

Updated Technical Memorandum

DATE: August 27, 2020

TO: Bill Ladd, Project Manager, City of Rio Rancho
Stephanie DuBois, Utilities Department

FROM: Wes Vote, PE, Project Manager, Huitt-Zollars, Inc.

SUBJECT: The City of Rio Rancho Site 9 Improvements
City Project No. WA 1937
HZ Project No. R312054.01 – New Water Reservoir at Well Site 9

EXECUTIVE SUMMARY

This Updated Technical Memorandum (UTM) serves as an update to the “Technical Memorandum for the City of Rio Rancho Site 9 Proposed Improvements” dated September 2018 by Bohannon Huston, Inc. (BHI), Appendix A. This UTM is not intended to change the original intent and design basis for the overall Site 9 evaluation of the BHI Technical Memorandum (TM) and will emphasize some of its conclusions. In an effort to not rewrite the approved TM, this UTM will utilize, when possible, the TM descriptions. As part of Huitt-Zollars, Inc. (HZ) contractual services, we have been tasked with updating and modifying the original technical memorandum to consider site-specific conditions, perform the required Environmental Information Documentation (EID), land acquisition and to optimize probable estimated construction costs, in order to comply with USDA RUS Bulletin 1780-2 and NMED PER checklist requirements. This entailed reviewing the memorandum for overall system consistencies, existing site conditions / structures, modeling existing flows and potential future flows. As part of this review process, we met on several occasions with the City of Rio Rancho’s (City) engineering staff and Jacobs operation & maintenance (O&M) personnel to better understand the existing system’s limitations. Through these meetings, we have been able to pinpoint the water system deficiencies within Pressure Zone 6, O&M limitations, and additional costs. The City intends to design and construct the overall required project improvements for Site 9 in three phases over a minimum of three years.

Reservoir 9 is located west of City Center, outside the City limits, off King Boulevard and is a critical location for existing and future operations of the City’s water distribution system. Reservoir 9 services the City’s Pressure Zone 6A. Reservoir 9 is filled by Well 9, constructed in the mid 1980’s, with an original production rate of approximately 950-gallons per minute (gpm). The well has become prone to sand production; thus, reducing pumping capacity to approximately 450-gpm and requiring pump replacement every 2 to 4 years based on communications with Jacobs personnel. Additionally, the well was never equipped to fulfill either its permit limit of 2,419-acre-feet per year (AFY), or continuous pumping of 1,500-gpm under permit RD-26259.

Well 9 was drilled to a depth of 1,540 feet and according to Jacobs personnel / record information the well was not drilled straight. This dogleg in the casing alignment has led to maintenance issues with pulling and setting the pump. Additionally, the power supply is inconsistent and the site is susceptible to lightning strikes (no existing lightning protection); thus, causing periodic outages and limiting water production.

Site 9 is undersized, deteriorating, and in need of upgrades. Several current factors limit the effectiveness of the facility. A single 10-inch transmission line limits conveyance capacity to developed areas of the City. Well 9 has experienced decreased production and the under capacity existing 200,000-gallon ground storage tank was recommended for replacement by recent site investigations. To reliably supply existing and future customers, Site 9 needs to be redeveloped. The deteriorated condition of Reservoir 9 is cause for concern and requires the City to perform additional water quality testing at this site.

The City's water distribution system (WDS) model was used to evaluate the hydraulic effectiveness of proposed facilities. The WDS model has spatially allocated demand by billing data for existing conditions as well as demands for future growth models, including ultimate buildout based on existing land Use (Zoning) and platting.

It is anticipated that the City's population will continue to grow. To ensure future water availability, all of the City's water resources need to be optimized and it is imperative the City continue to seek more efficient means of utilizing all of its available water resources. The following projects have been identified as required to complete the system at Site 9 to meet the existing and future demands, including their phases:

1. New 3 MG Reservoir at Well Site 9 – Phase I;
2. Re-drilling of the Existing Well 9 – Phase II;
3. Equipping Well 9 – Phase II;
4. New Onsite Water Treatment – Phase II;
5. New 16-inch parallel waterline within 20th Street – Phase III;
6. New 16-inch connector line within King Boulevard – Phase III.

1. GENERAL

The Updated Technical Memorandum (UTM) serves as an update to the “Technical Memorandum for the City of Rio Rancho Site 9 Proposed Improvements” dated September 2018 by Bohannon Huston, Inc. (BHI), Appendix A. Huitt-Zollars, Inc. (HZ) has been tasked with updating and modifying the original technical memorandum to consider site-specific conditions, perform the required Environmental Information Documentation (EID), land acquisition and to optimize probable estimated construction costs, in order to comply with USDA RUS Bulletin 1780-2 and NMED PER checklist requirements. The City intends to design and construct the overall project in three phases over three years.

Reservoir 9 is located west of City Center, outside City limits, off King Boulevard and is a critical location for existing and future operations of the City’s water distribution system. Reservoir 9 services the City’s Pressure Zone 6A. Reservoir 9 is filled by Well 9, which was constructed in mid-1980. It had an original production rate of approximately 950-gpm. The well has become prone to sand production; thus, reducing pumping capacity to approximately 450-gpm and requiring pump replacement every 2 to 4 years based on communications with Jacobs personnel. Additionally, the well was never equipped to fulfill its permit limits of 2,419 acre-feet per year (AFY), or continuous pumping of 1,500-gpm under permit RD-26259.

Well 9 was drilled to a depth of 1,540 feet. According to Jacobs personnel and record information the well was not drilled straight and. This dogleg in the casing alignment has led to maintenance issues with pulling and setting the pump. Additionally, the power supply is inconsistent and the site is susceptible to lightning strikes (no existing lightning protection); thus, causing periodic outages and limiting water production.

Site 9 is undersized, deteriorating, and in need of upgrades. Several current factors limit the effectiveness of the facility. A single 10-inch transmission line limits conveyance capacity to developed areas of the City. Well 9 itself has experienced decreased production and the under capacity existing 200,000-gallon ground storage tank was recommended for replacement by recent site investigations. To reliably supply existing and future customers, Site 9 needs to be redeveloped. The deteriorated condition of Reservoir 9 is cause for concern and requires the City to perform additional water quality testing at this site.

The City’s water distribution system (WDS) model was used to evaluate the hydraulic effectiveness of proposed facilities. The WDS model has spatially allocated demand by billing data for existing conditions as well as demands for future growth models, including ultimate buildout based on existing land Use (Zoning) and platting. This project originated as the result of several recent planning and feasibility studies. These include:

- NMED -CPB Reaffirmation Letter, New Mexico Environment Department, Construction Programs Bureau (January 2020).
- Technical Memorandum for the City of Rio Rancho Site 9, Bohannon Huston (September 2018)
- 2018 Water Reuse Plan, Bohannon Huston

2. PROJECT PLANNING AREA

2.1 LOCATION

The Reservoir / Well Site 9 is located within the unincorporated limits of the City of Rio Rancho west of City Center just off King Boulevard. **Figure 2-1, Overall Water System** illustrates the City's existing water distribution system and pressures zones. The existing site is located in Sections 24-26 of Township 13 North, Range 1 East, Unit 23 Block 77, Lot 17. In order to complete the project, the City purchased Lots 16, 18, 19 and 20 in August 2020 as shown on **Figure 2-2, Existing Site and Land Requirements**. **Figure 2-3** illustrates the **Sites Improvements**, including land requirements.

2.2 ENVIRONMENTAL RESOURCES PRESENT

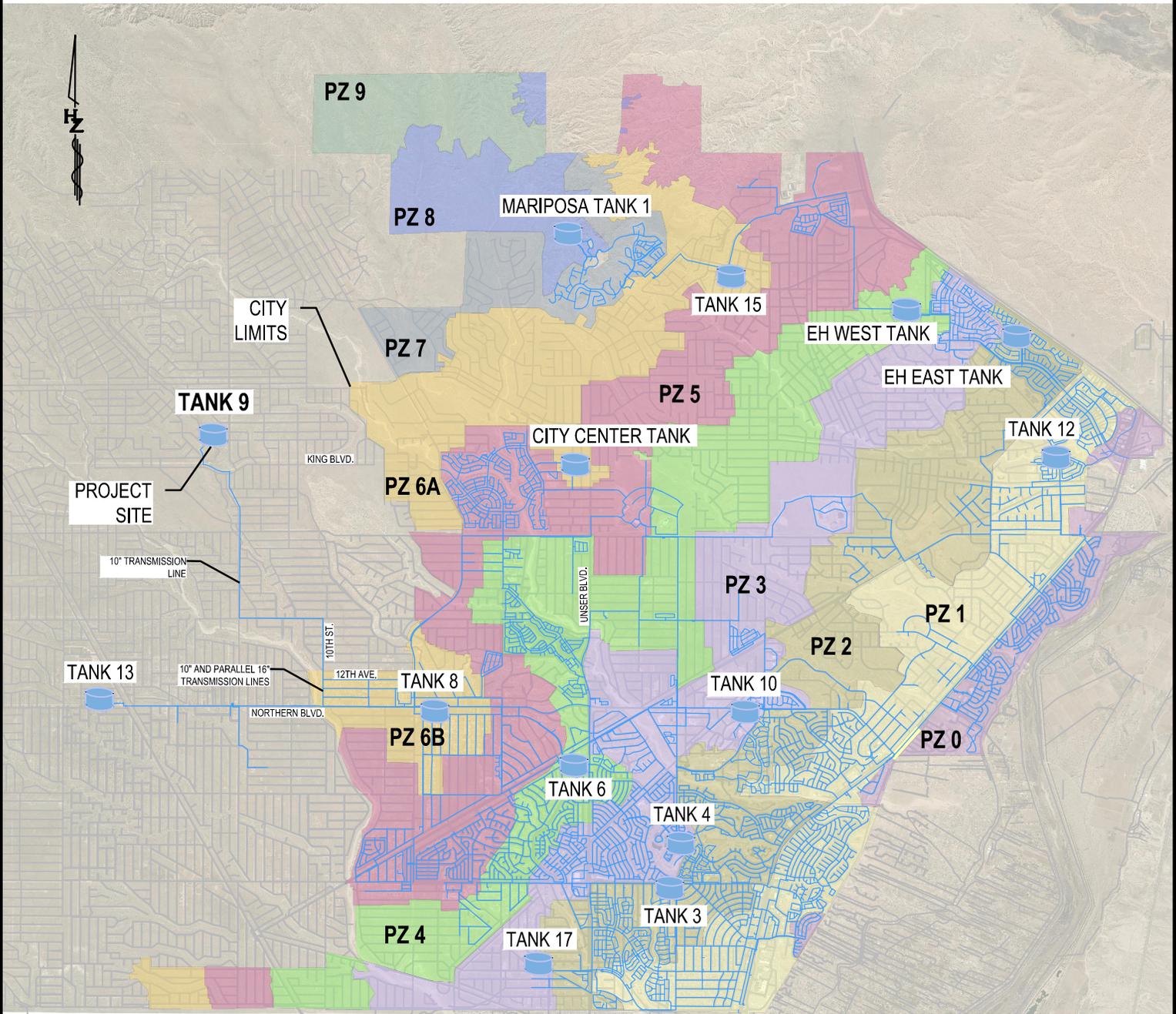
Rocky Mountain Ecology, LLC., a sub consultant to HZ, has performed an environmental / cultural resources review and completed the Environmental Information Document (EID), April 2020. The following is a summary of the information contained in the review:

During the planning process, consultation letters were sent to numerous agencies and Native American tribes that could have legal or cultural affiliations to the area. Moreover, archeological and biological surveys were conducted within the project area to identify cultural or biological resources of significance. No habitat for state or federal threatened/endangered species was located within the project area. No impacts to these species are expected from the proposed action. No archaeological sites or historic buildings were identified during the survey, within the APE, and no impacts to these resources are expected.

2.3 GROWTH AREAS AND POPULATION TRENDS

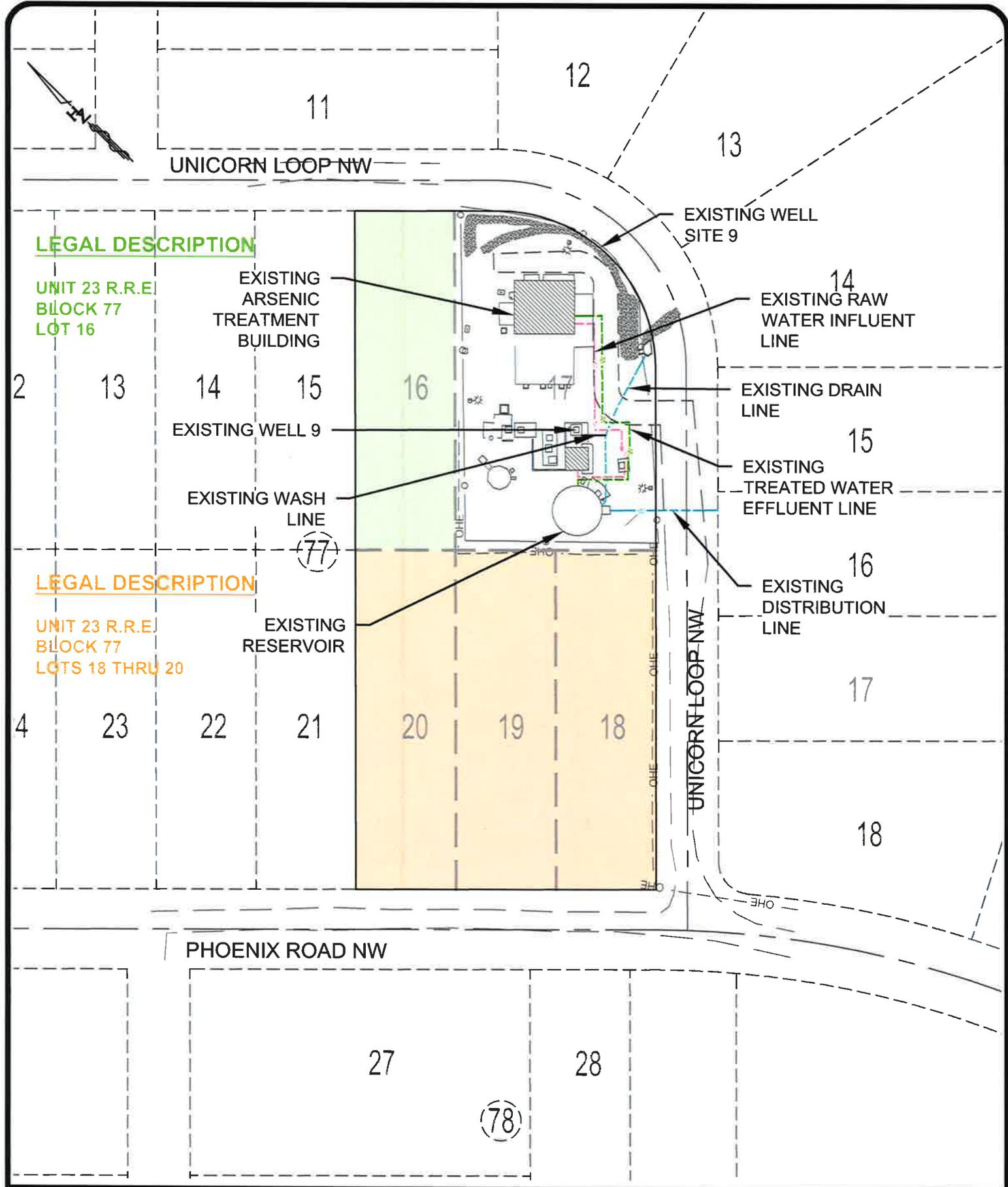
Rio Rancho is one New Mexico's newest communities, incorporated as a City in 1981. It encompasses approximately 105 square miles. Rio Rancho is one of the fastest growing cities and the third largest city in New Mexico. According to the U.S. Census Bureau in 2010 and 2012, Rio Rancho had respective populations of 87,521 and 90,818. The water distribution system includes approximately 560 miles of water line, 32 million gallons per day (MGD) of supply from ground water wells, and 44 MG of storage.

The City Center corridor is seeing increased development after being stalled for a number of years after 2008. The Sandoval Regional Medical Center, Rio Rancho Star Center, City offices, and other commercial and institutional facilities are all located in the City Center corridor. This critical region is served by the City Center Reservoir, currently undersupplied with limited capacity to maintain water levels. A transmission line within King Boulevard would create a direct connection between the Reservoir 9 Site and the City Center corridor providing a much-needed redundant supply line.



OVERALL WATER SYSTEM

SCALE: 1" = 10,000'

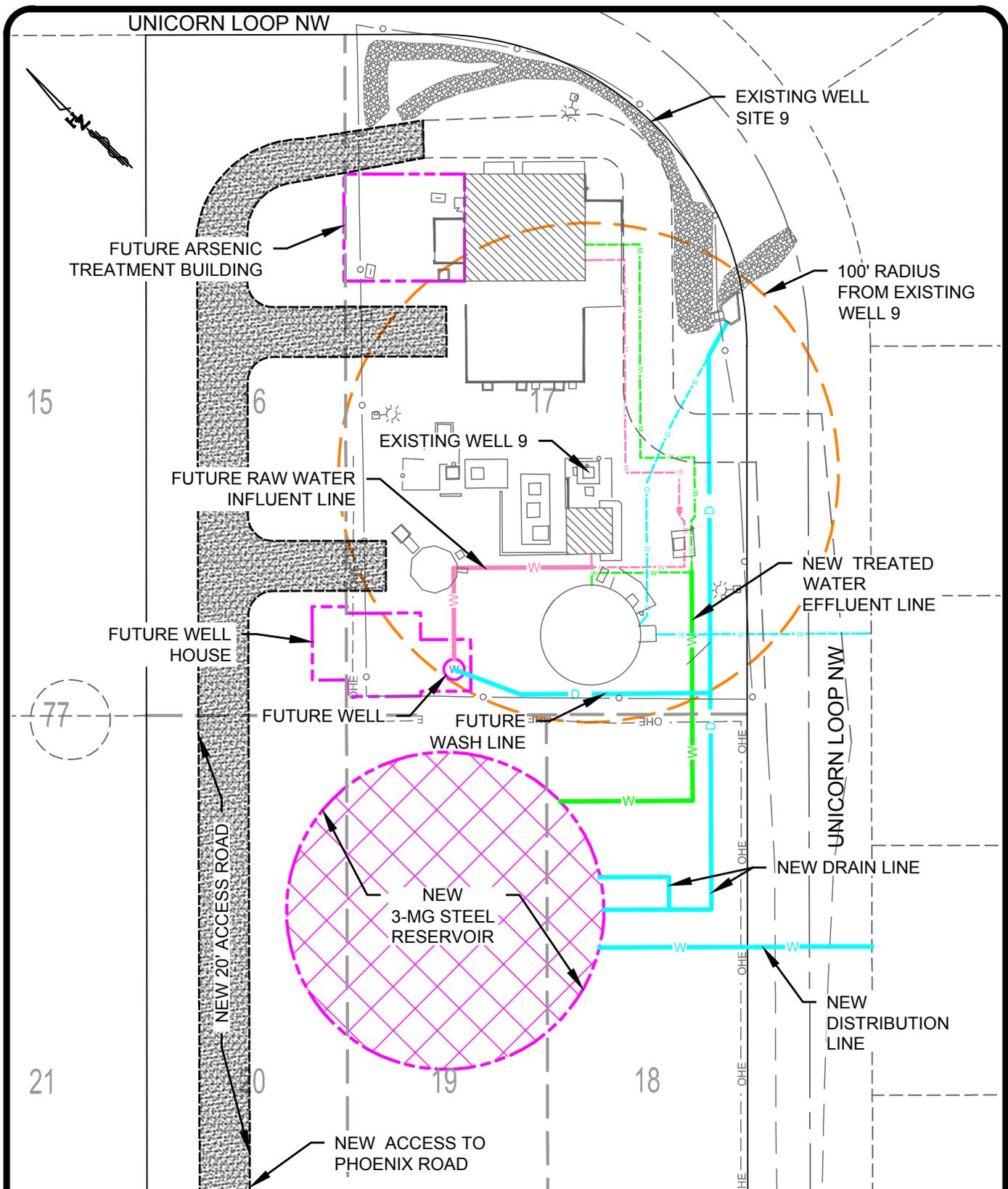


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**EXISTING SITE AND
 LAND REQUIREMENTS**

SCALE: 1" = 100'

FIGURE 2-2



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SITE IMPROVEMENTS

SCALE: 1" = 50'

FIGURE 2-3

EXISTING FACILITIES

3.1 LOCATION MAP

The City is currently permitted to operate 22 groundwater wells (not all in operation), 13 booster stations, and 18 reservoirs. The water distribution system includes approximately 560 miles of water lines, 32 million-MGD of supply from ground water wells, and 44 MG of storage. The existing water system facilities and infrastructure are illustrated on **Figure 2-1, System Overview**. The City intends to design and construct the overall required project improvements for Site 9 in three phases over a minimum of three years. The proposed improvements for Site 9, including capacities and sizes are illustrated **Table 3-1**.

Table 3-1	
Site 9 Proposed Improvements	
New Reservoir	Phase I - 3-MG
Re-Drilling / Equipping Existing Well	Phase II - 2,419 AFY, 1,500-GPM
Water Treatment Facility Upgrades	Phase II - 2,419 AFY, 1,500-GPD
New Parallel Waterline 20 th Street	Phase III
New 16" Connector Line in King Blvd.	Phase III

3.2 CONDITION OF FACILITIES

3.2.1 History

The City of Rio Rancho is seeking funding assistance to update and expand Site 9. Rio Rancho has identified this site as a critical facility for existing and future operations. Site 9 currently includes a well, reservoir, and arsenic treatment facility.

The site was developed in the mid 1980’s making the existing facilities over 30 years old. The well and reservoir have out served their usefulness and reliability, especially considering their deteriorating conditions. The existing 200,000-gallon reservoir is undersized and unable to provide the required storage capacities for the serviced pressure zones. Additionally, Well 9 was never equipped to meet its pumping permit limits and the well has seen a decrease in production due to a number of factors discussed later in this UTM.

Additionally, subsequent reports including the “Water Reuse Master Plan”, Bohannon Huston, Inc., (2018) and the “Technical Memorandum for the City of Rio Rancho Site 9 Proposed Improvements”, Bohannon Huston, Inc. (2018) have defined the project needs.

3.2.2 Reservoir 9

Site 9 is located west of City Center, outside City limits, off King Boulevard and is a critical location for existing and future operations. The existing reservoir was constructed in 1985 and has a limited capacity of 200,000-gallons. Reservoir 9’s overflow elevation of 6,080 feet

above mean sea level is the highest in the City's water system; therefore, defining the City's uppermost pressure zone (Zone 7). Currently, no customers exist in this pressure zone and pressure from this supply is reduced at Pressure Zone 6A near Northern Boulevard. This connection provides additional capacity if and when Site 13 is offline. Reservoir 9 was independently inspected and received a recommendation for replacement due to its age, condition, and capacity.

3.2.3 Well 9

Well 9, constructed in the mid 1980's, with an original production rate of approximately 950-gallons per minute (gpm). The well has become prone to sand production; thus, reducing pumping capacity to approximately 450-gpm and requiring pump replacement every 2 to 4 years based on communications with Jacobs personnel. Additionally, the well was never equipped to fulfill either its permit limit of 2,419-acre-feet per year (AFY), or continuous pumping of 1,500-gpm under permit RD-26259. Well 9 was drilled to a depth of 1,540 feet and according to Jacobs personnel / record information the well was not drilled straight. This dogleg in the casing alignment has led to maintenance issues with pulling and setting the pump. Additionally, the power supply is inconsistent and the site is susceptible to lightning strikes (no existing lightning protection); thus, causing periodic outages and limiting water production.

3.2.4 Arsenic Treatment

Water from Well 9 is currently treated by a Hungerford and Terry coagulation-filtration arsenic treatment system constructed in October 2006. Water is also chlorinated with ferric and PH adjustment prior to entering the water distribution system. The existing arsenic treatment system has a maximum capacity of 0.95-MGD.

3.2.5 Distribution

Water from Site 9 is conveyed to the system through a 10-inch transmission line, approximately 4.5 miles in length. This is the only transmission main from Site 9 to the system. The transmission main connects to the distribution at 10th Street and Northern Boulevard through a pressure reducing valve (PRV) to supply Pressure Zone 6B.

3.3 NEED FOR PROJECT

3.3.1 Reservoir 9 – Phase I

Reservoir 9 defines Pressure Zone 7 while serving Pressure Zone 6A and is capable of serving Pressure Zone 6B. The combined peak day demands of Zones 6A and 6B, at full build out, are projected to be approximately 28 MGD. Given this demand and the City's design standards for total storage, the storage requirement to serve these Pressure Zones is approximately 13-MG. Currently, the combined storage of Reservoir 9, Reservoir 13 and Mariposa 1 (which also serve these zones) is 8-MG; thus, yielding a 5-MG storage capacity deficiency. To offset this inadequacy and provide redundancy to Reservoir 13, Reservoir 9 should be replaced with a 3.0-MG Reservoir.

3.3.2 Well 9 – Phase II

Replacement of Well 9 requires drilling within 100 feet of the existing well to be considered a replacement well under the existing permit. If drilling / construction of the new well cannot occur within the 100-foot radius, it is still possible to modify the existing permit through additional coordination with the Office of the State Engineer (OSE). The City intends for the new well to be equipped to provide the permitted 2,419 AFY or 1,500-gpm. The new well will be drilled in accordance with the hydrogeologist’s recommendations. Depending on the well’s straightness and depth, the well will be equipped with either a submersible or lineshaft vertical turbine pump. Lastly, as part of this project, the existing power supply will be analyzed and recommendations provided to improve power supply, efficiency, and redundancy to mitigate power outages.

3.3.3 Arsenic Treatment – Phase II

The requirements for treatment at Site 9 will be determined upon well production and water quality testing of the re- drilled Well 9. It is anticipated that arsenic treatment will be required based on other wells in the City’s water system. The existing arsenic treatment has a maximum capacity of 0.95-MGD; therefore, the system will likely need to be expanded or replaced to meet the new capacity. New treatment methods / processes will be evaluated based on the future water quality.

3.3.4 Distribution – Phase III

20th Street Parallel Line:

An existing 10-inch transmission main in the ROW of 20th Street is the only conveyance means to the City’s system. The line is adequately sized to meet existing demands but falls short in meeting the projected demands. It is recommended, the City install a parallel 16-inch transmission main of approximately 22,000-LF.

To provide a more direct connection to the City’s upper supply wells and to provide redundancy to the City Center Reservoir, a 16-inch transmission main in King Boulevard should be constructed from Reservoir 9 to Rainbow. This line in King Boulevard’s ROW would be approximately 11,000 feet.

3.4 FINANCIAL STATUS OF EXISTING FACILITIES

The City of Rio Rancho will submit the most recent audit and/or financial statement as part of their loan application package. This information will also be submitted to the City’s Finance Department for review and approval of a potential Public Works/Utilities Bond.

3.4.1 Annual Operations and Maintenance (O&M)

The City contracts with Jacobs for operations of all of its water and wastewater system facilities so the O&M costs associated with the existing water system are not directly known.

3.4.2 Current Water Rate Schedule

The new rates became effective July 1, 2019 as approved by the City of Rio Rancho’s Governing Body in Ordinance Title V: Public Works, Chapter 51.12. The City’s current and future charges for water are as follows:

WATER:

Monthly Base Charges: Based on Meter size for all classes:

5/8” Meter.....	\$ 11.73
1” Meter.....	\$ 13.40

Volume Charges per 1,000 Gallons:

Rate is based on class:

Single Family Residential Per Thousand

First 6,000 Gallons.....	\$ 5.41
7,000-10,000 Gallons.....	\$ 5.86
More than 10,000 gallons.....	\$ 6.32

Multi-Family Residential.....	\$ 5.51
Commercial.....	\$ 5.74
Commercial Irrigation	\$ 6.32
City.....	\$ 6.01

Water Rights Acquisition Fee..... \$ 6.00

The greater of the minimum fee (\$6.00) or the volume fee (\$.50 per 1,000 gallons billed).

3.4.3 Other Capital Improvements

The Infrastructure Capital Improvement Plan (ICIP) adopted by the City of Rio Rancho is a 5 year plan that is updated annually. The plan constantly accounts for necessary existing projects upgrades, repairs, and expansions, including new projects based on growth / demands. As part of this project, four additional future projects have been identified as shown in Table 3-1 and are included in the City’s ICIP.

3.4.4 Existing Debt and Required Reserve Account Status

The City does not have any outstanding debt related to any aspect of the Site 9 proposed improvements. The City intends to self-fund the engineering and land acquisition for Phase I, while pursuing a loan from the United States Army Corps of Engineers for the construction of the 3-MG steel reservoir. Additionally, the City has committed to a loan of \$15,150,000.00 to finance Phases II and III through the New Mexico Finance Authority (NMFA) Drinking Water Revolving Loan Fund.

4.1 HEALTH, SANITATION, & SECURITY

Well 9 works in conjunction with Wells 13 and 14 in the City's water distribution system. Well 13 is being re-drilled and is currently unavailable. Well 14 historically has gone offline for various reasons and several times all three wells serving these pressure zones have simultaneously been offline. In February 2015, a boil alert was issued and modifications made to the existing system to supply water to Pressure Zone 6A.

The deteriorated condition of Reservoir 9 presents a cause for concern requiring the City to perform additional water quality testing at this site. The water supplied from the facility continues to meet Drinking Water Standards.

4.2 SYSTEM O&M

The City is the sole water and wastewater utility provider within the project area. The City's Utilities Operation Division subcontracts operation and maintenance of all the water, wastewater, and recycled effluent facilities to Jacobs. Specific operational issues for this project are similar to the existing water transmission systems and include, pump maintenance, treatment maintenance, valve maintenance.

The majority of the proposed improvements, including the new pipeline and reservoir, are not expected to appreciably change the operations or maintenance costs associated with the existing infrastructure. The updated arsenic treatment and well infrastructure O&M costs will be dependent on the well capacity and water quality. In 2013, the City reported an electrical cost associated with Well 9 of about \$170,000 for the year. Assuming the new well is 1,500-feet deep and is pumped at a rate of 1,500-gpm, the cost of electricity to operate the pump would likely be similar to that of Well 19 (depth 1,060-feet, 1,500-gpm) at about \$220,000 per year.

4.3 REASONABLE GROWTH

Land use in the project area is comprised mostly of residential, commercial, and light industrial development and some open space. Additionally, this area is experiencing rapid growth in the medical industry due to the construction of UNM Regional Medical Center and the potential medical centers. With population growth, water demands are will increase. Commercial and industrial growth in the area will also increase the water demand.

The City of Rio Rancho completed their Water Reuse Master Plan in 2018. Population projections were included in this report and were the basis for demand projections. Currently, the peak day for the total system is approximately 17.3 MGD. The peak day in 2021 is projected to be 18.5 MGD.

Based on the 2018 Water Reuse Plan, the City's goal is to meet peak day demand with 75 percent of the well production in service. This will provide system redundancy in the event multiple wells are out of service or unavailable for extended periods, as well allowing to rest wells from continuous operation. To meet these criteria, Well 13 was recommended to come online in 2019; however, the completion of this project is ongoing. Well 13 geohydrology investigations are complete, Well 13 has been re-drilled and is scheduled to be equipped in 2021. Additionally, to meet the 2018 Water Reuse Plan requirements, Well 9 has been identified as the next well to be re-drilled in 2021.

The City Center corridor is seeing increased development after stalling for a number of years after 2008. The Sandoval Regional Medical Center, Rio Rancho Star Center, City offices, and other commercial / institutional facilities are all located in the City Center corridor. This critical region is served by the City Center Reservoir that is currently undersupplied and has limited redundancy. A transmission line within King Boulevard would create a direct connection between the Reservoir 9 Site and the City Center corridor providing a more direct supply and a redundancy to this area.

4.4 LAND ACQUISITION

The City currently owns the existing Site 9 parcel described as Unit 23, Block 77, Lot 17. To accommodate the new reservoir, well, and treatment facility, additional property (lots) were purchased in August 2020. The additional properties purchased included Lots 16, 18, 19, and 20 as shown on Figure 2-2.

The City currently owns the right-of-way along the existing 10-inch transmission line and King Boulevard which for the construction of the proposed transmission mains.

5. ALTERNATIVES CONSIDERED

Three alternatives have been identified and considered viable for this project. Alternatives 1 and 2 consist of designing and constructing the recommended 3 MG Reservoir at Well Site 9. The alternatives consider include; 1) an on grade steel reservoir, 2) an on grade concrete reservoir, and 3) is the "Do Nothing" alternative. The basis of the analysis includes the most beneficial; aesthetically pleasing; cost effective; accessibility; and ability to expand the site. Additionally, new treatment methods / processes will be evaluated based on the future water quality.

5.1 ALTERNATIVE 1 – New On Grade 3-MG Steel Reservoir

5.1.1 Description

Alternative 3 includes designing and constructing a 3-MG AWWA D100 welded steel reservoir. The new reservoir will have internal cathodic corrosion protection as a mixing system to prevent short-circuiting. To make the site more aesthetically pleasing, the reservoir will be painted a color to match the existing surroundings.

5.1.2 Design Criteria

A conceptual-level analysis for all considered alternatives was performed using topographic survey and existing facilities. The design will adhere to the following criteria:

Leakage	Zero Measurable Loss
Seismic Criteria	TBD
O&M	15 Year Maintenance

5.1.3 Site Design

Refer to **Figure 2 -3, Project Improvements**

5.1.4 Environmental Impacts

None

5.1.5 Land Requirements

Land requirements for all the alternatives are the same.

Construction Problems

Although varying levels of complexity affect construction costs for the project Alternatives, no significant construction difficulty is anticipated for Alternative 1. The C completed the design and construction of very similar reservoirs throughout its system. Construction issues affecting Alternative 1 are as follows:

- Site Access.
- Site Security
- Seasonal Construction

5.2 ALTERNATIVE 2 – New On-Grade 3-MG Concrete Reservoir

5.2.1 Description

Alternative 2 includes designing and constructing a 3-MG AWWA D110 concrete reservoir. The reservoir will be designed will be designed to provide zero measurable loss for leakage and an internal mixing system to prevent short-circuiting. To make the site more aesthetically pleasing, the reservoir will be stained a color to match the existing surroundings.

5.2.2 Design Criteria

A conceptual-level analysis for all considered alternatives was performed using topographic survey and existing facilities. The design will adhere to the following criteria:

Leakage	Zero Measurable Loss
Seismic Criteria	TBD
O&M	20 Year Maintenance

5.2.3 Site Design

Refer to **Figure 2 -3, Project Improvements**

5.2.4 Environmental Impacts

None

5.2.5 Land Requirements

Land requirements for all three alternatives are the same.

Construction Problems

Although varying levels of complexity affect construction costs for the project Alternatives, no significant construction difficulty is anticipated for Alternative 2. The City completed the design and construction of very similar reservoirs at WWTP 6 in 2014 and Well 10A in 2017. Construction issues affecting Alternative 2 are as follows:

- Site Access.
- Site Security
- Seasonal Construction
- Distance from the concrete source.

5.3 ALTERNATIVE 3 – Do nothing

5.3.1 Description

Leave the site as is and make no additional improvements.

6. SELECTION OF ALTERNATIVE

6.1 PRESENT WORTH ANALYSIS

A comparison of the difference in costs for each alternative on the project essentially leads to the difference in construction and material costs. Alternative 1 offers the cheapest reservoir cost but has the higher O&M cost due to cathodic protection and special coatings requiring more frequent maintenance; however, the frequency and cost of periodic maintenance is not enough to justify the additional construction costs. On this basis, Alternative 1 is the most economical option.

6.2 NON-MONETARY FACTORS

Non-monetary factors are the same for the alternatives.

6.3 ADVANTAGES / DISADVANTAGES

ITEM	ALTERNATE 1	ALTERNATE 2	ALTERNATE 3
Leakage	Zero Measurable Loss	Zero Measurable Loss	NA
Seismic Criteria	TBD	TBD	NA
O&M	15 Year Maintenance Free	20 Year Maintenance Free	NA
O&M Costs	Moderate	Low	NA
Site Access	Easy	Easy	NA
Cost	Lowest	Highest	NA
Manpower Access	Moderate	Moderate	NA

7. PROPOSED PROJECT / RECOMMENDED ALTERNATIVE

7.1 PROJECT DESIGN

Alternative 1 includes the design and construction of a 3-MG AWWA D100 welded steel reservoir. The reservoir will be designed for a volume of 3 MG per the “Technical Memorandum for the City of Rio Rancho Site 9 Proposed Improvements,” Bohannon Huston, Inc., (2018).

7.2 TOTAL PROJECT COST ESTIMATE

Engineer’s Estimate of Probable Cost

Item	Uni	Unit Price	Quantity	Amount
3MG Steel Reservoir	Gal	\$0.90	3,000,000	\$2,700,000
Well 9 Drilling and Equipping	EA	\$5,500,000	1	\$5,500,000
Arsenic Treatment Facility modifications	EA	\$3,250,000	1	\$3,250,000
16-inch Parallel Waterline in 20th St	LF	\$100	22,000	\$2,200,000
New 16-inch Waterline in King	LF	\$100	11,000	\$1,100,000
Subtotal				\$14,750,000
Preliminary Capital Costs				
Contingency			20%	\$2,950,000
Engineering and Construction Administration			15%	\$2,212,500
NMGRT			7.6875%	\$1,530,774
TOTAL				\$21,443,274

7.3 ANNUAL OPERATING BUDGET

Operations budget for the reservoir will approximately \$50,000.00 every 15 years for recoating and cathodic protection maintenance. The updated arsenic treatment and well infrastructure O&M costs will be dependent on the well capacity and water quality. In 2013, the City reported an electrical cost associated with Well 9 of about \$170,000 for the year. Assuming the new well is 1,500-feet deep and is pumped at a rate of 1,500-gpm, the cost of electricity to operate the pump would likely be similar to that of Well 19 (depth 1,060-feet, 1,500-gpm) at about \$220,000 per year.

7.4 FUNDING AND DEBT REPAYMENT PLAN

The City intends to self-fund the engineering and land acquisition for Phase I, while pursuing a loan from the United States Army Corps of Engineers for the construction of the 3-MG steel reservoir. Additionally, the City has committed to a loan of \$15,150,000.00 to finance Phases II and III through the New Mexico Finance Authority (NMFA) Drinking Water Revolving Loan Fund.

8. CONCLUSIONS & RECOMMENDATIONS

Given the discussion above, Alternative 1 is the recommended construction method for the new 3 MG reservoir at Site 9. The reservoir shall be designed in accordance with AWWA D100 welded steel tank specifications. Depending on the geohydrology of the new well, the new well will be equipped with either a submersible or lineshaft vertical turbine pump. New treatment methods / processes will be evaluated based on the future water quality of Well 9 in order to determine the type and level of treatment required. As the demand for potable water increases in the rapidly growing Rio Rancho metropolitan area, efficient use of potable water becomes imperative.

Appendix A

Technical Memorandum for the City of Rio Rancho Site 9, Bohannon Huston (September 2018)

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MEMORANDUM

DATE: August 17, 2018

TO: Jim Chiasson, PE, City of Rio Rancho

FROM:  Nathan Roberts, PE
Cole Bedford, PE

SUBJECT: City of Rio Rancho Site 9 Proposed Improvements

The City of Rio Rancho is seeking funding assistance to update and expand Site 9. Rio Rancho has identified this site as a critical facility for existing and future operations. Site 9 currently includes a well, storage tank, and arsenic treatment building.

The following technical memorandum has been prepared in accordance with the New Mexico Environment Department (NMED) Construction Programs Bureau (CPB) Technical Memorandum Outline.

1. Background and Existing Conditions

The City of Rio Rancho is the largest community in Sandoval County. It is located immediately North of Albuquerque along the west side of the I-25 corridor. The City covers an area of 103.7 square miles and has a population of nearly 100,000. The water distribution system includes approximately 560 miles of water line, 32 million gallons per day (MGD) of supply from ground water wells, and 44 MG of storage.

Site 9 is located west of City Center, outside City limits, off King Boulevard and is a critical location for existing and future operations. Tank 9 has an overflow elevation of 6,080 feet above mean sea level. This tank sets the hydraulic grade line for Zone 7 of the City's water distribution system. Currently, no customers exist in this pressure zone and pressure from this supply is reduced to Pressure Zone 6A near Northern Boulevard. Tank 9 has recently been inspected and recommended for replacement.

Pressure Zone 6 is divided into 6A and 6B as the pressure zone piping is not interconnected between the northern and southern portions. The customer elevations of 6A and 6B are approximately the same. Site 9 has the ability to serve both portions off Pressure Zone 6 with the buildout infrastructure.

Tank 9 is filled by Well 9 which was installed in 1984. It had an original production rate of approximately 950 gpm. However, sand production deteriorates the pump capacity to 450 gpm between every two to four years period requiring pump replacement. Furthermore, the well was never equipped to fulfill either of its permit limits of 2,419 acre-feet per year (AFY), or continuous pumping of 1,500 gpm under permit RD-26259.

Well 9 was drilled to a depth of 1,540 feet. The well was not drilled plumb but has a dog leg in the alignment which has created maintenance issues at the facility. The well is also susceptible to lightning strikes, causing periodic outages of Well 9 and limiting supply to the City. The limited storage of Tank 9 has been inadequate during recent events, and Tank 13 is required to supplement supply for the customers in Pressure Zone 6A and below.

Water from Well 9 is treated with a Hungerford and Terry coagulation and filtration arsenic treatment system. Water is also chlorinated with ferric and PH adjustment prior to entering the water distribution system.

From Site 9, water is conveyed through a 10-inch transmission line, approximately 4.5 miles in length, which connects the existing infrastructure at 10th Street and 12th Avenue off Northern Boulevard. A pressure reducing valve (PRV) at this location reduces the hydraulic gradient to match Zone 6B.

Tanks 9 and 13 have matching overflow elevations which, in theory, allow Booster Station 8 to pump to either tank location. In order for this to happen, a new waterline from the 16-inch transmission line in Northern Blvd would need to have a lateral constructed along 10th St. and connect north of the existing PRV mentioned. Additionally, a new transmission line would need to be constructed between the PRV in 10th St and Tank 9, so headloss along this corridor would equal the headlosses to Tank 13. With these improvements, Tanks 9 and 13 would float with each other and provide reliability and redundancy to these facilities as well as customers in Zone 6A and 6B.

Figure 1 shows the City's water distribution system overview, and Figure 2 shows the project vicinity and infrastructure. Also, Appendix A shows the distribution system in schematic format developed as part of the Ultimate System Master Plan.

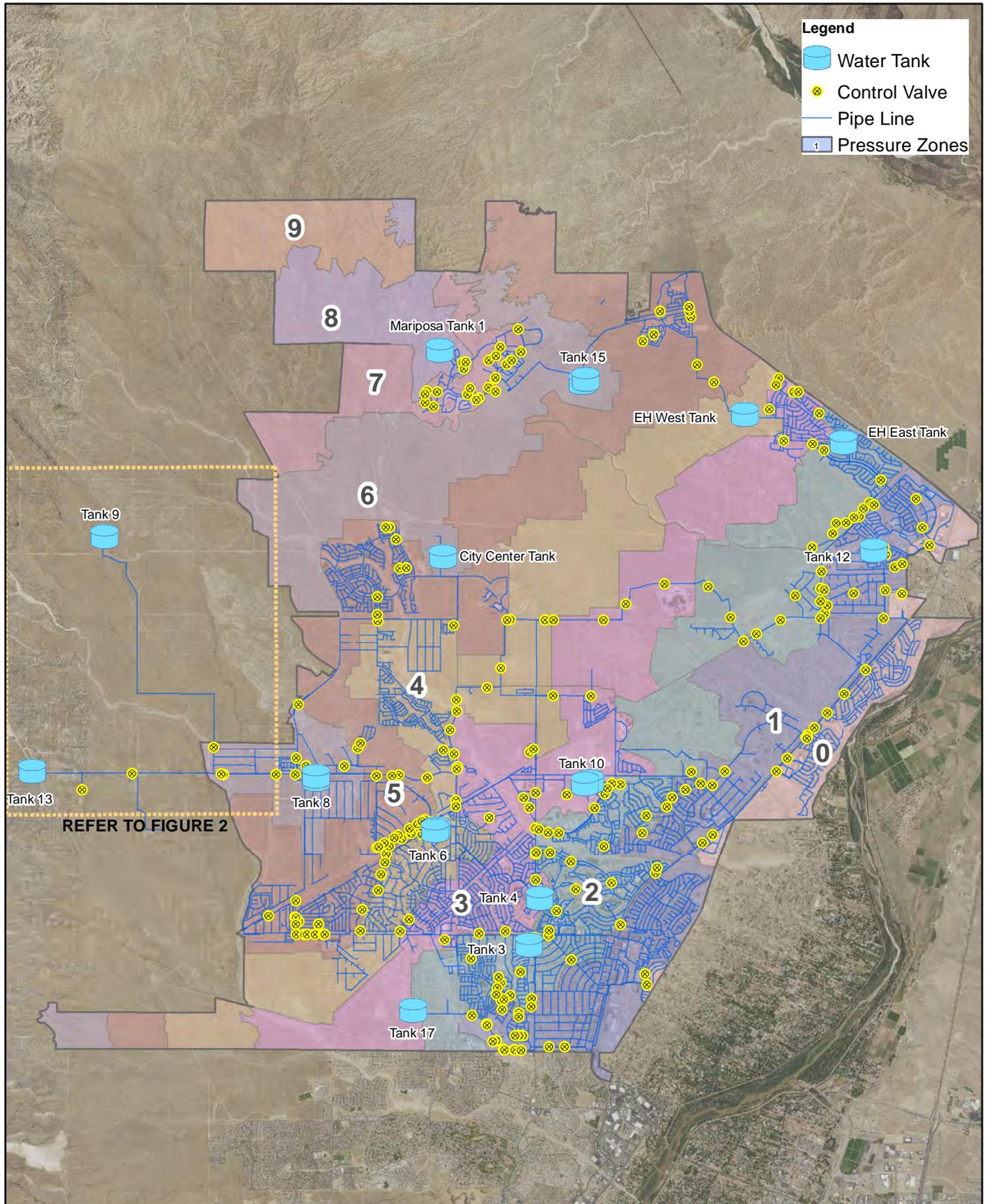
2. Project Need

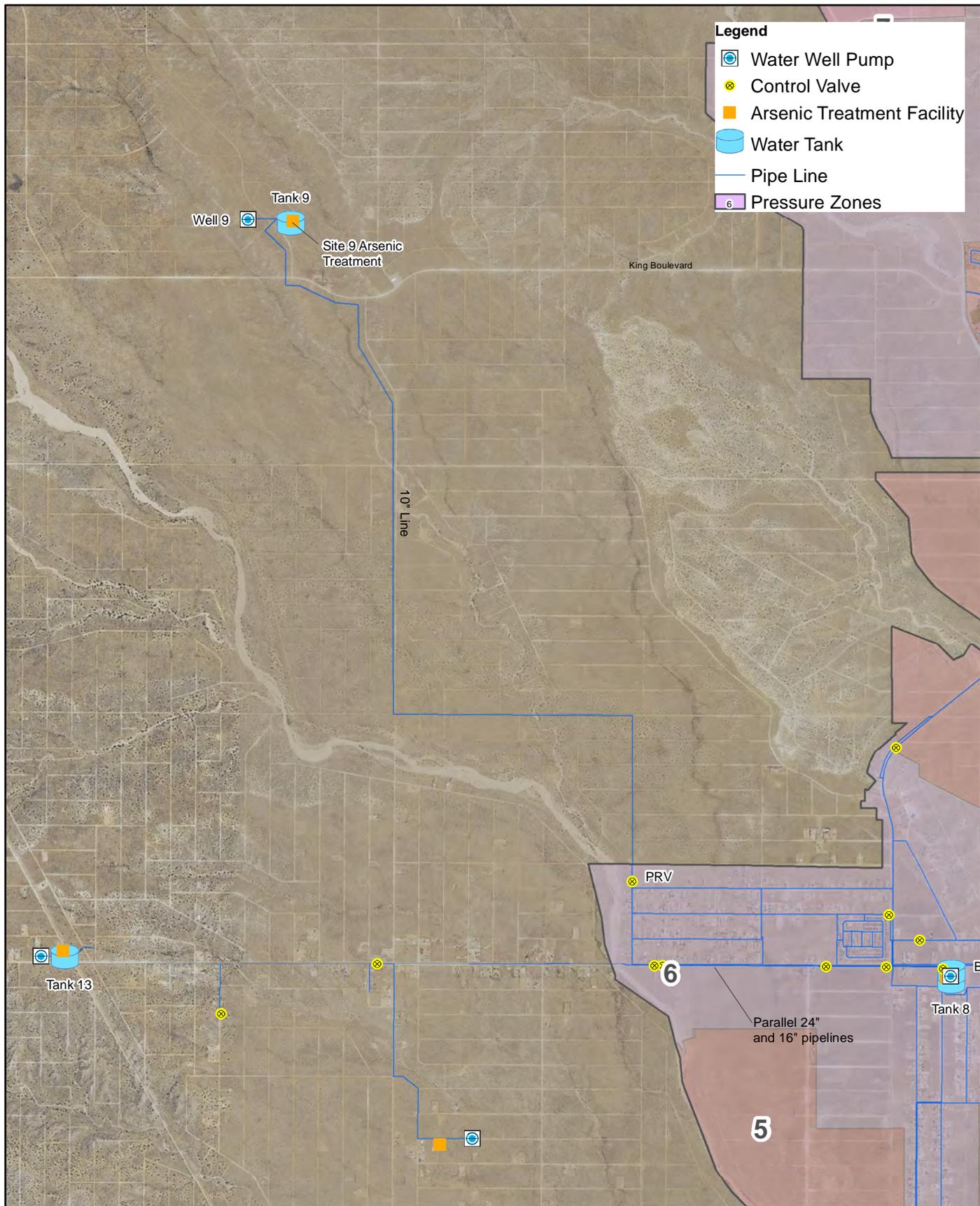
Site 9 is undersized, deteriorating, and in need of upgrades. Several current factors limit the effectiveness of the facility. A single 10-inch transmission line limits conveyance capacity to developed areas of the City. Over the years, Well 9 has seen decreased production, and the existing 200,000-gallon ground storage tank has recently been inspected and is recommended for replacement. In order to reliably supply existing and future customers, Site 9 needs to be redeveloped.

a. Health, Sanitation and Security

Well 9 works in conjunction with Wells 13 and 14 in the City's water distribution system. Well 13 is being re-drilled and is currently unavailable. Well 14 has gone down for extended periods in the past, and at times all three wells have been down at once. In February 2015, a boil alert was issued and modifications made to the existing system to supply water to Pressure Zone 6A.

The deteriorated condition of Tank 9 is cause for concern. Consequently, the City has been observing and testing the water quality at this site. To date, the water supplied from the facility continues to meet Drinking Water Standards.





Legend

-  Water Well Pump
-  Control Valve
-  Arsenic Treatment Facility
-  Water Tank
-  Pipe Line
-  Pressure Zones



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0 1,600 3,200 Feet
1 in = 3,200 ft

**City of Rio Rancho
Water Distribution System
Figure 2
Project Vicinity**

b. *Aging Infrastructure / Reliability*

The site was developed in the mid 1980's. The current facilities are over 30 years old and are deteriorating. Well 9 was never equipped to meet its permit limits, and the well hole is not straight, resulting in maintenance issues. The well has seen a decrease in production due to sanding and is susceptible to power outages.

c. *Reasonable Growth*

The City of Rio Rancho completed their Water Reuse Master Plan in 2018. Population projections were included in this report and were the basis for demand projections. Currently, the peak day for the total system is approximately 17.3 MGD. The peak day in 2021 is projected to be 18.5 MGD.

As identified in the 2018 Water Reuse Plan, the City's goal is to be able to meet peak day demand with 75 percent of the well production. This provides system redundancy if several wells are out of service or unavailable and provides the ability to rest wells from continuous operation. In order to meet these criteria, Well 13 was recommended to come online in 2019. Well 13 improvements are currently under construction, and the City is on track to have Well 13 re-drilled in by the end of 2018. Another well is recommended to meet projected growth in 2021. Well 9 has been identified as the next well to be re-drilled.

The City Center corridor is seeing increased development which stalled for a number of years after 2008. The Sandoval Regional Medical Center, Rio Rancho Star Center, City offices, and other commercial and institutional facilities are all located in the City Center corridor. This critical region is served by the City Center Tank which is currently undersupplied and has limited capacity to maintain water levels. A transmission line along King Boulevard would create a direct connection between the Tank 9 Site and the City Center corridor, providing a more direct supply to customers in this area.

3. Proposed Improvements

The City's water distribution system (WDS) model was used to evaluate the hydraulic effectiveness of proposed facilities. The WDS model has spatially allocated demand by billing data for existing conditions as well as demands for future growth models, including ultimate buildout.

Proposed improvements for the Site 9 infrastructure include:

- replacing the existing Tank 9 with a new tank sized to provide adequate storage capacity and redundancy, working in conjunction with Tank 13;
- re-drilling Well 9 and increasing its yield up to permitted limits; and
- adding additional arsenic treatment capacity to the existing treatment facility.

New transmission lines will be required to effectively and efficiently transfer supply from Site 9 and include:

- a new transmission line parallel to the existing 10-inch transmission line; and
- a new transmission line along King Blvd with connection to existing infrastructure.

a. *Description of Projects*

i. *Tank 9*

Tank 9 most directly serves Pressure Zone 6A but is hydraulically capable of serving Zone 6B as well. It is expected that the combined peak day demands of Zones 6A and 6B, at full build out, will be approximately 28 MGD. Given this demand and the City's design standard for total storage, the storage requirement to serve the Zones is approximately 13 MG. As they currently exist, the combined storage of Tank 9, along with Tank 13 and Mariposa 1 which also serve these zones, are not adequate to meet the demands with a storage shortfall of 5.0 MG. At this time, it is recommended that Tank 9 be replaced with a 2.0 MG to 3.0 MG tank to provide full redundancy to Tank 13 and the additional storage needed to accommodate full build-out conditions be installed at a later date.

ii. *Well 9*

Replacement of Well 9 requires drilling within 100 feet of the existing well in order to be considered a replacement well under the existing permit. Siting the new well within this radius would be ideal; however, if it is not feasible to do so, building outside of it is possible with additional Office of the State Engineer (OSE) coordination. The City would like this well to be re-drilled and equipped to fulfill the 2,419 AFY of water permitted for this well. The new well will be drilled in accordance with the hydrogeologist's recommendations. Furthermore, power availability will be analyzed and extended as necessary to mitigate power outages.

iii. *Site 9 Water Treatment*

The requirements for treatment at Site 9 will be determined upon testing of the re-drilled Well 9. It is anticipated that arsenic treatment will be required based on other wells in the City's water system. Based on the future well capacity and assumed arsenic contamination, the existing arsenic treatment system will likely need to be expanded or replaced to meet the new capacity.

iv. *20th Street Parallel Line*

A 10-inch pipeline conveys flows from Site 9 southward toward Zone 6A in the right-of-way of 20th Street. While the existing pipe is adequate to convey existing required flows, it does so with significant pipe friction losses. In order to convey additional flows which will be required as demand increases as well as to reduce the friction losses, a parallel 16-inch pipeline of 22,000 feet is recommended.

v. *King Boulevard New Connector Line*

In order to address the limited connectivity between Zones 6A and 6B, it is proposed that a connector line, 16-inch in diameter, be installed from the new Tank 9 to the City Center corridor. This line would follow the King Boulevard right-of-way for approximately 11,000 feet.

b. Basis of Design / Design Criteria

The basis of design for these projects are the City of Rio Rancho's Development Process Manual (DPM). In addition to the City's DPM, the NMED's Recommended Standards for Water Facilities and associated AWWA Guidelines and Standards will be used.

The sizing of the facilities is based on information in previous reports by the City of Rio Rancho including the Reuse Master Plan (2018) and other planning documents. Undeveloped areas within the City limits have future demand projections based on land use demand factors in the City's DPM.

Facilities will be designed with a wholistic perspective on future growth and facility consistency.

c. Land Requirements

The City currently owns the existing Site 9 parcel. The City intends to purchase additional parcels near the current Site 9 as needed for new facilities. The City has already received interest from landowners in the vicinity who are willing to sell their land.

The City currently owns the right-of-way along the existing 10-inch transmission line and King Boulevard which can be utilized for any improvements in those areas.

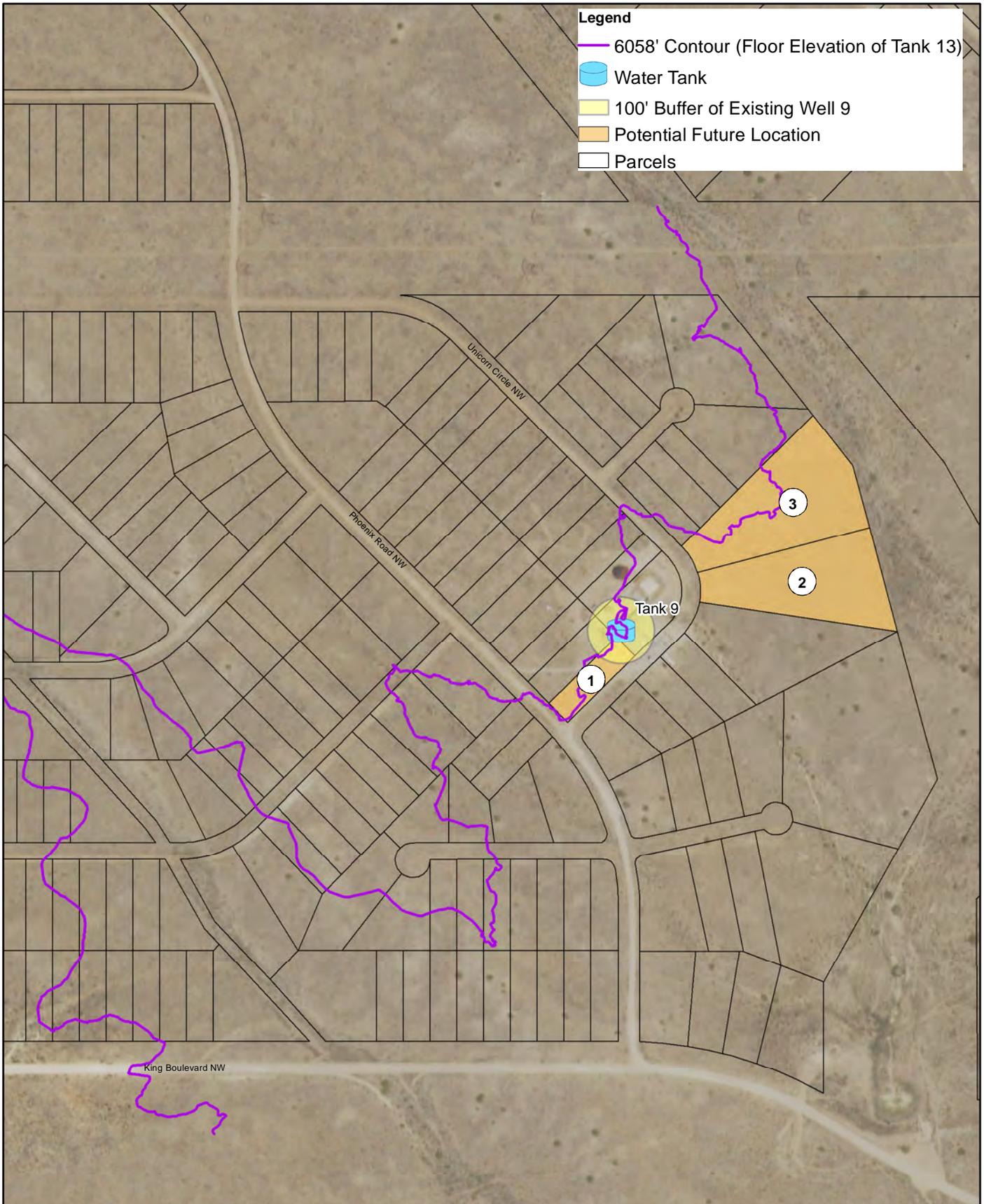
Figure 3 identifies three parcels which could support Site 9 improvements.

1. Parcel 1 would allow for Well 9 to be relocated within 100 feet of its current location. It is adjacent to the existing Well 9 parcel which would allow the City to easily utilize both. The 6,058 ft contour line also crosses the parcel which would make it convenient for placing a new tank with the same overflow elevation as the existing.
2. Parcel 2 would not allow the new Well 9 to be sited within 100 feet of its current location but would allow the new well to be placed about 300 feet away. The parcel is large enough to allow for larger or more spread out infrastructure than currently exists. The 6,058 ft contour line does not cross Parcel 2, which would require either a taller tank to match the existing overflow or earthwork to raise the ground level.
3. Parcel 3 is the largest of the three potential parcels but also the furthest away from the current well site. The 6,058 ft contour line does cross it, and it borders an arroyo on its back side which might offer a convenient place to direct overflows.

If feasible, the new well should remain on the existing site. Parcel 3 is recommended for supporting infrastructure due to its size and proximity of the arroyo adjacent to the site.

d. Potential Construction Problems

It is currently assumed that Well 9 will have a capacity equal to that of its permitted allowance; however, hydrogeological investigations have not been conducted, and it is possible that the new well may not be able to meet the permitted allowance.



Legend

- 6058' Contour (Floor Elevation of Tank 13)
- Water Tank
- 100' Buffer of Existing Well 9
- Potential Future Location
- Parcels

Rio Rancho
City of Vision

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0 200 400 Feet
1 in = 400 ft

City of Rio Rancho
Water Distribution System
Figure 3
Site 9 Potential Parcels

e. *Permit Requirements*

Any changes to the existing water distribution system will need to be reviewed by the New Mexico Environment Department (NMED). Approval may or may not be required based on the various projects.

The Office of the State Engineer will need to approve the permit to replace Well 9. If the new location of the proposed Well 9 is greater than 100 feet from the existing wellhead, further coordination and permitting will be required by the OSE.

Site 9 is located within Sandoval County. The City will need to verify whether any permits are required by the county or if work is included in their franchise agreement.

Based on the funding source an environmental clearance will be required prior to construction.

4. **Cost**

Preliminary estimates of the project's associated cost are detailed below including construction costs, annual operations and maintenance costs, and an analysis of the project's lifecycle costs.

a. *Preliminary Construction Cost Estimate*

Table 1: Engineer's Estimate of Probable Cost

Item	Unit	Unit Price	Quantity	Amount
Tank 9A, 3MG Steel Tank	Gal	\$0.90	3,000,000	\$2,700,000
Well 9 Drilling and Equipping	EA	\$5,500,000	1	\$5,500,000
Site 9 Arsenic Treatment and Building modifications	EA	\$3,250,000	1	\$3,250,000
20th Street Parallel Line and appurtenances, 16" DIP	LF	\$100	22,000	\$2,200,000
King Blvd Connector and appurtenances, 16" DIP	LF	\$100	11,000	\$1,100,000
Preliminary Capital Costs				
Contingency			20%	\$2,950,000
Engineering and Construction Administration			15%	\$2,655,000
NMGRT			7.5625%	\$1,539,000
TOTAL				\$21,894,000

b. *Annual O&M*

Most of the proposed improvements, including the new pipeline construction and the replacement tank, are not expected to appreciably change the operations or maintenance costs associated with the existing infrastructure. The updated arsenic treatment and well infrastructure O&M costs will be dependent on the well capacity and water quality. In

2013, the City reported an electrical cost associated with Well 9 of about \$170,000 for the year. Assuming the new well is 1,500 feet deep and is pumped at a rate of 1,500 gpm, the cost of electricity to operate the pump would likely be similar to that of Well 19 (1060 feet, 1500 gpm) at about \$220,000 per year.

c. *Life Cycle Cost Analysis*

Table 2 Shows the probable life cycle costs for a 20-year period for the proposed improvement.

Table 2: Probable Life Cycle Costs for 20-year period

Component	Year 5	Year 10	Year 15	Year 20	PW of Capital Maintenance Costs
Tanks 9 Recoating			\$50,000		\$42,000
Well 9 Routine Brushing of Screen	\$10,000	\$10,000		\$10,000	\$26,000
Well 9 Brushing and Acidization			\$50,000		\$42,000
TOTAL					\$110,000

NOTE: All Costs Assuming 1.2% Inflation

5. Schedule

Based on the work elements and costs, construction is anticipated to be phased. Below is an estimated schedule of construction.

Table 3: Estimated Construction Schedule

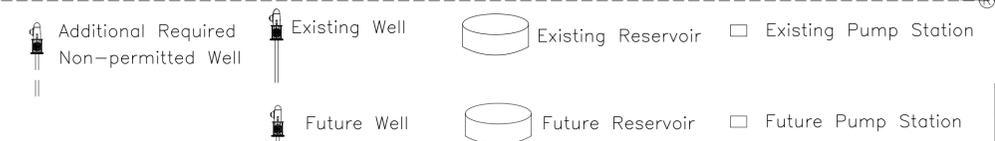
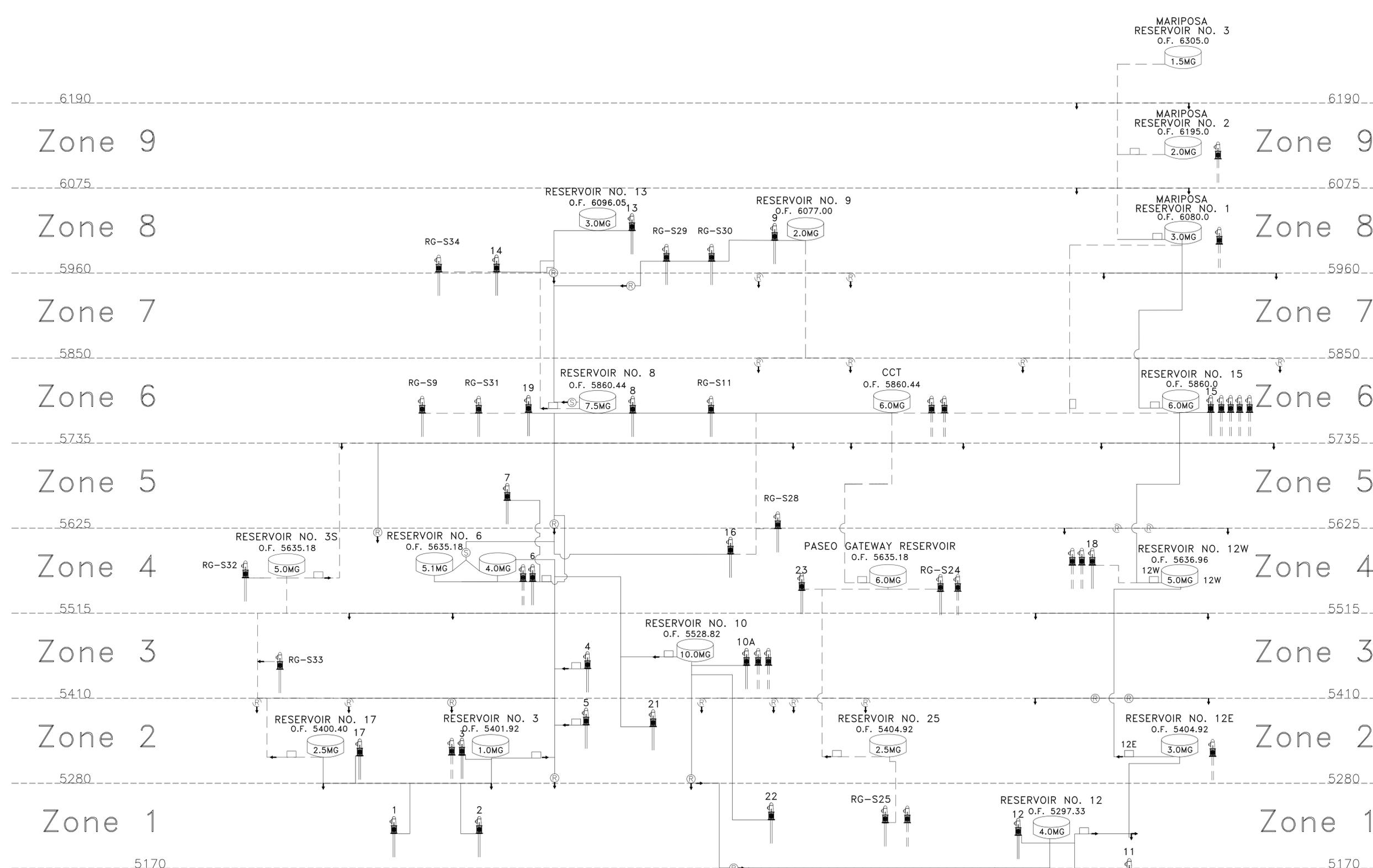
Construction Item	Approximate Start Date
Storage Tank and Demolish Old	Fall 2019
Well Drilling	Spring 2020
Parallel 10-inch Transmission Line	Summer 2020
Well Equipping	Spring 2021
Arsenic Treatment	Spring 2021
King Boulevard Connector Line	Fall 2021

6. Conclusions and Recommendations

The City of Rio Rancho needs to replace the existing Tank 9 and Well 9 to provide reliable supply to their existing and future customers. As a result of these needs, supporting infrastructure is required to send the water to where it is needed at the required standard.

APPENDIX A

City of Rio Rancho Water System Schematic



Ultimate City Limits System
HYDRAULIC PROFILE

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Jul 10, 2018 - 9:41am