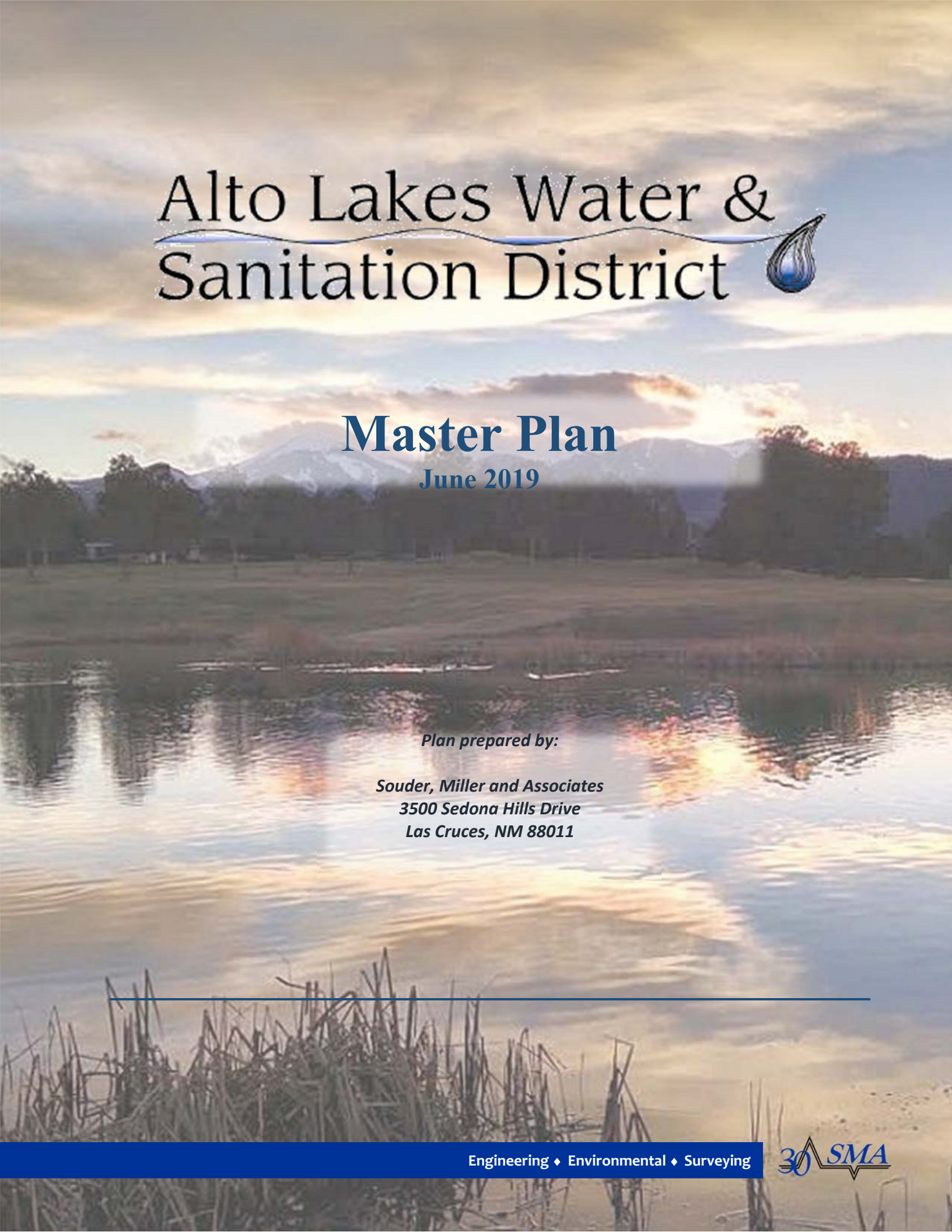

Alto Lakes Water & Sanitation District

Master Plan

June 2019

Plan prepared by:

Souder, Miller and Associates
3500 Sedona Hills Drive
Las Cruces, NM 88011

Engineering ♦ Environmental ♦ Surveying

30 SMA

TABLE OF CONTENTS

List of Figures

List of Tables

Abbreviations and Acronyms

ALGCC	Alto Lakes Golf & Country Club
AMSL	above mean sea level
AWWA	American Water and Wastewater Association
BOD	Biochemical Oxygen Demand
CIP	Capital Improvements Plan
EPA	Environmental Protection Agency
FOG	fats, oils and greases
gpd	gallons per day
gpm	gallons per minute
HDPE	High density polyethylene
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
OSHA	Occupational Safety and Health Administration
PER	Preliminary Engineering Report
PRV	Pressure Reducing Valve
PSCI	Parkhill, Smith and Cooper, Inc.
psi	pounds per square inch
PVC	polyvinyl chloride
SCADA	System Control and Data Acquisition
SMA	Souder, Miller & Associates
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USEPA	Unites States Environmental Protection Agency
VFD	Variable Frequency Drive
W&SD	Water & Sanitation District
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

This Master Plan evaluates the water, wastewater and solid waste systems of the Alto Lakes Water and Sanitation District (W&SD) and presents the District's Capital Improvement Plan (CIP) for accomplishing various recommendations for improvement, along with estimated costs and implementation schedule. The total water system CIP is slightly over ten million dollars during the next 20 year period, and the wastewater system CIP is slightly over four million dollars for the same period.

1. INTRODUCTION

1.1. Purpose

The purpose of this Master Plan is to assess the Alto Lakes Water & Sanitation District (W&SD) water, wastewater and solid waste infrastructure and provide recommendations for improvements to those systems. The Master Plan evaluates the water distribution system, and presents recommendations for infrastructure improvements. In addition, the existing wastewater collection and treatment system is reviewed with recommendations presented for improvements and expansion of the system. The new solid waste infrastructure is also summarized.

The District has completed a number of reports and plans in recent years including:

- Water and Wastewater System Master Plan Master Plan, Livingston Associates, P.C., 2008
- Water System Improvements Preliminary Engineering Report, Parkhill Smith & Cooper, Inc. (PSCI), 2008
- Wastewater Treatment Plan Subsurface Disposal Field Evaluation Report, Souder, Miller and Associates (SMA), 2010
- Proposed Rehabilitation and Replacement of Existing Ground Storage Tanks Preliminary Engineering Report, PSCI, 2013
- Water Conservation Plan, SMA, 2015
- Wastewater Discharge Permit Renewal Application, SMA, 2015
- Water Treatment System Evaluation, SMA, 2015
- Wastewater System Improvements Preliminary Engineering Report, SMA, 2016
- 40 Year Water Plan (Draft), SMA, 2016

The 2004 Water and Wastewater Master Plan (Livingston Associates, P.C., 2004) evaluated the water and wastewater systems, projected water demands and proposed water, wastewater and water supply development alternatives. The Master Plan also explored different ownership structures and recommended that the then private water system convert to a water and sanitation district. Based on that recommendation, Alto Lakes W&SD was formed and purchased the assets of Alto Lakes Water Corporation in 2008.

The 2008 Water System Improvements PER (PSCI, 2008) was prepared to evaluate the water treatment and distribution systems and recommend improvements necessary to provide stable pressure, improved fire protection capabilities and treatment to remove iron, manganese, total dissolved solids (TDS) and hardness. The 2008 PER included recommendations to add water treatment and replace undersized portions of the distribution system in phases. Based on the 2008 PER, Alto Lakes W&SD constructed a water treatment facility to reduce iron and manganese levels

in the drinking water. The District has also completed the first two of six phases of distribution improvements recommended in the 2008 PER.

The 2010 Wastewater Treatment Plant Subsurface Disposal Field Evaluation Report (SMA, 2010) detailed the field investigation and engineering evaluation of the District's wastewater treatment plant disposal leach field. The evaluation was conducted to address operational issues with the leach field and the concern that the subsurface disposal field may be at its operational limit. The report indicated that diligent management of the disposal field zones was necessary to ensure that the leach field was not surcharged.

The 2013 Proposed Rehabilitation and Replacement of Existing Ground Storage Tanks PER (PSCI, 2013) evaluated options for rehabilitating or replacing the District's water storage tanks to address deficiencies in the water tanks and increase storage for future growth. The report recommended that the District demolish the existing 150,000-gallon storage tank and construct a new 500,000-gallon storage in the same location.

The 2015 Water Conservation Plan (SMA, 2015) and the 40 Year Water Plan (Draft) (SMA, 2016) evaluated the District's water use and water loss and laid out a strategic plan to maximize the District's water rights and maintain the existing Alto Lakes conservation ethic in the future.

The 2015 Wastewater Discharge Permit Renewal Application (SMA, 2015) and 2016 Wastewater System Improvements PER, SMA (2016) identified alternatives for improvements at the wastewater treatment plant (WWTP) that would meet New Mexico Environment Department (NMED) Class 1A requirements for reuse. The PER recommended that the existing plant be rehabilitated with the addition of a manual bar screen and tertiary treatment (sand filtration and ultraviolet germicidal disinfection) prior to discharge to the adjacent golf course ponds for reuse as irrigation water.

The 2015 Water Treatment System Evaluation (SMA, 2015) evaluated innovative water treatment technologies to determine if the District could cost-efficiently add treatment for TDS and hardness within the limited geographical footprint available for brine disposal. The report determined that based on the makeup of the District's groundwater, there is not a viable water treatment option currently available for TDS and hardness.

1.2. Alto Lakes Water & Sanitation District

The Alto Lakes W&SD provides water, wastewater and solid waste services for the Alto Lakes community, Kokopelli subdivision, and Eagle Creek II subdivision. These unincorporated communities are located in the Sacramento Mountains of Lincoln County, New Mexico, approximately five miles north of Ruidoso, NM. Figure 1 shows the location of Alto Lakes.

Figure 1. Alto Lakes W&SD Vicinity Map

The water and wastewater infrastructure of Alto Lakes was constructed by a developer beginning in the late 1960's. The systems were developed in small increments as indicated by the nominal backbone system and the various pipe sizes and piping materials extended to the outlying areas. In 1990, the system was acquired out of bankruptcy by the Alto Lakes Water Corporation, a private company which was regulated by the New Mexico Public Regulatory Commission. In April of 2008, Alto Lakes W&SD purchased the water and wastewater assets from the Water Corporation and now operates the system as a public entity with the intention of improving the infrastructure while taking advantage of public programs developed to help public utilities meet State and Federal standards. Staff of the Alto Lakes W&SD consists of a General Manager, Executive Assistant, Billing Clerk and four field crew (operators).

1.2.1 Service Area

The District serves an area of approximately 3.15 square miles, extending almost 3.3 miles east west and about 2.3 miles north south. The service area includes the residential community of Alto Lakes subdivision and the Alto Lakes Golf and Country Club (ALGCC). The service area ranges in elevation from 6,915 to 7,550 feet above sea level. The customer base includes a high number of vacation homes which seasonally utilize the golf course and country club facilities. Currently, the Alto Lakes subdivision is approximately 50% built-out, with just over 1,200 of the 2,200 lots occupied.

The District serves 1,261 residential water connections, 20 small commercial water connections (i.e. condominiums), and 3 large water commercial connections (i.e., ALGCC). Of the 1,261 residential connections, 727 are active 10-12 months per year, 316 are active 6-9 months per year, and 218 are active 5 months or less per year. The seasonal nature of the residents could be interpreted as a 18% vacancy rate averaged over an entire year. The Alto Lakes W&SD also provides domestic water for two areas outside of the subdivision: the Kokopelli Golf and Country Club area which includes about 10 lots currently (with an obligation to serve a total of 120), and the Eagle Creek development which includes about 8 lots currently (25 total obligation). In addition, the District also provides wastewater service to 77 customers. Figure 2 details the District's service area.

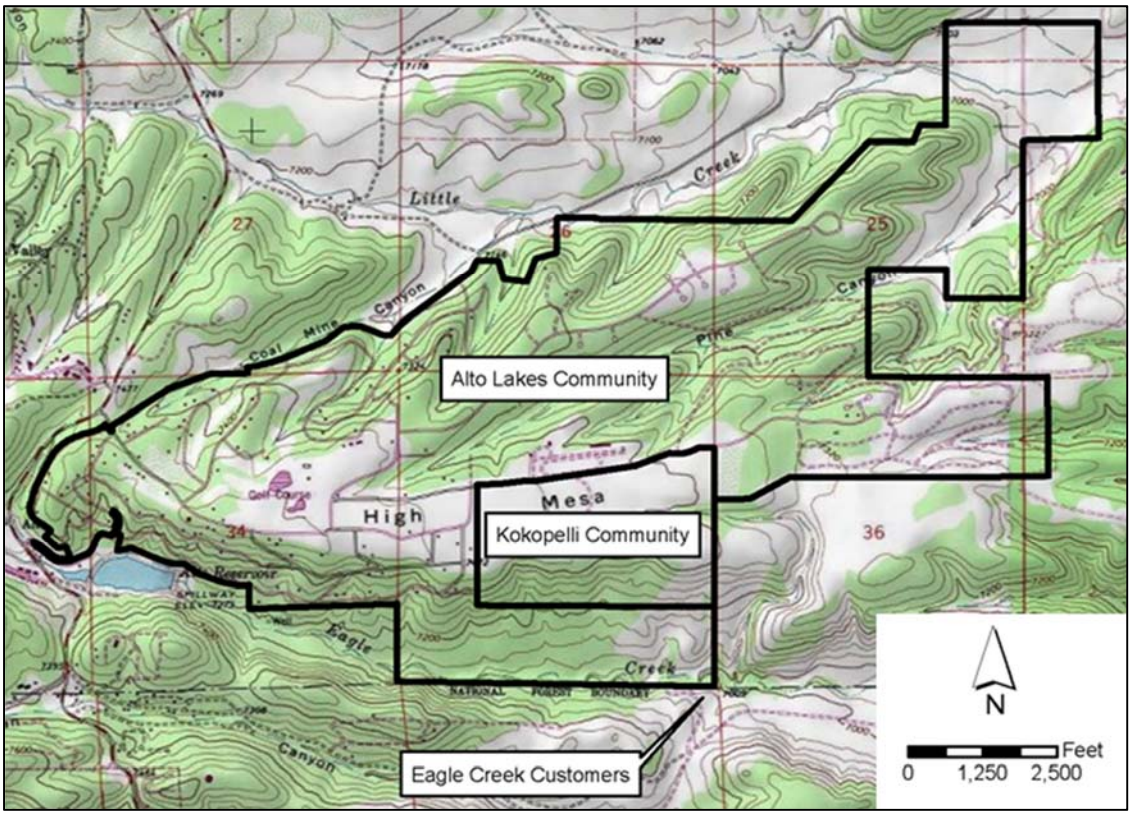

Figure 2. Alto Lakes W&SD Service Area Map

1.2.2 Conservation

Alto Lakes W&SD has a stringent demand-side water conservation program that includes an inclining block rate structure, water restrictions in the event of reduced supplies and prohibition of water waste. Water restrictions which were implemented in 2012 are based on the District's water supply levels according to the following definitions:

- Normal – Ability to deliver 120% of 3-year average monthly demand
- Moderate – Ability to deliver 100% of 3-year average monthly demand
- Serious – Ability to deliver 75-99% of 3-year average monthly demand
- Severe – Ability to deliver less than 75% of 3-year average monthly demand
- Emergency – as declared by District Board.

The restrictions for the stepped program are as follows:

- Normal – no restrictions
- Moderate – Reduce demand by 20% by watering outdoors twice per week
- Serious – Reduce demand by 30% by watering outdoors once per week
- Severe – Reduce demand by 40% by watering outdoors twice per month
- Emergency – Reduce demand as required with no outdoor watering.

In addition, the District adopted an ordinance that required all outdoor irrigation systems utilizing potable water within the District to be converted to drip irrigation systems by December 31, 2016.

The core of the Alto Lakes W&SD water conservation program is an aggressive inclining block rate structure and education outreach. The rate structure is detailed in Table 1 below.

Tier	Charge per 1,000 gallons
Residential & Small Commercial	
Residential & Small Commercial Base Charge	$33.78
0 gallons up to 5,000 gallons	$3.52
5,001 gallons up to 10,000 gallons	$5.15
10,001 gallons up to 25,000 gallons	$6.78
25,001 gallons up to 50,000 gallons	$10.02
over 50,001 gallons	$32.74
Large Commercial	
Large Commercial Base Charge	$97.44
0 gallons up to 175,000 gallons	$6.13
175,001 gallons up to 350,000 gallons	$11.97
over 350,001 gallons	$32.74
Irrigation Water Service (non-potable)	
Irrigation Water Base Charge	$14,292.09
0 gallons up to 6,600,000 gallons	$3.23
6,600,001 gallons up to 15,000,000 gallons	$5.86
over 15,000,001 gallons	$32.48

Table 1. Water Rate Structure

Alto Lakes W&SD also provides irrigation water from three separate wells to the ALGCC. Since 1995, the District has provided an average of 67 million gallons per year of irrigation water.

1.2.3 Other Local Conditions – Water Rights Analysis

Alto Lakes W&SD owns the right to divert a total of 613.94 acre-feet per year with water rights contained in New Mexico Office of the State Engineer (NMOSE) File No. H-719-1 and H-719-2 (leased). Table 2 summarizes the District's current water rights.

File No	Volume (acre-feet/year)	Priority
H-719-1	67.4	1867
H-719-1	434.54	1964
H-719-2	112.0	1866
Total	**613.94**	

Table 2. Water Rights Summary

2. Water System Evaluation and Recommendations

2.1 Existing Water System Description

2.1.1 Water System Distribution System

A large portion of the Alto Lakes W&SD distribution system consists of 2, 3 and 4-inch diameter pipe dating to the 1960s and 1970s, with some segments of 6 and 8-inch pipe. The system has over 25 pressure reducing stations to regulate pressure. Water is pumped from supply wells to a 60,000-gallon storage tank prior to treatment. Water is drawn from the storage tank through an iron and manganese treatment system, stored in a 6,000-gallon finish storage tank at the treatment plant and chlorinated prior to being pumped into the two main storage tanks (300,000 and 150,000- gallons). Water is drawn from the main storage tanks and pumped to the distribution system through an adjacent booster station. The water system is illustrated on Figure 3.

In 2012, an 8-inch waterline was installed (including necessary pressure reducing stations) to replace the existing waterline along French Drive, Deer Park Drive and High Mesa Drive from the water tanks towards the east end of the line. In 2015, the District upgraded waterlines on Midiron Drive and Deer Valley Drive to facilitate fire flows in those areas.

As shown in Table 3, the pipe system is comprised of 2-inch to 8-inch pipe including polyvinyl chloride (PVC), high density polyethylene (HDPE) and ductile iron.

Pipe	Quantity, LF
Distribution	
2-inch PVC	7,244
3-inch PVC	11,7002
4-inch PVC	178?
6-inch PVC	65,017
8-inch PVC	18,412
Transmission	
6-inch Ductile Iron	14,129
8-inch Ductile Iron	4,600
8-inch HDPE	12,696

Table 3. Alto Lakes W&SD Water System Water Line Summary

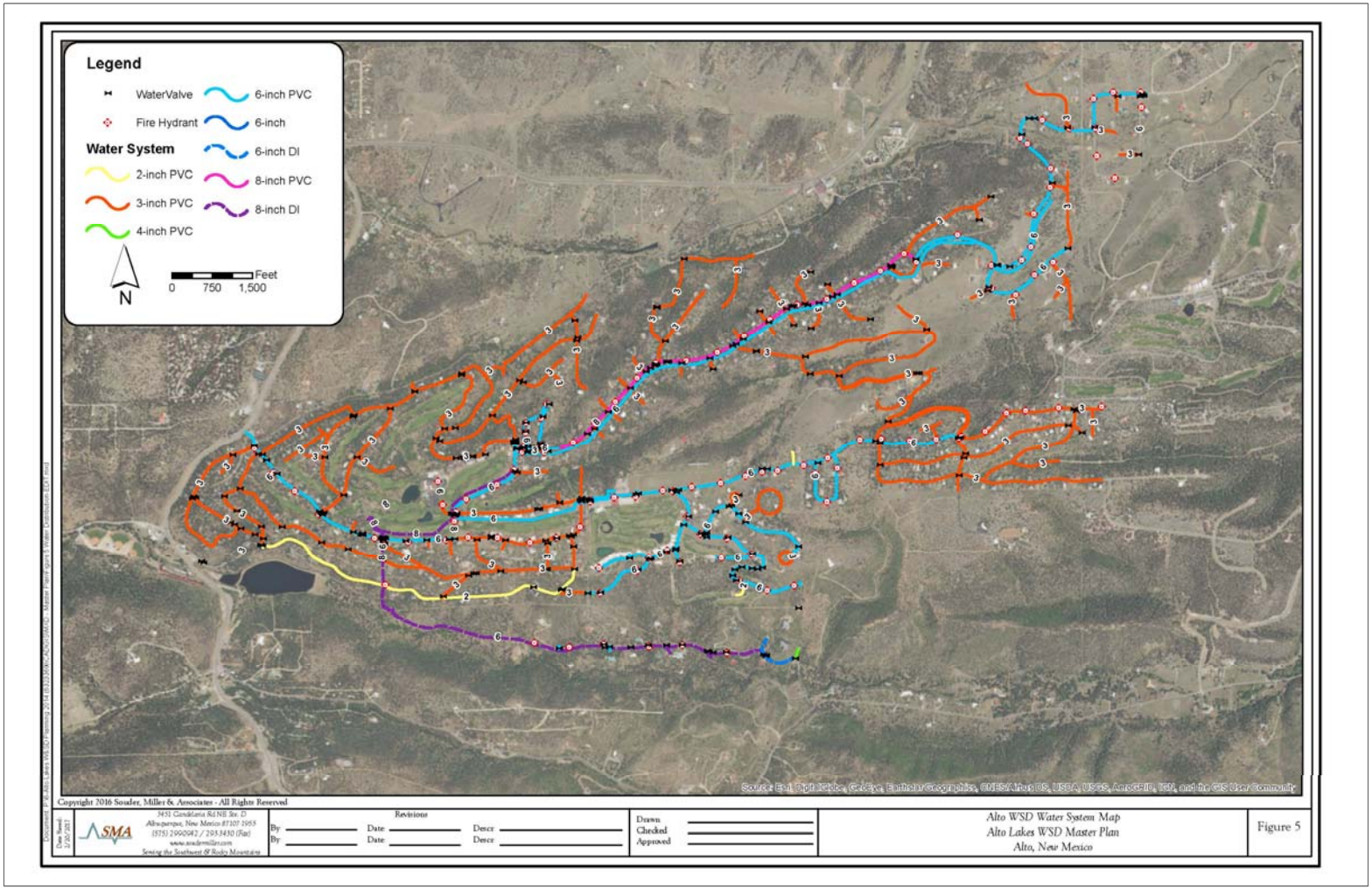

Figure 3. Alto Lakes W&SD Water System

The Water System Improvements PER (2008) evaluated the water distribution system and recommended a series of improvements identified as Phases I through VI to replace small and substandard piping to improve fire flow throughout the District. The District modified the phasing of the work into the phases detailed in Table 4 to prioritize improved fire protection and to allow for funding of smaller increments of the project.

Name	PER Phases	Estimated Cost	Timeframe
Distribution A	I	$2,100,813	2012
Distribution B	II, III, IV, VI[1]	$1,965,000	2015
Distribution B1	II, III, IV, VI[1]	$2,345,791	2019
Distribution C	II, III,	$2,829,398	2022
Distribution D	IV	$1,415,260	2025
Distribution E	V	$1,796,433	2028
Distribution F	VI	$1,702,713	2031

1 – Portions of Phases II, III, IV, and VI (primarily fire hydrants)

Table 4. Water Distribution System Improvements Projects

Distribution A was completed in 2012, which included the construction of 8-inch waterline (including necessary pressure reducing stations) to replace the existing waterline along French Drive, Deer Park Drive and High Mesa Drive from the water tanks towards the east end of the line.

Distribution B was completed in 2015, which included the construction of 8-inch waterline to replace undersized waterlines in Deer Valley Drive and Midiron Drive and the installation of 39 fire hydrants to improve fire protection in the service area. Figure 5 illustrates the various phases of planned distribution system improvements. As shown on Figure 4, the system includes 58 fire hydrants.

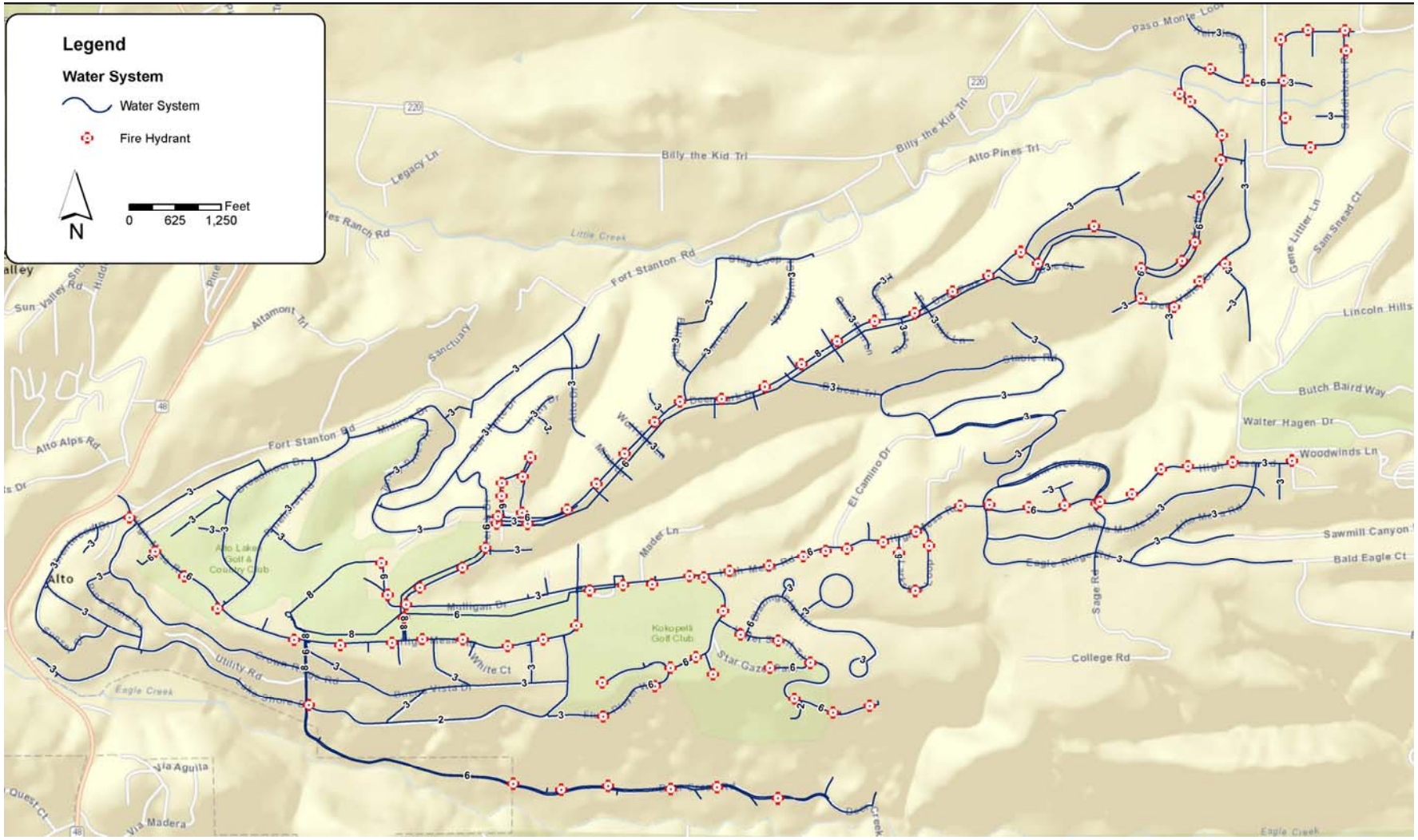

Figure 4. Fire Hydrant Locations

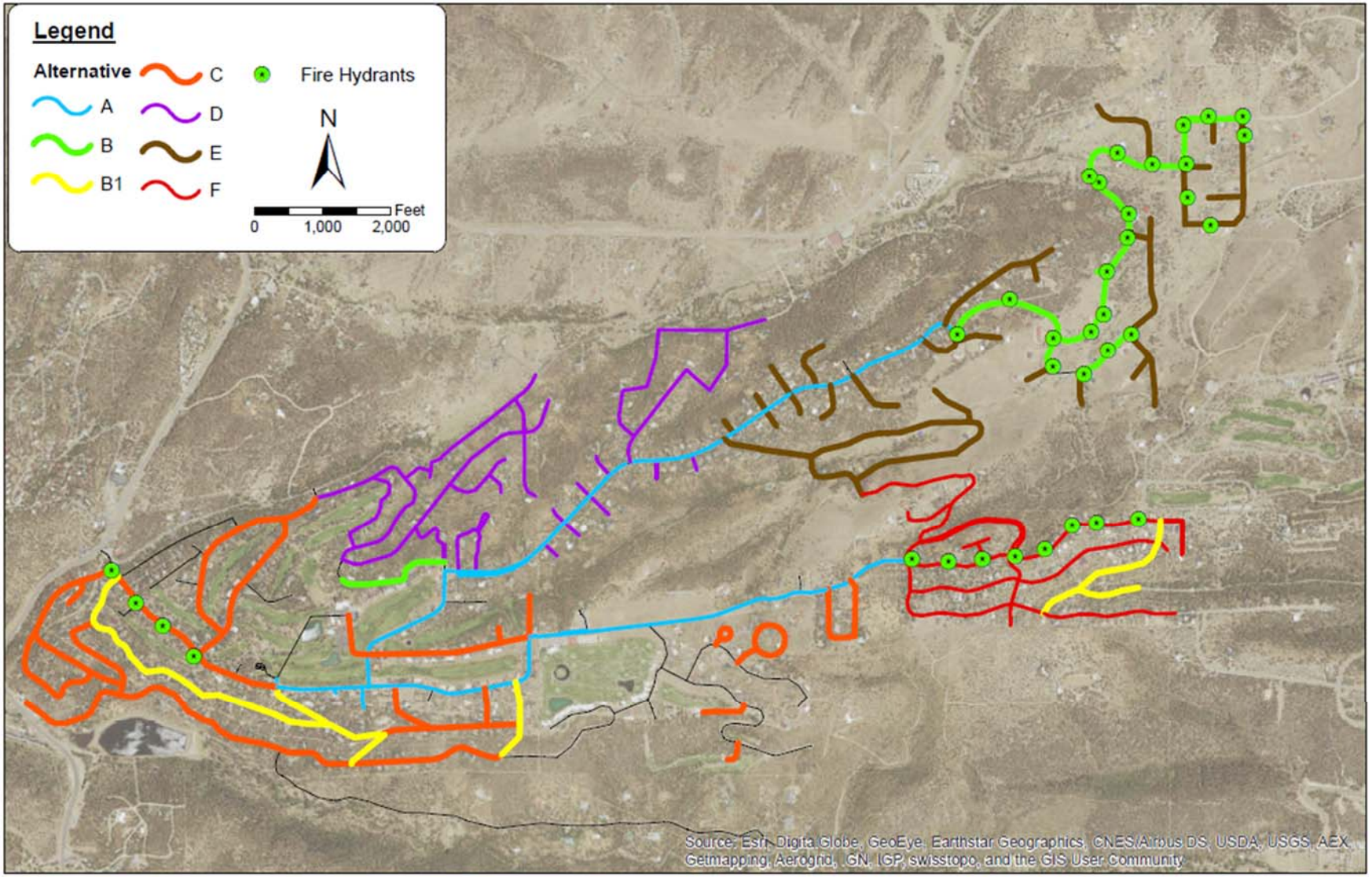

Figure 5. Water System Phase Improvements

2.1.2 Wells

Alto Lakes W&SD is supplied by four wells (Wells E1, E2, E4, and E5) used for domestic demands and three wells (Wells S-6, 12, and 16) available to provide irrigation water to the golf course. The domestic wells are located along the southern boundary of the service area, while the irrigation wells are located on the northern boundary of the service area. The domestic wells can provide up to 520 gallons per minute (gpm) according to the Alto Lakes W&SD. The well NMOSE permit numbers are summarized in Table 5 below and the well locations are shown on Figure 6.

NMOSE Permit Number	Common Well Name	Capacity (gpm)
Domestic Use		
H 00719 S16	E-1	150
H-00719 S17	E-2	200
H 00719 S19	E-4	200
H 00719 S20	E-5	160
Irrigation Use		
H 00719 S6	Well 6	120
H 00719 S11	Well 12	90
H 00719 S14	Well 16	120

Table 5. Well Summary

2.1.3 Water Storage System

The District has four existing welded steel ground water storage tanks, one 300,000-gallon, one 150,000-gallon, one 60,000-gallon and one 6,000-gallon finished water tank for a total of 516,000 gallons in storage capacity. The two large storage tanks are located at the highest point in ground elevation (7,550) in the Alto Lakes W&SD service area. The water storage tanks serve as suction supply to the booster pumping station adjacent to the golf course.

Based on the previous Master Plan (Livingston, 2004), the minimum required water storage for Alto Lakes W&SD was at least 395,000 gallons in 2004 and will be 635,000 gallons in 2024. The current water storage amount of 516,000 gallons is adequate for the 2016 requirements, but additional storage will be necessary as system demand increases.

Based on the Ground Storage Tank PER (PSCI, 2013), the existing steel water tanks were constructed in 1975. Both tanks were inspected in 2004 and 2008. The 2004 report consisted of a visual inspection, while the 2008 report consisted of both a visual and a dive report. The 2008 report states that the exterior coating for both tanks was in good condition with little to no corrosion being

present, but the interior of both tanks were found to be in poor condition with heavy corrosion and pitting. Corrosion was reported to cover 40% to 80% of the interior surfaces and appurtenances. Pitting ranged from $^{1}/_{16}$" to ¼" deep in areas throughout the interior of both tanks. The roof joists and center support for the smaller 150,000-gallon tank were reported to be in poor condition.

Both the 2004 and 2008 reports state that some of the water tank appurtenances are not up to current Occupational Safety and Health Administration (OSHA) and American Water and Wastewater Association (AWWA) standards and need upgrading. The 2004 report recommended that the interior of both tanks be cleaned, sand-blasted, and recoated; and the exterior of both tanks be pressure washed and recoated. The paint coatings were not tested for lead in either the 2004 or 2008 inspections. Paint samples were taken from the exterior of the existing 150,000-gallon water tank and the interior and exterior of the existing 300,000-gallon water tank in 2013 and tested for the presence of lead. The exterior of both tanks tested positive for high levels of lead, well above the allowable limits set by the Unites States Environmental Protection Agency (USEPA). The test results from the interior of both tanks were well below the USEPA allowable limits.

The Storage Tank PER evaluated viable options to both address lead concerns with the existing tanks and increase storage to provide for future needs. The PER recommended that the existing 150,000-gallon steel ground water storage tank be demolished and replaced with the construction of a new 500,000-gallon ground water storage tank in the same location. This approach has the benefit of providing space for future expansions on the tank site. The 300,000-gallon storage tank would be rehabilitated to address interior corrosion and exterior lead issues.

2.1.4 Booster Station and Pressure Reducing Valves

The District operates a pressure booster station that provides 800 gpm at 60 psi located alongside the two large water storage tanks. According the Water System PER (PSCI, 2008), there are in excess of 25 pressure reducing stations throughout the system to regulate the customer pressures. Some areas currently experience pressures in excess of 100 psi (compared to national standard maximum of 80 psi) which increases the risk of leaks and pipe failures. PRV locations are shown on Figure 7.

2.1.5 Disinfection

The District provides disinfection by adding sodium hypochlorite as water enters the storage tanks, with detention time in the tanks well in excess of 60 minutes. Free chlorine residuals are measured weekly in the distribution system to ensure proper disinfection is achieved, to maintain a minimum chlorine residual of 0.2 mg/L.

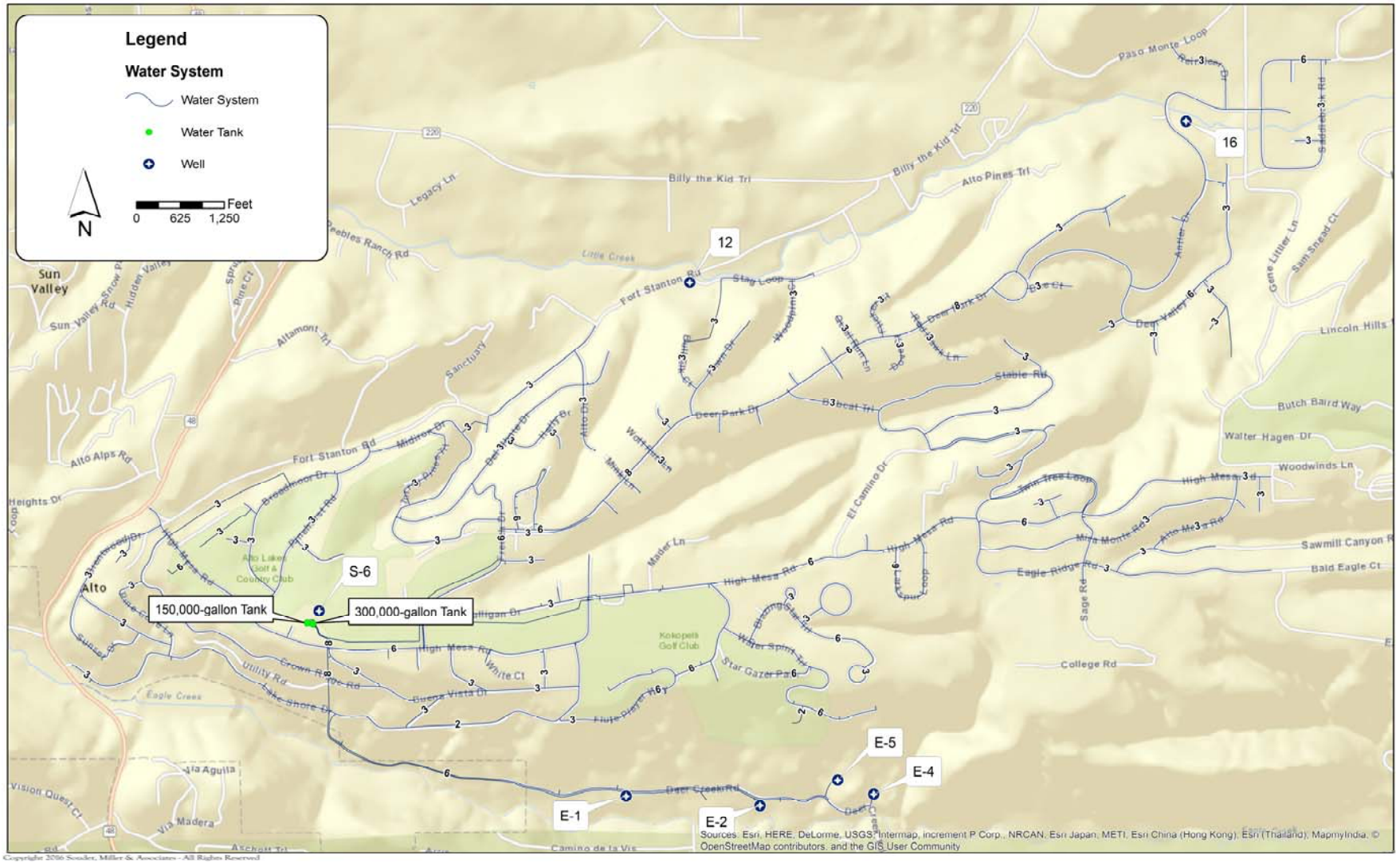

Figure 6. Well and Tank Locations

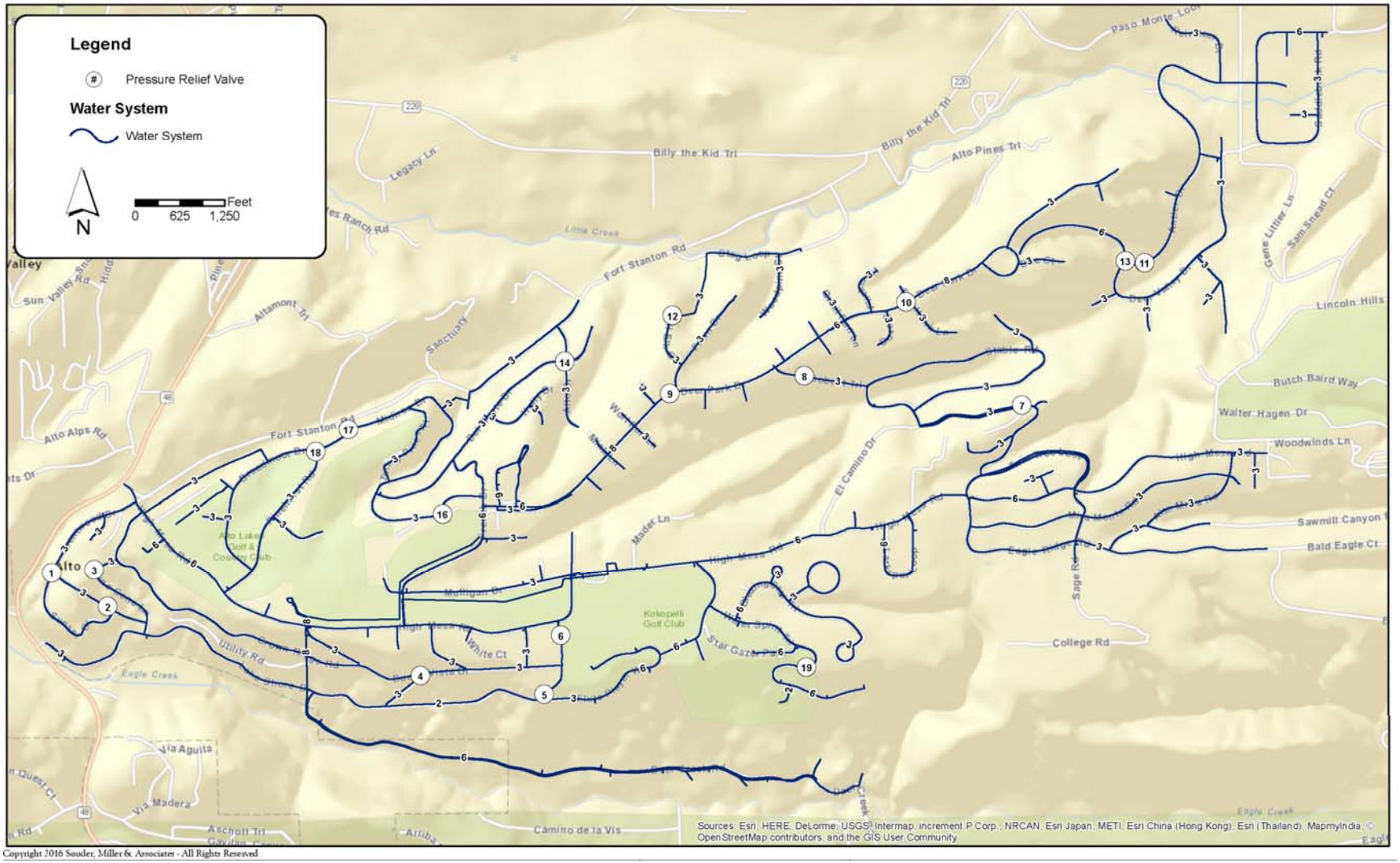

Figure 7. PRV Locations

2.1.6 Operations

The water system is currently operated by four operators, who check tank levels and well status. The operators drive to the facilities and manually control the wells. Typically, the District's wells are in operation for approximately 12 to 16 hours daily. The booster station is automatic and controlled by water distribution system pressure. The pumps operate with variable frequency drive (VFD) motors to maintain constant system pressures of 60 psi at the booster station.

Water is pumped from the supply wells to a 60,000-gallon water storage tank prior to treatment (unless diverted to the golf course lakes). Water is drawn from the storage tank through an iron and manganese treatment system, stored in a 6,000-gallon finish storage tank at the treatment plant and chlorinated prior to being pumped into the two main storage tanks.

From the storage tanks, water is pumped through the booster station, which pressurizes the upper (top) zone to about 60 psi, then the lower zones are fed via PRV's. All water not used for golf course irrigation is pumped through the booster station. The following Table 6 shows the pressure zones and their elevations.

Zone	Upper Service	Lower Service
	AMSL	AMSL
1	7450	7381
2	7381	7311
3	7311	7242
4	7242	7173
6	7173	7104
7	7104	7034
8	7034	6965
59	6965	6895

Table 6. Water Zone Elevations

2.1.7 Water Quality

While District wells produce water that complies with the USEPA Safe Drinking Water Act (SDWA) primary drinking water quality standards, the wells have high levels of TDS, hardness and sulfates as shown on Table 6 below. The average level of TDS for the last two years is around 2,200 mg/L The NMED secondary standard for potable water is 500 mg/L TDS.

Secondary water quality standards are primarily aesthetic in nature (from a taste and odor standpoint), are not known to produce toxic effects and are not regulated by either the USEPA or the

NMED. Typically, elevated levels of these may cause taste concerns, plumbing fixture scaling and staining of sinks. Although the secondary parameters are not regulated, the USEPA and NMED have adopted recommended maximum levels to minimize the potential for taste and plumbing concerns. Table 7 lists select secondary water quality constituent levels in District wells and the NMED recommended limits for those constituents.

Well	TDS	SO4	Chloride	Fluoride	Iron	Mg	Hardness
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
E-1	1,580	730	200	0.27	0.21	0.019	920
E-2	2,390	1,300	170	0.45	0.56	0.038	1,400
E-4	3,200	2,050	98	1.5	1.7	0.69	700
E-5	1,300	610	170	0.4	0.78	0.030	780
S-6	1,600	688	230	0.4	0.24	0.18	750
12	2,100	984	350	0.4	ND	ND	1,300
16	2,220	893	360	0.4	0.74	0.040	2,220
Raw Water[1]	1,775	985	155	0.46	0.83	0.065	1,190
NMED Limit[2]	500	250	250	2.0	0.30	0.05	

1. Combined influent to water treatment facility 2. NMED secondary standard for potable water

Table 7. Well Water Quality Summary

Nearly all of the residents in the Alto Lakes community use water softeners to improve the quality of the water by removing the "hardness" components from the water. However, these systems use excessive amounts of water when they regenerate the resins and contribute to high salt levels at the wastewater treatment plant.

Based on the water quality issues identified above and recommendations from the Water System Improvements PER (PSCI, 2008), the District designed and constructed a 140 gpm oxidation/filtration iron and manganese removal water treatment facility. This water treatment facility connects to the system using 6,000-gallon and 60,000-gallon steel ground water storage tanks and associated piping.

The Water System Improvements PER also recommended that the District acquire a site for brine disposal and construct a reverse osmosis treatment system to reduce TDS to NMED secondary standards and hardness to levels that would allow customers to discontinue the use of individual water softeners. However, the District is not pursuing the implementation of a treatment system for hardness or TDS until a cost-effective, proven technology becomes available that can meet the District's treatment goals with minimum brine generation due to space limitations.

2.2 System Deficiencies

The District is systematically upgrading undersized piping to a minimum of 6-inch diameter waterlines to meet fire flow requirements of 750 gpm. The District is also planning to replace the current 150,000-gallon ground storage tank with a 500,000-gallon tank. In addition, the District is repairing and replacing inoperable PRV's and installing new PRV's to manage pressure zones within the service area.

As discussed above, additional distribution storage is required to meet two average day (one peak day) emergency storage volumes and the ISO 2-hour fire flow duration. Approximately 350,000 gallons of additional storage (for a total of 866,000 gallons) is recommended by year 2024.

The District's Capital Improvement Plan for the water system (summarized in Section 5) includes preliminary cost estimates to address these deficiencies.

2.3 Operational Improvements

To allow for more efficient operation of the water system, and allow more economical use of labor, the District plans to install an automated metering and a Supervisory Control and Data Acquisition (SCADA) system. The proposed computer-based SCADA system would monitor well status, storage tank level, booster station status, pressures and other system data. The system would allow for remote operation of wells and booster pumps, saving operator time from driving to each well site for operational status.

3. Wastewater System Evaluation and Recommendations

3.1 Existing Wastewater Collection System

3.1.1 Wastewater Flows

The Alto Lakes W&SD wastewater system was built in conjunction with the Alto Lakes Development in the late 1960's. The Alto Lakes Water Corporation acquired the system in 1990 and Alto Lakes W&SD purchased the assets of the system from the Alto Lakes Water Corporation in April, 2008. The system serves the ALGCC as well as nearby single-family homes and condominiums and the District has no plans for expansion.

The system includes 74 residential connections (condominiums) and 3 commercial connections (ALGCC). The WWTP receives an average of approximately 10,000 gallons per day (gpd) with peaks during holiday weekends to as much as 28,000 gpd. Return flows to the sewer system are estimated to be 90% of the water usage because the condominiums and clubhouse have little outdoor usage.

3.1.2 Wastewater Collection System

Based on the previous Master Plan (Livingston, 2004), the sewer collection system consists of approximately 1,025 feet of 8-inch gravity flow PVC sewer pipe, 1,450 feet of 6-inch gravity flow PVC sewer pipe and 20 concrete manholes.

The sewer collection system consists of three segments:

1) gravity flow west to the WWTP from the west end of the condominiums;
2) gravity flow north to the WWTP from the ALGCC clubhouse and;
3) gravity flow from the central portion of the condominiums to the east into the Moss Lift Station, then pumped back west to the WWTP via force main piping.

The sewer line which serves the condominiums runs along Midiron Drive, from the WWTP to the Moss Lift Station. The sewer line serving the clubhouse flows from the clubhouse north to the WWTP.

A map of the sewer system is shown on Figure 8 and depicts the location of 23 manholes, two lift station, two grease traps and one clean out. There are three separate gravity systems connected by 1,490 feet of forcemain. In total, there are approximately 3,688 feet of gravity flow PVC sewer pipe.

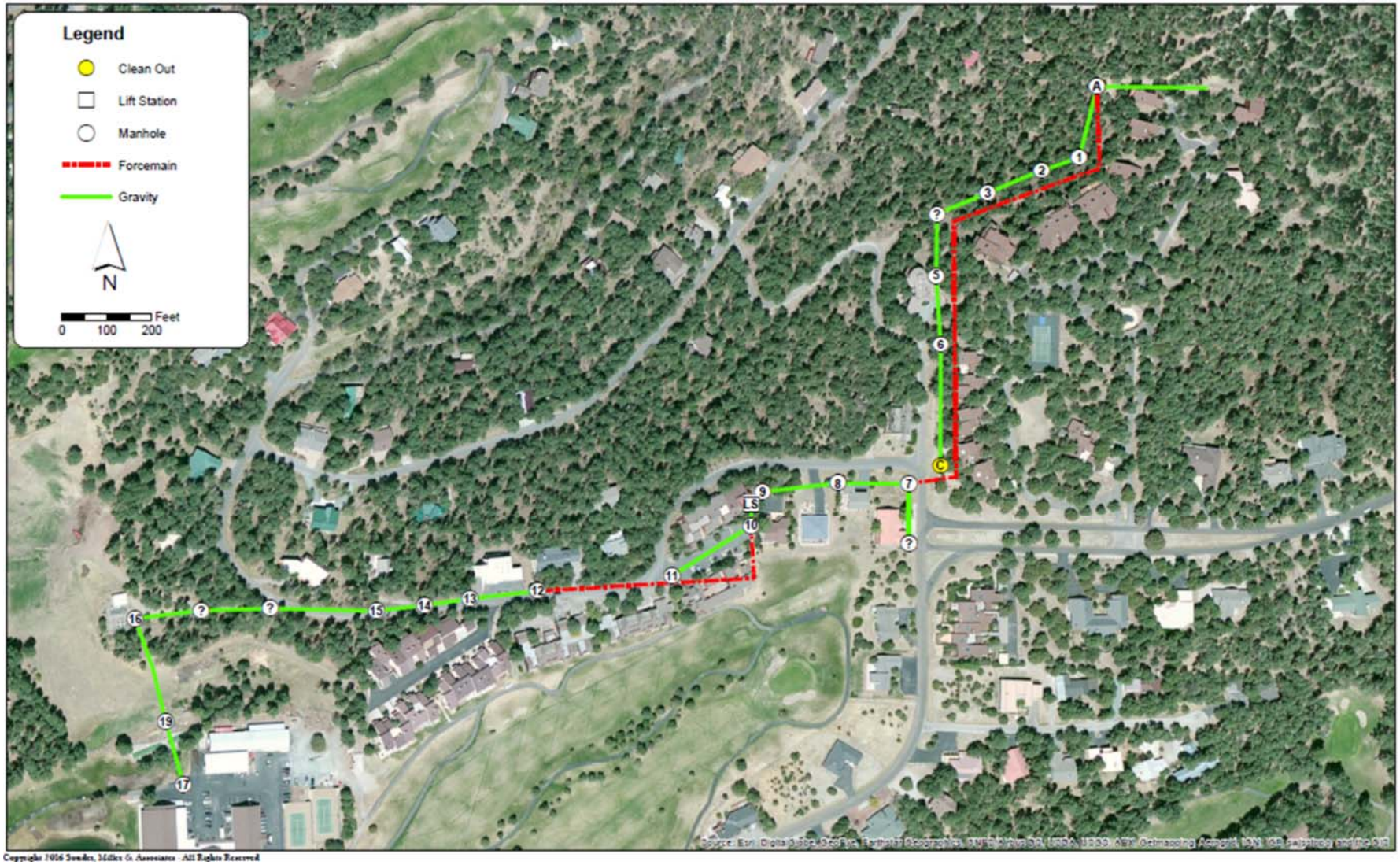

Figure 8. Alto Lakes W&SD Wastewater System

3.1.3 Lift Stations

The sewer system includes two lift stations (Moss Lift Station and Site C Lift Station) that pump sewage from the central and eastern portion of the condominiums to the WWTP. The Moss Lift Station consists of a 10-foot deep, 6-foot diameter concrete manhole with a duplex pump system. The Site C Lift Station is similar to the Moss Station and consists of an 11-foot deep, 6-foot diameter concrete manhole with a duplex pump system.

3.1.4 Manholes

The Alto Lakes W&SD wastewater collection system includes twenty-three manholes.

3.2 Existing Wastewater Treatment Plant

The Alto Lakes W&SD WWTP consists of a sequencing batch reactor (SBR) manufactured by Austgen Biojet Sanitaire, rated at a treatment capacity of 30,000 gallons per day. The system utilizes an activated sludge method of wastewater treatment that features the fill and draw principle in which all phases of the treatment cycle occur sequentially in one basin.

As part of the 2004 discharge permit renewal, the NMED Groundwater Quality Bureau required the owner of the WWTP to implement a Corrective Action Plan (CAP) to address elevated levels of total dissolved solids (TDS) and chlorides in the groundwater downstream of the groundwater disposal leach field.

The District completed the Water System Improvements PER in 2008 and a more recent evaluation of available water treatment technologies to assess methods to improve water quality flowing to the wastewater treatment plant prior to treatment. Neither of these evaluations identified viable approaches that would reduce hardness and dissolved solids to acceptable levels given the District's limited physical area.

The Wastewater Treatment Plan Improvements PER (SMA, 2016) evaluated treatment plant performance and assessed the available options to treat and dispose of wastewater to meet NMED permit requirements. To meet NMED requirements, the WWTP needs to produce effluent that meets NMED Class 1A requirements (detailed below in Table 8) and transfer that effluent to the adjacent ALGCC for reuse as an alternate irrigation supply source.

Constituent	30-Day Average	Maximum
	30-Day Average	Maximum
BOD_5	10 mg/L	15 mg/L
Turbidity	3 NTU	5 NTU
Fecal Coliform	5 per 100 ml	23 per 100 ml
Total Residual Chlorine or Ultraviolet Transmissivity	Monitor only	Monitor only

Table 8. NMED Class 1A Reuse Requirements

The WWTP does not currently include a means to remove large objects, rags and wood also known as coarse materials. The lack of screening at the front of the WWTP can create system maintenance issues and potentially disrupt system operations. The system also does not include a method to measure flows into the plant.

Treated effluent from the process is discharged through a V-notch weir into an adjoining subsurface groundwater leach field that is located on the steep slopes of the golf course driving range. The leach field consists of two separate disposal fields. The original, southern 2,800 square foot disposal field is built in a classic serial distribution style (i.e., one trench fills, then spills into the next trench.) Each trench lateral departs from the main distribution pipe at a concrete junction box. The second disposal field was constructed in 2000 with an estimated disposal area of 10,400 square feet. Flows to the newer disposal field are split at a distribution manhole with two distribution mains which are both divided into four zones. While the disposal fields experienced failures in the past, no failures have occurred since system operators began regularly alternating the flow into the different zones in the newer disposal field.

Wasted sludge is aerobically digested in sludge holding tanks prior to disposal. The solids that are withdrawn from the bottom of the tank are pumped to sludge holding tanks with a sludge pump. The basins from the original 15,000 gpd system have been repurposed for use as sludge holding tanks (or aerobic digesters) with manually-controlled aeration to minimize odors. When sludge volumes warrant, the sludge holding tanks are pumped out for disposal off-site.

The SBR uses a suspended growth biological process called "activated sludge" in which aeration is used to produce an environment favorable to naturally occurring bacteria that feed on the biodegradable material in sewage. This converts the suspended and dissolved organics to solids that are easily separated from the water by a settling process. There are many types of activated sludge treatment plants. Typically, aeration occurs constantly in one tank, while settling is performed in separate tanks known as clarifiers. In an SBR, both functions are performed in the same tank by sequencing the treatment processes to treat the wastewater in batches (hence the term SBR). The

wastewater is aerated while the tank is filled until the wastewater reaches a certain level or a set period of time has passed, then aeration is turned off and the solids settle to the bottom of the tank, leaving a layer of treated water at the top of the tank, which is decanted off. The Alto Lakes W&SD SBR goes through five 288-minute treatment cycles per day. Each cycle consists of three stages:

1) an aeration/mix stage of 168 minutes;
2) a settling stage of 60 minutes, and
3) a decant stage of 60 minutes.

The Alto Lakes W&SD SBR is also equipped to accomplish denitrification. The SBR is aerated for a set period of time, increasing the dissolved oxygen (DO) concentration to above 1.5 mg/L. In high DO conditions, bacteria convert ammonia (NH_3) to nitrite ($N0_2$) and then to nitrate ($N0_3$) in the process known as nitrification. Then the aeration is turned off and mixers in the SBR start automatically. Because the bacteria are still coming into contact with food (organics) they will continue to use oxygen until the DO drops into the anoxic range of less than 0.5 mg/L. Without the presence of free oxygen, the bacteria enter the denitrification process by breaking down the $N0_3$ for the oxygen source and releasing the remaining nitrogen as a gas. This process reduces the nitrogen content of the effluent sufficiently to meet NMED requirements for subsurface disposal.

The characteristics of Alto Lakes W&SD wastewater influent and effluent are summarized in Table 9 below.

Constituent	Influent		Effluent	
	Max	Min	Max	Min
	mg/L	mg/L	mg/L	mg/L
Biochemical Oxygen Demand (BOD)	138	910	1.0	51.6
Total Suspended Solids (TSS)	64	953	1.0	83.5
Total Kjehldahl Nitrogen (TKN)	-	-	0.4	17
Nitrate ($N0_3$)	-	-	0.01	9
Total Dissolved Solids (TDS)	-	-	1400	3580
Chlorides	-	-	340	1380

Table 9. Wastewater Characterization

These characteristics vary due to the large variation in flows to the plant and the limited ability to control the aeration cycles for treatment. The chloride levels are elevated because the drinking water in Alto Lakes is very hard and most households use water softeners. The treatment plant aeration system (blowers, diffusers and controls) have reached the end of their useful life. The current control system does not allow operators to vary plant cycles to match system demand and the District has received numerous complaints about noise from the blowers.

District operators report that in the past, the plant experienced issues related to excessive levels of fats, oils and greases (FOG). However, the plant has not experienced major issues related to FOG since the ALGCC installed a grease separator upstream of the plant and the District revised the controls on the system's lift stations to spread out inflows and prevent large batches of wastewater from entering the plant.

3.3 Discharge Permit

Treated effluent from the WWTP is discharged to the subsurface leach fields below the golf course driving range under a ground water discharge permit issued May 5, 2003 by the New Mexico Environment Department, Ground Water Quality Bureau (DP-600). The permit allows discharge of up to 30,000 gpd with the following quality requirements:

- less than I0 milligrams per liter (mg/L) total nitrogen, which is the total of $N0_2$, $N0_3$, and total Kjedahl nitrogen (TKN), or organic nitrogen;
- less than 250 mg/L of chloride; and
- less than 1,000 mg/L total dissolved solids (TDS).

Samples taken from the WWTP effluent and from the monitoring well must be taken and tested for the parameters above on a quarterly basis. In addition to these parameters, the monitoring well depth-to-water at the time of sampling must be reported.

In addition to the monitoring requirements, the permit requires submittal of a corrective action plan to identify the source(s) of high chloride and dissolved solids found in the WWTP effluent and monitoring well samples. The plan also required characterization of TDS background levels in the community's water supply.

A Corrective Action Plan was submitted to the NMED on December 18, 2003. The Corrective Action Plan requested modification of the Discharge Permit to allow reclaimed water use on the golf course, instead of subsurface discharge through the absorption fields. The Corrective Action Plan requested a 270-day compliance schedule (after NMED approval), to construct the reclaimed water facilities at the WWTP, install a V-notch effluent flow meter and recorder and the safety fencing.

Based on the Corrective Action Plan prepared by the Alto Lakes Water Corporation in 2003 to address elevated levels of total dissolved solids and chlorides in the monitoring well downstream of the disposal fields, the Groundwater Discharge Permit Renewal (DP-600) issued by NMED in 2004 included the following requirements:

- Design and construct a reclaimed wastewater system meeting the NMED Reclaimed Domestic Wastewater Policy, for discharge into Alto Lakes Golf Course Lake No. 1 and use on the golf course. The equipment will include tertiary filtration, ultraviolet (UV) disinfection, turbidity meter, lift station and piping and miscellaneous appurtenances.
- Installation of an effluent v-notch flow meter and recorder on the WWTP.
- Abandon the existing absorption fields from normal use, except for emergency discharges and as a back-up location for reclaimed wastewater discharge.

Total dissolved solids in the monitoring well downstream of the disposal fields varied from 2630 mg/L up to 3310 mg/L from 2009 to 2014 with an average level of 2944 mg/L. Chloride levels have varied from 554 mg/L to 1120 mg/L with an average of 690 mg/L.

The NMED groundwater discharge permit includes the following specific design requirements:

- Treated wastewater discharged from the package treatment plant shall not exceed the following limitation: 10 mg/L total nitrogen. [20.6.2.3109 NMAC]
- Reclaimed wastewater to be used for irrigation shall not exceed the following limitations:
    - BOD: 10 mg/L (30-day average) and 15 mg/L (maximum)
    - Turbidity: 3 NTU (30-day average) and 5 NTU (maximum)
    - Fecal coliform bacteria: 5 CFU/100 ml (30-day average) and 23 CFU/100 ml (maximum) [20.6.2.3109 NMAC]
- The permittee shall apply reclaimed wastewater to the golf course in such a manner that the amount of total nitrogen applied in the wastewater and supplemental fertilizer shall not exceed 200 pounds per acre per year. Nitrogen content shall not be adjusted to account for volatilization or mineralization processes. Excessive ponding shall be prevented. [20.6.2.3106 NMAC, 20.6.2.3109 NMAC]
- The permittee shall land apply domestic wastewater in accordance with the NMED Policy for the Above Ground Use of Reclaimed Domestic Wastewater, dated August 7, 2003. [20.6.2.3109 NMAC]
- The permittee shall remove solids from the treatment plant as needed, based on process control testing (e.g., 30-minute settleometer test). The solids shall be contained, transported, and disposed of in accordance with all local, state, and federal (40 CPR Part 503) regulations. Records of solids removal and disposal shall be submitted to NMED in the quarterly monitoring reports. [20.6.2.3109 NMAC]

Alto Lakes W&SD received a renewed discharge permit on March 27, 2017.

3.4 Wastewater System Improvements

The previous Master Plan (2004) recommended the following improvements to the wastewater collection system:

1. Coat the existing 19 manholes with a spray applied epoxy coating, such as "Raven", to minimize concrete corrosion due to sewer gas.
2. Repair or add grout shelving in all manholes and coat with epoxy.
3. Replace manhole ring and cover and repair cone on manhole No. 1.
4. Clean horizontal joints and add ram-neck joint filler in manhole Nos. 1, 5 and 6.
5. Clean and paint the lift station pump and piping components with epoxy paint, and provide a carbon-filter vent to release sewer gases and inhibit corrosion.
6. Perform a visual internal inspection on the sewer collection system using CCTV equipment, to check for piping defects, profile sags and obstructions.

The Wastewater Treatment System Improvements PER (2016) recommend the following improvements to the WWTP:

1. Install a new manual bar screen and flow meter upstream of the WWTP.
2. Upgrade the existing treatment process by replacing the system:
    a. blowers,
    b. diffusers,
    c. electrical service and control panels,
    d. basin cement lining, and
    e. waste activated sludge disposal.
3. Install a new effluent discharge pump and pipeline to the golf course pond.
4. Install new handrails around the existing plant and dispose of damaged grating.
5. Install a new prefabricated sand filter at the plant discharge which includes grating, handrails, and access ladder.
6. Install a new UV disinfection system.

The District's Capital Improvement Plan for the wastewater system (summarized in Section 5) includes preliminary cost estimates to address these deficiencies.

3.5 Operational Recommendations

The previous Master Plan included the following recommendations to optimize performance of the wastewater system which are still valid:

1. To enhance operation and ensure that total effluent nitrogen is maintained at less than 10 mg/L, the dissolved oxygen (DO) should be monitored weekly during the aeration and anoxic stages. During the aeration stage, DO should be above 1.5 mg/L and during the anoxic stage DO should be less than 0.5 mg/L. The aeration should be adjusted accordingly.
2. Monitor the sludge blanket depth closely to maintain a depth of approximately 5-feet deep, and adjust waste pump run-times accordingly.
3. Maintain control arm adjusting controls for proper decant operation.
4. Sample and analyze for effluent BOD and Total Suspended Solids (TSS) quarterly and sample influent BOD, TSS and TKN quarterly, to assist in future WWTP evaluation should problems occur.
5. The sewer collection system should be flushed with water at least twice annually, at a flow-rate of about 1,500 gpm for 30-minutes to maintain a clear flow path and minimize sewer gas development and odor generation.
6. The grease trap from the ALGCC clubhouse should be maintained regularly to eliminate grease from entering the WWTP.
7. The lift station should be inspected monthly, and areas of corrosion cleaned and painted. Pumps should be checked for blockages annually and a spare pump should be provided as stand-by (stored in yard).
8. Manholes should be inspected annually, and areas of corrosion cleaned and re-grouted if needed and coated with epoxy. Shelving should be re-grouted as needed.

In addition, the wastewater treatment plant does not have a redundant supply in the event of power failure. The District should budget to purchase a portable generator unit that could be used to power either the wastewater treatment facility or portions of the water supply system during power failure.

4 Solid Waste System Evaluation and Recommendations

4.1 Solid Waste System Infrastructure

In 2009, the District completed $175,000 in improvements to the District-owned solid waste station. The facility which is secured and staffed on a regular basis, accepts household waste, recyclables, bulk waste, metal, and green waste. In 2012, the District assumed management and operation of the station and invested an additional $75,000 to improve operations, including new signage and traffic control, a new gatehouse and toilet facilities. The District also acquired a skid loader, allowing the Station to accept larger tree trunks and limbs. In 2014, the District added gates and fencing to the compost facility. Figure 9 provides a layout of the District's solid waste collection station.

The Solid Waste Facility provides for disposal of the following wastes:

- Household Wastes (bagged trash)
- Recyclables
- Cardboard
- Paper and recyclable plastic
- Tin and aluminum cans
- Plastic
- Bulk Wastes
- Scrap metal
- Miscellaneous bulk waste including construction materials
- Green Waste
- Yard Waste
- Forest Waste

The District's solid waste fee schedule is detailed in Table 10 below.

Fee Schedule	
Miscellaneous Bulk Waste	
Residential Metered Property	$17.45 per cubic yard
District Property	$22.89 per cubic yard
Non-District	$31.22 per cubic yard
Yard Waste	
District Metered Customer	Free
District Fire Protection	$10.41 per cubic yard
Non-District	$15.61 per cubic yard
Forest Waste	
District Customers	$10.41 per cubic yard
Non-District	$15.61 per cubic yard

Table 10. Solid Waste Fees

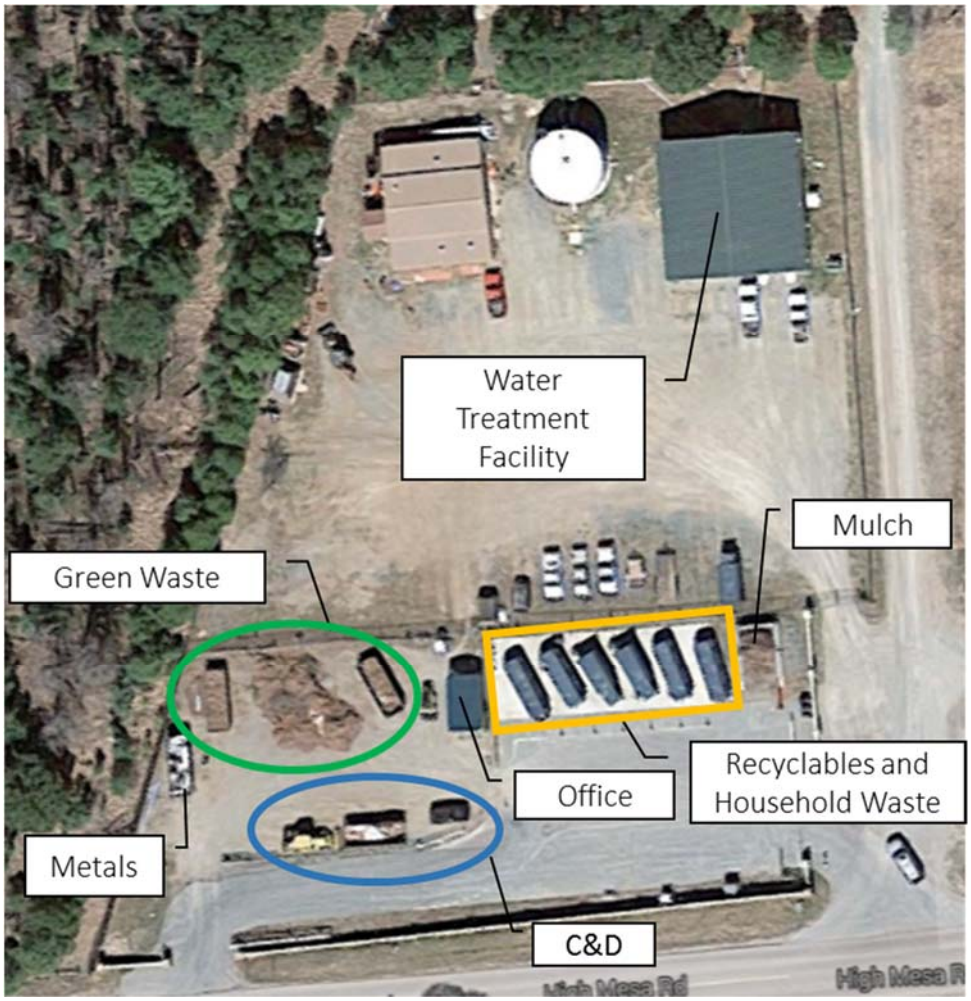

Figure 9. Alto Lakes W&SD Solid Waste Collection Station

4.2 Solid Waste System Improvements

Planned improvements to the solid waste system in 2020 include grading and drainage improvements at the collection site, including asphalt and concrete pavement. Chip sealing improvements at the Solid Waste Collection site are also recommended in 2021.

5. Capital Improvements Plan

5.1 Capital Improvements Plan

Name		Year/Capital Cost in Thousands of Dollars						
	Past	2018	2019	2020	2022-2024	2025-2027	2028-2030	2031-2032
Water System								
Distribution A	$2,100							
Distribution B	$1,965							
Distribution B Design Construction			$213 $2,133					
Distribution C Design Construction					$257 $2,572			
Distribution D Design Construction						$129 $1,286		
Distribution E Design Construction							$163 $1,632	
Distribution F Design Construction								$155 $1,548
Storage Tank Replacement Design Construction		$125 $850						
Portable Generator					$100			
AMR / SCADA					$500			
Treatment Improvements							$1,180	
Total	**$4,065**	**$ 975**	**$2,346**	**$ 0**	**$ 3,429**	**$1,415**	**$2,975**	**$1,703**

Table 11. Water System Capital Improvements Plan

Name		Year/Capital Cost in Thousands of Dollars						
	Past	2017	2018	2019	2020	2022-2024	2025-2027	2028-2030
Wastewater System								
Treatment Plant Improvements - Design - Construction Jet and Inspect Entire Collection System		$148 $100	$457					
Total	**$ 0**	**$ 248**	**$ 457**	**$ 0**	**$ 0**	**$ 0**	**$ 0**	**$ 0**
Solid Waste System								
Paving/Drainage Improvements Chip Seal		$36			$20			
Total	**$ 0**	**$ 36**	**$ 0**	**$ 0**	**$ 20**	**$ 0**	**$ 0**	**$ 0**

Table 12. Wastewater and Solid Waste System Capital Improvements Plans

6. REFERENCES

Livingston Associates, P.C., 2004	*Water and Wastewater System Master Plan*
Parkhill, Smith & Cooper, Inc, 2008	*Preliminary Engineering Report, Alto Lakes Water & Sanitation District Water System Improvements*
Souder, Miller and Associates (SMA), 2010	*Wastewater Treatment Plan Subsurface Disposal Field Evaluation Report*
Parkhill, Smith & Cooper, Inc, 2013	*Proposed Rehabilitation and Replacement of Existing Ground Storage Tanks Preliminary Engineering Report*
Souder, Miller and Associates (SMA), 2015	*Alto Lakes Water & Sanitation District Water Conservation Plan*
Souder, Miller and Associates (SMA), 2015	*Alto Lakes Water & Sanitation District Wastewater Discharge Permit Renewal Application*
Souder, Miller and Associates (SMA), 2015	*Alto Lakes Water & Sanitation District Water Treatment System Evaluation*
Souder, Miller and Associates (SMA), 2015	*Preliminary Engineering Report, Alto Lakes Water & Sanitation District Wastewater System Improvements*
Souder, Miller and Associates (SMA), 2016	*40 Year Water Plan (Draft)*