age), specifically the waterline pipes of the distribution system and several of the groundwater supply wells and their associated pumping systems. The current system is fed by several wells located in the southwest portion of the City. The wells are used to fill the Cook Street storage tank. From the Cooks Street storage tank, and by using its booster station, water is pumped into Morgan Street storage tank. The Morgan Street booster pump station, then pumps the water into the upper tanks located at Cemetery Road to feed the City's water distribution system. (**See Figure 6**)

In addition to the current pipe network system, in 2018 the City added the Municipal Airport water system, which dates back to at least the 1930's. The components of the system were located within buildings that have historical importance and must be preserved from any damage. The system is currently fed by a well located near the historical buildings. The distribution components at the airport are beyond their useful life and in need for replacement. (See **Exhibit 109** in **Appendix 6**)

The following summarizes the history and condition of the Water System components by category.

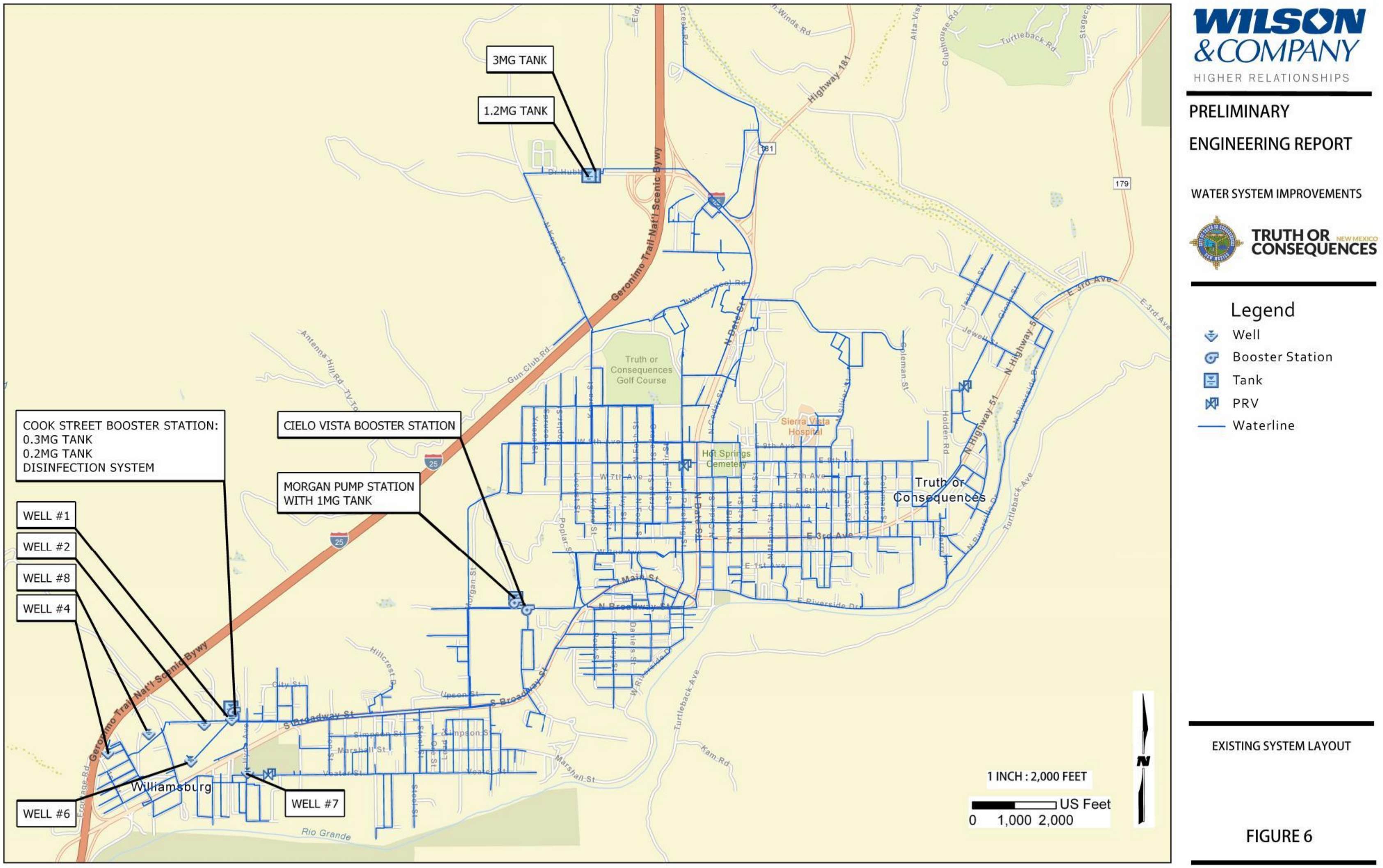

Figure 6: Existing System Layout

3.2 Condition

The City of T or C's Public Water System ID is NM 3514327. **Figure 7** for system layout

The city of T or C's Municipal Airport Water System ID is NM 3501427. **Figure 8** for system location

"The Asset Management Plan City of Truth or Consequences" for the existing water system was prepared by Smith Engineering in 2014, revised (2017)(Available upon request). Created an inventory of all the water system components with details on capacity, material, age, etc. and assessed the condition of the components based on age (remaining useful life), field investigations, and operator interviews, and water usage.

The Municipal Airport water system was recently activated as a public water system, its inventory of all water system components with details on material, capacity and condition were assessed as part of the PER and per sanitary survey report (**See Appendix 3**) by field investigations, operator interviews, and site visits. The following report section summarizes the condition, capacity/adequacy, and prioritizes replacement of the water system components, organized by component category.

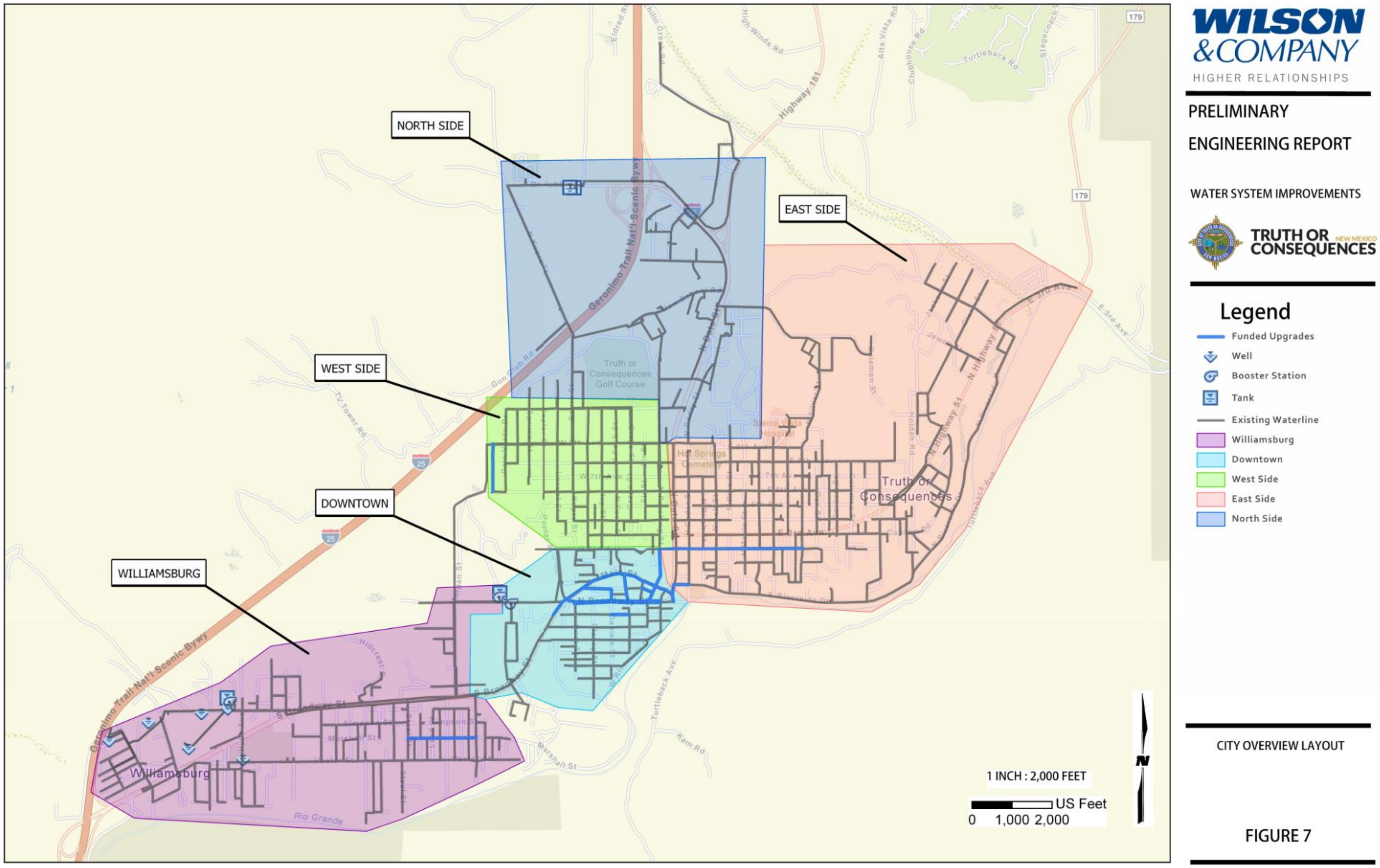

Figure 7: City Overview Layout

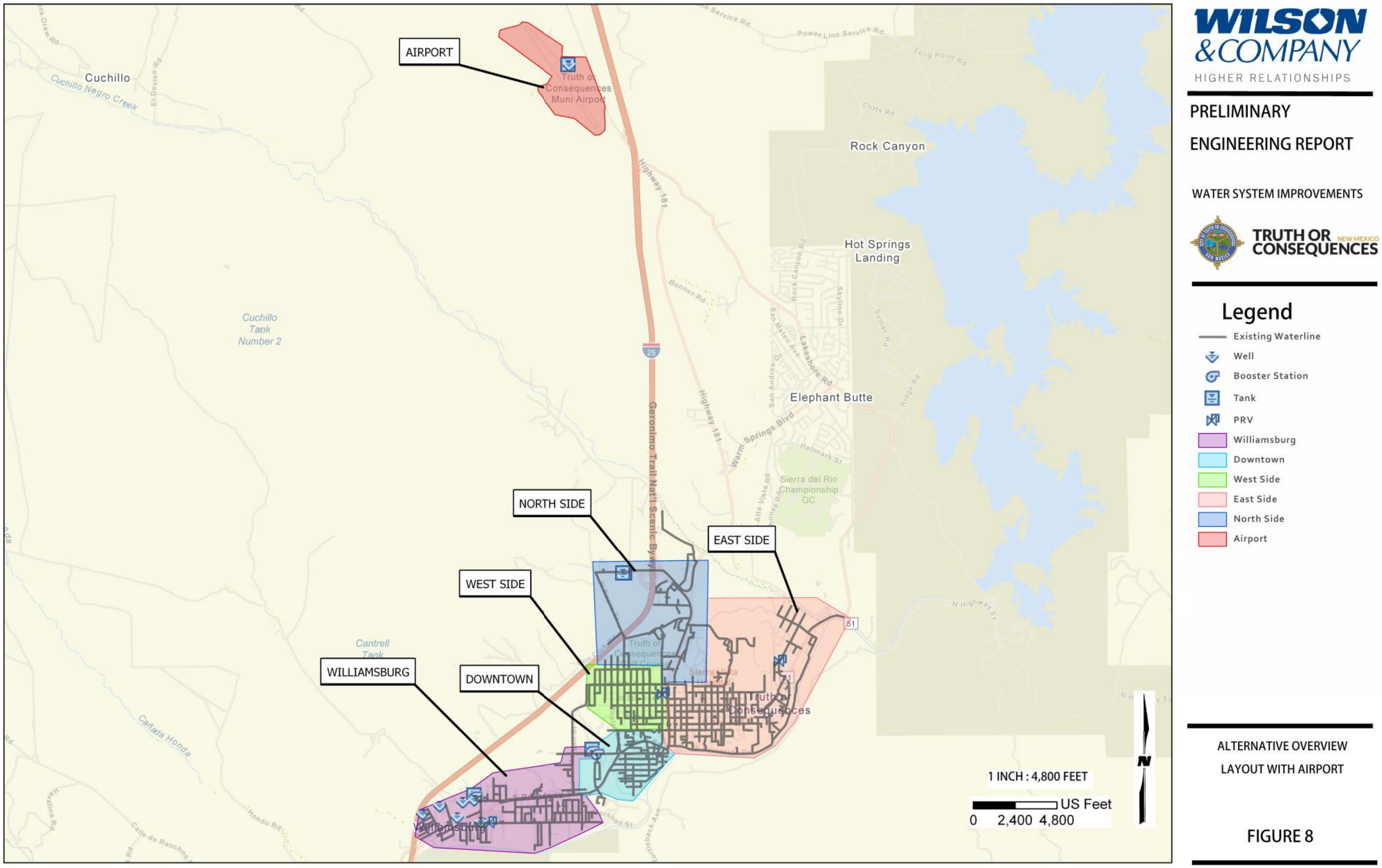

Figure 8: City Overview Layout W/ Airport

3.2.1 Distribution:

The existing water distribution type consists of waterline pipes, valves, Pressure Reducing Valves (PRV's), hydrants, Air Release Valve (ARV), and meters. Most of the overall water system components within the distribution system vary greatly in condition, primarily as a function of age and material. Many of the distribution system waterlines are considered to be beyond their expected useful life due to age and are considered to be in poor condition. As a result, these old waterlines are leaking significant amounts of water, increasing the overall operation and maintenance cost as well as decrease the overall energy efficiency of the system due to the need for more pumping.

The Water System GIS Inventory database contains records related to the distribution system. Currently, the distribution system provides water to a service area greater than five square miles including 3,538 water meters thorough the City. The City's Asset Management Plan shows that 239,046 linear feet (45.3 miles) of pipeline (approximately 57% of the system) consist of Asbestos Cement (AC), Cast Iron (CI) and Ductile Iron (DI) pipe.

The oldest pipe in the system is asbestos cement (AC) installed primary in the 1930s and again in the 1960s, representing approximately 28% of the distribution system. About 9% of the system is cast iron pipe (CI) that was installed primary in the 1940s and again in the 1970's which causes discoloration of the water system in certain areas of the City. Discoloration is not aesthetically pleasing to customers. 60% of waterline pipe is made of PVC, either schedule 40 or C900, installed throughout the 1970s to the 2000s. The schedule 40, which is a thin wall pipe is susceptible to breakage under pressure surges that are prevalent in the water system. Approximately 47% of the waterlines in the City are older than 50 years old, 59 % of the system is older than 40 years old and almost 77% of the City's waterline system is older than 30 years old. **Figure 9** shows the existing pipe material thorough the City.

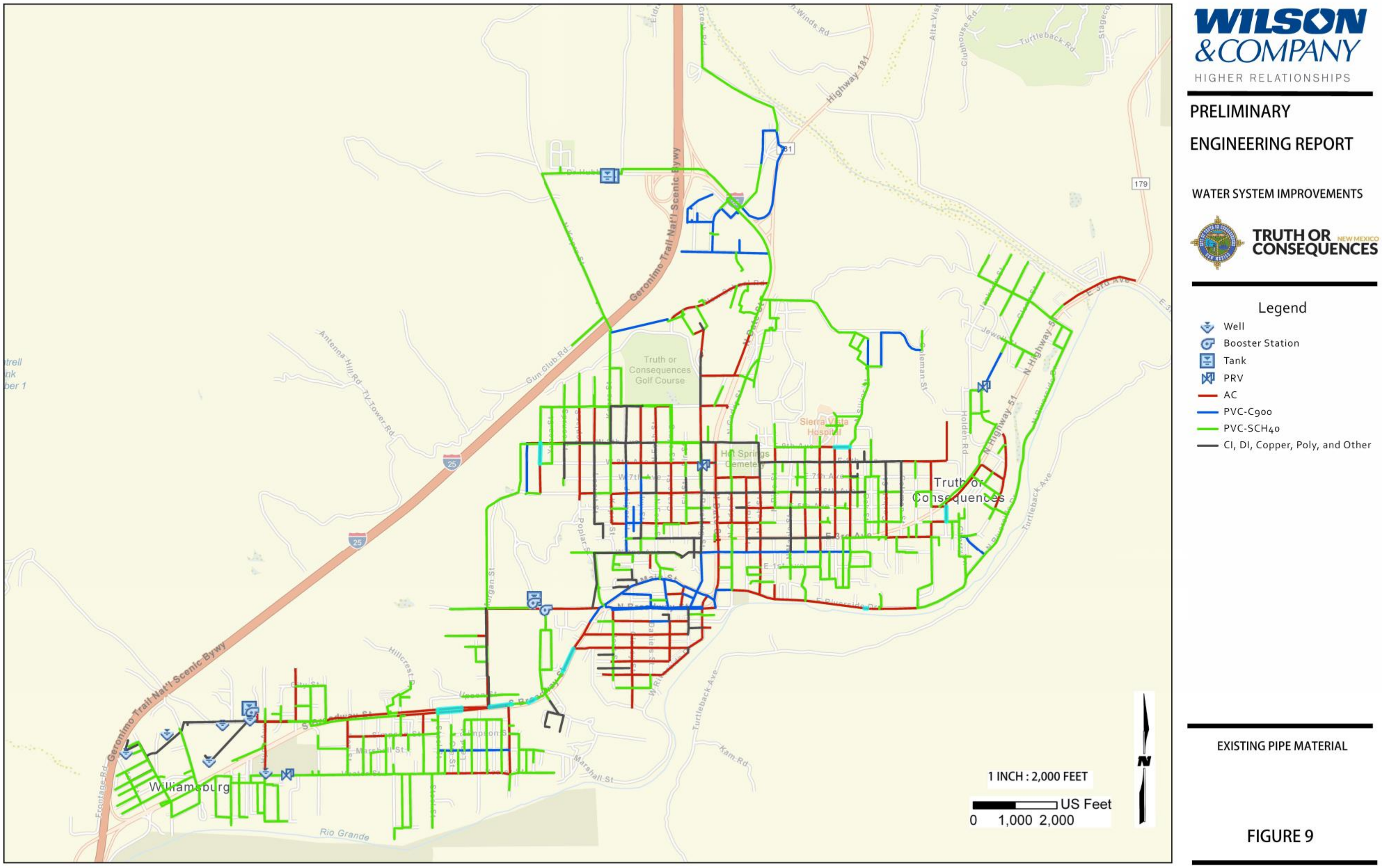

Figure 9: Existing Pipe Material

In 1930 the Initial waterline design for the City of Truth or Consequences satisfied fire flow requirements. Over the course of time, the expansion of the system and the addition of water service connections, coupled with changes in industry fire flow requirements, these requirements are no longer met. Presently, over 33.5% of the current system is under 6 Inch diameter trunk lines that cannot provide adequate pressure under peak demands and fire flow within some of the areas of the City.

The current pumping system arrangement does not have a dedicated transmission line, but instead utilizes the existing aging distribution pipelines to pump water from the Cook Street water storage facility to the Morgan Street water storage facility. The pressure fluctuation is approximately a 30-psi increase in the distribution system when the Cook Street booster pumps are running. The peak pressure surges are causing line breakages in the “Williamsburg” area since it is fed from this zone.

Current reports have shown that the implementation of the tank located in Cemetery Road has increase the water pressure of the system on the “West” area of the City, resulting in waterline breakages and blowouts in these areas. Water breaks are mostly seen when the storage tank is at full capacity. As a precaution, and to minimize waterline repairs, the City decided to only use the water storage tank at half capacity.

Operator interviews, City records, and show existing reports for the year of 2019 indicate 260 water breakages on the City’s water system, due to high pressure surges in mostly the “West” and “Williamsburg” areas. Breakages with an average cost of $1,000 dollars per break including the cost of manpower, materials, fuel, other city resources, road repairs, equipment and water/water loss. The total repair cost for the breaks in 2019 are broken down by; 1) manpower, materials, and fuel is 53% ($137,800.00) from the water utility budget. 2) other city resources and road repairs is 29% ($75,400.00) from other City budgets. 3) equipment and water/water loss is 18% ($46,800.00) which are inherent costs for perspective, such as and equipment hourly rate and the cost of water/water losses because of the break. These equipment and water/water loss cost do not come out of any of the city’s budget but are inherent cost of a waterline break. Thus, the actual cost to the City’s water operation and maintenance expenses has an approximate value of $137,800.00 in 2019, which came from salaries/benefits, repair/maintenance, and supplies.

Water breakages in the City have been a noticeable issue due to added monetary expenses as well as water leakages within the piping system. In addition, a water Mass Balance calculation of years 2016-2019 was completed to estimate the System's approximate water loss percent to estimate condition of the existing water system.

Table 6: System's Approximate Water Loss Percent

Year	Total Water Production (Gallons)	Total Water Consumption (Gallons)	Difference (Gallons)	Water loss Percent
2016	421,281,718	316,158,000	105,123,718	25%
2017	425,646,000	316,963,000	108,683,000	26%
2018	443,881,000	302,863,000	141,018,000	32%
2019	454,209,000	326,675,000	127,534,000	28%

As is shown in the above **Table 6**, the water system in 2016 had a loss of 25% and in 2019 that loss percentage increased by almost 3%. The current year of 2019 report had 260 water breakages that can foreseeably increase the water leakage in the years to come.

3.2.2 Fire Hydrant:

The existing fire hydrant system was installed between 1960's and 2000's. A 2013 report IMS by Hurco Technologies Inc. for the City of Truth or consequences fire department presents some flaws concerning residual pressures, age, and fire flow requirements. The system is currently represented by 7.8% of the hydrants are older than 50 years, 20% of the hydrants are older than 40 years, and 35 % of the hydrants are older than 30 years. A big portion of the system is reaching its useful life.

Additionally, Emergency Services Administrator/Sierra county Fire Marshall and the National Fire Protection Association (NFPA) codes, the municipal fire flow should be at least 1,500-gpm with a residual adjacent pressure not less than 20-psi. A report provided by the City's Fire Marshall Indicate 5.36% of the fire hydrants are running with a fire flow below 1500 GPM, and 46% of the hydrants have fire flow below 20 psi. The deficiency of pressure on the fire hydrants also can be affected because 33.5% of the waterline in the City is under 6 Inch diameter. Other minimal diameter trunk lines throughout the City cannot meet the requirement. For further hydrant breakdown report see **Appendix 9,** Additional Fire Hydrant testing report available upon request.

3.2.3 Water Meter:

Truth or Consequences distribution system currently provides water service to 3,538 active water meters. Current field investigations, and operator interviews indicate that meters are approximately older than 30-40 years old exceeding their useful life. Meter changes are randomized and replaced on an as needed basis. Furthermore, water meter are currently read manually which increases the operation and maintenance cost for the City.

3.2.4 Wells:

The existing water supply for the T or C water system is entirely from six wells located in the southwest portion the system. At present, all the groundwater supply wells are producing consistently except for Well No. 4, and Well No. 8 which are currently off-line. The combined production capacity of the wells is adequate to meet the anticipated current demands and the wells are suitable for continued use.

Table 7: Well Information

WELL NO.	WATER WATCH ID	ELEVATIONS	WATER PUMP RATE (GPM)	WELL DIAMETER (IN.)	DEPTH OF WELL (FT.)	DEPTH OF THE WATER INSIDE (FT.)
1	HS 001151	4248	475	20	400	38
2	VHS 00011 or HS 00011-S	4248	350	12.75	405	43
4*	HS-0011-S-5/HS-00019	4269	200	10	355	0
6	HS 01059	4244	575	12.75	414	52
7	HS 01059	4237	725	12 to 18	431	69
8*	HS 00011-S-9	4264	725	12 to 18	367	5

** wells currently offline*

**Drinking Water watch website #NM3514327*

Well No. 2 and Well No. 4 are the oldest wells in the system, installed in 1945 and 1958, respectively. Well No. 6 is the next oldest well, installed in 1976. The other three wells were all installed in the 1990's and are relatively new. Well No. 4 and Well No. 8 are out of service. City's water maintenance group stated that Well No. 4 had lower pumping rates than expected and its running cost was exceeding the budget. Additionally, Well No. 8 casing slipped causing the well to be inoperable Well No. 8 it is planned to be evaluated and repaired in 2020, if possible.

The Initial design for the water system of the City of T or C met the terms with the water supply based on the City's location and low expansion. But during the course of time, the expansion and escalation in water service connections in different areas of the City has changed the initial requirement. The system currently has a total of six wells, all of them located on the southwest portion of the City. The location of these wells determines the pumping system design to transfer water to three different tanks from the southern part (Cook Street), to the middle part (Morgan Street), and to the north part (Cemetery Road). The water transfer between the three zones does not allow for water supply redundancy and increases the failure potential for long water outages in the future.

3.2.5 Pump System:

Pump systems include the following: pumps, motors, manifolds/valves, flow meters, and all associated electrical components. There are essentially two distinct pump systems, separate from the well submersible pumps, currently used to transfer water from the supply wells to the storage tanks and distribution throughout the water system. The two distinct pump systems are the following:

1. Cook Street Treatment Facility Pump Station
2. Morgan Booster Station

The Cook Street Facility was constructed in 1996 and has two 250-Hp centrifugal pumps. To address water-hammer issues, a new soft-start system and a new electrical system for the two original pumps was installed in early 2014.

The Morgan Booster Station was constructed in 2007. The transfer switch for the electrical system of Morgan Booster Station was replaced in 2013. Replacement of various gauges, valves, and flow meters, as well as motor repairs/modifications, have occurred for multiple pumps systems throughout the years the water system has been operating. Other than what has been previously mentioned, no major pump system replacements have occurred. Morgan Street pumps have failed but the system will be upgraded in 2021.

The individual pump systems of the overall water system all have adequate capacity to provide the expected level of service and were designed in a manner which allows them to be suitable for continued use in the future. In general, the pump systems operate in an energy-efficient manner with the exception of the large booster pumps at the Cook Street Treatment Facility Pump Station. The current operations at the Cook Street Pump Station result in frequent start/stop cycles of the large 250 HP pumps due net flow of the facility and the small volume of on-site storage.

The City currently has a project that includes improvements to the Cook Street Facility and waterlines in the Downtown area. The Cook Street improvements will double the on-site storage and equip the existing 250HP booster pumps with new VFD controllers to run the pumps between 1,000 GPM and 3,000 GPM (full capacity). This will extend the run times of the pumps and reduce the head loss in the water system when the pumps are running at a lower capacity, instead of when the pumps are running 3,000 GPM (full capacity), with a total dynamic head of 192.3 TDH (a pressure differential of 30 PSI). The total dynamic head when the pumps are running at 1,000 GPM is estimated to be 134.6 TDH (a differential pressure of 5 psi). Improvements for the existing system also include the replacement of Cla-Val Valves with micro switches, Hydraulic Check Valves, concrete repair, new electric heater, and a new Digital Mag Flow meter on the booster station outlet.

3.2.6 Well Pumps:

Corresponding to the oldest well, the oldest pump system is the one for Well No.1 and No. 2, originally installed in 1945. The existing pumps system for Well No.1 and No. 2 is not thought to be the original system from the 1940's, but rather a newer system installed in the 1980's and 1960's respectively. Due to age, the original pump system for Well No. 4 was replaced in 2001 with the current pump system. Similarly, the pump system for Well No. 6 was replaced in 1999 with the current pump system. The existing pump systems for Wells No. 7 and No. 8 were installed new as part of the same project in 1999.

The individual pump systems of the overall water system all have adequate capacity to provide the expected level of service and were designed in a manner which allows them to be suitable for continued use in the future.

3.2.7 Water system SCADA:

Operation of the different pump systems and storage tanks that make up the existing water system is coordinated and controlled using a Supervisory Control and Data Acquisition (SCADA) system with the master control computer located at the T or C WWTP. The hardware and software of the system was initially installed in 1997. Since installation, the SCADA software and computer have been upgraded several times. In contrast, all the existing communication remote terminal units (RTUs), located throughout the Water System at the various pump system and storage tanks sites, are the original units from 1997. The City currently has a project to upgrade the SCADA system in 2022. The plan is to upgrade and incorporate in-to the new WWTP

SCADA/HMI system to be fully compatible with the same equipment used for the WWTP system. RTU's will be replaced/upgraded at all locations.

3.2.8 Disinfection System:

The existing disinfection system is a gas-chlorination system, located at the Cook Street Facility. The chlorination system, including all associated piping, equipment, and fiberglass housing (shed) was installed in 1996, at the same time the rest of the facility was constructed. This system is old and beyond its expected useful life. The City is currently replacing the gas chlorination system in its entirety with the Cook Street Facility Improvements project.

3.2.9 Buildings:

The existing T or C water system includes various buildings, primarily used to house pump systems. The water system buildings are as follows:

1. Cook Street Treatment Facility Pump Station Building
2. Cook Street Treatment Facility Storage Building
3. Morgan Street Booster Station

Another existing old building is the one that used to be the Pershing Pump House, estimated to have been constructed in 1945. This building no longer contains pumps but is used to house a critical pressure-reducing valve that separates the upper pressure zone of the water system from the lower pressure zone.

The existing Cook St. Treatment Facility Pump Station Building was constructed in 1996. The existing Storage Building located at the Cook St. Facility site predates the facility and is much older, estimated to have been constructed in the mid-1970s.

The Well pump houses for Wells No. 6, No. 7, and No. 8 were all constructed in 1999 as part of the same project as the pump upgrades. As a result, these building are some of the newest existing buildings of the water system.

The Morgan Booster Pump is the newest building in the water system. This building was constructed in 2007 as part of the overall Morgan Booster Station project in which the pump system, including electrical components and the back-up generator, were installed.

3.2.10 Storage Tank

The existing water system includes the following four operational storage tanks:

1. 0.2 MG Storage Tank, located at Cook Street Treatment Facility
2. 1.2 MG Storage Tank, located on Cemetery Road
3. 3.0 MG Storage Tank, located on Cemetery Road
4. 3.0 MG Storage Tank, located next to Morgan Booster Station

The oldest operational storage tank is the 3.0 MG tank located on Cemetery Road, which was originally constructed in 1978 to provide storage and pressure for the upper distribution zone of the water system. Due to age and corrosion, the tank underwent major rehabilitation and repair including sandblasting, re-priming/repainting, new hatches, access ladders, and cathodic protection in 2013.

The 0.2 MG storage tank located at Cook Street Treatment Facility was constructed at the same time as the rest of the facility, in 1996, and is used to store and transfer chlorinated water to the distribution system and the Morgan storage tank. Due to age, the tank underwent minor repairs in 2012, including new hatches, access ladders and cathodic protection.

The newest operational storage tanks are the 1.2 MG tank located on Cemetery Road and the 3.0 MG tank located next at the Morgan Booster Pump Station, both of which were constructed in 2004. The 1.2 MG tank was added to the water system to provide additional storage and a back-up tank for the upper distribution zone and sits next to older 3.0 MG tank. The newest 3.0 MG tank at the Morgan Street site was added to the water system to provide storage and pressure for the lower distribution zone.

All of the storage tanks have been rehabilitated or installed as new within the last ten years and are in excellent condition. As a result, none of the storage tanks have been scheduled for significant repair or rehabilitation in the next 10 years.

All the storage tanks have been designed with the proper capacity to be suitable for many more years of use, except for the 0.200 MG storage transfer tank at the Cook Street Treatment Facility. The capacity of the tank appears to be undersized resulting in excessive start/stop cycles of the booster pumps that operate with the tank. Improvements to the Cook Street Facility equipment and operations are presently under design and scheduled to be constructed in 2022. In addition to the pump improvements previously discussed, a new additional ground 300,000-gallon steel water storage tank is planned at the Cook Street Booster Station site on year 2022. This tank is to increase the storage capacity at the site to reduce the pump on/off cycles of the booster pumps and increase the run time of the booster pumps. And will extend the life of the existing booster pumps

3.2.11 Municipal Airport Water System:

The existing Municipal Airport Water System was recently added under jurisdiction of the T or C Water Utility and must comply with all the relevant rules and regulations for the public water system. The Municipal Airport water system has been classified as a Non-Community water system with a transient population of 40. Current field investigations, and operator interviews indicates the system is located in an estimate of three Historical buildings. Inside of these historical buildings there are different parts of the existing water system including water pump, vault, control room, pressure gage, meter valve, electrical system, and pressure storage tank. The system is currently presenting a pressure issues, electrical outages, as well as pressure tank bladder issues. (See **Exhibit 109** in **Appendix 6**)

The system is currently in poor conditions and it needs a replacement and the installation of a storage tank to prevent water pumps burnout. The City expressed the importance of preserving these buildings because of its historical status.

3.3 Financial Status of Existing Facilities

3.3.1 Current Energy Consumption

The current energy consumption for the T or C water system is shown the City's FY 19/20 Budget under the Utilities Line item. It is our understanding that electrical power is the only item under utilities. While specific consumption is not known, the total water system consumption can be back calculated using an average rate of $0.07/kWh. The estimated energy consumption is as follows in **Table 8**:

Table 8: Estimated Energy Consumption

FY	Budget	Rate($/kWh)	Est. QTY(kWh)
13/14	$138,833.00	$0.07	198,329
14/15	$124,941.00	$0.07	1,784,871
15/16	$107,944.00	$0.07	1,542,057
16/17	$98,141.00	$0.07	1,402,014
17/18	$91,277.00	$0.07	1,303,243
18/19	$131,825.00	$0.07	1,883,243
19/20	$95,000.00	$0.07	1,357,143
AVG	**$112,565.86**		**1,352,986**

3.3.2 Existing Asset Management Plan

The Asset management Plan for the existing water system of the City of Truth or Consequences was prepared by Smith Engineering in 2014, revised (2017). (Available upon request)

3.3.3 Revenue

The current source of revenue is from utility billings provided by the City of T or C's residents for water system services. The utility rate structure is broken out below in **Table 9** as provided by the City's database.

3.3.4 Operations and Maintenance Cost

Table 9 Shows the operating revenue and operating expenses of the T or C Water System for FY 2011/12 through FY 2019/20. As of December 2019, the water system generates revenue from a total of 56 governmental connections, 481 commercial connections, 3 industrial connection, and 2741 residential connections. As indicated in **Table 9**, from FY 2017/18 to FY 2018/19, the annual water system revenue was very consistent as were the annual operating expenses. In general, the T or C Water System generates adequate annual revenue to cover what is included in its current operating expenses

Table 9: T or C Water System Five-Year Financial Data

	Item	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Operating Revenue	Revenue from Water Utility Service connections	$934,957	$957,153	$72,952	$1,006,193	$955,250	$945,330	$1,057,195	$1,404,617
	Revenue from Other Water System services	$2,380	$4,043	$0	$298	$0	$3,706	$0	$20,740
	TOTAL REVENUE	**$937,337**	**$961,196**	**$72,952**	**$1,006,491**	**$955,250**	**$949,036**	**$1,057,195**	**$1,425,357**
	Item	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Operating Expenses	Salaries/Benefits	$336,137	$281,136	$242,237	$207,723	$281,860	$272,138	$277,130	$257,796
	Supplies	$25,478	$16,788	$14,746	$13,189	$18,126	$35,933	$24,700	$95,057
	Office	$493	$1,087	$76	$2,114	$1,812	$1,529	$3,500	$2,055
	Testing	$0	$0	$0	$0	$89	$3,743	$2,000	$0
	Repair/Maintenance	$87,982	$72,599	$104,081	$92,701	$59,214	$44,430	$91,000	$131,528
	Tax	$40,399	$40,248	$44,902	$42,302	$42,905	$42,587	$44,000	$58,451
	Utilities	$139,795	$126,205	$109,449	$99,672	$92,736	$133,268	$96,000	$119,276
	Professional Fees	$0	$0	$4,215	$12,950	$53,278	$30,434	$22,350	$21,661
	Equipment (Incl. Rental)	$5,010	$1,906	$3,426	$3,313	$3,593	$3,880	$3,000	$18,147
	Accounting	$37,257	$38,159	$37,691	$49,307	$51,792	$50,765	$58,958	$34,269
	Employee Training	$0	$0	$0	$0	$0	$4,564	$4,000	$1,185
	Non-Capital Equipment	$13,078	$11,720	$12,294	$12,676	$12,880	$13,632	$10,000	$4,847
	water Conservation	$2,046	$1,218	$715	$1,461	$1,385	$550	$4,000	$14,756
	Miscellaneous	$0	$0	$0	$0	$2,098	$0	$0	$0
	Capital outlay-Machinery & Equipment	$55,565	$23,748	$28,500	$0	$79,000	$48,938	$103,000	$95,542
	Jt. Utility Office Support	$27,261	$24,000	$33,000	$44,400	$86,200	$82,130	$59,740	$50,962
	TOTAL OPERATING EXPENSES	**$770,501**	**$638,814**	**$635,332**	**$581,808**	**$786,968**	**$768,521**	**$803,378**	**$905,532**

**Reconciled amount from T or C utilities department*

3.3.5 Planned Capital Improvements

Other capital improvements the City of T or C plans to undergo include enhancements to the entire downtown area as described in the City of Truth or Consequences Downtown Master Plan. As the economy of T or C is driven primarily by tourism, recreation, and the business which support the retirement communities, the upgrades set out by the master plan will create a more inviting and attractive destination for visitors as well as residents. Ensuring that the water system is upgraded prior to additional downtown improvements is vital.

3.3.6 Existing Debt

At present, the water system also has outstanding debt in the form of nine loans, which are shown below in **Table 10.** The total of the nine annual loan repayment amounts is approximately $557,197.

Table 10: T or C Existing Debt

Owed To	Purpose	Balance Owed	Maturity Date	Annual Payment	Annual Reserve	Outstanding Balance Sept 2020	Interest Rate
NMFA TorC17/WTB-229)	Ground Storage	$256,000	2032	$13,138	N/A	$13,138	2.50%
NMFA (TorC18)	Ground Storage	$165,741	2032	$8,287	$8,200	$99,445	0.00%
NMFA (TorC19)	Water Rev Bonds (95,96,98)	$1,424,865	2033	$91,185	$91,500	$949,380	2.90%
NMFA (TorC22/WTB-292)	Water PER/AMP	$64,000	2033	$3,380	N/A	$43,185	0.00%
NMED Loa*n 95-16	Improvements to system	$504,483	2022	$33,909	N/A	$64,884	3.00%
NMFA DW-4794	High Risk Waterline Replacement	$620,543	2041	$31,866	N/A	$620,543	2.50%
CIF-4927	Water Sytem PER	$9,000	2041	$450	N/A	$9,000	0.00%
NMFA (WPF-5089)	Boostr System Improvements Loan	$264,155	2042	$13,208	N/A	$264,155	2.50%
USDA	MSD Project	$5,487,000	2059	$204,598	$204,598	$5,487,000	2.13%
USDA RD	Water System Performance Improvements (WSPI-1)	$4,811,000	2061	$157,176	$15,718	$4,811,000	2.13%
	TOTAL	**$13,606,787**		**$557,197**	**$320,016**		

**Loan to be paid in 2022*

3.3.7 Water Connections

The below **Table 11** provides a tabulation of water connections for the fiscal year 2019/2020 as provided by the City of T or C's Billed Consumption reports.

Table 11: Number of Water Connections (FY 2018/2019)

T or C Water Connections	
Type	Connections
Residential	2516
Commercial	464
City	56
Industrial	3
Williamsburg Water Connection	
Type	Connections
Residential	225
Commercial	17
TOTAL	3281

3.3.8 Water/Energy/Waste Audits

Per the request from the Office of the State Engineer a water audit was necessary for the Water Conservation Plan Verification. An audit was performed on the water system providing 33-percent of losses in the existing water system for the years 2015 and 2016. In order to compare performance of previous years a water system a Mass Balance calculation of 2016-2018 was completed estimating an average of 38-percent of losses. Percent losses have increased during the past three years approximately 5-percent, this five percent could be a result of the poor conditions of the system.

4 NEED FOR PROJECT

4.1 Water System - Health, Sanitation, and Security

The need for the project is due to aging infrastructure inadequate pipe sizes to provide consistent water pressure and adequate fire flow throw-out the City along with addressing reasonable growth discussed within the following sections

4.1.1 Health, Sanitation, Security issues

The health and safety of the citizens of T or C is of great importance when considering future community growth and development. At present, the City Water System is not in compliance with the water quality regulations of the NMED Drinking Water Bureau and has nine compliance issues in recent years of 2018/2019 (See **Appendix 10**). All the critical components of the system responsible for the delivery of good quality, and properly disinfected water to consumers are currently in poor working condition but is being update in 2020 and have appropriate security (fences, lights, etc.).

As another means to protect the health and safety of the public, efforts should be made to ensure proper fire flow capacity in areas of the City that are planned to have new development redevelopment, or scheduled waterline replacement. Since the City is planning to redevelop critical areas in the very near future, the associated planned improvements to waterlines in these areas should be done in a manner to provide proper fire flow to protect the public.

The area on the west side of the City is fed by the Cemetery Road Tank that is prone to water line breaks when the tank is full. This situation produces a health and safety issues, as there is not a continuous supply capacity for on this specific area. Break on the pipes affects not only households but also critical facilities such as high school and hospitals.

During the year 2019, existing reports indicated 260 waterline breakages on the city's water system, most of which are located on the "East," "West," "Williamsburg," and "Downtown" areas of the city. These continuous breakages represent a health and sanitation issue within the city's residents due to water outages that usually range from 4-6 hours while the city crew makes the repairs. An average of 20 -30 residents are affected per each water line repair.

4.1.2 Aging Infrastructure

Aging water infrastructure is the main justification for this project. The condition of the aging infrastructure is corroborated by information provided to Wilson & Company from system operators, and the condition assessment as included in the Water System GIS Inventory database that contains records related to the distribution system. The City intends to redevelop a significant portion of the main transmission lines to provide accurate water distribution flow and prevent high pressures around the city. The development of the “System Performance Upgrade “area includes many planned improvements to infrastructure. Primary elements of infrastructure to be improved are waterlines, valves, fire hydrants, PRV’s, and improved redundancy of water supply to critical storage tanks.

Water system mass balance calculations from years 2016, 2017, 2018 and 2019 show loses of 25%, 26%, 32% and 28% respectively in the system. This can be attributed to water line breaks throughout the system. The high number of breaks results in emergency repairs and high maintenance costs. The increase consequence of failure also adds to the high cost.

Additionally, the existing reports for the year of 2019 shows the system had 260 water breakages attributed to high pressures in the system and mostly occurred in the “Williamsburg” area. Breakages with an average cost of $1,000 dollars per break including the cost of manpower, materials, fuel, other city resources, road repairs, equipment, and water/water loss. The total repair cost for the breaks in 2019 are broken down by; 1) manpower, materials, and fuel is 53% ($137,800.00) from the water utility budget. 2) other city resources and road repairs is 29% ($75,400.00) from other City budgets. 3) equipment and water/water loss is 18% ($46,800.00) which are inherent costs for perspective, such as and equipment hourly rate and the cost of water/water losses because of the break. These equipment and water/water loss cost do not come out of any of the city’s budget but are inherent cost of a waterline break. Thus, the actual cost to the City’s water operation and maintenance expenses has an approximate value of $137,800.00 in 2019, which came from salaries/benefits, repair/maintenance, and supplies.

The Municipal Airport Water System operated by the City does not have a chlorination system, the pressure tanks are not functioning, existing well head is not properly protected, and the historical buildings are in need improvements due its aging and poor condition.

4.1.3 Reasonable Growth

The water system needs to have adequate water supply to meet consumer demand and the ability to distribute safe water to all the end-users of the system. As a result, appropriate improvements to the overall system need to be made to ensure efficient system performance.

Table 12: 2009-2019 Annual Water System GPD/Connection

Year	System GPCD
2009	NA
2010	142
2011	170
2012	195
2013	205
2014	203
2015	189
2017	200
2019	212
Average	**190**

Anticipated future water demand on the overall water system can be estimated by combining historical water usage data, and population projections. As discussed in this report, the future population of the project planning area in 2040 is estimated to be 9,372. Evaluation of recent historical water system production records show a water demand of Gallons per day per connection (GPD) of 212.**Table 12**. A water audit completed in 2014 shows the monthly peaking factor to be 1.71.

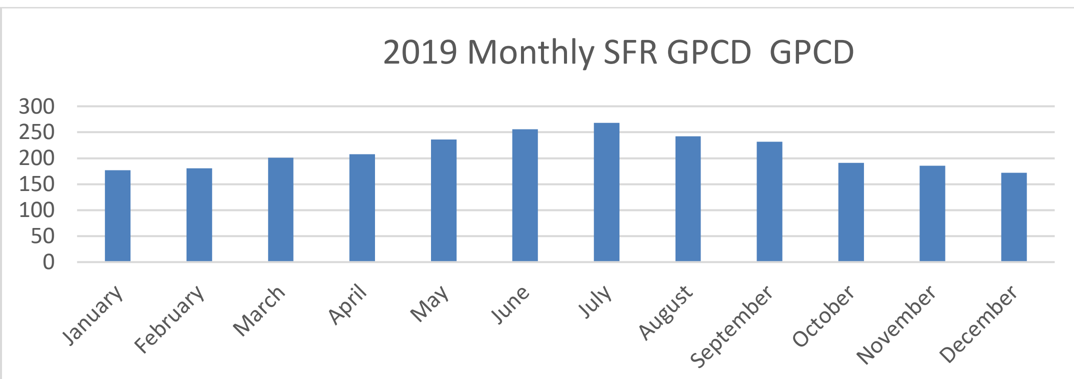

Figure 10: 2019 Monthly GPD/Connection

5 ALTERNATIVES CONSIDERED

5.1 Water System Description

Eleven alternatives are considered in this PER to address the aging infrastructure, material type, pressure problems, and water supply redundancy in the City's water system. There are four additional alternatives considered for the Municipal Airport Water system.

5.1.1 Design Criteria

To determine the best approach for water line rehabilitation, three methods were evaluated in this report. Although there are several methods of water line rehabilitation, several were determined to be infeasible and are not considered. The following methods were eliminated prior to full evaluation:

- Pipe Bursting: Pipe bursting option allows water main installation without roadway disruption, however the service interruption caused would be unacceptable and customers would be without water for long periods while the Contractor is, pipe bursting, resorting water service to the main and re-connecting service lines. Pipe Bursting is more cost effective on transmission lines that run point to point with minimal connections but becomes expensive and evasive when considered on distribution lines. Pipe bursting works best when the existing line can be taken out of service with minimal impact.
- Horizontal Directional Drilling: Allows for the water main to be installed with minimal disruption to roadways, traffic, and other infrastructure. However, on lines with a large number of services it requires excavation to reconnect services and lateral line connections. Horizontal directional drilling is more cost effective on transmission lines that run point to point with minimal connections, but becomes expensive and evasive when considered on distribution lines.

5.1.2 System Design:

The City's water system has an urgent need for replacement of the critical water system components in within the City. Much of the City's water system infrastructure is beyond its useful life, increasing probability for failure.

The existing system does not have a preliminary model to determine if sufficient pressure is available within the project limits as defined in **Figure 7 and Figure 8.** It is recommended that a hydraulic water model be developed during the design stages of the project to estimate system's capacity and evaluate current and future new pipeline size requirements to meet the community needs.

5.1.3 Contingencies:

Contingencies have been set at 10% for the purposes of this project. Unknown subsurface conditions and shallow groundwater table can impact project costs and are not possible to estimate at this stage without geotechnical investigation. A portion of the replacement area are located near Rio Grande River. As underground conditions are better evaluated, the contingency will be lowered to match the amount of uncertainty.

5.1.4 Cost Evaluation Methodology:

The costs for system replacement are based on historical bid data received by Wilson & Company on projects of similar size, nature, and location. Costs for the system have been supplemented by information from vendors and equipment manufacturers. Dewatering was particularly difficult to evaluate for this PER, as underground conditions are not known. For the purposes if this report it is assumed that the first 2 feet of any trenching does not contain water, as the project is within previously excavated roadways. Below the first 2 feet, 60% of excavation in the "Downtown", southern portion of the "East" side, and "Williamsburg" is assumed to contain groundwater, and for the remaining areas Below the first 2 feet, 5% of excavation "North", "West" side

Operation and maintenance cost for the water line is not accounted for in this PER, as there is no additional cost that the City of T or C would realistically experience; new water lines will decrease O&M costs due to less frequent line breaks.

Costs for water losses are assumed to be equal to the cost per gallon that the City charges its customers. The cost charged to customers represents the amount that the City pays to get the water out of the ground and to the customer.

5.2 Water System Alternatives

The following Alternatives I thru VIII are considered in this report to address system issues with reliability, aging in the system, high pressure issues, and redundant water supply in the City's water system.

The alternatives IX thru XII additionally include the current Municipal Airport Water System infrastructure which is in poor conditions beyond its useful life and in need for replacement.

Alternative I: No action

Alternative II: (Full Replacement). Complete waterline replacement including "System Performance Upgrade", "North", "East", "West", "Downtown", and "Williamsburg" areas of the City, additional water supply wells near the cemetery road tanks in the northern portion of the city, and replacement of all water meters within the City (See **Figure 11**).

Alternative III: (System performance upgrade). Waterline replacement and installation of water meter pertaining to region characterized as “System Performance Upgrade” which entails the transmission water transmission lines throughout the city with the addition of a water supply wells near the northern tanks (See **Figure 12**).

Alternative III-A: (System High Pressure Solution). Waterline replacement and installation of water meter pertaining to the region characterized as “System High Pressure Solution”, which entails the water transmission lines including pressure relief valves (PRV) throughout the city. (See **Figure 13**)

Alternative III-B: (System Redundancy and Hydraulic Performance Enhancements). Waterline replacement and installation of water meter pertaining to region characterized as “System Redundancy and Hydraulic Performance Enhancements”, which entails the upsizing transmission water transmission lines located in the “East” and “Williamsburg” areas with the addition of a water supply wells near the northern tanks (See **Figure 14**).

Alternative III-C: (Additional Hydraulic Performance Enhancements). Waterline replacement and installation of water meter pertaining to region characterized as “Additional Hydraulic Performance Enhancements”, which entails upsizing the remaining transmission water transmission lines located in the “East”, “North” and “Williamsburg” areas of the city to meet the remaining requirements of alternative III “System Performance Upgrade”.(See **Figure 15**).

Alternative IV: (North Side). Waterline replacement and installation of water meter pertaining to region characterized as “North Side” with an addition of water supply wells near the northern tanks. (See **Figure 16**).

Alternative V: (East Side). Waterline replacement and installation of water meter pertaining to the region characterized as “East Side” with the addition of water supply wells near the northern tanks (See **Figure 17**).

Alternative VI: (West Side). Waterline replacement and installation of water meter pertaining to the region characterized as “West Side” with the addition of water supply wells near the northern tanks (See **Figure 18**)

Alternative VII: (Downtown). Waterline replacement and installation of water meter pertaining to region characterized as “Downtown” with the addition of water supply wells near the northern tanks (See **Figure 19**).

Alternative VIII: (Williamsburg). Waterline replacement and installation of water meter pertaining to region characterized as “Williamsburg” with the addition of water supply wells near the northern tanks (See **Figure 20**)

Alternative IX: (Airport Improvements).Replacement of the complete water system with a new building that will enclose two 200-gallon pressure storage tanks, chlorination system, and control panel (See **Figure 21**).

Alternative X: (Airport Improvements without fire flow). Replacement of the complete water system with a new building that will enclose a chlorination system, variable speed booster pack and control panel with an additional 7.2-thousand-gallon steel storage tank. (See **Figure 22**)

Alternative XI: (Airport Improvements with fire flow).Replacement of complete water system with a new building that will enclose a chlorination system, variable speed booster pack, fire booster pump, and control panel with an additional 200 thousand gallon steel storage tank and an additional 8 Inch waterline replacement. (See **Figure 23**)

Alternative XII: (Airport Improvements). Replacement of the complete water system with a new building that will enclose one 30-gallon pressure storage tank, chlorination system, control panel and a 50 GPM variable speed pump.(See **Figure 24**).

Alternative I to VIII all consider replacement of service connections and distribution piping within the city area due to aging infrastructure, material, and pressure problems. Replacement for each alternative requires service line trenching. Alternatives IX to XII all consider replacement of the control, storage, and water system within the Municipal Airport due to aging infrastructure and pressure problems.

5.2.1 Alternative I: No Action

5.2.1.1 Description

This alternative involves taking no action and leaving the existing system as-is. The system will be patched/fixed as problems are encountered.

Leaving the system as-is creates potential for service disruptions for the existing residents when line breaks need to be repaired, potential for water contamination, as well as financial loss to the City due to line repairs. The estimated cost of water losses in this area has been included in the cost evaluation below.

As evaluated in the "existing facilities" portion of this report the existing system in in poor condition and in need of frequent repairs. As the city does not keep exact records of repair costs it is not easy to quantify the exact amount spent on repairs. Per the City approximately 260 system repairs are required yearly in this area. The per-repair cost has been estimated to be one thousand dollars. A yearly cost for repairs, inflated at 2.25% discount rate, has been used to calculate the present cost for maintaining the system within the 20-year evaluation period.

5.2.1.2 Water and Energy Efficiency

This alternative is the least water/energy efficient option of the eight considered in this report. As stated previously the amount of lost water in this portion of the network is estimated at ~120 Million gallons per year. This amount of water represents $211,032 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.1.3 Green Infrastructure

As the current system is in poor condition, 120 Million gallons of water are estimated to be lost per year in this portion of the system (See **Appendix 8**) as water conservation is of the highest priority in New Mexico due to limited water supply, it is essential that these large losses be minimized.

5.2.1.4 Land Requirements

No additional land requirements are necessary for this alternative, all existing infrastructure is to remain as-is.

5.2.1.5 Potential Construction Problems

Since the existing system has the potential for a line break at any time, the City must be ready to repair line breaks and orchestrate road closures at any time. This can lead to business disruptions, traffic disruptions, and other service issues that cannot be anticipated.

5.2.1.6 Resiliency and Operational Simplicity

This is the least operator friendly alternative, as it involves the potential for unscheduled line breakages. The system will become more unreliable as time passes and components surpass their operational life expectancy.

5.2.1.7 Cost Estimates

This alternative has no capital costs associated with it.

5.2.1.8 Alternative Pros/Cons

ADVANTAGES:

- This option has no capital cost

DISADVANTAGES:

- This option continues the safety issues (in the form of infiltration and lack of fire flow)
- This option continues to waste large amounts of water
- This option does not solve the high pressures that causes the aging infrastructure to break more often
- This option continues to create service outages for residents
- This option continues the constant line break repairs

5.2.1.9 Cost Summary

Table 13: Alternative I Cost Summary

Alternative I-No Action		
20 Yrs O&M PW	$	11,871,223
Construction Cost	$	-
Non-Construction Cost	$	-
Total	$	11,871,223

The annual 2020 Operation and maintenance is $743,638 see breakdown provided in **Appendix 5**

5.2.2 Alternative II: Complete Water System Replacement

5.2.2.1 Description

Alternative II involves replacing 57 percent of the existing waterlines within the city with new pipeline equal or less than 6 inches PVC C-900 DR-18. This alternative will replace 96.6 percent of pipe over 30 years old. All waterlines in this alternative are replaced via open trench by placing the new line and abandon in place the existing waterline except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information, upsizing the existing water line to a 6, 810, 12, and 14 inch will significantly increase available pressure in the city as well as provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12’ of pavement removal, and removal off any, sidewalk or curb and gutter as needed. If a water meter is found in the existing roadway and is to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW’s via bore and jack.

The proposed water well will be located on Cemetery Road**,** the system currently has six wells all of them located on the southern part of the City, and the current water system design uses two pumping stations to feed the water storage tanks on the north part of the city. A new well located on the north end of the City will provide reliable water production back up and prevent water outages, if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City’s existing wells fail due to age.

5.2.2.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the “Existing Facilities” portion of this report, it has been determined that most of the pipes within the City should be replaced in their entirety. **Figure 11** shows this alternative’s recommendations. Existing flow capacity has been determined to generally be not sufficient per pipe pressure fluctuation during peak flow periods as well as not meeting the fire flow requirement in multiple areas of the city. **Exhibit 110** in **Appendix 6** shows the complete system by pipe size. Increasing pipe size as needed within the neighborhoods is recommended at this time. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6-Inch or greater, dewatering will be necessary as described in the previous “Cost Evaluation Methodology” section via open trench.

Six additional Pressure Reducing Valves (PRV) are recommended to be installed within the system on the northern and south part of the city to avoid high pressure peaks which results in waterline breaks within the City’s neighborhoods. These new PRV’s will also allow the City to use the full volume of the Cemetery road tanks, which are currently operating at 50% so to minimize the high pressure in the west side area that cause a majority of the waterline breaks.

5.2.2.3 Replacement of City Water Meters

Due to aging inaccurate meter readings and manually reading record described in the "Existing Facilities" portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years, exceeding their useful life. This provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. The new meter shall be automatic radio read meters integrated into the city's electrical billing system. This will reduce the manpower needed to reading the meters, which will reduce the labor cost on the water system.

5.2.2.4 Construction of Water Well Northern Area

Presently there is a dependence of Cook Street and Morgan Street Booster stations to provide water to the northern area of the City. Water production back up in the northern area of the city is non-existent making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells all of them located on the southern part of the City; most of fall past or are near their end of useful life. A new well located in the north will provide reliable water production back up and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable back up water supply to this area and the rest of the city if needed under emergency situation.

5.2.2.5 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump,the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 116 Million gallons per year. This amount of water represents $203,857 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.2.6 Green Infrastructure

This alternative will reduce water losses by approximately 116 Million gallons per year that occurs through line breaks within the current system, which is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.2.7 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.2.8 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road, Crossings will either require extensive closures, or more likely will require directional. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Dewatering quantities are another large potential concern for this alternative, a large proportion of these main transmission lines run parallel with the Rio Grande which indicate a shallow water table. Existing water levels on excavation trenches cannot be quantified until further examination. As explained in the “existing system” part of this report, waterlines replaced within the southern portion of the “East Side” and “Downtown” areas will have 60 percent dewatering of the trench in other areas of the city 5 percent dewatering will be assumed.

5.2.2.9 Resiliency and Operational Simplicity

The only regular maintenance items for this alternative are the new water well pumping station, and PRV‘s, which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.2.10 Alternative Pros/Cons

ADVANTAGES:

- This option fixes safety issues (in the form of infiltration and lack of fire flow)
- This option eliminates high pressures issues that caused the aging infrastructure to break more often
- This option conserves largest amounts of water
- This option eliminates service outages for residents
- This option improves the backup and redundancy of the water system
- This option improves approximately 97 percent of the aging water system

DISADVANTAGES:

- This option has the highest capital cost and it is out of the City's budget
- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option does will modify billing rates

5.2.2.11 Cost Summary

Table 14: Alternative II Cost Summary

Alternative II- Complete System		
20 Yrs O&M PW	$	9,325,812
Construction Cost	$	88,435,392
Non-Construction Cost	$	14,137,544
Total	$	111,898,748

The annual 2020 Operation and maintenance is $584,188. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4.**

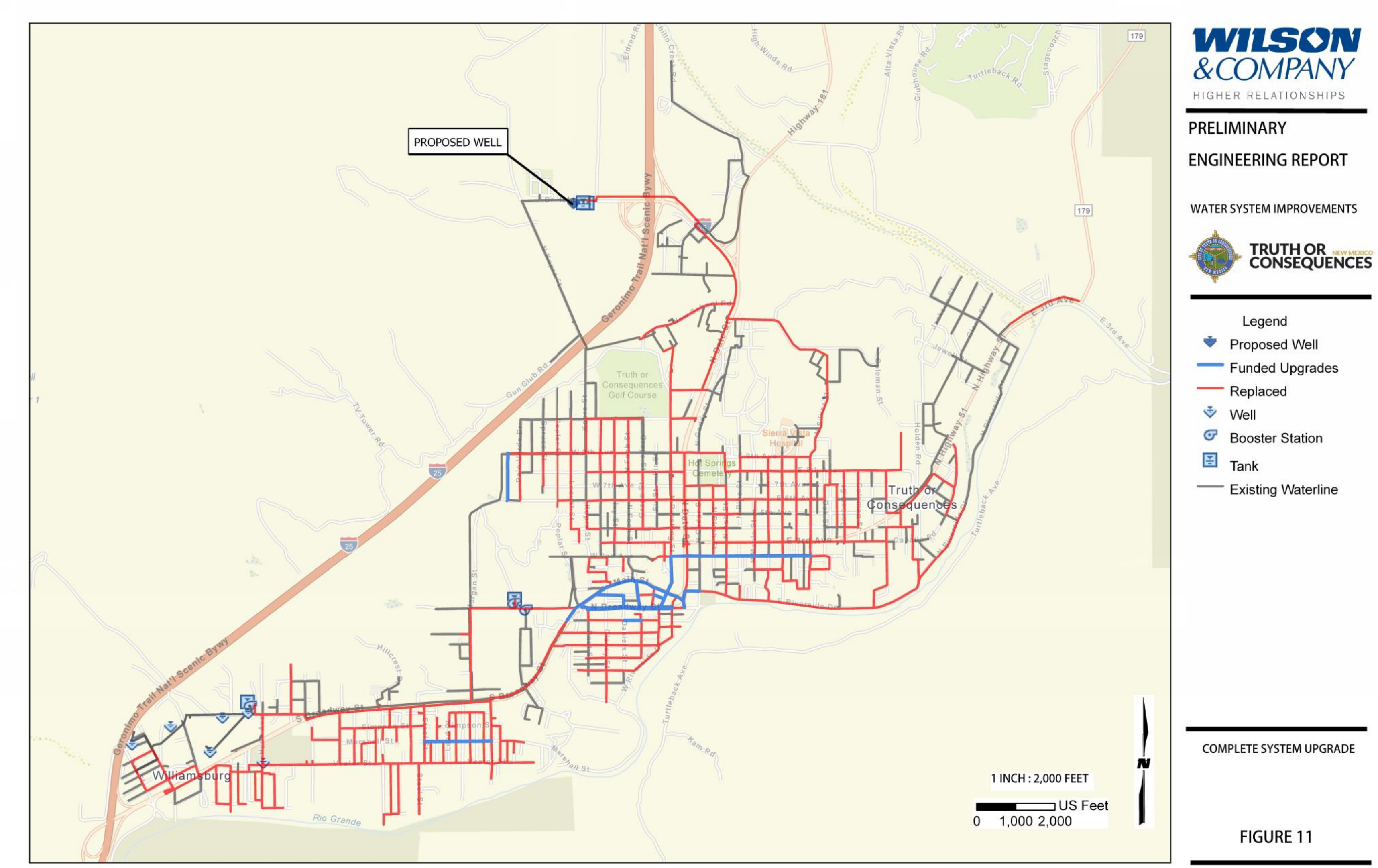

Figure 11: Alternative II Complete System upgrade

5.2.3 Alternative III: System Performance Upgrade

5.2.3.1 Description

Alternative III involves replacing 11.3 percent of the existing waterlines within the city with new pipeline equal to, or greater than, 6-inch PVC C-900 DR-18. This alternative will replace 37.8 percent of pipe this is over 30 years old. This replacement also upgrades around 15 percent of the Asbestos Cement (AC), Cast iron (CI), and Ductile Iron (DI) material in the existing system. All waterlines in this alternative are replaced via open trench by placing the new line parallel to the existing and abandoning the existing water line in place except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing water line to 8, 10, 12, and 14 inch will significantly adjust available pressure in the City, as well as provide for better fire flow capacity important areas such as the City's hospital and high school. This alternative significantly increases available pressure in the City and provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal and removal for any sidewalk or curb and gutter as needed. If a water meter is found in the existing roadway it is to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via jack and bore construction methods.

The proposed water well will be located on Cemetery Road. The system currently has six wells, all of them located on the south part of the city near "Williamsburg". Additionally, the existing water system uses two pumping stations to feed the water storage tanks on the north part of the city. A new well located in the north will provide reliable water production back up and prevent water outages if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City's existing wells fail due to their age.

5.2.3.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report, infrastructure defined as "System Performance Upgrade" (See **Figure 12**) should be replaced. Since these particular waterlines are also known as the main transmission lines, their primary purpose is to ensure that water transmission runs from Cook Street Booster station to Morgan Street Booster station to finally provide water flow to multiple areas of the city. By replacing these particular lines, the water system will reduce the 30 psi pressure fluctuation in the system, mostly in the "Williamsburg" and "East" areas.

The existing flow capacity has been determined to be insufficient due to several breakages reports and the inability to meet fire flow requirement. All pipes are assumed to be replaced with PVC C-900 DR18, sizes 6 Inch greater. Dewatering of groundwater is a consideration in this alternative as described in the previous “Cost Evaluation Methodology” section via open trench.

Six Additional Pressure Reducing Valves (PRV) are recommended to be installed within the system on the northern and south parts of the city. This is to avoid high pressure peaks which results in water breaks within the city’s neighborhoods.

5.2.3.3 Replacement of City Water Meters

Due to aging, inaccurate meter readings and manually reading record described in the “Existing Facilities” portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years exceeding their useful life. This provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City’s billing system. The new meters shall be automatic radio read meters integrated into the city’s electrical billing system. This will reduce the manpower needed to read the meters, which will reduce the labor cost on the system.

5.2.3.4 Construction of Water Well Northern Area

Presently there is a dependence on the Cook Street and Morgan Street Booster stations to provide water to the northern area of the City. Back up water production in the northern area of the City is non-existent, making the distribution system open for failure if any of the booster stations don’t work as desired. The system has six wells all of them located on the southern part of the city, most of which fall on are near their end of useful life. A new well located in the north will provide reliable backup water production and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable backup water supply to this area and the rest of the city if needed under an emergency situation.

5.2.3.5 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 45 Million gallons per year. This amount of water represents $79,770 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.3.6 Green Infrastructure

This alternative will reduce water losses by approximately 45 Million gallons per year due to line breaks, which is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.3.7 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued, the owner of this land will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.3.8 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road, Crossings will either require extensive closures, or more likely will require directional drilling. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Dewatering quantities are another large potential concern for this alternative. A large proportion of these main transmission's lines run parallel with the Rio Grande, which indicate a shallow water table. Existing water levels in excavation trenches cannot be quantified until further examination. As explained in the "existing system" part of this report waterlines replaced within the southern portion of the "East Side" and "Downtown" areas will have 60 percent dewatering of the trench. In other areas of the city 5 percent dewatering will be assumed.

5.2.3.9 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative are the new water well pump, and the PRV's which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.3.10 Alternative Pros/Cons

ADVANTAGES:

- This option fixes a majority of the safety issues (in the form of infiltration and lack of fire flow)
- This option eliminates high pressures issues that caused the aging infrastructure to break more often
- This option conserves a large percentage of water, close to half the water losses
- This option extremely reduces service outages for residents
- This option improves the backup and redundancy to the water system
- This option improves approximately 13 percent of the existing water system
- This option improves approximately 38 percent of the aging water system
- This option doesn't produce any changes on billing charges

DISADVANTAGES:

- This option doesn't have a capital cost that is within the City's budget
- This option has a large dewatering cost for the areas near the Rio Grande
- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone

5.2.3.11 Cost Summary

Table 15: Alternative III Cost Summary

Alternative III- System Performance Update	
20 Yrs O&M PW	$10,989,446
Construction Cost	$21,701,685
Non-Construction Cost	$4,093,148
Total	$36,784,279

The annual 2020 Operation and maintenance is $688,402. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4.**

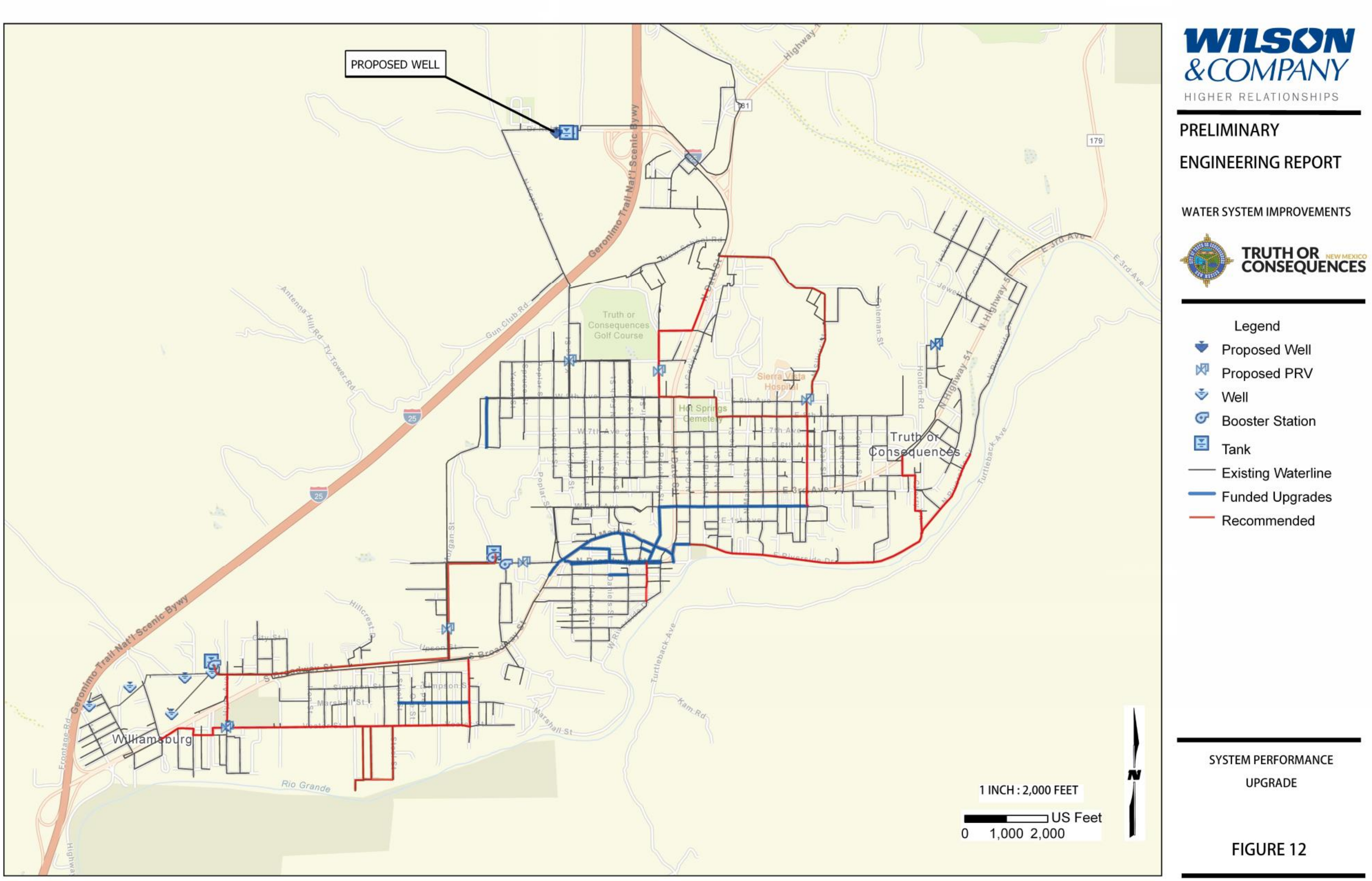

Figure 12: Alternative III System Performance Upgrade

5.2.4 Alternative III-A: System High Pressure Solution

5.2.4.1 Description

Alternative III-A addresses the high-pressure issues in the “West” and “Williamsburg” areas by replacing the Cook St. to Morgan St. main transmission line and installing main lines PRV to eliminate high pressures issues within the City’s water system. This involves replacing 6.2 percent of the existing waterlines within the city that are 6 inches or less diameter, with new pipeline PVC C-900 DR -18 pipelines 6 inches or greater. This alternative will replace 26.7 percent of pipe over 30 years old, this replacement also upgrades around 16.9 percent of the Asbestos Cement (AC), Cast iron (CI), and Ductile Iron (DI) material in the existing system. All waterlines in this alternative are replaced via open trench by placing the new line parallel to the existing and abandoning the existing waterline in place; except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information, upsizing the existing water line to an 6, 8, 10, and 12, inch will significantly adjust available pressure in the City as well as provide for better fire flow capacity including important areas such as the City’s hospital and a City’s high school. This alternative significantly increases available pressure in the City and provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12’ of pavement removal, and removal of any side walk or, curb and gutter if a water meter is found in the existing roadway and needs to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW’s via jack and bore construction methods.

5.2.4.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the “Existing Facilities” portion of this report, infrastructure defined as “System High Pressure Solutions” (**Figure 13**) should be replaced. Since these four particular waterlines are also known as the main transmission lines, their primary purpose is to ensure that water transmission runs from Cook Street Booster station to Morgan Street Booster station to finally provide water flow to multiple areas of the city. By replacing these particular lines, the water system will reduce the 30 psi pressure fluctuation in the system, mostly in the “Williamsburg” and “East” areas

Waterlines replacements locating on the “North” area feeding the City’s high school and hospital, Upsizing a main cast iron waterline located on portions of East 8th and East 9th Streets in the “East” side of the city, and additionally replacing and looping an area in the “Williamsburg” area will also prevent pressure fluctuation in the system and mostly in the “Williamsburg” and “East” areas and will ensure water quality for the “Williamsburg” area.

The existing flow capacity has been determined to be insufficient due to several breakages reports and the inability to meet fire flow requirement. All pipes are assumed to be replaced with PVC C-900 DR18, sizes with 6 Inch or greater. Dewatering of groundwater is a consideration in this alternative as described in the previous "Cost Evaluation Methodology" section via open trench.

Six Additional Pressure Reducing Valves (PRV) are recommended to be installed within system on the northern and south part of the city. This is to avoid high pressure peaks which results in water breaks within the city's neighborhoods.

5.2.4.3 Replacement of City Water Meters

Due to aging, inaccurate meter readings and manually reading record described in the "Existing Facilities" portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years, exceeding their useful life. This provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. The new meters shall be automatic radio read meters integrated into the city's electrical billing system. This will reduce the manpower needed to read the meters, which will reduce the labor cost on the system.

5.2.4.4 Water and Energy Efficiency

The amount of lost water in this portion of the system is estimated at ~ 32 Million gallons per year. This amount of water represents $56,346 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.4.5 Green Infrastructure

This alternative will reduce water losses by approximately 32 Million gallons per year due to line breaks, which is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.4.6 Land Requirements

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.4.7 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road. Crossings will either require extensive closures, or more likely, will require directional drilling. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Dewatering quantities are another large potential concern for this alternative. A large proportion of these main transmission lines run parallel with the Rio Grande, which indicate a shallow water table. Existing water levels in excavation trenches cannot be quantified until further examination. As explained in the “existing system” part of this report, waterlines replaced within the southern portion of the “East Side”” and “Williamsburg” areas will have 60 percent dewatering of the trench. In other areas of the city 5 percent dewatering will be assumed.

5.2.4.8 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative are the PRV ‘s which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.4.9 Alternative Pros/Cons

ADVANTAGES:

- This option has a capital cost that is within the City’s budget
- This option fixes a large percentage of the safety issues (in the form of infiltration and lack of fire flow)
- This option eliminates high pressures issues that caused the aging infrastructure to break more often.
- This option conserves a large percentage of water, close to a third of the water losses
- This option extremely reduces service outages for residents
- This option improves approximately 6.2 percent of the existing water system
- This option improves approximately 27 percent of the aging water system
- This option doesn’t produce any changes on billing charges

DISADVANTAGES:

- This option has a large dewatering cost for the “East” and “Williamsburg” areas near the Rio Grande
- This option requires a large amount of NMDOT crossing permits
- This option doesn’t improve the backup and redundancy to the water system

5.2.4.10 Cost Summary

Table 16: Alternative III-A Cost Summary

Alternative III A- System High Pressure Solution	
20 Yrs O&M PW	$11,115,798
Construction Cost	$6,208,432
Non-Construction Cost	$1,321,898
Total	$18,646,128

The annual 2020 Operation and maintenance is $696,317. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4.**

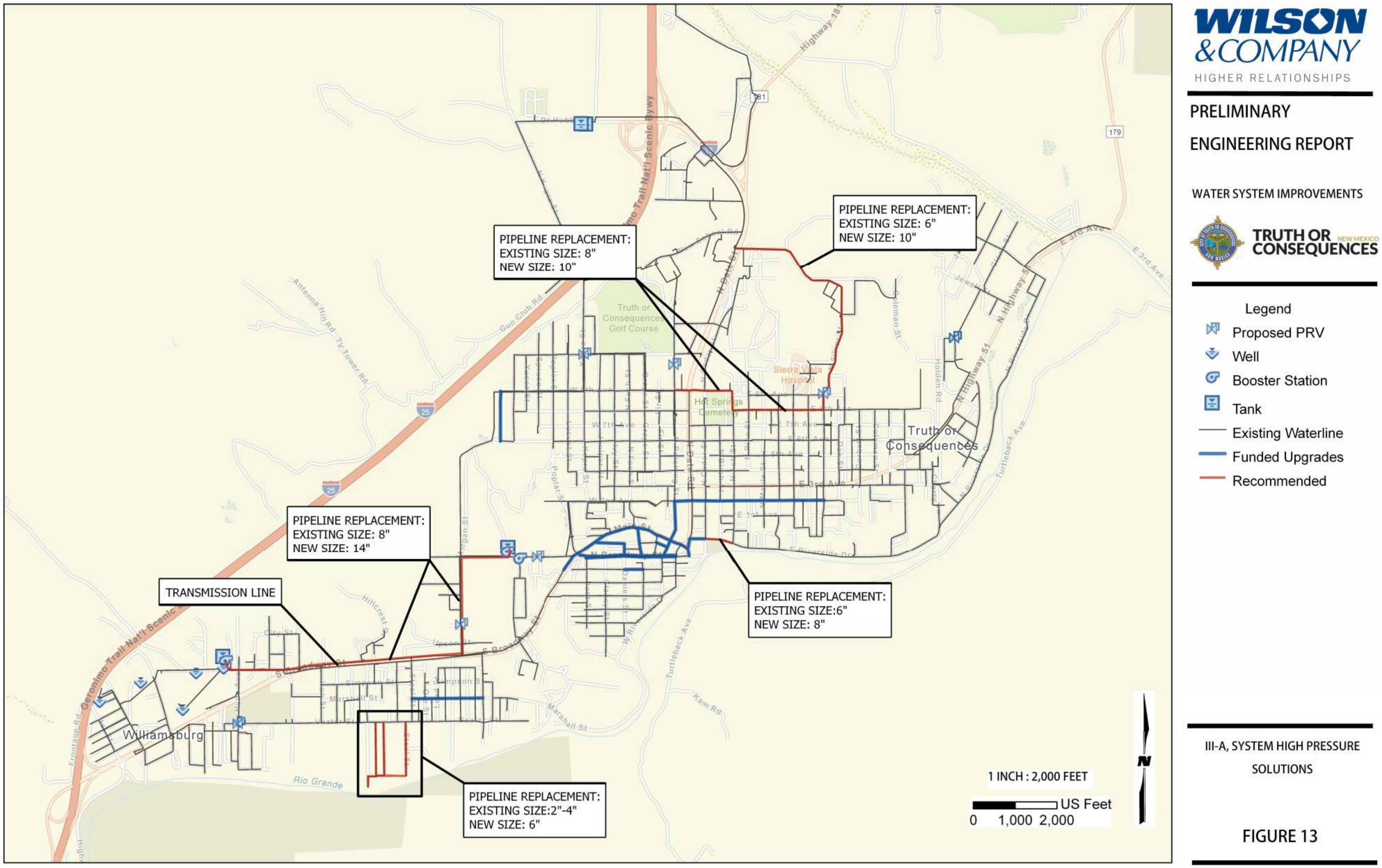

Figure 13: III-A System High Pressure Solutions

5.2.5 Alternative III-B: System Redundancy and Hydraulic Performance Enhancements

5.2.5.1 Description

Alternative III-B improves the system hydraulics by replacing and upgrading main distribution lines to increase the efficiency of the water distribution throughout the City's. This involves replacing 3.6 percent of the existing waterlines within the city with new pipeline equal to or greater than, 6-inch PVC C-900 DR-18. This alternative will replace 6.3 percent of pipe over 30 years old, this replacement also upgrades around 4.7 percent of the Asbestos Cement (AC), Cast iron (CI), and Ductile Iron (DI) materials in the existing system. All waterlines in this alternative are replaced via open trench by placing the new line parallel to the existing and abandoning the existing water line in place except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing water line to an 8, and 10 inch will significantly adjust available pressure in the City as well as provide for better fire flow capacity throughout the City. This alternative significantly increases available pressure in the City and provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal, and removal for any side walk and curb and gutter if a water meter is found in the existing roadway it is to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via jack and bore construction methods.

The proposed water well will be located on Cemetery Road. The system currently has six wells all of them located on the south part of the city near "Williamsburg". Additionally, the existing water system uses two pumping stations to feed the water storage tanks on the north part of the city. A new well located in the north will provide reliable water production back up and prevent water outages if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City's existing wells fail due to their age.

5.2.5.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report, infrastructure defined as "System Redundancy and Hydraulic Performance Enhancements" (See **Figure 14**) should be replaced. Since these particular waterlines located in the "East" and "Williamsburg" areas will continue to help with pressure issues and improving fire flow requirements throughout the city,.

The existing flow capacity has been determined to be insufficient due to several breakage reports and the inability to meet fire flow requirement. All pipes are assumed to be replaced with PVC C-

900 DR18, sizes 6 Inch or greater. Dewatering of groundwater is a consideration in this alternative as described in the previous “Cost Evaluation Methodology” section via open trench.

5.2.5.3 Replacement of City Water Meters

Due to aging, inaccurate meter readings and manually reading record described in the “Existing Facilities” portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years, exceeding their useful life. This provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City’s billing system. The new meter shall be automatic radio read meters integrated into the city’s electrical billing system. This will reduce the manpower for reading the meters manually, which reduce the labor cost on the system. For this alternative water meters will only be replaced in areas where the waterline is being replaced.

5.2.5.4 Construction of Water Well Northern Area

Presently there is a dependence on the Cook Street and Morgan Street Booster stations to provide water to the northern area of the City. Back up water production in the northern area of the City is non-existent making the distribution system open for failure if any of the booster stations don’t work as desired. The system has six wells, all of them located on the southern part of the city, most of which fall on are near their end of useful life. A new well located on the north will provide reliable backup water production and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable backup water supply to this area and the rest of the city if needed under an emergency situation.

5.2.5.5 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 7 Million gallons per year. This amount of water represents $13,295 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.5.6 Green Infrastructure

This alternative will reduce water losses by approximately 7Million gallons per year due to line breaks, which is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.5.7 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner of this land will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.5.8 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road. Crossings will either require extensive closures, or more likely will require directional drilling. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Dewatering quantities are another large potential concern for this alternative. A large proportion of these main transmissions lines run parallel with the Rio Grande which indicate a shallow water table. Existing water levels in excavation trenches cannot be quantified until further examination. As explained in the “existing system” part of this report, waterlines replaced within the southern portion of the “East Side” area will have 60 percent dewatering of the trench. In areas of the city 5 percent dewatering will be assumed.

5.2.5.9 Resiliency and Operational Simplicity

The only regular maintenance items for this alternative are the new water well pump which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.5.10 Alternative Pros/Cons

ADVANTAGES:

- This option has a capital cost that is within the City's budget
- This option fixes a majority of the safety issues (in the form of infiltration and lack of fire flow)
- This option continues to eliminate high pressures issues
- This option supplements the conservation of a large percentage of water, close to half water losses
- This option reduces service outages for residents, due to the supply and distribution system redundancy
- This option improves the backup and redundancy to the water system
- This option improves approximately 4 percent of the existing water system
- This option improves approximately 4.7 percent of the aging water system
- This option doesn't produce any changes on billing charges

DISADVANTAGES:

- This option has a large dewatering cost for the "East" area near the Rio Grande
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone

5.2.5.11 Cost Summary

Table 17: Alternative III B Cost Summary

Alternative III B- System Redundancy and Hydraulic Performance Enhancements	
20 Yrs O&M PW	$11,880,678
Construction Cost	$6,901,998
Non-Construction Cost	$1,531,515
Total	$20,314,191

The annual 2020 Operation and maintenance is $744,230. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

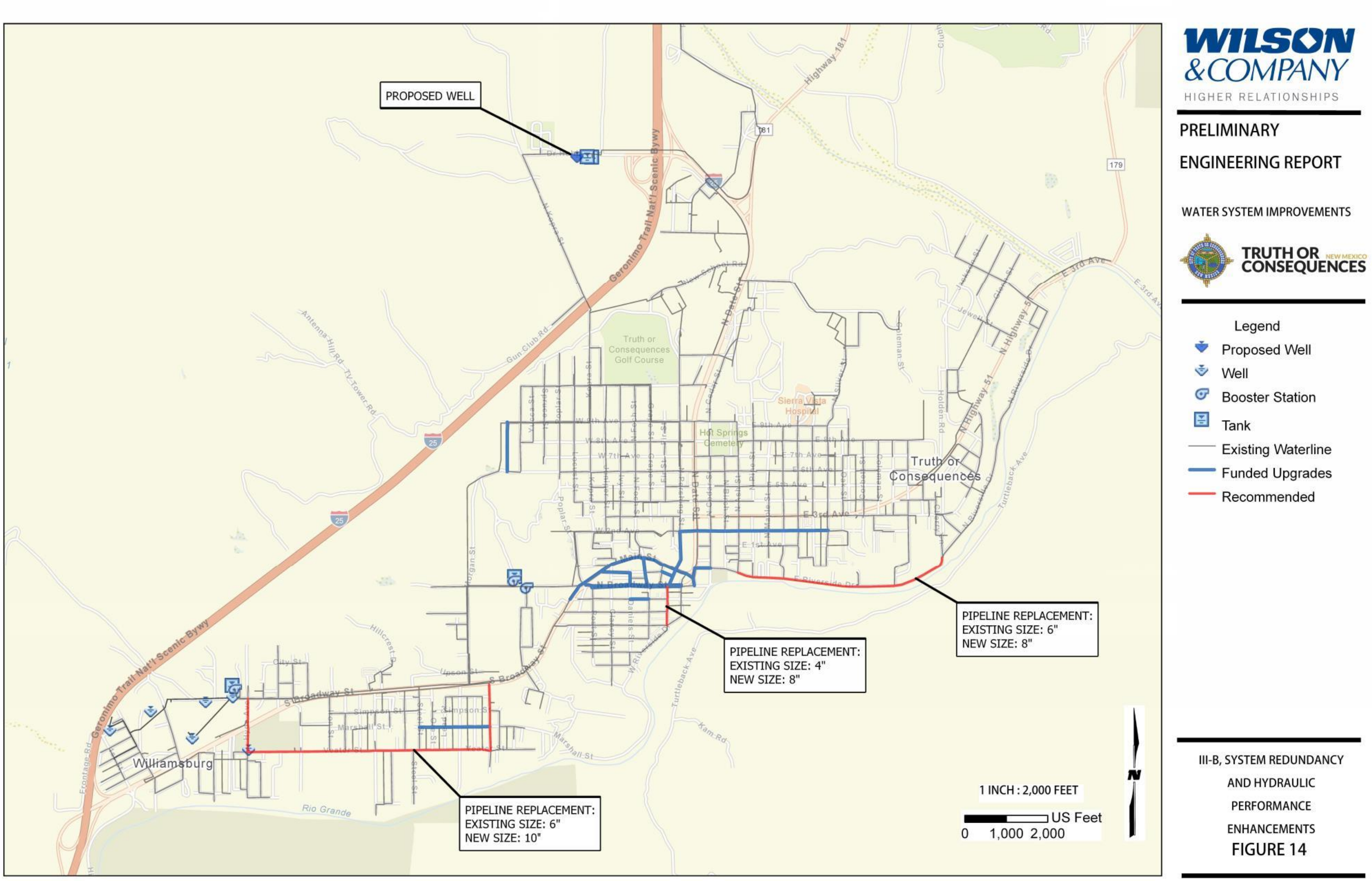

Figure 14: III-B System Redundancy and Hydraulic Enhancements

5.2.6 Alternative III-C: Additional Hydraulic Performance Enhancements

5.2.6.1 Description

Alternative III-C completes the "System Performance Upgrade" alternative to ensure proper water distribution and pressure throughout the City's water system. This involves replacing 2.9 percent of the existing waterlines within the city with new pipeline equal to or greater than 6-inch PVC C-900 DR-18. This alternative will replace 5.2 percent of pipe this is over 30 years old. This replacement also upgrades around 2.9 percent of the Asbestos Cement (AC), Cast iron (CI), and Ductile Iron (DI) material in the existing system. All waterlines in this alternative are replaced via open trench by placing the new line parallel to the existing and abandoning the existing water line in place except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing water line to an 8, 10, and 12 inch will significantly adjust available pressure in the City, as well as provide for better fire flow capacity throughout the City. This alternative significantly increases available pressure in the City and provides for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal, and removal for any sidewalk or curb and gutter as needed. If a water meter is found in the existing roadway it is to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via jack and bore construction methods.

5.2.6.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report, infrastructure defined as "Additional Hydraulic Performance Enhancements" (See **Figure 15**) should be replaced Since these particular waterlines located in the "East", "Williamsburg" and " North" areas will complete to help with pressure issues and improving fire flow requirements throughout the city.

The existing flow capacity has been determined to be insufficient due to several breakage reports and the inability to meet fire flow requirement. All pipes are assumed to be replaced with PVC C-900 DR18, sizes with 6 Inch or greater. Dewatering of groundwater is a consideration in this alternative as described in the previous "Cost Evaluation Methodology" section via open trench.

5.2.6.3 Replacement of City Water Meters

Due to aging, inaccurate meter readings and manually reading record described in the "Existing Facilities" portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years exceeding their useful life. This provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. The new meters shall be automatic radio read meters integrated into the city's electrical billing system. This will reduce the manpower needed to read the meters, which will reduce the labor cost on the system.

5.2.6.4 Water and Energy Efficiency

The amount of lost water in this portion of the system is estimated at ~ 6 Million gallons per year. This amount of water represents $10,974 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.6.5 Green Infrastructure

This alternative will reduce water losses by approximately 6 Million gallons per year due to line breaks, which is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.6.6 Land Requirements

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.6.7 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road, which will either require extensive closures, or more likely, will require directional drilling. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Dewatering quantities are another large potential concern for this alternative. A large proportion of these main transmission's lines run parallel with the Rio Grande which indicate a shallow water table. Existing water levels in excavation trenches cannot be quantified until further examination. As explained in the "existing system" part of this report waterlines replaced within the southern portion of the "East Side" area will have a 60 percent dewatering of the trench. In other areas of the city 5 percent dewatering will be assumed.

5.2.6.8 Resiliency and Operational Simplicity

No additional Maintenance item are added in this alternative. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.6.9 Alternative Pros/Cons

ADVANTAGES:

- This option has a capital cost that is within the City's budget
- This option fixes a majority of the safety issues (in the form of infiltration and lack of fire flow)
- This option intensifies the elimination of pressures issues.
- This option concludes the conservation of a large percentage of water, close to half water losses
- This option continues to reduce service outages for residents, due to distribution system redundancy
- This option improves approximately 3 percent of the existing water system
- This option improves approximately 3 percent of the aging water system
- This option doesn't produce any changes on billing charges

DISADVANTAGES:

- This option has a large dewatering cost for the "East" area near the Rio Grande
- This option requires a significant amount of NMDOT crossing permits

5.2.6.10 Cost Summary

Table 18: Alternative III C Cost Summary

Alternative III C- Additional Hydraulic Performance Enhancements	
20 Yrs O&M PW	$11,724,099
Construction Cost	$5,280,984
Non-Construction Cost	$989,461
Total	$17,994,544

The annual 2020 Operation and maintenance is $734,422. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4.**

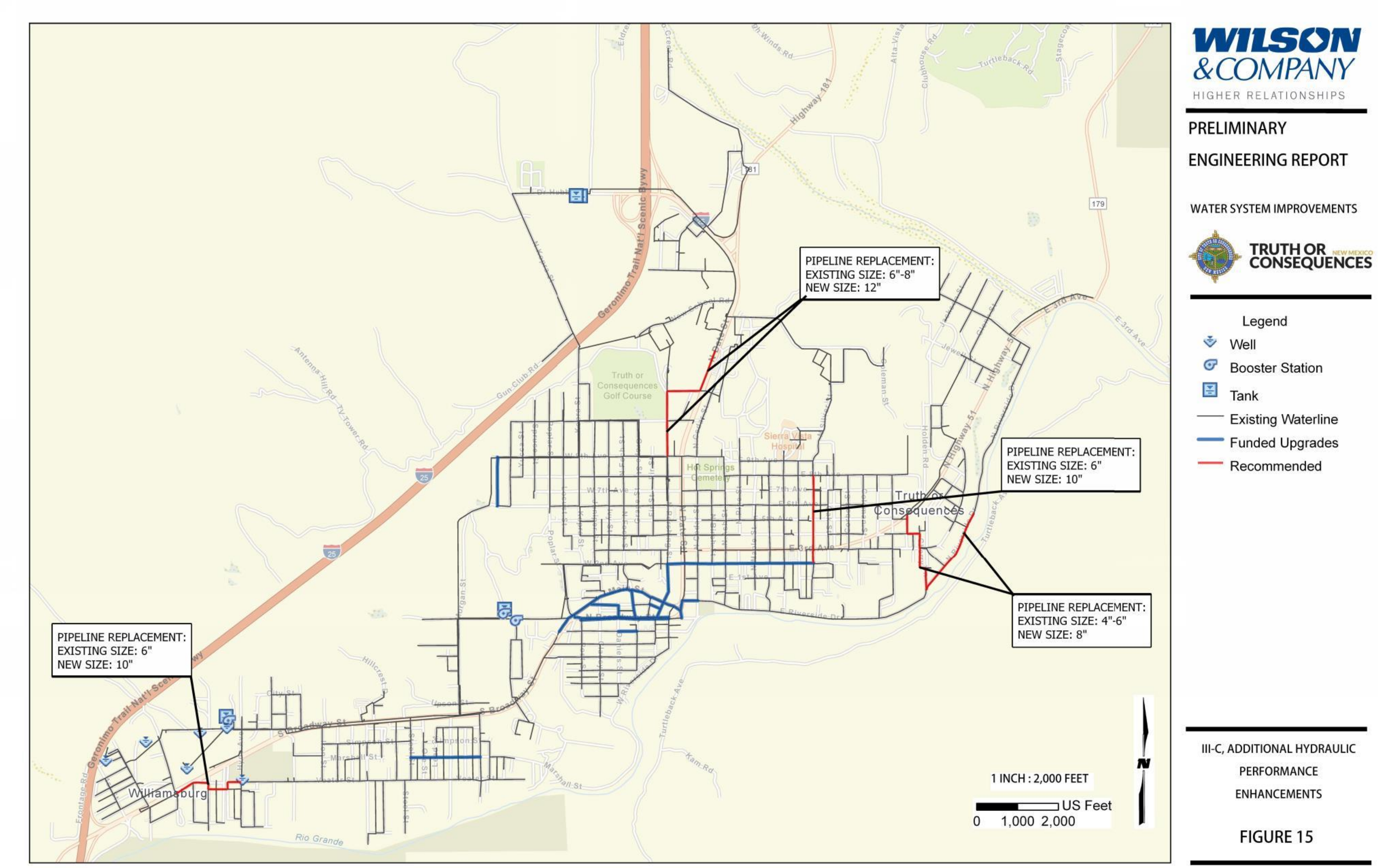

Figure 15: III-C Additional Hydraulic Performance Enhancements

5.2.7 Alternative IV: North Side Replacement

5.2.7.1 Description

Alternative IV involves replacing 2.9 percent of the existing waterlines within the city that are 6 inches or less in diameter, with the new PVC C-900 DR-18. This alternative will replace 5.1 percent of pipe over 30 years old. All waterlines in this alternative are replaced via open trench by constructing the new waterline parallel to the existing, then abandoning the existing waterline in place; except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information, by upsizing the existing water line to 6, 8, 12, and 14-inch diameter. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal and removal for sidewalk or, curb and gutter as needed. If an existing water meter is found in the existing road, it is to be replaced. This alternative includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via jack and bore construction methods.

The proposed water well will be located on Cemetery Road, the system currently has six wells, all of them located on the southern part of the City. The current water system uses two pumping stations to feed the water storage tanks on the north part of the City. A new well located in the north will provide reliable back up water production back up and prevent water outages if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City's existing wells finally fail due to their age.

5.2.7.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" the portion of this report defined as "North Side" (See **Figure 16**) should be replaced. Existing flow capacity has been determined to be generally insufficient, per pipe pressure fluctuation during peak flow periods and not meeting fire flow requirements on multiple areas of the city. Pipe size increases within the neighborhoods are recommended to address flow and pressure issues. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6 Inch or greater. Dewatering as described in the previous "Cost Evaluation Methodology" section via open trench.

5.2.7.3 Replacement of City Water Meters

Due to aging meters, inaccurate meter readings, and manually reading record described in the "Existing Facilities" portion of this report, it has been determined that all of the water meters should be replaced in their entirely. Many of the water meters are currently older than 40 years exceeding their useful life, older meters may be providing incorrect data regarding water usage, and water loss percentages and also having a negative impact on the City's billing system.

5.2.7.4 Construction of Water Well Northern Area

Presently there is a dependence on Cook Street and Morgan Street Booster stations to provide, a backup source of water in the northern area of the City. Backup water production in the northern area of the City is non-existent, making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells, all of them located in the southern part of the City, most of which are near their end of useful life. A new well located in the north will provide reliable backup water production and prevent water outages

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable back up water supply to this area and the rest of the city if needed under an emergency situation.

5.2.7.5 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 6 Million gallons per year. This amount of water represents $10,763 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.7.6 Green Infrastructure

This alternative will reduce water losses by approximately 6 Million gallons per year due to 15 within this area reported by the city officials. This is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.7.7 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.7.8 Potential Construction Problems

The largest potential for construction problems in this alternative lies in the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within n NMDOT owned road. Construction will either require extensive closures, or more likely directional drilling for the new service lines. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Groundwater dewatering is another large potential concern for this alternative. A large portion of these main transmission lines run parallel with the Rio Grande, which contributes to a shallow groundwater table in this area. This alternative will assume 5 percent dewatering in areas that are not near the Rio Grande.

5.2.7.9 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative is the new water well pump, which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.7.10 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues on the North Side (in the form of leakage and lack of fire flow)
- This option eliminates high pressures issues that caused the aging infrastructure to break more often
- This option improves water supply to the water system
- This option improves approximately 3 percent of the existing water system
- This option improves approximately 5 percent of the aging water system

DISADVANTAGES:

- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option doesn’t reduce a large amount of water losses
- This option doesn’t reduce pressure peaks in the system that causes the water breaks
- This option doesn’t prevent service outages for residents

5.2.7.11 Cost Summary

Table 19: Alternative IV Cost Summary

Alternative IV- North Side	
20 Yrs O&M PW	$11,914,630
Construction Cost	$7,372,834
Non-Construction Cost	$1,499,712
Total	$20,787,176

The annual 2020 Operation and maintenance is $746,357. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

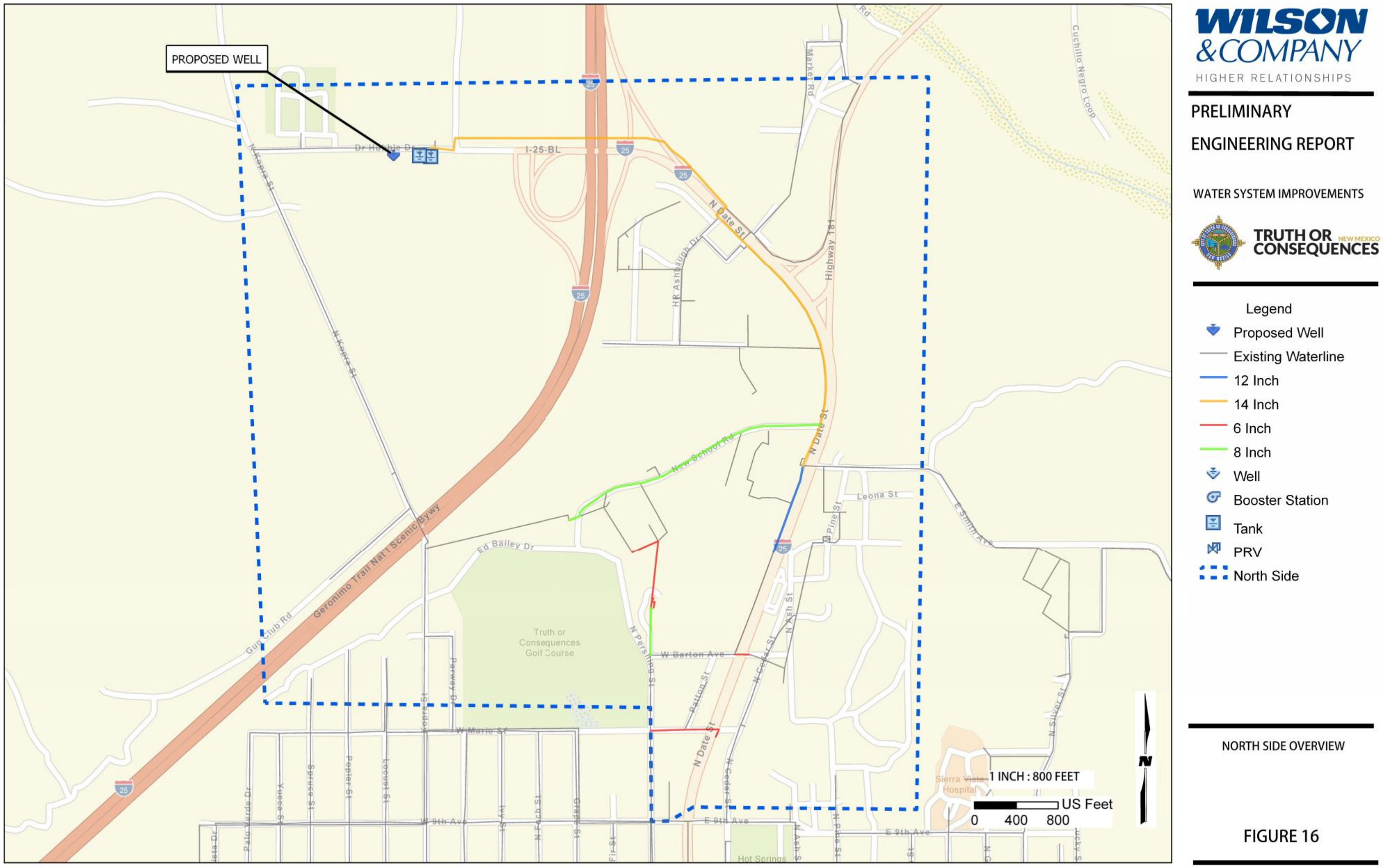

Figure 16: Alternative IV North Side

5.2.8 Alternative V: East Side Replacement

5.2.8.1 Description

Alternative V involves replacing 13.1 percent of the existing waterlines within the City, that are equal or less than 6 inch, with new PVC C-900 DR-18. This alternative will replace 23.2 percent of pipe that is over 30 years old. All waterlines in this alternative are replaced via open trench by placing the new line parallel to the existing and abandoning the existing waterline in place; except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing water line to a 6, and 8-inch diameter will significantly adjust available pressure in the east side of the city as well as provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal, and an additional removal for any sidewalk or curb and gutter as needed. If a water meter is to be found in the existing road, it will be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via jack and bore.

The proposed water well will be located on Cemetery Road. The system currently has six wells all of them located on the southern part of the city. Additionally. The current water system uses two pumping stations to fill the water storage tanks in the north part of the City. A new well located in the north will provide reliable backup water production and prevent water outages if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City's existing wells fail due to their age.

5.2.8.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report defined as "East Side" (See **Figure 17**) should be replaced. Existing flow capacity has been determined to be insufficient due to pressure fluctuation during peak flow periods. The available fire flow does not meet NFPA fire flow requirements on multiple areas of the city. Increasing the pipe diameter within the neighborhoods is recommended at this time. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6 Inch or greater. Dewatering required as described in the previous "Cost Evaluation Methodology" section via open trench.

5.2.8.3 Replacement of City Water Meters

Due to aging meters that may be inaccurate and/or require manually reading described in the "Existing Facilities" portion of this report, it is been recommended that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years and exceed their expected useful life, which provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system.

5.2.8.4 Construction of Water Well Northern Area

Presently there is a dependence/reliability issue from the Cook Street and Morgan Street Booster stations to provide, to the northern area of the City. Water supply redundant in the northern area of the City is non-existent making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells all of them located on the southern part of the City. Most of the wells are past, or near their end of useful life. A new well located in the northern area will provide reliable water supply to the Cemetery Tanks, prevent water outages and provide a back-up supply for the rest of the City under an emergency situation.

5.2.8.5 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 27 Million gallons per year. This amount of water represents $48,875 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.8.6 Green Infrastructure

This alternative will reduce water losses by approximately 27 Million gallons per year due to 90 within this area reported by the city officials. This is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.8.7 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.8.8 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 which will require service lines crossing all lanes within an NMDOT owned road. This, will either require extensive closures, or more likely directional drilling for the new service lines. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Groundwater dewatering is another large potential concern for this alternative. A large proportion of these main transmissions lines run parallel with the Rio Grande, which is expected to have a shallow groundwater table. However, existing water levels on excavation trenches cannot be quantified until further exploratory borings are conducted as part of the design effort. As explained in the "existing system" part of this report waterlines replaced within the southern-most portion of the East Side Area will require an estimated 60 percent dewatering of the construction trench. In other areas a 5 percent dewatering will be assumed.

5.2.8.9 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative is the new water well house, which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.8.10 Alternative Pros/Cons

ADVANTAGES:

- This option has a capital cost that is within the City's budget
- This option fixes safety issues on the East Side (in the form of leakage and lack of fire flow)
- This option improves water supply to the water system
- This option improves approximately 13 percent of the existing water system
- This option improves approximately 23 percent of the aging water system

DISADVANTAGES:

- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option doesn't reduce a large amount of water losses
- This option doesn't reduce pressure peaks in the system that causes the water breaks
- This option doesn't prevent service outages for residents
- This option has a high dewatering cost for the areas near the Rio Grande

5.2.8.11 Cost Summary

Table 20: Alternative V Cost Summary

Alternative V- East Side	
20 Yrs O&M PW	$11,402,777
Construction Cost	$21,132,888
Non-Construction Cost	$3,990,200
Total	$36,525,865

The annual 2020 Operation and maintenance is $714,294. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

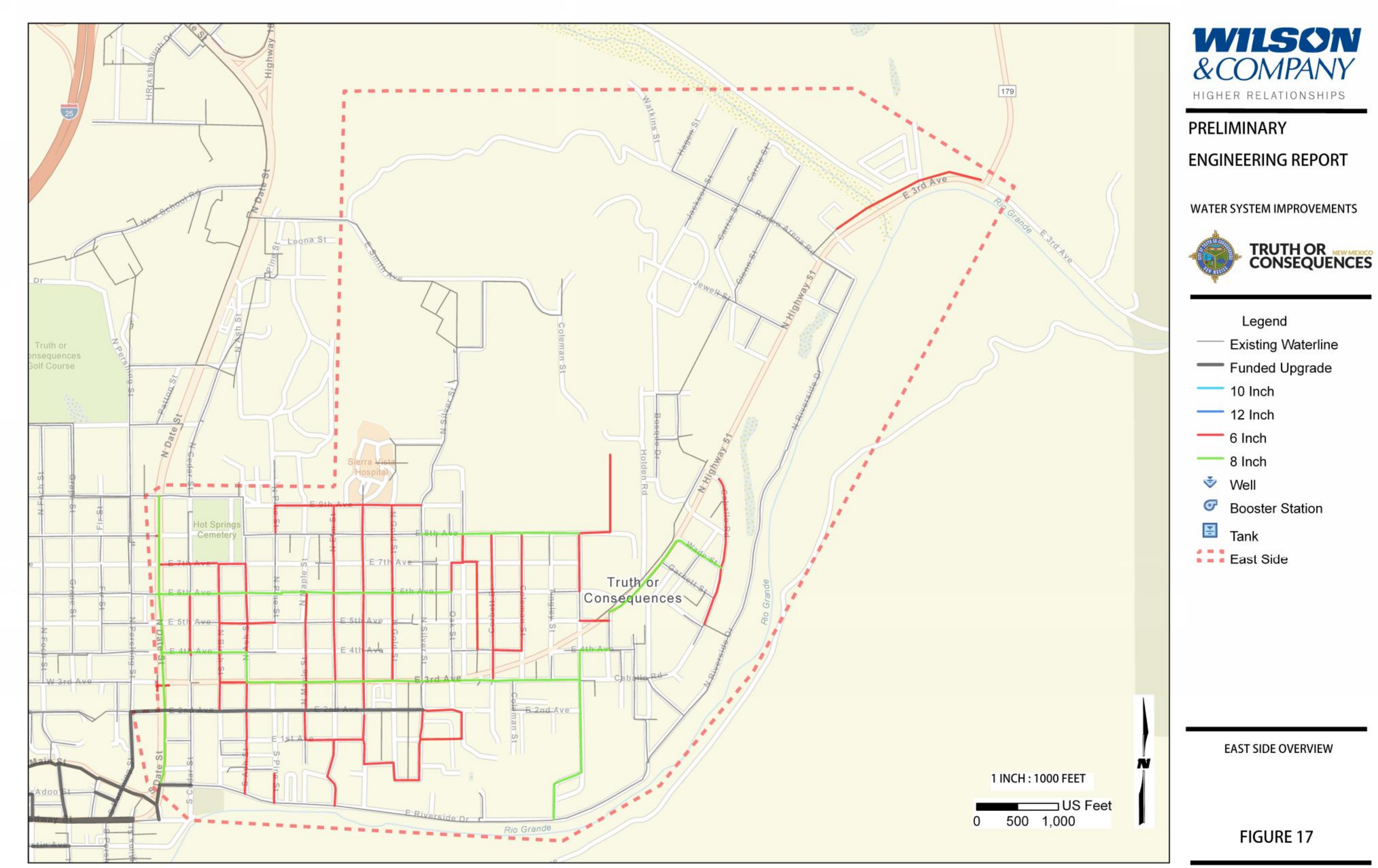

Figure 17: Alternative V East Side

5.2.9 Alternative VI: West Side Replacement

5.2.9.1 Description

Alternative VI involves replacing 7.9 percent of the existing waterlines that are 6 inches or less with PVC C-900 DR-18. This alternative will replace 14.1 percent of pipe over 30 years old. All waterlines in this alternative include pipelines segments with breakages due to high pressure fluctuations. These waterlines are planned to be replaced via open trench by placing the new line parallel to the existing waterline and then abandoning the existing waterline in place except where noted otherwise. Areas in the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing waterline to 6, and 8 inches in diameter will significantly increase available pressure in the west of the city and provide for better fire flow capacity. The new water line is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal and additional removal for any sidewalk and/or curb and gutter as needed. If an existing water meter is to be found in the existing roadway, it will be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any DOT ROW's via bore and jack.

The proposed water well will be located on Cemetery Road), the system currently has six wells, all of them located on the southern part of the City. Additionally, the existing water system uses two pump stations to fill the Cemetery Road water storage tanks in the north part of the City. A new well located in the north area will provide a reliable water supply and prevent water outages for this area. If any of the southern wells or booster stations fail. A northern well would also provide a redundant water supply to the rest of the City's water system.

5.2.9.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report defined as "West Side" (See **Figure 18**) should be replaced. Existing flow capacity has been determined to be insufficient for providing pressure and required fire flow to multiple areas of the City. Increasing the pipe size within the neighborhoods is recommended at this time. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6 Inch or great with, dewatering as described in the previous "Cost Evaluation Methodology" section via open trench.

5.2.9.3 Replacement of City Water Meters

Due to aging meters that may be inaccurate and/or require manually reading described in the "Existing Facilities" portion of this report, it is been recommended that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years and exceed their expected useful life, which provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. Construction of Water Well Northern Area

Presently there is a dependence on Cook Street and Morgan Street Booster stations to provide water to the northern area of the City. Backup water production in the northern area of the City is non-existent, making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells, all of them located on the southern part of the City, most of which are near their end of useful life, a new well located in the north will provide reliable water production and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the tanks located on Cemetery Road. This new water source, when connected to the new Cemetery tanks, will provide a reliable and consistent water supply to this area and the rest of the City if needed under an emergency situation.

5.2.9.4 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 16 Million gallons per year. This amount of water represents $29,713 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.9.5 Green Infrastructure

This alternative will reduce water losses by approximately 16 Million gallons per year due to 30-line breaks within this area reported by the city officials. This is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.9.6 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.9.7 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on the east side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road. This will either require extensive closures, or more likely, directional drilling for the new service lines. It is assumed that horizontal directional drilling will be required, and a bid item has been included in the cost estimate for this portion of the alternative.

Groundwater dewatering is another large potential concern for this alternative. A large portion of these main transmission lines run parallel with the Rio Grande, which has a shallow groundwater table in this area. This alternative will assume 5 percent dewatering since it isn’t near the Rio Grande.

5.2.9.8 Resiliency and Operational Simplicity

The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.9.9 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues on the West Side (in the form of leakage and lack of fire flow)
- This option minimizes the high pressures issues that caused the line breaks, since the aging infrastructure is replaced in this area
- This option improves water supply to the water system
- This option improves only approximately 8 percent of the existing water system
- This option improves approximately 14 percent of the aging water system

DISADVANTAGES:

- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option doesn't reduce a large amount of water losses
- This option doesn't reduce pressure peaks in the system that causes the water breaks
- This option doesn't prevent service outages for residents

5.2.9.10 Cost Summary

Table 21: Alternative VI Cost Summary

Alternative VI- West Side	
20 Yrs O&M PW	$11,660,118
Construction Cost	$13,021,208
Non-Construction Cost	$2,522,034
Total	$27,203,360

The annual 2020 Operation and maintenance is $730,414. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4.**

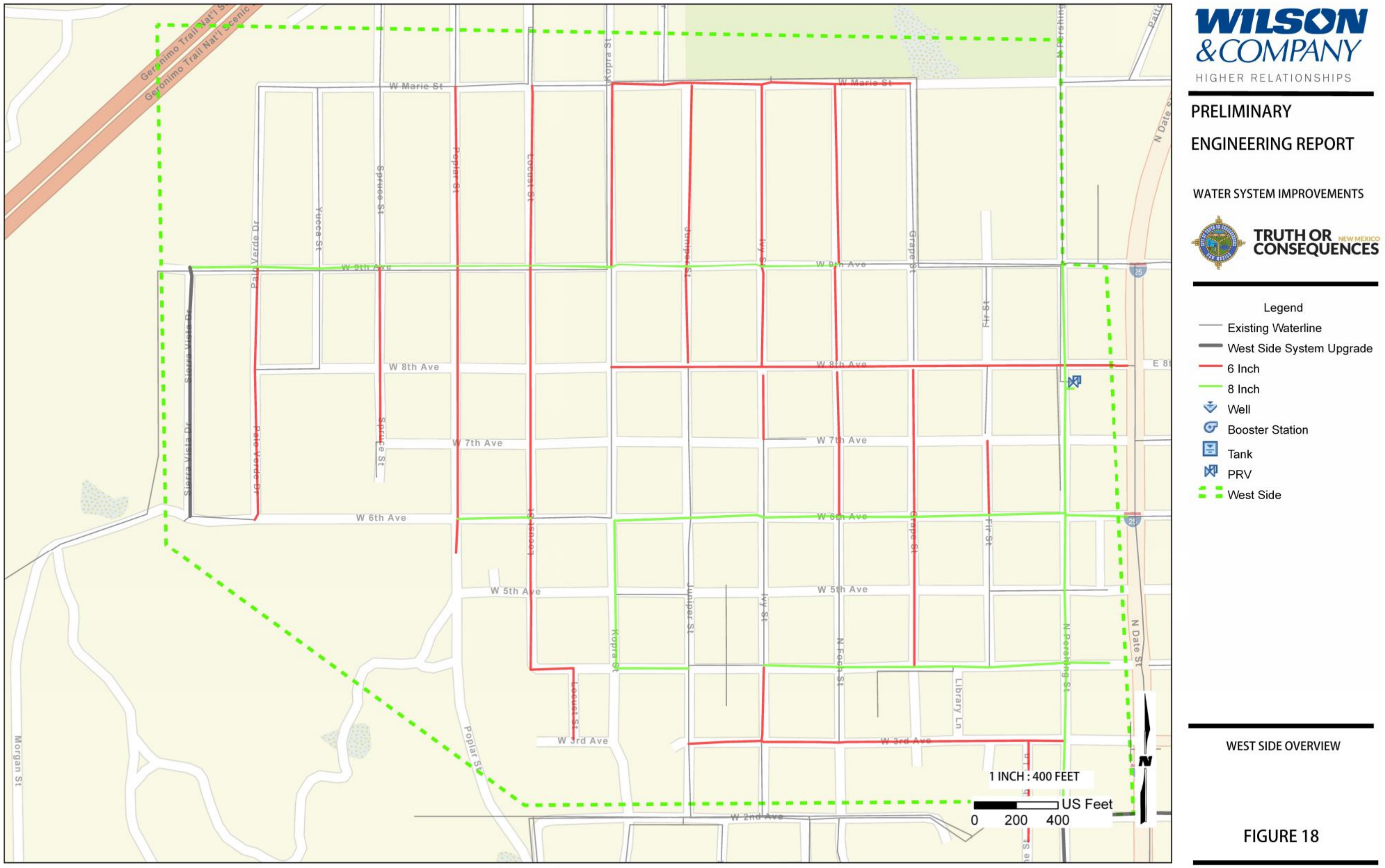

Figure 18: Alternative VI West Side

5.2.10 Alternative VII: Downtown Replacement

5.2.10.1 Description

Alternative VII involves replacing 6.8 percent of the existing waterlines within the city that are equal or less than, 6 inches with new PVC C-900 DR-18 waterlines. This alternative will replace 12 percent of pipe over 30 years old. All waterlines in this alternative are located on the most populated area of the city, with high business developments. It is planned to be replaced via open trench, placing the new line and abandoning in place the existing waterline; except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing waterlines to 6, 8, 10, and 12-inch diameter waterlines will significantly adjust available pressure in the Downtown area of the City as well as provide improved fire flow capacity. The new waterline is assumed to be installed in the shoulder of the road, with 6-12' of pavement removal and additional removal for any sidewalk or curb and gutter. If an existing water meter is found in the existing road, it is to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any NMDOT ROW's via bore and jack.

The proposed water well will be located on Cemetery Road. The system currently has six wells, all of them located on the southern part of the City. The current water system uses two pump stations to fill the Cemetery Road water storage tanks in the northern part of the City. A new well located in the northern area will provide a reliable water supply to this area and prevent water outages. If any of the southern wells or booster stations fail, it would also provide a redundant water supply to the remainder of the City.

5.2.10.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report defined as "Downtown" (See **Figure 19)** should be replaced. Existing flow capacity has been determined to be insufficient due to pipe pressure fluctuations during peak flow periods and not meeting the fire flow requirement in multiple areas of the City. Increasing pipe size within the neighborhoods are recommended at this time. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6 Inch or greater. Dewatering considerations are described in the previous "Cost Evaluation Methodology" section via open trench.

5.2.10.3 Replacement of City Water Meters

Due to aging meters that may be inaccurate and/or require manually reading described in the "Existing Facilities" portion of this report, it is been recommended that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years and exceed their expected useful life, which provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. Construction of Water Well Northern

Presently there is a dependence on Cook Street and Morgan Street Booster stations to provide, a backup source of water in the northern area of the City. Backup water production in the northern area of the City is non-existent, making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells all of them located on the southern part of the City, most of which are near their end of useful life. A new well located in the north will provide reliable water production and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable back up water supply to this area and the rest of the city if needed under an emergency situation.

5.2.10.4 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~14 Million gallons per year. This amount of water represents $25,366 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.10.5 Green Infrastructure

This alternative will reduce water losses by approximately 14 Million gallons per year due to 35, line breaks within this area reported by the city officials. This is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.10.6 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.10.7 Potential Construction Problems

The largest potential for construction problems in this alternative lies in the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road. This will either require extensive closures, or more likely, directional drilling for the new service lines. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Groundwater dewatering is another large potential concern for this alternative. A large portion of these main transmission lines run parallel with the Rio Grande which has a shallow groundwater table. As explained in the “existing system” part of this report waterlines replaced within the southern portion of the Downtown area will have a 60 percent dewatering of the trench. If located in other areas a 5 percent dewatering will be assumed.

5.2.10.8 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative is the new water well which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.10.9 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues in the Downtown area (in the form of leakage and lack of fire flow)
- This option improves water supply to the water system
- This option improves approximately 7 percent of the existing water system
- This option improves approximately 12 percent of the aging water system

DISADVANTAGES:

- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option doesn't reduce a large amount of water losses
- This option doesn't reduce pressure peaks in the system that causes the water breaks
- This option doesn't prevent service outages for residents
- This option has a high dewatering cost

5.2.10.10 Cost Summary

Table 22: Alternative VII Cost Summary

Alternative VII- Downtown	
20 Yrs O&M PW	$11,719,281
Construction Cost	$12,157,023
Non-Construction Cost	$2,365,623
Total	$26,241,927

The annual 2020 Operation and maintenance is $734,120. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

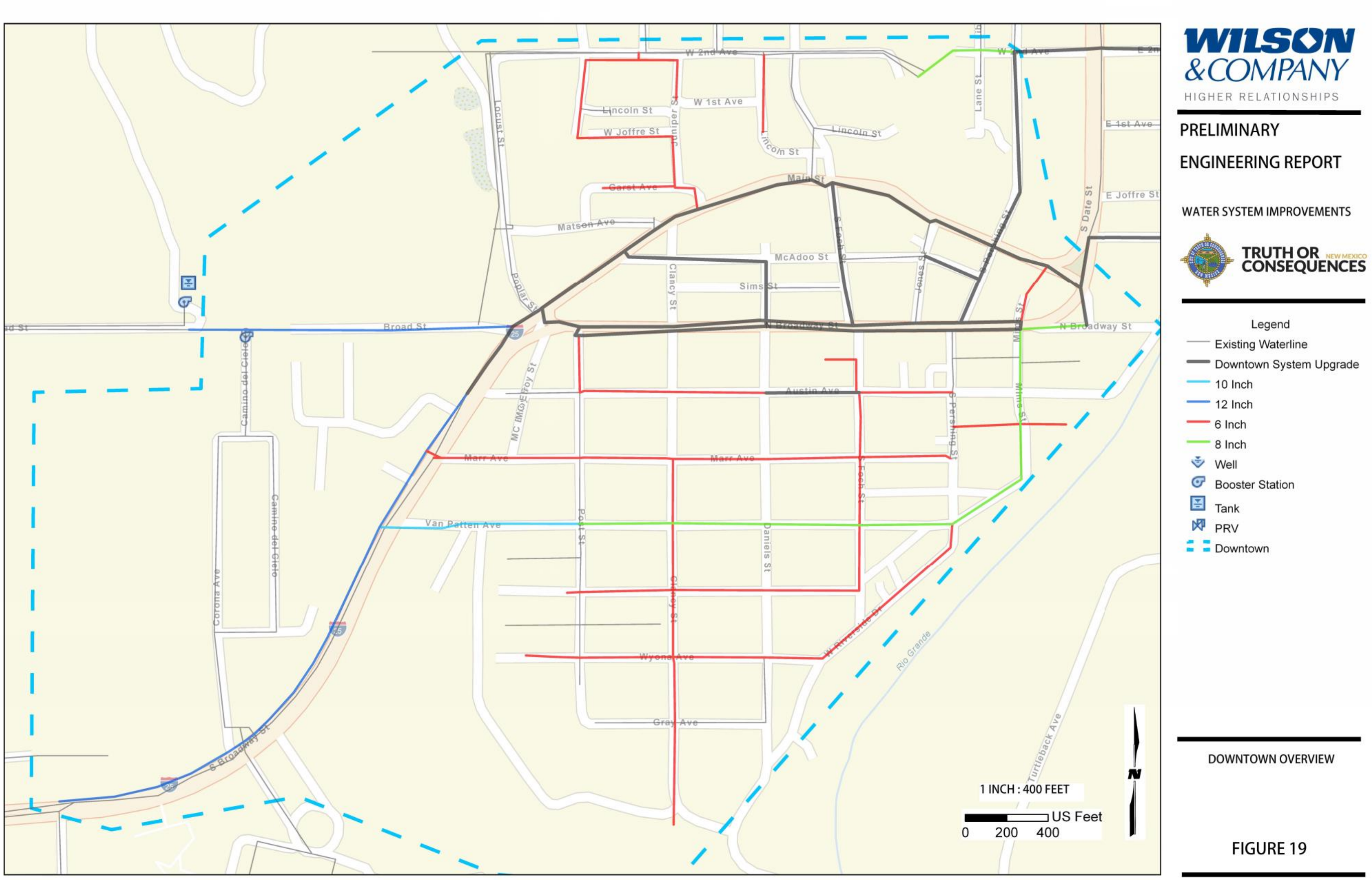

Figure 19: Alternative VII Downtown

5.2.11 Alternative VIII: Williamsburg Replacement

5.2.11.1 Description

Alternative VIII involves replacing 12.5 percent of the existing waterlines within new pipeline equal or less than 6 inches with new PVC C-900 DR-18 pipeline. This alternative will replace 22 percent of pipe over 30 years old. All waterlines in this alternative present a high-pressure breakages along record along Veater St. This alternative will be replaced via open trench by placing the new line and abandoning in place the existing waterline except where noted otherwise. Areas of the City of Truth or Consequences were evaluated based on current GIS information. Upsizing the existing water lines to be 6, 8, and 14-inch diameters will significantly adjust available pressure in the Downtown area and provide for better fire flow capacity. The new waterlines are assumed to be installed in the shoulder of the road, with 6-12' of pavement removal and an additional removal for any sidewalk or curb and gutter as needed. If an existing water meter is found in the existing road, it will need to be replaced. This portion of line repairs also includes the replacement of the existing casing and crossing pipe underneath any DOT ROW's via bore and jack.

The proposed water well will be located on Cemetery Road. The system currently has six wells all of them located on the southern part of the city. The existing water system uses two pumping stations to feed the water storage tanks on the north part of the city. A new well located in the north will provide reliable water production and prevent water outages if any of the southern wells or booster stations fail. It would also provide an additional water source when one of City's existing wells fail due to their age.

5.2.11.2 Replacement of City Water Lines

Due to extensive leaks and pipe breaks as described in the "Existing Facilities" portion of this report and defined as "Williamsburg" (See **Figure 20)** should be replaced. Existing flow capacity has been determined to generally be not sufficient per pipe pressure fluctuations during peak flow periods, as well as not meeting the fire flow requirement on multiple areas of the city. Increasing the pipe size within the neighborhoods is recommended at this time. All pipes are assumed to be replaced with PVC C-900 DR18 with sizes 6 Inch or greater via open trench, with dewatering as described in the previous "Cost Evaluation Methodology" section.

5.2.11.3 Replacement of City Water Meters

Due to aging meters that may be inaccurate and/or require manually reading described in the "Existing Facilities" portion of this report, it is been recommended that all of the water meters should be replaced in their entirely. Water meters are currently older than 40 years and exceed their expected useful life, which provides incorrect data regarding water usage, water loss percentages and has a negative impact on the City's billing system. Construction of Water Well Northern Area.

Presently there is a dependence on Cook Street and Morgan Street Booster stations to provide, a backup source of water in the northern area of the City. Backup water production in the northern area of the City is non-existent making the distribution system open for failure if either of the booster stations do not work as desired. Currently the system has six wells all of them located on the southern part of the City, most of which are near their end of useful life, a new well located in the north will provide reliable water production and prevent water outages.

Additionally, most of the water system users in this northern area are currently connected to the northern tanks located on Cemetery Road. This new water source, when connected to the Upper tanks located on Cemetery Road, will provide a reliable backup supply to this area and the rest of the city if needed under an emergency situation.

5.2.11.4 Water and Energy Efficiency

This alternative will cost approximately $12,000 additional per year in electricity costs due to the new well pump, the addition of a new well will reduce the cost of boosting the water from the southern part of the City to the north tanks, which could counter the O&M cost of this improvement. The amount of lost water in this portion of the system is estimated at ~ 26 Million gallons per year. This amount of water represents $46,849 in lost revenue per year, at the rate the city charges per gallon of water.

5.2.11.5 Green Infrastructure

This alternative will reduce water losses by approximately 26 Million gallons per year due to 90-line breaks within this area reported by the city officials. This is an essential consideration in New Mexico with limited water supply available. See **Appendix 8** for justification on water loss numbers.

5.2.11.6 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new water well. A small easement may need to be purchased by the City in order to build this water well. If the land is privately owned, and if this option is pursued the owner will need to be determined.

No additional land requirements are anticipated for the replacement of the water lines, as all new water lines are within existing right-of-way.

5.2.11.7 Potential Construction Problems

The largest potential for construction problems in this alternative lies on the neighborhoods located on each side of I-25 business route which will require service lines crossing all lanes within an NMDOT owned road. This will either require extensive closures, or more likely, directional drilling for the new service lines. It is assumed that drilling will be required, and a bid item for drilling has been included in the cost estimate for this portion of the alternative.

Groundwater dewatering is another large potential concern for this alternative. A large portion of these main transmission lines run parallel with the Rio Grande which has a shallow groundwater table in this area. This alternative will assume 5 percent dewatering since it isn’t near the Rio Grande.

5.2.11.8 Resiliency and Operational Simplicity

The only regular maintenance item for this alternative is the new water well pump which will require periodic maintenance as recommended by the manufacturer. The new pipelines and water meter replacements are anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.11.9 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues in the Williamsburg area (in the form of infiltration and lack of fire flow)
- This option improves the back up and redundancy to the water system
- This option improves approximately 11 percent of the water system
- This option improves approximately 22 percent of the aging water system

DISADVANTAGES:

- This option requires a large amount of NMDOT crossing permits
- This option has additional O&M for the new well, but pumping cost will be countered by not boosting the water twice to this upper zone
- This option doesn’t reduce a large amount of water losses
- This option doesn’t reduce pressure peaks in the system that causes the water breaks
- This option doesn’t prevent service outages for residents

5.2.11.10 Cost Summary

Table 23: Alternative VIII Cost Summary

Alternative VIII- Williamsburg	
20 Yrs O&M PW	$11,430,818
Construction Cost	$18,538,532
Non-Construction Cost	$3,520,636
Total	$33,489,986

The annual 2020 Operation and maintenance is $716,050. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

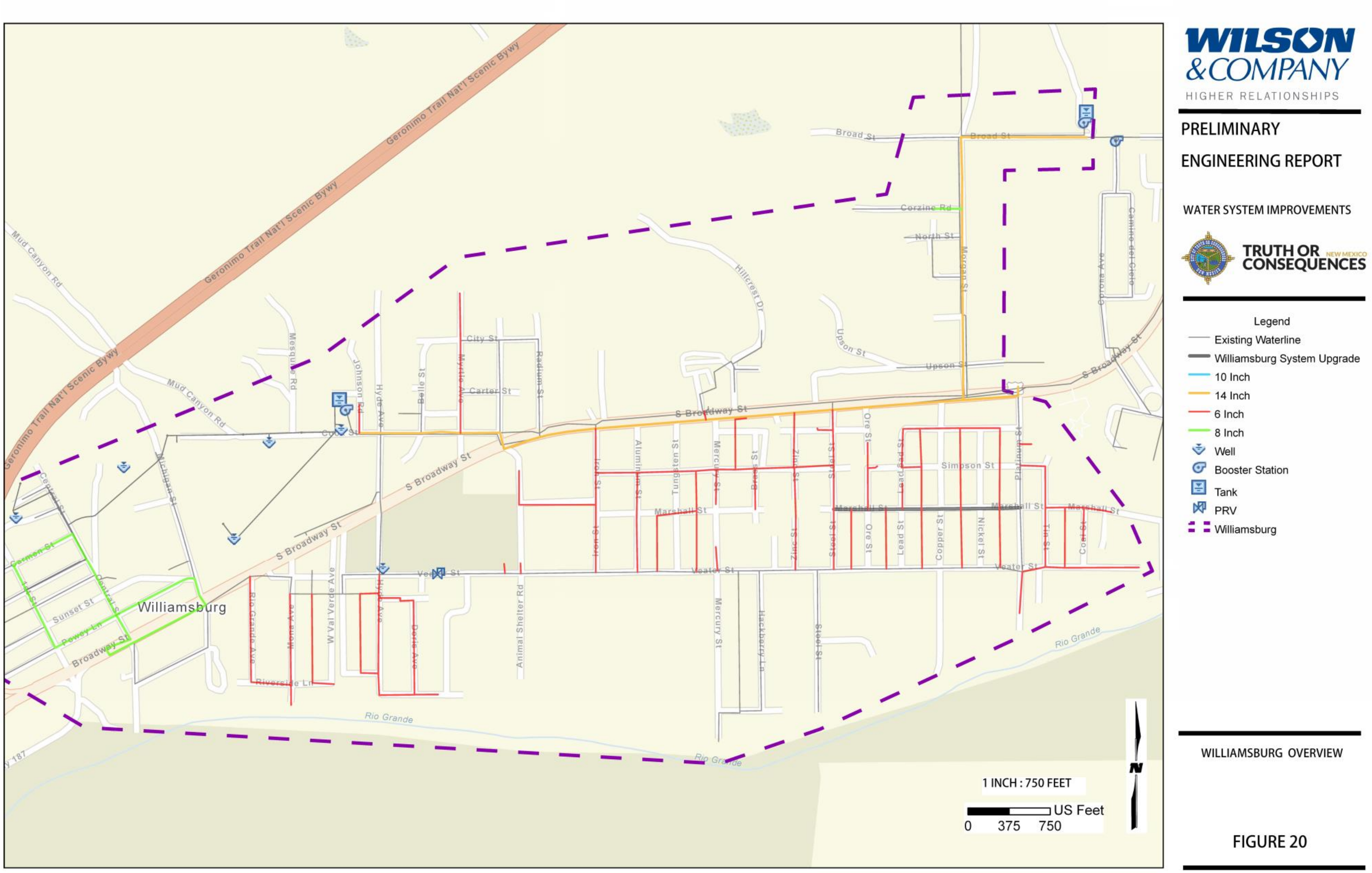

Figure 20: Alternative VIII Williamsburg

5.2.12 Alternative IX: Pressure Tank Replacement

5.2.12.1 Description

Alternative IX will consist of installing a new water system, with a building located near the existing water well which will; enclose two 200-gallon capacity pressure tanks, a chlorination system, and a control panel at the municipal airport. The existing well will include a new 8 Inch sanitary pitiless seal unit to protect the wellhead from contamination (surface water, debris, insects, vermin and other contaminants).

5.2.12.2 Design Layout Map

A map illustrating the schematic design layout of Alternative IX is shown in **Figure 21.** The new pressure tanks will be on the south-west side of the building. As show in the design layout a new waterline will be connected to the well. Isolation valves will be installed with the new inlets and outlets piping to allow the new tank to be isolated for maintenance and repairs. In addition, the chlorination system and control panels will be design and located within the building and comply with health and safety requirements.

5.2.12.3 Green Infrastructure

This alternative is not expected to have any environmental impacts. This is because the new pressure tanks will be located within the existing boundaries of the new building. Installation of this system will not add any further impact on endangered species, flood plains, wetlands, historical or archaeological sites due that existing buildings will not be affected by this upgrade.

5.2.12.4 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new building and fence of 30’ by 45’.

5.2.12.5 Potential Construction Problems

Construction of Alternative IX is not expected to have any significant problems. There are no known utilities in the direct vicinity of the proposed locations of the new building and its associated pipeline.

5.2.12.6 Resiliency and Operational Simplicity

Installation and future operation of the new pressure tank is anticipated to have a beneficial impact on the system because it will provide redundancy to the system and will allow for more energy efficient use of the well pump. No interruption in the delivery of chlorinated water to distribution system means there is a much smaller chance of water consumers ingesting water that has not been properly disinfected. The new water system replacements are anticipated to greatly reduce the operations costs associate with repairs of the failing system.

5.2.12.7 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues at the Municipal airport of no chlorination and lack of secure building for the facilities
- This option prevents service outages for the airport buildings

DISADVANTAGES:

- This option has additional O&M for the new chlorination system
- This option doesn't provide enough to back up water storage to the water system if power outage occurs
- This option only addresses a small transient population
- This option doesn't repair the small existing distribution system

5.2.12.8 Cost Summary

Table 24: Alternative IX Cost Summary

Alternative IX-Airport 1	
20 Yrs O&M PW	$33,305
Construction Cost	$342,862
Non-Construction Cost	$90,328
Total	$466,495

The annual 2020 Operation and maintenance is $2,086. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

Figure 21: Airport Alternative IX Pressure Tank Replacement

5.2.13 Alternative X: Airport Improvements – New ground water storage tank without fire flow

5.2.13.1 Description

Alternative X will consist of installing a new Municipal Airport water System with a new building located near the existing water well. The building will enclose a chlorination system, Variable speed booster system and a control panel. A new 7,200 gallons steel storage tank will be located near the building. The existing well will include a new 8 Inch sanitary pitiless seal unit to protect the wellhead from contamination (surface water, debris, insects, vermin and other contaminants).

5.2.13.2 Design Layout Map

A map illustrating the schematic design layout of Alternative X is shown in **Figure 22.** The new steel storage tank will be nearby the new building. As show in the design layout, a new water system will be connected to the well. Isolation valves will be installed with the new inlets and outlets piping to allow the new tank to be isolated for maintenance and repairs. In addition, chlorination system, booster system, and control panels will be design and located within the building following hazards protocols.

5.2.13.3 Green Infrastructure

This alternative is not expected to have any environmental impacts. This is because the new storage tanks will be located within the existing boundaries of the existing system. Installation of this system will not add any further impact on endangered species, flood plains, wetlands, historical or archaeological sites since the existing buildings will not be affected by this upgrade.

5.2.13.4 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new storage tank, building, and fence of 30' by 80'.

5.2.13.5 Potential Construction Problems

Construction of Alternative X is not expected to have any significant problems. There are no known utilities in the direct vicinity of the proposed location of the new building and its associated pipeline.

5.2.13.6 Resiliency and Operational Simplicity

Installation and future operation of the new tank is anticipated to have a beneficial impact on the environment because it will provide a 3-day storage in the system and will allow for more energy efficient use of the new water pump. No interruption in the delivery of chlorinated water to distribution means there is a much smaller chance of water consumers ingesting water that has not been properly disinfected. The new water system replacements is anticipated to greatly reduce the operations costs associated with the failing system.

5.2.13.7 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues at the Municipal Airport of no chlorination and lack of secure building for the facilities
- This option improves the water storage requirement and reliability of water supply if a power outage occurs
- This option prevents service outages for the airport buildings.

DISADVANTAGES:

- This option has additional O&M for the new chlorination system, booster pumps, and storage tank
- This option only addresses a small transient population
- This option doesn't repair the small existing distribution system

5.2.13.8 Cost Summary

Table 25: Alternative X Cost Summary

Alternative X-Airport 2	
20 Yrs O&M PW	$33,305
Construction Cost	$447,772
Non-Construction Cost	$107,461
Total	$588,538

The annual 2020 Operation and maintenance is $2,086. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

Figure 22: Airport Alternative X New Ground Water Storage Tank without Fire Flow

5.2.14 Alternative XI: Airport Improvements- with Fire flow

5.2.14.1 Description

Alternative XI will consist of installing a new Municipal Airport water System with a new building located near the existing water well. The building will enclose a chlorination system, variable speed booster system, a 1,600 GPM fire pump, and a control panel. A new 190,000-gallon steel storage tank will be constructed near the building. The existing well will include a new 8 Inch sanitary pitiless seal unit to protect the wellhead from contamination (surface water, debris, insects, vermin and other contaminants).

5.2.14.2 Design Layout Map

A map illustrating the schematic design layout of Alternative XI is shown in **Figure 23.** The new steel storage tank will be located near the new building. As shown in the design layout, a new waterline will be connected to the outlet of the water well. Isolation valves will be installed with the new inlet and outlet piping to allow the new tank to be isolated for maintenance and repairs. The chlorination system, booster system, and control panels will be designed and located within the building complying with health and safety requirements.

5.2.14.3 Green Infrastructure

This alternative is not expected to have any environmental impacts. This is because the new storage tanks will be located within the existing boundaries of the existing system. Installation of this system will not add any further impact on endangered species, flood plains, wetlands, historical and archaeological sites due that existing buildings will not be affected by this upgrade.

5.2.14.4 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new storage building and fence of 30’ by 90’.

5.2.14.5 Potential Construction Problems

Construction of Alternative XI is not expected to have any significant problems. There are no known utilities in the direct vicinity of the proposed locations of the new building and its associated pipeline.

5.2.14.6 Resiliency and Operational Simplicity

Installation and future operation of the new tank is anticipated to have a beneficial impact on the environment because it will provide a three day redundancy in the system, comply with fire flow requirements, and will allow for more energy efficient use of the new water pump. No interruption in the delivery of chlorinated water to distribution means there is a much smaller chance of water consumers ingesting water that has not been properly disinfected. The new water system replacements is anticipated to greatly reduce the operations costs associated with pipe repairs in this area.

5.2.14.7 Alternative Pros/Cons

ADVANTAGES:

- This option fixes safety issues at the Municipal Airport of no chlorination and lack of secure building for the facilities
- This option improves the water storage requirement and reliability of water supply if a power outage occurs
- This option complies with fire flow requirement
- This option prevents service outages for the airport buildings.
- This option repairs the small existing distribution system to meet fire flow requirements

DISADVANTAGES:

- This option has a high capital cost
- This option has additional O&M for the new chlorination system, booster pumps, fire flow pump, and storage tank
- This option only addresses a small transient population

5.2.14.8 Cost Summary

Table 26: Alternative XI Cost Summary

Alternative XI-Airport 3	
20 Yrs O&M PW	$647,893
Construction Cost	$1,850,550
Non-Construction Cost	$336,534
Total	$2,834,977

The annual 2020 Operation and maintenance is $40,585. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

Figure 23: Airport Alternative XI New Ground Water Storage Tank with Fire Flow

5.2.15 Alternative XII: Airport Improvements – VFD Well pump

5.2.15.1 Description

Alternative IX consist of installing a new water system with a building located near the existing water well at the municipal airport. The building will house one 30 gpm capacity pressure tank, a chlorination system, 50 gpm variable speed pumps, and a control panel. The existing well will include a new 8 Inch sanitary pitiless seal unit to protect the wellhead from contamination (surface water, debris, insects, vermin and other contaminants).

5.2.15.2 Design Layout Map

A map illustrating the schematic design layout of Alternative XII is shown in **Figure 24.** The new pressure tanks will be on the south-west side of the building. As show in the design layout a new waterline will be connected to the outlet of the water well. Isolation valves will be installed with the new inlet and outlet piping to allow the new tank to be isolated for maintenance and repairs. In addition, the chlorination system, control panels, and VFD will be design and located within the building meeting health and safety requirements.

5.2.15.3 Green Infrastructure

This alternative is not expected to have any environmental impacts. This is because the new pressure tank will be located within the existing boundaries of the new building. Installation of this system will not add any further impact on endangered species, flood plains, wetlands, historical or archaeological sites due that existing buildings will not be affected by this upgrade.

5.2.15.4 Land Requirements

Minimal additional land requirements are anticipated for the installation of the new building and fence of 30’ by 45’.

5.2.15.5 Potential Construction Problems

Construction of Alternative XII is not expected to have any significant problems. There are no known utilities in the direct vicinity of the proposed locations of the new building and its associated pipeline.

5.2.15.6 Resiliency and Operational Simplicity

Installation and future operation of the new pressure tank is anticipated to have a beneficial impact on the system because it will allow for more energy efficient use of the well pump. No interruption in the delivery of chlorinated water to distribution means there is a much smaller chance of water consumers ingesting water that has not been properly disinfected. The new water system replacements is anticipated to greatly reduce the operations costs associate repairs of the failing system.

5.2.15.7 Alternative Pros/Cons

ADVANTAGES:

- This option has a low capital cost
- This option fixes safety issues at the Municipal Airport of no chlorination and lack secure building for the facilities
- This option reduces service outages for the airport buildings

DISADVANTAGES:

- This option has additional O&M for the new chlorination system and well pump VFD
- This option doesn't provide enough to back up water storage to the water system if power outage occurs
- This option only addresses a small transient population
- This option doesn't repair the small existing distribution system

5.2.15.8 Cost Summary

Table 27: Alternative XII Cost Summary

Alternative XII -Airport 4	
20 Yrs O&M PW	$38,021
Construction Cost	$393,623
Non-Construction Cost	$98,618
Total	$530,262

The annual 2020 Operation and maintenance is $2,382. See the breakdown of Annual Operation and Maintenance cost is provided in **Appendix 5** and full construction and non-construction cost breakdown is in **Appendix 4**.

Figure 24: Airport Alternative XII VFD Well Pump

6 SELECTION OF AN ALTERNATIVE

6.1 Life Cycle and Capital Cost Analysis

When analyzing project alternatives, different avenues for selecting the best project must be evaluated. In selecting the most feasible and functional project for the water system, two features were considered. The first is a life cycle cost analysis (LCCA) which was developed as a tool to assist asset managers with decisions solely based off monetary value. Other non-monetary factors help analyze and selecting an alternative are listed in the section below.

6.1.1 Capital & Life Cycle Cost Summary

All alternatives were evaluated on a lifecycle cost basis with estimated future maintenance, electricity, and water losses accounted for. All alternatives use a 2.25% (2 years) discount rate, to calculate future and present values. All alternatives are evaluated for a 20-year period and the total net present value for this period is calculated.

Present worth is the future value, capital and annual O&M costs, of a project for its entire operational or design life discounted to reflect its current value. It is a useful tool for comparing cash flows that don't necessarily occur at the same time. When developing the present worth of each alternative, a 2.25% Real Interest Rate was used for 20 years based on Discount Rates for Cost-Effectiveness, Lease Purchase, Related Analysis, and OMB Circular No. A-94 (US Office of Management and Budget).

The present worth of the annual O&M costs is calculated using the equation below

$$\boldsymbol{PV} = A * \frac{(1+i)^n - 1}{i(1+i)^n}$$

PV: Present Value

A: Annual Cost (O&M costs)

I: Real Interest Rate: 2.25%

N: number of years: *20 years*

The Net Present Value was calculated as the sum of the Capital Cost plus the present worth of the uniform series of annual O&M (USPW (O&M)).

Evaluation of the T or C water system Alternatives I through VIII, the Capital Costs for Alternative II is the highest and the Annual O&M Costs for Alternative II is the highest Alternative I has the lowest Capital Costs and Annual O&M Costs, as one would expect resulting in a Net Present Value less than the other eight alternatives.

Alternatives I through XII presented herein are comprised of installing new facilities in addition to upgrading the existing facilities. As such the existing equipment, tanks, pumps, PRV, piping, buildings, valves, and appurtenances, will remain in service through the end of their useful life. Therefore, the salvage value for alternatives I through XII is $0.

Table 28 : Cost Estimate Summary

	Annual O&M Present Worth 20 Yrs	Capital Cost	Net Present Value	2020 Annual O&M Cost
Alternative I- No Action	$11,871,223	$0	$11,871,223	$743,638
Alternative II- Complete System*	$9,325,812	$100,624,621	$109,950,433	$584,188
Alternative III- System Performance Update*	$10,989,446	$23,929,588	$34,919,034	$688,402
Alternative III A- System High Pressure Solutions	$11,115,798	$7,530,330	$18,646,128	$696,317
Alternative III B- System Redundancy and Hydraulic Performance Enhancements *	$11,880,678	$8,433,513	$20,314,191	$744,230
Alternative III C- Additional Hydraulic Performance Enhancements	$11,724,099	$6,270,445	$17,994,544	$734,422
Alternative IV- North Side*	$11,914,630	$8,872,546	$20,787,176	$746,357
Alternative V- East Side*	$11,402,777	$25,123,088	$36,525,865	$714,294
Alternative VI- West Side*	$11,660,118	$15,543,242	$27,203,360	$730,414
Alternative VII- Downtown*	$11,719,281	$14,522,646	$26,241,927	$734,120
Alternative VIII- Williamsburg*	$11,430,818	$22,059,168	$33,489,986	$716,050
Alternative IX-Airport 1 - Pressure tank Replacement **	$33,305	$433,190	$466,495	$2,086
Alternative X-Airport 2- Without Fire Flow**	$33,305	$555,233	$588,538	$2,086
Alternative XI-Airport 3-With Fire Flow**	$647,893	$2,187,084	$2,834,977	$40,585
Alternative XII-Airport 4-VFD Well Pump**	$38,021	$492,241	$530,262	$2,382

*Alternative includes new well
***Alternative 9-13 the airport system is newly acquired, so the O&M cost for this alternative will be added to additional O&M cost to the city's O&M budget.*

6.2 Non-Monetary Factors

It is important to not only evaluate alternatives on a cost basis; all alternatives are also evaluated on a Non-Monetary basis. All alternatives are scored based on six factors, then given a total score based on the sum of all weighted factors. The Scores and Score Weights are as explained below:

6.2.1 Score Weights

- Environmental Impacts: **(Score Weight: 5)** This factor was given high importance, as environmental safety and water conservation is a large concern for long-term sustainability. **Table 29** is a summary of the T or C water system alternatives**.**

Table 29: Water Reduction and Cost savings

	Water Losses (G)	Monetary Losses
Alternative I - No Action	120,589,680	$ 211,032
Alternative II - Complete System	116,489,630	$ 203,857
Alternative III - System Performance Update	45,582,899	$ 79,770
Alternative III A- System High Pressure Solutions	32,197,444	$ 56,346
Alternative III B- System Redundancy and Hydraulic Performance Enhancements)	7,597,150	$ 13,295
Alternative III C- Additional Hydraulic Performance Enhancements	6,270,663	$ 10,974
Alternative IV - North Side	6,150,074	$ 10,763
Alternative V - East Side	27,928,570	$ 48,875
Alternative VI - West Side	16,979,027	$ 29,713
Alternative VII - Downtown	14,494,879	$ 25,366
Alternative VIII - Williamsburg	26,770,909	$ 46,849

- Operation and Maintenance: **(Score Weight: 2)** This factor was given a low importance, operation and maintenance cost is relatively low for distribution system infrastructure. **Table 30** summarizes all the alternative's O&M cost.

Table 30: Operation and maintenance cost

	2020 Annual O&M Cost	2021 Annual O&M Cost	2023 Annual O&M Cost
Alternative I- No Action	$743,638	$760,370	$794,971
Alternative II- Complete System	$584,188	$597,332	$624,515
Alternative III- System Performance Update	$688,402	$703,891	$735,922
Alternative III A- System High Pressure Solutions	$696,317	$711,984	$744,383
Alternative III B- System Redundancy and Hydraulic Performance Enhancements)	$744,230	$760,975	$795,605
Alternative III C- Additional Hydraulic Performance Enhancements	$734,422	$750,946	$785,119
Alternative IV- North Side	$746,357	$763,150	$797,878
Alternative V- East Side	$714,294	$730,365	$763,601
Alternative VI- West Side	$730,414	$746,848	$780,834
Alternative VII- Downtown	$734,120	$750,638	$784,796
Alternative VIII- Williamsburg	$716,050	$732,161	$765,479
Alternative IX-Airport 1 - Pressure tank Replacement	$2,086	$2,133	$2,230
Alternative X-Airport 2- Without Fire Flow	$2,086	$2,133	$2,230
Alternative XI-Airport 3-With Fire Flow	$40,585	$41,499	$43,387
Alternative XII-Airport 4-VFD Well Pump	$2,382	$2,435	$2,546

** 2023 annual O&M Cost is projected at the estimated project completion*

- Constructability: **(Score Weight: 4)** This factor was given a high score, as constructability in this area can potentially have a high construction cost for dewatering.

- Capital Cost: **(Score Weight: 5)** This factor was given a high score as securing funding is the most important step to getting a project started.
- Public Safety: **(Score Weight: 5)** This was given a high score; public safety is always a major concern.
- Disruption of Service: **(Score Weight: 4)** This factor was given a slightly lower score because temporary service outages can be endured. However, long term service disruption is unacceptable.

6.2.2 *Alternate I: No Action*

Scores for Alternate I are justified as follows:

- Environmental Impacts: **(Score: 1)** This alternative was given a low environmental score, as taking no action will not mitigate leaks, and make any water conservation problems worse.
- Operation and Maintenance: **(Score: 2)** This alternative was given a low score for ease of maintenance; this alternative requires a large amount of maintenance due to frequent line breaks in the areas which will require constant repairs.
- Constructability: **(Score: 5)** This alternative was given a high constructability score, as no construction is required.
- Capital Cost: **(Score: 5)** This alternative is no cost and was given a high Capital Cost score.
- Public Safety: **(Score: 2)** This alternative puts existing customers at risk of water outages as well as the possibility of contamination due to line breaks and was given a low public safety score.
- Disruption of Service: **(Score: 2)** This alternative puts customers at a high risk of outages and was given a low score for service disruption.

6.2.3 *Alternate II: Complete Water Replacement*

Scores for Alternate II are justified as follows:

- Environmental Impacts: **(Score: 5)** This option will reduce leaks and aid in water conservation, construction takes place in previously disturbed areas and should have minimal impact.
- Operation and Maintenance: **(Score: 5)** This option will greatly improve operation and maintenance (O&M) compared to the existing system by replacing the old infrastructure.

- Constructability: **(Score: 1)** This option is within existing right-of-way, and it is assumed that trenching dewatering will be extensive on the East area and Downtown area. Extensive geotechnical investigations are highly recommended prior to construction. four points were deducted for the difficulty of installing service lines on these previously mention areas. Points were deducted because of the longevity of the construction phase.
- Capital Cost: **(Score: 1)** This is the most expensive option and was given a low score for initial capital cost.
- Public Safety: **(Score: 5)** This alternative will greatly reduce the risk of contamination due to line breaks, repairs and water redundancy for the water system.
- Disruption of Service: **(Score: 3)** This option will greatly diminish the amount of service disruptions but will create a long temporary disruption during construction.

6.2.4 Alternate III: System Performance Upgrade

Scores for Alternate III are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will address flow and pressure surges that are prevalent in the water system, it will reduce leaks and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. A point was deducted compared to Alternative II because it doesn't assess the aging waterline replacement within the neighborhoods.
- Operation and Maintenance: **(Score: 4)** This option will greatly improve operation and maintenance compared to the existing system. A point was deducted as since the aging infrastructure that causes the breaks is not being replaced.
- Constructability: **(Score: 3)** This is the most constructible option; a small percentage of service lines are to be installed where shallow groundwater table has lower probability to impact the construction.
- Capital Cost: **(Score: 1)** This option was given a low score due to high initial capital cost which exceeds the city's budget.
- Public Safety: **(Score: 4)** This alternative will greatly reduce the risk of contamination due to reduction in pressure surges which reduces line breaks and repairs of the aging infrastructure.
- Disruption of Service: **(Score: 4)** This option will greatly diminish the amount of service disruptions but will create a temporary disruption during construction.

6.2.5 Alternate III-A: System High Pressure Solutions

Scores for Alternate III-A are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will address flow and pressure surges that are prevalent in the transmission line from Cook Street to Morgan booster Station in water system, it will reduce leaks and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. A point was deducted compared to Alternative II because it doesn't assess the aging waterline replacement within the neighborhoods.
- Operation and Maintenance: **(Score: 3)** This option will greatly improve operation and maintenance compared to the existing system. Two points were deducted as since the aging infrastructure that causes the breaks is not being replaced.
- Constructability: **(Score: 4)** This is the most constructible option, as a low percentage of service lines are to be installed where shallow groundwater table has lower probability to impact the construction.
- Capital Cost: **(Score: 4)** This option was given a relatively high score due to high initial capital cost but still the cost doesn't exceed the city's budget.
- Public Safety: **(Score: 4)** This alternative will greatly reduce the risk of contamination due to reduction in pressure surges which reduces line breaks and repairs of the aging infrastructure.
- Disruption of Service: **(Score: 4)** This option will greatly diminish the amount of service disruptions due to waterline breakages caused by pressure surges but will create a temporary disruption during construction.

6.2.6 Alternate III-B: System Redundancy and Hydraulic Performance Enhancements

Scores for Alternate III-B are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will address flow and pressure surges that are prevalent in the "Williamsburg" area of the water system, it will reduce leaks and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. A point was deducted compared to Alternative II because it doesn't assess the aging waterline replacement within the neighborhoods.
- Operation and Maintenance: **(Score: 3)** This option will greatly improve operation and maintenance compared to the existing system. Two points were deducted as since the aging infrastructure that causes the breaks is not being replaced.

- Constructability: **(Score: 3)** This option supplements and address pressure issues in the system, two points were deducted as major service lines are to be installed where shallow groundwater table has higher probability to impact the construction.
- Capital Cost: **(Score: 4)** This option was given a relatively high score due to high initial capital cost but still the cost doesn't exceed the city's budget.
- Public Safety: **(Score: 4)** This alternative will greatly reduce the risk of contamination due to reduction in pressure surges which reduces line breaks and repairs of the aging infrastructure.
- Disruption of Service: **(Score: 4)** This option will greatly diminish the amount of service disruptions due to waterline breakages in the "Williamsburg" area caused by pressure surges but will create a temporary disruption during construction.

6.2.7 Alternate III-C: Additional Hydraulic Performance Enhancements

Scores for Alternate III-C are justified as follows:

- Environmental Impacts: **(Score: 3)** This option will address part of the flow and pressure surges that are in the water system, it will reduce leaks and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. Two points were deducted compared to Alternative III-A because it doesn't assess the aging waterline replacement within the neighborhoods and entails small speeded areas within the city.
- Operation and Maintenance: **(Score: 4)** This option will greatly improve operation and maintenance compared to the existing system. A point was deducted as since the aging infrastructure that causes the breaks is not being replaced.
- Constructability: **(Score: 3)** This option has a small percentage of service lines are to be installed where shallow groundwater table has lower probability to impact the construction.
- Capital Cost: **(Score: 4)** This option was given a relatively high score due to high initial capital cost but still the cost doesn't exceed the city's budget.
- Public Safety: **(Score: 4)** This alternative will greatly reduce the risk of contamination due to reduction in pressure surges which reduces line breaks and repairs of the aging infrastructure.
- Disruption of Service: **(Score: 4)** This option will greatly diminish the amount of service disruptions, but will create a temporary disruption during construction

6.2.8 Alternate IV: North Side

Scores for Alternate IV are justified as follows:

- Environmental Impacts: **(Score: 2)** This option will address flow, reduce leaks, and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. three points were deducted due to the small percentage of pipeline replacements compared to other alternatives and compared to alternative III because it doesn't assess pressure surges within the water system.
- Operation and Maintenance: **(Score: 2)** This option will improve a small part of the operation and maintenance compared to the existing system, but it doesn't address the remaining issues of the water system.
- Constructability: **(Score: 5)** This alternative was given a relative high score, as no service lines are to be installed where shallow groundwater table that lowers the probability to impact the constructability.
- Capital Cost: **(Score: 4)** This option was given a relatively high score due to low initial capital cost.
- Public Safety: **(Score: 2)** This alternative will greatly reduce the risk of contamination due to line breaks to the specific area but does not address rest of the existing aging infrastructure.
- Disruption of Service: **(Score: 2)** This option will reduce the amount of service disruptions but will create a temporary disruption during construction. Three points were deducted due to trench dewatering possibly extending the period of disruption while in construction.

6.2.9 Alternate V: East Side

Scores for Alternate V are justified as follows:

- Environmental Impacts: **(Score: 2)** This option will address flow, reduce leaks, and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. Three points were deducted compared to alternative III because it doesn't assess pressure surges within the water system.
- Operation and Maintenance: **(Score: 2)** This option will improve operation and maintenance compared to the existing system but doesn't address the remaining part of the water system or resolves pressure issues.

- Constructability: **(Score: 3)** This alternative was given a relative low score, as almost 60 percent of the service lines will require extensive trenching dewatering. Broad geotechnical investigations are highly recommended prior to construction.
- Capital Cost: **(Score: 2)** This option was given a relatively low score due to high initial capital cost.
- Public Safety: **(Score: 2)** This alternative will greatly reduce the risk of contamination due to line breaks, repairs, and water redundancy in the East area only.
- Disruption of Service: **(Score: 2)** This option will reduce the amount of service disruptions but will create a temporary disruption during construction. Three points were deducted due to trench dewatering possibly extending the period of disruption while in construction.

6.2.10 Alternate VI: West Side

Scores for Alternate VI are justified as follows:

- Environmental Impacts: **(Score: 3)** This option will address flow, reduce leaks, and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. Two points were deducted compared to alternative III because it doesn't assess pressure surges within the water system.
- Operation and Maintenance: **(Score: 3)** This option will improve operation and maintenance compared to the existing system, but it doesn't address the remaining issues of the water system.
- Constructability: **(Score: 4)** This alternative was given a relative high score, as no service lines are to be installed where shallow groundwater table that lowers the probability to impact the constructability.
- Capital Cost: **(Score: 3)** This option was given a medium score due to high initial capital cost, but the cost still doesn't exceed the city's budget.
- Public Safety: **(Score: 3)** This alternative will greatly reduce the risk of contamination due to line breaks, repairs, water redundancy, and addresses aging infrastructure in the West area only. This helps mitigate the issues with the high-pressure surges in this area.
- Disruption of Service: **(Score: 3)** This option will reduce the amount of service disruptions but will create a temporary disruption during construction.

6.2.11 Alternate VII: Downtown

Scores for Alternate VII are justified as follows:

- Environmental Impacts: **(Score: 2)** This option will address flow, reduce leaks, and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. Three points were deducted compared to alternative III because it doesn't assess pressure surges within the water system.
- Operation and Maintenance: **(Score: 2)** this option will improve operation and maintenance compared to the existing system, but it doesn't address the remaining issues of the water system or resolves pressure issues.
- Constructability: **(Score: 2)** This alternative was given a low score, as almost 90 percent of the service lines will require extensive trenching dewatering. Broad geotechnical investigations are highly recommended prior to construction.
- Capital Cost: **(Score: 3)** This option was given a medium score due to high initial capital cost, but the cost doesn't exceed the city's budget.
- Public Safety: **(Score: 3)** This alternative will greatly reduce the risk of contamination due to line breaks, repairs and water redundancy in the Downtown area. This area is one of the busiest areas of the city.
- Disruption of Service: **(Score: 2)** This option will reduce the amount of service disruptions but will create a temporary disruption during construction. Three points were deducted due to trench dewatering possibly extending the period of disruption during construction.

6.2.12 Alternate VIII: Williamsburg

Scores for Alternate VIII are justified as follows:

- Environmental Impacts: **(Score: 3)** This option will address flow reduce leaks, and aid in water conservation. Construction takes place in previously disturbed areas and should have minimal impact. Two points were deducted compared to alternative III because it doesn't assess pressure surges within the water system.
- Operation and Maintenance: **(Score: 3)** This option will improve operation and maintenance compared to the existing system, but it doesn't address the remaining part of the water system or resolves pressure issues.
- Constructability: **(Score: 4)** This alternative was given a relative high score, as no service lines are to be installed where shallow groundwater table that lowers the probability to impact the constructability.

- Capital Cost: **(Score: 2)** This option was given a relative low score due to high initial capital which is out of the city's budget.
- Public Safety: **(Score: 3)** This alternative will greatly reduce the risk of contamination due to line breaks, repairs, water redundancy, and addresses aging infrastructure in the Williamsburg area only. This helps mitigate the issues with the high-pressure surges in this area.
- Disruption of Service: **(Score: 3)** This option will reduce the amount of service disruptions but will create a temporary disruption during construction.

6.2.13 Alternate IX: Airport Improvements Pressure Tank Replacement

Scores for Alternate IX are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will reduce leaks and aid in water conservation, construction takes place in a undisturbed areas owned by the city and should have small impact due to the size of required building.
- Operation and Maintenance: **(Score: 3)** This option will significantly improve operation and maintenance compared to the existing system. Two points were deducted per absence replacement of the existing waterlines.
- Constructability: **(Score: 4)** This option was given a relatively high constructability scored due to no additional land requirements are anticipated for the installation of the new building and fence.
- Capital Cost: **(Score: 5)** This option was given a relatively high score due to low initial capital cost (common with Alternative XIII due to similar cost).
- Public Safety: **(Score: 2)** This alternative will reduce the risk of contamination due to line breaks and repairs as well as provide constant flow. Three points were deducted compared to Alternative XI due to not complying with fire flow requirements.
  Disruption of Service: **(Score: 2)** This option will greatly reduce the amount of service disruptions but will create a temporary disruption during construction.

6.2.14 Alternate X: Airport Improvements without Fire Flow

Scores for Alternate X are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will reduce leaks and aid in water conservation, construction takes place in a undisturbed areas owned by the city and should have small impact due to size of the required tank and building.

- Operation and Maintenance: **(Score: 4)** This option will significantly improve operation and maintenance compared to the existing system. A point was deducted per absence replacement of the existing waterlines.
- Constructability: **(Score: 4)** This option was given a relatively high constructability scored due to no additional land requirements are anticipated for the installation of the new storage tank, building, and fence.
- Capital Cost: **(Score: 3)** This option was given a neutral score due to higher initial capital cost than alternative IX and XII.
- Public Safety: **(Score: 3)** This alternative will reduce the risk of contamination due to line breaks and repairs as well as provide constant flow. Two points were deducted compared to Alternative XI due to not complying with fire flow requirements.

  Disruption of Service: **(Score: 4)** This option will greatly diminish the amount of service disruptions but will create a temporary disruption during construction.

6.2.15 Alternate XI: Airport Improvements with Fire Flow

Scores for Alternate XI are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will reduce leaks and aid in water conservation, construction takes place in a undisturbed areas owned by the city and should have small impact due to size of the required tank and building .
- Operation and Maintenance: **(Score: 4)** This option will significantly improve operation and maintenance compared to the existing system. A point was deducted due to additional maintenance of the fire pump system.
- Constructability: **(Score: 4)** This option was given a relatively high constructability scored due to no additional land requirements are anticipated for the installation of the new storage tank, building, and fence.
- Capital Cost: **(Score: 2)** This option was given a relatively low due to higher initial capital cost.
- Public Safety: **(Score: 5)** This alternative will reduce the risk of contamination due to line breaks and repairs as well as provide constant flow. This alternative complies with fire flow requirement.

  Disruption of Service: **(Score: 5)** This option will greatly diminish the amount of service disruptions but will create a temporary disruption during construction.

6.2.16 Alternate XII: Airport Improvements –VFD Well Pump

Scores for Alternate XII are justified as follows:

- Environmental Impacts: **(Score: 4)** This option will reduce leaks and aid in water conservation, construction takes place in a undisturbed areas owned by the city and should have small impact due to the size of required building.
- Operation and Maintenance: **(Score: 3)** This option will significantly improve operation and maintenance compared to the existing system. Two points were deducted per absence replacement of the existing waterlines.
- Constructability: **(Score: 4)** This option was given a relatively high constructability scored due to no additional land requirements are anticipated for the installation of the new building and fence.
- Capital Cost: **(Score: 5)** This option was given a relatively high score due to low initial capital cost (common with Alternative IX due to similar cost).
- Public Safety: **(Score: 1)** This alternative will reduce the risk of contamination due to line breaks and repairs as well as provide constant flow. Four points were deducted compared to Alternative IX due to not complying with fire flow requirements as well as not providing redundancy.

  Disruption of Service: **(Score: 2)** This option will greatly diminish the amount of service disruptions, but will create a temporary disruption during construction

6.2.17 Non-Monetary Evaluation

Based on **Table 31** below, Alternative III is the recommended option on a non-cost basis.

Table 31: Non-Monetary Factors Scoring

	WEIGHT FACTOR	Weighted Score														
		I	II	III	IIIA	IIIB	IIIC	IV	V	VI	VII	VIII	IX	X	XI	XII
ENVIRONMENTAL IMPACTS	5	5	25	20	20	20	15	10	10	15	10	15	20	20	20	20
OPERATION & MAINTENANCE	2	4	10	8	6	6	8	4	4	6	4	6	6	8	8	6
CONSTRUCTABILITY	4	20	4	12	16	12	12	20	12	16	8	16	16	16	16	16
CAPITAL COST	5	25	5	5	20	20	20	20	10	15	15	10	25	15	10	25
PUBLIC SAFETY	5	10	25	20	20	20	20	10	10	15	15	15	10	15	25	5
DISRUPTION SERVICE	4	8	12	16	16	16	16	8	8	12	8	12	8	16	20	8
TOTAL		**72**	**81**	**81**	**98**	**94**	**91**	**72**	**54**	**79**	**60**	**74**	**85**	**90**	**99**	**80**

"I= No Action; II=Complete System; III= System Performance; IV=North Side; V=East Side; VI= West Side; VII= Downtown; VIII= Williamsburg; IX= Airport - Pressure Tank Replacement; X= Airport Without Fire Flow; XI= Airport With Fire flow; XI= Airport VFD Well Pump

7 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

According to the above analysis, Alternative IIIA- System High Pressure Solutions scores the highest, this alternative was recently funded by the United States Department of Agriculture Rural Development (USDA-RD) under the Preliminary Engineering Report (PER) Water System Performance Improvements 1.

The second highest score and the strongly recommended alternative for construction is Alternative IIIB - System Redundancy and Hydraulic Performance Enhancements (See **Figure 14**). This alternative it is crucial to the city of T or C since it includes the installation of a new well located in the north which will provide reliable water production back up and minimize water outages, along with providing consistent water supply to this area and the rest of the city if needed under emergency situation.

Additionally, This alternative scored the second highest in non-cost factors, due to the greater impact on the relieving pressure fluctuation problems within the southern area of the City. This will ensure appropriate water transmission from the loop located on the south area and Williamsburg area by addressing aging infrastructure on key water transmission and distribution lines. This alternative involves extra operational costs for a new water supply compared to Alternative IIIA. Nevertheless, it alleviates the constant water breakages in the "Williamsburg" area of the system due to high pressure. This alternative will consist of 14,995 linear feet of waterline and transmission line replacements.

The System Redundancy and Hydraulic Performance Enhancements alternative accounts for approximately 2.63 % of the pipe in the water system that is in poor condition, per the City's operation staff interviews and database. (See Section 5.2.4.1)

Per the extensive amount of losses in the current system and large monetary losses due to water leaks, it is not recommended that the "No Action" alternative be considered. While this option includes no initial capital expenditure, it continues the high O& M expenses due to the large number of leaks present in the system.

Alternatives II was discarded due to a large initial capital cost, mainly due to the large size and the cost of the trenching dewatering, which is necessary for the waterlines located on the "East" and "Downtown" areas. This alternative would also require a large number of crossing permits from NMDOT, which could significantly complicate the permit application process and construction process if done all at once.

Alternative III-B takes priority over alternatives IV, V, VII, and VIII since it addresses the pressure issues within the southern parts of the city and provides reliable water supply backup on to the water system. These discarded alternatives focus mainly on specific areas, but then again, don't provide a significant solution to the pressure and water supply problems of the system.

It is recommended in the near future that Alternative III-C be completed when funding becomes available to successfully manage and address pressure issues within the city. This alternative address the remaining pressure issues within main transmission lines in the water system. Alternative III-C will complete the pressure issues and improving fire flow requirements throughout the City.

7.1 Project Schedule

The below preliminary schedule is provided pending PER approval.

Table 32 : Project Schedule

Milestones	Start	Finish
PER & Environmental Review & Approval	8/1/2021	9/1/2021
Funding Application & Approval	1/1/2022	5/1/2022
Engineering Services	7/1/2022	6/31/2023
Final Design Approval	7/1/2023	9/1/2023
Bidding Phase	9/1/2023	11/1/2023
Construction Phase	11/2/2023	11/2/2027
Project Closeout	11/3/2027	1/1/2028

7.2 Total Project Cost Estimate

Table 33: Alternative III B- System Redundancy and Hydraulic Performance Enhancements

Alternative III-B System Redundancy and Hydraulic Performance Enhancements					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$216,546.60	$216,546.60
2	Traffic Control **(3.43% of General Cost)**	LS	1	$346,474.55	$346,474.55
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$93,981.22	$93,981.22
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$151,582.62	$151,582.62
5	Materials Testing **(0.2% of General Cost)**	LS	1	$86,618.64	$86,618.64
6	Subsurface Utility Locating	LS	1	$6,209.75	$6,209.75
7	Utility Relocation	LS	1	$6,209.75	$6,209.75
8	AC Pipe Removal and Disposal	LS	1	$4,396.50	$4,396.50
Waterline					
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	6181	$35.70	$220,661.70
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	8774	$36.50	$320,251.00
11	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	300	$220.00	$66,000.00
12	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	30	$3,500.00	$104,685.00
13	6" Gate Valves w/ Valve Can, CIP	EA	13	$935.00	$12,155.00
14	8" Gate Valves w/ Valve Can, CIP	EA	107	$1,205.00	$128,935.00
15	10" Gate Valves w/ Valve Can, CIP	EA	49	$2,500.00	$121,534.41
16	Pressurized waterline connections, CIP	EA	46	$1,184.22	$54,533.30
17	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	15214	$3.00	$45,642.61
18	Joint Restraints, CIP	EA	647	$77.75	$50,290.65
19	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	70	$1,329.00	$93,030.00
20	Water Meter Box Remove & Replace	EA	70	$1,000.00	$70,000.00
21	Dewatering of Trench, CIP	LF	4147	$53.00	$219,806.90
22	Valve/Pipeline abandonment	LS	1	$58,508.98	$58,508.98
23	Hydrant removal and abandonment	LS	1	$12,666.89	$12,666.89
Water Well					
24	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$110,000.00	$110,000.00
25	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$45,000.00	$45,000.00
26	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
27	12" Steel Cased Potable Water Well - Drilling Complete	LF	750	$900.00	$675,000.00
28	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
29	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
30	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
31	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00

	ITEMS LIST	UNITS	QTY	UNIT COST	EXTEND COST
	Roadway				
32	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	4885	$42.00	$205,170.00
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	4885	$62.00	$302,870.00
34	Excavate and Dispose of Unsuitable Material, CIP	CY	29310	$15.00	$439,650.00
35	Import of Engineered Fill	CY	29310	$15.00	$439,650.00
36	Geogrid Base Roadway Reinforcement	SY	4885	$5.50	$26,867.50
37	Remove and replace Curb and Gutter @ Services, CIP	LF	280	$25.00	$7,000.00
38	Remove and replace Sidewalk @ Services, CIP	CY	196	$48.00	$9,408.00
				Construction Cost Subtotal:	$5,242,951.55
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$5,481,506.00
				Contingency - 10%:	$548,151.00
				NMGRT @ 8.5%:	$512,521.00
				Interim Finance Interest:	$359,820.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$6,901,998.00
	ENGINEERING SERVICES				
39	Bridge Loan @ 5.5%	LS	1	$68,106.00	$68,106.00
40	Additional Engineering - Data Collection*	LS	1	$186,000.00	$186,000.00
41	Preliminary Engineering Report-PER	LS	1	$35,000.00	$35,000.00
42	Environmental w/ Report	LS	1	$25,000.00	$25,000.00
43	Additional Engineering - Hydrogeology Well siting study *	LS	1	$45,000.00	$45,000.00
44	Engineering Design Services	LS	1	$602,966.00	$602,966.00
45	Engineering - Bid Phase	LS	1	$13,868.00	$13,868.00
46	Engineering - Construction Inspection	LS	1	$211,038.00	$211,038.00
47	Engineering-Well Construction Oversight	LS	1	$35,000.00	$35,000.00
48	Engineering - Construction Management	LS	1	$84,415.00	$84,415.00
				Engineering Services Subtotal:	$1,306,393.00
				NMGRT @ 7.875%:	$102,878.00
				Engineering Total:	$1,409,271.00
	FINANCING SERVICES				
49	Loan Origination Fee	LS	1	$61,667.00	$61,667.00
				Financing Services Subtotal:	$61,667.00
				Financing NMGRT @ 8.5%:	$5,242.00
				Legal Services Total:	$66,909.00
	LEGAL SERVICES				
50	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
51	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
	LEGAL SERVICES AND LAND ACQUISITION				
52	Land Acquisition New well	LS	1	$20,000.00	$20,000.00
				Legal Services Subtotal:	$51,000.00
				Legal NMGRT @ 8.5%:	$4,335.00
				Legal Services Total:	$55,335.00
				GRAND TOTAL:	**$8,433,513**

7.3 Annual Operation and Maintenance Cost/Budget

See **Table 35** for the total O&M cost estimate for the selected alternative. The O&M costs have also been evaluated as compared to the overall system costs. As seen **Table 34** the impacts to the complete System's O&M costs are significantly reduced by choosing Alternative III.

Table 34: Full System O&M Cost Analysis

FULL SYSTEM ANNUAL O&M COST			
	2020	**2021**	**2023**
O&M Cost for No Action Alternative	$ 743,638	$ 760,370	$ 794,971
O&M Cost for Selected Alternative	$ 744,230	$ 760,975	$ 795,605
O&M Cost Net Change	$592	$606	$633
Total O&M Cost W/ Selected Alternative "System Performance Upgrade"	$ 744,230	$ 760,975	$ 795,605

Table 35: Alternative III-B O&M Estimate

O&M Alternative III B- System Redundancy and Hydraulic Performance Enhancements
WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$129,119
Water Losses	$36,949
O&M	$566,404
Well equipment	$11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$132,023.77	$134,994.30	$138,031.68	$141,137.39	$144,312.98
Water Loss:	$37,780.82	$38,630.89	$39,500.08	$40,388.83	$41,297.58
O&M	$579,148.31	$592,179.15	$605,503.18	$619,127.00	$633,057.36
Well Equipment	$12,022.56	$12,293.06	$12,569.66	$12,852.47	$13,141.65
Future Value	**$760,975.45**	**$778,097.40**	**$795,604.59**	**$813,505.70**	**$831,809.57**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$147,560.02	$150,880.12	$154,274.92	$157,746.11	$161,295.40
Water Loss:	$42,226.78	$43,176.88	$44,148.36	$45,141.70	$46,157.39
O&M	$647,301.15	$661,865.43	$676,757.40	$691,984.44	$707,554.09
Well Equipment	$13,437.34	$13,739.68	$14,048.82	$14,364.92	$14,688.13
Future Value	**$850,525.29**	**$869,662.11**	**$889,229.51**	**$909,237.17**	**$929,695.01**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$164,924.54	$168,635.35	$172,429.64	$176,309.31	$180,276.27
Water Loss:	$47,195.93	$48,257.84	$49,343.64	$50,453.87	$51,589.08
O&M	$723,474.06	$739,752.22	$756,396.65	$773,415.57	$790,817.42
Well Equipment	$15,018.62	$15,356.54	$15,702.06	$16,055.35	$16,416.60
Future Value	**$950,613.14**	**$972,001.94**	**$993,871.98**	**$1,016,234.10**	**$1,039,099.37**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$184,332.48	$188,479.96	$192,720.76	$197,056.98	$201,490.76
Water Loss:	$52,749.83	$53,936.71	$55,150.28	$56,391.16	$57,659.96
O&M	$808,610.81	$826,804.56	$845,407.66	$864,429.33	$883,878.99
Well Equipment	$16,785.97	$17,163.66	$17,549.84	$17,944.71	$18,348.47
Future Value	**$1,062,479.11**	**$1,086,384.88**	**$1,110,828.54**	**$1,135,822.19**	**$1,161,378.19**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**
Total Lifetime Maintenance Cost (20 years):					**$ 18,957,055**
Total Lifetime Maintenance Cost (present value):					**$ 11,880,678**
ANNUAL TOTAL O&M ALT III-B					**$744,230**

7.3.1 Debt Repayment and Debt Service Reserve

The debt repayment will vary based on the loan to grant ratio that the City receives. Below a 25%/75% loan/grant ratio is assumed for the purposes of this report **Table 36.** An interest rate of 3% and a 40-year term was also assumed for the purposes of this report per USDA loan terms.

Table 36: Loan Scenarios

LOAN SCENARIOS	RATIO 25:75	RATIO 57:43
Project Cost	$ 8,433,513	$ 8,433,513
Estimated Loan Cost (25 % and 57%)	$ 2,108,378	$ 4,807,102
Estimated Interest Rate & Term	3%	3%
Estimated Annual Loan Payment	$ 91,213	$ 207,967
Estimated Reserve (10% Annual Payment)	$ 9,121	$ 20,797
Number of Connections	$ 3,538	$ 3,538
Estimated Annual Cost Per Connection	$ 25.78	$ 58.78
Estimated Monthly Cost Per Connection	$ 2.15	$ 4.90

7.3.2 Short-Lived Asset Reserve

Short lived assets are the system assets that are expected to need replacement or frequent maintenance. Based on the information provided by the City's Asset Management Plan (Available upon request), the assets as shown in **Table 37** Summary table below identified to be the most likely assets in need of short-term replacement.

Table 37 : Short lived Asset Summary

	Estimated Life Cycle	
	1-5 years	6-10 years
Subtotal of Short-Lived Assets (per period)	$ 127,530.00	$ 1,628,407.06
Subtotal of Short-Lived Assets (per year)	$ 25,506.00	$ 162,840.71
Subtotal of Short-Lived Assets (per month)	$ 2,125.50	$ 13,570.06
Total of Short-Lived Assets (1-20 years)	**$ 1,755,937**	
Total Annual Reserve Deposit, Short-Lived Assets (1-20 years, per year)	**$ 188,347**	
Total Monthly Reserve Deposit, Short-Lived Assets (1-20 years, per month)	**$ 15,696**	

8 CONCLUSIONS AND RECOMMENDATIONS

The City of Truth or Consequences currently presents a significant amount of water losses due to pipe breakage as well as a substantial yearly expense for wasted water. The system has components dating as far back as the 1930's to 1940's, as no significant work has been done in the area. Based upon the analysis conducted in this PER and following funding agencies guidelines, it is strongly recommended that the City of Truth or Consequences immediately pursue funding for the Alternative III-B System Redundancy and Hydraulic Performance Enhancements. This alternative in conjunction with anticipated funded Alternative IIIA-System Pressure Solution will mitigate significant pressure issues on the southern parts of the city, ensure proper distribution of water throughout the City, provide an additional water source, and a more reliable water production back up on the northern parts of the city. The recommended alternative has accounted for the capital costs required, the ease of maintenance, public safety, and environmental considerations. Alternative III-B has a relatively a higher capital cost compared to some of the alternatives, but it is still recommended due to the greater benefit to the public, as well as ease of maintenance and O&M cost. The "System Redundancy and Hydraulic Performance Enhancements" it is supplemented by another project Alternative III-C to obtain a progressed benefit without disrupting the performance of the water system, as well as obtaining the best outcomes for the benefit of the community.

Although Alternative XI Airport Improvements with fire flow is the most viable alternative to upgrade the airport water system since it provides fire flow in the area as well as a three-day water storage backup for the system, it is not recommended that the City of Truth or Consequences pursue funding for this section of the project. It doesn't do any benefit to the City's community, and it doesn't affect the City's water system performance.

APPENDIX 1- ENVIRONMENTAL RESOURCES

TABLE OF CONTENT:

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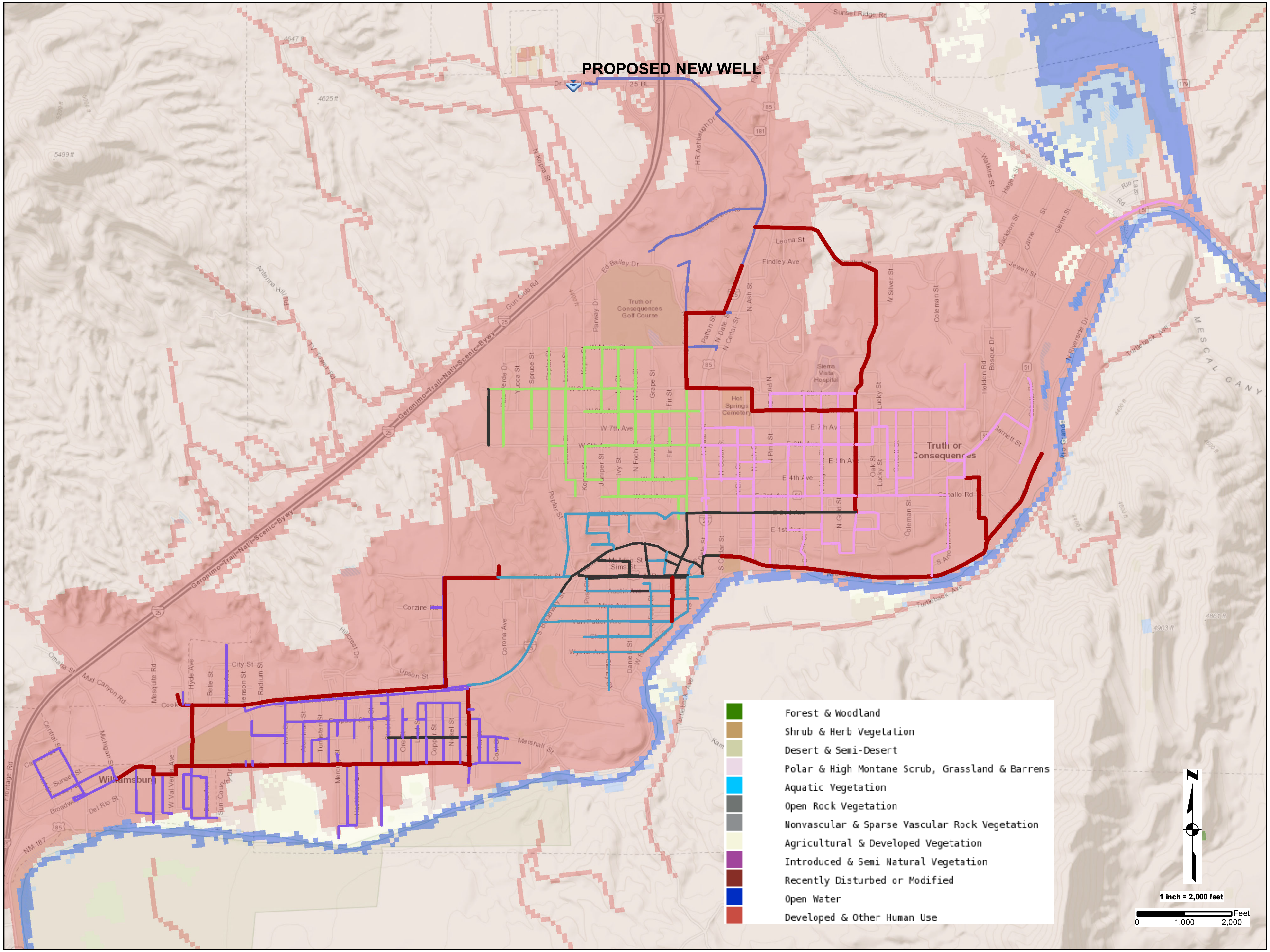

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- CURRENT
- System Performance Upgrade
- Williamsburg
- Downtown
- East Side
- West Side
- North Side

CITY OF T OR C LAND COVERAGE

EXHIBIT 101

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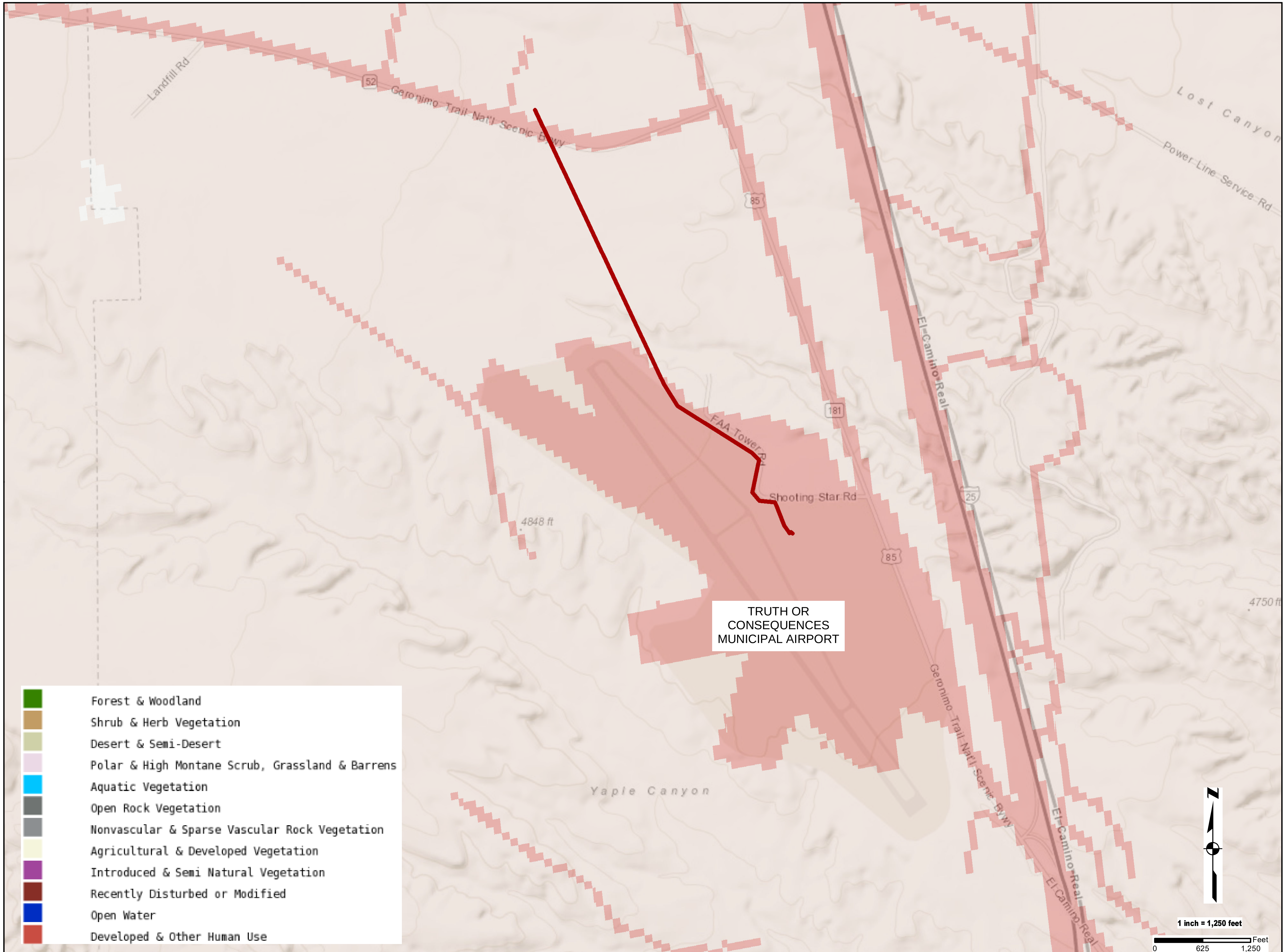

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY

ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- CURRENT
- System Performance Upgrade
- Williamsburg
- Downtown
- East Side
- West Side
- North Side

T OR C AIRPORT LAND COVERAGE

EXHIBIT 102

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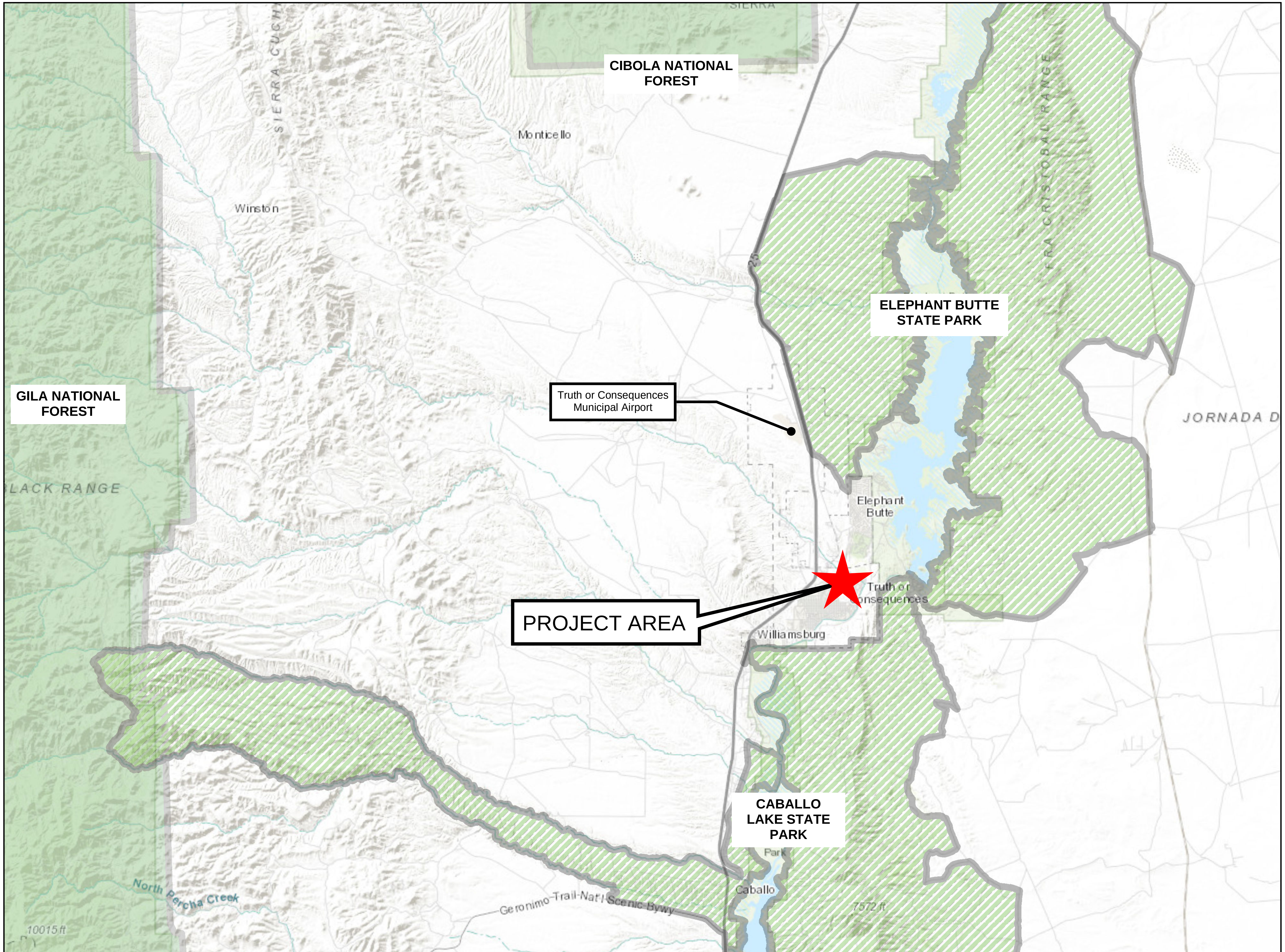

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- National Forests
- State Parks
- National Parks

FOREST LOCATION

EXHIBIT 103

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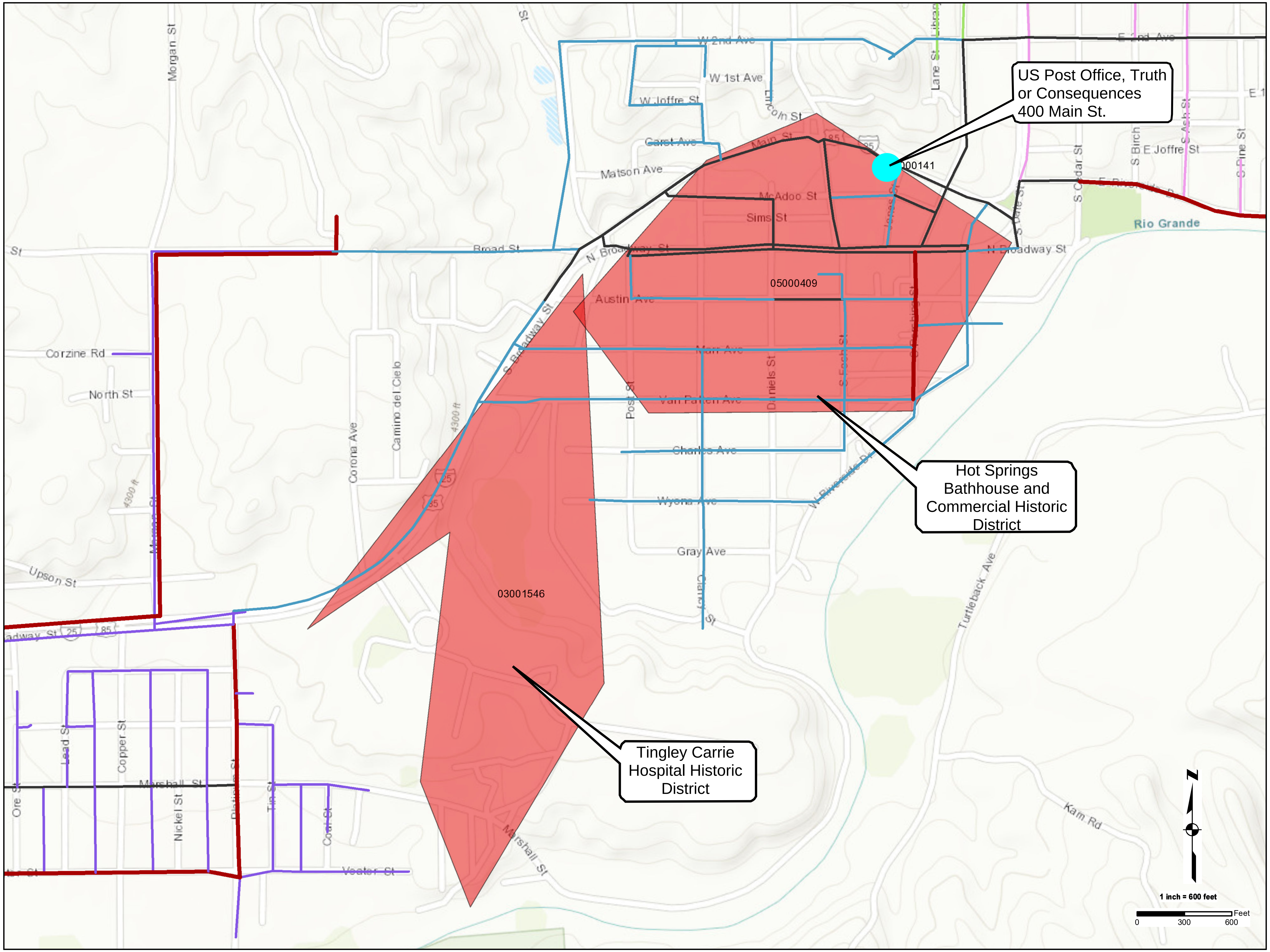

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY

ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- National Register of Historic Places Points
- National Register of Historic Places Polygons
- CURRENT
- System Performance Upgrade
- Williamsburg
- Downtown
- East Side
- West Side
- North Side

HISTORICAL PLACES

EXHIBIT 104

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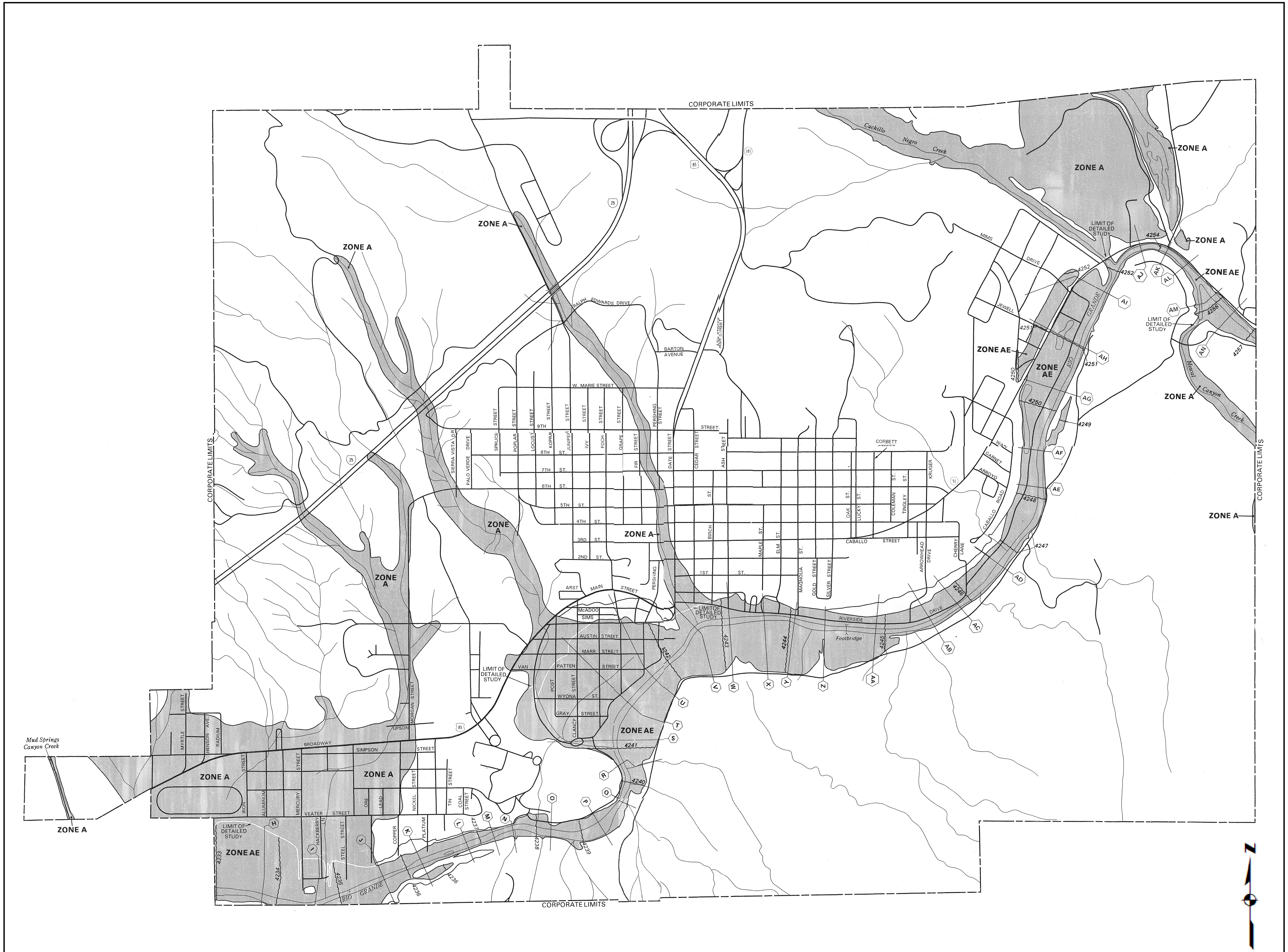
WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO



Legend

	SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.
	FLOODWAY AREAS IN ZONE AE
	OTHER FLOOD AREAS
ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
	OTHER AREAS
ZONE X	Areas determined to be outside 500-year flood plain.
ZONE D	Areas in which flood hazards are undetermined.
	Flood Boundary
	Floodway Boundary
	Zone D Boundary
	Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
513	Base Flood Elevation Line; Elevation in Feet*
D — D	Cross Section Line
(EL 987)	Base Flood Elevation in Feet Where Uniform Within Zone*
RM7 X	Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

FLOOD HAZARDS

EXHIBIT 105

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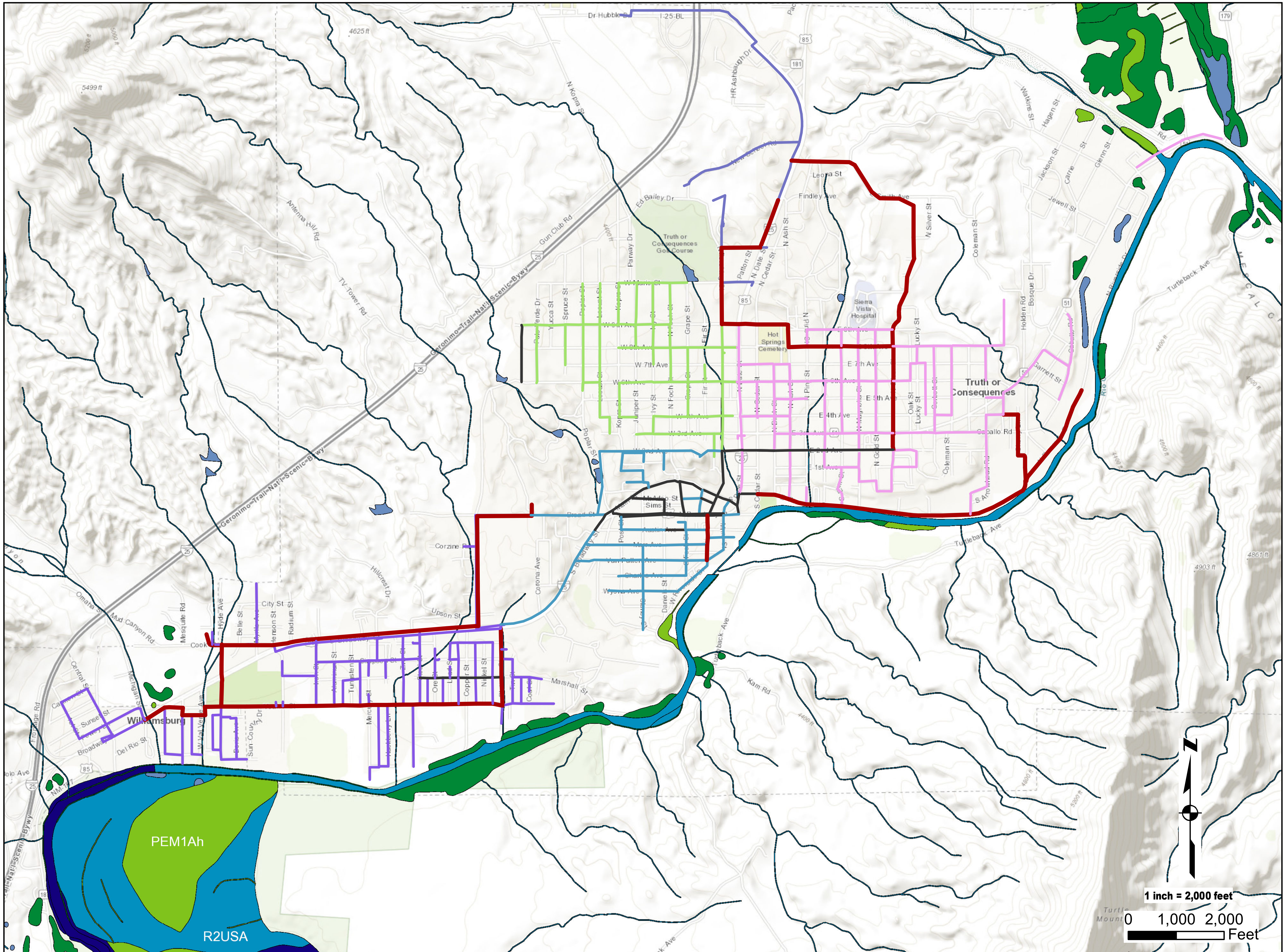

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY

ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- CURRENT
- System Performance Upgrade
- Williamsburg
- Downtown
- East Side
- West Side
- North Side

WETLANDS

EXHIBIT 106

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SPECIES OF GREATEST CONSERVATION NEED AND FEDERAL OR STATE THREATENED/ENDANGERED – SIERRA COUNTY

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Species of Greatest Conservation Need and Federal or State Threatened/Endangered
Sierra

Taxonomic Group	# Species	Taxonomic Group	# Species
Amphibians	1	Birds	19
Fish	2	Mammals	2
Molluscs	1		

TOTAL SPECIES: 25

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Mexican Gray Wolf	Canis lupus baileyi	E	E		Y	View
Penasco Least Chipmunk	Neotamias minimus atristriatus	E	C		Y	View
Common Ground Dove	Columbina passerina	E			Y	View
Yellow-billed Cuckoo (western pop)	Coccyzus americanus occidentalis		T		Y	View
Lucifer Hummingbird	Calothorax lucifer	T			Y	View
Costa's Hummingbird	Calypte costae	T			Y	View
Broad-billed Hummingbird	Cynanthus latirostris	T			Y	View
Least Tern	Sternula antillarum	E	E		Y	View
Neotropic Cormorant	Phalacrocorax brasilianus	T			Y	View
Bald Eagle	Haliaeetus leucocephalus	T			Y	View
Common Black Hawk	Buteogallus anthracinus	T			Y	View
Mexican Spotted Owl	Strix occidentalis lucida		T	Y	Y	View
Elegant Trogon	Trogon elegans	E			Y	View
Aplomado Falcon	Falco femoralis	E	E		Y	View
Peregrine Falcon	Falco peregrinus	T			Y	View
Thick-billed Kingbird	Tyrannus crassirostris	E			Y	View
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y	Y	View
Bell's Vireo	Vireo bellii	T			Y	View
Gray Vireo	Vireo vicinior	T			Y	View
Baird's Sparrow	Centronyx bairdii	T			Y	View
Varied Bunting	Passerina versicolor	T			Y	View
Chiricahua Leopard Frog	Lithobates chiricahuensis		T	Y	Y	View
Gila Trout	Oncorhynchus gilae	T	T		Y	View
White Sands Pupfish	Cyprinodon tularosa	T			Y	No Photo

Species of Greatest Conservation Need and Federal or State Threatened/Endangered

Sierra

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Mineral Creek Mountainsnail	Oreohelix pilsbryi	T			Y	No Photo

IPAC RESOURCE LIST

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IPaC **U.S. Fish & Wildlife Service**

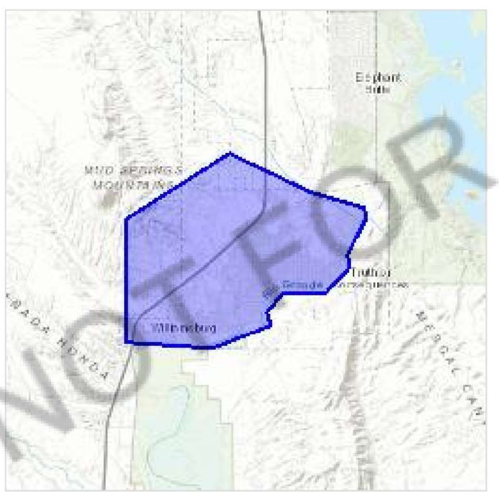
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Sierra County, New Mexico



Local office

New Mexico Ecological Services Field Office

(505) 346-2525
(505) 346-2542

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

http://www.fws.gov/southwest/es/NewMexico/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Mexican Wolf Canis lupus baileyi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3916	EXPN

Birds

NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8196	Threatened
Northern Aplomado Falcon Falco femoralis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1923	EXPN
Southwestern Willow Flycatcher Empidonax traillii extimus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6749	Endangered
Yellow-billed Cuckoo Coccyzus americanus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Narrow-headed Gartersnake Thamnophis rufipunctatus There is **proposed** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2204	Threatened

Amphibians

NAME	STATUS
Chiricahua Leopard Frog Rana chiricahuensis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1516	Threatened

Fishes

NAME	STATUS

Gila Trout *Oncorhynchus gilae* — Threatened
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/781

Rio Grande Silvery Minnow *Hybognathus amarus* — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1391

Flowering Plants

NAME	STATUS
Todsen's Pennyroyal *Hedeoma todsenii* There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1081	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Jul 31
Black Throated Sparrow Amphispiza bilineata This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 15 to Sep 5
Black-chinned Sparrow Spizella atrogularis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9447	Breeds Apr 15 to Jul 31

Chestnut-collared Longspur Calcarius ornatus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Black-hawk Buteogallus anthracinus — Breeds Apr 1 to Sep 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Grace's Warbler Dendroica graciae — Breeds May 20 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Lark Bunting Calamospiza melanocorys — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Virginia's Warbler Vermivora virginiae — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9441

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

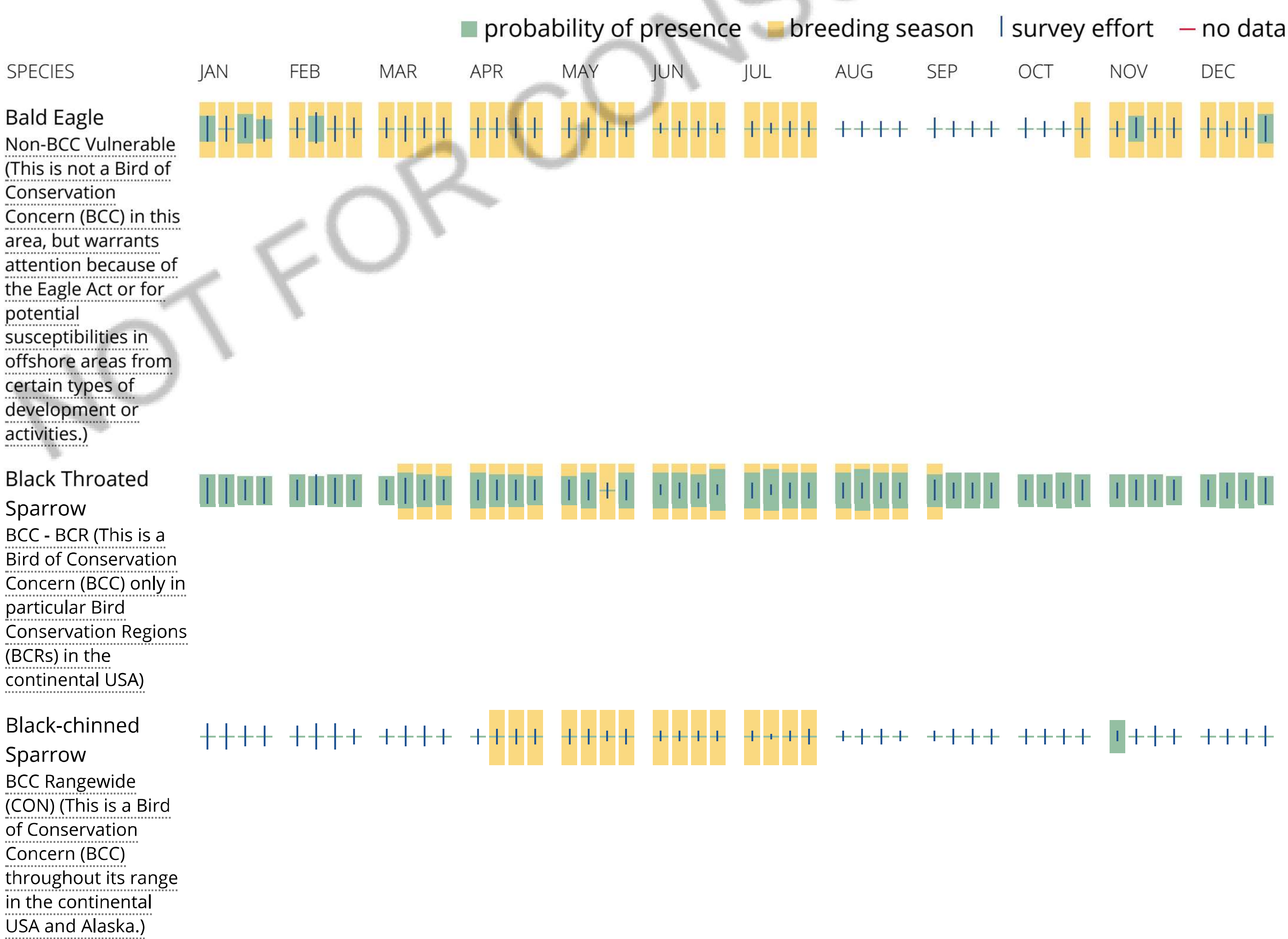
Breeding Season ( )
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

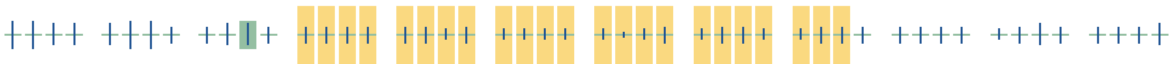
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

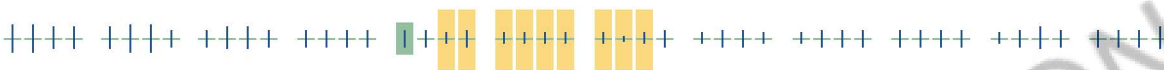


Chestnut-collared Longspur
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Common Black-hawk
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

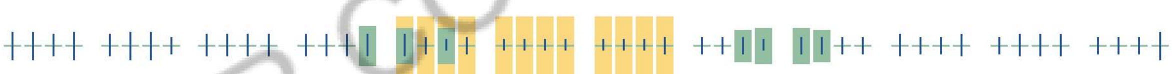


Grace's Warbler
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Lark Bunting
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Virginia's Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1Ah
- PEM1A
- PEM1C
- PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

- PSS2A
- PSS2Ah
- PFO1A
- PSS2Ax

FRESHWATER POND

- PUBF
- PUBHx
- PUSC
- PUBFh
- PUSAh

LAKE

- L1UBHh
- L2USAh

RIVERINE

- R4SBC
- R2USA
- R2UBH
- R4SBA
- R4SBAx
- R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

SOIL MAP

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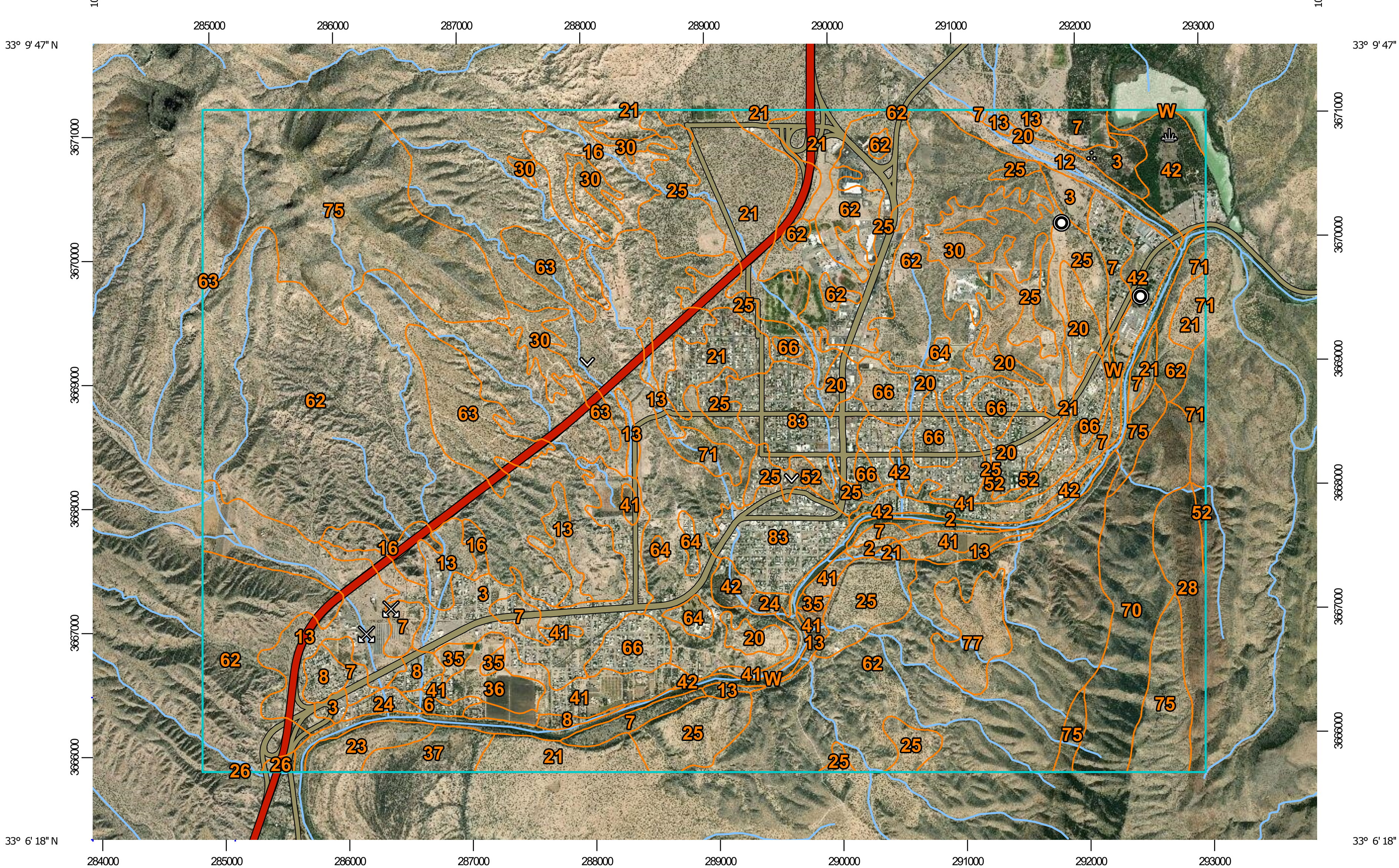
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map—Sierra County Area, New Mexico
(Custom Soil Resource Report)



Map Scale: 1:45,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 2000 4000 8000 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:48,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sierra County Area, New Mexico
Survey Area Data: Version 15, Sep 15, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Dec 6, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Agua silt loam, 0 to 2 percent slopes	19.8	0.2%
3	Agustin gravelly sandy loam, 1 to 9 percent slopes	347.4	3.2%
6	Anapra clay loam	16.9	0.2%
7	Anthony-Vinton fine sandy loam	234.2	2.2%
8	Anthony-Vinton loams, 0 to 1 percent slopes	64.0	0.6%
12	Arizo-Riverwash complex, 1 to 3 percent slopes	81.1	0.8%
13	Arizo and Canutio soils, gently sloping	439.1	4.1%
16	Badland-Nickel complex, extremely steep	255.3	2.4%
20	Bluepoint loamy sand, 0 to 5 percent slopes	322.2	3.0%
21	Bluepoint loamy fine sand, moderately rolling	567.1	5.3%
23	Brazito loamy fine sand, gently sloping	59.0	0.5%
24	Brazito very fine sandy loam	34.1	0.3%
25	Caliza-Bluepoint-Yturbide association, very steep	970.8	9.0%
26	Canutio-Pajarito association, moderately rolling	7.9	0.1%
28	Courthouse-Rock outcrop association, very steep	126.8	1.2%
30	Delnorte-Cave-Tencee complex, moderately rolling	193.7	1.8%
35	Glendale loam	28.0	0.3%
36	Glendale clay loam, 0 to 1 percent slopes	61.0	0.6%
37	Glendale-Gila complex, nearly level	66.4	0.6%
41	Harkey loam	248.2	2.3%
42	Harkey loam, saline and alkali	246.0	2.3%
52	Lozier-Rock outcrop association, hilly	26.1	0.2%
62	Nickel very gravelly fine sandy loam, very steep	3,986.5	37.1%
63	Nickel-Chamberino association, gently sloping	221.4	2.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
64	Nickel-Tencee-Delnorte complex, moderately sloping	44.3	0.4%
66	Pajarito fine sandy loam	240.9	2.2%
70	Rock outcrop, extremely steep	313.4	2.9%
71	Rock outcrop-Courthouse complex, extremely steep	78.0	0.7%
75	Rock outcrop-Torriorthents association, extremely steep	834.4	7.8%
77	Simona loamy fine sand, gently sloping	99.2	0.9%
83	Urban land	319.8	3.0%
W	Water	196.6	1.8%
Totals for Area of Interest		**10,749.7**	**100.0%**

Sierra County Area, New Mexico

3—Agustin gravelly sandy loam, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1wss
Elevation: 4,100 to 5,300 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Agustin and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agustin

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: gravelly sandy loam
H2 - 6 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Gravelly (R042XB010NM)
Hydric soil rating: No

Minor Components

Arizo

Percent of map unit:

Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Canutio

Percent of map unit:
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

6—Anapra clay loam

Map Unit Setting

National map unit symbol: 1wtz
Elevation: 4,050 to 5,200 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Anapra and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Anapra

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 29 inches: clay loam
H2 - 29 to 60 inches: stratified sand to loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Minor Components

Vinton

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Glendale

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Harkey

Percent of map unit:
Ecological site: Clayey (R042XB023NM)
Hydric soil rating: No

Brazito

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Agua

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

7—Anthony-Vinton fine sandy loam

Map Unit Setting

National map unit symbol: 2sps4
Elevation: 4,100 to 4,350 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Anthony and similar soils: 50 percent
Vinton and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Anthony

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 12 inches: fine sandy loam
H2 - 12 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Description of Vinton

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 15 inches: fine sandy loam
H2 - 15 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional

Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Minor Components

Harkey

Percent of map unit:
Ecological site: Loamy (R042XB014NM)
Hydric soil rating: No

Vinton

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Anthony

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

8—Anthony-Vinton loams, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2tm52
Elevation: 3,740 to 4,980 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Anthony and similar soils: 50 percent
Vinton and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Anthony

Setting

Landform: Flood plains

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Ap1 - 0 to 9 inches: loam
Ap2 - 9 to 17 inches: loam
C1 - 17 to 39 inches: fine sandy loam
C2 - 39 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Description of Vinton

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Ap - 0 to 14 inches: silt loam
C1 - 14 to 22 inches: fine sand
C2 - 22 to 45 inches: loamy fine sand
C3 - 45 to 50 inches: fine sand
C4 - 50 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Minor Components

Harkey

Percent of map unit:

Agua

Percent of map unit:
Hydric soil rating: No

13—Arizo and Canutio soils, gently sloping

Map Unit Setting

National map unit symbol: 1ws6
Elevation: 4,050 to 5,300 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Arizo and similar soils: 40 percent
Canutio and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arizo

Setting

Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Mixed gravelly alluvium

Typical profile

H1 - 0 to 4 inches: very gravelly sandy loam
H2 - 4 to 60 inches: stratified sand to very gravelly loamy sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Description of Canutio

Setting

Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Rise, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed gravelly alluvium

Typical profile

H1 - 0 to 4 inches: very gravelly sandy loam
H2 - 4 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Minor Components

Bluepoint

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Yturbide

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

23—Brazito loamy fine sand, gently sloping

Map Unit Setting

National map unit symbol: 1wsk
Elevation: 4,050 to 5,300 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Brazito and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brazito

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: loamy fine sand
H2 - 6 to 60 inches: sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained

Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Minor Components

Caliza

Percent of map unit:
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Glendale

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Arizo

Percent of map unit:
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Gila

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

24—Brazito very fine sandy loam

Map Unit Setting

National map unit symbol: 1wsl
Elevation: 4,050 to 5,200 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Brazito and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brazito

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 14 inches: very fine sandy loam
H2 - 14 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Minor Components

Vinton

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Agua

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Anthony

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

26—Canutio-Pajarito association, moderately rolling

Map Unit Setting

National map unit symbol: 1wsn
Elevation: 4,050 to 5,300 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Canutio and similar soils: 45 percent
Pajarito and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canutio

Setting

Landform: Ridges on alluvial fans
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, crest, side slope, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed gravelly alluvium

Typical profile

H1 - 0 to 4 inches: very gravelly sandy loam
H2 - 4 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 1 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: Gravelly (R042XB010NM)

Hydric soil rating: No

Description of Pajarito

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 4 inches: gravelly sandy loam
H2 - 4 to 60 inches: loam

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: Loamy (R042XB014NM)
Hydric soil rating: No

Minor Components

Glendale

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Bluepoint

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Yturbide

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

37—Glendale-Gila complex, nearly level

Map Unit Setting

National map unit symbol: 1wt1
Elevation: 4,050 to 5,300 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Glendale and similar soils: 40 percent
Gila and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glendale

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 3 inches: silty clay loam
H2 - 3 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: C
Ecological site: Bottomland (R042XB018NM)

Hydric soil rating: No

Description of Gila

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 8 inches: very fine sandy loam
H2 - 8 to 60 inches: stratified gravelly sandy loam to silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: C
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Minor Components

Arizo

Percent of map unit:
Ecological site: Gravelly Sand (R042XB024NM)
Hydric soil rating: No

Brazito

Percent of map unit:
Ecological site: Deep Sand (R042XB011NM)
Hydric soil rating: No

Canutio

Percent of map unit:
Ecological site: Gravelly (R042XB010NM)
Hydric soil rating: No

Vinton

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

41—Harkey loam

Map Unit Setting

National map unit symbol: 1wtb
Elevation: 4,100 to 5,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Harkey and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Harkey

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 12 inches: loam
H2 - 12 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: Loamy (R042XB014NM)
Hydric soil rating: No

Minor Components

Agua

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Anthony

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

Glendale

Percent of map unit:
Ecological site: Salty Bottomland (R042XB033NM)
Hydric soil rating: No

Vinton

Percent of map unit:
Ecological site: Bottomland (R042XB018NM)
Hydric soil rating: No

62—Nickel very gravelly fine sandy loam, very steep

Map Unit Setting

National map unit symbol: 1wv2
Elevation: 3,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 58 to 65 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Nickel and similar soils: 80 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nickel

Setting

Landform: Fan piedmonts
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed gravelly alluvium

Typical profile

H1 - 0 to 12 inches: very gravelly fine sandy loam
H2 - 12 to 60 inches: very gravelly fine sandy loam

Properties and qualities

Slope: 10 to 65 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 25 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Gravelly (R042XB010NM)
Hydric soil rating: No

Minor Components

Badlands

Percent of map unit:
Hydric soil rating: No

Chamberino

Percent of map unit:
Ecological site: Gravelly (R042XB010NM)
Hydric soil rating: No

Eba

Percent of map unit:
Ecological site: Gravelly Loam (R042XB035NM)
Hydric soil rating: No

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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APPENDIX 2- WATER SYSTEM FINANCIAL INFORMATION

TABLE OF CONTENT:

CITY OF TRUTH OR CONSEQUENCES BUDGET FOR FISCAL YEAR 7/1/19 TO 6/30/20

504 WATER DIVISION

Account	Description	2013-2014 Actual	2014-15 Actual	2015-16 Actual	2016-17 Actual	2017-18 Actual	2018-19 Actual	2019-20 Final	% Change	
REVENUES										
504-3803-30153	GROSS RECEIPTS-WA	37,593	38,940	5,533	41,029	39,667	39,327	49,355	25%	
504-3803-34523	UTILITY SERVICES	877,635	893,992	56,768	950,421	897,364	884,756	987,100	12%	928,994
504-3803-34533	UTILITY SERVICES CONNECTIONS	12,370	12,275	9,744	11,810	13,092	11,637	14,400	24%	
504-3803-35543	NON-PAYMENT PENALTIES	1,041	1,862	907	540	2,097	2,937	2,300	-22%	
504-3803-34553	WATER TAP FEES	3,937	6,042	-	2,095	3,030	2,967	4,040	36%	
504-3803-34773	MERCHANDISE & JOBBING	700	50	-	298	-	3,093			
504-3803-37380	MISC.	1,680	3,993	-	-	-	613			
	TOTAL REVENUE	**934,957**	**957,153**	**72,952**	**1,006,193**	**955,250**	**945,330**	**1,057,195**	12%	
TRANSFERS IN (OUT)										
504-3803-	IN							276,341		
504-3803-49930	OUT	(288,037)	(247,624)	(297,827)	(308,773)	(510,573)	(322,318)	(398,511)		
	TOTAL TRANSFERS	**(288,037)**	**(247,624)**	**(297,831)**	**(308,773)**	**(510,573)**	**(322,318)**	**(122,170)**		
PERSONNEL EXPENSES										
504-3803-40110	FULL TIME WAGES	216,565	182,617	170,369	136,248	180,932	176,514	167,211	-5%	
504-3803-40125	OVERTIME WAGES	19,234	17,808	17,461	23,934	23,206	25,224	15,000	-41%	
504-3803-40135	STANDBY WAGES	6,608	6,036	1,150	2,764	4,638	7,230	4,950	-32%	
504-3803-	DELAYED COMPENSATION	279	1,983	565	-	-	-		#DIV/0!	
504-3803-41205	FICA - REGULAR	14,448	14,781	11,629	9,990	12,542	12,681	11,604	-8%	
504-3803-41210	FICA - MEDICARE	3,379	3,457	2,720	2,336	2,933	2,966	2,714	-9%	
504-3803-41215	PERA	19,721	17,017	14,001	12,250	16,729	15,070	16,314	8%	
504-3803-41225	HEALTH INSURANCE	39,166	24,979	9,590	8,523	26,266	21,103	43,094	104%	
504-3803-41226	RETIREE INSURANCE	6,485	5,197	4,490	3,829	5,071	4,802	5,016	4%	
504-3803-41235	UNEMPLOYMENT INS.	3,984	215	1,058	379	-	-	1,250	#DIV/0!	
504-3803-41240	WORKER'S COMP. ASSESSMENT	71	58	44	39	41	37	70	89%	
504-3803-41785	WORKERS' COMP PREMIUMS	6,476	8,971	9,725	7,431	9,502	6,511	9,906	52%	
TOTAL PERSONNEL EXPENSES		**336,418**	**283,116**	**242,802**	**207,723**	**281,860**	**272,138**	**277,130**	2%	

CITY OF TRUTH OR CONSEQUENCES BUDGET FOR FISCAL YEAR 7/1/19 TO 6/30/20

38-03 WATER DIVISION		2013-2014 Actual	2014-15 Actual	2015-16 Actual	2016-17 Actual	2017-18 Actual	2018-19 Actual	2019-20 Final	% Change
EXPENDITURES									
504-3803-42305	MILEAGE REIMB.	-	-	-	292	685	131	1,000	663%
504-3803-42310	PER DIEM	1,829	874	785	1,659	2,438	1,117	3,300	195%
504-3803-43316	FUEL	10,760	8,355	6,471	5,682	7,650	6,844	8,000	17%
504-3803-43317	DIESEL FUEL	9,459	6,249	4,677	4,487	6,646	9,262	7,200	-22%
504-3803-47415	SYSTEM MAINT.	77,170	67,071	62,982	65,008	44,393	34,270	75,000	119%
504-3803-47420	MAINT. VEHICLE	5,704	2,731	25,445	14,501	9,717	4,399	6,000	36%
504-3803-47421	MAINT. EQUIPMENT	-	212	9,981	13,192	2,649	3,580	4,000	12%
504-3803-47425	OTHER MAINT./WATER METERS	5,108	2,585	5,673	-	2,455	2,241	6,000	168%
504-3803-48598	PROFESSIONAL SERVICES	-	-	4,215	12,950	52,918	30,434	22,350	-27%
504-3803-48599	PROFESSIONAL SERVICES	-	-	-	-	630	-	-	#DIV/0!
504-3803-44605	CHEMICALS/LABORATORY TESTING	-	-	-	-	89	3,743	2,000	-47%
504-3803-44606	OFFICE SUPPLIES	493	1,087	76	2,114	975	878	3,000	242%
504-3803-44607	FIELD SUPPLIES	2,711	436	2,268	1,258	2,089	18,476	8,000	-57%
504-3803-44613	NON-CAPITAL EQUIPMENT	-	-	-	-	-	4,564	4,000	-12%
504-3803-44615	SAFETY EQUIPMENT	5,010	1,906	3,426	3,313	3,593	3,880	3,000	-23%
504-3803-42620	UNIFORM/LINEN	2,548	1,768	1,330	1,762	1,741	1,351	1,500	11%
504-3803-42720	EMPLOYEE TRAINING	2,046	1,218	715	1,461	1,385	550	4,000	627%
504-3803-45555	MISC EXPENSE	-	-	-	-	2,098	-	-	#DIV/0!
504-3803-46731	PROPERTY LIABILITY INSURANCE	8,284	9,084	8,445	8,165	8,538	9,936	10,600	7%
504-3803-46732	GENERAL LIABILITY INSURANCE	19,786	19,620	19,392	19,194	19,545	20,488	24,100	18%
504-3803-46733	VEHICLE INSURANCE	7,358	7,920	8,027	8,411	11,460	8,876	9,958	12%
504-3803-43770	DUES & SUBSCRIPTIONS	-	661	1,042	11,586	9,126	10,217	10,000	-2%
504-3803-43775	TELEPHONE	962	1,264	1,455	1,531	1,509	1,443	1,000	-31%
504-3803-43780	UTILITIES	138,833	124,941	107,994	98,141	91,227	131,825	95,000	-28%
504-3803-46794	GOVT GRT	38,717	38,554	43,208	39,673	40,005	39,598	41,000	4%
504-3803-45796	FRANCHISE TAX	1,682	1,694	1,694	2,629	2,900	2,989	3,000	0%
504-3803-43797	WATER CONSERVATION	13,078	11,720	12,294	12,676	12,880	13,632	10,000	-27%
504-3803-43740	PRINTING/PUBLISHING	-	-	-	-	837	651	500	-23%
TOTAL OPERATING EXPENSES		**351,536**	**309,949**	**331,594**	**329,683**	**340,178**	**365,375**	**363,508**	**-1%**
CAPITAL OUTLAY									
504-3803-80810	CAPITAL EQUIPMENT/MACHINERY	55,565	23,748	28,500	-	79,000	48,938	103,000	110%
					-				
TOTAL CAPITAL OUTLAY		**55,565**	**23,748**	**28,500**	**-**	**79,000**	**48,938**	**103,000**	110%
TOTAL EXPENDITURES		**743,518**	**616,813**	**602,896**	**537,406**	**701,038**	**686,451**	**743,638**	**8%**
NET INCOME		**(96,598)**	**92,717**	**(827,772)**	**160,014**	**(256,361)**	**(63,439)**	**191,387**	**-402%**
TRANSFERS OUT									
101	General Fund	(120,000.00)	(100,000.00)	(100,000.00)	(100,000.00)	(100,000.00)	(75,000.00)	(50,000.00)	
301	W/WW Effluent Fund		(2.00)	(2.00)	(2.00)	-	-		
502	Jt. Utility Office Support	(27,261.00)	(24,000.00)	(33,000.00)	(44,400.00)	(86,200.00)	(82,130.00)	(59,740.00)	
306	Capital Improvement Jt. Utility Per Code	(115,000.00)	(125,000.00)	(141,159.00)	(141,159.00)	(141,159.00)	(141,974.00)	(23,787.00)	
306	Capital Improvement Jt. Utility Debt Service	(23,276.00)	(21,124.00)	(21,168.00)	(20,714.00)	(20,714.00)	(20,714.00)	(254,984.00)	
313	R&R Water Fund		(2.00)	(2.00)	(2.00)	-	-	-	
314	CDBG	-	-	-	-	(160,000.00)	-	-	
316	Emergency Repair Fund	(2,500.00)	(2,500.00)	(2,500.00)	(2,500.00)	(2,500.00)	(2,500.00)	(10,000.00)	
		(288,037)	(272,628)	(297,831)	(308,777)	(510,573)	(322,318)	(398,511)	

CITY OF TRUTH OR CONSEQUENCES BUDGET FOR FISCAL YEAR 7/1/19 TO 6/30/20

Enterprise Funds Recap	Fiscal Year 2013-14 Actual	Fiscal Year 2014-15 Actual	Fiscal Year 2015-16 Actual	Fiscal Year 2016-17 Final	Fiscal Year 2016-17 Final	Fiscal Year 2018-19 Actual	Fiscal Year 2019-20 Final	% Change Last FY
504 Water Division								
Revenues	$ 934,957	$ 957,153	$ 72,952	$ 1,006,193	$ 955,250	$ 945,330	$ 1,057,195	12%
Total Revenues	**$ 934,957**	**$ 957,153**	**$ 72,952**	**$ 1,006,193**	**$ 955,250**	**$ 945,330**	**$ 1,057,195**	12%
Transfers: IN (OUT)	$ (288,037)	$ (247,624)	$ (297,827)	$ (308,773)	$ (510,573)	$ (322,318)	$ (122,170)	-62%
Expenditures								
Personnel Services	$ 336,418	$ 283,116	$ 242,802	$ 207,723	$ 281,860	$ 272,138	$ 277,130	2%
Operating Expense	$ 351,536	$ 309,949	$ 331,594	$ 329,683	$ 340,178	$ 365,375	$ 363,508	-1%
Capital Outlay	$ 55,565	$ 23,748	$ 28,500	$ -	$ 79,000	$ 48,938	$ 103,000	110%
Total Expenditures	**$ 743,519**	**$ 616,813**	**$ 602,896**	**$ 537,406**	**$ 701,038**	**$ 686,451**	**$ 743,638**	8%
505 Solid Waste Division								
Revenues	$ 1,249,276	$ 1,241,653	$ 1,177,548	$ 1,394,707	$ 1,453,594	$ 1,525,765	$ 2,147,200	41%
Total Revenues	**$ 1,249,276**	**$ 1,241,653**	**$ 1,177,548**	**$ 1,394,707**	**$ 1,453,594**	**$ 1,525,765**	**$ 2,147,200**	41%
Transfers: IN (OUT)	$ (178,569)	$ (194,319)	$ (179,034)	$ (189,314)	$ (213,114)	$ (218,710)	$ (400,901)	83%
Expenditures								
Personnel Services	$ 575,309	$ 436,829	$ 428,140	$ 468,949	$ 506,028	$ 510,070	$ 631,930	24%
Operating Expense	$ 449,998	$ 504,959	$ 468,366	$ 555,006	$ 535,784	$ 609,091	$ 1,098,171	80%
Capital Outlay	$ -	$ 21,346	$ -	$ 74,021	$ 27,232	$ 40,121	$ 201,209	402%
Total Expenditures	**$ 1,025,307**	**$ 963,134**	**$ 896,506**	**$ 1,097,976**	**$ 1,069,044**	**$ 1,159,282**	**$ 1,931,310**	67%
506 Waste Water Division								
Revenues	$ 702,329	$ 746,677	$ 882,012	$ 1,064,404	$ 1,035,164	$ 1,107,661	$ 1,153,300	4%
Total Revenues	**$ 702,329**	**$ 746,677**	**$ 882,012**	**$ 1,064,404**	**$ 1,035,164**	**$ 1,107,661**	**$ 1,153,300**	4%
Transfers: IN (OUT)	$ 40,027	$ (14,064)	$ (146,763)	$ (187,333)	$ 41,129	$ (214,801)	$ (238,902)	11%
Expenditures								
Personnel Services	$ 325,599	$ 340,992	$ 340,747	$ 333,565	$ 292,170	$ 273,938	$ 320,628	17%
Operating Expense	$ 402,568	$ 409,812	$ 342,183	$ 329,368	$ 587,817	$ 446,162	$ 447,053	0%
Capital Outlay	$ 65,020	$ 32,181	$ -	$ -	$ 115,622	$ 110,038	$ 135,000	23%
Total Expenditures	**$ 793,187**	**$ 782,985**	**$ 682,930**	**$ 662,933**	**$ 995,609**	**$ 830,138**	**$ 902,681**	9%

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APPENDIX 3- MUNICIPAL AIRPORT

TABLE OF CONTENT:

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TRUTH OR CONSEQUENCES MUICIPAL AIRPORT ACTIVATION AS A PUBLIC WATER SYSTEM

WILSON
&COMPANY

NEW MEXICO
ENVIRONMENT DEPARTMENT
Drinking Water Bureau
2301 Entrada Del Sol
Tel. 575-915-1113• Fax 575-526-6162
Toll Free 1-877-654-8720
www.nmenv.state.nm.us

SUSANA MARTINEZ
Governor
JOHN A. SANCHEZ
Lt. Governor

BUTCH TONGATE
Cabinet Secretary
J.C. BORREGO
Deputy Secretary

August 27, 2018

Juan Fuentes-City Manager
Truth or Consequences Municipal Airport; NM3501427
505 Sims
Truth or Consequences, NM 87901

Subject: Truth or Consequences Municipal Airport Activation as a Public Water System; #NM3501427

Mr. Juan Fuentes,

The New Mexico Environment Department Drinking Water Bureau (NMED-DWB) has determined that the Truth or Consequences Municipal Airport water system located near Truth or Consequences, NM requires monitoring as a Public Water System (PWS). The Truth or Consequences Municipal Airport water system has been classified as a Non-Community water system with a transient population of 40. As a result of this determination of PWS status, the Truth or Consequences Municipal Airport must comply with all relevant rules and regulations for public water systems in 40 CFR 141 and 20.7.10 NMAC. Some of the initial requirements that you should immediately begin working on are as follows:

The Truth or Consequences Municipal Airport water system is required to employ a certified operator with a minimum of a Small Water Certification. You can obtain operator certification information at the following link: https://www.env.nm.gov/drinking_water/dwb-utility-operator-certification-program/

Pursuant to Section 20.7.10.100 NMAC [incorporating 40 CFR Section 141.853(a)(1)], The Truth or Consequences Municipal Airport water system must develop a written sample siting plan that identifies sampling sites and a sample collection schedule that is representative of water throughout the distribution system. You can obtain a sample plan template at https://www.env.nm.gov/dwb/RTCR.htm Microbiological samples are required to be collected by your certified operator according to an approved sample siting plan. Your plan will need to be provided to NMED-DWB for review and approval before samples can be used for compliance determination. Your first microbiological sample to be used for compliance is due in October 2018. The Truth or Consequences Municipal Airport water system is required to collect one microbiological sample per month and provide analytical results to NMED each month.

Pursuant to Section 20.7.10.100 NMAC [incorporating 40 CFR Section 141.403(a)(4)], the Truth or Consequences Municipal Airport water system is required to develop a written Operation and Maintenance (O&M) Plan. You can obtain an O&M Plan template at https://www.env.nm.gov/dwb/forms/index.htm The O&M Plan will need to be provided to NMED-DWB for review.

The Truth or Consequences Municipal Airport water system is required to retain the records associated with the water system for the following periods of time:

- Bacteriological samples – 5 years
- Nitrate samples – 10 years
- Records of action taken to correct violations – 3 years after last action
- Reports, correspondence, communication and sanitary surveys - 10 years
- Variance granted to the system – 5 years following the expiration of the variance

If you have any questions regarding the activation of your system, please contact your assigned Compliance Officer Aaron Beckworth in the Silver City office at 575-956-1552 or by email at aaron.beckworth@state.nm.us.

Sincerely,

B Garcia

Brandi Garcia, Compliance Supervisor
Drinking Water Bureau
Water Protection Division

cc: Joe Martinez-PWSS Manager (electronic)
Aaron Beckworth-Compliance Officer (electronic)
Silver City Field Office
Electronic File System

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2019 SANITARY SURVEY REPORT T OR C MUNICIPAL AIRPORT ACTION PLAN

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Sandra Whitehead
Mayor

Kathy Clark
Mayor Pro-Tem

Rolf Hechler
Commissioner

Paul Baca
Commissioner

George Szigeti
Commissioner

Morris Madrid
City Manager

505 Sims St.
Truth or Consequences, New Mexico 87901
P: 575-894-6673 ♦ F: 575-894-7767
www.torcnm.org

Notification Sent via Email

March 8, 2019

Aaron Beckworth, Compliance Officer
Drinking Water Bureau
Water Protection Division
3082 32nd Street Bypass, Suite D
Silver City, NM 88061

RE: 2019 Sanitary Survey Report
T or C Municipal Airport Action Plan

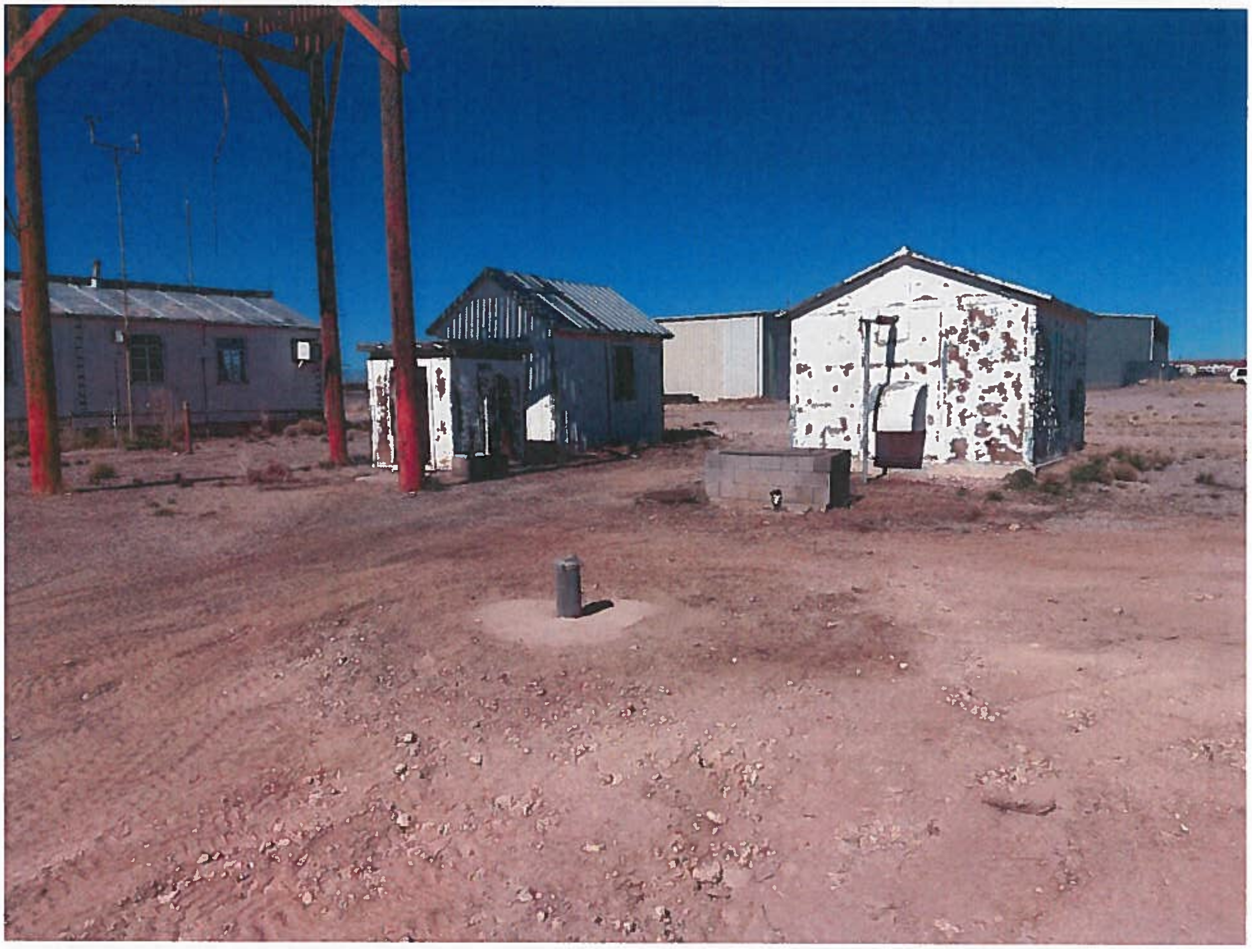
Good Afternoon Mr. Beckworth,

Please accept this letter as a formal action plan as noted and required in the T or C Municipal Airport Sanitary Survey Report 2019. The City is diligently working to correct all violations. Please see references below:

1. **(004C) System Management - Inadequate or lack of an operations and maintenance plan or necessary operational policies.** The City is in the process of revising the operations and maintenance plan for the City Water Department to include operations and maintenance of the Airport Water System. This will also include an update to the City Water Department Emergency Response Plan to include the Airport Water System.

2. **(001E) System Management - Poor housekeeping of system facilities.** The City of T or C Water Department has a work order to disconnect and remove the sand separator and water softener and then Airport personnel will address housekeeping issues within that building. Water Department will install and bury new PVC pipe as directed. Maintenance of this will be part of the O & M Plan.

3. **(001L) Source - Wellhead is not secured from the elements or intrusion or is susceptible to flooding.** As shown in the attached picture, the Airport Personnel has begun the ground maintenance and cleanup around the well casing and exposing the concrete pad. Water will be diverted away from the well head area and a proper containment shelter will be constructed preventing potential contaminants and damage from enter the well and/or aquifer.



If you have any questions or concerns, or need additional information, please contact me at 575-894-6673.

Sincerely,

Morris Madrid – City Manager
Truth or Consequences
505 Sims Street T or C, NM 87901
575-894-6673
mmadrid@torcnm.org

SAMPLING TESTING – MUNICIPAL AIRPORT

WILSON
&COMPANY

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From:	Beckworth, Aaron, NMENV
To:	Navarro, Jesus
Cc:	Traci Burnette
Subject:	RE: [EXT] Airport
Date:	Friday, January 18, 2019 11:20:00 AM

Jesus,

One bac-t sample per month for the airport. The sampling sites have been uploaded to the SDWIS database, so everything is in order. I am expecting to see a sample from the **RT001** location before the end of the month.

No lead and copper sampling required for the airport.

Thank you,
Aaron

Water System Detail Information			
Water System No.:	NM3501427	Federal Type:	NC
Water System Name:	TRUTH OR CONSEQUENCES MUNICIPAL AIRPORT	Federal Source:	GW
Principal County Served:	SIERRA	System Status:	A

Routine TCR Sample Schedules		
Begin/End Date	**Seasonal Period**	**Requirements**
10-01-2018 - Continuous	1/1 - 12/31	1 RT/MN

Facility ID	Facility Name	Fac Type Code	Smpl Pt ID Type Code Status	Location	Designations Type	Designations Begin/End Date
01427000	DIST	DS	RP001D - DS - A	PUBLIC RESTROOMS		
01427000	DIST	DS	RP001O - DS - A	TERMINAL BUILDING		
01427000	DIST	DS	RP001U - DS - A	MECHANICAL ROOM		
01427000	DIST	DS	RP002D - DS - A	TRAILER HOME		
01427000	DIST	DS	RP002O - DS - A	PUBLIC RESTROOMS		
01427000	DIST	DS	RP002U - DS - A	TERMINAL BUILDING		

01427000	DIST	DS	RP003D - DS - A	LAFONT HANGER	
01427000	DIST	DS	RP003O - DS - A	TRAILER HOME	
01427000	DIST	DS	RP003U - DS - A	PUBLIC RESTROOMS	
01427000	DIST	DS	RP004D - DS - A	AUGE HANGER	
01427000	DIST	DS	RP004O - DS - A	LAFONT HANGER	
01427000	DIST	DS	RP004U - DS - A	TRAILER HOME	
01427000	DIST	DS	RT001 - DS - A	TERMINAL BUILDING	
01427000	DIST	DS	RT002 - DS - A	PUBLIC RESTROOMS	
01427000	DIST	DS	RT003 - DS - A	TRAILER HOME	
01427000	DIST	DS	RT004 - DS - A	LAFONT HANGER	
01427000	DIST	DS	SP014270001 - DS - A	DIST	
01427001	AIRPORT WELL #1	WL	SP014270011 - EP - A	AIRPORT WELL #1	

From: Navarro, Jesus <jnavarro@torcnm.org>
Sent: Friday, January 18, 2019 11:15 AM
To: Beckworth, Aaron, NMENV <Aaron.Beckworth@state.nm.us>
Cc: Traci Burnette <tburnette@torcnm.org>
Subject: [EXT] Airport

Good Morning Aaron Beckworth just so we don’t drop the ball on the airport I would like to know as far as the Bac-t samples for the airport its one sample a month and is the airport going to be required to be test for led and copper or its not do to it being none community can you please let me know so we could be able to get everything we need to get thank you have a nice day

2019 SANITARY SURVEY REPORT

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State of New Mexico
ENVIRONMENT DEPARTMENT
Drinking Water Bureau
3082 32nd Street Bypass, Suite D
Silver City, NM 88061
Tel. 575-388-1934 • Fax 575-388-3258
www.env.nm.gov/drinking_water/

MICHELLE LUJAN GRISHAM
Governor

HOWIE C. MORALES
Lt. Governor

JAMES C. KENNEY
Cabinet Secretary Designate

JENNIFER J. PRUETT
Deputy Secretary

Notification Sent via Email

February 14, 2019

Morris Madrid
Truth or Consequences Municipal Airport, NM3501427
505 Sims St
Truth or Consequences, NM 87901

RE: 2019 Sanitary Survey Report

Dear Mr. Madrid,

Enclosed is a report documenting the recent sanitary survey for the Truth or Consequences Municipal Airport water system, completed on January 15, 2019 by Aaron Beckworth of the New Mexico Environment Department, Drinking Water Bureau (DWB). During the survey, three significant deficiencies were identified.

Upon receipt of this report, the Truth or Consequences Municipal Airport must consult with the DWB within 30 days of the date of this letter for all significant deficiencies (i.e., provide written documentation to DWB within 30 days of receipt of this letter stating how and when each significant deficiency will be corrected). Failure to consult with DWB within 30 days on all significant deficiencies will result in a violation of NMAC 20.7.10.100 incorporating 40 CFR Part 141 Subpart S.

Additionally, the Truth or Consequences Municipal Airport must take corrective action on all significant deficiencies and provide compliance documentation that is acceptable to DWB no later than 120 days of the date of this letter OR be in compliance with a DWB approved schedule and plan for correcting these deficiencies within 120 days of the date of this letter. Failure to correct and provide documentation of significant deficiency corrections no later than 120 days of the date of this letter will result in a treatment technique violation of NMAC 20.7.10.100 incorporating 40 CFR Part 141 Subpart S.

If you have any questions or need additional clarification concerning this report, please contact me in the Silver City office at 575-388-1934 or by e-mail at Aaron.Beckworth@state.nm.us.

Respectfully,

Aaron Beckworth

Aaron Beckworth, Compliance Officer
Drinking Water Bureau
Water Protection Division

cc: Brandi Garcia, Southern Region Supervisor
Silver City Area Office File
Electronic Central File

SANITARY SURVEY REPORT

For

Truth or Consequences Municipal Airport NM3501427

Este informe contiene información importante acerca de su agua potable. Haga que alguien lo traduzca para usted, o hable con alguien que lo entienda.

Prepared by: Aaron Beckworth

New Mexico Environment Department
Drinking Water Bureau
Silver City Field Office
3082 32nd Street Bypass, Suite D
Silver City, NM 88061

State of New Mexico
Environment Department
Water Protection Division
Drinking Water Bureau

RECORD OF INSPECTION

This sanitary survey report fulfills the requirements of New Mexico Administrative Code 20.7.10.100 incorporating 40 Code of Federal Regulations 141.21(d)(2) and 142.16(o)(2) for completing a State approved survey.

NMED APPROVING AUTHORITY: Aaron Beckworth Date: 2/14/2019

Aaron Beckworth, Compliance Officer

Introduction

A sanitary survey enables the New Mexico Environment Department, Drinking Water Bureau (DWB) to provide a comprehensive and accurate review of the components of a water system, to assess the operating condition and adequacy of the water system, and to determine if past recommendations have been implemented effectively. The sanitary survey encompasses eight specific elements that are evaluated during the survey. Those eight elements are listed below.

- Source (protection, physical components, and condition)
- Treatment
- Distribution system
- Finished water storage
- Pumps, pump facilities, and controls
- Monitoring, reporting, and data verification
- System management, and operation
- Operator compliance with State requirements

Each element may not be specifically mentioned within this report; however, a significant deficiency or recommendation will be noted if any issues are discovered with any of these eight (8) elements.

As part of the sanitary survey a site inspection of the Truth or Consequences Municipal Airport water system was conducted on January 15, 2019 by DWB Compliance Officer Aaron Beckworth, accompanied by DWB Community Services Coordinator Michael Montoya, Truth or Consequences Grant Coordinator Traci Burnett, the water system operator, Jesus Navarro, and Jeff Dornbush, consultant and member of the Public Utility Advisory Board. In addition to the site inspection, a review of various operational and managerial documents, and DWB compliance files for the water system was conducted.

System Description

The Truth or Consequences Municipal Airport water system is classified as a transient non-community water system according to the New Mexico Drinking Water Regulations 20.7.10 NMAC. The water system consists of one well, two pressure tanks, and a distribution system with 5 service connections.

Survey Findings

Sanitary surveys serve as a proactive public health measure and can provide important information on a water system's design and operations, can identify minor and significant deficiencies for correction before they become major problems, and can improve overall system compliance.

Significant Deficiencies

A significant deficiency is defined as any deficiency that is causing or has the potential to cause a threat to public health [New Mexico Administrative Code (NMAC) 20.7.10.100 incorporating 40 Code of Federal Regulations (CFR) §141.403(a)(4)]. Water systems must consult with the DWB within 30 days and take corrective action for any significant deficiencies found during the sanitary survey no later than 120 days after receiving written notification of such deficiencies, or be in compliance with a DWB-approved schedule and plan for correcting these deficiencies within the same 120-day period [NMAC 20.7.10.100 incorporating 40 CFR §141.403(a)(4) and §141.403(a)(5)]. Failure to remedy any significant deficiency will result in a treatment technique violation of NMAC 20.7.10.100 incorporating 40 CFR Part 141 Subpart S.

A total of three significant deficiencies were identified during the survey.

1. ***Deficiency:*** **(004C)** System Management - Inadequate or lack of an operations and maintenance plan or necessary operational policies.

   Regulatory Citation: NMAC 20.7.10.100, incorporating 40 CFR Part 141.403(a)(4)

   Concern/Description: An operation and maintenance plan is an essential part of any water system. The plan should summarize the actions required for cost effective, efficient, safe and reliable operation of the water system. An adequate plan should allow for a flawless transition from one operator to the next. Lacking a written plan could result in insufficient operation and maintenance of the water system as well as prolonged water outages during emergency situations.

   Corrective Action: Truth or Consequences Municipal Airport must prepare and implement an operation and maintenance plan. A template has been developed to aid in the preparation of a written plan and can be located on the Technical Assistance page of the DWB website.

2. ***Deficiency:*** **(001E)** System Management - Poor housekeeping of system facilities.

   Regulatory Citation: NMAC 20.7.10.400, GENERAL OPERATING REQUIREMENTS, Paragraph B. Security and protection of a public water system.
   "Any part or component of a public water system including but not limited to spring junction boxes, well houses, storage reservoirs, collection devices, pump facilities, and treatment facilities shall be constructed, operated and maintained to prevent:
   (1) unauthorized entry to the water supply;
   (2) flooding of the water supply; and
   (3) contamination of, the water supply."

   Concern/Description: Poor housekeeping can result in safety hazards, inability to access critical facilities, failure of system components, and possible introduction of contaminants into the water supply.

   Corrective Action: Truth or Consequences Municipal Airport must remove unused piping and equipment, such as the sand separator and water softener; replace deteriorated PVC pipe; properly bury and/or protect newly installed PVC pipe from direct exposure to sunlight; and maintain system facilities as part of an operation and maintenance plan.

3. ***Deficiency:*** **(001L)** Source - Wellhead is not secured from the elements or intrusion or is susceptible to flooding.

   Regulatory Citation: NMAC 20.7.10.400, GENERAL OPERATING REQUIREMENTS, Paragraph C. Protection of a public water system well.

"A ground water supply well serving a public water system shall have a sanitary seal installed at the wellhead to protect against entry of storm water and other non-potable fluids or foreign materials and against access by insects, rodents, birds or other vermin. All vents installed in the well casing shall be protected against entrance of foreign material and flooding. If the well is completed in a subsurface vault, the casing shall extend above the potential flooding height. All cracks, joints or other openings at the wellhead and all penetrations to the casing at or near the ground surface shall be tightly sealed with an impermeable material."

Concern/Description: Properly protected wellheads prevent contaminated water, insects, vermin, or other potential contaminants from entering the well and/or aquifer. Facilities that are susceptible to flooding have an increased potential for contamination by surface water.

Corrective Action: Truth or Consequences Municipal Airport must remove the dirt mounted up around the well casing and verify the existence of a properly constructed concrete pad surrounding the wellhead as part of the required sanitary seal.

Conclusion

A sanitary survey of the Truth or Consequences Municipal Airport water system was conducted on January 15, 2019. Based upon the onsite inspection and review of various operational and managerial documents, and DWB compliance files, a total of three significant deficiencies were identified. Truth or Consequences Municipal Airport must comply with the each of the following requirements.

- Upon receipt of this report, Truth or Consequences Municipal Airport must consult with the DWB within 30 days for all significant deficiencies (i.e., provide written documentation to the DWB within 30 days of receipt of this report stating how and when each significant deficiency will be addressed).

- Truth or Consequences Municipal Airport must take corrective action on all significant deficiencies and provide compliance documentation that is acceptable to the DWB no later than 120 days after receiving written notification of such deficiencies or be in compliance with an approved schedule and plan for correcting these deficiencies within the same 120-day period.

- In addition, Truth or Consequences Municipal Airport must provide written documentation to the DWB within 30 days of completing corrective action for each significant deficiency.

- Failure to correct any significant deficiency in accordance with the previous bullet will result in a treatment technique violation of NMAC 20.7.10.100 incorporating 40 CFR Part 141 Subpart S.

If you have any questions or need additional clarification concerning this report, please call 575-388-1934 or e-mail Aaron.Beckworth@state.nm.us.

APPENDIX 4- CONSTRUCTION AND NON-CONSTRUCTION DETAIL COST ESTIMATE

TABLE OF CONTENT:

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ALTERNATIVE II - COMPLETE SYSTEM

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Alternative II - Complete System					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$2,602,278.11	$2,602,278.11
2	Traffic Control **(3.43% of General Cost)**	LS	1	$4,163,644.97	$4,163,644.97
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$1,129,388.70	$1,129,388.70
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$1,821,594.68	$1,821,594.68
5	Materials Testing **(0.2% of General Cost)**	LS	1	$1,040,911.24	$1,040,911.24
6	Subsurface Utility Locating	LS	1	$95,275.00	$95,275.00
7	Utility Relocation	LS	1	$95,275.00	$95,275.00
8	AC Pipe Removal and Disposal	LS	1	$67,454.70	$67,454.70
Waterline					
9	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	106,343	$28.78	$3,060,551.54
10	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	54,966	$35.70	$1,962,286.20
11	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	23,367	$36.50	$852,895.50
12	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	18,724	$37.30	$698,405.20
13	14"Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	15,949	$50.77	$809,730.73
14	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	5,784	$220.00	$1,272,480.00
15	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	409	$3,500.00	$1,431,563.00
16	6" Gate Valves w/ Valve Can, CIP	EA	881	$935.00	$823,893.08
17	8" Gate Valves w/ Valve Can, CIP	EA	1,827	$1,205.00	$2,202,026.17
18	10" Gate Valves w/ Valve Can, CIP	EA	294	$2,500.00	$734,435.39
19	12" Gate Valves w/ Valve Can, CIP	EA	132	$3,263.00	$429,339.84
20	14" Gate Valves w/ Valve Can, CIP	EA	18	$4,000.00	$73,838.40
21	Furnish and Install 1-inch Single Body Combination Air Valve w/ Traffic Rated Vault on new waterline, (including all materials, labor, excavation, rock excavation, backfill and site restoration), CIP	EA	5	$8,000.00	$40,000.00
22	Furnish and Install 6"x2" PRV Assembly (including PRV, vault, excavation, labor and all required appurtenances for a complete installation)	EA	1	$60,000.00	$60,000.00
23	Furnish and Install 10"x4" PRV Assembly (including PRV, vault, excavation, labor and all required appurtenances for a complete installation)	EA	6	$80,000.00	$480,000.00
24	Pressurized waterline connections, CIP	EA	727	$1,184.22	$861,378.24
25	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	258,670	$3.00	$776,010.14
26	Joint Restraints, CIP	EA	11,703	$77.75	$909,912.45
27	1" Water Service, New single connection to existing watermain, cip. SD 2362	EA	3,139	$1,329.00	$4,171,731.00
28	Water Meter Box Remove & Replace	EA	3,139	$1,000.00	$3,139,000.00
29	Dewatering of Trench, CIP	LF	44,850	$53.00	$2,377,062.19
30	Valve/Pipeline abandoment	LS	1	1,093,878.88	$1,093,878.88
31	Hydrant removal and abandonment	LS	1	173,219.12	$173,219.12
Water Well					
32	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
33	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
34	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
35	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
36	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
37	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
38	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
39	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
43	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	74,949.67	$42.00	$3,147,886.00
44	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	74,949.67	$62.00	$4,646,879.33
45	Excavate and Dispose of Unsuitable Material, CIP	CY	449,698	$15.00	$6,745,470.00
46	Import of Engineered Fill	CY	449,698	$15.00	$6,745,470.00
47	Geogrid Base Roadway Reinforcement	SY	74,950	$5.50	$412,223.17
48	Remove and replace Curb and Gutter @ Services, CIP	LF	12,556	$25.00	$313,900.00
49	Remove and replace Sidewalk @ Services, CIP	CY	8,789	$48.00	$421,881.60

				Construction Cost Subtotal:	$63,061,384.59
				5-YR Inflation @ 11.375% + Construction Cost Subtotal:	$70,234,617.00
				Contingency - 10%:	$7,023,462.00
				NMGRT @8.5%:	$6,566,937.00
				Interim Finance Interest:	$4,610,376.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$88,435,392.00
	ENGINEERING SERVICES				
50	Bridge Loan @ 5.5%	LS	1	$636,481.00	$636,481.00
51	Additional Engineering - Data Collection*	LS	1	$927,097.00	$927,097.00
52	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
53	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
54	Engineering Design Services	LS	1	$7,725,808.00	$7,725,808.00
55	Engineering - Bid Phase	LS	1	$177,694.00	$177,694.00
56	Engineering - Construction Inspection	LS	1	$1,545,162.00	$1,545,162.00
57	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
58	Engineering - Construction Management	LS	1	$1,081,613.00	$1,081,613.00
				Engineering Services Subtotal:	$12,208,855.00
				NMGRT @ 8.5%:	$1,037,753.00
				Engineering Total:	$13,246,608.00
	FINANCING SERVICES				
59	Loan Origination Fee	LS	1	$790,139.00	$790,139.00
				Financing Services Subtotal:	$790,139.00
				Financing NMGRT @8.5%:	$67,162.00
				Legal Services Total:	$857,301.00
	LEGAL SERVICES				
60	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
61	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$102,572,936**

ALTERNATIVE III – SYSTEM PERFORMANCE UPGRADE

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Alternative III - System Performance Update					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$680,549.74	$680,549.74
2	Traffic Control **(3.43% of General Cost)**	LS	1	$1,088,879.58	$1,088,879.58
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$295,358.59	$295,358.59
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$476,384.82	$476,384.82
5	Materials Testing **(0.2% of General Cost)**	LS	1	$272,219.89	$272,219.89
6	Subsurface Utility Locating	LS	1	$22,461.02	$22,461.02
7	Utility Relocation	LS	1	$22,461.02	$22,461.02
8	AC Pipe Removal and Disposal	LS	1	$15,902.40	$15,902.40
Waterline					
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	11,796	$35.70	$421,117.20
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	22,393	$36.50	$817,344.50
11	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	13,319	$42.30	$563,393.70
12	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	947	$220.00	$208,340.00
13	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	79	$3,500.00	$277,823.00
14	6" Gate Valves w/ Valve Can, CIP	EA	45	$935.00	$42,075.00
15	8" Gate Valves w/ Valve Can, CIP	EA	980	$1,205.00	$1,181,438.34
16	10" Gate Valves w/ Valve Can, CIP	EA	124	$2,500.00	$310,180.07
17	12" Gate Valves w/ Valve Can, CIP	EA	5	$3,263.00	$17,383.96
18	Furnish and Install 6"x2"" PRV Assembly (including PRV, vault, excavation, labor and all required appurtenances for a complete installation)	EA	6	$80,000.00	$480,000.00
19	Pressurized waterline connections, CIP	EA	315	$1,184.22	$373,502.07
20	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	104,203	$3.00	$312,609.15
21	Joint Restraints, CIP	EA	4,430	$77.75	$344,443.85
22	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	285	$1,329.00	$378,765.00
23	Water Meter Box Remove & Replace	EA	285	$1,000.00	$285,000.00
24	Dewatering of Trench, CIP	LF	12,163	$53.00	$644,649.60
25	Valve/Pipeline abandonment	LS	1	$400,731.69	$400,731.69
26	Hydrant removal and abandonment	LS	1	$33,616.58	$33,616.58
Water Well					
27	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
28	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
29	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
30	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
31	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
32	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
33	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
34	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
35	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	17,669	$42.00	$742,112.00
45	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	17,669	$62.00	$1,095,498.67
46	Excavate and Dispose of Unsuitable Material, CIP	CY	106,016	$15.00	$1,590,240.00
47	Import of Engineered Fill	CY	106,016	$15.00	$1,590,240.00
48	Geogrid Base Roadway Reinforcement	SY	17,669	$5.50	$97,181.33
49	Remove and replace Curb and Gutter @ Services, CIP	LF	1,140	$25.00	$28,500.00
50	Remove and replace Sidewalk @ Services, CIP	CY	798	$48.00	$38,304.00
				Construction Cost Subtotal:	$16,485,211.76
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$17,235,289.00
				Contingency - 10%:	$1,723,529.00
				NMGRT @ 8.5%:	$1,611,500.00
				Interim Finance Interest:	$1,131,367.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$21,701,685.00

ENGINEERING SERVICES					
51	Bridge Loan @ 5.5%	LS	1	$184,945.00	$184,945.00
52	Additional Engineering - Data Collection*	LS	1	$379,176.00	$379,176.00
53	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
54	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
55	Engineering Design Services	LS	1	$1,895,882.00	$1,895,882.00
56	Engineering - Bid Phase	LS	1	$43,605.00	$43,605.00
57	Engineering - Construction Inspection	LS	1	$663,559.00	$663,559.00
58	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
59	Engineering - Construction Management	LS	1	$265,423.00	$265,423.00
				Engineering Services Subtotal:	$3,547,590.00
				NMGRT @8.50%:	$301,545.00
				Engineering Total:	$3,849,135.00
FINANCING SERVICES					
60	Loan Origination Fee	LS	1	$193,897.00	$193,897.00
				Financing Services Subtotal:	$193,897.00
				Financing NMGRT @ 8.5%:	$16,481.00
				Legal Services Total:	$210,378.00
LEGAL SERVICES					
61	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
62	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$25,794,833**

ALTERNATIVE III – A SYSTEM HIGH PRESSURE SOLUTION

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Alternative III A- System High Pressure Solution					
Open Trench Waterline					
ITEMS LIST		**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$194,215.79	$194,215.79
2	Traffic Control **(3.43% of General Cost)**	LS	1	$310,745.27	$310,745.27
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$84,289.65	$84,289.65
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$135,951.05	$135,951.05
5	Materials Testing **(0.2% of General Cost)**	LS	1	$77,686.32	$77,686.32
6	Subsurface Utility Locating	LS	1	$10,670.76	$10,670.76
7	Utility Relocation	LS	1	$10,670.76	$10,670.76
8	AC Pipe Removal and Disposal	LS	1	$7,554.90	$7,554.90
Waterline					
8	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	5,500	$28.78	$158,290.00
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	671	$35.70	$23,954.70
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	9,797	$36.50	$357,590.50
11	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	9,862	$42.30	$417,162.60
12	14"Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF		$50.77	$0.00
13	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	647	$220.00	$142,340.00
14	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	32	$3,500.00	$111,776.00
15	6" Gate Valves w/ Valve Can, CIP	EA	19	$935.00	$17,765.00
16	8" Gate Valves w/ Valve Can, CIP	EA	56	$1,205.00	$67,204.57
17	10" Gate Valves w/ Valve Can, CIP	EA	54	$2,500.00	$135,704.65
18	12" Gate Valves w/ Valve Can, CIP	EA	4	$3,263.00	$12,871.88
19	14" Gate Valves w/ Valve Can, CIP	EA		$4,000.00	$0.00
20	Furnish and Install 6"x2"" PRV Assembly (including PRV, vault, excavation, labor and all required appurtenances for a complete installation)	EA	6	$80,000.00	$480,000.00
21	Pressurized waterline connections, CIP	EA	36	$1,184.22	$43,014.43
22	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	12,001	$3.00	$36,001.69
23	Joint Restraints, CIP	EA	510	$77.75	$39,667.94
ITEMS LIST		**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
24	1" Water Service, New single connection to existing watermain, cip. SD 2362	EA	95	$1,329.00	$126,255.00
25	Water Meter Box Remove & Replace	EA	95	$1,000.00	$95,000.00
26	Dewatering of Trench, CIP	LF	4,686	$53.00	$248,334.15
25	Valve/Pipeline abandonment	LS	1	$46,150.34	$46,150.34
26	Hydrant removal and abandonment	LS	1	$13,524.90	$13,524.90
Roadway					
27	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	8,394	$42.00	$352,562.00
28	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	8,394	$62.00	$520,448.67
29	Excavate and Dispose of Unsuitable Material, CIP	CY	12,342	$15.00	$185,130.00
30	Import of Engineered Fill	CY	12,342	$15.00	$185,130.00
31	Geogrid Base Roadway Reinforcement	SY	8,394	$5.50	$46,168.83
32	Remove and replace Curb and Gutter @ Services, CIP	LF	380	$25.00	$9,500.00
33	Remove and replace Sidewalk @ Services, CIP	CY	266	$48.00	$12,768.00
				Construction Cost Subtotal:	$4,716,100.35
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$4,930,683.00
				Contingency - 10%:	$493,068.00
				NMGRT @ 8.5%:	$461,019.00
				Interim Finance Interest:	$323,662.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$6,208,432.00

ENGINEERING SERVICES					
34	Bridge Loan @ 5.5%	LS	1	$56,899.00	$56,899.00
35	Preliminary Engineering Report-PER	LS	1	$35,000.00	$35,000.00
36	Environmental w/ Report	LS	1	$12,000.00	$12,000.00
37	Additional Engineering - Data Collection*	LS	1	$108,475.00	$108,475.00
38	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
39	Engineering Design Services	LS	1	$542,375.00	$542,375.00
40	Engineering - Bid Phase	LS	1	$12,475.00	$12,475.00
41	Engineering - Construction Inspection	LS	1	$235,270.00	$235,270.00
42	Engineering - Construction Management	LS	1	$75,933.00	$75,933.00
				Engineering Services Subtotal:	$1,138,427.00
				NMGRT @ 7.875%:	$89,651.00
				Engineering Total:	$1,228,078.00
	ITEMS LIST	**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
FINANCING SERVICES					
43	Loan Origination Fee	LS	1	$55,470.00	$55,470.00
				Financing Services Subtotal:	$55,470.00
				Financing NMGRT @ 8.5%:	$4,715.00
				Legal Services Total:	$60,185.00
LEGAL SERVICES					
44	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
45	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$7,530,330**

ALTERNATIVE III – B SYSTEM REDUNDANCY AND HYDRAULIC ENHANCEMENTS

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Alternative III-B System Redundancy and Hydraulic Performance Enhancements					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$209,376.60	$209,376.60
2	Traffic Control **(3.43% of General Cost)**	LS	1	$335,002.55	$335,002.55
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$90,869.44	$90,869.44
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$146,563.62	$146,563.62
5	Materials Testing **(0.2% of General Cost)**	LS	1	$83,750.64	$83,750.64
6	Subsurface Utility Locating	LS	1	$6,209.75	$6,209.75
7	Utility Relocation	LS	1	$6,209.75	$6,209.75
8	AC Pipe Removal and Disposal	LS	1	$4,396.50	$4,396.50
Waterline					
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	6181	$35.70	$220,661.70
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	8774	$36.50	$320,251.00
11	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	300	$220.00	$66,000.00
12	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	30	$3,500.00	$104,685.00
13	6" Gate Valves w/ Valve Can, CIP	EA	13	$935.00	$12,155.00
14	8" Gate Valves w/ Valve Can, CIP	EA	107	$1,205.00	$128,935.00
15	10" Gate Valves w/ Valve Can, CIP	EA	49	$2,500.00	$121,534.41
16	Pressurized waterline connections, CIP	EA	46	$1,184.22	$54,533.30
17	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	15214	$3.00	$45,642.61
18	Joint Restraints, CIP	EA	647	$77.75	$50,290.65
19	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	70	$1,329.00	$93,030.00
20	Water Meter Box Remove & Replace	EA	70	$1,000.00	$70,000.00
21	Dewatering of Trench, CIP	LF	4147	$53.00	$219,806.90
22	Valve/Pipeline abandonment	LS	1	$58,508.98	$58,508.98
23	Hydrant removal and abandonment	LS	1	$12,666.89	$12,666.89
Water Well					
24	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
25	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
26	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
27	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
28	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
29	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
30	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
31	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
32	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	4885	$42.00	$205,170.00
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	4885	$62.00	$302,870.00
34	Excavate and Dispose of Unsuitable Material, CIP	CY	29310	$15.00	$439,650.00
35	Import of Engineered Fill	CY	29310	$15.00	$439,650.00
36	Geogrid Base Roadway Reinforcement	SY	4885	$5.50	$26,867.50
37	Remove and replace Curb and Gutter @ Services, CIP	LF	280	$25.00	$7,000.00
38	Remove and replace Sidewalk @ Services, CIP	CY	196	$48.00	$9,408.00
				Construction Cost Subtotal:	$5,069,910.77
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$5,300,592.00
				Contingency - 10%:	$530,059.00
				NMGRT @ 8.5%:	$495,605.00
				Interim Finance Interest:	$347,944.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$6,674,200.00

ENGINEERING SERVICES					
39	Bridge Loan @ 5.5%	LS	1	$61,258.00	$61,258.00
40	Additional Engineering - Data Collection*	LS	1	$116,613.00	$116,613.00
41	Preliminary Engineering Report-PER	LS	1	$35,000.00	$35,000.00
42	Environmental w/ Report	LS	1	$25,000.00	$25,000.00
43	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
44	Engineering Design Services	LS	1	$583,065.00	$583,065.00
45	Engineering - Bid Phase	LS	1	$13,410.00	$13,410.00
46	Engineering - Construction Inspection	LS	1	$204,073.00	$204,073.00
47	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
48	Engineering - Construction Management	LS	1	$81,629.00	$81,629.00
				Engineering Services Subtotal:	$1,175,048.00
				NMGRT @ 7.875%:	$92,535.00
				Engineering Total:	$1,267,583.00
FINANCING SERVICES					
49	Loan Origination Fee	LS	1	$59,632.00	$59,632.00
				Financing Services Subtotal:	$59,632.00
				Financing NMGRT @ 8.5%:	$5,069.00
				Legal Services Total:	$64,701.00
LEGAL SERVICES					
50	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
51	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
LEGAL SERVICES AND LAND ACQUISITION					
52	Land Acquisition New well	LS	1	$20,000.00	$20,000.00
				Legal Services Subtotal:	$51,000.00
				Legal NMGRT @ 8.5%:	$4,335.00
				Legal Services Total:	$55,335.00
				GRAND TOTAL:	**$8,061,819**

ALTERNATIVE III – C ADDITIONAL HYDRAULIC PERFROMANCE ENHACNECMENT

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Alternative III-C Additional Hydraulic Performance Enhancements					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$165,640.17	$165,640.17
2	Traffic Control **(3.43% of General Cost)**	LS	1	$265,024.27	$265,024.27
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$71,887.83	$71,887.83
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$115,948.12	$115,948.12
5	Materials Testing **(0.2% of General Cost)**	LS	1	$66,256.07	$66,256.07
6	Subsurface Utility Locating	LS	1	$5,179.24	$5,179.24
7	Utility Relocation	LS	1	$5,179.24	$5,179.24
8	AC Pipe Removal and Disposal	LS	1	$3,666.90	$3,666.90
Waterline					
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	4,944	$35.70	$176,500.80
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	3,822	$36.50	$139,503.00
11	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	3,457	$42.30	$146,231.10
15	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	18	$3,500.00	$61,362.00
16	6" Gate Valves w/ Valve Can, CIP	EA	13	$935.00	$12,155.00
17	8" Gate Valves w/ Valve Can, CIP	EA	411	$1,205.00	$495,170.49
18	10" Gate Valves w/ Valve Can, CIP	EA	21	$2,500.00	$52,941.02
19	12" Gate Valves w/ Valve Can, CIP	EA	1	$3,263.00	$4,512.08
24	Pressurized waterline connections, CIP	EA	122	$1,184.22	$144,404.14
25	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	40,287	$3.00	$120,861.59
26	Joint Restraints, CIP	EA	1,713	$77.75	$133,169.59
27	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	120	$1,329.00	$159,480.00
28	Water Meter Box Remove & Replace	EA	120	$1,000.00	$120,000.00
29	Dewatering of Trench, CIP	LF	3,330	$53.00	$176,508.55
30	Valve/Pipeline abandonment	LS	1	$154,931.71	$154,931.71
31	Hydrant removal and abandonment	LS	1	$7,424.80	$7,424.80
Roadway					
32	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	4,074	$42.00	$171,122.00
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	4,074	$62.00	$252,608.67
34	Excavate and Dispose of Unsuitable Material, CIP	CY	24,446	$15.00	$366,690.00
35	Import of Engineered Fill	CY	24,446	$15.00	$366,690.00
36	Geogrid Base Roadway Reinforcement	SY	4,074	$5.50	$22,408.83
37	Remove and replace Curb and Gutter @ Services, CIP	LF	480	$25.00	$12,000.00
38	Remove and replace Sidewalk @ Services, CIP	CY	336	$48.00	$16,128.00
				Construction Cost Subtotal:	$4,011,585.20
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$4,194,112.00
				Contingency - 10%:	$419,411.00
				NMGRT @ 8.5%:	$392,149.00
				Interim Finance Interest:	$275,312.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$5,280,984.00

ENGINEERING SERVICES					
39	Bridge Loan @ 5.5%	LS	1	$43,466.00	$43,466.00
40	Additional Engineering - Data Collection*	LS	1	$92,270.00	$92,270.00
41	Engineering Design Services	LS	1	$461,352.00	$461,352.00
42	Engineering - Bid Phase	LS	1	$10,611.00	$10,611.00
43	Engineering - Construction Inspection	LS	1	$161,473.00	$161,473.00
44	Engineering - Construction Management	LS	1	$64,589.00	$64,589.00
				Engineering Services Subtotal:	$833,761.00
				NMGRT @ 8.5%:	$70,870.00
				Engineering Total:	$904,631.00
FINANCING SERVICES					
45	Loan Origination Fee	LS	1	$47,184.00	$47,184.00
				Financing Services Subtotal:	$47,184.00
				Financing NMGRT @ 8.5%:	$4,011.00
				Legal Services Total:	$51,195.00
LEGAL SERVICES					
46	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
47	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$6,270,445**

ALTERNATIVE IV – NORTH AREA

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Alternative IV - North Side					
Open Trench Waterline					
ITEMS LIST		**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$231,489.60	$231,489.60
2	Traffic Control **(3.43% of General Cost)**	LS	1	$370,383.35	$370,383.35
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$100,466.48	$100,466.48
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$162,042.72	$162,042.72
5	Materials Testing **(0.2% of General Cost)**	LS	1	$92,595.84	$92,595.84
6	Subsurface Utility Locating	LS	1	$5,111.44	$5,111.44
7	Utility Relocation	LS	1	$5,111.44	$5,111.44
8	AC Pipe Removal and Disposal	LS	1	$3,618.90	$3,618.90
Waterline					
9	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	1,927	$28.78	$55,459.06
10	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	3,115	$35.70	$111,205.50
11	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	872	$37.30	$32,525.60
12	14"Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	6,149	$50.77	$312,184.73
13	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	535	$220.00	$117,766.00
14	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	10	$3,500.00	$35,294.00
15	6" Gate Valves w/ Valve Can, CIP	EA	128	$935.00	$119,680.00
16	8" Gate Valves w/ Valve Can, CIP	EA	433	$1,205.00	$521,329.86
17	10" Gate Valves w/ Valve Can, CIP	EA	2	$2,500.00	$5,000.00
18	12" Gate Valves w/ Valve Can, CIP	EA	2	$3,263.00	$8,025.67
19	14" Gate Valves w/ Valve Can, CIP	EA	2	$4,000.00	$9,838.40
20	Pressurized waterline connections, CIP	EA	167	$1,184.22	$197,680.48
21	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	67,272	$3.00	$201,816.98
22	Joint Restraints, CIP	EA	1,793	$77.75	$139,382.74
23	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	73	$1,329.00	$97,017.00
24	Water Meter Box Remove & Replace	EA	73	$1,000.00	$73,000.00
25	Dewatering of Trench, CIP	LF	603	$53.00	$31,966.95
26	Valve/Pipeline abandonment	LS	1	$196,942.66	$196,942.66
27	Hydrant removal and abandonment	LS	1	$4,270.57	$4,270.57
Water Well					
28	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
29	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
30	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
31	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
32	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
33	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
34	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
35	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
36	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	4,021	$42.00	$168,882.00
37	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	4,021	$62.00	$249,302.00
38	Excavate and Dispose of Unsuitable Material, CIP	CY	24,126	$15.00	$361,890.00
39	Import of Engineered Fill	CY	24,126	$15.00	$361,890.00
40	Geogrid Base Roadway Reinforcement	SY	4,021	$5.50	$22,115.50
41	Remove and replace Curb and Gutter @ Services, CIP	LF	292	$25.00	$7,300.00
42	Remove and replace Sidewalk @ Services, CIP	CY	204	$48.00	$9,811.20

				Construction Cost Subtotal:	$5,600,611.68
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$5,855,440.00
				Contingency - 10%:	$585,544.00
				NMGRT @ 8.5%:	$547,484.00
				Interim Finance Interest:	$384,366.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$7,372,834.00
ENGINEERING SERVICES					
43	Bridge Loan @ 5.5%	LS	1	$67,009.00	$67,009.00
44	Additional Engineering - Data Collection*	LS	1	$128,820.00	$128,820.00
45	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
46	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
47	Engineering Design Services	LS	1	$644,098.00	$644,098.00
48	Engineering - Bid Phase	LS	1	$14,814.00	$14,814.00
49	Engineering - Construction Inspection	LS	1	$225,434.00	$225,434.00
50	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
51	Engineering - Construction Management	LS	1	$90,174.00	$90,174.00
				Engineering Services Subtotal:	$1,285,349.00
				NMGRT @ 8.5%:	$109,255.00
				Engineering Total:	$1,394,604.00
FINANCING SERVICES					
52	Loan Origination Fee	LS	1	$65,874.00	$65,874.00
				Financing Services Subtotal:	$65,874.00
				Financing NMGRT @ 8.5%:	$5,599.00
				Legal Services Total:	$71,473.00
LEGAL SERVICES					
53	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
54	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$8,872,546**

ALTRENATIVE V – EAST AREA

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Alternative V - East Side					
Open Trench Waterline					
ITEMS LIST		**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$662,571.27	$662,571.27
2	Traffic Control **(3.43% of General Cost)**	LS	1	$1,060,114.03	$1,060,114.03
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$287,555.93	$287,555.93
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$463,799.89	$463,799.89
5	Materials Testing **(0.2% of General Cost)**	LS	1	$265,028.51	$265,028.51
6	Subsurface Utility Locating	LS	1	$23,132.20	$23,132.20
7	Utility Relocation	LS	1	$23,132.20	$23,132.20
8	AC Pipe Removal and Disposal	LS	1	$16,377.60	$16,377.60
Waterline					
9	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	35,430	$28.78	$1,019,675.40
10	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	19,162	$35.70	$684,083.40
12	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	804	$220.00	$176,792.00
13	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	109	$3,500.00	$382,144.00
13	6" Gate Valves w/ Valve Can, CIP	EA	219	$935.00	$204,794.43
14	8" Gate Valves w/ Valve Can, CIP	EA	140	$1,205.00	$168,367.15
14	10" Gate Valves w/ Valve Can, CIP	EA	33	$2,500.00	$82,500.00
15	12" Gate Valves w/ Valve Can, CIP	EA	2	$3,263.00	$6,526.00
16	Furnish and Install 6” PRV Assembly (including PRV, vault, excavation, labor and all required appurtenances for a complete installation)	EA	1	$44,000.00	$44,000.00
17	Pressurized waterline connections, CIP	EA	71	$1,184.22	$83,593.11
18	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	21,965	$3.00	$65,896.10
19	Joint Restraints, CIP	EA	1,517	$77.75	$117,912.88
20	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	1,128	$1,329.00	$1,499,112.00
21	Water Meter Box Remove & Replace	EA	1,128	$1,000.00	$1,128,000.00
22	Dewatering of Trench, CIP	LF	13,102	$53.00	$694,410.24
23	Valve/Pipeline abandonment	LS	1	$136,633.07	$136,633.07
24	Hydrant removal and abandonment	LS	1	$46,239.42	$46,239.42
Water Well					
25	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
26	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
27	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
28	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
29	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
30	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, CIP.	LF	200	$25.00	$5,000.00
31	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
32	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	18,197	$42.00	$764,288.00
34	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	18,197	$62.00	$1,128,234.67
35	Excavate and Dispose of Unsuitable Material, CIP	CY	109,184	$15.00	$1,637,760.00
36	Import of Engineered Fill	CY	109,184	$15.00	$1,637,760.00
37	Geogrid Base Roadway Reinforcement	SY	18,197	$5.50	$100,085.33
38	Remove and replace Curb and Gutter @ Services, CIP	LF	4,512	$25.00	$112,800.00
39	Remove and replace Sidewalk @ Services, CIP	CY	3,158	$48.00	$151,603.20

				Construction Cost Subtotal:	$16,053,137.04
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$16,783,555.00
				Contingency - 10%:	$1,678,356.00
				NMGRT @ 8.5%:	$1,569,262.00
				Interim Finance Interest:	$1,101,715.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$21,132,888.00
ENGINEERING SERVICES					
40	Bridge Loan @ 5.5%	LS	1	$180,264.00	$180,264.00
41	Additional Engineering - Data Collection*	LS	1	$369,238.00	$369,238.00
42	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
43	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
44	Engineering Design Services	LS	1	$1,846,191.00	$1,846,191.00
45	Engineering - Bid Phase	LS	1	$42,462.00	$42,462.00
46	Engineering - Construction Inspection	LS	1	$646,167.00	$646,167.00
47	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
48	Engineering - Construction Management	LS	1	$258,467.00	$258,467.00
				Engineering Services Subtotal:	$3,457,789.00
				NMGRT @ 8.5%:	$293,912.00
				Engineering Total:	$3,751,701.00
FINANCING SERVICES					
49	Loan Origination Fee	LS	1	$188,815.00	$188,815.00
				Financing Services Subtotal:	$188,815.00
				Financing NMGRT @ 8.5%:	$16,049.00
				Legal Services Total:	$204,864.00
LEGAL SERVICES					
50	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
51	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$25,123,088**

ALTERNATIVE VI – WEST AREA

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Alternative VI - West Side					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$408,264.73	$408,264.73
2	Traffic Control **(3.43% of General Cost)**	LS	1	$653,223.57	$653,223.57
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$177,186.89	$177,186.89
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$285,785.31	$285,785.31
5	Materials Testing **(0.2% of General Cost)**	LS	1	$163,305.89	$163,305.89
6	Subsurface Utility Locating	LS	1	$14,112.29	$14,112.29
7	Utility Relocation	LS	1	$14,112.29	$14,112.29
8	AC Pipe Removal and Disposal	LS	1	$9,991.50	$9,991.50
Waterline					
9	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	21,979	$28.78	$632,555.62
10	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	11,326	$35.70	$404,338.20
11	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	67	$3,500.00	$233,135.00
12	6" Gate Valves w/ Valve Can, CIP	EA	192	$935.00	$179,699.87
13	8" Gate Valves w/ Valve Can, CIP	EA	206	$1,205.00	$248,777.20
14	12" Gate Valves w/ Valve Can, CIP	EA	4	$3,263.00	$13,052.00
16	Pressurized waterline connections, CIP	EA	73	$1,184.22	$86,456.74
17	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	22,157	$3.00	$66,469.86
18	Joint Restraints, CIP	EA	1,571	$77.75	$122,126.88
19	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	597	$1,329.00	$793,413.00
20	Water Meter Box Remove & Replace	EA	597	$1,000.00	$597,000.00
21	Dewatering of Trench, CIP	LF	1,665	$53.00	$88,258.25
22	Valve/Pipeline abandonment	LS	1	$139,718.33	$139,718.33
23	Hydrant removal and abandonment	LS	1	$28,209.34	$28,209.34
Water Well					
24	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
25	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
26	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
27	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
28	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
29	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
30	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
31	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
32	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	11,102	$42.00	$466,270.00
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	11,102	$62.00	$688,303.33
34	Excavate and Dispose of Unsuitable Material, CIP	CY	66,610	$15.00	$999,150.00
35	Import of Engineered Fill	CY	66,610	$15.00	$999,150.00
36	Geogrid Base Roadway Reinforcement	SY	11,102	$5.50	$61,059.17
37	Remove and replace Curb and Gutter @ Services, CIP	LF	2,388	$25.00	$59,700.00
38	Remove and replace Sidewalk @ Services, CIP	CY	1672	$48.00	$80,236.80
				Construction Cost Subtotal:	$9,891,277.05
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$10,341,330.00
				Contingency - 10%:	$1,034,133.00
				NMGRT @ 8.5%:	$966,914.00
				Interim Finance Interest:	$678,831.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$13,021,208.00

ENGINEERING SERVICES					
39	Bridge Loan @ 5.5%	LS	1	$113,499.00	$113,499.00
40	Additional Engineering - Data Collection*	LS	1	$227,509.00	$227,509.00
41	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
42	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
43	Engineering Design Services	LS	1	$1,137,546.00	$1,137,546.00
44	Engineering - Bid Phase	LS	1	$26,164.00	$26,164.00
45	Engineering - Construction Inspection	LS	1	$398,141.00	$398,141.00
46	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
47	Engineering - Construction Management	LS	1	$159,256.00	$159,256.00
				Engineering Services Subtotal:	$2,177,115.00
				NMGRT @ 8.5%:	$185,055.00
				Engineering Total:	$2,362,170.00
FINANCING SERVICES					
48	Loan Origination Fee	LS	1	$116,340.00	$116,340.00
				Financing Services Subtotal:	$116,340.00
				Financing NMGRT @ 8.5%:	$9,889.00
				Legal Services Total:	$126,229.00
LEGAL SERVICES					
49	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
50	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$15,543,242**

ALTRENATIVE VII – DOWNTOWN AREA

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Alternative VII - Downtown					
Open Trench Waterline					
ITEMS LIST		**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$381,999.53	$381,999.53
2	Traffic Control **(3.43% of General Cost)**	LS	1	$611,199.25	$611,199.25
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$152,799.81	$152,799.81
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$267,399.67	$267,399.67
5	Materials Testing **(0.2% of General Cost)**	LS	1	$152,799.81	$152,799.81
6	Subsurface Utility Locating	LS	1	$10,572.03	$10,572.03
7	Utility Relocation	LS	1	$10,572.03	$10,572.03
8	AC Pipe Removal and Disposal	LS	1	$7,485.00	$7,485.00
Waterline					
9	6" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	15,694	$28.78	$451,673.32
10	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	3,749	$35.70	$133,839.30
11	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	974	$36.50	$35,551.00
12	12" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	4,533	$37.30	$169,080.90
13	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	431	$220.00	$94,886.00
14	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	50	$3,500.00	$174,650.00
15	6" Gate Valves w/ Valve Can, CIP	EA	99	$935.00	$92,471.59
16	8" Gate Valves w/ Valve Can, CIP	EA	37	$1,205.00	$44,299.76
17	10" Gate Valves w/ Valve Can, CIP	EA	135	$2,500.00	$336,755.32
18	12" Gate Valves w/ Valve Can, CIP	EA	90	$3,263.00	$292,988.21
19	14" Gate Valves w/ Valve Can, CIP	EA	2	$4,000.00	$8,000.00
20	Pressurized waterline connections, CIP	EA	63	$1,184.22	$74,691.37
21	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	24,151	$3.00	$72,451.66
22	Joint Restraints, CIP	EA	1,280	$77.75	$99,500.99
23	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	403	$1,329.00	$535,587.00
24	Water Meter Box Remove & Replace	EA	403	$1,000.00	$403,000.00
25	Dewatering of Trench, CIP	LF	14,970	$53.00	$793,410.00
26	Valve/Pipeline abandonment	LS	1	$125,668.33	$125,668.33
27	Hydrant removal and abandonment	LS	1	$21,132.65	$21,132.65
Water Well					
28	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$50,000.00	$50,000.00
29	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
30	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
31	12" Steel Cased Potable Water Well - Drilling Complete	LF	674	$900.00	$606,600.00
32	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
33	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
34	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
35	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
36	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	8,317	$42.00	$349,300.00
	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	8,317	$62.00	$515,633.33
37	Excavate and Dispose of Unsuitable Material, CIP	CY	49,900	$15.00	$748,500.00
38	Import of Engineered Fill	CY	49,900	$15.00	$748,500.00
39	Geogrid Base Roadway Reinforcement	SY	8,317	$5.50	$45,741.67
40	Remove and replace Curb and Gutter @ Services, CIP	LF	1,612	$25.00	$40,300.00
41	Remove and replace Sidewalk @ Services, CIP	CY	1,128	$48.00	$54,163.20

				Construction Cost Subtotal:	$9,234,817.72
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$9,655,002.00
				Contingency - 10%:	$965,500.00
				NMGRT @ 8.5%:	$902,743.00
				Interim Finance Interest:	$633,778.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$12,157,023.00
		ENGINEERING SERVICES			
42	Bridge Loan @ 5.5%	LS	1	$106,386.00	$106,386.00
43	Additional Engineering - Data Collection*	LS	1	$212,410.00	$212,410.00
44	Additional Engineering - Computer hydraulic model and calibration*	LS	1	$60,000.00	$60,000.00
45	Additional Engineering - Hydrogeology Well siting study *	LS	1	$35,000.00	$35,000.00
46	Engineering Design Services	LS	1	$1,062,050.00	$1,062,050.00
47	Engineering - Bid Phase	LS	1	$24,427.00	$24,427.00
48	Engineering - Construction Inspection	LS	1	$371,718.00	$371,718.00
49	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
50	Engineering - Construction Management	LS	1	$148,687.00	$148,687.00
				Engineering Services Subtotal:	$2,040,678.00
				NMGRT @ 8.5%:	$173,458.00
				Engineering Total:	$2,214,136.00
		FINANCING SERVICES			
51	Loan Origination Fee	LS	1	$108,619.00	$108,619.00
				Financing Services Subtotal:	$108,619.00
				Financing NMGRT @ 8.5%:	$9,233.00
				Legal Services Total:	$117,852.00
		LEGAL SERVICES			
52	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
53	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
				Legal Services Subtotal:	$31,000.00
				Legal NMGRT @ 8.5%:	$2,635.00
				Legal Services Total:	$33,635.00
				GRAND TOTAL:	**$14,522,646**

ALTERNATIVE VIII – WILLIAMSBURG AREA

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Alternative III-B System Redundancy and Hydraulic Performance Enhancements					
Open Trench Waterline					
ITEMS LIST		UNITS	QTY	UNIT COST	EXTEND COST
General					
1	Mob/Demob. **(5% of General Cost)**	LS	1	$216,546.60	$216,546.60
2	Traffic Control **(3.43% of General Cost)**	LS	1	$346,474.55	$346,474.55
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$93,981.22	$93,981.22
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$151,582.62	$151,582.62
5	Materials Testing **(0.2% of General Cost)**	LS	1	$86,618.64	$86,618.64
6	Subsurface Utility Locating	LS	1	$6,209.75	$6,209.75
7	Utility Relocation	LS	1	$6,209.75	$6,209.75
8	AC Pipe Removal and Disposal	LS	1	$4,396.50	$4,396.50
Waterline					
9	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	6181	$35.70	$220,661.70
10	10" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	8774	$36.50	$320,251.00
11	Jack and Bore w/ 18-inch Casing pipe, CIP	LF	300	$220.00	$66,000.00
12	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	30	$3,500.00	$104,685.00
13	6" Gate Valves w/ Valve Can, CIP	EA	13	$935.00	$12,155.00
14	8" Gate Valves w/ Valve Can, CIP	EA	107	$1,205.00	$128,935.00
15	10" Gate Valves w/ Valve Can, CIP	EA	49	$2,500.00	$121,534.41
16	Pressurized waterline connections, CIP	EA	46	$1,184.22	$54,533.30
17	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	15214	$3.00	$45,642.61
18	Joint Restraints, CIP	EA	647	$77.75	$50,290.65
19	1" Water Service, New single connection to existing watermian, cip. SD 2362	EA	70	$1,329.00	$93,030.00
20	Water Meter Box Remove & Replace	EA	70	$1,000.00	$70,000.00
21	Dewatering of Trench, CIP	LF	4147	$53.00	$219,806.90
22	Valve/Pipeline abandonment	LS	1	$58,508.98	$58,508.98
23	Hydrant removal and abandonment	LS	1	$12,666.89	$12,666.89
Water Well					
24	Furnish and Install 40 HP Pump, duty point of 500 GPM at 110 PSI, CIP. With drop pipe/cable/pit less CIP	EA	1	$110,000.00	$110,000.00
25	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$45,000.00	$45,000.00
26	Building 24X30 - Complete w/ Electrical and Plumbing	SQFT	720	$425.00	$306,000.00
27	12" Steel Cased Potable Water Well - Drilling Complete	LF	750	$900.00	$675,000.00
28	Furnish and install new gas- chlorination disinfection system, CIP.	EA	1	$165,000.00	$165,000.00
29	8" Waterline Pipe excl. fitting, (std. spec.sec 801), icl. Trench, & compacted backfill, to 6' depth, cip.	LF	200	$25.00	$5,000.00
30	8" Gate Valve, cip SD 2333	EA	3	$1,205.00	$3,615.00
31	6" Service Stub-Out w/ 6" Gate Valve, 100'	EA	2	$6,000.00	$12,000.00
Roadway					
32	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	4885	$42.00	$205,170.00
33	Asphalt Roadway, Remove, Dispose and Replace with SP III, 6" Thick for Arerial Streets, include Subgrade Prep, CIP	SY	4885	$62.00	$302,870.00
34	Excavate and Dispose of Unsuitable Material, CIP	CY	29310	$15.00	$439,650.00
35	Import of Engineered Fill	CY	29310	$15.00	$439,650.00
36	Geogrid Base Roadway Reinforcement	SY	4885	$5.50	$26,867.50
37	Remove and replace Curb and Gutter @ Services, CIP	LF	280	$25.00	$7,000.00
38	Remove and replace Sidewalk @ Services, CIP	CY	196	$48.00	$9,408.00
				Construction Cost Subtotal:	$5,242,951.55
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$5,481,506.00
				Contingency - 10%:	$548,151.00
				NMGRT @ 8.5%:	$512,521.00
				Interim Finance Interest:	$359,820.00
				TOTAL ESTIMATED CONSTRUCTION COST:	$6,901,998.00

ENGINEERING SERVICES					
39	Bridge Loan @ 5.5%	LS	1	$68,106.00	$68,106.00
40	Additional Engineering - Data Collection*	LS	1	$186,000.00	$186,000.00
41	Preliminary Engineering Report-PER	LS	1	$35,000.00	$35,000.00
42	Environmental w/ Report	LS	1	$25,000.00	$25,000.00
43	Additional Engineering - Hydrogeology Well siting study *	LS	1	$45,000.00	$45,000.00
44	Engineering Design Services	LS	1	$602,966.00	$602,966.00
45	Engineering - Bid Phase	LS	1	$13,868.00	$13,868.00
46	Engineering - Construction Inspection	LS	1	$211,038.00	$211,038.00
47	Engineering-Well Construction Oversight	LS	1	$35,000.00	$35,000.00
48	Engineering - Construction Management	LS	1	$84,415.00	$84,415.00
				Engineering Services Subtotal:	$1,306,393.00
				NMGRT @ 7.875%:	$102,878.00
				Engineering Total:	$1,409,271.00
FINANCING SERVICES					
49	Loan Origination Fee	LS	1	$61,667.00	$61,667.00
				Financing Services Subtotal:	$61,667.00
				Financing NMGRT @ 8.5%:	$5,242.00
				Legal Services Total:	$66,909.00
LEGAL SERVICES					
50	Legal Fees - Project Attorney	LS	1	$10,000.00	$10,000.00
51	Legal Fees - Bond Counsel	LS	1	$21,000.00	$21,000.00
LEGAL SERVICES AND LAND ACQUISITION					
52	Land Acquisition New well	LS	1	$20,000.00	$20,000.00
				Legal Services Subtotal:	$51,000.00
				Legal NMGRT @ 8.5%:	$4,335.00
				Legal Services Total:	$55,335.00
				GRAND TOTAL:	**$8,433,513**

ALTERNATIVE IX – AIRPORT 1 PRESSURE TANK REPLACEMENT

Alternative IX - Airport 1 Pessure Tank Replacement					
Item #	**ITEMS LIST**	**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
	General				
1	Mob/Demob. **(5% of General Cost)**	LS	1	$10,392.00	$10,392.00
2	Traffic Control **(3.43% of General Cost)**	LS	1	$16,627.20	$16,627.20
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$4,156.80	$4,156.80
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$7,274.40	$7,274.40
5	Materials Testing **(0.2% of General Cost)**	LS	1	$4,156.80	$4,156.80
6	Subsurface Utility Locating	LS	1	$5,000.00	$5,000.00
7	Utility Relocation	LS	1	$5,000.00	$5,000.00
	Airport Water system				
8	Site Grading/Excavation	CY	60	$100.00	$6,000.00
9	6-Inch Gravel Pad, Including Subgrade Prep, Installed	SY	12	$120.00	$1,440.00
10	Furnish and Install 200 Gallon Pressure Tank	LS	2	$8,000.00	$16,000.00
11	Furnish and Install 4 inch DIP, Including Trenching and Compacted Backfill, per APWA Standard Spec.801 CIP.	LF	100	$90.00	$9,000.00
12	Furnish and Install new chlorinaiton disinfection systemr CIP	EA	1	$8,000.00	$8,000.00
13	Connect to existing well , CIP.	EA	1	$6,000.00	$6,000.00
14	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
15	Chain Link Fence, incl. All attachments, hwardware & anchor posts. CIP	LF	200	$35.00	$7,000.00
16	Ductile Iron MJ fittings, class 250,8" forceman, INCL. Joining Material	LB	2,000	$4.20	$8,400.00
17	Furnish and install Building 12' by 30'	SQ-FT	360	$300.00	$108,000.00
18	well sanitary seal pitless unit 8-inch W/ concrete slab	EA	1	$8,000.00	$8,000.00
				Construction Cost Subtotal:	$260,447.20
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$272,298.00
				Contingency - 10%:	$27,230.00
				NMGRT @ 8.5%:	$25,460.00
				Interim Finance Interest:	$17,874.00
				TOTAL ESTIMATED CONSTRUCTION COST:	**$342,862.00**
	ENGINEERING SERVICES				
19	Bridge Loan @ 5.5%	LS	1	$4,340.00	$4,340.00
20	Additional Engineering - Data Collection*	LS	1	$3,594.00	$3,594.00
21	Additional Engineering - Geotech	LS	1	$10,000.00	$10,000.00
22	Engineering Design Services	LS	1	$29,953.00	$29,953.00
23	Engineering - Bid Phase	LS	1	$689.00	$689.00
24	Engineering - Construction Inspection	LS	1	$10,483.00	$10,483.00
25	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
26	Saw cut, remove, and dispose of existing asphalt, CIP	LS	1	$4,193.00	$4,193.00
				Engineering Services Subtotal:	$83,252.00
				NMGRT @ 8.5%:	$7,076.00
				Engineering Total:	**$90,328.00**
				TOTAL ESTIMATED COST:	**$433,190.00**

ALTERNATIVE X – AIRPORT 2 WITHOUT FIRE FLOW

Alternative X - Airport 2 Without Fire Flow					
Item #	**ITEMS LIST**	**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
	General				
1	Mob/Demob. **(5% of General Cost)**	LS	1	$13,795.00	$13,795
2	Traffic Control **(3.43% of General Cost)**	LS	1	$22,072.00	$22,072
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$5,518.00	$5,518
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$9,656.50	$9,657
5	Materials Testing **(0.2% of General Cost)**	LS	1	$3,198.00	$3,198
6	Subsurface Utility Locating	LS	1	$5,000.00	$5,000
7	Utility Relocation	LS	1	$5,000.00	$5,000
	Airport Water system				
8	Site Grading/Excavation	CY	60	$100.00	$6,000.00
9	Engineered Fill/Subgrade Prep for Tank Foundation, Including Compaction/Testing	CY	8	$120.00	$960.00
10	6-Inch Gravel Pad, Including Subgrade Prep, Installed	SY	12	$200.00	$2,400.00
11	Furnish and Install 7200 Gallon Welded Steel Tank, AWWA D100-11 CIP.	GAL	7,200	$3.20	$23,040.00
12	Tank Foundation Installed	LS	1	$6,000.00	$6,000.00
13	Furnish and Install Cathodic Protection/Level Monitor for Tank, CIP	LS	1	$12,000.00	$12,000.00
14	Furnish and Install 4 inch DIP, Including Trenching and Compacted Backfill, per APWA Standard Spec.801 CIP.	LF	100	$90.00	$9,000.00
15	Furnish and Install new chlorinaiton disinfection systemr CIP	EA	1	$8,000.00	$8,000.00
16	Chain Link Fence, incl. All attachments, hwardware & anchor posts. CIP	LF	200	$35.00	$7,000.00
17	2-50 GPM Variable speed Booster pack	EA	1	$45,000.00	$45,000.00
18	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$30,000.00	$30,000.00
19	Ductile Iron MJ fittings, class 250,8" forceman, INCL. Joining Material	LB	2,500	$4.20	$10,500.00
20	Furnish and install Building 12' by 30'	SQ-FT	360	$300.00	$108,000.00
21	well sanitary seal pitless unit 8-inch W/ concrete slab	EA	1	$8,000.00	$8,000.00
				Construction Cost Subtotal:	$340,139.50
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$355,616.00
				Contingency - 10%:	$35,562.00
				NMGRT @ 8.5%:	$33,250.00
				Interim Finance Interest:	$23,344.00
				TOTAL ESTIMATED CONSTRUCTION COST:	**$447,772**
	ENGINEERING SERVICES				
22	Bridge Loan @ 5.5%	LS	1	$5,163.00	$5,163.00
23	Additional Engineering- Data Collection*	LS	1	$4,694.00	$4,694.00
24	Additional Engineering - Geotech	LS	1	$10,000.00	$10,000.00
25	Engineering Design Services	LS	1	$39,118.00	$39,118.00
26	Saw cut, remove, and dispose of existing asphalt, CIP	LS	1	$900.00	$900.00
27	Engineering - Construction Inspection	LS	1	$13,691.00	$13,691.00
28	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
29	Engineering - Construction Management	LS	1	$5,476.00	$5,476.00
				Engineering Services Subtotal:	$99,042.00
				NMGRT @ 8.5%:	$8,419.00
				Engineering Total:	**$107,461.00**
				TOTAL ESTIMATED COST:	**$555,233.00**

ALTERNATIVE XI – AIRPORT 3 WITH FIRE FLOW

Alternative XI - Airport 3 With Fire Flow					
Item #	**ITEMS LIST**	**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
	General				
1	Mob/Demob. **(5% of General Cost)**	LS	1	$57,914.12	$57,914.12
2	Traffic Control **(3.43% of General Cost)**	LS	1	$92,662.59	$92,662.59
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$23,165.65	$23,165.65
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$40,539.88	$40,539.88
5	Materials Testing **(0.2% of General Cost)**	LS	1	$23,165.65	$23,165.65
6	Subsurface Utility Locating	LS	1	$5,000.00	$5,000.00
7	Utility Relocation	LS	1	$5,000.00	$5,000.00
	Airport Water system				
8	Site Grading/Excavation	CY	181	$10.00	$1,810.00
9	Engineered Fill/Subgrade Prep for Tank Foundation, Including Compction and Testing	CY	84	$12.00	$1,008.00
10	6-Inch Gravel Pad, Including Subgrade Prep, Installed	SY	125	$20.00	$2,500.00
11	Furnish and Install 200.000 Gallon Welded Steel Tank, AWWA D100-11 CIP.	GAL	200,000	$1.75	$350,000.00
12	Tank Foundation Installed	LS	1	$45,000.00	$45,000.00
13	Furnish and Install Cathodic Protection/Level Monitor for Tank, CIP	LS	1	$24,000.00	$24,000.00
14	Furnish and Install 8 inch DIP, Including Trenching and Compacted Backfill, per APWA Standard Spec.801 CIP.	LF	140	$120.00	$16,800.00
15	Furnish and Install new chlorinaiton disinfection systemr CIP	EA	1	$8,000.00	$8,000.00
16	Chain Link Fence, incl. All attachments, hwardware & anchor posts. CIP	LF	720	$35.00	$25,200.00
17	2-50 GPM Variable Speed Booster pack	EA	1	$45,000.00	$45,000.00
18	Furnish and Install Electrical/Control Panel for Booster/Well Pumps and NEMA 12 Enclosure, Complete in Place	EA	1	$30,000.00	$30,000.00
19	Ductile Iron MJ fittings, class 250,8" forceman, INCL. Joining Material	LB	3,500	$4.20	$14,700.00
20	Fire Booster Pump 1500GPM	EA	1	$60,000.00	$60,000.00
21	Furnish and install Building 12' by 30'	SQ-FT	360	$300.00	$108,000.00
22	8" Waterline C-900 DR-18 PVC Pipe Installed With Trenching and Backfill	LF	2,549	$35.70	$90,999.30
23	4-1/2' Fire Hydrant w/ piping valves, and connection	EA	5	$3,500.00	$17,500.00
24	8" Gate Valves w/ Valve Can, CIP	EA	15	$1,205.00	$18,075.00
25	Ductile Iron MJ Fittings, All Sizes, Class 25, CIP	LB	2,270	$3.00	$6,810.00
	Roadway				
26	Asphalt Roadway, Remove, Dispose and Replace with SP III, 3" Thick for Residential Streets, include Subgrade Prep, CIP	SY	1,699	$50.00	$84,966.67
27	Excavate and Dispose of Unsuitable Material, CIP	CY	5,098	$15.00	$76,470.00
28	Import of Engineered Fill	CY	5,098	$15.00	$76,470.00
29	Geogrid Base Roadway Reinforcement	SY	850	$5.50	$4,673.17
32	Saw cut, remove, and dispose of existing asphalt, CIP	SY	1,699	$4.10	$6,967.27
33	Subgrade Prep,	SY	1,699	$2.50	$4,248.33
34	6" Aggregate Base Course, CIP	SY	1,699	$7.00	$11,895.33
35	Asphalt Paving, 2-3" Lifts, w/ machine laydown, CIP	SY	1,699	$16.00	$27,189.33
				Construction Cost Subtotal:	$1,405,730.29
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$1,469,691.00
				Contingency - 10%:	$146,969.00
				NMGRT @ 8.5%:	$137,416.00
				Interim Finance Interest:	$96,474.00
				TOTAL ESTIMATED CONSTRUCTION COST:	**$1,850,550.00**
	ENGINEERING SERVICES				
36	Bridge Loan @ 5.5%	LS	1	$16,170.00	$16,170.00
37	Additional Engineering - Data Collection*	LS	1	$19,400.00	$19,400.00
38	Additional Engineering - Geotech	LS	1	$10,000.00	$10,000.00
39	Engineering Design Services	LS	1	$161,666.00	$161,666.00
40	Engineering - Bid Phase	LS	1	$3,718.00	$3,718.00
41	Engineering - Construction Inspection	LS	1	$56,583.00	$56,583.00
42	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
43	Engineering - Construction Management	LS	1	$22,633.00	$22,633.00
				Engineering Services Subtotal:	$310,170.00
				NMGRT @ 8.5%:	$26,364.00
				Engineering Total:	**$336,534.00**
				TOTAL ESTIMATED COST:	**$2,187,084.00**

AIRPORT XII – AIRPORT 4 VFD WELL PUMP

Alternative XII - Airport 4 VFD Well Pump					
Item #	**ITEMS LIST**	**UNITS**	**QTY**	**UNIT COST**	**EXTEND COST**
	General				
1	Mob/Demob. **(5% of General Cost)**	LS	1	$11,992.00	$11,992.00
2	Traffic Control **(3.43% of General Cost)**	LS	1	$19,187.20	$19,187.20
3	Construction Survey/Staking **(2.17% of General Cost)**	LS	1	$4,796.80	$4,796.80
4	SWPPP Preparation, Implementation, and Inspection **(1% of General Cost)**	LS	1	$8,394.40	$8,394.40
5	Materials Testing **(0.2% of General Cost)**	LS	1	$4,796.80	$4,796.80
6	Subsurface Utility Locating	LS	1	$5,000.00	$5,000.00
7	Utility Relocation	LS	1	$5,000.00	$5,000.00
	Airport Water system				
8	Site Grading/Excavation	CY	60	$100.00	$6,000.00
9	6-Inch Gravel Pad, Including Subgrade Prep, Installed	SY	12	$120.00	$1,440.00
10	Furnish and Install 30 Gallon Pressure Tank	LS	1	$2,000.00	$2,000.00
11	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, and NEMA 12 Enclosure, CIP	EA	1	$18,000.00	$18,000.00
12	2-50 GPM Variable Speed Booster pack W/VFD	EA	1	$28,000.00	$28,000.00
13	Furnish and Install new chlorinaiton disinfection systemr CIP	EA	1	$8,000.00	$8,000.00
14	Furnish and Install Electrical/Control Panel for Booster/Well Pumps, Including Well VFD and NEMA 12 Enclosure, CIP	EA	1	$45,000.00	$45,000.00
15	Chain Link Fence, incl. All attachments, hwardware & anchor posts. CIP	LF	200	$35.00	$7,000.00
16	Ductile Iron MJ fittings, class 250,8" forceman, INCL. Joining Material	LB	2,000	$4.20	$8,400.00
17	Furnish and install Building 12' by 30'	SQ-FT	360	$300.00	$108,000.00
18	well sanitary seal pitless unit 8-inch W/ concrete slab	EA	1	$8,000.00	$8,000.00
				Construction Cost Subtotal:	$299,007.20
				2-YR Inflation @ 4.55% + Construction Cost Subtotal:	$312,612.00
				Contingency - 10%:	$31,261.00
				NMGRT @ 8.5%:	$29,229.00
				Interim Finance Interest:	$20,521.00
				TOTAL ESTIMATED CONSTRUCTION COST:	**$393,623.00**
	ENGINEERING SERVICES				
19	Bridge Loan @ 5.5%	LS	1	$4,738.00	$4,738.00
20	Additional Engineering - Data Collection*	LS	1	$4,126.00	$4,126.00
21	Additional Engineering - Geotech	LS	1	$10,000.00	$10,000.00
22	Engineering Design Services	LS	1	$34,387.00	$34,387.00
23	Engineering - Bid Phase	LS	1	$791.00	$791.00
24	Engineering - Construction Inspection	LS	1	$12,036.00	$12,036.00
25	Engineering-Well Construction Oversight	LS	1	$20,000.00	$20,000.00
26	Saw cut, remove, and dispose of existing asphalt, CIP	LS	1	$4,814.00	$4,814.00
				Engineering Services Subtotal:	$90,892.00
				NMGRT @ 8.5%:	$7,726.00
				Engineering Total:	**$98,618.00**
				TOTAL ESTIMATED COST:	**$492,241.00**

APPENDIX 5- OPERATION AND MAINTENANACE

TABLE OF CONTENT:

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O&M Alternative I - Do Nothing

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 137,800
Power cost due to Water Losses	$ 39,434
O&M	$ 566,404

Year:	1	2	3	4	5
Repair Costs:	$ 140,900.50	$ 144,070.76	$ 147,312.35	$ 150,626.88	$ 154,015.99
Water Loss:	$ 40,321.04	$ 41,228.27	$ 42,155.90	$ 43,104.41	$ 44,074.26
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Future Value	**$ 760,369.86**	**$ 777,478.18**	**$ 794,971.44**	**$ 812,858.29**	**$ 831,147.60**
Net Present Value:	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**

Year:	6	7	8	9	10
Repair Costs:	$ 157,481.35	$ 161,024.68	$ 164,647.73	$ 168,352.31	$ 172,140.23
Water Loss:	$ 45,065.93	$ 46,079.91	$ 47,116.71	$ 48,176.84	$ 49,260.82
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Future Value	**$ 849,848.43**	**$ 868,970.02**	**$ 888,521.84**	**$ 908,513.58**	**$ 928,955.14**
Net Present Value:	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**

Year:	11	12	13	14	15
Repair Costs:	$ 176,013.39	$ 179,973.69	$ 184,023.10	$ 188,163.62	$ 192,397.30
Water Loss:	$ 50,369.19	$ 51,502.49	$ 52,661.30	$ 53,846.18	$ 55,057.72
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Future Value	**$ 949,856.63**	**$ 971,228.40**	**$ 993,081.04**	**$ 1,015,425.36**	**$ 1,038,272.44**
Net Present Value:	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**

Year:	16	17	18	19	20
Repair Costs:	$ 196,726.24	$ 201,152.58	$ 205,678.51	$ 210,306.28	$ 215,038.17
Water Loss:	$ 56,296.52	$ 57,563.19	$ 58,858.36	$ 60,182.67	$ 61,536.78
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Future Value	**$ 1,061,633.57**	**$ 1,085,520.32**	**$ 1,109,944.53**	**$ 1,134,918.28**	**$ 1,160,453.94**
Net Present Value:	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**	**$ 743,638.00**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,941,969**
				Total Lifetime Maintenance Cost (present value):	**$ 11,871,223**
				ANNUAL TOTAL O&M ALT I	**$ 743,638**

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O&M Alternative II - Complete System

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 4,685
Water Losses	$ 1,341
O&M	$ 566,404
Well Equipment	$ 11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 4,790.62	$ 4,898.41	$ 5,008.62	$ 5,121.31	$ 5,236.54
Water Loss:	$ 1,370.92	$ 1,401.76	$ 1,433.30	$ 1,465.55	$ 1,498.52
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well Equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	**$ 597,332.40**	**$ 610,772.38**	**$ 624,514.76**	**$ 638,566.34**	**$ 652,934.08**
Net Present Value:	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 5,354.37	$ 5,474.84	$ 5,598.02	$ 5,723.98	$ 5,852.77
Water Loss:	$ 1,532.24	$ 1,566.72	$ 1,601.97	$ 1,638.01	$ 1,674.87
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well Equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	**$ 667,625.10**	**$ 682,646.66**	**$ 698,006.21**	**$ 713,711.35**	**$ 729,769.86**
Net Present Value:	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 5,984.46	$ 6,119.11	$ 6,256.79	$ 6,397.56	$ 6,541.51
Water Loss:	$ 1,712.55	$ 1,751.08	$ 1,790.48	$ 1,830.77	$ 1,871.96
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well Equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	**$ 746,189.68**	**$ 762,978.95**	**$ 780,145.97**	**$ 797,699.26**	**$ 815,647.49**
Net Present Value:	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 6,688.69	$ 6,839.19	$ 6,993.07	$ 7,150.41	$ 7,311.30
Water Loss:	$ 1,914.08	$ 1,957.15	$ 2,001.18	$ 2,046.21	$ 2,092.25
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well Equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	**$ 833,999.56**	**$ 852,764.55**	**$ 871,951.75**	**$ 891,570.67**	**$ 911,631.01**
Net Present Value:	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**	**$ 584,188.17**
				Total Lifetime Maintenance Cost (20 years):	**$ 14,880,458**
				Total Lifetime Maintenance Cost (present value):	**$ 9,325,812**
				ANNUAL TOTAL O&M ALT II	**$ 584,188**

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O&M Alternative III - System Performance Upgrade

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 85,712
Water Losses	$ 24,528
O&M	$ 566,404
Well Equipment	$ 11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$87,640.11	$89,612.01	$91,628.28	$93,689.92	$95,797.94
Water Loss:	$25,079.69	$25,643.98	$26,220.97	$26,810.94	$27,414.19
O&M	$579,148.31	$592,179.15	$605,503.18	$619,127.00	$633,057.36
Well Equipment	$12,022.56	$12,293.06	$12,569.66	$12,852.47	$13,141.65
Future Value	**$703,890.67**	**$719,728.21**	**$735,922.09**	**$752,480.34**	**$769,411.15**
Net Present Value:	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$97,953.40	$100,157.35	$102,410.89	$104,715.13	$107,071.22
Water Loss:	$28,031.01	$28,661.71	$29,306.59	$29,965.99	$30,640.23
O&M	$647,301.15	$661,865.43	$676,757.40	$691,984.44	$707,554.09
Well Equipment	$13,437.34	$13,739.68	$14,048.82	$14,364.92	$14,688.13
Future Value	**$786,722.90**	**$804,424.16**	**$822,523.71**	**$841,030.49**	**$859,953.67**
Net Present Value:	**$688,401.63**	**$110,239.41**	**$110,239.41**	**$110,239.41**	**$110,239.41**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$109,480.33	$111,943.63	$114,462.37	$117,037.77	$119,671.12
Water Loss:	$31,329.63	$32,034.55	$32,755.33	$33,492.32	$34,245.90
O&M	$723,474.06	$739,752.22	$756,396.65	$773,415.57	$790,817.42
Well Equipment	$15,018.62	$15,356.54	$15,702.06	$16,055.35	$16,416.60
Future Value	**$879,302.63**	**$899,086.94**	**$919,316.40**	**$940,001.02**	**$961,151.04**
Net Present Value:	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$122,363.72	$125,116.90	$127,932.03	$130,810.50	$133,753.74
Water Loss:	$35,016.43	$35,804.30	$36,609.90	$37,433.62	$38,275.88
O&M	$808,610.81	$826,804.56	$845,407.66	$864,429.33	$883,878.99
Well Equipment	$16,785.97	$17,163.66	$17,549.84	$17,944.71	$18,348.47
Future Value	**$982,776.94**	**$1,004,889.42**	**$1,027,499.43**	**$1,050,618.17**	**$1,074,257.08**
Net Present Value:	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**	**$688,401.63**
				Total Lifetime Maintenance Cost (20 years):	**$ 17,534,986**
				Total Lifetime Maintenance Cost (present value):	**$ 10,989,446**
				ANNUAL TOTAL O&M ALT III	**$ 688,402**

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O&M Alternative III A- System High Pressure Solutions

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$101,007
Water Losses	$28,905
O&M	$566,404

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$103,280.07	$105,603.87	$107,979.96	$110,409.50	$112,893.72
Water Loss:	$29,555.32	$30,220.32	$30,900.28	$31,595.53	$32,306.43
O&M	$579,148.31	$592,179.15	$605,503.18	$619,127.00	$633,057.36
Future Value	**$711,983.70**	**$728,003.34**	**$744,383.41**	**$761,132.04**	**$778,257.51**
Net Present Value:	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**
	$15,667.12				

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$115,433.83	$118,031.09	$120,686.79	$123,402.24	$126,178.79
Water Loss:	$33,033.33	$33,776.58	$34,536.55	$35,313.62	$36,108.18
O&M	$647,301.15	$661,865.43	$676,757.40	$691,984.44	$707,554.09
Future Value	**$795,768.30**	**$813,673.09**	**$831,980.73**	**$850,700.30**	**$869,841.06**
Net Present Value:	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$129,017.81	$131,920.71	$134,888.93	$137,923.93	$141,027.22
Water Loss:	$36,920.61	$37,751.33	$38,600.73	$39,469.25	$40,357.31
O&M	$723,474.06	$739,752.22	$756,396.65	$773,415.57	$790,817.42
Future Value	**$889,412.48**	**$909,424.26**	**$929,886.31**	**$950,808.75**	**$972,201.95**
Net Present Value:	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$144,200.33	$147,444.84	$150,762.35	$154,154.50	$157,622.98
Water Loss:	$41,265.35	$42,193.82	$43,143.18	$44,113.90	$45,106.46
O&M	$808,610.81	$826,804.56	$845,407.66	$864,429.33	$883,878.99
Future Value	**$994,076.49**	**$1,016,443.21**	**$1,039,313.18**	**$1,062,697.73**	**$1,086,608.43**
Net Present Value:	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**	**$696,316.58**
				Total Lifetime Maintenance Cost (20 years):	**$ 17,736,596**
				Total Lifetime Maintenance Cost (present value):	**$ 11,115,798**
				ANNUAL TOTAL O&M ALT III-A	**$696,317**

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O&M Alternative III B- System Redundancy and Hydraulic Performance Enhancements

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$129,119
Water Losses	$36,949
O&M	$566,404
Well equipment	$11,758

Year:	1	2	3	4	5
Repair Costs:	$132,023.77	$134,994.30	$138,031.68	$141,137.39	$144,312.98
Water Loss:	$37,780.82	$38,630.89	$39,500.08	$40,388.83	$41,297.58
O&M	$579,148.31	$592,179.15	$605,503.18	$619,127.00	$633,057.36
Well Equipment	$12,022.56	$12,293.06	$12,569.66	$12,852.47	$13,141.65
Future Value	**$760,975.45**	**$778,097.40**	**$795,604.59**	**$813,505.70**	**$831,809.57**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	6	7	8	9	10
Repair Costs:	$147,560.02	$150,880.12	$154,274.92	$157,746.11	$161,295.40
Water Loss:	$42,226.78	$43,176.88	$44,148.36	$45,141.70	$46,157.39
O&M	$647,301.15	$661,865.43	$676,757.40	$691,984.44	$707,554.09
Well Equipment	$13,437.34	$13,739.68	$14,048.82	$14,364.92	$14,688.13
Future Value	**$850,525.29**	**$869,662.11**	**$889,229.51**	**$909,237.17**	**$929,695.01**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	11	12	13	14	15
Repair Costs:	$164,924.54	$168,635.35	$172,429.64	$176,309.31	$180,276.27
Water Loss:	$47,195.93	$48,257.84	$49,343.64	$50,453.87	$51,589.08
O&M	$723,474.06	$739,752.22	$756,396.65	$773,415.57	$790,817.42
Well Equipment	$15,018.62	$15,356.54	$15,702.06	$16,055.35	$16,416.60
Future Value	**$950,613.14**	**$972,001.94**	**$993,871.98**	**$1,016,234.10**	**$1,039,099.37**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**

Year:	16	17	18	19	20
Repair Costs:	$184,332.48	$188,479.96	$192,720.76	$197,056.98	$201,490.76
Water Loss:	$52,749.83	$53,936.71	$55,150.28	$56,391.16	$57,659.96
O&M	$808,610.81	$826,804.56	$845,407.66	$864,429.33	$883,878.99
Well Equipment	$16,785.97	$17,163.66	$17,549.84	$17,944.71	$18,348.47
Future Value	**$1,062,479.11**	**$1,086,384.88**	**$1,110,828.54**	**$1,135,822.19**	**$1,161,378.19**
Net Present Value:	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**	**$744,230.27**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,957,055**
				Total Lifetime Maintenance Cost (present value):	**$ 11,880,678**
				ANNUAL TOTAL O&M ALT III-B	**$744,230**

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O&M Alternative III C- Additional Hydraulic Performance Enhancements

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$130,634
Water Losses	$37,383
O&M	$566,404

Year:	1	2	3	4	5
Repair Costs:	$133,573.67	$136,579.08	$139,652.11	$142,794.28	$146,007.15
Water Loss:	$38,224.35	$39,084.40	$39,963.80	$40,862.98	$41,782.40
O&M	$579,148.31	$592,179.15	$605,503.18	$619,127.00	$633,057.36
Future Value	**$750,946.33**	**$767,842.63**	**$785,119.09**	**$802,784.27**	**$820,846.91**
Net Present Value:	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**

Year:	6	7	8	9	10
Repair Costs:	$149,292.32	$152,651.39	$156,086.05	$159,597.99	$163,188.94
Water Loss:	$42,722.50	$43,683.76	$44,666.64	$45,671.64	$46,699.25
O&M	$647,301.15	$661,865.43	$676,757.40	$691,984.44	$707,554.09
Future Value	**$839,315.97**	**$858,200.58**	**$877,510.09**	**$897,254.07**	**$917,442.28**
Net Present Value:	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**

Year:	11	12	13	14	15
Repair Costs:	$166,860.69	$170,615.06	$174,453.90	$178,379.11	$182,392.64
Water Loss:	$47,749.99	$48,824.36	$49,922.91	$51,046.18	$52,194.72
O&M	$723,474.06	$739,752.22	$756,396.65	$773,415.57	$790,817.42
Future Value	**$938,084.73**	**$959,191.64**	**$980,773.45**	**$1,002,840.86**	**$1,025,404.77**
Net Present Value:	**$734,421.84**	**$168,017.63**	**$168,017.63**	**$168,017.63**	**$168,017.63**

Year:	16	17	18	19	20
Repair Costs:	$186,496.47	$190,692.64	$194,983.23	$199,370.35	$203,856.18
Water Loss:	$53,369.10	$54,569.90	$55,797.72	$57,053.17	$58,336.87
O&M	$808,610.81	$826,804.56	$845,407.66	$864,429.33	$883,878.99
Future Value	**$1,048,476.38**	**$1,072,067.10**	**$1,096,188.61**	**$1,120,852.85**	**$1,146,072.04**
Net Present Value:	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**	**$734,421.84**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,707,215**
				Total Lifetime Maintenance Cost (present value):	**$ 11,724,099**
				ANNUAL TOTAL O&M ALT III-C	**$734,422**

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O&M Alternative IV - North Side

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 130,772
Water Losses	$ 37,423
O&M	$566,404
Well equipment	$11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 133,714.57	$ 136,723.15	$ 139,799.42	$ 142,944.91	$ 146,161.17
Water Loss:	$ 38,264.67	$ 39,125.63	$ 40,005.95	$ 40,906.09	$ 41,826.47
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	**$ 763,150.11**	**$ 780,320.99**	**$ 797,878.21**	**$ 815,830.47**	**$ 834,186.66**
Net Present Value:	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 149,449.80	$ 152,812.42	$ 156,250.70	$ 159,766.34	$ 163,361.08
Water Loss:	$ 42,767.57	$ 43,729.84	$ 44,713.76	$ 45,719.82	$ 46,748.52
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	**$ 852,955.86**	**$ 872,147.36**	**$ 891,770.68**	**$ 911,835.52**	**$ 932,351.82**
Net Present Value:	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 167,036.70	$ 170,795.03	$ 174,637.92	$ 178,567.27	$ 182,585.04
Water Loss:	$ 47,800.36	$ 48,875.87	$ 49,975.57	$ 51,100.02	$ 52,249.77
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	**$ 953,329.73**	**$ 974,779.65**	**$ 996,712.20**	**$ 1,019,138.22**	**$ 1,042,068.83**
Net Present Value:	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**	**$ 746,357.08**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 186,693.20	$ 190,893.80	$ 195,188.91	$ 199,580.66	$ 204,071.22
Water Loss:	$ 53,425.39	$ 54,627.46	$ 55,856.58	$ 57,113.36	$ 58,398.41
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	**$ 1,065,515.38**	**$ 1,089,489.47**	**$ 1,114,002.99**	**$ 1,139,068.05**	**$ 1,164,697.09**
Net Present Value:	**$ 746,357.08**	**$ 168,194.86**	**$ 168,194.86**	**$ 168,194.86**	**$ 168,194.86**
				Total Lifetime Maintenance Cost (20 years):	**$ 19,011,229**
				Total Lifetime Maintenance Cost (present value):	**$ 11,914,630**
				ANNUAL TOTAL O&M ALT IV	**$ 746,357**

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O&M Alternative V - East Side

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 105,830
Water Losses	$ 30,301
O&M	$566,404
Well equipment	$11,758

Year:	1	2	3	4	5
Repair Costs:	$ 108,211.58	$ 110,646.34	$ 113,135.89	$ 115,681.44	$ 118,284.28
Water Loss:	$ 30,982.69	$ 31,679.80	$ 32,392.60	$ 33,121.43	$ 33,866.66
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	$ 730,365.14	$ 746,798.36	$ 763,601.32	$ 780,782.35	$ 798,349.95
Net Present Value:	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**

Year:	6	7	8	9	10
Repair Costs:	$ 120,945.67	$ 123,666.95	$ 126,449.46	$ 129,294.57	$ 132,203.70
Water Loss:	$ 34,628.66	$ 35,407.81	$ 36,204.48	$ 37,019.08	$ 37,852.01
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	$ 816,312.83	$ 834,679.86	$ 853,460.16	$ 872,663.01	$ 892,297.93
Net Present Value:	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**	**$ 714,293.54**

Year:	11	12	13	14	15
Repair Costs:	$ 135,178.28	$ 138,219.79	$ 141,329.74	$ 144,509.66	$ 147,761.12
Water Loss:	$ 38,703.68	$ 39,574.51	$ 40,464.94	$ 41,375.40	$ 42,306.35
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	$ 912,374.64	$ 932,903.07	$ 953,893.38	$ 975,355.99	$ 997,301.50
Net Present Value:	**$ 714,293.54**	**$ 136,131.32**	**$ 136,131.32**	**$ 136,131.32**	**$ 136,131.32**

Year:	16	17	18	19	20
Repair Costs:	$ 151,085.75	$ 154,485.18	$ 157,961.10	$ 161,515.22	$ 165,149.31
Water Loss:	$ 43,258.24	$ 44,231.55	$ 45,226.76	$ 46,244.36	$ 47,284.86
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	$ 1,019,740.78	$ 1,042,684.95	$ 1,066,145.36	$ 1,090,133.63	$ 1,114,661.63
Net Present Value:	**$ 714,293.54**	**$ 136,131.32**	**$ 136,131.32**	**$ 136,131.32**	**$ 136,131.32**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,194,506**
				Total Lifetime Maintenance Cost (present value):	**$ 11,402,777**
				ANNUAL TOTAL O&M ALT V	**$ 714,294**

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O&M Alternative VI - West Side

WATERLINES

Input Variables		
Discount Rate:		2.25%
Repair Costs:	$	118,370
Water Losses	$	33,882
O&M	$	566,404
Well equipment	$	11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 121,033.53	$ 123,756.78	$ 126,541.31	$ 129,388.49	$ 132,299.73
Water Loss:	$ 34,643.84	$ 35,423.33	$ 36,220.35	$ 37,035.31	$ 37,868.60
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	**$ 746,848.24**	**$ 763,652.32**	**$ 780,834.50**	**$ 798,403.28**	**$ 816,367.35**
Net Present Value:	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 135,276.48	$ 138,320.20	$ 141,432.40	$ 144,614.63	$ 147,868.46
Water Loss:	$ 38,720.65	$ 39,591.86	$ 40,482.68	$ 41,393.54	$ 42,324.89
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	**$ 834,735.61**	**$ 853,517.17**	**$ 872,721.30**	**$ 892,357.53**	**$ 912,435.58**
Net Present Value:	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 151,195.50	$ 154,597.40	$ 158,075.84	$ 161,632.55	$ 165,269.28
Water Loss:	$ 43,277.20	$ 44,250.94	$ 45,246.59	$ 46,264.64	$ 47,305.59
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	**$ 932,965.38**	**$ 953,957.10**	**$ 975,421.13**	**$ 997,368.11**	**$ 1,019,808.89**
Net Present Value:	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 168,987.84	$ 172,790.06	$ 176,677.84	$ 180,653.09	$ 184,717.79
Water Loss:	$ 48,369.97	$ 49,458.29	$ 50,571.10	$ 51,708.95	$ 52,872.40
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	$ 1,042,754.59	$ 1,066,216.57	$ 1,090,206.44	$ 1,114,736.09	$ 1,139,817.65
Net Present Value:	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**	**$ 730,413.92**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,605,125**
				Total Lifetime Maintenance Cost (present value):	**$ 11,660,118**
				ANNUAL TOTAL O&M ALT VI	**$ 730,414**

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O&M Alternative VII - Downtown

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 121,264
Water Losses	$ 34,694
O&M	$ 566,404
Well equipment	$ 11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 123,992.44	$ 126,782.27	$ 129,634.87	$ 132,551.66	$ 135,534.07
Water Loss:	$ 35,474.45	$ 36,272.63	$ 37,088.76	$ 37,923.26	$ 38,776.53
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	**$ 750,637.76**	**$ 767,527.11**	**$ 784,796.47**	**$ 802,454.39**	**$ 820,509.61**
Net Present Value:	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 138,583.58	$ 141,701.71	$ 144,890.00	$ 148,150.03	$ 151,483.40
Water Loss:	$ 39,649.01	$ 40,541.11	$ 41,453.28	$ 42,385.98	$ 43,339.67
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	**$ 838,971.08**	**$ 857,847.93**	**$ 877,149.51**	**$ 896,885.37**	**$ 917,065.29**
Net Present Value:	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 154,891.78	$ 158,376.85	$ 161,940.33	$ 165,583.98	$ 169,309.62
Water Loss:	$ 44,314.81	$ 45,311.89	$ 46,331.41	$ 47,373.87	$ 48,439.78
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	**$ 937,699.26**	**$ 958,797.50**	**$ 980,370.44**	**$ 1,002,428.77**	**$ 1,024,983.42**
Net Present Value:	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 173,119.09	$ 177,014.27	$ 180,997.09	$ 185,069.52	$ 189,233.59
Water Loss:	$ 49,529.67	$ 50,644.09	$ 51,783.58	$ 52,948.71	$ 54,140.06
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	**$ 1,048,045.55**	**$ 1,071,626.57**	**$ 1,095,738.17**	**$ 1,120,392.28**	**$ 1,145,601.11**
Net Present Value:	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**	**$ 734,120.06**
				Total Lifetime Maintenance Cost (20 years):	**$ 18,699,528**
				Total Lifetime Maintenance Cost (present value):	**$ 11,719,281**
				ANNUAL TOTAL O&M ALT VII	**$ 734,120**

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O&M Alternative VIII - Wiliamsburg

WATERLINES

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 107,208
Water Losses	$ 30,679
O&M	$566,404
Well equipment	$11,758

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 109,620.59	$ 112,087.05	$ 114,609.01	$ 117,187.71	$ 119,824.44
Water Loss:	$ 31,369.77	$ 32,075.59	$ 32,797.29	$ 33,535.23	$ 34,289.77
O&M	$ 579,148.31	$ 592,179.15	$ 605,503.18	$ 619,127.00	$ 633,057.36
Well equipment	$ 12,022.56	$ 12,293.06	$ 12,569.66	$ 12,852.47	$ 13,141.65
Future Value	$ 732,161.23	$ 748,634.86	$ 765,479.14	$ 782,702.42	$ 800,313.22
Net Present Value:	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 122,520.49	$ 125,277.20	$ 128,095.93	$ 130,978.09	$ 133,925.10
Water Loss:	$ 35,061.29	$ 35,850.17	$ 36,656.80	$ 37,481.58	$ 38,324.92
O&M	$ 647,301.15	$ 661,865.43	$ 676,757.40	$ 691,984.44	$ 707,554.09
Well equipment	$ 13,437.34	$ 13,739.68	$ 14,048.82	$ 14,364.92	$ 14,688.13
Future Value	$ 695,799.78	$ 711,455.28	$ 727,463.02	$ 743,830.94	$ 760,567.14
Net Present Value:	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 136,938.42	$ 140,019.53	$ 143,169.97	$ 146,391.29	$ 149,685.10
Water Loss:	$ 39,187.23	$ 40,068.94	$ 40,970.49	$ 41,892.33	$ 42,834.90
O&M	$ 723,474.06	$ 739,752.22	$ 756,396.65	$ 773,415.57	$ 790,817.42
Well equipment	$ 15,018.62	$ 15,356.54	$ 15,702.06	$ 16,055.35	$ 16,416.60
Future Value	$ 914,618.31	$ 935,197.23	$ 956,239.16	$ 977,754.54	$ 999,754.02
Net Present Value:	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 153,053.01	$ 156,496.71	$ 160,017.88	$ 163,618.28	$ 167,299.69
Water Loss:	$ 43,798.69	$ 44,784.16	$ 45,791.80	$ 46,822.12	$ 47,875.62
O&M	$ 808,610.81	$ 826,804.56	$ 845,407.66	$ 864,429.33	$ 883,878.99
Well equipment	$ 16,785.97	$ 17,163.66	$ 17,549.84	$ 17,944.71	$ 18,348.47
Future Value	$ 1,022,248.49	$ 1,045,249.08	$ 1,068,767.18	$ 1,092,814.44	$ 1,117,402.77
Net Present Value:	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**	**$ 716,050.10**
				Total Lifetime Maintenance Cost (20 years):	**$ 17,598,452**
				Total Lifetime Maintenance Cost (present value):	**$ 11,430,818**
				ANNUAL TOTAL O&M ALT VIII	**$ 716,050**

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O&M Alternative IX - Airport 1 Pressure Tank

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 1,200
Annual Running cost	$ 886
O&M	$ -

Year:	1	2	3	4	5
Repair Costs:	$ 1,227.00	$ 1,254.61	$ 1,282.84	$ 1,311.70	$ 1,341.21
Running cost	$ 906.22	$ 926.61	$ 947.45	$ 968.77	$ 990.57
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,133.22**	**$ 2,181.21**	**$ 2,230.29**	**$ 2,280.47**	**$ 2,331.78**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	6	7	8	9	10
Repair Costs:	$ 1,371.39	$ 1,402.25	$ 1,433.80	$ 1,466.06	$ 1,499.04
Running cost	$ 1,012.86	$ 1,035.65	$ 1,058.95	$ 1,082.77	$ 1,107.14
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,384.25**	**$ 2,437.89**	**$ 2,492.75**	**$ 2,548.83**	**$ 2,606.18**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	11	12	13	14	15
Repair Costs:	$ 1,532.77	$ 1,567.26	$ 1,602.52	$ 1,638.58	$ 1,675.45
Running cost	$ 1,132.05	$ 1,157.52	$ 1,183.56	$ 1,210.19	$ 1,237.42
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,664.82**	**$ 2,724.78**	**$ 2,786.09**	**$ 2,848.77**	**$ 2,912.87**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	16	17	18	19	20
Repair Costs:	$ 1,713.15	$ 1,751.69	$ 1,791.10	$ 1,831.40	$ 1,872.61
Running cost	$ 1,265.26	$ 1,293.73	$ 1,322.84	$ 1,352.61	$ 1,383.04
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	$ 2,978.41	$ 3,045.42	$ 3,113.95	$ 3,184.01	$ 3,255.65
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**
				Total Lifetime Maintenance Cost (20 years):	**$ 53,142**
				Total Lifetime Maintenance Cost (present value):	**$ 33,305**
				ANNUAL TOTAL O&M ALT IX	**$ 2,086**

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O&M Alternative X - Airport 2 Without Fire Flow

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 1,200.00
Annual Running cost	$ 886
O&M	$ -

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 1,227.00	$ 1,254.61	$ 1,282.84	$ 1,311.70	$ 1,341.21
Running cost	$ 906.22	$ 926.61	$ 947.45	$ 968.77	$ 990.57
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,133.22**	**$ 2,181.21**	**$ 2,230.29**	**$ 2,280.47**	**$ 2,331.78**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 1,371.39	$ 1,402.25	$ 1,433.80	$ 1,466.06	$ 1,499.04
Running cost	$ 1,012.86	$ 1,035.65	$ 1,058.95	$ 1,082.77	$ 1,107.14
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,384.25**	**$ 2,437.89**	**$ 2,492.75**	**$ 2,548.83**	**$ 2,606.18**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 1,532.77	$ 1,567.26	$ 1,602.52	$ 1,638.58	$ 1,675.45
Running cost	$ 1,132.05	$ 1,157.52	$ 1,183.56	$ 1,210.19	$ 1,237.42
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,664.82**	**$ 2,724.78**	**$ 2,786.09**	**$ 2,848.77**	**$ 2,912.87**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 1,713.15	$ 1,751.69	$ 1,791.10	$ 1,831.40	$ 1,872.61
Running cost	$ 1,265.26	$ 1,293.73	$ 1,322.84	$ 1,352.61	$ 1,383.04
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,978.41**	**$ 3,045.42**	**$ 3,113.95**	**$ 3,184.01**	**$ 3,255.65**
Net Present Value:	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**	**$ 2,086.27**
Total Lifetime Maintenance Cost (20 years):					**$ 53,142**
Total Lifetime Maintenance Cost (present value):					**$ 33,305**
ANNUAL TOTAL O&M ALT X					**$ 2,086.27**

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O&M Alternative XI - Airport 3 With Fire Flow

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 2,791
Annual Running cost	$ 37,795
O&M	$ -

Year:	**1**	**2**	**3**	**4**	**5**
Repair Costs:	$ 2,853.41	$ 2,917.61	$ 2,983.26	$ 3,050.38	$ 3,119.02
Running cost	$ 38,645.09	$ 39,514.61	$ 40,403.69	$ 41,312.77	$ 42,242.31
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 41,498.51**	**$ 42,432.22**	**$ 43,386.95**	**$ 44,363.16**	**$ 45,361.33**
Net Present Value:	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**

Year:	**6**	**7**	**8**	**9**	**10**
Repair Costs:	$ 3,189.20	$ 3,260.95	$ 3,334.32	$ 3,409.35	$ 3,486.06
Running cost	$ 43,192.76	$ 44,164.60	$ 45,158.30	$ 46,174.36	$ 47,213.29
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 46,381.96**	**$ 47,425.55**	**$ 48,492.63**	**$ 49,583.71**	**$ 50,699.34**
Net Present Value:	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**

Year:	**11**	**12**	**13**	**14**	**15**
Repair Costs:	$ 3,564.49	$ 3,644.69	$ 3,726.70	$ 3,810.55	$ 3,896.29
Running cost	$ 48,275.58	$ 49,361.79	$ 50,472.43	$ 51,608.05	$ 52,769.24
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 51,840.08**	**$ 53,006.48**	**$ 54,199.13**	**$ 55,418.61**	**$ 56,665.52**
Net Present Value:	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**

Year:	**16**	**17**	**18**	**19**	**20**
Repair Costs:	$ 3,983.95	$ 4,073.59	$ 4,165.25	$ 4,258.97	$ 4,354.79
Running cost	$ 53,956.54	$ 55,170.57	$ 56,411.90	$ 57,681.17	$ 58,979.00
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 57,940.50**	**$ 59,244.16**	**$ 60,577.15**	**$ 61,940.14**	**$ 63,333.79**
Net Present Value:	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**	**$ 40,585.34**
				Total Lifetime Maintenance Cost (20 years):	**$ 1,033,791**
				Total Lifetime Maintenance Cost (present value):	**$ 647,893**
				ANNUAL TOTAL O&M ALT XI	**$ 40,585**

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O&M Alternative XII- Airport 4 VFD Well Pump

Input Variables	
Discount Rate:	2.25%
Repair Costs:	$ 1,200
Annual Running cost	$ 1,182
O&M	$ -

Year:	1	2	3	4	5
Repair Costs:	$ 1,227.00	$ 1,254.61	$ 1,282.84	$ 1,311.70	$ 1,341.21
Running cost	$ 1,208.29	$ 1,235.47	$ 1,263.27	$ 1,291.70	$ 1,320.76
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,435.29**	**$ 2,490.08**	**$ 2,546.11**	**$ 2,603.40**	**$ 2,661.97**
Net Present Value:	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**

Year:	6	7	8	9	10
Repair Costs:	$ 1,371.39	$ 1,402.25	$ 1,433.80	$ 1,466.06	$ 1,499.04
Running cost	$ 1,350.48	$ 1,380.86	$ 1,411.93	$ 1,443.70	$ 1,476.18
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 2,721.87**	**$ 2,783.11**	**$ 2,845.73**	**$ 2,909.76**	**$ 2,975.23**
Net Present Value:	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**

Year:	11	12	13	14	15
Repair Costs:	$ 1,532.77	$ 1,567.26	$ 1,602.52	$ 1,638.58	$ 1,675.45
Running cost	$ 1,509.40	$ 1,543.36	$ 1,578.08	$ 1,613.59	$ 1,649.90
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 3,042.17**	**$ 3,110.62**	**$ 3,180.61**	**$ 3,252.17**	**$ 3,325.34**
Net Present Value:	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**

Year:	16	17	18	19	20
Repair Costs:	$ 1,713.15	$ 1,751.69	$ 1,791.10	$ 1,831.40	$ 1,872.61
Running cost	$ 1,687.02	$ 1,724.98	$ 1,763.79	$ 1,803.47	$ 1,844.05
O&M	$ -	$ -	$ -	$ -	$ -
Future Value	**$ 3,400.16**	**$ 3,476.67**	**$ 3,554.89**	**$ 3,634.88**	**$ 3,716.66**
Net Present Value:	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**	**$ 2,381.70**
				Total Lifetime Maintenance Cost (20 years):	**$ 60,667**
				Total Lifetime Maintenance Cost (present value):	**$ 38,021**
				ANNUAL TOTAL O&M ALT XII	**$ 2,382**

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APPENDIX 6- EXHIBITS

TABLE OF CONTENT:

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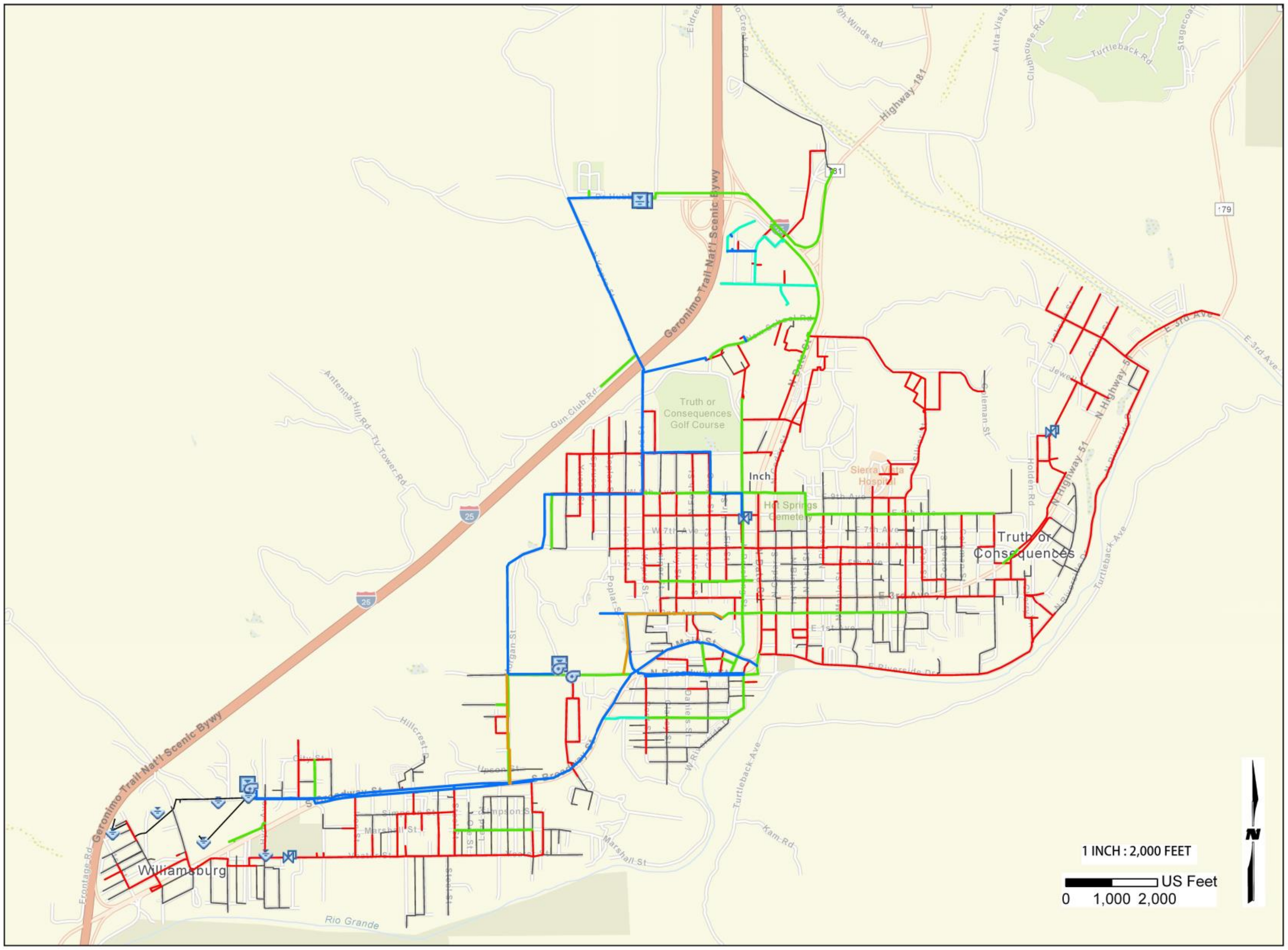
WILSON
&COMPANY



WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- Well
- Booster Station
- Tank
- PRV
- 6 Inch
- 8 Inch
- 10 Inch
- 12 Inch
- 14 Inch
- <6 Inch

EXISTING PIPE DIAMETER

EXHIBIT 107

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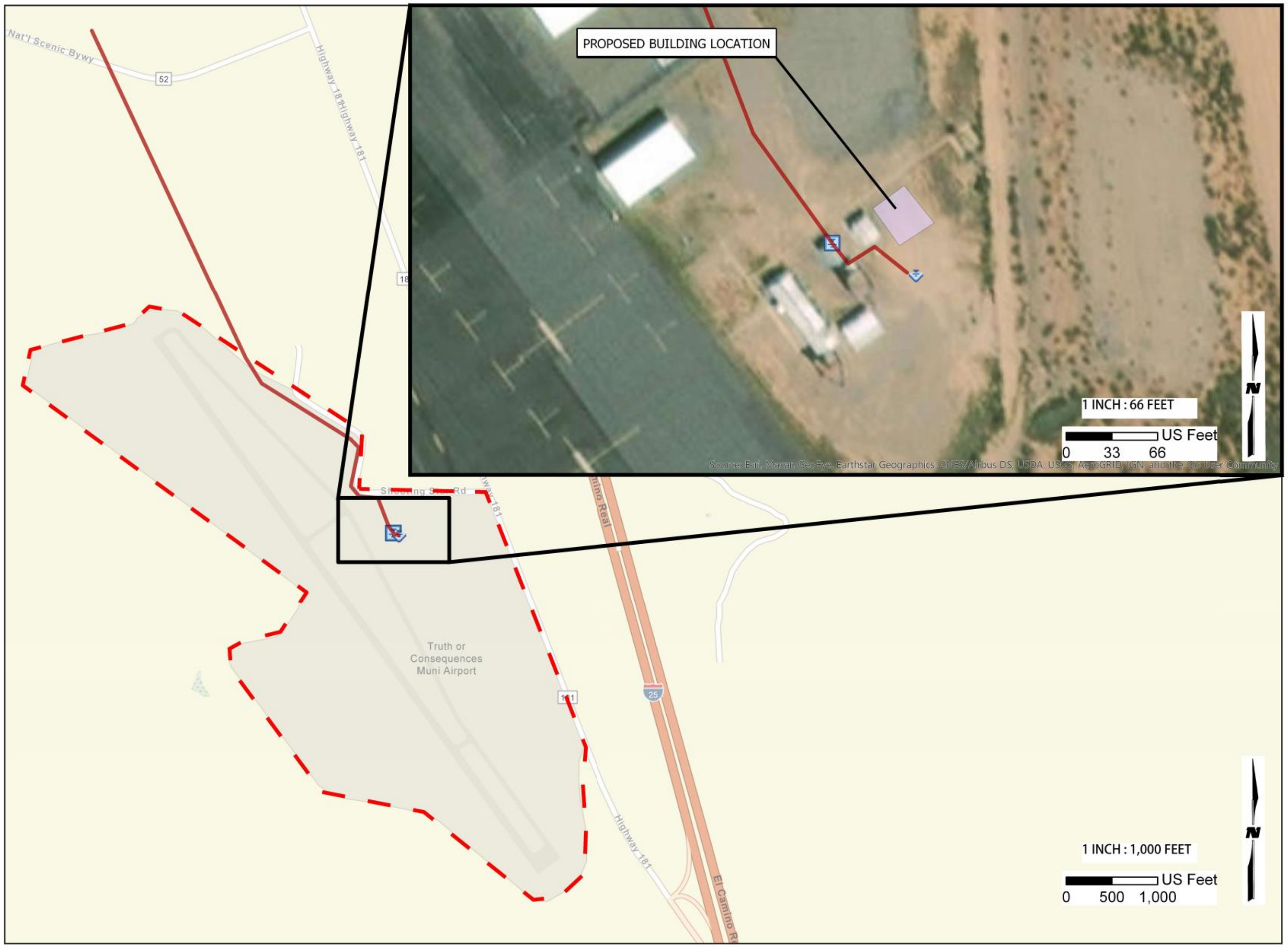

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

AIRPORT OVERVIEW

EXHIBIT 108

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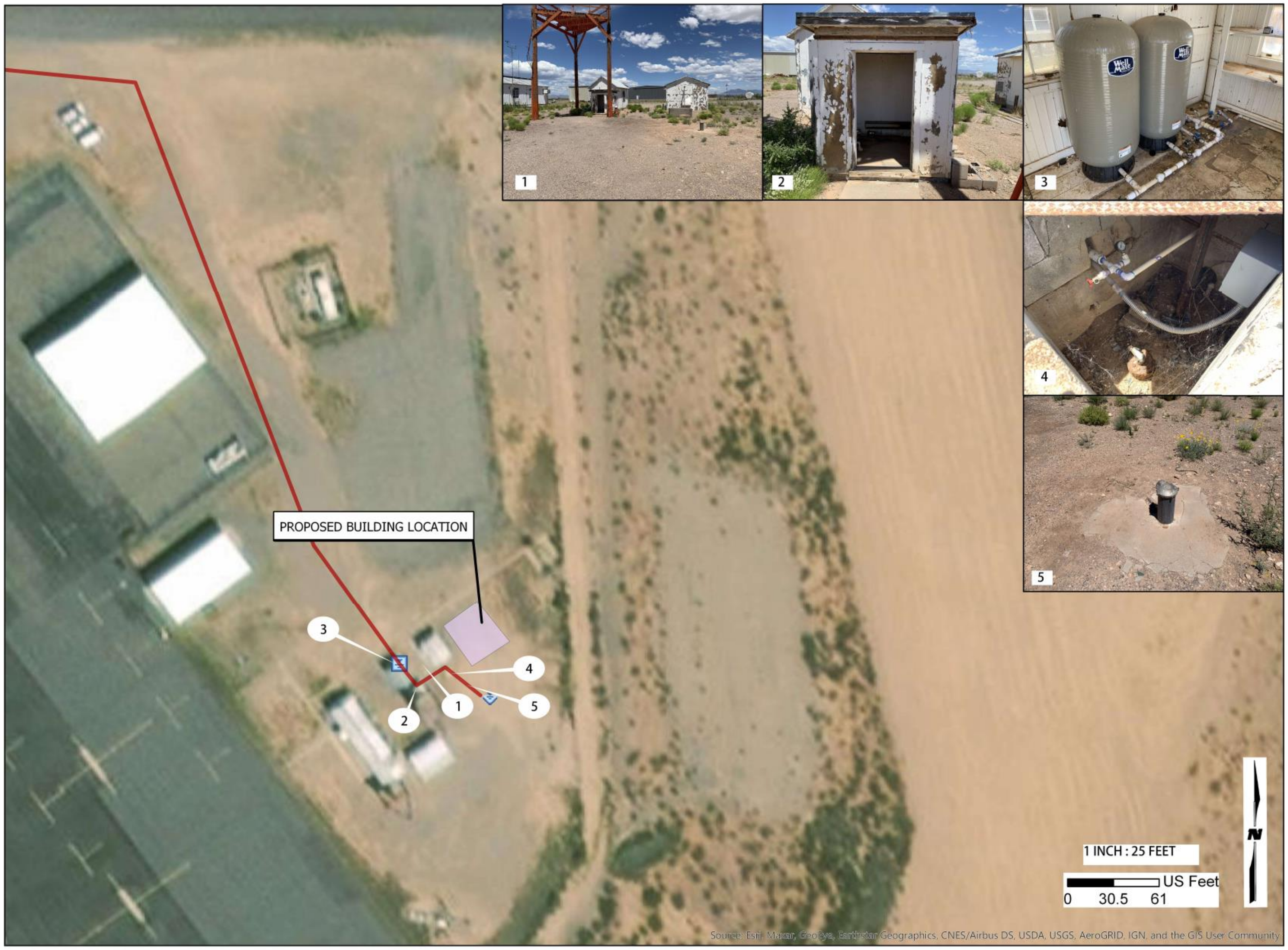

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend

- Recommended upgrades
- WATER SEWER BUILDING
- Well
- Booster Station
- Tank
- PRV
- Airport

AIRPORT OVERVIEW

EXHIBIT 109

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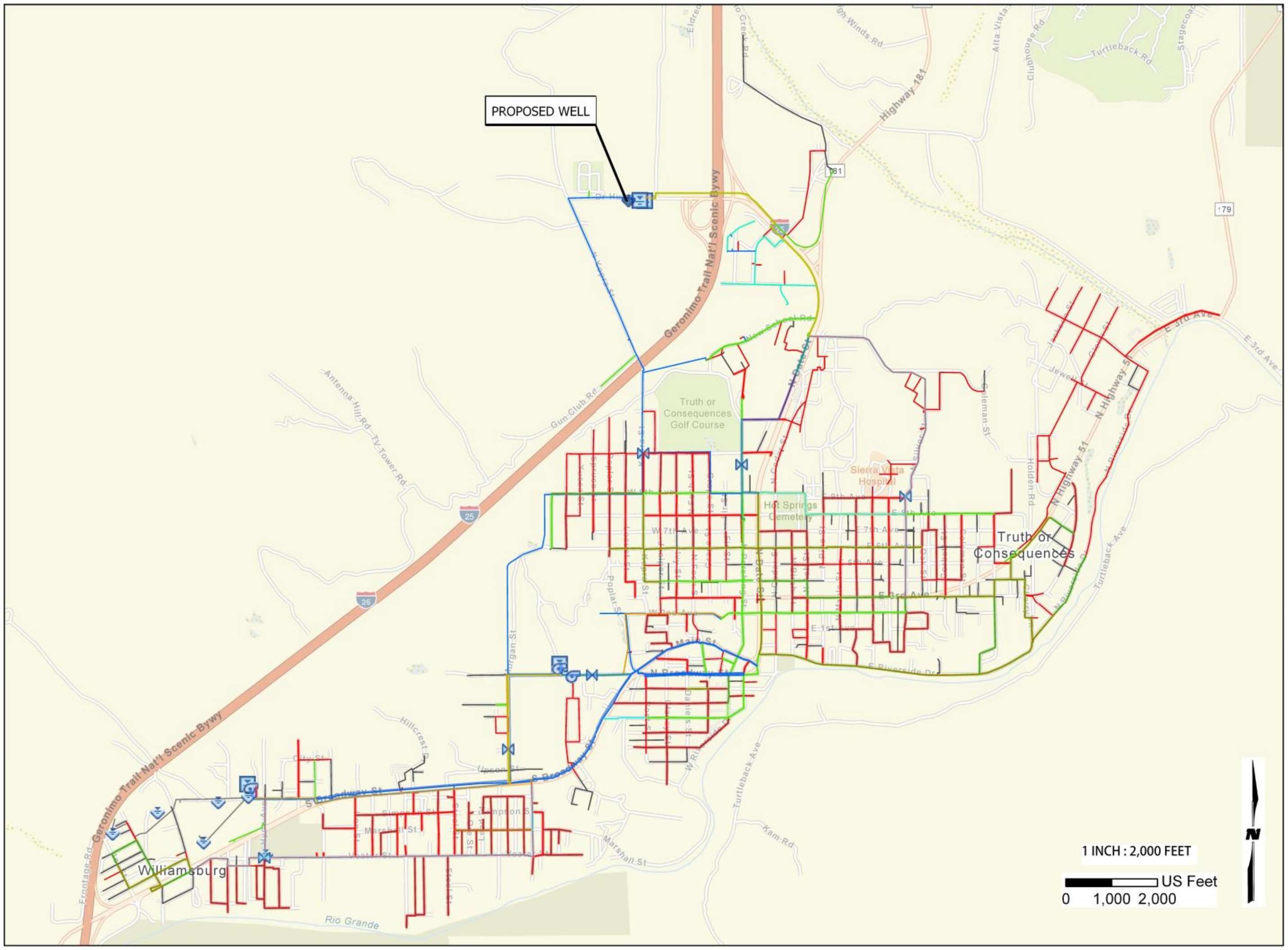

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend
- Proposed Well
- New PRV
- Well
- Booster Station
- Tank
- 6 Inch
- 8 Inch
- 10 Inch
- 12 Inch
- 14 Inch
- <6 Inch

SYSTEM COMPLETION
OVERVIEW

EXHIBIT 110

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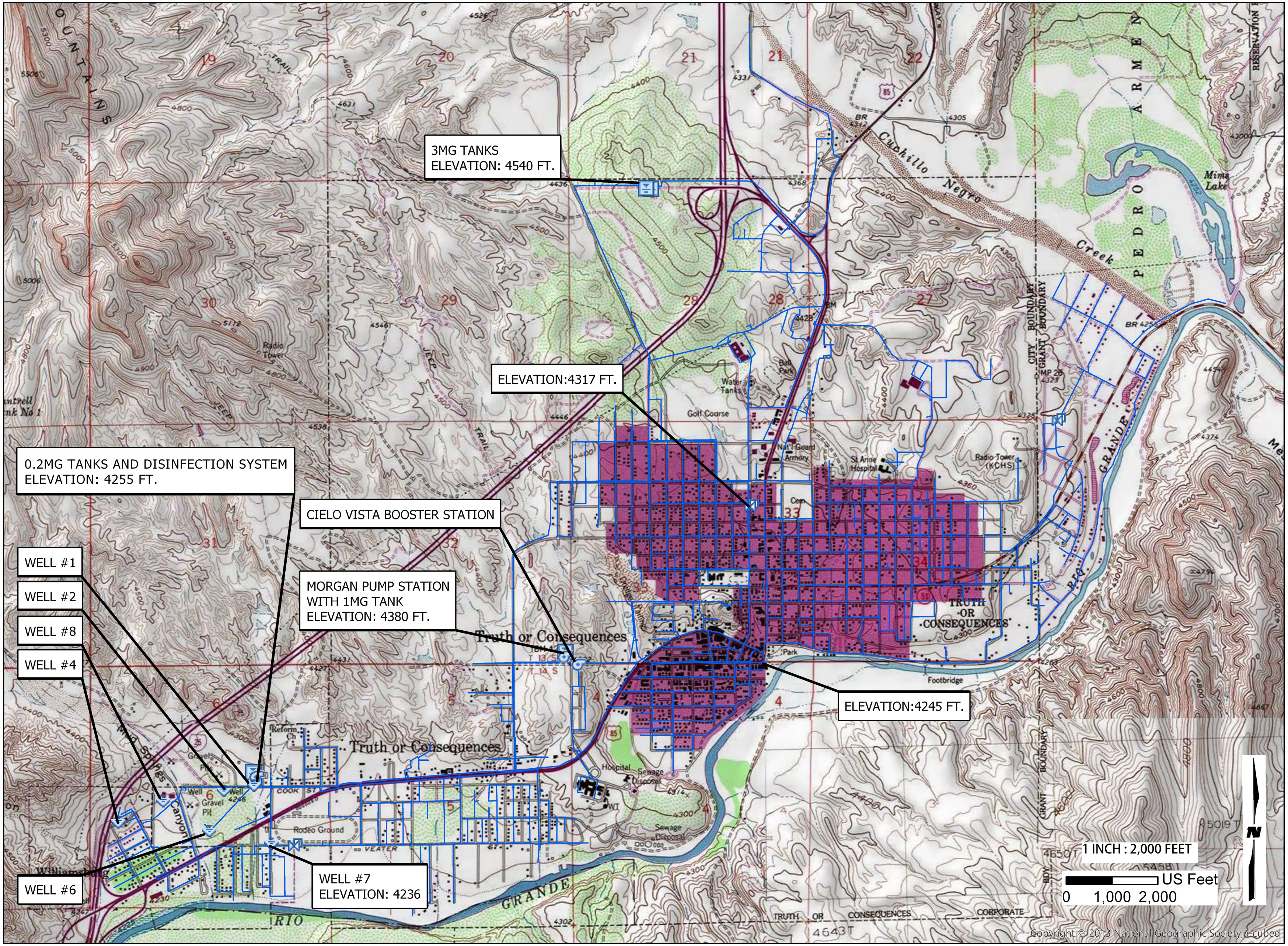

WILSON & COMPANY
HIGHER RELATIONSHIPS

PRELIMINARY
ENGINEERING REPORT

WATER SYSTEM IMPROVEMENTS

TRUTH OR CONSEQUENCES NEW MEXICO

Legend
EXISTING SYSTEM
- Well
- Booster Station
- Tank
- PRV
- Waterline

EXISTING SYSTEM OVERVIEW
USDA TOPOGRAPHIC MAP

EXHIBIT 111

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APPENDIX 7- SHORT LIVE ASSET RESERVE

TABLE OF CONTENT:

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Description	Estimated Life Cycle	
	1-5 years	6-10 years
Asset		
Cook Street TreatmentFacility Pump #2 Motor	$ 16,070.00	
Well #7 Pump Motor	$ 7,720.00	
Well #6 Pump Motor	$ 6,630.00	
Well #8 Pump Motor	$ 6,630.00	
Well #1 Pump Motor	$ 3,730.00	
Well #4 Pump Motor	$ 410.00	
Cielo Vista Pump Station Pump No. 2 Motor	$ 680.00	
Cielo Vista Pump Station Pump No. 1 Motor	$ 700.00	
Booster Pump Station No. 2 Pump No. 1 Motor	$ 7,690.00	
Cook St. Treatment Facility Pump No. 1 Motor	$ 16,070.00	
250 HP Booster Pump Motors x2	$ 31,200.00	
Well #2 Pump Motor		$ 3,310.00
Well #8 Pump		$ 27,580.00
Well #7 Pump		$ 39,510.00
Well #6 Pump		$ 39,510.00
Booster Pump Station #2 Pump		$ 7,690.00
Well #1 Pump		$ 12,420.00
Well #4 Pump		$ 33,910.00
Cielo Vista Pump Station Pump No. 1		$ 31,190.00
Cielo Vista Pump Station Pump No. 3		$ 10,400.00
Pershing Booster Pump Station No. 2, Pump No. 1*		$ -
Pershing Booster Pump StationNo. 2, Pump No. 2*		$ -
Cook St. Treatment Facility Flow Meter*		$ -
Well #2 Pump		$ 16,550.00
Well No. 2 Flow Meter*		$ -
Well No. 7 Flow Meter		$ 5,200.00
Well No. 8 Flow Meter		$ 5,200.00
Well No. 4 Flow Meter		$ 5,200.00
Well No. 6 Flow Meter		$ 5,200.00
Booster Pump Station No. 2 Flow Meter		$ 5,200.00
Well No. 1 Flow Meter*		$ -
Well No. 2 pump Electrical System*		$ -
Well No. 4 pump Electrical System		$ 47,480.00
Well No. 1 pump Electrical System*		$ -
Well No. 6 pump Electrical System		$ 69,860.00
Well No. 7 pump Electrical System		$ 67,820.00
Well No. 8 pump Electrical System		$ 69,860.00
Cielo Vista Pump Station Electrical System		$ 51,980.00
Pershing Booster pump Station No. 2 Electrical System*		$ -
Pershing Booster Pump Station No. 2 Back-up Generator*		$ -
Cook St Treatment Facility Electrical System*		$ -
SCADA System RTUs*		$ -
SCADA System Software		$ 38,600.00
Gas-Chlorination System*		$ -
250 HP Vertical Turbine Booster Pump x2		$ 249,500.00
Pump Control Panel/Soft Starter*		$ -
0.2 MG Electrical/Control System*		$ -
0.3 MG Electrical Control *		$ -
3.0 MG Steel Storage Tank on Morgan St.		$ 261,486.69
1.2 MG Steel Storage Tank on Cemetery Rd.		$ 156,892.01
3.0 MG Steel Storage Tank on Cemetery Rd.		$ 261,486.69
0.2 MG Steel Storage Tank		$ 26,148.67
0.3 MG Steel Storage Tank		$ 39,223.00
New Well Pump and Motor		$ 40,000.00
Pressure Reducing Valve (PRV)	$ 30,000.00	
Subtotal of Short-Lived Assets (per period)	$ 127,530.00	$ 1,628,407.06
Subtotal of Short-Lived Assets (per year)	$ 25,506.00	$ 162,840.71
Subtotal of Short-Lived Assets (per month)	$ 2,125.50	$ 13,570.06
Total of Short-Lived Assets (1-10 years)	**$**	**1,755,937**
Total Annual Reserve Deposit, Short-Lived Assets (1-10 years, per year)	**$**	**188,347**
Total Monthly Reserve Deposit, Short-Lived Assets (1-10 years, per month)	**$**	**15,696**

*Items addressed under previously funded, not constructed projects.

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APPENDIX 8- WATER LOSSES

TABLE OF CONTENT:

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Summary of Water Losses

	Full System				Alternative II - Complete System			
Alternative %	-				96.60%			
Year	2016	2017	2018	2019	2016	2017	2018	2019
Losses (GAL)	105,123,718	108,683,000	141,018,000	127,534,000	101,549,512	104,987,778	136,223,388	123,197,844
Annual Losses	$ 183,967	$ 190,195	$ 246,782	$ 223,185	$ 177,712	$ 183,729	$ 238,391	$ 215,596
	Alternative III - System Performance Updgrade				**Alternative III A - System High pressure Soultion**			
Alternative %	37.80%				26.70%			
Year	2016	2017	2018	2019	2016	2017	2018	2019
Losses (GAL)	39,736,765	41,082,174	53,304,804	48,207,852	28,068,033	29,018,361	37,651,806	34,051,578
Annual Losses	$ 69,539	$ 71,894	$ 93,283	$ 84,364	$ 49,119	$ 50,782	$ 65,891	$ 59,590
	Alternative III B - System Redundancy and Hydraulic Performance Enhancements				**Alternative IIIC -Adiditonal Hydraulic Perfromance Enhancements**			
Alternative %	6.30%				5.20%			
Year	2016	2017	2018	2019	2016	2017	2018	2019
Losses (GAL)	6,622,794	6,847,029	8,884,134	8,034,642	5,466,433	5,651,516	7,332,936	6,631,768
Annual Losses	$ 11,590	$ 11,982	$ 15,547	$ 14,061	$ 9,566	$ 9,890	$ 12,833	$ 11,606
	Alternative IV - North Side				**Alternative V - East Side**			
Alternative %	5.10%				23.16%			
Year	2016	2017	2018	2019	2016	2017	2018	2019
Losses (GAL)	5,361,310	5,542,833	7,191,918	6,504,234	24,346,653	25,170,983	32,659,769	29,536,874
Annual Losses	$ 9,382	$ 9,700	$ 12,586	$ 11,382	$ 42,607	$ 44,049	$ 57,155	$ 51,690
	Alternative VI - West Side				**Alternative VII - Downtown**			
Alternative %	14.08%				12.02%			
Year	2016	2017	2018	2019	2016	2017	2018	2019
Losses (GAL)	14,801,419	15,302,566	19,855,334	17,956,787	12,635,871	13,063,697	16,950,364	15,329,587
Annual Losses	$ 25,902	$ 26,779	$ 34,747	$ 31,424	$ 22,113	$ 22,861	$ 29,663	$ 26,827
	Alternative VIII - Williamsburg							
Alternative %	22.20%							
Year	2016	2017	2018	2019				
Losses (GAL)	23,337,465	24,127,626	31,305,996	28,312,548				
Annual Losses	$ 40,841	$ 42,223	$ 54,785	$ 49,547				

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APPENDIX 9- FIRE HYDRANT BREAKDOWN

CONTENT:

- FIRE HYDRANT SUMMARY TABLE AGE/PRESSURE CAPACITY BREAKDOWN
- FIRE FLOW HYDRANT TESTING REPORT (THIS PAGE REPORT IS NOT INCLUDED IN THIS APPENDIX, AVALIABLE PER REQUEST)

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FIRE HYDRANT SUMMARY TABLE AGE/PRESSURE CAPACITY BREAKDOWN

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Fire Hydrant Age Breakdown

Age (Years)	Number of Hydrants	Percentage of Total
> 50	25	7.8%
> 40	42	13.1%
> 30	45	14.0%
> 3	209	65.1%

Fire Hydrant Pressure Capacity Breakdown

Pressure Capacity (GPM)	Number of Hydrants	Percentage of Total
< 1500	16	5.3%
< 2500	123	40.5%
< 3500	152	50.0%
< 5700	13	4.3%

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APPENDIX 10- NMED WATER SYSTEM VIOLATIONS

CONTENT:

- NMED WATER SYSTEM VIOLATIONS

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New Mexico Environment Department	UOCP Operator Lookup	Drinking Water Program
County Map of NM	Water System Search	Help

Water System Detail Information

Water System No.:	NM3514327	Federal Type:	C
Water System Name:	TRUTH OR CONSEQUENCES	Federal Source:	GW
Principal County Served:	SIERRA	System Status:	A
Principal City Served:	TRUTH OR CONSEQUENCES	Activity Date:	06-01-1977

Group Violations

Fed Fiscal Year	Determ. Date	Violation Type	Violation Name	Analyte Group	Analyte Group Name
2017	11-18-2016	27	MONITORING, ROUTINE (DBP), MAJOR	DBP2	DBP STAGE 2
2016	11-03-2015	27	MONITORING, ROUTINE (DBP), MAJOR	DBP2	DBP STAGE 2
2006	11-30-2005	03	MONITORING, ROUTINE MAJOR	SOCS	OLD SOCS

Individual Violations

Violation No.	Determ. Date	Violation Type	Violation Name	Analyte Code	Analyte Name	RTC Exp.	RTC Imp.	RTC Other
2018-36616	02-09-2018	75	PUBLIC NOTICE RULE LINKED TO VIOLATION	7500	PUBLIC NOTICE	Y		
2017-36615	02-23-2017	52	FOLLOW-UP OR ROUTINE TAP M/R (LCR)	5000	LEAD & COPPER RULE	Y		
2017-36614	12-19-2016	72	CCR ADEQUACY/AVAILABILITY/CONTENT	7000	CONSUMER CONFIDENCE RULE	Y		
2017-36611	11-23-2016	3A	MONITORING, ROUTINE, MINOR (RTCR)	3014	E. COLI	Y		
2016-36610	08-03-2016	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	Y		
2016-36609	07-20-2016	52	FOLLOW-UP OR ROUTINE TAP M/R (LCR)	5000	LEAD & COPPER RULE	Y		
2006-36606	06-12-2006	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	Y	Y	
2004-304	08-03-2004	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	Y		
2000-33400	10-10-2000	24	MONITORING (TCR), ROUTINE MINOR	3100	COLIFORM (TCR)	Y	Y	

* Denotes violation began in last 6 months but is currently eligible for implicit RTC.
RTC EXP denotes violation has any of the following enforcement actions: SOX, EOX.
RTC IMP denotes SWTR or TCR violation does not have a violation in the following 6 months.

New Mexico Environment Department	UOCP Operator Lookup	Drinking Water Program
County Map of NM	Water System Search	Help

Water System Detail Information

Water System No.:	NM3501427	Federal Type:	NC
Water System Name:	TRUTH OR CONSEQUENCES MUNICIPAL AIRPORT	Federal Source:	GW
Principal County Served:	SIERRA	System Status:	A
Principal City Served:	TRUTH OR CONSEQUENCES	Activity Date:	08-27-2018

Group Violations

Fed Fiscal Year	Determ. Date	Violation Type	Violation Name	Analyte Group	Analyte Group Name

Individual Violations

Violation No.	Determ. Date	Violation Type	Violation Name	Analyte Code	Analyte Name	RTC Exp.	RTC Imp.	RTC Other
2019-3	01-16-2019	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	Y		
2019-2	12-18-2018	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	Y		
2019-1	11-21-2018	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	Y		

* Denotes violation began in last 6 months but is currently eligible for implicit RTC.
RTC EXP denotes violation has any of the following enforcement actions: SOX, EOX.
RTC IMP denotes SWTR or TCR violation does not have a violation in the following 6 months.
RTC Other denotes violation has any of the following enforcement actions:
EF&, EF/, EF9, EFK, EFL, EFQ, EFV, EO0, EO6, SF&, SF9, SFK, SFL, SFO, SFQ, SFV, SF0, SF6

APPENDIX 11 - UTILITY RATES

CONTENT:

- UTILITY RATES TABLE

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OLD WATER RATES PRIOR JULY 1,2020

Residential Rates – City of T or C & Village of Williamsburg	
Base Customer Charge (Minimum)	$8.15
Rate per 1000 gallons for Level 1 Usage (1 - 7,000 gallons)	$1.75
Rate per 1000 gallons for Level 2 Usage (7,000 - 30,000 gallons)	$1.93
Rate per 1000 gallons for Level 3 Usage (30,000 – 50,000 gallons)	$2.12
Rate per 1000 gallons for Level 4 Usage (Above 50,000 gallons)	$2.33
Commercial Rates – City of T or C & Village of Williamsburg	
Base Customer Charge (Minimum)	$8.15
Rate per 1000 gallons for Level 1 Usage (1 - 7,000 gallons)	$1.75
Rate per 1000 gallons for Level 2 Usage (7,000 - 30,000 gallons)	$1.93
Rate per 1000 gallons for Level 3 Usage (30,000 – 50,000 gallons)	$2.12
Rate per 1000 gallons for Level 4 Usage (Above 50,000 gallons)	$2.33
Industrial Rates – City of T or C	
Base Customer Charge (Minimum and for Usage 1 – 50,000 gallons)	$91.91
Rate per 1000 gallons for Level 2 Usage (50,001 – 100,000 gallons)	$1.84
Rate per 1000 gallons for Level 3 Usage (100,001 – 150,000 gallons)	$2.02
Rate per 1000 gallons for Level 4 Usage (Above 150,000 gallons)	$2.22

NEW WATER RATES EFFECTIVE JULY 1,2020

Residential Rates – City of T or C & Village of Williamsburg	
15.5	Base Customer Charge (Minimum)
2.71	per 1,000 gallons for first 7,000 gallons
3.07	per 1,000 gallons from 7001 gallons to 29,000 gallons
3.45	per 1,000 gallons from 29,001 gallons to 50,000 gallons
3.88	per 1,000 gallons for amount over 50,000 gallons
Commercial Rates – City of T or C & Village of Williamsburg	
15.5	Base Customer Charge (Minimum)
2.71	per 1,000 gallons for first 7,000 gallons
3.07	per 1,000 gallons from 7001 gallons to 29,000 gallons
3.45	per 1,000 gallons from 29,001 gallons to 50,000 gallons
3.88	per 1,000 gallons for amount over 50,000 gallons
Industrial Rates – City of T or C	
91.91	Customer Charge for first 50,000 gallons
3.07	per 1,000 gallons from 50,001 gallons to 100,000 gallons
3.45	per 1,000 gallons from 100,001 gallons to 150,000 gallons
3.88	per 1,000 gallons for amount over 150,000 gallons
Effluent Water	
100	Deposit
$1.35 per 1,000 gallons + $25.00 if used	

The NEW water rates will affect the City's revenue from July 1, 2020.