Eldorado Area Water & Sanitation District

2022 WATER UTILITY MASTER PLAN

PRELIMINARY ENGINEERING REPORT

FINAL

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The technical material and data contained in this Master Plan was prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

Casey W. Cook, P.E.　　　　N.M.P.E. No. 16216

All questions about the meaning or intent of this document shall be submitted only to the Engineer of Record, stated above, in writing.

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ABBREVIATIONS / ACRONYMS

AC	asbestos cement
ACA	asset condition assessment
ac-ft	acre-feet
AFY	acre-feet per year
AM	Asset Management
AMP	Asset Management Plan
AMREP	American Realty and Petroleum Corporation
AMSC	Asset Management Steering Committee
AMSL	above mean sea level
ARV	air release valve
ATS	automatic transfer switches
AWIA	America's Water Infrastructure Act
BISON	Biota Information System of New Mexico
BOP	Best Operating Practice
BPS	Booster Pump Station
BDD	Buckman Direct Diversion
CDP	census designated place
CID	Construction Industries Division
CMU	concrete masonry unit
CP	cathodic protection
CPB	Construction Programs Bureau
CY	cubic yards
DIP	ductile iron pipe
DU	dwelling unit
DWB	Drinking Water Bureau
DWSRF	Drinking Water State Revolving Fund
EAWSD	Eldorado Area Water and Sanitation District

ABBREVIATIONS / ACRONYMS (continued)

ECIA	Eldorado Community Improvement Association
ERP	Emergency Response Plan
FEMA	Federal Emergency Management Agency
fps	feet per second
FY	Fiscal Year
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GO	General Obligation
HDD	horizontal directional drilling
HDPE	High Density Polyethylene
HOA	Home Owners Association
HP	horsepower
ICI	Industrial, Commercial, and Institutional
IFC	International Fire Code
MC	Molzen Corbin
MCL	maximum contaminant limit
MOU	Memorandum of Understanding
NHPA	National Historic Preservation Act
NMDGF	New Mexico Department of Game and Fish
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environment Department
NMGRT	New Mexico Gross Receipts Taxes
NFPA	National Fire Protection Association
NMOSE	New Mexico Office of the State Engineer
NRCS	National Resource Conservation Service
NRW	non-revenue water

ABBREVIATIONS / ACRONYMS (continued)

O&M	Operations & Maintenance
PER	Preliminary Engineering Report
psi	pounds per square inch
PRV	pressure reducing valve
PVC	polyvinyl chloride
PZ	pressure zone
PZO	Pressure Zone Optimization
ROW	rights-of-way
RUS	Rural Utility Services
SAMP	Strategic Asset Management Plan
SCADA	Supervisory Control and Data Acquisition
SDR	Standard Dimension Ratio
SFC	Santa Fe County
SFR	single-family residence
SGMP	Sustainable Growth Management Plan
SHPO	State Historic Preservation Office
SLDC	Sustainable Land Development Code
SUE	subsurface utility engineering
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TDS	total dissolved solids
TTHM	total trihalomethane
UMP	Utility Master Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	United States Department of the Interior Fish and Wildlife Service

ABBREVIATIONS / ACRONYMS (continued)

USGS	United States Geological Survey
VFD	variable frequency drive
WDA	Water Delivery Agreement
WTB	Water Trust Board

EXECUTIVE SUMMARY

Background

Eldorado Area Water and Sanitation District (EAWSD or District) owns and operates a water system serving Eldorado at Santa Fe, New Mexico and surrounding communities in Santa Fe County (SFC), New Mexico. Development of the water system began in the early 1970s, and additions and extensions of the system have been incorporated as new and existing subdivisions have grown. Much of the original infrastructure is still in operation but is rapidly approaching the end of its design life.

The *Water Utility Master Plan (UMP) Preliminary Engineering Report (PER)*, 2013 (Souder Miller & Associates [SMA]), also known as the "*2013 UMP / PER*", proposed numerous improvements to the system, many of which have been implemented. The *2013 UMP / PER* was updated as the *Water Utility Master Plan Preliminary Engineering Report Update*, October 2017 (MC), also known as the "*2017 UMP*", to capture a number of system improvements that had been constructed, some of which were not identified or described in the 2013 planning document. This UMP Update is intended to:

- Update population and water demand projections over the 20-year planning period.
- Identify system deficiencies and shortcomings within the planning period.
- Propose improvements to address deficiencies and shortcomings.
- Present short-term, intermediate-term, and long-term projects to meet system needs.
- Provide estimated capital and operation and maintenance (O&M) costs for the proposed projects.

Population and Water Demand

The EAWSD currently serves a population of 6,129. While the 2020 U.S. Census shows a decline in population in the last decade, that trend has recently turned around with significant housing construction in 2021 and 2022.

Population growth over the planning period is estimated in this UMP using two methods: 1) based on the growth rate from 2010 U.S. Census data; and 2) based on numbers of undeveloped lots in new subdivisions in developed areas (infill). The 2000-2010 growth rate of 0.56%, applied to the current population, projects the population to be 6,849 in 2040. The District estimates there are 390 undeveloped lots within the service area. At the U.S. Census occupation rate of 2.02 persons per household, and assuming all 390 lots are developed within the planning period, 2040 population is projected to be 6,917. For conservatism, the higher of the two population projections is used in this UMP.

Average daily water consumption has been about 65 gallons per capita over the past 5 years of meter records. Non-revenue water, which is unaccounted water due to leaks, theft and meter errors, has averaged about 9%. Including non-revenue water, daily average consumption is 71 gallons per capita per day.

Current average daily demand for the entire District is estimated at 435,000 gallons per day (gpd). Peak day demand is approximately 975,000 gpd. Those demands are expected to rise to 491,000 and 1,100,000 gpd by 2040. The demands translate into an annual use of 487 acre-feet per year (AFY) presently and 550 AFY in 2040. The EAWSD has adequate water rights and sources to meet these needs system wide, although improvements are needed to efficiently distribute water to all pressure zones.

Existing Facilities

The EAWSD system consists of 10 active wells (one of which, Well 19, is on standby status until a cartridge filter system to remove iron and manganese can be installed), six primary storage tanks, seven booster pump stations, disinfection facilities, and an integrated supervisory control and data acquisition (SCADA) system. The EAWSD also has a new source of supply from the SFC Cañoncito-Eldorado pipeline that was constructed in 2021, which enters the District at the northern boundary and is conveyed to Tank 4 through a new booster station (Alcalde) and 2.4 miles of new waterline.

Tank 4 is equipped with an aeration and blower system to remove total trihalomethane (TTHM), a disinfection byproduct that is known to be present in County water. The distribution system includes over 120 miles of pipeline ranging 2 to 10 inches in diameter. The system is divided into four primary pressure zones and a number of subzones separated by pressure reducing valves, zone valves, and check valves. Customer water is measured through manual, radio, and fixed-base automatic read meters. Plate 1 in the back pocket of this UMP shows the layout of the system and major system components.

Hydraulic Analysis

Using a digital water model, a hydraulic analysis was made of the existing system under current and future demands to identify pressure, storage distribution and fire flow deficiencies in the distribution network. The model shows that, under drought conditions (Well 9 unable to produce), the system is able to meet current average demands with the largest source (County water supply) out of service, and to meet current peak demands with all wells (except Well 9) in service. Future average demands during a drought and with the largest source out of service also can be met with existing sources. However, due to declines in well production the EAWSD water source fall slightly short of meeting peak day demand during a drought.

Storage capacities are adequate to meet current and future demands, fire flow, and emergency reserves. However, as production capacities in Wells 17 and 18 decline, Tank 2 Zone demand requirements will not be met without additional boosting and transmission capabilities to supply County or well water to that tank.

The model shows that fire flows are met throughout the system for current and future demands. The model also shows several areas where system pressures are in excess of 100 pounds per square inch (psi).

Need for Improvements

This UMP Update assesses the need for improvements with consideration for: health, safety and security; aging infrastructure; reasonable growth; and system O&M. Based on site visits, data analysis, discussion with EAWSD managers and operators, and hydraulic model results, the following primary deficiencies have been identified:

- Lack of water sources for Tank Zone 2.
- Aging distribution system, leading to leaks and frequent line breaks.
- Unused facilities that require maintenance and present security and safety concerns.
- Need for tank site security and drainage improvements and mixers.

Proposed Projects and Implementation Timelines

Several alternative projects were evaluated to address deficiencies and meet system needs. Table ES-1 provides a summary of the alternatives, estimated costs, project durations and the timeframe for implementation. The timeframes are short-term (within 5 years), medium-term (6 to 10 years) and long-term (10 to 20 years).

Other projects that the EAWSD may consider in the short-, medium-, or long-term include:

- Additional U.S. Route 285 (US-285) crossing.
- Abandon Well 7 transmission line.
- Additional security at monitoring wells.
- 40-year water plan.

TABLE ES-1
SUMMARY OF PROPOSED ALTERNATIVES

ALTERNATIVE	ESTIMATED COST	DURATION	TIMEFRAME	NOTES
DISTRIBUTION AND TRANSMISSION				
Tanks 4 to 2 Transmission Line	$ 1,024,000	14 to 16 months	Short	Needed to convey County water to Tank 2.
Wells 14 and 15 Transmission Line to Tank 2	$ 1,664,000	14 to 16 months	Short	Provide alternate source of water to Tank 2.
Service Lateral and Waterline Replacements	$ 1,330,000	13 to 15 months	Short	Reduce leaks, breaks, and maintenance burden.
Tank 1 Transmission / Tank 2 Distribution Line Replacements	$ 4,605,000	14 to 16 months	Short	Reduce leaks, breaks, and maintenance burden.
OPERATION AND MAINTENANCE				
Tank Site Improvements and Mixers	$ 1,653,000	11 to 13 months	Short	Improve security and reliability of tanks, and improve water quality.
Demolition of Unused Facilities	$ 1,112,000	9 to 11 months	Short	Reduce maintenance burden.
Booster Pump Station (BPS) Emergency Generators	$ 210,000 (each)	6 to 8 months	Medium	Provide continued operation of critical facilities during power outages.

1.0 GENERAL

1.1 Introduction

The EAWSD or "District" contracted with MC to update their *Water Utility Master Plan (UMP) Preliminary Engineering Report (PER)*, 2013 (Souder Miller & Associates [SMA]) also known as the "*2013 UMP / PER*". The *2013 UMP / PER* was updated as the *Water Utility Master Plan Preliminary Engineering Report Update*, October 2017 (MC), also known as the "*2017 UMP*", to capture a number of system improvements that had been constructed, some of which were not identified or described in the 2013 planning document. Many funding agencies require planning documents, such as master plans, be updated every 5 years to reflect changes in population, water demand, infrastructure, construction and engineering costs, and aspects of the utility's operation and finances. Since 2017, the District has executed several system modifications and improvements, which have changed project priorities and resulted in the need to update the *2017 UMP* to capture the District's current needs.

1.2 Report Objectives

This 2022 UMP is intended to summarize changes in existing facilities, extend population projections, redefine water use needs, identify current deficiencies in the system, and present EAWSD's short-, intermediate-, and long-term strategies for improvement of the water system, including the capital and O&M costs for such improvements. This 2022 UMP will highlight modifications or changes to the system since the preparation of the *2017 UMP*.

With limited financial resources, EAWSD realizes the importance of prioritizing improvements so that the most critical system components are addressed first, and less urgent elements are scheduled as time and resources permit. This 2022 UMP presents the planning processes that identify, select, and prioritize the recommended projects.

The following is a summary of the UMP objectives:

- Provide an update to the *2017 UMP*, with a planning period from years 2020 to 2040.
- Update population and water demand projections.
- Identify system deficiencies and shortcomings within the updated planning period.
- Propose improvements to address deficiencies and shortcomings.
- Present short-term, intermediate-term, and long-term projects to meet system needs.
- Prioritize estimated capital and O&M costs for the proposed projects.

1.3 Organization

This UMP is generally structured based on the United States Department of Agriculture (USDA), Rural Utility Services (RUS) PER format (RUS Bulletin 1780-2). The format is required by many of the funding agencies that may review the UMP as part of a funding request.

The layout of this 2022 UMP is outlined below:

- Sections 1.0 explains the need for updating the UMP and presents the planning objectives.
- Sections 2.0 and 3.0 present the planning factors, system background, existing facilities, and financial and operational parameters.
- Section 4.0 summarizes the findings of EAWSD's system water model update, identifying pressure zone (PZ), transmission line, fire protection, and storage deficiencies.
- Observations noted in Sections 3.0 and 4.0 are used to draw conclusions regarding the system's most important needs, summarized in Section 5.0.
- Section 6.0 evaluates solutions to the needs defined in Section 5.0, considering design criteria, land acquisition and permitting requirements, potential construction problems, environmental impacts, and costs.
- Section 7.0 presents the recommended projects on short-, medium-, or long-term timeframes and provides a schedule, prioritization, and discussion regarding project cost and funding implications.

2.0 PROJECT PLANNING

2.1 Location

The EAWSD is located approximately 12 miles south of the City of Santa Fe, New Mexico, in SFC at the intersection of Interstate-25 (I-25) and US-285 (Figure 2-1). The District encompasses 31.3 square miles of hilly, pinon-juniper forest on the western slopes of the Sangre de Cristo Mountains. The Eldorado at Santa Fe Census Designated Place (CDP) is partly coincident with the District boundary and encompasses approximately 22 square miles. The EAWSD service area, which lies within the District boundary, covers 20.7 square miles. The EAWSD lies entirely within the Cañada de los Alamos Land Grant. The planning area for purposes of this 2022 UMP is the District boundary.

2.2 Environmental Resources Present

All federally funded projects require an environmental resource assessment / review be performed prior to any construction taking place. Both regulatory and funding agencies will review these assessments for any potential impacts that might occur for a particular capital improvement project. The requirements of the environmental assessment are dependent on the final project scope and can be unique to each individual project.

2.2.1 Topography

The EAWSD is located in the foothills of the Sangre de Cristo Mountain range which is the southernmost reach of the Rocky Mountains. Due to the "hilly" nature of the area, the elevations of the installed water system components vary considerably. Tank 3 is the highest point in the water system and sits at an approximate elevation of 7,200 feet above mean sea level (AMSL), while the lowest point, Well 9, sits at an elevation of approximately 6,400 feet AMSL. These variable system elevations create unique design and operational challenges for the District's water system. Figure 2-2 shows the planning area on United States Geological Survey (USGS) topography.

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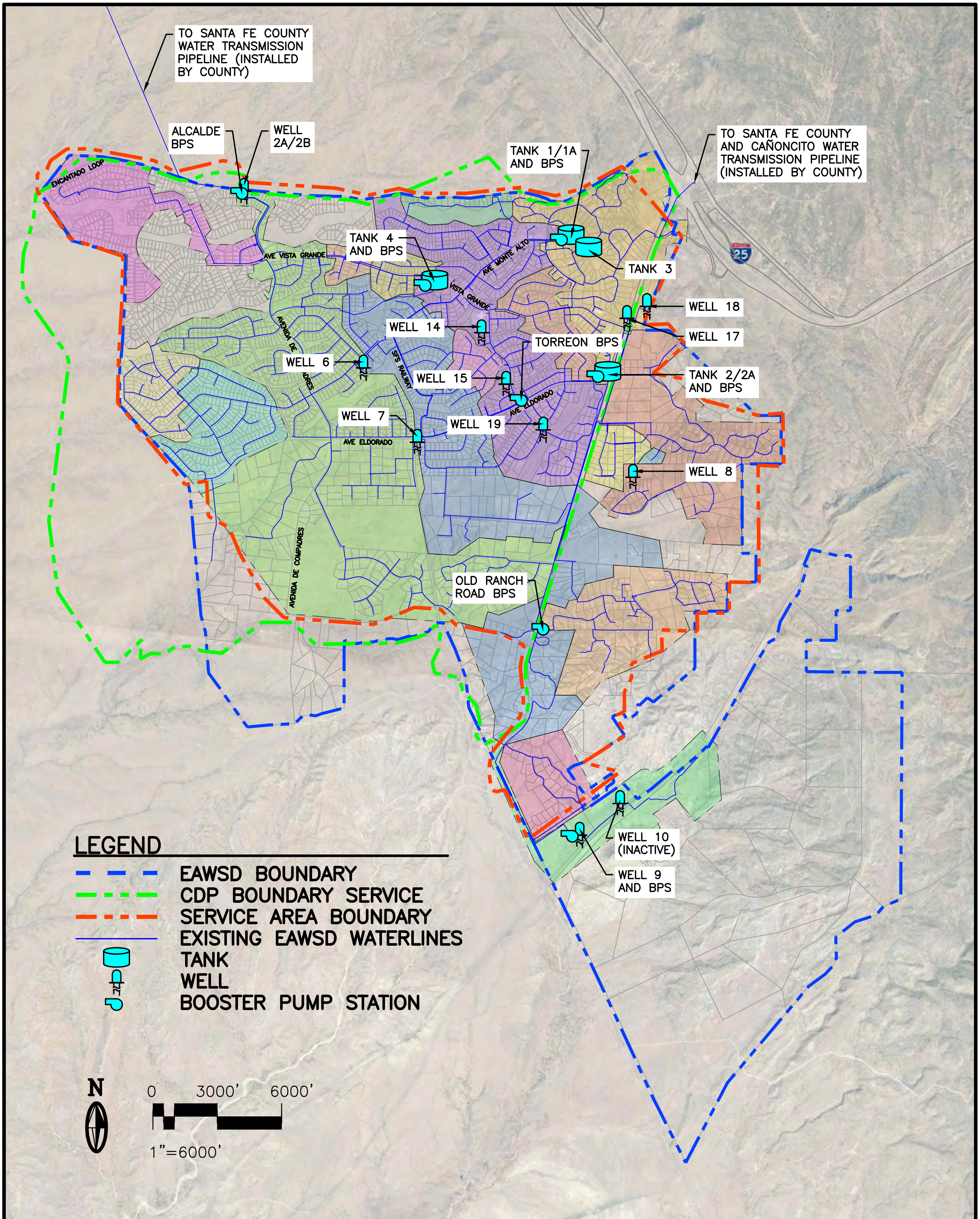

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Figure 2-1
PROJECT AREA

LAST MODIFIED: Jun 15, 2022 - 5:04pm BY USER: pdelarosa
DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
DWG. NAME: FIGURE 2-2 TOPO MAP OF SERVICE AREA.dwg

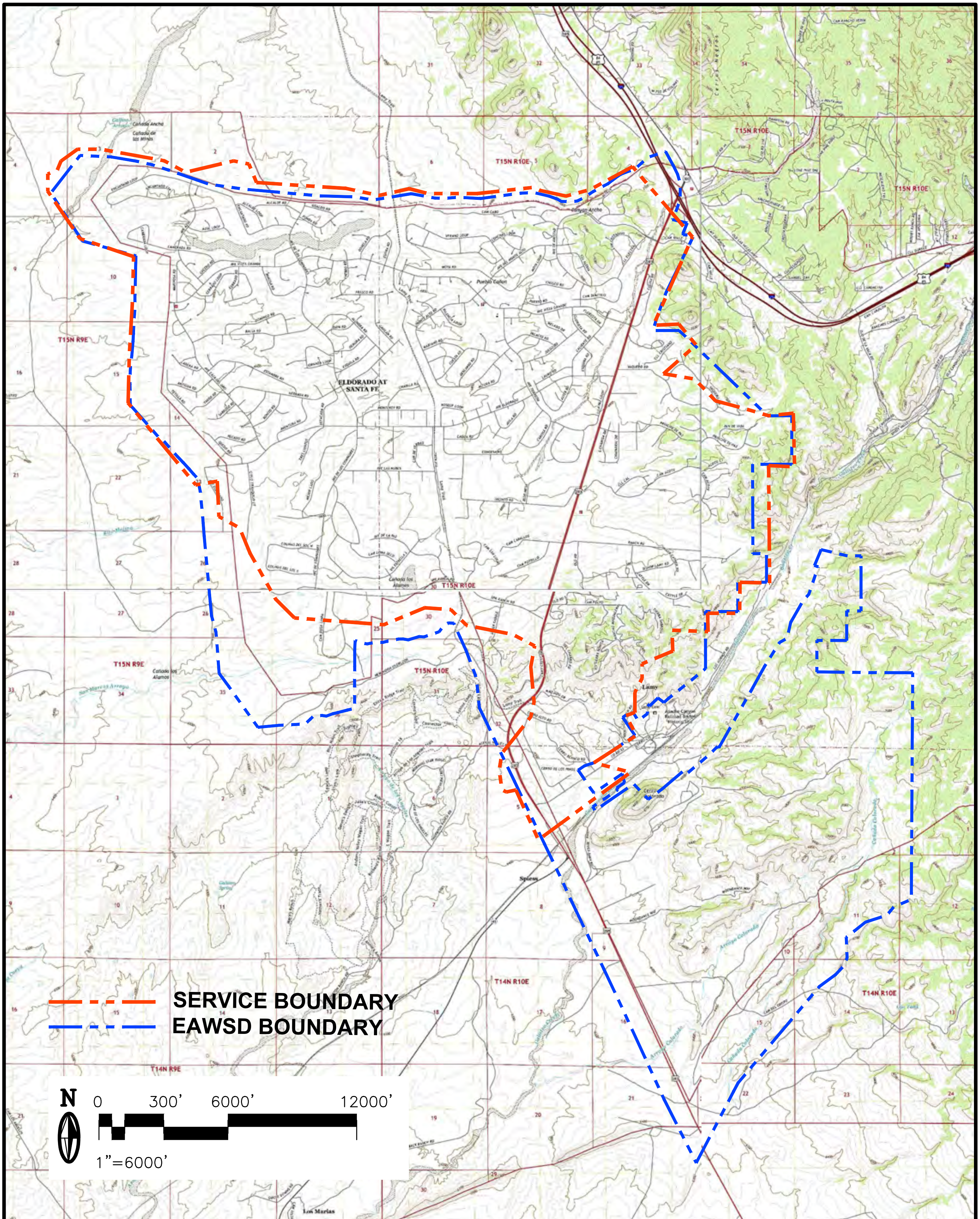

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Figure 2-2

TOPOGRAPHIC MAP OF SERVICE AREA

2.2.2 Land Use and Ownership

All of the water system improvements that are proposed in this planning document will take place within the EAWSD service area. These projects will parallel and cross county and state roads and may potentially cross private properties for which applicable easements and rights-of-way (ROW) will need to be acquired. The SFC Sustainable Land Development Code (SLDC) has established land use and zoning definitions for residential, non-residential, and commercial developments within the planning area.

The majority of the existing commercial developments in the EAWSD are located along the US-285 corridor and are more specifically concentrated near the US-285 and Vista Grande intersection. The most abundant zoning designation in the planning area is rural, single family, residential (RUR-R) dwellings with lot sizes ranging from 1 to 40 acres. Public and community facilities spread throughout the planning area at varying locations account for the non-residential land use and developments within the District.

Existing and future residential development for EAWSD can be separated into three categories: 1. Sites that are approved and not yet built; 2. Sites that have been identified and proposed for development but not yet approved; and 3. Sites that are eligible to apply for commercial development zoning. The criteria and limitations for the development of these commercial categories are set forth by the SLDC. The 2015 Sustainable Growth Management Plan (SGMP) map is located in the Appendix A.

2.2.3 Soils

Soils within the EAWSD service area located in SFC are surveyed by the National Resource Conservation Service (NRCS). This survey is used to create a map of soil classifications that identify the characteristics of each individual soil type. This soil survey is a valuable tool in assessing the construction limitations of each type of soil that must be considered when planning, designing, and constructing water system improvements. Appendix A contains the NRCS' soils map of the planning area.

While the soil survey maps are useful for general planning purposes, each improvement will include a geotechnical investigation during the design phase at the project location to determine the specific nature of the soils. The geotechnical information is used to design foundations, identify any difficulties that may be encountered during excavation, and assess the suitability of the soil for backfill purposes.

Based on geotechnical studies undertaken for past projects, soils throughout the planning area are loose, fine- to coarse-grained clayey sands with medium plasticity. The soils are readily excavated and suitable for grading and trench backfill. Some import is needed for pipe bedding and structural fill. The exceptions are the north and east parts of the planning area where bedrock is at or near the surface and excavation is more difficult.

2.2.4 Vegetation

The NRCS publishes ecological site information for all counties within the United States. These ecological site descriptions are utilized for classifying and describing rangeland and forestland vegetation, delineating land units that share similar capabilities to respond to disturbances. Detailed ecological site descriptions for the service area are provided in Appendix B. These ecological site descriptions highlight the three most prevalent ecological conditions present in the EAWSD (Gravelly, Pinyon-Juniper-Apache Plume, and Pinyon Upland).

2.2.5 Biological Resources

The United States Department of the Interior Fish and Wildlife Service (USFWS) is the federal agency with direct responsibility for implementing the Federal Endangered Species Act, listing species as threatened or endangered, and protecting such listed species. A list of threatened and endangered species from the USFWS Information for Planning and Construction (iPAC) website that might be found in the project area is contained in Appendix B.

Other agencies, such as the New Mexico Department of Game and Fish (NMDGF) keep their own list of species they deem as being sensitive, threatened, and/or endangered. The NMDGF Biota Information System of New Mexico (BISON) website provides detailed information about endangered, threatened, candidate and other species, as well as habitat information, for SFC. This list is provided in Appendix B.

Projects using Federal funds, such as the Drinking Water State Revolving Fund (DWSRF), normally require an environmental study to assess and mitigate environmental impacts. Nearly all projects completed by the District with DWSRF funds have taken place within disturbed areas such as roadways and developed sites. In these cases, the District submits a categorical exclusion checklist that allows the environmental study to be waived.

2.2.6 Geology

Eldorado is located in the northeastern portion of the southern Santa Fe Embayment of the Española Structural Basin. This embayment, also known as the Galisteo Basin, is located south of I-25 to Galisteo Creek and between the Sangre de Cristo Mountains and the Cerrillos Hills. This area is a relatively undeformed block of sedimentary rocks that is the northern extension of the Estancia Basin Syncline, with the Cañoncito-Tijeras Fault System separating the Estancia and Galisteo Basin depressions (Grant, 1998[1]). The Cañoncito-Tijeras Fault System defines the Galisteo Creek valley through the embayment and north to the community of Cañoncito. The Sangre de Cristo Mountains are bounded on the west by steeply dipping, north-northwest trending, down to the west normal faults. The Seton Village Fault and the Hondo Fault bound the southernmost exposures of the Precambrian crystalline basement rock. Cañada de Los Alamos arroyo is developed along a fault or fracture zone parallel to the trace of the arroyo.

[1] Grant, P.R. 1998. "Subsurface Geology and Related Hydrologic Conditions, Santa Fe Embayment and Contiguous Areas, New Mexico." Hydrology Bureau Technical Report 97–5. 53 pp.

Aerial photography and local surface exposures of bedrock show strong northeast and northwest fracture patterns that relate to larger, regional scale structures.

Subsurface formations include Quaternary / Tertiary Ancha-Tesuque, Tertiary Espinaso / Galisteo, Permian Sangre de Cristo, Permo-Pennsylvanian fractured Madera limestone and Precambrian fractured crystalline granite. Where these formations are water bearing, they serve as aquifers that provide water to supply wells. Primary water-bearing formations supplying water to District wells include the Ancha-Tesuque, Madera and Precambrian granite.

Further descriptions, maps and cross sections of the planning area geology are provided in Appendix C.

2.2.7 Watersheds and Floodplains

Review of the National Wetlands Inventory via the USFWS has identified that no registered wetlands exist in the planning area.

The Federal Emergency Management Agency (FEMA) designates flood-prone areas throughout the United States and provides those data to the public for planning purposes. Flood zones are delineated by a classification system that evaluates the potential for an area to experience flooding. The EAWSD resides in two separate flood zone categories, Zone A and Zone X. Zone A is considered an area of which that is prone to 100-year flooding events, while Zone X is classified as an area with a moderate risk of flooding, typically somewhere between the 100 and 500-year flooding events.

Appendix A contains a map of FEMA flood zones in the planning area. Running directly across the northernmost service boundary is Gallina Arroyo, an east-west travelling stream that resides within a FEMA distinguished flood plain classified as Zone A. Galisteo Creek, also classified as a Zone A flood plain, is a stream that travels southwest through the service area alongside the railroad tracks near the intersection of US-285 and State Road 41. District water system components that lie within the Zone A flood plain include, Wells 3, 8, 9, 10, 12, and 17. Well 19 is directly adjacent to a Zone A flood plain, with the associated well house encroaching about 12 feet into the floodplain.

Originating in the foothills, are multiple streams that run through the planning area to the most southern extent of the Sangre de Cristo Mountains. The Cañada de los Alamos Arroyo is the most prevalent watercourse that exists throughout the planning area and runs parallel to US-285 from the intersection of I-25 to Avenida Vista Grande and then east-west immediately south of Spur Ranch road. The Cañada de los Alamos Arroyo is designated in the Zone A flood plain, while tributaries of this river and surrounding areas are all situated within the Zone X flood plain.

2.2.8 Historic Sites

The State of New Mexico's Department of Cultural Affairs Historic Preservation Office (SHPO) is responsible for overseeing all archeological, historical, and architectural artifacts and their preservation in the State of New Mexico. The National Historic Preservation Act (NHPA) defines the responsibilities of SHPO for these sites that are listed on the National Register of Historic Places. Any archaeological clearances that may be required for construction within the planning area would require a notification to the SHPO to obtain proper clearances. Similar to environmental studies, Federal funded projects undertaken in disturbed areas often are allowed to proceed without a cultural study if a categorical exclusion form is submitted with the funding request and accepted by the funding agency.

2.3 Future Growth

2.3.1 Population Trends

For planning purposes in this UMP, population projections will be evaluated in two ways:

- United States Census Data.
- Planned Developments and Infill.

2.3.1.1 United States Census Data

United States Census data for the Eldorado CDP (see Figure 2-1) is presented in Table 2-1. The population grew by about 0.54% per year from 2000 to 2010 but fell by -0.21% per year from 2010 to 2020. This trend appears to be reversing, however, with numerous residential developments undergoing construction in 2021 and 2022. To estimate future growth, we use the 2000 to 2010 rate to project population from 2020 to 2040.

TABLE 2-1
UNITED STATES CENSUS DATA

YEAR	2000	2010	2020
POPULATION	5,799	6,130	6,005
GROWTH RATE	-	0.56%	-0.21%

The Eldorado CDP does not cover the entire service area covered by EAWSD. Therefore, a more accurate estimate of the population can be made from the District's inventory of single-family residence (SFR) meters. The 2020 Gallons-per-Capita-per-Day (GPCD) Calculator, prepared annually for the NMOSE as a water permit condition, reports an average of 3,034 SFR connections in 2020. The United States Census estimates the average number of persons per dwelling unit in Eldorado is 2.02. These two numbers give a 2020 population of 6,129 persons. This value is used as the starting point in the projection of future population.

Utilizing a growth rate of 0.56% applied to the 2020 population results in a population projection of 6,849 persons within the planning area in 2040, or an increase of 720.

2.3.1.2 Planned Growth Areas

Another approach to estimating population growth is to assume that approved residential subdivisions within the planning area will build out and become occupied during the planning period, and that unimproved lots within developed areas also will be constructed and occupied (known as infill).

The District has identified six approved subdivisions with undeveloped lots, summarized below:

- Cimarron Village: 94 remaining undeveloped equivalent dwelling units of the 94 approved.

- Tierra Bello: 42 remaining undeveloped equivalent dwelling units of the 50 approved.

- Spirit Wind: 27 remaining undeveloped equivalent dwelling units of the 38 approved.

- Rancho San Lucas: 5 remaining undeveloped equivalent dwelling units of the 29 approved.

- Cielo Colorado: 13 remaining undeveloped equivalent dwelling units of the 42 approved.

- Mejor Lado: 14 remaining equivalent dwelling units of the 34 approved.

Figure 2-3 depicts a map of the EAWSD service boundaries and the location of these subdivisions within those boundaries. It should be noted that each of these subdivisions listed have made previous water service agreements with the utility provider. Assuming all of the undeveloped lots are built and occupied , a total of 195 new connections will be added to the District.

LAST MODIFIED: Jun 15, 2022 - 5:04pm BY USER: pdelarosa
DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
DWG. NAME: FIGURE 2-3 DEVELOPMENT AREAS.dwg

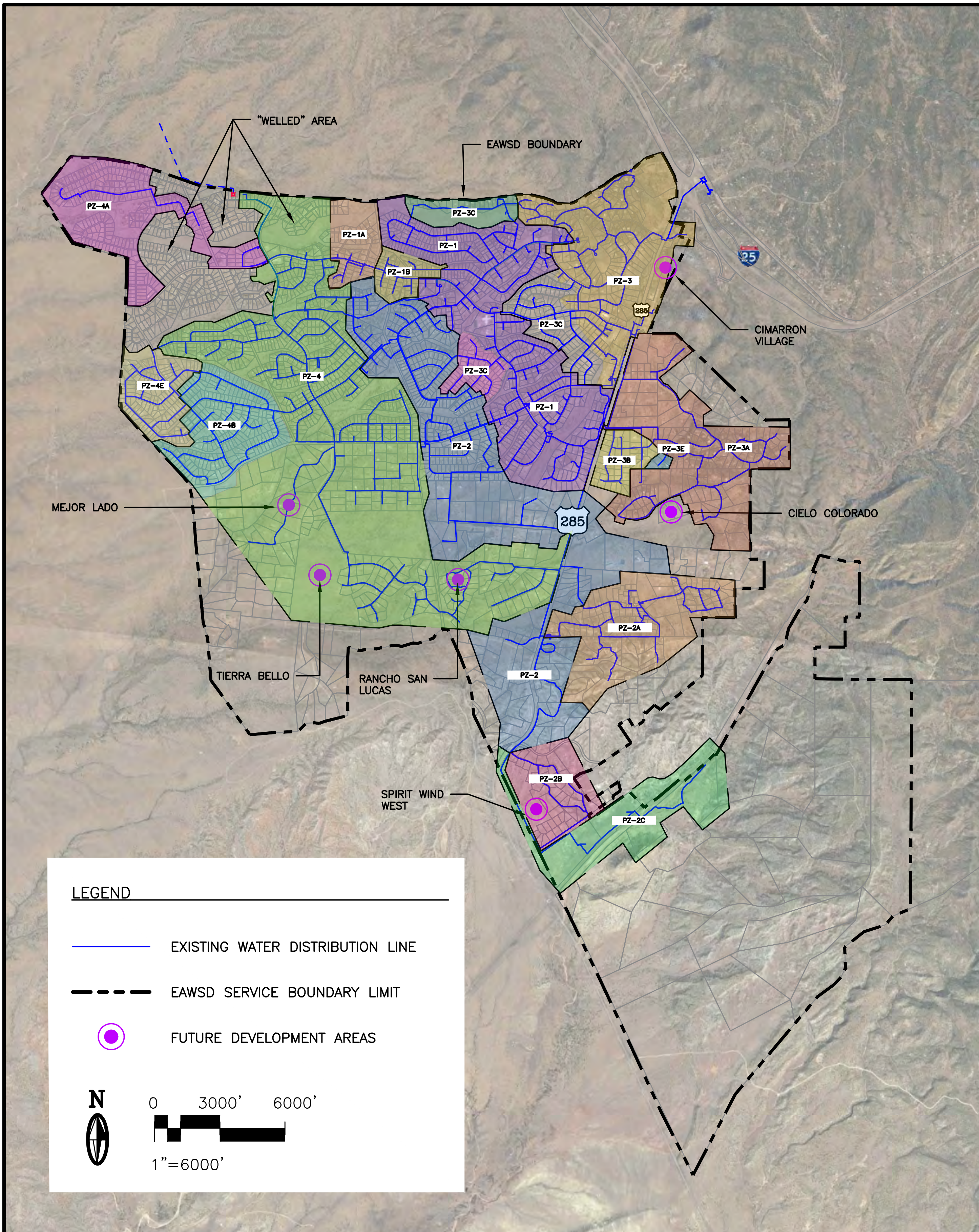

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Figure 2-3

EAWSD DEVELOPMENT AREAS

The District estimates that there are about 195 undeveloped lots within the already developed areas of the service area that are likely to be built up over the planning period. Thus, including additional homes in the approved subdivisions, a total of 390 new connections are anticipated within the planning period. The United States Census for the Eldorado CDP estimates 2.02 persons per dwelling unit, giving an increase in population of 788 persons. This value is higher, but generally in agreement with the projection based on past growth (720). For planning future water demands, we will use the higher growth value of 788. Thus the future population in 2040 is estimated to be 6,917. Table 2-2 and Figure 2-4 show population growth in tabular and graphic form.

TABLE 2-2
PROJECTED POPULATION

YEAR	POPULATION
2020	6129
2021	6168
2022	6208
2023	6247
2024	6287
2025	6326
2026	6365
2027	6405
2028	6444
2029	6484
2030	6523
2031	6562
2032	6602
2033	6641
2034	6681
2035	6720
2036	6759
2037	6799
2038	6838
2039	6878
2040	6917

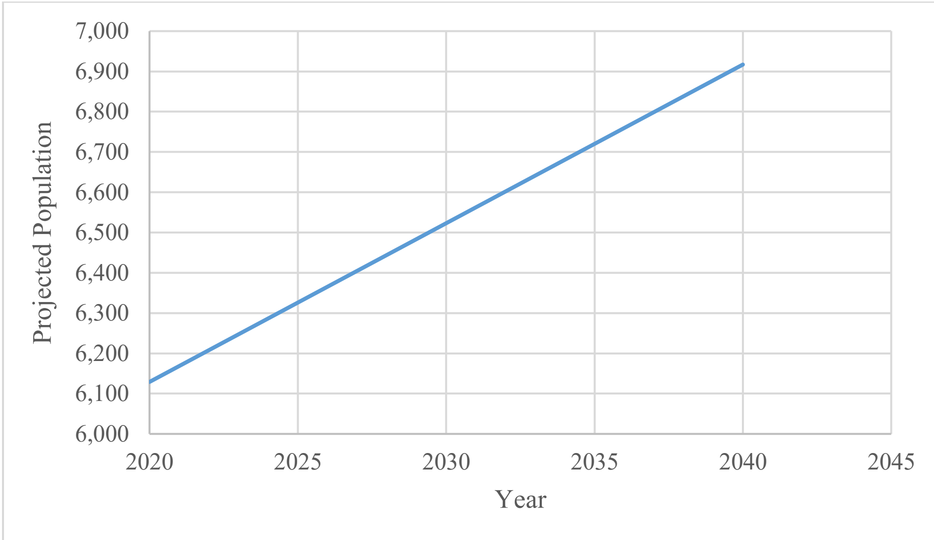


FIGURE 2-4
PLANNING AREA POPULATION PROJECTION

2.4 Water Use

2.4.1 Water Demand Factors

There are multiple design guidelines that highlight the anticipated usage of water for residential, commercial, and industrial customers throughout the United States. These types of literature are useful for estimating the expected daily water usage per person and where those demands are coming from. Table 2-3 below compares the distribution of residential indoor water use for typical levels of conservation and extensive conservation practices.

TABLE 2-3
INDOOR WATER USAGE IN THE UNITED STATES[1]

USE	FLOW (GPCD), WITH TYPICAL LEVELS OF CONSERVATION	FLOW (GPCD), WITH EXTENSIVE LEVELS OF CONSERVATION
Bath	1.2	1.2
Washing Clothes	15.0	9.5
Dishwashing	0.9	0.7
Faucet	10.4	6.9
Shower	11.7	6.9
Toilet Flushing	18.2	8.2
Other Domestic	1.4	1.4
Leakage	6.2	6.0
Outdoor Use	35.0	24.2
TOTAL USAGE:	**100.0**	**65.0**

[1] *Wastewater Engineering Treatment and Resource Recovery*, Fifth Edition, 2014 (Metcalf & Eddy / AECOM)

Devices and applications used to reach the levels of extensive indoor conservation highlighted in the table include faucet aerators, flow-limiting shower heads, low-flush toilets, pressurized showers, toilet dams, toilet leak detectors, vacuum toilet systems, and installation of water efficient appliances. Outdoor conservation can be achieved with reduced and/or xeriscape plantings, rooftop catchment systems for irrigation and outdoor water use restrictions.

2.4.2 Gallons per Capita per Day (GPCD)

The EAWSD utilizes spreadsheets to track the usage of water for all billed customers throughout the service area. These spreadsheets track SFR and Industrial, Commercial, and Institutional (ICI) annual use in gallons, the number of connections served during the period, and the overall water use in gpcd for the years 2016 through 2020. Data for the 2021 gpcd were not available for this 2022 UMP. The data in these spreadsheets were utilized to extract a prediction of the current average water usage for the service area, Table 2-4 summarizes these data and provides a calculation of population served (based on 2.02 persons / DU) and gpcd. The average metered gpcd is 65. However, this does not include non-revenue water (NRW). NRW consists of leaks, breaks, theft, and other unaccounted water losses. The District estimated the NRW averages about 9%. Therefore, to calculate overall water use including NRW, gpcd is increased by 9% to 71.

2.4.3 Current and Projected Future Demands

Table 2-5 provides a summary of current and projected water use based on population projections and gpcd. The following peaking factors are utilized for estimating peak day and peak hour demands:

- Peak day factor = 2.24 based on District water use data.
- Peak hour factor = 3.1 based on design guidelines.

Future peak day water demands increase to over 1 million gallons per day (MGD). Annual demand increases to 550 AFY.

TABLE 2-4
WATER USAGE DATA

YEAR	SINGLE FAMILY ANNUAL USE (GALLONS)	ICI[1] ANNUAL USE (GALLONS)	TOTAL USE (GALLONS)	SFR CONNECTIONS	POPULATION[2]	GPCD
2016	131,779,600	3,857,100	135,636,700	2,926	5911	63
2017	133,971,600	3,653,700	137,625,300	2,936	5931	64
2018	140,671,600	5,114,100	145,785,700	2,960	5979	67
2019	136,542,700	3,923,600	140,466,300	3,019	6098	63
2020	153,797,100	2,946,200	156,743,300	3,034	6129	70
AVG.	**139,352,520**	**3,898,940**	**143,251,460**	**2975**	**6,010**	**65**

[1]Industrial, commercial and institutional.
[2]2.02 Persons / dwelling unit (DU).

TABLE 2-5
SUMMARY OF WATER DEMANDS

DESCRIPTION	CURRENT	FUTURE (2040)	LITERATURE[1, 2]
Population	6,129	6,849	-
Average Per Capita Demand (gpcd)	71	71	65-100
Average Daily Demand (gpd)	435,000	491,000	-
Peak Daily Demand (gpd)	975,000	1,100,000	-
Peak Daily Factor	2.24	2.24	1.5-3.0
Peak Hourly Factor	3.1	3.1	2.5-4.0
Peak Hour Demand (gpd/ gallons per minute [gpm])	1,349,000 / 937	1,522,400 / 1,057	-
Yearly Demand (afy)[3]	487	550	-

[1]*Wastewater Engineering Treatment and Resource Recovery*, Fifth Edition, 2014 (Metcalf & Eddy / AECOM)
[2]*Water-Resources Engineering*, Second Edition, 2007 (David A. Chin)
[3]Current yearly demand is calculated based on recent average use. Actual diversions during 2020 were higher due to the pandemic shutdown and residents having to quarantine at home.

2.5 Community Engagement

EAWSD participates in community outreach by inviting the public to monthly board meetings, providing informational tables at local events, making presentations in local school classrooms, and providing periodic open houses for customers on specific topics of interest. It also maintains a comprehensive website (https://www.eawsd.org/) that provides information about customer service, billing and payment questions, rates and fees, District policies and procedures, District Planning Documents, water sources, water quality, water conservation information, current construction projects, emergency contact phone numbers, organizational structure of the water utility, and other important information for customers. Many of the technical reports and studies prepared for EAWSD are available for download from the website.

During planning and design of new facilities, EAWSD actively engages local homeowners associations to solicit their input, thus ensuring the project will meet community standards and have community support. Individual homeowners often are consulted during design to make sure any structures installed near their property are placed in an acceptable location. For certain projects that require significant disturbance of vegetation within easements along the roads, the District also has consulted with an association interested in preserving trees. These discussions often result in slight realignments or special construction methods to avoid unnecessary tree removals.

2.6 Permitting and Approval Requirements for New Projects

EAWSD secures approvals and permitting from various State, County and local governing bodies for infrastructure modifications and additions. A summary of the requirements of each level of government is provided in the following sections.

2.6.1 State of New Mexico

2.6.1.1 New Mexico Office of the State Engineer (NMOSE)

The NMOSE administers water rights in the state. EAWSD water rights holdings are described in its Partial License (License Nos. RG-18529 and RG-18556) and summarized in Section 3.3.3.9 of this 2022 UMP. Projects involving new wells, replacement wells or deepening of existing wells require a well permit from the NMOSE. The application process includes public advertisement with the potential for protest. Turnaround time for approval of a permit can be 6 months to 1 year without a protest, or many years if a protest is filed. Exploratory wells also require a permit, though no public notice is required. Under an exploratory permit, a well can be drilled, but not used to supply water for beneficial purposes until permitting is approved to add the well to an existing permit.

Typically, once a well is drilled, the permit conditions of approval require submittal to the NMOSE of the Well Record, a proof of well completion form, monthly metering and reporting of well diversions, and, if a replacement well, either permitting the old well as a monitoring well or plugging and abandoning it. The water well contractor is responsible for filing the Well Record; all other documentation or actions are the responsibility of EAWSD.

2.6.1.2 New Mexico Environment Department (NMED)

The Drinking Water Bureau (DWB) of the NMED regulates water quality in public water supply systems. Depending on the nature of the project, some water system improvements may need to be reviewed and approved by the DWB prior to construction, while others require only notification. Projects involving a new water source, storage, or treatment other than chlorine disinfection require review and approval. Turnaround time is from 30 days up to 120 days for proposed treatment that uses methods not currently considered to be best available technology. Projects involving over 1,000 feet of new or replaced pipe, replacement or addition of valves, pump stations, or chlorine disinfection only require notification to the DWB, as long as a registered New Mexico Professional Engineer in responsible charge of the project is employed or contracted by the water system. The following projects and activities are considered routine maintenance and do not require notification or review by DWB:

- Pipeline leak repair.
- Replacement of existing deteriorated pipeline, or addition of distribution pipeline, if such replacements or additions, or both, total less than 1,000 feet in any 60-calendar day period.
- Entry into a drinking water storage facility for the purposes of cleaning and maintenance.
- The replacement of chemical feed pumps and associated appurtenances.
- The replacement of electrical or mechanical equipment in an existing public water supply system; and
- The replacement of equipment or pipeline appurtenances with the same type, size and rated capacity (fire hydrants, valves, pressure regulators, meters, service laterals, chemical feeders and booster pumps including deep well pumps).

The DWB also requires project completion forms and Record Drawings to be submitted at the end of an approved project.

The NMED Construction Programs Bureau (CPB) administers funding for publicly financed projects. Plans and specifications for such projects must be submitted at about the 90% level of completion for review by CPB to ensure the project complies with the funding agency requirements. CPB remains involved during the construction phase, attending progress meetings, reviewing and approving change orders, and processing payment applications. The CPB also requires that certain closeout documents be submitted at the end of projects it is administering.

2.6.1.3 New Mexico Construction Industries Division (CID)

Building Permit Drawings must be prepared for all facilities to meet the New Mexico Construction Industries Division (CID) requirements for issuance of building permits. These Drawings typically include the following:

- Site Plan
- Foundation Plan
- Floor Plan
- Framing Plans and Roof Framing Plans
- Exterior Elevations
- Building Sections and Walls Sections
- Mechanical System
- Plumbing System
- Electrical System
- Structural Calculations Specifications

A CID certificate of occupancy is required prior to use of a building by the District.

2.6.1.4 New Mexico Department of Transportation (NMDOT) Utility Permit

Where a waterline runs parallel to and within a state road ROW or crosses US-285 or I-25, a utility permit must be acquired from the NMDOT.

The *Application for Permit to Install Utility Facilities within Public Right-of-Way* requires the following:

- Completed application form.
- Plan and profile of proposed parallel line or crossing.
- Archaeological and environmental clearances from NMDOT.

- Traffic Control Plan.
- Proof of insurance.

A meeting with NMDOT may be required. NMDOT typically requires trenchless (e.g., jack-and-bore) installation of all crossings.

2.6.1.5 New Mexico Department of Transportation (NMDOT) Railroad Crossing Permit

This permit is required wherever a waterline is proposed to cross the Santa Fe Southern Railway.

The *Application for Pipeline Crossing or Longitudinal NMDOT-Owned Railroad Right-of-Way Temporary Access / Occupancy Permit* requires the following:

- Completed application form.
- Detailed Construction Drawings.
- Proof of insurance.
- Commercial General Liability Insurance.
- Business Automobile Insurance.
- Workers Compensation and Employers Liability Insurance.
- Railroad Protective Liability Insurance.

A jack-and-bore or horizontal directional drilling installation is required.

Any utility installed parallel to NMDOT administered railroad must be placed at least 90 feet from the track centerline.

2.6.2 Santa Fe County (SFC)

SFC requires new facilities to be designed and constructed in compliance with the SFC SLDC, which became effective in January 2016. The SLDC is a planning and zoning document that stipulates permitted uses, setbacks, floodplain regulations, minimum lot sizes, allowable building heights, design guidelines, fence and wall regulations, etc.

Most of the EAWSD service area is zoned Rural Residential, Residential Fringe or Residential Estate. The SLDC permits the following uses in those zoning designations:

- Local distribution facilities for water, natural gas and electric power.
- Water tanks.
- Water wells, well fields and bulk water transmission pipelines.
- Water treatment and purification facilities.
- Water reservoirs.

The SLDC prohibits the following uses in those zoning designations:

- Warehouses.
- Truck storage and maintenance facilities.

A portion of the EAWSD service area falls in the US-285 South Highway Corridor District, a corridor that includes all land within 2,000 feet of US-285. The SLDC permits the following use in that district:

- Water treatment and purification facility.

The SLDC designates the following as conditional uses in the US-285 South Highway Corridor District:

- Local distribution facilities for water, natural gas and electric power.
- Water tanks.
- Water wells, well fields and bulk water transmission pipelines.

The SLDC prohibits the following uses in that corridor:

- Warehouses.
- Truck storage and maintenance facilities.

SLDC setback requirements include the following:

- No structures within 75 feet of a FEMA-designated floodplain.
- 25-foot setback from all arroyos.
- No driveways within 200 feet of an intersection.
- No structure within 150 feet of the edge of pavement of a highway.
- No structure within 100 feet of the edge of pavement of a highway, major arterial, or railroad.
- 25-foot rear and side yard setback.
- 10-foot front yard setback (except in Rural Residential where a 20 foot setback is required).
- 40-foot intersection sight-triangle setback.
- 30-foot driveway sight-triangle setback.

SFC requires the following permits:

- Land Development Permit – for any construction.
- Driveway access permit for construction of a driveway on a County Road.
- ROW Excavation / Restoration Permit for excavation within a County ROW.

The Land Development Permit requires an application form with sealed drawings attached and a meeting with the County Technical Advisory Committee (TAC). If any variances or conditional uses are requested, they can be approved by the Zoning Hearing Officer and the SFC Planning Commission at public hearings.

The TAC determines what studies, if any, are required for a permit to be issued. Typically, a Terrain Management Plan, Site Plan and Utility Site Plan are required. Other studies, such as a Traffic Impact Analysis or Environmental Impact Report may be required.

2.6.3 Local Homeowners Associations (HOAs)

EAWSD is a regional water utility serving about 27 individual and distinct communities within SFC. The largest of those communities is Eldorado at Santa Fe, represented by its Home Owners Association (HOA), the Eldorado Community Improvement Association (ECIA). ECIA requires that plans for new construction and remodels be submitted to the ECIA Architecture Committee for review. ECIA requires that construction comply with the Guidelines for Protective Covenants and Building Restrictions for Eldorado at Santa Fe. These guidelines address setbacks, architectural styles, paint colors, stormwater management, lot sizes, setbacks, walls and fences. HOAs representing other communities served by EAWSD have varying requirements for construction within their communities. As a local governmental body, EAWSD is not required to comply with HOA construction requirements and covenants; however, EAWSD works closely with the HOAs in its service area to meet the standards of each community to the extent possible.

2.6.4 Environmental and Archaeological Clearances

The New Mexico Cultural Properties Act prohibits the disturbance of cultural properties listed on the State Register of Cultural Properties, whenever a construction project occurs on “State land.” “State land” is defined in the Act as property owned, controlled or operated by a department, agency, institution or political subdivision of the state, which would include EAWSD. This requirement exists regardless of the funding source.

Typically, easements and disturbed areas have received a clearance in the past if they contain cultural sites. However, if the clearance is more than 5 years old, a renewal may be required. For all projects, verification should be made during the planning or pre-design phase that there are no listed cultural sites within the limits of excavation. If such sites are found to exist within the limits of the proposed excavation, an archaeological inventory may be required.

As described earlier, projects executed within disturbed areas (roadways, developed sites) usually receive a categorical exclusion and do not require any mitigation or special construction measures.

2.6.5 United States Army Corps of Engineers (USACE) 404 Permit

If a minimal excavation (such as a utility trench) is proposed across a waterway or arroyo, documentation must be produced to show that the area of disturbance falls below thresholds that trigger the requirement of an individual 404 Permit. The United States Army Corps of Engineers (USACE) issues such permits. Larger excavations may require a 404 Permit. Jacking and boring or horizontal directional drilling beneath a waterway avoids 404 Permit requirements.

3.0 EXISTING FACILITIES

The following Sections review the District's existing water infrastructure and evaluates their feasibility for continued use throughout the duration of this planning period.

3.1 Location Map

A map of the planning area can be seen on Figure 2-1 of this planning document. This map depicts the service area that the District encompasses, and defines the extent of each PZ within the system. The location and interconnection of water facilities are provided on Plates 1 and 2, located in the pocket of the hard copy version of this 2022 UMP.

3.2 History

Located in the Cañada de los Alamos Land Grant, the community of Eldorado's water system has been under the control and operation of EAWSD as a "quasi-municipal" public utility since December of 2004. Prior to this, the water system was managed and owned by the American Realty and Petroleum Corporation (AMREP) who began the residential development of Eldorado starting in 1969. The EAWSD was formed in 1997 to provide residents of the area with the prerogative power to dictate the future of their water system. Following years of arbitration between AMREP and EAWSD, the District Court ruled in the favor of the District and granted ownership and control of the water system to the EAWSD.

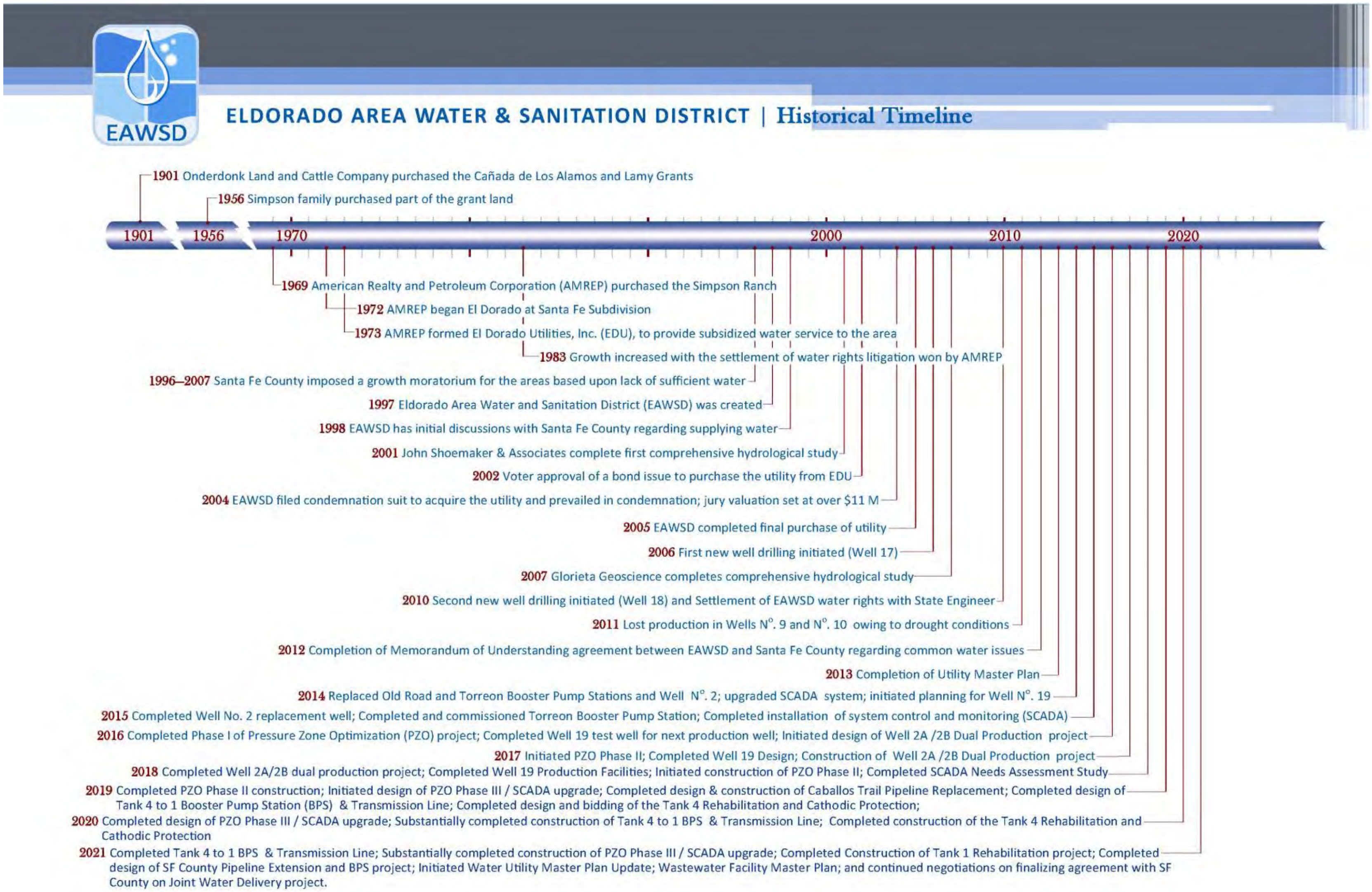
EAWSD began operating the water system in December 2004. Using funds raised by issuing a revenue bond in 2005, the District immediately began making infrastructure improvements critically needed to provide safe, reliable drinking water service to its customers. EAWSD has continued an aggressive capital improvements program to this day, supported by State and Federal grants and loans, as well as revenues from water sales and ad valorem tax proceeds. Since 2005, EAWSD has replaced one well and added four new wells to the water system.

Currently, the EAWSD and SFC are constructing an interconnection of the two water systems to supplement the District's water supply capacity and provide water to the community of Cañoncito. The EAWSD has replaced two booster pumping stations and installed a new one at Tank 4, is presently under construction with the SFC connection to Tank 4, completed two pressure zone optimization (PZO) projects, is currently upgrading its SCADA system, and replaced about 3,000 customer meters. Some of these recent projects are further described in the following sections.

In 2010, EAWSD resolved complex water rights issues and was granted a license from the NMOSE, which confirmed sufficient water rights for the District to meet water demand for the foreseeable future. EAWSD has developed a hydraulic model of its water system, has conducted a comprehensive hydrogeologic study of the aquifers it uses as sources of supply and has developed a *Water Conservation Plan*, a *Water Restrictions and Alert Management Plan,* an *Emergency Response Plan,* a *Utility Master Plan,* an *Asset Management Plan,* and a *Source Water Protection Plan.* It also conducts annual water quality reports and water audits.

Figure 3-1 shows a historical timeline for EAWSD, highlighting major events and infrastructure improvements.

FIGURE 3-1
ELDORADO AREA WATER & SANITATION DISTRICT HISTORICAL TIMELINE



3.3 Condition of Existing Facilities

3.3.1 Existing Facilities Overview

Phased construction of the EAWSD water system began about 50 years ago in the early 1970s. The *Reference Guide For Asset Management Inventory and Risk Analysis, undated*, (Southwest Environmental Finance Center) for drinking water, expresses 50 years as a typical service life for water supply infrastructure. In 2011, the EAWSD contracted a consulting firm who produced the *EAWSD Asset Condition and Risk Assessment Report*, 2011, (Jacobs Engineering, Inc.) for all components of the water system except for the below ground infrastructure. That report rated 74% of the systems components as either in a "good" or "very good" condition. Similarly, the NMED performed a Sanitary Survey of the water system in late 2011 and again in 2014 and 2017, and found no regulatory deficiencies within the system.

The EAWSD service area is split up into four primary pressure zones with corresponding tanks (e.g., Tank 3 serves PZ-3), and thirteen pressure sub-zones, (Figure 2-1 and Plate 1). The NMED recommends a pressure range of 35 to 80 psi at all points in a water system to provide adequate service pressure to homes, and to avoid excess pressures that may cause increased consumption and water leakage. Pressure zones and subzones are separated by pressure reducing valves (PRVs), closed zone valves, and a check valve.

Water is sourced exclusively from groundwater supply wells although that will change once the SFC interconnection is complete. Each of these wells, except for Wells 17 and 18, have a "point of use" sodium hypochlorite (chlorine) disinfection system at the well head. Wells 17 and 18 are combined and disinfected at the Tank 2 site. The District has 2.5 MG of total storage capacity provided by six above-ground storage tanks. These tanks are filled via a combination of well pumps and booster pumping stations depending on where they are situated within the service area. The delivery of this water is facilitated through a 131-mile distribution network comprised of 4- to 12-inch diameter piping. Most of the piping exists is 6- or 8-inch polyvinyl chloride (PVC). Asbestos-cement (AC) and ductile iron pipe (DIP) waterlines are found in the oldest parts of the system. Recommended pressures are maintained using 28 active PRV stations throughout the distribution network. Monitoring and automatic operation of the system is accomplished via the SCADA network. Photographs of selected system components are provided in Appendix D.

3.3.2 Related System Planning and Assessment Documents

3.3.2.1 Asset Management Plan (AMP)

The *Asset Management Plan (AMP)*, June 2019 (Jacobs Engineering, Inc.), also known as the "*2019 AMP*", was prepared in 2019 for the District. A summary of the Plan is provided below:

- In 2016 the first AMP was prepared to meet Water Trust Board (WTB) funding requirements. The *2019 AMP* extends and updates the 2016 plan.
- The *2019 AMP* recommends EAWSD organize an Asset Management Steering Committee (AMSC), Asset Management (AM) Team, and AM Champions.
- The AMSC is to develop a Strategic Asset Management Plan (SAMP).
- The EAWSD is to develop an Asset Management Policy.
- As of 2019, EAWSD had not developed an Asset Management System.
- Goal of AMP is to provide guidance for strategically planning maintenance and replacement of assets.
- The EAWSD has asset registry with inventory of water system vertical assets.
- The EAWSD also has asset map that is not linked to asset registry.

- Asset condition assessment (ACA) was conducted for 291 vertical assets. District will conduct an ACA of high-risk critical assets on annual basis. Important assets will be evaluated every 2 years and noncritical every 3 years.

- AMP recommends District undertake Asset Criticality workshops.

- AMP lists operating expenses and revenues from 2013 thru 2017, as well as energy costs and non-operating revenue and expenses.

- AMP lists assets and liabilities from 2013 through 2017.

3.3.2.2 10-Year Leak Assessment

The purpose of the *Desktop Condition Assessment & 10 Year Leak Report*, August 2020 (Jacobs Engineering, Inc.) was to evaluate existing data to compare EAWSD waterline leak and breaks to national averages to facilitate decision making on pipe replacement. A summary of the Report is provided below.

- The EAWSD experiences 3.8 main breaks per 100 miles per year. The national average is 14.

- The EAWSD serves 61 people per mile of waterline. The national average is 308.

- 123.34 miles of water mains serving 7,525 people

- 97% of the system is 8-inch diameter or less

- 91% of lines are PVC. Nationally PVC has the lowest rate of water main breaks.

- 6% of lines are AC pipe, most installed in 1970s.

- Study recommends replacing 4 miles of DI pipe.

- Study recommends replacing Standard Dimension Ratio (SDR) 26 and SDR 21 pipe.

3.3.2.3 Risk and Resiliency Assessment

The *Water System Risk and Resilience Assessment*, June 2021 (Jacobs Engineering, Inc.) was prepared for the EAWSD in 2021. Section 2013 of America's Water Infrastructure Act of 2018 (AWIA) requires community water systems that serve more than 3,300 people to complete a risk and resilience assessment and develop an emergency response plan (ERP). A summary of the Assessment is provided below:

- The Assessment identified the following critical assets:
  - All tanks.
  - Wells 2A/2B, 14, 15 17, and 18.
  - BPS 1, 2, Torreon, and ORR.
  - Administration Building.
  - District and Jacobs servers and networks.
  - SCADA.
  - 6-inch and 8-inch waterlines.
  - Representative pressure reducing valve (PRV).

- The Assessment identified the following threats:
  - Malevolent.
  - Natural hazards.
  - Dependency hazards (loss of key employee).
  - Proximity hazards.

- The highest threats include:
  - Cyber process sabotage to Wells and BPS 1 and 2.
  - Physical process sabotage / theft to all Tanks and BPS 2.

- The risk values for all of the above ranges $56K to $62K per year.

- The Assessment made the following recommendations:
  - Security training.
  - Valve exercise program.
  - Cross connection control program.
  - Intrusion detection on doors and tank hatches.
  - Business continuity plan.
  - Pole mounted security cameras.
  - No trespassing signage.
  - Improve fencing at certain sites (especially Tank 2).
  - SCADA upgrades (in work).
  - Fire inspections and access for fire department.
  - Confined space training and evacuation guidance.

3.3.2.4 Emergency Response Plan (ERP)

The *Emergency Response Plan*, December 2021 (Jacobs Engineering, Inc.) was prepared for the EAWSD as part of the requirements of the AWIA. A summary of the document is provided below.

- The purpose of the ERP is to provide the EAWSD with a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin.

- The ERP fulfills the requirements of ERP development under the authority of the U.S. Environmental Protection Agency (USEPA) and as required under Section 2013 of the AWIA.

- ERP is to be updated every 5 years or as incidents occur, personnel changes, or laws and regulations change.

- The ERP lists partner agencies that would be involved in an incident, such as first responders, County, State and federal agencies, and other water systems for potential mutual aid agreements.

- The ERP provides general descriptions of water system layout and operation.

- The ERP identifies critical system components, EAWSD operations and administration headquarters, all storage tanks, and top four Wells (14, 15 17 and 18).

- Identifies alternate emergency water sources.

- Lists equipment that may be needed during emergencies.

- Lists critical equipment and parts, such as VFDs, pumps, transducers and rebuild kits for which the District should have spares on hand.

- Sets forth an incident command structure.

- Sets forth an incident response process.

- Sets forth communication procedures.

- Provides and assessment of potential risks and hazards and the likelihood of occurrence.

- Provides ERPs for specific incidents and lists response tasks.

3.3.2.5 Water Conservation Plan

Glorieta Geoscience, Inc. prepared the *Water Conservation Plan of The Eldorado Area Water & Sanitation District* in February 2015. A summary of the document is outlined below:

- The NMSA requires public water suppliers diverting more than 500 AFY to submit water conservation plan to the NMOSE (“covered entity”).
- At the time the *Water Conservation Plan* was prepared, the District served 2,950 customers and 50 commercial connections.
- The EAWSD diverted an average of 493 and max of 498 AFY from 2011 to 2014 – not a covered entity.
- The 2010 census for the Eldorado area estimates a population of 6,130 with 3,100 housing units.
- Non-revenue water in 2014 was 10.6% by volume.
- Apparent losses 3.6 MG per year, real losses 10.002 MG per year, total losses 13.658 MG per year.
- Residential gpcd was 68.47 in 2014.

3.3.2.6 Water Restrictions and Alert Management Plan

The EAWSD published the *Water Restrictions and Alert Management Plan* in August 2014. The purpose of the Plan is to “…set out the various stages of water alerts, the triggers for those alerts, and the measures, including restrictions on water use, that will be enforced during alert stages.” A summary of the Plan is provided on the following page.

- Stage 0 – Normal Conditions:
  - Wells and tanks can meet demands.
  - Customers practice normal conservation measures.
  - Metered water sales ok.
  - Water use of more than 10,000 gallons per month in May through August will be charged a conservation surcharge.

- Stage 1 – Guarded Conditions:
  - Water supply may not be able to keep up with demand, well(s) off line, tank(s) declining, line break, and/or high demand.
  - Outdoor watering restricted to two or three days per week and only between 6:00 p.m. to 9:00 a.m.
  - No watering lawns and no new plantings.
  - No washing driveways, patios, and/or cars.
  - No filling pools or fountains.
  - No water sales from hydrants except existing Contracts if they allow.
  - Enforcement: Upon third warning water is turned off.

- Stage 2 – Severe Conditions:
  - Tank levels cannot be maintained above 60-70% full.
  - Outdoor watering one day per week.
  - No planting or filling of pools.
  - No water for customer construction.
  - Enforcement: Upon second warning water is turned off.

- Emergency Conditions:
  - Situation that places system integrity at risk.
  - Stages 1 and 2 conservation measures are mandatory.

- Tables at end of document provide guidelines for storage tank levels and triggers for water conservation stages

3.3.2.7 EAWSD Monitoring Plan Annual Report 2020

The *EAWSD Monitoring Plan Annual Report 2020*, October 2021 (Glorieta Geoscience, Inc.) summarizes water level measurements in monitoring wells throughout and near the District boundary and is submitted annually to NMOSE as a requirement of their well permit. A further summary of the Report is provided below.

- Water levels from 22 wells are measured and recorded each month. Some wells are in service, others are off-line or are dedicated monitoring wells.

- Most wells show a decline in the last 5 years, ranging from a fraction of a foot to over 13 feet per year (OW 18).

- The highest decline is in the fractured granite aquifer (Wells 17 and 18).

- The lowest decline is in the cavernous limestone (Wells 14 and 15).

3.3.3 Water Supply

3.3.3.1 Wells and Aquifers

The existing water supply for the EAWSD is comprised of 18 production wells spread throughout the service area. Of the 18 wells that have been drilled, there are currently 10 that are operable (9 active and 1 standby) and can be used to supply the District's water demands. In addition to these water production wells, the District maintains 16 stand-alone, unequipped domestic monitoring wells for level and water quality analysis.

The entirety of the utilities production wells are situated in four distinct geological formations; Ancha-Tesuque, Madera Limestone, Fractured Granite, and Galisteo Creek Alluvium. The location of the production wells within these formations is as follows:

- Ancha-Tesuque: Wells 1, 2A, 2B, 3, 4, 5, 6, 7, and 8.
- Madera Limestone: Wells 13, 14, and 15.
- Precambrian Fractured Granite: Wells 12, 17, and 18.
- Galisteo Creek Alluvium: Wells 9 and 10.
- Madera Limestone and Precambrian Fractured Granite: Well 19.

The *EAWSD Asset Condition and Risk Assessment Report*, 2011, (Jacobs Engineering, Inc.) highlighted the physical conditions of Wells 2, 3, 5, and 12 as "very poor" and in need of complete rehabilitation for continued use. Well 2 has since been redeveloped and is now known as Well 2A.

3.3.3.2 Inactive Wells

Of the District's 18 wells, there are 8 that have been deemed inactive because they no longer produce water to meet the District's demands. Table 3-1 below lists these inactive wells and provides details of their construction.

TABLE 3-1
INACTIVE EAWSD PRODUCTION WELLS

WELL	NMOSE WR FILE #	STATIC WATER LEVEL (FT)	TOTAL WELL DEPTH (FT)	WELL CASING DEPTH (FT)	CASING DIAMETER (IN)	SCREENED AREA(S) (FT BELOW GROUND)	YEAR DRILLED
1	RG-18528	174.7	786	700	10.75	350-700	Pre 1969
3	RG-18543	72.9	325	320	10.75	113-324	1970
4	RG-18550	N/A	375	365	10.75	76-365	1970
5	RG-18515	109.7	192	192	6	N/A	Pre-1969
6	RG-18571	223.9	280	280	8.625	220-260	1982
10	RG-18524	46.3	100	97	10.625	30-90	1995
12	RG-18517	74.7	197	197	6	N/A	Pre-1969
13	RG-18529-POD2	N/A	1,000	340	6.625	160-200; 210-290	1995

Well 1, situated at the edge of the district boundary in a spot of low elevation not only has economical disadvantages with delivery, but contains arsenic concentrations above the maximum contaminant limit (MCL) of 10 ppb established by the EPA. Wells 3, 4, 5, and 12 are all more than 50 years of age and have all experienced poor production rates and low water levels. Well 13 is hydraulically tied to both Wells 14 and 15, essentially forcing them to operate as one individual well. Well 10 was taken out of service due to excess sand production, thought to be caused by a casing or screen rupture. In summary, each of these wells has been deemed unusable due to either economical or operational issues.

Well 6 was previously operated as an intermittent production well, EAWSD halted the pumping from the Well in April of 2012 due to insufficient water levels in the aquifer. It is currently unknown if the water levels within the aquifer will recover. Consequently, Well 6 is assumed to be inactive and is excluded from any future considerations for the purpose of this planning period.

3.3.3.3 Active Wells

The District maintains and operates nine active wells that are utilized to provide clean potable water to the customers within the service area. Of these nine active wells, two (Wells 15 and 18) supply over 50% of the District's demands,. Conversely, there are two of these wells that produce less than a combined total of 3% of the water demands, Wells 7 and 8. Five active wells (Wells 2A, 2B, 9, 14, and 17) supply approximately 42% of the District's water demands. Well 19 is not used due to high iron and manganese levels. Mitigating the issue requires installation of an expensive filter system, so the District has opted to put this well on standby status for now. As other District wells decline in capacity, it may become necessary in the future to invest in treatment to allow this well to be used for supply. Table 3-2 lists each of the District's active wells and provides construction details.

TABLE 3-2
ACTIVE EAWSD PRODUCTION WELLS

WELL #	NMOSE WR FILE #	STATIC WATER LEVEL (FT)	TOTAL WELL DEPTH (FT)	WELL CASING DEPTH (FT)	CASING DIAMETER (IN)	SCREENED AREA(S) (FEET BELOW GROUND)	YEAR DRILLED	AGE (YEARS)
2A	RG-18529-POD1	160.2	315	154	10.75	154-168; 178-260; 263-294	1997	25
2B	RG-18529-POD3	157.8	290	170	8.625	170-230; 260-280	2014	8
7	RG-18595	188.3	280	268	8.625	185-212; 234-250	1982	40
8	RG-18531	62.7	325	312	8.625	165-215; 268-278	1983	39
9	RG-18556	49.9	161	134	10.75	46-114	1984	39
14	Supplemental	259.1	430	385	8.625	235-315; 345-385	1996	24
15	Supplemental	235.3	420	401	8	287-407	1996	24
17	Supplemental	71.7	675	647	6.625	396-457; 497-637	2007	15
18	RG-88451	95.4	713	710	8.625	420-700	2011	11
19[1]	RG-95577-EXPL	150	980	970	6.625	384-524; 567-687; 708-768; 790-970	2016	6

[1] On standby status until filter system installed in the future.

Well 2B was drilled in 2014, and was originally intended to replace Well 2 due to declining production. However, subsequent development and testing indicated that Well 2 could be equipped with a smaller pump and continue to be productive. The well was renamed Well 2A. Wells 2A and 2B are capable of producing 120 gpm while operating simultaneously. Each of these wells also have the ability to operate independently and both of them pump into Tank 4. These wells are permitted by the NMOSE as additional points of diversion under EAWSD's Partial License.

Wells 7 and 8, both drilled in the early 1980s, are productive throughout the year and account for less than 3% of the total water production.

Prior to the *2017 UMP*, Well 9 had not produced water for the District since December of 2010 and January of 2011 respectively. Drought conditions in the Galisteo Creek watershed and little to no run-off into the alluvium led to conditions that restricted the operation of this well. Since the *2017 UMP*, Well 9 has been utilized in 2017, 2018, 2019, and 2020 to provide supplemental water into the service area. However, drought conditions in 2021 precluded the use of the well. This well is permitted to produce up to 200 AFY of water from the Galisteo Creek alluvium by the NMOSE Partial License.

Wells 14 and 15 are some of the District's most productive wells, producing a combined total of about 25% of the water supply. The two wells are hydraulically interconnected via caverns and fractures within saturated Madera Limestone that essentially cause them to operate as a single well. The operation of these wells is an essential piece to the District's ability to provide clean water to the service area. Any disruption in the ability of these wells to produce clean water will have a major impact on the District's supply.

Wells 17 and 18 were drilled in 2007 and 2011 and are highly productive wells, producing a combined total of about 53% of the water supply. Any disturbance in the operation of these wells will have major implications on the District's ability to provide safe clean drinking water to their customers.

Well 19 went into production following the completion of construction in 2018. The well produces antimony above the MCL and utilizes a blending system that draws water from Tank Zone 2 to blend and reduce antimony levels. Within a month of placing the well online, iron and manganese levels increased, leading to stained appliances, customer complaints, and eventually, shut down of the well. The District contracted with MC to conduct pilot scale studies to evaluate the feasibility of a treatment system to reduce the iron and manganese levels. However, the expense of the water system (both capital and operating costs) has led the District to put design on hold.

In 2022, the District executed a zone chemical sampling study in Well 19 to determine if the iron and manganese is concentrated in one of the productive intervals. If this was found to be the case, it may be possible to cement off the interval and improve the quality of the water enough to avoid having to use filtration. However, the results of the study were ambiguous and did not conclusively point to any one zone having higher levels of iron or manganese.

TABLE 3-3
WELL PRODUCTION FOR 2020

WELL	PUMPING RATE (GPM)	TOTAL PRODUCTION (ACRE-FEET)	PRODUCTION AS A % OF TOTAL PRODUCTION
2A	65	30.00	5.8
2B	65	36.08	7.0
7	25	6.97	1.3
8	25	6.99	1.4
9	180	32.71	6.3
14	150	34.05	6.6
15	240	96.30	18.6
17	90	83.18	16.1
18	200	190.32	36.8
19[1]	70	0.43	0.10
Total	**1,113**	**517.03**	**100.00**

[1]Well 19 was only pumped for periodic flushing to waste.

3.3.3.4 Santa Fe County (SFC)

The District and SFC have entered into a Memoranda of Understanding (MOU) regarding regionalization and mutual use of the County water supply. The First MOU was signed October 12, 2012 and provided, among other things, that the District and County would work toward a subsequent agreement for the County to provide water to the District from its portion of the Buckman Direct Diversion (BDD). The Second MOU, signed August 28, 2018, is the "subsequent agreement" and provides more specific details of water service and cost sharing. Specifically, the Second MOU stipulates that the County will provide water to the District from the BDD, and the District will move part of the County water through its system to County water customers east of the District. The project benefits both entities by: 1) Providing an alternative source of water to the District, allowing their wells to recover and prolong the life of the source aquifers; 2) Providing the County access to the District's existing infrastructure to convey water to its customers, thus reducing the length of transmission lines and overall costs; and 3) Providing a source of potable water to County residents in Cañoncito, whose supply is contaminated with radionuclides. The MOU stipulates that any cost savings are to be shared between the two parties.

In 2021 the parties signed a temporary Water Delivery Agreement (WDA) that set forth delivery flows and volumes, cost sharing, wheeling rates and water quality requirements for water delivered from the County to the District, and from the District to Cañoncito.

This water would be conveyed from the County's Rancho Viejo Tank to a point of connection at the EAWSD's Well 2A / 2B site where it would enter the water system, be utilized as needed, and would ultimately be conveyed to a County connection point just outside of the service area on the east side. The County supply is diverted from Rio Grande at the BDD plant, treated at the Buckman treatment facility, and conveyed into the County system. As an alternative source, the County has engaged in a project to permit and equip an existing well near the Santa Fe Community College and pump it into County waterline. The District has agreed to share some of the initial costs of this project, as it will provide a more secure source during times of drought.

To facilitate this conveyance, the District has constructed or is currently constructing water system improvements, including transmission lines, pumping stations, and storage tank improvements for water quality treatment. These improvements are described in later sections covering booster stations, transmission lines and water treatment. The MOU identifies the agreed-upon flows and volumes that would be delivered to the District for use and what the District would be required to supply to Cañoncito accordingly. A summary of the flows and volumes are outlined in Table 3-4.

TABLE 3-4
MOU DESIGN FLOWS

	INITIAL DISTRICT WATER DEMANDS	ULTIMATE DISTRICT WATER DEMANDS IN THE NEXT 20 YEARS
VOLUME	up to 100 afy	up to 300 afy
AVG. FLOW RATE	100 gpm	200 gpm
PEAK FLOW RATE	200 gpm	400 gpm
	INITIAL COUNTY WATER DEMANDS	ULTIMATE COUNTY WATER DEMANDS IN THE NEXT 20 YEARS
VOLUME	up to 25 afy	up to 75 afy
AVG. FLOW RATE	15 gpm	50 gpm
PEAK FLOW RATE	45 gpm	100 gpm
	INITIAL AMOUNT DELIVERED AT DISTRICT BOUNDARY	ULTIMATE AMOUNT DELIVERED AT DISTRICT BOUNDARY IN THE NEXT 20 YEARS
VOLUME	up to 125 afy	up to 375 afy
AVG. FLOW RATE	115 gpm	250 gpm
PEAK FLOW RATE	245 gpm	500 gpm

3.3.3.5 Production Capacity and Ability to Meet Demands

The *Construction Programs Bureau Recommended Standards for Water Facilities*, 2006 Edition (NMED) recommends that water systems should have adequate capacity to meet average daily demand with the largest source out of service and to have adequate sources to meet peak daily demand. These guidelines should be met both in the system as a whole and within each individual PZ. EAWSD's ability to meet the guidelines for the system as a whole are addressed in this Section, while individual pressure zones are addressed in Section 4.0 Hydraulic Evaluation.

3.3.3.5.1 Average Demand

To evaluate the average demands that the EAWSD water system is capable of delivering we estimate daily production of each well assuming the District's Best Operating Practice (BOP) of running the wells no more than 60% of the day (14.4 hours per day). This BOP allows a rest period between run cycles, allowing water levels to recover. Table 3-5 below summarizes the average daily production capacity of the water system on a well-by-well basis and the system as a whole.

Wells 7 and 8 are typically operated only during peak demand or emergency periods due to their tendency to produce iron on start-up. For this calculation, however, they are assumed to be operating under average demand conditions. With all of the District's active wells operating, a production of approximately 1.1 MGD can be expected.

TABLE 3-5
EAWSD AVERAGE DAILY PRODUCTION

WELL	PUMPING CAPACITY (GPM)	NOMINAL PRODUCTION, GPD (60% OF THE DAY)	
2A	65	56,000	
2B	65	56,000	
7[1]	25	22,000	
8[1]	25	22,000	
9	180	156,000	
14	150	130,000	
15	240	207,000	
17	90	78,000	
18	200	173,000	
County Supply	250	216,000	
All Sources Operational:			1,116,000 gpd
Largest Source Out of Service (County Supply):			900,000 gpd
Dry Year Operations with Largest Source Out of Service (Well 9 County Supply Out of Service):			744,000 gpd
Current Average Day Demand:			435,000 gpd

[1]Typically used as a peaking well in high demand months of summer.

With the District's largest capacity source out of service (County Supply), the system is capable of delivering 0.9 MGD into the system. With a current average daily demand of 435,000 gpd (Table 3-4), EAWSD has adequate capacity to meet the current system average demands with the largest supply out of service and during drought.

To further complicate the operational challenges the District faces with the supply of water to the service area, Well 9 is frequently out of service due to its location in the shallow alluvial aquifer associated with Gallisteo Creek. In the years between 2011 and 2020, the District was able to pump water from Well 9 for 6 of those 10 years. As climate change continues to increase the frequency of droughts and scarcity of water, it can be expected that this well will be offline more regularly going into the future. With both Wells 9 and the County supply out of operation, the productive capacity of the system drops to 744,000 gpd, still an adequate supply to meet the District's current demands.

3.3.3.5.2 Peak Demand

To meet times of peak demand, the EAWSD can temporarily operate their wells at pumping cycles greater than the BOP established of 60% of the day. Although it is a possibility for these wells to be operated on a 24-hour cycle, it is not appropriate to expect a 100% production capacity to be sustained for long periods of peak demands beyond one week. To have a representational analysis of the system's capacity to meet peak demands, an operation cycle of 80% was utilized to evaluate expected production capacities from each individual well.

Table 3-6 evaluates the calculated peak daily production capacity of the District's wells assuming the extended operating schedule of 80% and other operating constraints associated with Wells 14 and 15. Wells 14 and 15 have a tendency to lose about 40% of their productive capacity after several weeks of relatively high production. Glorieta Geoscience, Inc., the District's hydrogeology consultant, describes the phenomenon as being caused by a hydrologic boundary in the limestone aquifer or possibly from dewatering of a productive fracture. The wells regain full capacity after an extended period of rest. The pumps in these wells are driven by VFDs that are controlled through the District's SCADA system to maintain the pumping water level about 5 feet above the pumps. When the capacity drop occurs, the VFDs reduce the pump speeds to compensate. The pump capacities listed in Table 3-5 for Wells 14 and 15 reflect the capacity loss.

TABLE 3-6
EAWSD PEAK DAILY PRODUCTION

WELL	PUMPING CAPACITY (GPM)	MAXIMUM PRODUCTION, GPD (80% OF THE DAY)
2A	65	75,000
2B	65	75,000
7	25	29,000
8	25	29,000
9	180	207,000
14[1]	90	104,000
15[1]	140	161,000
17	90	104,000
18	200	230,000
County Supply	250	288,000
All Sources Operational:		1,302,000 gpd
Dry Year Operations (Well 9 out of service):		1,095,000 gpd
Current Peak Day Demand:		975,000 gpd

[1] Wells 14 and 15 lose approximately 40% of their capacities when pumped for extended periods during peak demand.

As evaluated in Section 2.0, the current peak day demand of the EAWSD water system is about 975,000 gpd. The current peak production of the system is about 1.3 MGD with all sources operational and about 1.1 MGD during dry year operations. Although it is apparent that the system is capable of meeting the current peak demands, this situation is only attainable through pushing the system to its production capacity limits. In the event that the District's largest producing source (County Supply) is taken offline, the District would not be able to keep up with the current peak demands of the water system.

3.3.3.6 Future Well Decline and Production Capacity

Like most groundwater wells that are used for production, the EAWSD wells have experienced water level declines since they were drilled and put into service. The decline rates vary depending on hydrogeologic conditions, climate variations, other wells drawing from the same aquifer, and the well's own pumping. Appendix E contains charts showing the historic water levels in currently active EAWSD wells, along with projections of future water levels. The future water levels are projected using a groundwater model that was prepared by Glorieta Geoscience, Inc. for evaluating the effects of water permit applications made to the NMOSE. The current version of the model has undergone numerous recent modifications to meet NMOSE conditions for evaluating the impacts of Well 19.

The charts in Appendix E show both projected non-pumping and pumping water levels. The pumping water levels are based on observed well drawdown during pumping, which is assumed to remain unchanged over time[2]. The screened interval for each well also is shown, which we assume represents the productive interval. Utilizing this information, we estimate the future well capacity in 2040 based on the percentage of available screen (the length of screen below the pumping water level) in the future relative to today. Inherent in this estimate is the assumption that aquifer yield to the well is uniformly distributed across the screen. In other words, if half the screen is dewatered in the future, we would expect the well to have half the capacity. The calculations are shown on each chart in Appendix E and summarized in Table 3-7. Note that because the groundwater model does not simulate fractured aquifer response very well, a linear projection of historic water level declines was used for Wells 14, 15, 17 and 18. This may overstate the decline and loss of capacity, especially for Wells 17 and 18, but provides a conservative approach to estimating future production.

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[2] Well screens may be expected to clog over time, which can increase draw down due to pumping. The EAWSD implements a regular program of well rehabilitation to maintain maximum well efficiency and minimize pumping draw down.

TABLE 3-7
FUTURE WELL CAPACITY

WELL NO.	WELL CAPACITY, GPM	REMAINING PERCENT CAPACITY IN 20 YEARS	FUTURE WELL CAPACITY, GPM
2A	65	80%	52
2B	65	80%	52
7	25	100%	25
8	25	100%	25
9	180	100%	180
14	150	67%	101
15	240	100%	240
17	90	43%	39
18	200	25%	50
19	70	100%	70

Table 3-8 provides a future daily average production for EAWSD water sources assuming operations 60% of the day. Well 19 is assumed to continue to be on standby status. County supply is delivered at the MOU future rate of 500 gpm. The District can produce about 1.1 MGD with all sources operating, 0.66 MGD with the largest source (County) out of service and 0.50 MGD with both the County and Well 9 out of service (drought). Under all these scenarios, the District is able to produce adequate water to meet future average demands, but only by a small margin.

TABLE 3-8
EAWSD FUTURE AVERAGE DAILY PRODUCTION

SOURCE	PUMPING CAPACITY (GPM)	NOMINAL PRODUCTION, GPD (60% OF THE DAY)
2A	52	45,000
2B	52	45,000
7	25	22,000
8	25	22,000
9	180	156,000
14	101	87,000
15	240	207,000
17	39	33,000
18	50	43,000

TABLE 3-8
EAWSD FUTURE AVERAGE DAILY PRODUCTION (continued)

SOURCE	PUMPING CAPACITY (GPM)	NOMINAL PRODUCTION, GPD (60% OF THE DAY)
County	500	432,000
All Sources Operational:		1,092,000 gpd
Largest Source Out of Service (County Supply):		660,000 gpd
Dry Year Operations with Largest Source Out of Service (Well 9 and County Supply Out of Service):		504,000 gpd
Future Average Day Demand:		491,000 gpd

Table 3-9 provides a summary of peak daily production from all District sources, assuming all sources are operated 80% of the time. Wells 14 and 15 are reduced to 60% production based on their loss of capacity observed during peak production. With all sources operational the District is able to meet the peak demand with existing sources. However, in dry years with Well 9 out of service, production falls short of meeting peak future demand. The shortfall is small (8,000 gpd) and can be met by operating supply sources longer than 80% of the time.

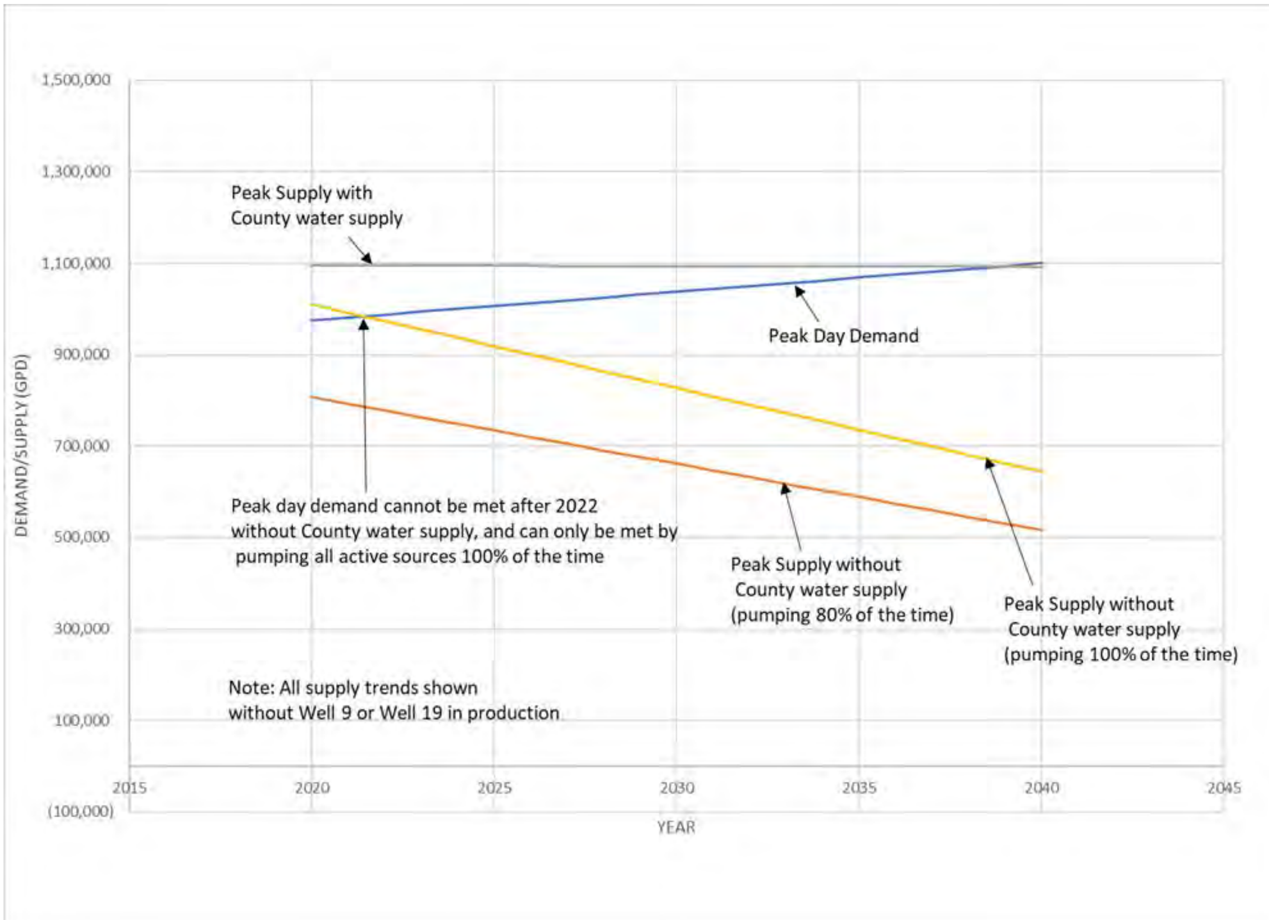
TABLE 3-9
EAWSD FUTURE PEAK DAILY PRODUCTION

SOURCE	PUMPING CAPACITY (GPM)	MAXIMUM PRODUCTION, GPD (80% OF THE DAY)
2A	52	60,000
2B	52	60,000
7	25	29,000
8	25	29,000
9	180	207,000
14[1]	60	69,000
15[1]	144	166,000
17	39	45,000
18	50	58,000
County	500	576,000
All Sources Operational:		1,299,000 gpd
Dry Year Operations (Well 9 Out of Service):		1,092,000 gpd
Future Peak Day Demand:		1,100,000 gpd

[1]Wells 14 and 15 lose approximately 40% of their capacities when pumped for extended periods during peak demands

Figure 3-2 shows a chart of growth in peak demand compared to peak supply. The chart shows that the District will have difficulty meeting peak demand after 2022, without the County supply. The graph of peak supply with County water does not account for increased peak supply from Wells 17 and 18 that is expected when those Wells are shut down and allowed to recover.

FIGURE 3-2
GROWTH IN PEAK DEMAND VERSUS SUPPLY



3.3.3.7 Well Pumps and Motors

Table 3-10 details the pumps and motors that are installed at each individual well within the service area. This table has been updated from the *2017 UMP* based on the best available information.

TABLE 3-10
EAWSD ACTIVE WELLS PUMPS AND MOTORS

WELL	PUMP MFG.	YEAR LATEST PUMP INSTALLED	PUMP CONDITION	PUMP MOTOR MFG.	HP	MOTOR CONDITION
2A	Franklin	2017	Very Good	Franklin	15	Very Good
2B	Franklin	2016	Very Good	Franklin	15	Very Good
6	Grundfos	2000	Poor	Franklin	7.5	Good
7	Grundfos	2008	Good	Franklin	5	Very Good
8	Grundfos	2008	Poor	Franklin	3	Good
9	Grundfos	2011	Good	Franklin	10	Good
14	Grundfos	2009	Poor	Franklin	40	Good
15	Grundfos	2016	Very Good	Franklin	60	Very Good
17	Berkley	2018	Very Good	Franklin	15	Very Good
18	Wolf	2018	Very Good	Franklin	50	Very Good
19	Grundfos	2017	Very Good	Franklin	40	Very Good

3.3.3.8 Water Quality

The EAWSD provides annual Water Quality (Consumer Confidence) Reports to the customers within the service area that are available for viewing on its website (https://www.eawsd.org/). These reports highlight any contaminant violations that have occurred within the system and detail the constituents identified within the water sampling program (including, total dissolved solids [TDS], hardness, chlorides, and nitrogen).

A summary of the water quality in active wells is provided in Table 3-11. Of the District's active and inactive wells, there are 5 of which that contain contaminants of varying concern. Well 19 has experienced high levels antimony, manganese and iron, Well 1 has been contaminated with levels of arsenic above the Maximum Contaminant Level (MCL) of 10 ppb, and excessive levels of iron have been identified in Wells 6, 7, and 8. Wells 1 and 6 are inactive wells as they have extremely low production capacities. Well 8 has extremely high levels of iron and can only be operated after an extensive flushing period of at least 24 hours and is only utilized as a backup supply. Wells 7 and 8 can be operated with shorter flushing cycles when operated simultaneously. As mentioned previously, Well 19 is in need of a cartridge filtration system that will reduce the levels of iron in the water. Appendix F contains water quality records.

TABLE 3-11
EAWSD WATER QUALITY SUMMARY

WELL	TDS (MG/L)	HARDNESS (MG/L AS $CACO_3$)	CHLORIDE (MG/L)	NITROGEN (MG/L NO_3)
2A	261	158	15.6	1.99
2B	264	150	15	2.00
7	250	158	9	3.72
8	335	190	36	2.00
9	450	230	30	0.71
14	302	160	26	3.20
15	270	170	20	2.40
17	364	200	42	1.90
18	385	200	45	1.80
19	255	170	13	ND

3.3.3.9 Water Rights

EAWSD holds NMOSE License Nos. RG-18529 and RG-18556 for diversions of up to 783.43 AFY with priority dates of 1968 to 1970. The license also grants the District the right to perfect an additional 254.37 AFY. Development of the first 127.19 AFY of these appropriative rights was to occur by January 31, 2021. The District did not produce enough water to place these appropriate rights to use by the deadline, so they were forfeited. The second 127.19 AFY of these appropriative rights must be perfected by January 31, 2031. A summary of the past 10 years of District water use is shown in Table 3-12.

The NMOSE license is included in Appendix G, along with other water rights and permit documents.

Well 19, though drilled in 2016, still has not been permitted by the NMOSE for diversion. The District applied for 115 AFY diversions from the well as part of the license but the NMOSE denied the amount citing impairment to nearby wells. Coordination with the NMOSE is ongoing for an acceptable reduced diversion amount.

In the early 2010s, the diversion of water had decreased significantly with the implementation of conservation measures, tiered (inclining block) water rates, and a summer conservation surcharge rate. Since 2017, the diversion of water has had minimal up and down spikes and has seemingly reached a point at which the conservation efforts have reached their potential reduction values. Diversions remain well within the permitted amount.

TABLE 3-12
SUMMARY OF EAWSD DIVERSIONS

YEAR	CENTRAL WELL FIELD PRODUCTION[1]	GALISTEO BASIN WELL FIELD PRODUCTION[1]	TOTAL[1]
2012	528	0	528
2013	500	0	500
2014	498	0	498
2015	453	23	476
2016	357	111	468
2017	427	52	479
2018	500	8	508
2019	376	90	466
2020	485	33	518
2021	498	0	498
Firm Water Rights:	583.23	200.20	783.43

[1]Acre feet (ac-ft)

The State of New Mexico (NMSA 72-1-9) provides for municipalities, counties, and member owned community water systems to acquire and hold unused water rights for a 40-year period provided such rights are not greater than their reasonable future needs. The NMOSE typically requires users to prepare and file a 40-year water plan (now called a Water Development Plan) containing projections of growth and water use over the 40-year period. The plan must be reviewed and approved by the NMOSE, and periodic updates may be required. The EAWSD does not have a 40-year water plan but having one may allow them to extend the period in which they must perfect the unused rights. It is recommended that the EAWSD prepare a 40-year plan (Water Development Plan) for review and approval by the NMOSE.

3.3.4 Water Storage

3.3.4.1 Storage Tanks

The EAWSD water system includes of six primary storage tanks with a numbering scheme that relates each tank to the PZ that they service (e.g., Tank 3 services PZ-3). In addition to these six primary service tanks, the District also operates a sub-tank at Well 9 that functions as a nurse tank for the Well 9 booster station. The main tanks are designed with a storage capacity of 2.53 MG of treated water. The actual total storage volume of the tanks is dictated by the elevations of outlet pipes and available freeboard above the overflow weirs in the storage tanks. Thus, the actual storage capacity of the system is around 2.36 MG, approximately 93.5% of the designed system capacity. Table 3-13 below relates each tank to the wells that supply them and provides basic design information of each tank.

TABLE 3-13
STORAGE TANK DETAILS

SITE	SUPPLY WELLS	DESIGN CAPACITY (GAL.)	EFFECTIVE CAPACITY (GAL.)	PRESSURE ZONE	YEAR INSTALLED	OVERFLOW ELEVATION (FT. MSL)
1, 1A	1, 3, 4, 5, 7, 13, 14, 15, 19	254,167 254,167	238,297 238,297	1 1	Pre-1990 1998	7,064
2, 2A	6, 8, 9, 10, 12, 17, 18	257,925 380,310	239,519 353,169	2 2	Unknown 1997	6,951
3	None	528,530	495,718	3	Unknown	7,206
4	2A, 2B, 14, 15, 19	853,020	799,758	4	1994	6,855

Table 3-14 lists average daily demand in each tank zone along with residence time and emergency reserve. Demand in each zone is calculated from the water model (see Section 4.0) based on average per capita daily demand and the distribution of meters in each PZ. Average daily demand ranges 16 to 21% among the tanks, implying 5 to 6.4 days of residence time. However, due to a lack of dedicated transmission lines, well water may be intercepted by water users enroute to the tanks, effectively increasing the water residence time. Good operating practices suggest maintaining water age in tanks of less than 5 days. An additional problem is short circuiting due to a lack of mixing. This problem is ongoing, as none of the storage tanks have been equipped with mixers to date.

TABLE 3-14
STORAGE TANK RESIDENCE TIME AND
EMERGENCY RESERVE (CURRENT DEMANDS)

	TANK 1	TANK 2	TANK 3	TANK 4	TOTALS
STORAGE CAPACITY (GAL.)	476,594	592,688	495,718	799,758	**2,364,758**
AVERAGE DAILY DEMAND (GAL.)	99,979	92,246	87,552	158,472	**438,250**
ADD AS % OF STORAGE	21%	16%	18%	20%	**-**
RESIDENCE TIME (DAYS)	4.8	6.4	5.7	5.0	**-**
2 DAY ADD EMERGENCY RESERVE (GAL.)	199,958	184,493	175,104	316,944	**876,499**
FIRE STORAGE (1,000 GPM X 4 HR / 4 TANKS) (GAL.)	60,000	60,000	60,000	60,000	**240,000**
STORAGE RESERVE	259,958	244,493	235,104	376,944	**1,116,499**
RESERVE AS % OF STORAGE	55%	41%	47%	47%	**-**

NMED recommends water systems maintain an emergency reserve in tanks to supply fire flows and “a volume of water for other unusual emergencies, such as primary power outages” (*Construction Programs Bureau Recommended Standards for Water Facilities*, 2006 Edition [NMED]). Two days of average demand and four hours of 1,000 gpm fire flow (240,000 gal) is a reasonable emergency reserve for the EAWSD System. Demand by Cañoncito and other County users supplied through the Amistad master meter is excluded from the reserve, as those reserves and fire storage are provided by the County’s Hondo II Tank. The fire storage is divided equally among the four tanks in Table 3-14 based on the system’s capability for any tank to provide fire storage to other zones through booster pumps or PRVs. The emergency reserve volumes, shown in Table 3-14, range from 41 to 55% of tank volume. Good operating practice dictates maintaining tank levels above the reserve volumes.

Table 3-15 presents tank residence time and reserve volumes for future demands. Additional demand reduces residence time in each tank, but also increased preserve volumes as a percent of storage. Overall reserve in all tanks is about 50%, which is considered satisfactory.

TABLE 3-15
STORAGE TANK RESIDENCE TIME AND
EMERGENCY STORAGE (FUTURE)

	TANK 1 / 1A	TANK 2 / 2A	TANK 3	TANK 4	TOTALS
STORAGE CAPACITY (GAL.)	476,594	592,688	495,718	799,758	**2,364,758**
AVERAGE DAILY DEMAND (GAL.)	106,243	102,010	109,483	177,552	**495,288**
ADD AS % OF STORAGE	22%	17%	22%	22%	**-**
RESIDENCE TIME (DAYS)	4.5	5.8	4.5	4.5	**-**
MAX DAILY DEMAND	237,985	228,502	245,242	397,716	**1,109,445**
2 -DAY ADD EMERGENCY RESERVE	212,486	204,019	218,966	355,104	**990,576**
FIRE STORAGE (1000 GPM X 4 HR / 4 TANKS) (GAL.)	60,000	60,000	60,000	60,000	**240,000**
STORAGE RESERVE (GAL.)	272,486	264,019	278,966	415,104	**1,230,576**
RESERVE AS % OF STORAGE	57%	45%	56%	52%	**-**

The District's tanks were inspected in March 2017. Table 3-16 contains a summary of the inspection results. Tanks 1A and 2A are equipped with a galvanic cathodic protection (CP) system; although, at the time of the inspection, the system at Tank 1A was not functional and was repaired during the inspection. Minor corrosion was reported in most instances, although Tanks 2 and 4 had instances of pitting corrosion in the floor and peeling paint. Blistered coating was more widespread in tanks without CP. Since the inspection the District has rehabilitated and installed CP in Tanks 1, 2 and 4. During the work on Tank 4, the floor was discovered to have severe corrosion and material loss, with 80-100 holes concentrated in one area of the floor. Lacking the funds and reluctant to keep the tank out of service for the required time to replace the floor, the District directed the Contractor to patch the area with the known holes. The Contractor recommended the entire floor be replaced at a future date. Tank 3 still needs to be rehabilitated, which is planned once the access road has been improved. Cathodic protection (CP) may be installed in Tank 3 in the short-term to extend the life of the existing coating.

The EAWSD has two sub-tanks at well locations. Sub-Tank 1 (17,000 gallons) is located at the Well 1 site, and Sub-Tank 9 (40,000 gallons) is located at the Well 9 site. Currently, Sub-Tank 1 is not in use. Both tanks were inspected in March 2017. Minor corrosion is present in both tanks. The ladder in Sub-Tank 1 needs to be recoated and corrosion pitting on the floor of Sub-Tank 9 needs to be repaired. As Well 1 is not in service, Sub-Tank 1 is available to relocate and use elsewhere.

TABLE 3-16
SUMMARY OF MARCH 2017 TANK INSPECTION

TANK	CP	COATING LIFE WITHOUT CP	COATING LIFE WITH CP	COMMENTS	CURRENT STATUS
1	Yes	NA	20 Years	Replace vent clamp.	Rehabilitated in 2021.
1A	Yes	NA	10 Years	CP was repaired. Inspect CP every 6 months.	-
2	Yes	NA	20 Years	Drain and recoat within 1 year and provide CP. Larger vent required.	Rehabilitated in 2019.
2A	Yes	NA	10 Years	-	-
3	No	2 Years	6 - 8 Years	Recommend CP to prevent blisters from turning into corrosion nodules. Trim vegetation to prevent rodent burrowing.	Possibly install CP in 2022.
4	Yes	NA	20 Years	70 % floor coating failure. CP system had been removed. Pitting corrosion. Rodent control needed.	Rehabilitated in 2020. Floor requires replacement in the next several years.

3.3.4.2 Fire Protection

SFC adopted guidelines described by the National Fire Protection Association (NFPA) and International Fire Code (IFC) for fire protection requirements. Each are discussed below in this 2022 UMP because the County requires the more stringent of the two to be used to determine required fire flow.

NFPA 1142 prescribes the volume required for fire protection based on an equation that considers factors such as the volume of the structure, occupancy hazard classification, and construction classification. The required rate of flow is based on the total volume of fire protection water needed. Thus, the fire flow requirements vary widely depending on the types and sizes of structures.

The 2015 IFC provides tables outlining the required fire flow and duration based on area and type of structure. Determining the fire flow requirements for residential units under 3,600 square feet is not complex, but larger structures and different types of construction complicate the required fire flow determination. Possible fire flow requirements range from 500 gpm for 1 hour (residential unit) to 8,000 gpm for four hours depending on the area and construction type. Although the majority of EAWSD customers are residential, there are currently 53 commercial customers, most of which are serviced in Zone 1. However, most of these commercial facilities are equipped with sprinkler systems, which reduces fire flow requirements significantly. For the evaluation of fire flows in this 2022 UMP, the residential requirement of 500 gpm is assumed to apply to existing developments and 1,000 gpm to new developments. Both rates of flow must be maintained with a minimum 20 psi residual pressure in the water system.

An evaluation of the fire flows withing the existing system is provided in Section 4.0.

3.3.5 Water Distribution

3.3.5.1 Waterline Materials and Sizes

The EAWSD distribution network is comprised of approximately 130 miles of distribution piping sized between 2 and 12 inches in diameter. The majority of the piping network consists of SDR 26 or SDR 21 PVC, which is rated at 160 psi and is not typically utilized for pressurized applications when sized larger than 4 inches in diameter. As this piping is more commonly used for gravity sewer installations, it can be concluded that many of the areas that experience frequent breaks can be attributed to operating at or near this pipe’s pressure rating. Furthermore, many of the High Density Polyethylene (HDPE) water service connections with flared joints are prone to leaking or breaking.

In the mid-1980s, when much of the EAWSD water system was constructed, asbestos cement (AC) pipe was a commonly used construction material in municipal water infrastructure projects. As a better understanding of environmental and health risks of asbestos developed, regulatory agencies began to discourage the use of AC pipe. When in good operational shape, health hazards from AC pipe are relatively minimal. However, when the pipe is damaged, asbestos fibers have the potential to be introduced into the surrounding environment. Although highly detrimental to the surrounding environment, ingestion of asbestos fibers in drinking water has not been found to cause an increased cancer risk or any other health concerns.

Like other pipe materials, the strength of AC pipe is affected by several environmental factors, including construction methods, soil conditions, water characteristics, and age. Over time, the strength of AC pipe decreases, and failures generally occur more often. Failure of AC pipe is especially concerning because the pipe typically has to be exposed for repairs. Exposed and broken, fragmented, or crushed, AC is considered a hazardous material and special precautions must be taken in its disposal.

In 2020, the District took a “coupon” sample out of one of the existing AC pipes that was installed in the system. Upon evaluation of this “coupon”, the District found the AC pipe to be in great condition as it did not have any sort of deterioration despite being installed over 50 years ago. Due to these findings, the District will not be pursuing the replacement of these pipes in the near future.

Table 3-17 below summarizes the EAWSD existing piping materials, lengths within the pressure network, and remaining useful life of each piping component.

TABLE 3-17
EXISTING WATER MAIN MATERIAL

PIPE MATERIAL	EXISTING PIPELINE LENGTHS (LF)	% OF TOTAL	TYPICAL DESIGN LIFE (YEARS)	REMAINING USEFUL LIFE (YEARS)
Ductile Iron	20,300	3	100	40-60
PVC (DR18) C900	53,480	8	50	30-50
Asbestos-Cement (AC)	46,500	7	70	10-30
PVC (SDR26 and SDR21)	563,200	82	50	0-20
HDPE	Service Connections	-	-	-
TOTAL	**683,480**	**100**	**-**	**-**

3.3.5.2 System Redundancy and Pressures

The EAWSD has made significant efforts towards developing system redundancy throughout all aspects of their water system. The *Eldorado Area Water & Sanitation District, Pressure Zone Optimization Study*, March 2014 (MC) outlined the District's desire to implement a strategy that would provide each PZ with two sources of supply and improve overall system pressures. This effort led to three phases of improvements to enhance the redundancy of the water system.

Phase 1 of the PZO Improvements was implemented in 2015-2016 to increase use of Tank 4 water, ensure that two sources of water are available for the affected zones, enhance fire flow capabilities, and reduce areas of high pressure to 100 psi or less. A total of six new PRVs and a check valve were installed in Phase 1. Phase II of the PZO Improvements installed three new PRV stations to either relocate zone boundaries or create new subzones for reducing system pressures. Phase III to be completed in 2022 focused primarily on equipping existing PRV stations with SCADA infrastructure and upgrading the entire SCADA system.

3.3.5.3 Transmission Lines and Intertank Transfers

The District has a few dedicated transmission lines for transferring water between tanks and from supply sources to tanks (see Plate 1) however most wells and booster pumps utilize the distribution system. The lack of transmission lines creates operational difficulties, including: (1) Water transfer through the distribution system may result in excess pressures; (2) A portion of the water produced at the well is distributed enroute to storage, which reduces storage turnover and increases water age; and (3) Reduced operational flexibility in moving water between zones.

With the completion in 2022 of SFC's Eldorado-Cañoncito Waterline to deliver potable water to the District's northern boundary (see Plate 1), the District will need to convey water from the western low part of the service area to the higher eastern parts. The District executed two projects, Tank 4 to Tank 1 BPS and Waterline and County Waterline Extension, to facilitate such eastward conveyance. Tank 4 to Tank 1, completed in 2021, involved construction of a BPS (see Section 3.3.3.5 for more details) and 6,700 feet of 10-inch transmission line. As the name implies, the project provides infrastructure to convey water from Tank 4 to Tank 1, which heretofore had been lacking. The County Waterline Extension project, scheduled to complete construction in 2022, will connect the County master meter at the Well 2 site to Tank 4 via a new booster station and 12,470 feet of 10-inch transmission line. The project also involves installation of a TTHM removal system in Tank 4.

In some areas, line sizes are inadequate to convey flow, resulting in competing operations. For example, the Torreon BPS cannot operate at the same time as Wells 14 and 15 because it causes excess pressure in distribution lines. Management of these facilities requires coordination so that Wells 14 and 15 are not called to operate when the Torreon BPS is pumping water up to Tank 1 / 1A. A dedicated transmission line from the Torreon BPS to Tank 1 or Tank 4 would resolve this issue. However, with operation of the system shifting to moving County water through the system, transfer from Tank 2 may no longer be as important.

3.3.5.4 Isolation and Flushing Capabilities

NMED recommends isolation valves in non-commercial areas be located no more than one block or 800 feet apart. Based on this standard, the EAWSD distribution system does not have adequate isolation capabilities due to insufficient numbers of isolation valves. When EAWSD performs line maintenance, it often has to shut down a significant portion of the pipe network where crews are working. This leaves a large number of customers without service until repairs are completed and the system can be brought back online. In recent years, EAWSD has been installing isolation valves as part of its repair process when line breaks occur, but lack of funding has precluded a more proactive approach.

3.3.6 Pumping Stations

The EAWSD booster pumping stations are utilized to provide a means of redundancy in the system by supporting the transfer of water through varying pressure zones while also assisting to maintain adequate fire flows throughout the service area. The District has seven booster pumping stations, two of which are no longer active. Table 3-18 evaluates the capacity and status of each of these pumping stations.

TABLE 3-18
EAWSD BOOSTER PUMPING STATIONS

BPS #	LOCATION	RATED CAPACITY (GPM)	STATUS	INSTALLATION YEAR
1	Tank 1 Site	180	Active	1970
--	Compadres / Vista Grande	30	Inactive	1984
4	Torreon / Eldorado	1,100	Active	2014
5	Old Road Ranch / 285	710	Active	2013
--	Well 1 Site	76	Inactive	1984
9	Well 9 Site	700	Active	1983
2	Tank 2 Site	640	Active	1998
--	Tank 4 Site	400	Active	2021
--	Alcalde (Well 2 site)	500	Active	2022

Booster pumping station 1, located at the Tank 1 site boosts water from Tank 1 into Tank 3, this station is the primary supply of water for Tank 3. BPS 1 is capable of pumping 180 gpm using a pair of pitless Grundfos pumps driven by 10 horsepower (HP) twin Franklin motors. Each of the pumps installed at this station are given a rating of “very good” physical condition, so is the motor installed on Pump 2. The motor installed on Pump 1 was given a rating of “good” physical condition.

The original Torreon Station was replaced in 2014 with an above-ground facility consisting of two 75 HP pumps each capable of moving 550 gpm at 300 feet of total dynamic head. The station transfers water from Tank zone 2 to Tank 1 / 1A but also can transfer water to Tank 4 through a control valve at the Tank 4 site. The station cannot be operated simultaneously with

Wells 14 and 15 due to excess pressure caused by moving water through lines that are undersized for the flows

The Old Ranch Road Booster Station was replaced in 2013-2014 with an above-ground facility consisting of two 5 HP pumps each capable of moving 70 gpm at 62 feet of total dynamic head and one 40 HP pump capable of moving 570 gpm at 117 feet of total dynamic head. The station boosts Tank 2 water to residents east of US-285, south of Camino Caballos and north of Lamy Ridge.

Station 9 located at the Well 9 site, boosts water produced from Wells 9 and 10 (when it was operating) over Lamy hill and into PZ-2. This BPS is capable of producing 700 gpm through the use of two Byron-Jackson turbine pumps coupled with motors from US Motors. These two pumps were given a rating of "very good", while the corresponding motors were given a rating of "good" physical condition.

BPS 2 located at the Tank 2 site, is utilized to pump water into the distribution system in PZ-3. The station is capable of pumping 640 gpm through two Grundfos turbine pumps coupled with Baldor motors. The pumps and motors reported by operators staff are reported to be in good condition.

The blend water pump for Well 19 serves as a *defacto* booster pump that transfers water from Tank 2 to Tanks 1 or 4 (depending on operator settings) at rates of 100 gpm. Well 19 and the blend pump are on indefinite standby pending installation of an iron / manganese filter for the well water.

The Tank 4 BPS was installed in 2021 at the Tank 4 site. The purpose of the station is to convey County water from Tank 4 to Tank 1 for distribution to other pressure zones within the District and to the County connection east of US-285 at Amistad Road. The station contains a duplex pump skid with two 200-gpm pumps contained within a clamshell style enclosure. The pumps are operated with VFDs which provide phase conversion (the Tank 4 site does not have 3-Phase electrical service) and soft start / stop to prevent surges. The booster station can pump up to 400 gpm to Tank 1.

The Alcalde BPS, located at the Well 2 site, is under construction as of publication of this 2022 UMP, with completion expected by the end of 2022. The station consists of a duplex pump skid with two 250-gpm pumps and room for a future third pump. The skid will be housed within a concrete masonry unit (CMU) block building, which also will house disinfection facilities. The purpose of the Alcalde station is to convey and raise the chlorine residual of incoming County water supply to Tank 4 for removal of TTHMs and further distribution into the District water system.

EAWSD has expressed a desire to demolish the inactive stations at Compadres / Vista Grande and the Well 1 site. Similarly, a station of unknown condition near Cattle Drive and Bishop Lamy was identified as an inactive station, which also may be demolished in the future.

3.3.7 Water Treatment

Water treatment generally consists of disinfection at all point of entry water sources, accomplished with 12% sodium hypochlorite solution dosed into raw water at most District wells. The exceptions are Wells 17 and 18, which pump to a common disinfection facility at Tank 2. A new disinfection system is currently under construction in the Alcalde BPS to allow operators to increase the chorine residual of incoming County water if necessary. Most of the dosing pumps are paced to match flow rate of their associated well pumps. The Alcalde dosing system includes a chlorine analyzer that trims the dosing rate to match the operator's set point.

Well 19 produces water containing elevated antimony, iron and manganese. To address antimony, a blend pump was installed at Well 19 to mix water free of antimony from the Tank Zone 2 with Well 19 water and reduce the concentration to levels below MCL. A cartridge filter system is needed to remove iron and manganese, but the design and installation has been put on indefinite hold due to the high cost.

SFC water has historically had high levels of TTHM. TTHM tends to increase in concentration over time. With the long transmission lines from the County's Rancho Viejo tank to the District boundary, and the additional 2.4 miles through the new line to Tank 4, there is concern that TTHM would increase further and possibly exceed the primary MCL. To address this possibility, a TTHM removal system is being installed in Tank 4 with the County Waterline Extension project. The system consists of a floating aerator sprayer (with room for a second future aerator) and blower that facilitates volatilization and removal of TTHMs. A tank mixer will also be installed to promote mixing and to operate in lieu of the aerator when TTHM levels are low and don't require as much energy to remove (e.g. during winter).

3.3.8 Valves

The EAWSD water supply network consists of over 600 individual gate valves for isolation purposes, multiple air release valves (ARVs) to mitigate the entrapment of air in the distribution network, and a series of PRVs that regulate the pressures within the entire system. There are currently 28 active PRV stations installed in the system, many of which were manufactured between 1990 and 1998. Additionally, there are an unknown number of abandoned or unused PRV stations from the early construction stages when the system was owned and operated by AMREP. Table 3-19 on the following page provides an updated listing of the PRV stations within the service area. Recent projects to optimize pressures with installation of new PRV stations were described in Section 3.3.5.2.

TABLE 3-19
PRV STATIONS

PRV NO.	LOCATION	SIZE, IN	PSI, IN	PSI, OUT	CONTROL SETTING	LOW FLOW PRV SIZE	FROM TANK / PRESSURE ZONE	TO TANK / PRESSURE ZONE	COMMENTS
1	Belicias	6	120	70	65	2	Tank 3	PZ-3C	To be decommissioned.
2	Ave de Amistad	6	105	45	30	3	Tank 3	Tank 1	Not in service. To be decommissioned and replaced with a closed zone valve.
3	Conchas Loop	Demolished in 2015 during PZO Improvements – Phase I							
4	Vista Grande and Torreon	8	140	70	70	4	Tank 3	Tank 1	Curently being equipped with pressure instrumentation and SCADA radio transmitters.
5	Espira Court	3	65	55	55	N/A	Tank 1	PZ-1A	Curently being equipped with pressure instrumentation and SCADA radio transmitters.
6	Vista Grande and Enebro	Decommissioned in 2015 during PZO Improvements – Phase I							
7	Vista Grande and Compadres South	Decommissioned in 2015 during PZO Improvements – Phase I							
X	Compadres North (@Booster)	6	N/A				Tank 4	PZ-4A	Not in service. To be decommissioned.
8	Fortuna Road	6	70	45	45	4	Tank 4	PZ-4A	Values reported during Well 2B Replacement project. Curently being equipped with pressure instrumentation and SCADA radio transmitters.
9	Estambre Road	6	120	55	50	4	Tank 4	PZ-4R	PZ nomenclature changed from previous "PZ-4[a]" to "PZ-4". Curently being equipped with pressure instrumentation and SCADA radio transmitters.
10	Casa del Oro Road	6	80	60	50	N/A	Tank 4	PZ-4R	Not in service. PZ nomenclature changed from previous "PZ-4[a]" to "PZ-4". Curently being equipped with pressure instrumentation and SCADA radio transmitters.
11	Sabroso Road	6	110	60	60	4	Tank 4	PZ-4R	PZ nomenclature changed from previous "PZ-4[a]" to "PZ-4". Curently being equipped with pressure instrumentation and SCADA radio transmitters.
12	Ave Eldorado and Compadres	Decommissioned in 2015 during PZO Improvements – Phase I							
13	Caliente Road	8	75	65	40	6	Tank 3	Tank 1	Placed back into service during PZO Improvements – Phase II.
14	Principe De Paz	4	105	56	40	N/A	PZ-3A	PZ-2R1	Curently being equipped with pressure instrumentation and SCADA radio transmitters.

TABLE 3-19
PRV STATIONS (continued)

PRV NO.	LOCATION	SIZE, IN	PSI, IN	PSI, OUT	CONTROL SETTING	LOW FLOW PRV SIZE	FROM TANK / PRESSURE ZONE	TO TANK / PRESSURE ZONE	COMMENTS
X	Rey De Reyes	6	N/A				Tank 3	Tank 3	Not in service. To be decommissioned
15	Highway 285	8	95	65	60	4	Tank 3	PZ-3A	Curently being equipped with pressure instrumentation and SCADA radio transmitters.
16	Lamy	6	220	190	55	2	Tank 2	PZ-2B	Curently being equipped with pressure instrumentation and SCADA radio transmitters.
17	Spirit Wind	6	160	75	115	2	Tank 2	PZ-2B	Curently being equipped with pressure instrumentation and SCADA radio transmitters.
18	Horse Ranch	8	N/A						Removed.
X	Monte Alto	Demolished in 2015 during PZO Improvements – Phase I							
19	Moya Road	6	105	55	45	2	Tank 1	PZ-1B	Installed in 2015 during PZO Improvements Phase I.
20	Vista Grande / Manzano Lane	6	110	55	50	2	Tank 1	PZ-1B	Installed in 2015 during PZO Improvements Phase I.
21	Herrada Road / Alondra	6	85	45	30	N/A	Tank 2	Tank 4	Installed in 2015 during PZO Improvements Phase I.
22	Bosque Loop / Ave Eldorado	6	135	75	50	N/A	Tank 1	Tank 2	Installed in 2015 during PZO Improvements Phase I.
23	Ave Eldorado / Tracks	6	75	40	30	N/A	Tank 2	Tank 4	Installed in 2015 during PZO Improvements Phase I.
24	Camino Caballos / Hwy 285	6	90	45	40	2	Tank 2	Tank 4	Installed in 2015 during PZO Improvements Phase I.
25	Vista Grande / Glorieta	6	98	54	55	1	Tank 3	PZ-3F	Installed in 2019 during PZO Improvements Phase II.
26	Torreon / Monte Alto	6	76	58	60	2	Tank 1	PZ-1C	Installed in 2019 during PZO Improvements Phase II.
27	Herrera Road	6	78	60	55	2	Tank 4	PZ-4F	Installed in 2019 during PZO Improvements Phase II.
CV-01	Frasco Road / Gavailan	6	65	45		N/A	Tank 4	Tank 2	Installed in 2015 during PZO Improvements Phase I.
28 PRV / PSV	Old Road / Bishop Lamy	6	90	70*	90-110	N/A	Tank 2	PZ-2A	*Discharge pressure varies depending on adjustable PRV / PSV pilot setting and the function of Old Road Ranch Booster Station

3.3.9 Supervisory Control and Data Acquisition (SCADA)

A SCADA system provides monitoring and control of major components of the EAWSD system, including wells, booster stations, tanks, and PRV stations. The original SCADA system was installed in 2015, and each new project since has added new sites with numerous data inputs. As the system grew, it began to respond slower to commands, a function of the polling method and now outdated radios used for communication between sites. In 2020 the District undertook a complete redesign of the system to upgrade the radios to more powerful units able to transmit data a much faster rate. The project is currently under construction and expected to be completed in summer 2022.

3.3.10 Customer Water Meters

In 2007, the EAWSD began replacing manual-read meters with drive-by radio-read meters at a rate of about 200 per year. The District has prioritized reducing water loss to minimize operational expenses and maximize utility revenue. To monitor system operation and help track losses, water production is metered at each individual well and is compared against the customers metered water use. With the ongoing implementation of the radio-read meters the system is now more effective in tracking water use and losses.

In 2015, EAWSD began replacing water meters with the Badger® Beacon® meter system. These meters communicate meter reading data through cellular towers to a cloud database, which can be accessed through the Internet. They further improve meter reading efficiency, eliminating the need for meter readers to drive by meters to obtain readings. More importantly, however, the Beacon system allows customers to access information about their daily and historical water use at any time and from anywhere online. Customers can use this information to monitor their water use and increase their conservation efforts. In addition, the Beacon meter system can be programmed to send alerts to the customer, by email and/or by text message, whenever continuous flow through the meter is detected for a 24-hour period, indicating the potential for a leak in the customer's plumbing.

EAWSD administers an ongoing, annual meter replacement program, but has limited funding for this effort. It annually budgets sufficient funds to replace about 200 customer meters. However, in 2020, the District received DWSRF funding to replace 1,300 meters. Currently, the District has 65 manual-read meters, 29 radio-read meters, and 2,949 Beacon meters installed.

3.4 Financial Status of Existing Facilities

Table 3-20 below summarizes the EAWSD's year-end financial accounting for Fiscal Year (FY) 2016 to FY 2021 based on EAWSD FY 2016-2021 audit reports. As outstanding debts have continued to be paid off and an increase in both the tax levy and the water rates in the area have been established, an annual increase in financial net position of about 8.5% was seen since FY 2016.

TABLE 3-20
EAWSD FINANCIAL INFORMATION FY 2016 TO 2020

DESCRIPTION	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Operating Revenues	$ 2,617,920	$ 2,793,971	$ 3,094,912	$ 2,899,971	$ 3,422,760	$ 3,877,505
Operating Expenses	$ 2,402,632	$ 2,586,901	$ 2,736,430	$ 2,900,263	$ 3,115,499	$ 3,806,101
Operating Income	$ 215,288	$ 207,070	$ 358,482	$ -292	$ 307,261	$ 71,404
Non-Operating Revenues and Grants	$ 2,097,975	$ 1,350,231	$ 1,369,609	$ 1,458,000	$ 1,683,285	$ 1,896,474
Non-Operating Expenses	$ -246,144	$ -230,022	$ -193,878	$ -200,888	$ -180,609	$ -199,448
Change in Net Position	$ 2,067,119	$ 1,327,279	$ 1,534,213	$ 1,256,820	$ 1,809,937	$ 1,768,430
Total Assets	$ 27,144,541	$27,938,051	$29,179,240	$31,022,417	$32,610,353	$34,363,495
Total Liabilities	$ 9,207,127	$ 8,673,358	$ 8,380,334	$ 8,966,691	$ 8,744,690	$ 8,729,402
Net Position	$ 17,937,414	$19,264,693	$20,798,906	$22,055,726	$23,865,663	$25,634,093

Principal operating expenses were contractual services, depreciation, personnel, utilities, and building and equipment rent.

With the exception of grants obtained for capital projects and the proceeds of construction loans, all District expenses are paid from revenue generated from water sales, fees, and ad valorem property taxes. A new rate schedule took effect in January 2016, with gradual increases taking effect in each of the following three years. In addition to operating expenses, water rates cover interest and principal on revenue bonds.

Non-operating revenues consist mainly of ad valorem property taxes, which cover interest and principal on General Obligation (GO) Bonds as well as certain capital and operating expenses. The District increased its mill levy in November 2015. Non-operating expenses consist mainly of interest expense on GO Bonds.

Monthly water rates consist of a fixed monthly base rate as well as graduated volumetric usage rates, shown for calendar years 2021 and 2022 in Table 3-21.

TABLE 3-21
EAWSD WATER RATES

RATE EXPLANATION	DESCRIPTION	CY 2021	CY 2022
In-District Base Rate	Inside District Boundary	$26.59/meter	$27.65/meter
Out-of-District Base Rate	Outside District Boundary	$58.39/meter	$59.45/meter
Tier 1 Usage Rate	3,000 gallons or less	$11.40/1,000 gallons	$11.86/1,000 gallons
Tier 2 Usage Rate	3,001-6,000 gallons	$14.25/1,000 gallons	$14.82/1,000 gallons
Tier 3 Usage Rate	6,001-10,000 gallons	$17.81/1,000 gallons	$19.06/1,000 gallons
Tier 4 Usage Rate	10,001-20,000 gallons	$30.58/1,000 gallons	$32.72/1,000 gallons
Tier 5 Usage Rate	20,001-30,000 gallons	$48.48/1,000 gallons	$53.33/1,000 gallons
Tier 6 Usage Rate	Over 30,000 gallons	$72.73/1,000 gallons	$80.01/1,000 gallons

A summary of EAWSD's debt is contained in Table 3-22. The debt service includes the repayment of loans for acquisition of the EAWSD water system in 2005, refunded in 2013, and additional debt from capital improvement projects.

TABLE 3-22
EAWSD DEBT SUMMARY

TYPE	YEAR ISSUED	YEAR DUE	ORIGINAL AMOUNT		AMOUNT OUTSTANDING	INTEREST RATE
			GRANT	LOAN		
PPRF[2]-2900	2013	2025	-	$ 3,775,000	$ 1,770,000	4.89%
PPRF-2901	2013	2023	-	$ 4,700,000	$ 1,110,000	4.70%
PPRF-2469	2010	2030	-	$ 1,433,759	$ 763,868	3.97%
PPRF-4735	2018	2048	-	$ 585,889	$ 549,037	3.41%
DW[1]-3401	2016	2038	-	$ 909,000	$ 777,174	2.00%
DW-3593	2017	2038	-	$ 357,035	$ 207,088	2.00%
DW-3620	2017	2039	$ 126,250	$ 378,750	$ 353,209	2.00%
DW-4208	2018	2040	$ 328,755	$ 986,265	$ 913,377	2.00%
DW-4215	2018	2040	-	$ 565,600	$ 78,464	2.00%
DW-4791	2019	2041	-	$ 252,500	$ 249,720	2.00%
DW-4800	2019	2041	$ 33,907	$ 1,481,093	$ 413,586	2.00%
DW-5238	2021	2052	$ 479,750	$ 1,439,250	-	1.00%
DW-5345	2021	2033	-	$ 500,000	-	1.00%
DW-5630	2021	2053	-	$ 2,020,000	-	0.25%
WPF[3]-4819	2019	2041	$ 300,000	$ 200,000	$ 197,084	0.25%
WPF-5113	2021	2041	$ 900,000	$ 100,000	-	0.25%
WPF-846	2013	2023	$ 168,750	$ 18,750	$ 11,369	0.25%
WPF-877	2014	2033	$ 423,000	$ 47,000	$ 29,312	0.25%
WPF-878	2014	2033	$ 324,000	$ 36,000	$ 22,451	0.25%
WPF-879	2014	2034	$ 184,500	$ 20,500	$ 12,784	0.25%
WPF-897	2015	2034	$ 231,007	$ 25,667	$ 17,488	0.25%

[1] Drinking Water
[2] Public Project Revolving Fund Loan
[3] Water Project Fund

The water system was purchased in 2005 with the proceeds of both GO Bonds and Revenue Bonds that were refinanced in 2013 through the New Mexico Finance Authority. The District has also been awarded capital project funding through the New Mexico WTB (80% grant / 20% loan) and through the federal Drinking Water State Revolving Loan Fund at low interest rates. No principal payments are due on pending loans until construction is complete.

3.5 Water / Energy / Waste Audits

EAWSD has prepared a formal water audit and maintains records of well pumping and meter billing. The average water loss for calendar years 2016 to 2020 is shown in Table 3-23. The 2021 data were not available at the time of this 2022 UMP. Water losses of up to 10% are considered reasonable for a system of this size.

TABLE 3-23
ESTIMATED NON-REVENUE WATER (GALLONS)

MONTH	2016	2017	2018	2019	2020
Diverted	152,364,000	149,376,000	162,360,000	151,825,000	172,143,000
Billed	137,625,300	139,516,000	137,625,000	140,466,300	156,743,000
Non-Revenue Water	14,738,700	9,860,000	24,735,000	11,358,700	15,400,000
Non-Revenue Water Loss	9.7%	6.6%	15.2%	7.5%	8.9%

Table 3-24 provides a summary of energy costs for FY 2016 to FY 2021. Power costs in FY 2020 were $92,666.72, representing 3.0% of operating expenses.

TABLE 3-24
ENERGY COSTS FY 2016 TO FY 2020

FY	ENERGY COST
FY 2016	$ 77,366.28
FY 2017	$ 91,797.29
FY 2018	$ 98,987.43
FY 2019	$ 84,788.78
FY 2020	$ 92,666.72
FY 2021	$ 106,931.38

4.0 HYDRAULIC EVALUATION

Analyses of the EAWSD water system were performed to evaluate whether current supply adequately meets current and future demand throughout pressure zones and to identify the additional infrastructure that will be needed to provide for growth. The adequacy of water supplies, storage, and the distribution system serving each PZ are considered in the analysis.

Hydraulic modeling involves evaluating the system production and storage capacity, fire flows, and system pressures under current and future water demands and supplies. The scenarios are structured to verify whether the system meets NMED guidelines for sources of supply as described in Section 3.3.3.5. The scenarios and evaluations discussed in the following sections include:

- Current Demand:
  - Average day demand during drought conditions [3] with largest well out of service.
  - Peak day demand during drought conditions.
  - Fire flow during peak hour demand.
  - System pressures.

- Future Demand (with current infrastructure):
  - Average day demand during drought conditions [3] with largest well out of service.
  - Peak day demand during drought conditions.
  - Fire flow during peak hour demand.
  - System pressures.

Other Evaluations:

- Supply to Welled Area.
  - Average day demand during drought conditions with largest well out of service.
  - Peak day demand during drought conditions.

[3] Typically, drought conditions for the EAWSD result in Well 9 being out of service.

    - Fire flow during peak hour demand.
    - System pressures.
- Taking Well 7 Transmission Line out of service.
- Torreon Pumping to Tank 1 pressure evaluation.
- Tank 4 to Tank 2 Transmission.
- Full County supply with Wells 17 and 18 offline for passive recovery.

Appendix H contains tables documenting model scenario results.

4.1 Model Updates and Calibration

The EAWSD water model was adapted from a model prepared in 2007 by ID Modeling utilizing the software WaterGEMS and updated as the *Eldorado Area Water & Sanitation District, Pressure Zone Optimization Study*, March 2014 (Molzen Corbin) and later as the *Water Utility Master Plan Preliminary Engineering Report Update*, October 2017 (Molzen Corbin). The model was further updated for this UMP to reflect recent system improvements. The model also incorporates projects recently completed or currently underway and considered to be part of the system (PZO Phase 2; Well 19 with the blend ; Tank 4 to Tank 1 BPS and transmission line; Caballo Road waterline replacement; connection to Cañoncito at Amistad; County Waterline Extension; Verano / Conchas waterline replacement). Pump controls from the EAWSD SCADA were incorporated into the model to reflect the current pumping patterns. PRV settings were updated based on data obtained from operations staff.

4.2 Current Day Demands

Modeling was performed using current day conditions under various operating scenarios. This modeling effort evaluated the adequacy of well supply and storage in each PZ to satisfy the guidelines of the *Construction Programs Bureau Recommended Standards for Water Facilities*, 2006 Edition (NMED). The model also was used to indicate areas of high pressure (>100 psi) and to confirm fire flow.

Model scenarios were run for 48 hours to include two full diurnal periods. This facilitates observing any potential trends that might not develop in a single day. The storage tanks were assumed to be full at the start of each scenario. The well and booster pump on / off set points correspond to the set points currently used by the EAWSD according to the SCADA system. The runs were initiated at 6:00 a.m. when morning demand begins and were ended 48 hours later. This allows a period of low demand (midnight to 6:00 a.m.) at the end of the run for the tanks to refill.

4.2.1 Average Day Demand with Largest Well Out of Service

NMED guidelines recommend that public water systems have adequate capacity to meet average day demand with the system's largest well out of service. As discussed in Section 3.3.3.5, the SFC water supply (Alcalde BPS) is considered to be the District's largest source. Tank 4 BPS is also disabled for this run as its purpose is to move County water up into the system.

In addition to Alcalde BPS being offline, this scenario considers reduced production during a drought year when Well 9 could not be pumped. Table 3-5 lists the capacity of wells during times of average demand, which are used for this scenario.

Figure 4-1 shows model results for this scenario. The upper part of the chart displays pumping rates and "on" times for wells and pumps; the lower part shows the percent capacity of each tank. Tanks drain to meet morning demand, and Wells 2A / 2B are called on after about 8 hours to fill Tank 4 to maintain a 90% to 95% fill. Tanks 2 / 2A and 3 begin filling 16 hours after the simulation start by calling Wells 7, 17, and 18 for Tank 2 / 2A to maintain 85% to 96% fill, and Tanks 1 and 2 booster pump stations fill Tank 3 to maintain 83% to 97% fill. Tanks 1 / 1A begin filling after about 17.5 hours with Wells 14 and 15 to maintain about 73% to 93% fill. Tanks 1 / 1A takes longest to fill at about 6.5 hours due to its large range between setpoints in SCADA. All tanks are able to fill by the end of the 48 hour run. The most active well during the 48 hour simulation is Well 2A / 2B, which runs for a total of 23.5 hours or 49% of the simulation. None of the wells exceed the 60% run time established as appropriate for long term sustainable well operation.

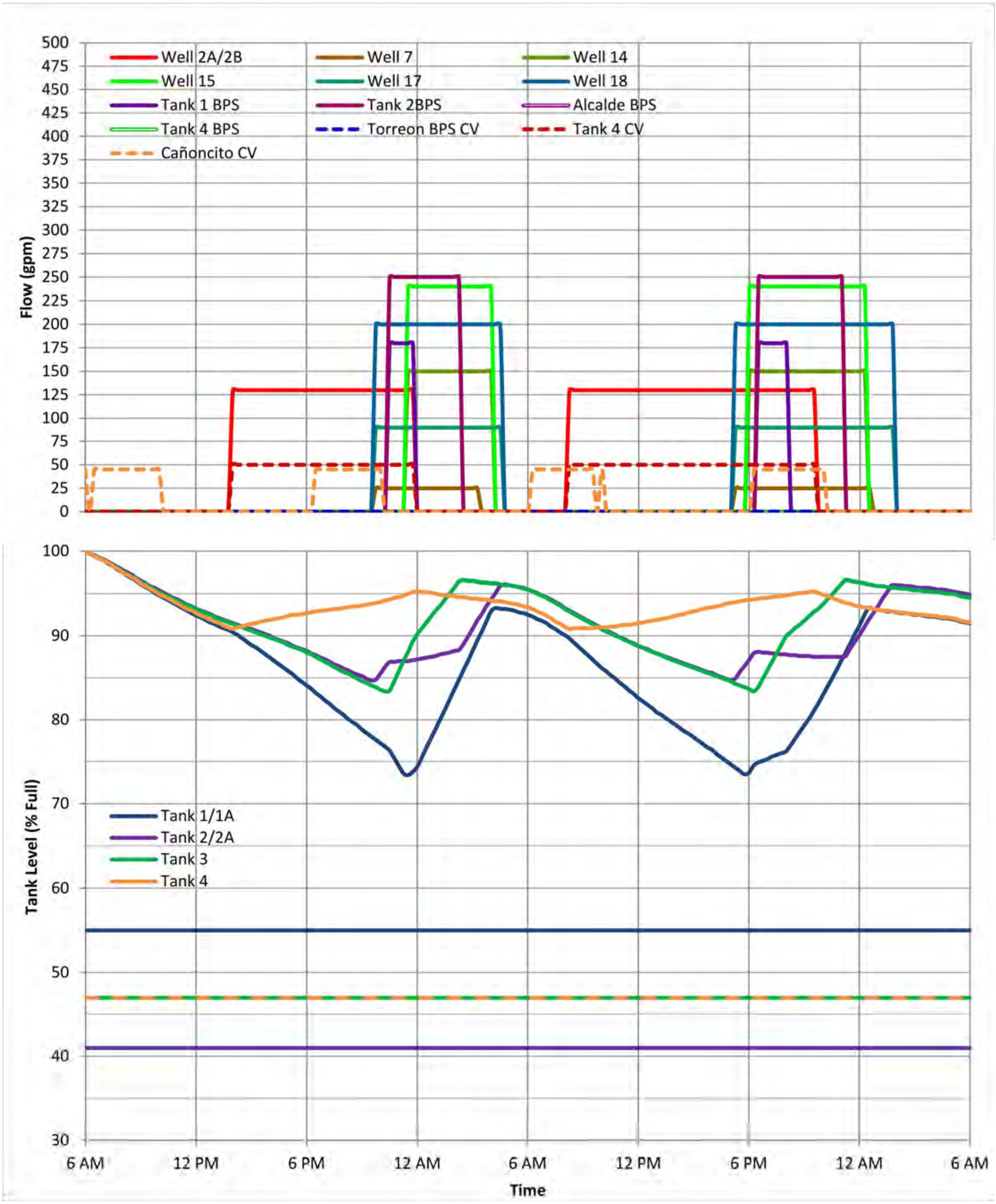


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Figure 4-1: Model Results

Current Average Day Demand with Largest Source Out of Service

The model illustrates that the system is capable of meeting average daily demand in a drought year with the largest source out of service.

4.2.2 Peak Day Demand

NMED guidelines recommend that water systems be able to meet peak day demand with the existing sources. This scenario considers peak demand with Well 9 out of service due to drought and Wells 14 and 15 pumping at a reduced rate. As discussed in Section 3.0, these wells tend to lose production by about 40% after an extended pumping period, which is expected during times of high demand. Alcalde BPS and Tank 4 BPS are active in this run. Table 3-6 shows the peak pumping capacities utilized in this scenario.

Figure 4-2 shows the results of the scenario. Tanks drain more quickly and initiate pumps "on" after about 4 to 8.5 hours. Tanks 1 / 1A and 3 maintain the same fill ranges as the average day scenario while Tanks 2 / 2A and 4 drain slightly more before refilling to their desired fill level. Wells 17 and 18 operate 83% of the run to maintain fill in Tank 2. Wells 2A / 2B operates 82% of the run due to Tank 4 emptying from Tank 4 BPS. These wells exceed the desired 80% run time assumed for periods of peak demand. Well 7 operates for 77% of the scenario.

The model results illustrate the system is capable of delivering current peak demand in all zones, but at the cost of barely exceeding desired well usage.

4.2.3 Storage

The average demand scenario (Figure 4-1) illustrates that zone demand is reasonably well distributed among the tanks. None of the tanks dip below the emergency reserve and are all able to refill before the end of the run. The peak day demand run (Figure 4-2) similarly illustrates a reasonable distribution of tank use. None of the tanks fall below emergency storage reserve.

LAST MODIFIED: Sep 12, 2022 - 2:33pm BY USER: pdelarosa
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 4-2 Current Peak Demand.dwg

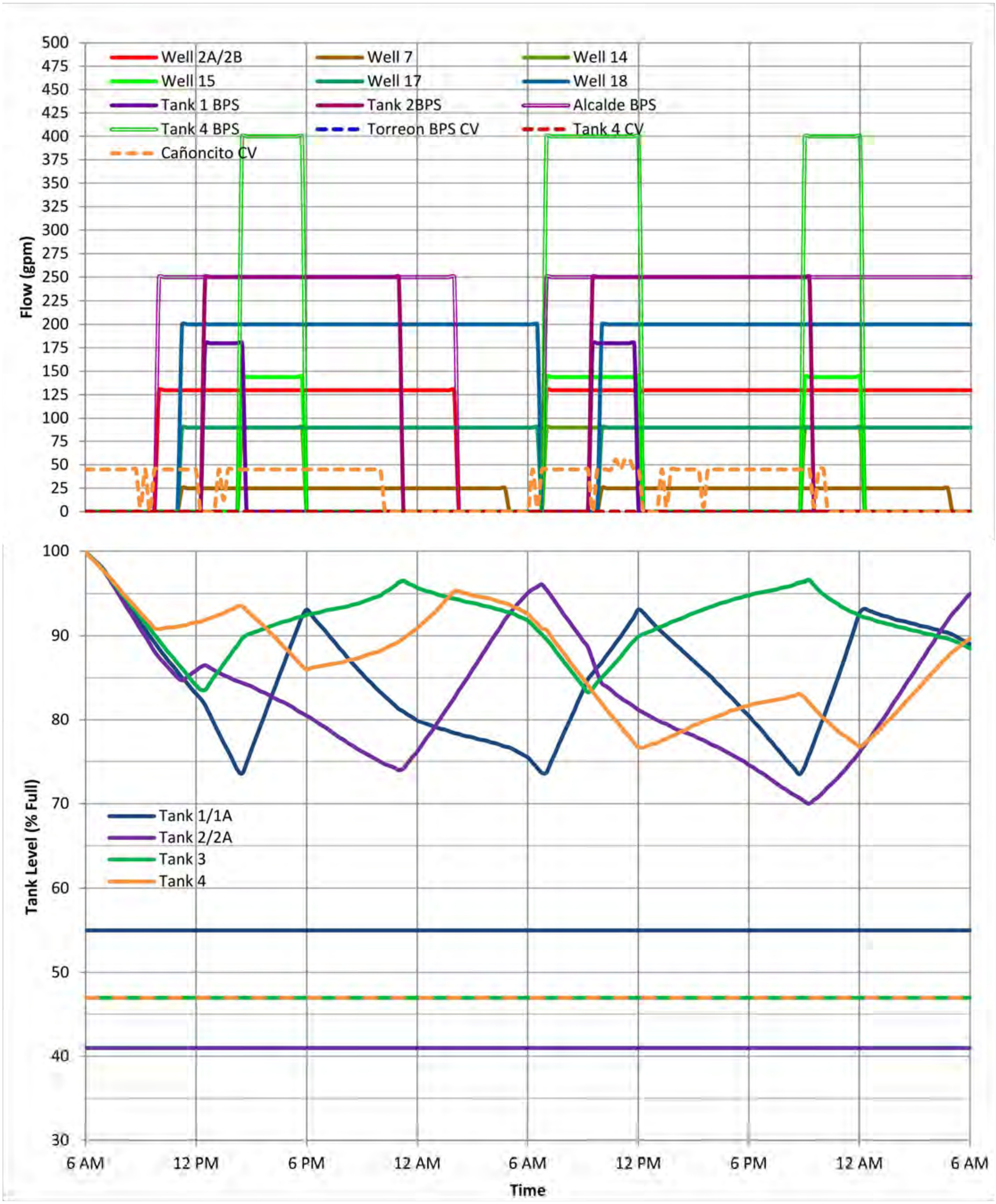

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Figure 4-2: Model Results
Current Peak Day Demand

4.2.4 Fire Flow

The model was used to evaluate fire flow under existing average and peak hour demands. The SFC Fire Code requires 500 gpm of fire flow at 20 psi residual pressure for residential areas built prior to 2013. For residences built after 2013, the requirement increases to 1,000 gpm at 20 psi residual pressure. Commercial structures require higher flows of several thousand gpm. Because EAWSD is 95% residential, and most existing developments were constructed prior to 2013, the 500 gpm requirement is assumed to apply. The model calculates that under both average and peak hour demands, 500 gpm fire flow at 20 psi residual pressure is available at all nodes except for nodes in PZ-3A at the end of any 2 inch waterlines. Any new developments would need to be designed with distribution lines sized appropriately to convey 1,000 gpm for fire flow.

4.2.5 Pressures

System pressures exceeding 100 psi during current peak hour demand are displayed in Figure 4-3. As expected, areas of high pressure occur on the west end (lowest elevation) of existing pressure zones. There are particularly high concentrations of nodes with pressure over 100 psi on the west sides of PZ-3 and PZ-4. Homes in these areas should be equipped with PRVs, either at the service connection (in the meter box) or where water service enters the home. PRVs will protect appliances from overpressure and potential damage.

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DWG. LOCATION: \\mca-fs\Project\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 4-3 Current Day System Pressure.dwg

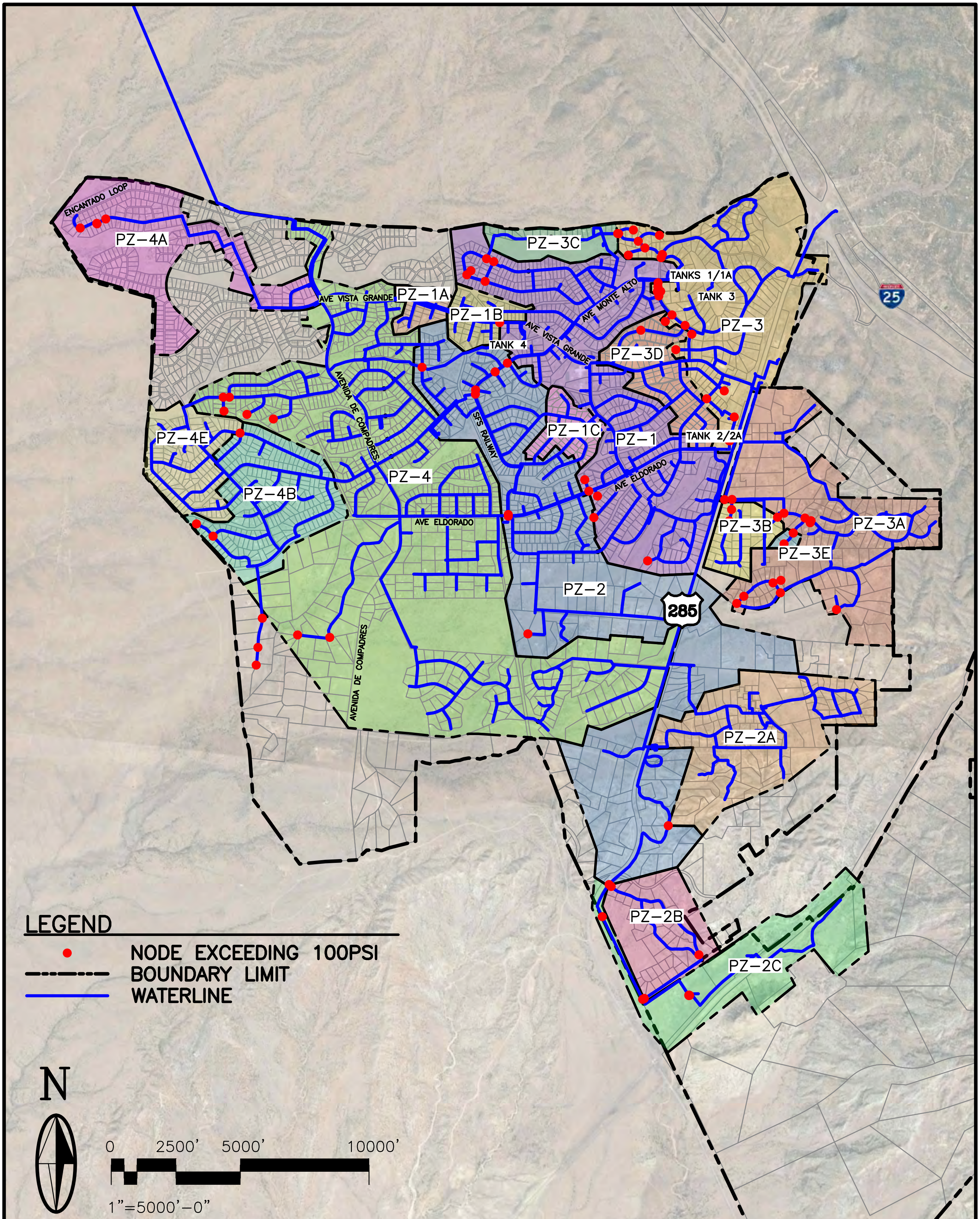

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Figure 4-3

Model Results - Pressures Exceeding 100 psi

4.3 Future Demands

The future scenarios simulate the EAWSD water system with all planned development areas and infill completely built out, but with no additional changes to existing infrastructure (similar to a no action alternative). Changes were made to BPS controls to accommodate the reduced production from Wells 17 and 18 to fill Tank 2. In the future scenarios Tank 1 BPS will act as the lead pump station to fill Tank 3 and Tank 2 BPS will act as the lag pump station. Torreon Control Valve can be used to fill Tank 2 from Zone 1, but the model shows pressure changes of up to 20 psi in the distribution pipes when the Torreon Control Valve is opened. With the control valve open for extended periods of time, Tank 3 begins to drain as pressure in PZ-1 drops to a level which allows flow through PRVs connecting Zones 1 and 3. Because of these negative effects, the Torreon Control Valve is not used to fill Tank 2 in the future scenarios described in this Section.

To assess future water supply, the scenario uses projected future well capacities, which are discussed in detail in Section 3.3.3.6. Over the 20+ year planning period, Wells 17 and 18 are projected to decline the most, reducing production by 57% and 75% respectively. Wells 17 and 18 are the primary sources for Tank 2. Other wells partially lose capacity. Well 9, which is dependent on wet winters for production, is assumed to be unusable during increasingly frequent drought years, and is not considered active in the future scenarios.

4.3.1 Average Demand with Largest Well Out of Service

This scenario involves modeling average future demand with the remaining EAWSD wells running at future capacities (see Table 3-7 for a list of future capacities). Well 9 is assumed to be out of service. County water / Alcalde BPS is still considered to be EAWSD's largest source and is disabled in this run, as is the Tank 4 BPS. Tank 3 Zone is providing water to the County at the Amistad master meter at the future agreed delivery rates. The model results are shown in Figure 4-4. Under the future conditions the wells can meet demands but require Well 7 to run about 65%, Wells 2A / 2B to run about 70% of the time, and Wells 17 and 18 run 75% of the simulation which exceeds the desired 60% sustainable operation time.

LAST MODIFIED: Sep 12, 2022 - 2:33pm BY USER: pdelarosa
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 4-4 Future Ave Demand.dwg

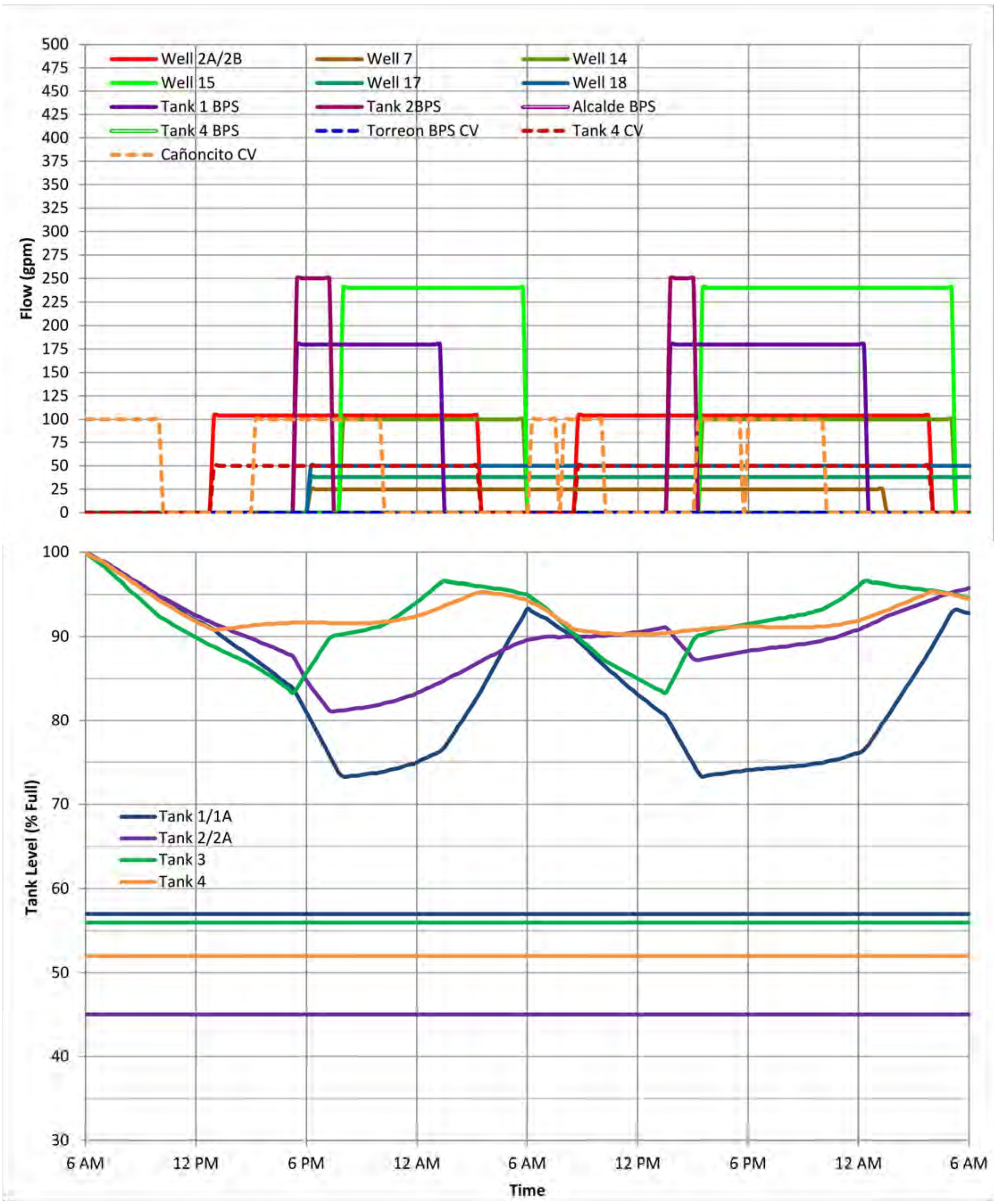

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Figure 4-4: Model Results

Future Average Day Demand with Largest Source Out of Service

After Wells 17 and 18 are called "on", they continue pumping for the remainder of the run and can be expected to continue if the scenario were to continue. The run confirms that future well capacity, with the largest well out of service, can meet future average demand but to the detriment of sustainable well use. However, this practice is acceptable for short periods of time (several days or a week) if the County supply is only temporarily unavailable.

4.3.2 Peak Day Demand

This scenario simulates peak future demand with Well 9 offline (drought) and Wells 14 and 15 at the diminished (60%) rate. All other wells are pumping at the future reduced production rate discussed in Section 3.3.3.6. The District is providing water to meet Cañoncito / County peak demand through the Amistad master meter. The results are shown in Figure 4-5. Tanks drain more quickly and initiate pumps "on" after about 3.75 hours to 7.25 hours. Tank 2 / 2A lacks sufficient sources to fill and reaches a minimum level of 6% full but would likely completely empty if the run continued. Wells 7, 17, and 18 were not able to refill Tank 2 / 2A and run for 91% of the simulation but could be expected to run indefinitely if the scenario were to continue. The results of this scenario indicate that current infrastructure cannot accommodate future peak demands with Tank 2 / 2A being the main concern. Specifically, Tank 2 / 2A needs an alternative supply of water from a source that is not already overtaxed. The model calculates that Wells 14 and 15 run 47% and the County supply was pumped through Alcalde 70% of the time, indicating available capacity from these sources. However, none of these sources pump directly to Tank 2. With existing infrastructure, all would have to pump to Tank 1, then backflow to Tank 2 through the Torreon Control Valve. As the use of this valve in its current configuration creates pressure drop issues in the distribution system, a means is needed to convey other sources such as Wells 14 and 15 and/or County water, directly to Tank 2.

LAST MODIFIED: Sep 12, 2022 - 2:34pm BY USER: pdelarosa
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 4-5 Future Peak Demand.dwg

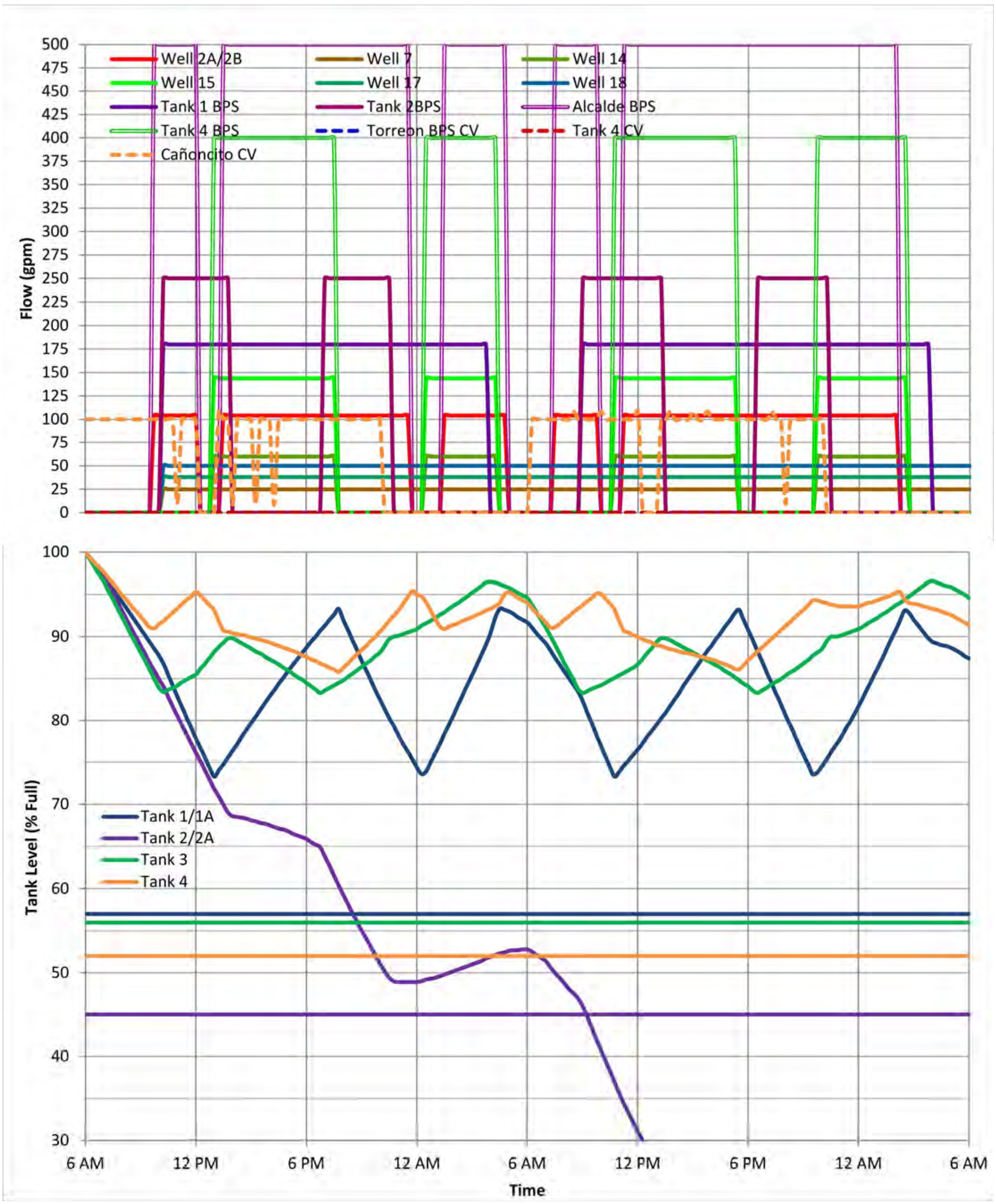

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Figure 4-5: Model Results

Future Peak Day Demand

4.3.3 Storage

The average future demand scenario (Figure 4-4) illustrates that, except for Zone 2, zone demand and supply is reasonably well distributed among the tanks. None of the tanks (except 2/2A) dip below the emergency reserve and all tanks are able to refill during the 48 hour scenarios. The future peak and average demand scenarios illustrate that Tank 2 is most burdened by the increased demand and reduced well production, but only falls below its reserve level during peak demand.

4.3.4 Fire Flow

The model was used to simulate fire flow under future peak demand conditions. All areas were able to provide 500 gpm at 20 psi residual pressure at existing residential areas. Looking at the approximate locations of the new development areas, Cielo Colorado and Cimarron Village looked to have the most trouble achieving 1,000 gpm at 20 psi residual. Cielo Colorado could only reach 700 gpm at 20 psi residual and Cimarron Village was able to reach 1,000 gpm at 20 psi residual as long as an 8-inch waterline is constructed along Camino Valle. In the future, these development areas will need to be carefully designed to allow proper fire flows with increased line sizes or multiple connections to the existing system.

In the case of Cimarron Village, an additional waterline was explored. An 8-inch line installed parallel to US-285 from Ave Vista Grande to Ave De Amistad, would assist in delivering additional flow in a fire event. Cimarron Village could achieve a fire flow of 1300 gpm at 20 psi with this additional infrastructure.

4.3.5 Pressures

Without changes to existing infrastructure, the high pressure areas resemble the current day scenarios. Some of the new development zones, specifically Mejor Lado, Spirit Wind West, and

Cielo Colorado are most likely to experience pressures over 100 psi. Pressures in these areas can be managed by installation of new PRV stations.

4.4 Other Evaluations

4.4.1 Monte Alto Tank 1 Transmission Line

Leaks and breaks due to aging pipes and inferior pipe material have plagued the Tank 1 Transmission Line starting at the Bosque Loop and continuing north along Monte Alto Avenue in PZ-1 (Plate 1). A possible option to address this maintenance issue is to isolate and abandon this 8-inch transmission line. All customers along Bosque Loop and Monte Alto Avenue are serviced by a separate distribution line fed by Tank 2 and parallel to the Tank 1 Transmission Line and would not lose service if the transmission line is isolated. A water model scenario was created to evaluate the impacts of this change.

In a current average day scenario, when wells are called on to fill Tank 1, approximately 120 – 130 gpm flows north through the transmission line from Wells 14 and 15. Abandoning the Tank 1 Transmission Line diverts this flow through 8-inch waterlines east on Avenue Eldorado, north on Avenida Torreon, and west on Avenue Vista Grande to reach Avenue Del Monte Alto leading directly to Tank 1. This alternate flow path allows tanks to fill and drain at the same rate as before. Pressures when wells are called on to fill Tank 1 increase when abandoning Tank 1 Transmission Line. The highest change in distribution is a pressure increase of 11.3 psi (to 110.4 psi) when wells are called on.

4.4.2 Torreon Pumping to Tank 1

Using Torreon BPS to fill Tank 1 along with Wells 14 and 15 has caused issues with high distribution pressures (over 100 psi). With the construction of the Tank 4 BPS and 10-inch transmission line, a connection was made to an existing 8-inch waterline along Avenue Del Monte Alto near the intersection of Avenue Vista Grande. This connection allows both lines to convey flows up to Tank 1 and potentially alleviate a bottleneck created by the 8 inch line. A model run scenario was created to evaluate the effect of using this transmission line in conjunction with Torreon BPS.

Using Wells 14 and 15, and Torreon BPS to fill Tank 1 only through the 8-inch line causes pressures to rise approximately 26.6 psi (to 110.5 psi at the Torreon discharge) when all pumps are on. If the new 10 inch Transmission Line is also used to fill Tank 1, this pressure increase is 21.5 psi (105.4 psi at the Torreon discharge). Incorporating changes as discussed in Section 4.4.2, such as abandoning the Tank 1 Transmission line, further exacerbates the problem, with the Torreon BPS possibly not being able to deliver full flow due to the increase in friction loss.

4.4.3 Tank 4 to Tank 2 Transmission

The future model run scenarios discussed in Section 4.3 identified a need to increase flow to Tank 2 as system demands increase and production in Wells 17 and 18 decrease. Using the Torreon BPS Control Valve, it is possible to fill Tank 2 from PZ-1, but doing so causes an undesirable pressure drop near the Torreon BPS. Another option is using the Tank 4 BPS in conjunction with a new transmission line to PZ-2. See Section 6.1 for more information on this option. Model run scenarios were created to evaluate using the Tank 4 BPS with different transmission line options to fill Tank 2.

This model run considers a transmission line from Tank 4 BPS south across ECIA property and an existing easement to Monte Alto Road and connecting to PZ-2 west of the isolation valve near the western intersection of Monte Alto Avenue and Valencia Loop. Using Tank 4 BPS with this transmission line setup creates an approximate 10.3 psi increase in pressure near the connection point (from 53.6 psi to 63.9 psi). This option would allow an additional 400 gpm to fill Tank 2.

4.4.4 Future Demand with Wells 17 and 18 Offline, Full County Supply, Full Supply to Cañoncito

The EAWSD may wish to take Wells 17 and 18 offline to allow passive groundwater recharge and extend the life of these wells. However, if Well 9 is also offline, this would eliminate Tank 2's major supply sources and create a need for an alternate source. One option is for Wells 14 and 15 to supply water to Tank 2 through a new line. Wells 17 and 18 would likely not be taken offline until the District is receiving the full 500 gpm/300 AFY supply from the County. At the same time, we assume that with Cañoncito also would be receiving full supply. A model run scenario was created to evaluate the effect of these conditions for a future peak day scenario.

4.4.4.1 Peak Day

Model results are shown in Figure 4-6. Compared to the future peak day demand scenario discussed in Section 4.3.2 (with existing sources and infrastructure), Wells 2A/2B and Well 7 operate longer at 84% and 85% of the run respectively. Tanks 1 and 3 can fill and drain to a similar range compared to the future peak day demand scenario, although Tank 1 takes approximately 8.75 additional hours to fill without Wells 14 and 15. Tank 4 maintains a slightly lower fill range of approximately 87% to 95%. Tank 2 can maintain approximately 77% to 92% but requires Wells 14 and 15 operate significantly more at 80% of the simulation. In practice, the District may want to bring Wells 17 and 18 back on line temporarily during the 3 or 4 weeks of peak demands and keep them offline the rest of the year. The Alcalde booster station operate 84% of the time, which is outside of the 80% limit of peaking operations. The run confirms that the water system can operate to fill all tanks without Wells 17 and 18 at the cost of undesirable pumping duration of Wells 14 and 15. However, this is probably acceptable for short periods of a few days or a week. This operation will require the construction of a new transmission line connecting Wells 14 and 15 to PZ-2.

4.4.4.2 Pressure Change Caused by Water Transfer to County

The model shows that 100 gpm flowing from the Tank 3 Zone to the Amistad master meter causes less than 1 psi pressure drop in the existing District distribution system on the west side of US-285.

LAST MODIFIED: Sep 12, 2022 - 2:34pm BY USER: pdelarosa
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 4-6 Well 17_18 OFF Alcalde FULL T4 to PZ1 and W14_15 to PZ2 Future Peak Day 48hr EPS.dwg

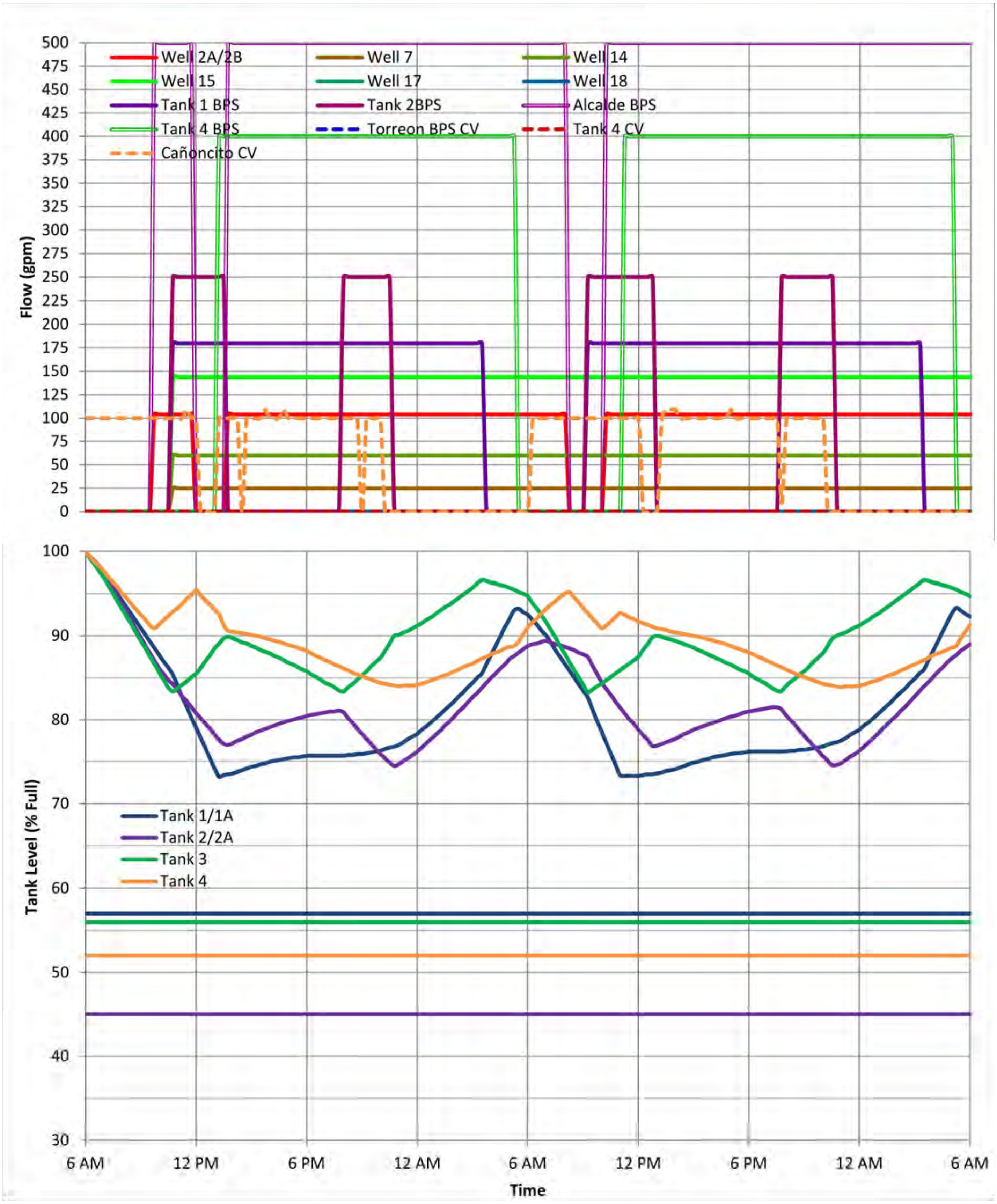

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Figure 4-6: Model Results

Well 17/18 Offline, Future Peak Day Demand

5.0 NEED FOR PROJECT

The following Section presents the District's water system deficiencies and categorizes them into four areas of prioritization following the format of the USDA RUS Bulletin for PERs: (1) Health, Sanitation, and Security; (2) Aging Infrastructure; (3) Reasonable Growth; and (4) System O&M.

5.1 Health, Sanitation, and Security

Health, sanitation and security relate to the system's ability to meet the following goals:

- Provide a secure water supply adequate to meet current and future demands.
- Deliver water that meets or exceeds primary health and secondary aesthetic standards.
- Provide adequate flows and pressures to fight fires throughout the system.
- Ensure all water facilities are protected against natural and man-made hazards and security threats.
- Ensure protection and conservation of the water resources the system relies upon.

5.1.1 Water Supply

As the impacts of drought and climate change continue to exacerbate water shortages, water managers are faced with increasing challenges to supply clean drinking water. The District is no exception, and has experienced loss of water supply in dry years, most notably from Well 9. Because of the importation of County water and the future increase in supply that it provides, the loss of supply capacity over the planning period is only about 2% with all sources available. The County supply mostly offsets the loss of production from wells. Without the County supply, the District can meet future average demands but cannot meet peak demands. This is worth considering because the County supply is not entirely drought resistant. Diversions of San Juan Chama water for the past 10 years have averaged 82,960 acre-feet. Diversions in 2018 and 2020 were only

34,000 and 48,000 due to drought. Because the San Juan project depends chiefly upon winter snowpack in the San Juan River basin, drought and climate change may increasingly impact the future availability of surface water and San Juan Chama contract deliveries. Furthermore, the current agreement between the District and County states that, in times of shortage, other County customers have priority over deliveries to the District. It is recommended the District utilize the County supply when available to replace the supply of high producing supply wells, especially Wells 17 and 18, and allow the aquifer to recover. With sufficient recovery, the wells can be brought back online at times when drought conditions cause San Juan-Chama deliver shortages and the County is unable to supply water to EAWSD. A necessary step in facilitating this operational objective is to install infrastructure to supply water to Tank 2 from other sources.

As discussed in Section 3.3.3.4, the County is pursuing a project to bring an existing well into production that could be used, during times of San Juan Chama delivery curtailment, to provide County water to the District. For that reason the District has agreed to partially fund the design phase of the project.

Another action the District is currently considering to secure water supplies is to drill a well supplemental to Well 9. While this well will not operate in dry years, it will allow the District in wet years to divert the full water right for Well 9. Because these wells supply Tank 2, this strategy provides another opportunity for Wells 17 and 18 to rest, recover, and rebuild storage.

5.1.2 Storage

Adequate water storage is critical for the health, sanitation, and security needs of water customers. Water tanks store water for daily operations, emergencies, and firefighting. Without adequate storage, a community may be left without water during emergencies such as power outages, line breaks and fires. Based on Tables 3-14 and 3-15 the District has adequate storage to meet current and future demands, emergency reserve and fires storage. The District has completed rehabilitation and installation of cathodic protection in three tanks (Tanks 1, 2 and 4) and intends to pursue installation of cathodic protection of Tank 3 this year. All tanks should be inspected again within the next few years, and Tank 3 should be rehabilitated once access road improvements are completed.

Tanks 2 and 2A are presently located on a site with inadequate security fencing. To provide proper security, the existing barbed wire fence should be replaced with a 6-foot chain link fence with three-strand barbed wire.

5.1.3 Replace Pipes and Service Connections

As highlighted in Section 3.3.5.1 of this 2022 UMP, much of the pipe (84%) installed within the service area is comprised of either SDR 26 or SDR 21 PVC pipe, which is not a typical installation for pressurized water systems. As this pipe is only rated for pressures of 160 psi, many of the locations where the District is experiencing leaky lines or complete line breaks can be attributed to this pipe being pushed past its design limits. As the District works to address the issues associated with revenue lost due to leaks or line breaks, removing and replacing these inadequate lines would be a significant improvement to the pressure network's ability to mitigate system losses.

Additionally, current HDPE service lines that are connected through flared joints have been prone to leaking and or breaking. Replacement of these service line connections will be imperative to improving overall water system performance and water system revenue generation.

The *Desktop Condition Assessment & 10 Year Leak Report*, August 2020 (Jacobs Engineering, Inc.), see Section 3.3.2.2 of this 2022 UMP, concluded that the EAWSD experiences 3.8 main breaks per 100 miles of waterline annually, compared to the national average of 14. While replacement of pipe and laterals in known problem areas is a priority, the District is not compelled to undertake wholesale replacement of aging waterlines since the number of breaks is well below average.

5.1.4 Water Quality

Water quality relates to the health impacts of the potable water supply. For the most part, the District's water quality both in the wells and in the overall system is considered very good and the only necessary treatment is disinfection prior to distribution. However, there are individual well sites that have contaminants of varying concern that are addressed directly at the point of production. Well 1 which is contaminated with arsenic, remains inactive. Well 19 contaminated with antimony, iron, and manganese is on standby until a cartridge filtration system can be installed. Wells 7, and 8 are contaminated with high levels of iron and are used only after extended flushing periods. The County water supply has elevated TTHM, which will be removed at Tank 4 prior to entering the distribution system.

As noted in Section 3.0, although there are no apparent issues with the residence time of water in each of the storage tanks (4.7 to 6.4 days), providing mixing capabilities would improve the overall quality of the water in the system by promoting turnover and helping maintain chlorine residuals. None of the EAWSD tanks have mixers, except Tank 4.

5.2 Aging Infrastructure

This section addresses issues of maintenance and risk of potential failures caused by aging equipment and facilities.

5.2.1 Wells

Active District wells range in age from 6 to 40 years old (Table 3-2). The useful lifetime of wells is highly variable and depends on many factors, including the material of construction, quality of construction, water quality, operational characteristics such as the magnitude of drawdown from pumping, and maintenance. Well failures may include screen clogging or encrustation, screen or casing failure, a stuck pump or tool, damage during maintenance, or water level decline below the practical pumping level. EPA (2003) estimates the design life of wells and springs to be 25 to 35 years. However, many wells in New Mexico have lasted well over 50 years. The District engages in an active well inspection and rehabilitation program that is meant to identify and fix any issues or damage, to clean the screen to maintain good capacity, and inspect and repair / replace the pump and drop pipe. So far, the inspections have not identified imminent failure potential for any wells.

If a 50-year well design life is planned, Wells 7, 8 and 9 will reach the design life about 10 years into this planning period. Well 6, currently inactive, is of similar age. Appendix I contains an evaluation of replacing Wells 6, 7, and 8. Only Well 7 is recommended for replacement. However, the recommendation is to locate farther down the adjacent arroyo, which increases the cost of supporting infrastructure and requires securing an easement. Based on the potential for low yield, replacing this well may not be worth the cost of installation. Wells 1, 3, 4, 6, and 12 should be considered for abandonment and demolition (including associated facilities) to remove the maintenance burden.

5.2.2 Distribution System

Much of the installed pipe within the service area is reaching or has reached its expected design life. As the pipe within the system continues to age and operate at pressures above their intended purpose, it can be expected that the system will experience an increased amount of system leaks, breaks, and overall loss of water. As the replacement of the AC pipe from the *2017 UMP* was deemed unnecessary, the priority to remove and replace the existing SDR 21 and SDR 26 PVC and HDPE service line piping should take precedence moving forward.

The SDR 26 pipe north of Well 7 along Avenida del Monte Alto Road to Avenida Vista Grande has experienced multiple line breaks in the past and is in need of replacement. The HDPE pipe with flared connections, used for service connections along Verano Loop and other neighboring streets have had numerous failures, which is being addressed in a project to be constructed this year. Similarly, HDPE service connections south of Avenida Vista Grande from Avenida de Compadres to Vista Grande Drive have experienced breaks in their service line connections and warrant some replacements. Furthermore, a grouping of both mainline and service line failures over the past few years can be seen on both the north and south sides of Balsa Road from Avenida de Compadres to Avenida Casa de Oro.

5.2.3 Storage Tanks

While the ages of some tanks are unknown, Tanks 1, 2, and 3 were likely constructed in the 1970s and 1980s when the water system was first installed. The tanks could be as old as 50 years. The EPA (2003) estimates design life of tanks to be 30-60 years, which suggest the older tanks have reached or are approaching their design life. However, because the District has instituted a program of inspection, rehabilitation, and cathodic protection of these assets, none of the tanks is anticipated to need replacement within the planning period. The floor of Tank 4 is in need of replacement in the next several years.

Drainage at some tank sites is another issue that should be addressed, especially at Tanks 1 and 4. Erosion off the hillside at Tank 1 has led to sediment buildup around the tank foundation. Drainage around the tanks is poor, leading to standing water that potentially can lead to corrosion of the tank floor. Tank 4 sits in a low area with unprotected slopes that experience erosion during storm events. Projects are needed to improve drainage and prevent erosion at both of these sites.

5.2.4 Booster Pumps

The District's has two older inactive booster pump stations (Compadres / Vista Grande and Well 1) that should be demolished for safety and to remove the maintenance burden. The Tank 1 booster is over 50 years old and appears to operate fine, but may need replacing in the near future. The Well 9 booster station is approaching 40 years of age but appears to be in reasonably good condition. The remaining booster pump stations were constructed in the 1990s or later. The District conducts regular inspection and maintenance of the booster pumps and associated equipment to ensure these critical facilities continue to operate into the future.

5.3 Growth

The EAWSD service area population is anticipated to grow from about 6,129 to about 6,917 customers by 2040. About half this growth is expected to occur in new subdivision developments. Through existing water service agreements, EAWSD is required to provide water service to Cimarron Village, Spirit Wind West, Tierra Bello, Cielo Colorado, Mejor Lado, and Rancho San Lucas as these areas develop. The other half of growth is expected to be the result of infill in developed areas.

This modest growth is anticipated to increase the average daily demand from about 435,000 gpd to about 481,000 gpd in 2040. Peak daily demand is estimated at 1.1 MGD in 2040 Considering the new County-to-District water supply line will be a reliable source moving forward, the EAWSD is capable of meeting future peak demands despite the anticipated growth of the District. The District's primary vulnerability is drought, which periodically may render the County supply unavailable. To manage this risk, the District should implement a program of passive recovery for Wells 17 and 18 to build up the storage reserve in the aquifer for future use.

5.4 System Operation and Maintenance (O&M)

5.4.1 Zone Supply Shortages

Tank Zone 2 will begin to experience shortages as Wells 17 and 18 decline in capacity, especially in dry years when Well 9 is out of service. This will be exacerbated when the District moves toward a full supply from the County and takes Well 17 and 18 offline to replenish the aquifer. The current infrastructure to allow movement of water to Tank 2 requires pumping to Tank 1, then backflowing water to Tank 2 through the Torreon control valve. Not only is it inefficient from an energy standpoint to pump water to a higher zone (Tank 1) only to convey it to a lower tank, but the operation through the Torreon control valve creates unacceptable pressure drops in distribution. A means to provide additional sources of water to Tank 2 is needed. This could include pumping Tank 4 water through the existing BPS to the Tank 2 zone, or adding a new waterline to convey Wells 14 and 15 water to Tank 2.

5.4.2 Transmission Lines

The District has been making significant steps toward improving transmission of water between tanks, including construction of the Tank 4 to Tank 1 and the County Waterline Extension transmission lines. As discussed in the previous section, a new transmission line is need between Tank 4 and Tank 2 to accommodate movement of County water to make up for lost production from Well 17 and 18.

5.4.3 Inefficient System

5.4.3.1 High System Pressures

Figure 4-3 shows that there are still significant areas of the distribution system with pressures over 100 psi. The PZO Cost-Benefit Analysis (Molzen Corbin, 2017) found that the cost of installing additional PRV stations outweighs the potential benefits. Another approach to managing the pressures to homes in these areas is to install small PRVs in the meter can at each connection. This won’t protect the distribution pipes from high pressures, but will protect household plumbing and appliances.

5.4.3.2 Low System Pressures

Low pressures along Camino Caballos resulted from installation of a new PRV station (PRV 24) during PZO Phase 1. The goal was to reduce high system pressures to less than 100 psi, but several connections at the high elevation of the sub zone ended up with undesirably low pressure. The problem has been temporarily fixed by increasing the outlet pressure of the new PRV and closing a zone valve farther west to prevent the higher pressure from overflowing Tank 4. The long-term solution is to install a new PRV in place of the closed zone valve.

There also have been low pressure complaints downstream of the new PRV 21 on Avenida Eldorado. This issue might also be resolved by adding another PRV downstream and increasing the setpoint pressure of PRV 21. The cost of installation for new PRV stations is considered to outweigh the benefits to the small number of connections that would be affected.

5.4.3.3 Inadequate Isolation and Flushing Capabilities

Isolation valves and flushing stations are needed throughout the system. This 2022 UMP recommends that EAWSD continue to install valves and flushing stations during new projects and install new valves when repairs are made on existing lines.

5.4.4 Removal of Unused Facilities

As described previously, Wells 1, 3, 4, 6 and 12 should be considered for abandonment and demolition, included the associated facilities. The booster pumps at Well 1 and Compadres / Vista Grande should similarly be considered for demolition.

5.5 Summary

In summary the most pressing needs for the EAWSD water system include:

- New transmission line from Tank 4 to Tank 2.
- Connect Wells 14 and 15 to Tank 2 zone.
- Replace failing lines along Monte Alto Road.
- Demolish existing unused well and booster station facilities.
- Waterline and service connection replacements.
- Tank site improvements including replacement of Tank 4 floor.

6.0 ALTERNATIVES CONSIDERED

The needs identified in Section 5.0 are addressed here with proposed project alternatives. Included are alternatives to improve transmission and boosting capabilities, replace aging distribution lines, and improve O&M and security aspects of the system. Other potential improvements that were considered but not developed in detail are briefly described at the end of this section.

Included in the following subsections are cost estimates for various improvements laid out for the EAWSD water system. The costs are presented on an improvement-by-improvement basis and include professional services (e.g. Design, Bidding, Construction Administration, Construction Observation, etc.), and New Mexico Gross Receipts Taxes (NMGRT). Phasing the projects and prioritizing short-, medium-, or long-term projects will be covered in Section 7.0 – Proposed Projects.

6.1 New Tank 4 to Tank 2 Transmission Line

6.1.1 Description

A Tank 4 to Tank 2 transmission line is necessitated by the District's strategy to utilize County water supply in lieu of Wells 17 and 18 when those wells are rested to allow passive recharge. Without these wells (and Well 9 during drought) the Tank 2 zone has inadequate sources to meet either average or peak demand. As previously discussed, the intent of resting and recovering Wells 17 and 18 is to extend the aquifer life by allowing water levels to recover, then use the wells as backup supply when County water is unavailable (e.g during drought when San Juan Chama deliveries are curtailed). The current infrastructure does not allow direct movement of water from Tank 4 to Tank 2. Tank 4 only serves customers in PZ-4 or is pumped through the Tank 4 booster station to Tank 1.

The layout of the proposed project is shown in Figure 6-1.

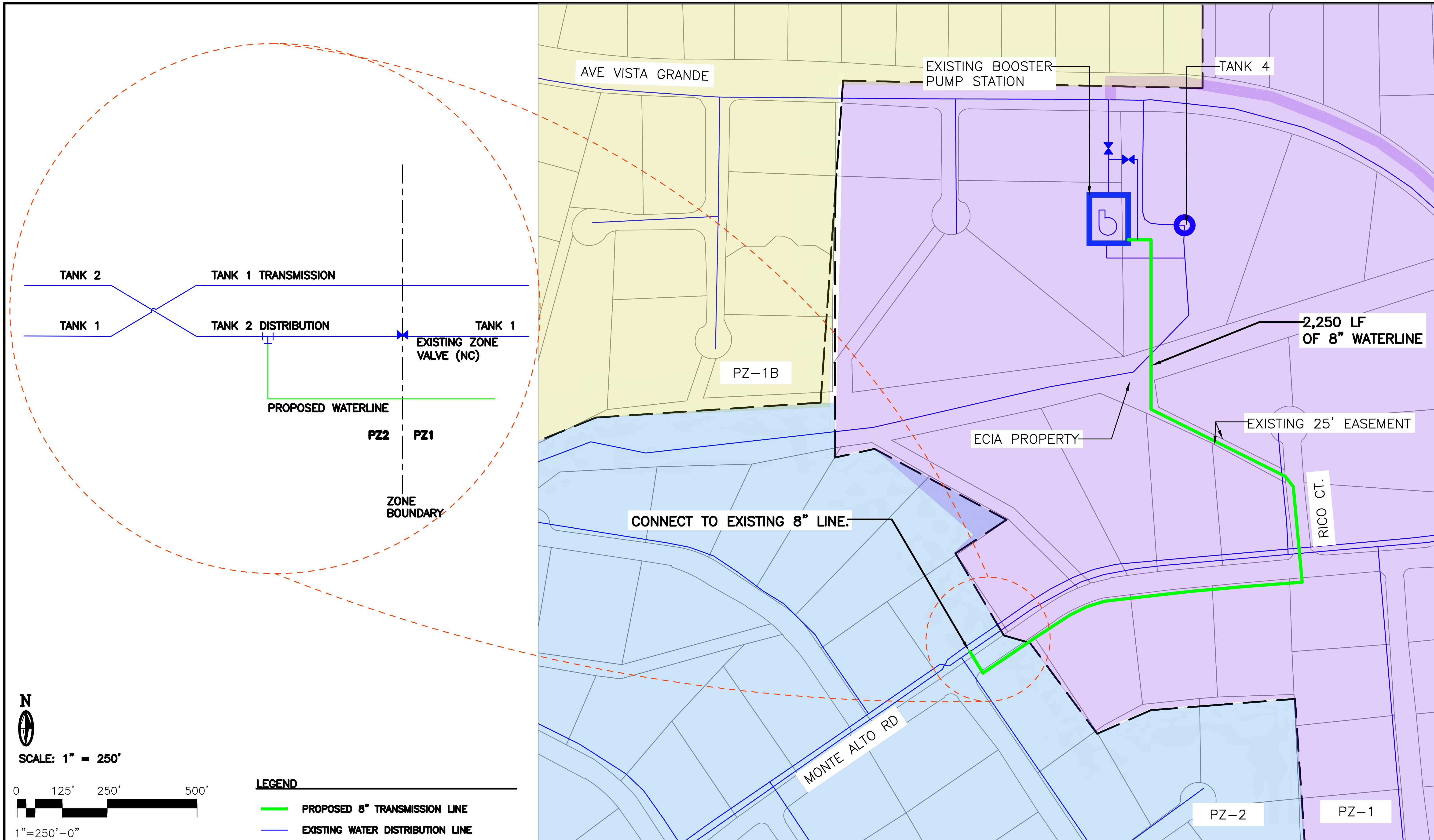

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Figure 6-1

TANK 4 TO TANK 2 TRANSMISSION LINE

6.1.2 Design Criteria

The proposed transmission line would fill Tank 2 with water from Tank 4 utilizing the existing BPS that conveys water from Tank 4 to Tank 1. Pumps are currently operated with VFDs which will allow speed adjustment to match Zone 2 hydraulic conditions. The pump discharge piping would need to be retrofitted with electrically actuated valves to allow operators to select the target tank.

A potential issue that may delay or extend design is that the District is not confident of the location and connections of the Tank 2 line. Prior to the design phase a study phase is necessary, including a subsurface utility engineering (SUE) study, to verify location and connections of the Tank 2 line. This study would most likely take place as a separate effort in advance of the design phase of either this project or the Tank 1 Transmission / Tank 2 Distribution Line Replacements Project.

The proposed transmission line would follow the path as identified in Figure 6-1. Pipe design would consider acceptable velocities (between 2 to 5 feet per second [fps]), pressure rating, and adequate isolation and other appurtenances. Where high spots exist air / vacuum valves would be constructed to allow release of entrained air and prevent vacuum conditions if the line were to experience a major break nearby. Isolation valves would be installed at least every 800 feet, and DR 18 C900 pipe (rated for 235 psi and typically used for waterline) would be used.

6.1.3 Environmental Impacts

Environmental impacts are expected to be minimal for the construction of the proposed transmission line. Any new pipe would follow existing utility easements as it will run parallel with existing waterlines in the area. The entirety of the project is likely to disturb more than 1 acre during construction, requiring the development of a Storm Water Pollution Prevention Plan (SWPPP). The arroyo crossing would be accomplished using horizontal directional drilling (HDD) methods to avoid open cut and a possible USEPA Section 404 Permit requirement.

6.1.4 Land Requirements and Permitting

The arroyo and the 25-foot easement are listed by the SFC Assessor as belonging to ECIA. Permission or an easement for the new waterline may need to be secured prior to construction. The remaining alignment would follow existing utility easements along roads.

The project construction documents would need to be reviewed and approved by the NMED DWB prior to bidding and construction.

6.1.5 Potential Construction Problems

Potential construction problems may include trenching through rock, implementing traffic control and maintaining business / residential access during construction, finding temporary space for trenchless crossing pits, and crossing unmapped utilities. The utility corridor along Avenida Monte Alto may be crowded and space for a new transmission line may be difficult to find. During the design phase, a geotechnical study would be performed to assess the nature of soil and rock at the construction locations, and SUE would be used to locate and identify underground utilities. The trenchless crossing locations would be selected with available area for temporary pits.

6.1.6 Sustainability Considerations

Pipe sizes and materials would be verified in design and selected to minimize the head losses and save energy. The construction of this transmission line would eliminate a potential source of wasted energy associated with filling Tank 2 through the Tank 1 Zone.

6.1.7 Project Timeline

Table 6-1 presents a proposed project schedule for the Design, Bidding, and Construction of the proposed improvement. Total project time to completion is expected to be 420 days or 14 months.

TABLE 6-1
PROJECT SCHEDULE FOR
TANK 4 TO TANK 2 TRANSMISSION LINES

TASKS	DURATION
Survey, SUE, and Geotechnical	60 Days
Design	120 Days
Bid and Award	90 Days
Construction	120 Days
Closeout	30 Days
TOTAL	**420 DAYS**

6.1.8 Cost Opinion

The total estimated cost for this alternative is $1,024,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. Additional O&M costs incurred by this alternative are estimated at $3,900 per year. Appendix K contains detailed O&M costs.

6.2 Wells 14 and 15 Connection to Tank 2 Pressure Zone

6.2.1 Description

To further improve the supply shortages to Tank 2 PZ or provide an alternate to conveying County water to Tank 2, it would be beneficial to alter the configuration of Wells 14 and 15 to directly fill Tank 2. This arrangement would lessen the Tank 2 dependency on Wells 17 and 18. Furthermore, this alternative would provide the District with system redundancy as the Tank 2 PZ has fewer alternatives for supply than that of the Tank 1 PZ that these wells currently feed.

6.2.2 Design Criteria

To facilitate this alternative, a transmission line dedicated strictly to the movement of water from Wells 14 and 15 would need to be constructed and connected to the Tank 2 PZ. The well pumps and motors at each of these locations would need to be removed and replaced to accommodate the pumping of water into the Tank 2 PZ. Well head discharge piping would need to be modified to connect to the new transmission line.

The proposed transmission line would follow the path along Avenida Torreon as identified in Figure 6-2. Pipe design would consider acceptable velocities (between 2 to 5 fps), pressure rating, and adequate isolation and other appurtenances. Where high spots exist air / vacuum valves would be constructed to allow release of entrained air and prevent vacuum conditions if the line were to experience a major break nearby. Isolation valves would be installed at least every 800 feet, and DR 18 C900 pipe (rated for 235 psi and typically used for waterline) would be used.

6.2.3 Environmental Impacts

Environmental impacts are expected to be minimal for the construction of the proposed transmission line. The waterline would follow existing utility easements which have already been disturbed. There is one arroyo crossing that would require HDD methods to avoid the disturbance of open trenching.

6.2.4 Land Requirements and Permitting

No additional land requirements would be needed, all the new pipelines would follow existing utility easements. All work at the well sites would be completed within the limits of the existing utility easements.

The project construction documents would need to be reviewed and approved by the NMED DWB prior to bidding and construction.

6.2.5 Potential Construction Problems

Potential construction problems may include trenching through rock, implementing traffic control and maintaining business / residential access during construction, finding temporary space for trenchless crossing pits, and crossing unmapped utilities. During the design phase, a geotechnical study would be performed to assess the nature of soil and rock at the construction locations, and SUE would be used to locate and identify underground utilities. The trenchless crossing locations would be selected with available area for temporary pits.

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DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
DWG. NAME: FIGURE 6-2 Well 14 & 15 Connections.dwg

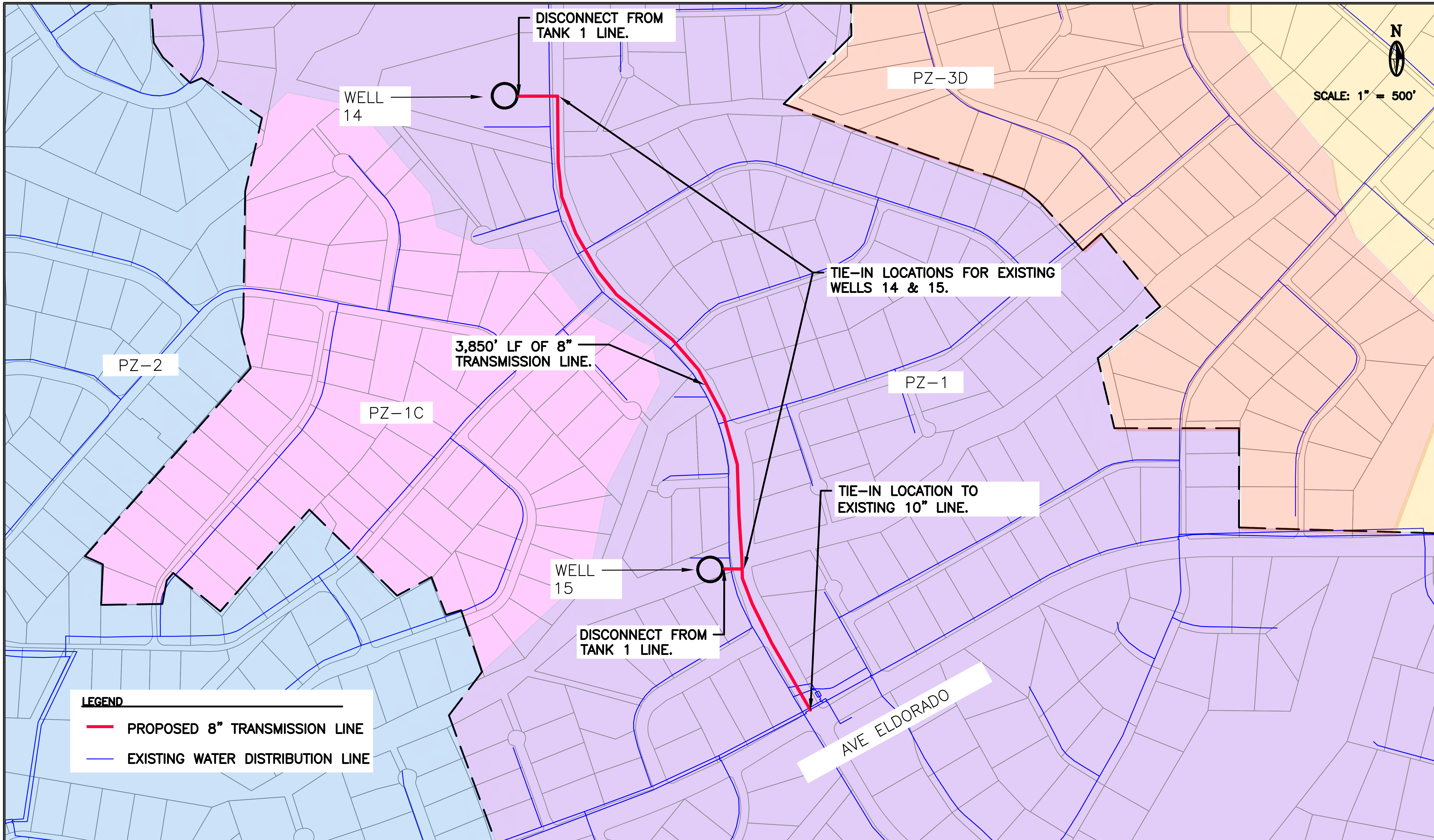

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Figure 6-2

WELL #14 AND #15 CONNECTION TO TANK 2

6.2.6 Sustainability Considerations

Pipe sizes and materials would be verified in design and selected to minimize the head losses and save energy. Pumping Wells 14 and 15 to Tank 2 instead of the higher-elevation Tank 1 will reduce energy usage to produce the same volume of water.

6.2.7 Project Timeline

Table 6-2 presents a proposed project schedule for the Design, Bidding, and Construction of the proposed improvement. Total project time to completion is expected to be 420 days or 14 months.

TABLE 6-2
PROJECT SCHEDULE FOR WELLS 14 AND 15
CONNECTION TO TANK 2 PRESSURE ZONE

TASKS	DURATION
Survey SUE and Geotechnical Investigation	60 days
Design	120 days
Bid and Award	90 days
Construction	120 days
Closeout	30 days
TOTAL:	**420 DAYS**

6.2.8 Cost Opinion

The total estimated cost for this alternative is $1,664,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. No additional O&M costs are expected to be incurred by this alternative.

6.3 Tank 1 Transmission / Tank 2 Distribution Line Replacements

6.3.1 Description

The District has identified operational issues with the Tank 1 transmission and the Tank 2 distribution lines. These parallel lines have experienced multiple line breaks / leaks that have led the District to consider the complete replacement of each of these lines. The transmission line is a key component to the water systems ability to convey water from Tank 2 to Tank 1. While the Tank 2 distribution line feeds water to multiple customers within PZ-2 and PZ-1.

The Tank 1 transmission and Tank 2 distribution lines run parallel to one another along Bosque Loop and Monte Alto Road between Avenida Eldorado and Avenida Vista Grande (Figure 6-3).

LAST MODIFIED: Sep 12, 2022 - 12:05pm BY USER: ATrujillo
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE 6-3 Well 7 Transmission Line.dwg

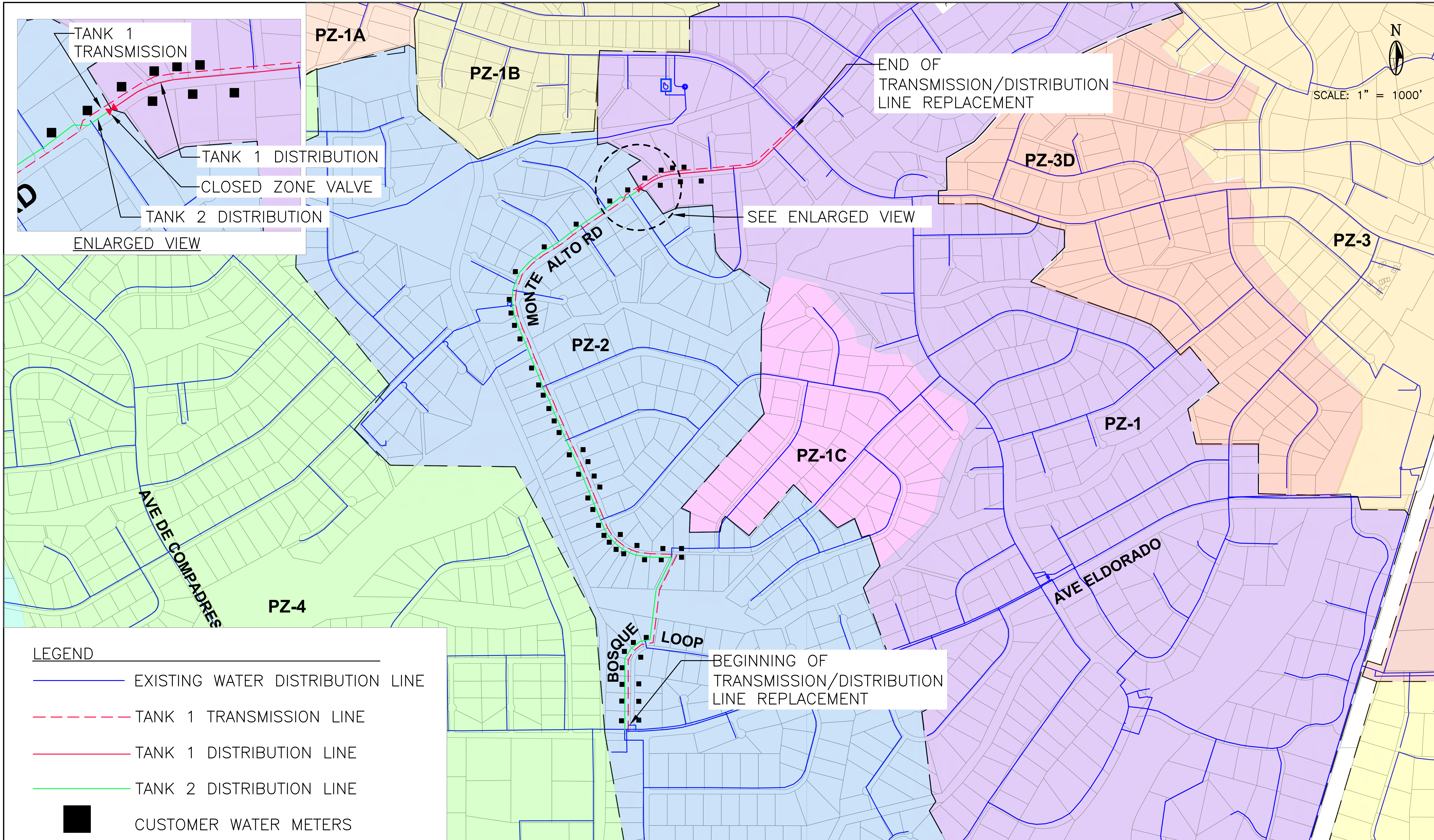

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Figure 6-3

TANK 1 TRANSMISSION/TANK 2 DISTRIBUTION LINE REPLACEMENTS

According to EAWSD online GIS information, the Tank 1 transmission line is east of the Tank 2 line until the western intersection of Valencia Loop and Monte Alto Road, where they cross and swap positions. Shortly northeast of that, the Tank 2 distribution line ends at a closed zone boundary valve beyond which the line is connected to Tank 1 and serves as distribution to Tank 1 zone.

The Tank 1 transmission line (which has also been called the Well 7 transmission line, as it once carried water from that well to Tank 1; Well 7 currently feeds Tank 2) serves an important hydraulic role by transmitting part of the flow from Wells 14/15 and the Torreon booster station to Tank 1. By carrying part of the flow, it reduces the load on the 8-inch line along Avenida Torreon and thereby reduces the friction loss and associated pressure increase. For this reason, the District prefers to keep this line in service but to replace it with a better designed and constructed waterline.

Records on the two lines are sparse. Much of what is known about them has been found during emergency repairs, and that information often has been conflicting. Part of the design effort will involve a comprehensive SUE effort to locate the line and adjacent utilities, establish their size, depth, and material of construction, and determine locations of connections.

6.3.2 Design Criteria

The proposed transmission and distribution line replacements would follow an alignment similar to the current configuration (Figure 6-3). Pipe design would consider acceptable velocities (between 2 to 5 fps) pressure ratings, and adequate isolation and other appurtenances. The distribution line would be reconnected to the existing fire hydrants, combination air valves, distribution branch lines, customer water meters, and all other associated appurtenances that are currently connected to the distribution line. New isolation valves would be installed at least every 800 feet, and DR 18 C900 pipe (rated for 235 psi and typically used for waterline) would be used.

6.3.3 Environmental Impacts

Environmental impacts are expected to be minimal for the construction of the proposed transmission and distribution lines. Any new pipe would follow existing utility easements as it will run parallel with existing waterline in the area. The entirety of the project is likely to disturb more than 1 acre during construction, requiring the development of a SWPPP.

6.3.4 Land Requirements and Permitting

No additional land requirements would be needed, all the new pipelines would follow existing utility easements.

The NMED DWB would need to review the project prior to bidding and construction.

6.3.5 Potential Construction Problems

Construction problems that may persist during the construction include trenching through rock, implementing traffic control and maintaining residential access during construction, finding temporary space for trenchless crossing pits, and crossing unmapped utilities. During the design phase, a geotechnical study would be performed to assess the nature of soil and rock at the construction locations and an SUE would be used to locate and identify underground utilities.

6.3.6 Sustainability Considerations

Pipe sized and materials would be verified in design and selected to minimize the head losses and save energy. The proposed transmission and distribution line replacements would prevent leaks and breaks, conserve water, and minimize service interruptions.

6.3.7 Project Timeline

Table 6-3 presents a proposed project schedule for the design, bidding, and construction of the proposed improvement. Total project time to completion is expected to be 420 days or 14 months.

TABLE 6-3
PROJECT SCHEDULE FOR TANK 1 TRANSMISSION AND TANK 2 DISTRIBUTION LINE REPLACEMENTS

TASKS	DURATION
Survey, Geotechnical, and SUE	30 Days
Design	90 Days
Bid and Award	90 Days
Construction	180 Days
Closeout	30 Days
TOTAL:	**420 DAYS**

6.3.8 Cost Opinion

The total estimated cost for this alternative is $4,605,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. No additional O&M costs are expected to be incurred by this alternative since in involves replacement of existing with similar infrastructure.

6.4 Service Lateral and Waterline Replacements

6.4.1 Description

As identified in Section 3.3.5.5 the EAWSD distribution network is constructed of several types of aging pipe materials including SDR 21 and SDR 26 PVC, DR18 C900 PVC, as well as thin-walled HDPE / service connections. Of particular concern are frequent breaks along Verano and Conchas Loops and Balsa Road, leaking HDPE service connections along the southern end of Avenida Vista Grande from Avenida de Compadres to Vista Grande, and leaking service connections and breaks along Moya Road. There is a current project expected to be completed in 2022 that addresses issues on Verano and Conchas Loops and Moya Road. The remaining areas of concern are shown on Figure 6-4.

6.4.1.1 Balsa Road

Balsa Road located in the western portion of the service area is an 8-inch PVC waterline situated in PZ-4. The area has experienced two main line breaks, one on the main 8-inch PVC pipe segment and one on a 6-inch PVC branch line heading north along Domingo Road from Balsa Road. Additionally, this area has recently seen multiple service line connection leaks and/or breaks on both the north and south sides of Balsa Road. Because service line failures are the predominant issue, this alternative entails replacing all service connections.

6.4.1.2 Avenida Vista Grande

Avenida Vista Grande is a segment of 8-inch AC waterline that runs west from US-285 all the way through the system to a connection point just west of Avenida de Compadres. Of recent, just south of Avenida Vista Grande between Avenida de Compadres and Vista Grande Drive, the District has experienced multiple service line leaks and/or breaks from pipes that are connected to both PVC and AC mainlines. The project would involve replacing all service connections in the project area. PVC and AC lines would remain.

6.4.1.3 Valencia Loop

Valencia Loop is a looping segment of 6-inch PVC waterline that comes directly off Monte Alto Road to the south. This segment of piping resides in two separate pressure zones, the eastern half of the loop in PZ-2, and the western half in PZ-1. While the western half of the looping pipe segment appears to be in good condition, the eastern half has experienced multiple service line leaks and/or breaks of recently. This alternative consists of replacing the service lateral connection in the area to mitigate future line leaks and water losses.

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DWG. NAME: FIGURE 6-4 WL AND SERVICE LAT REPLACEMENTS.dwg

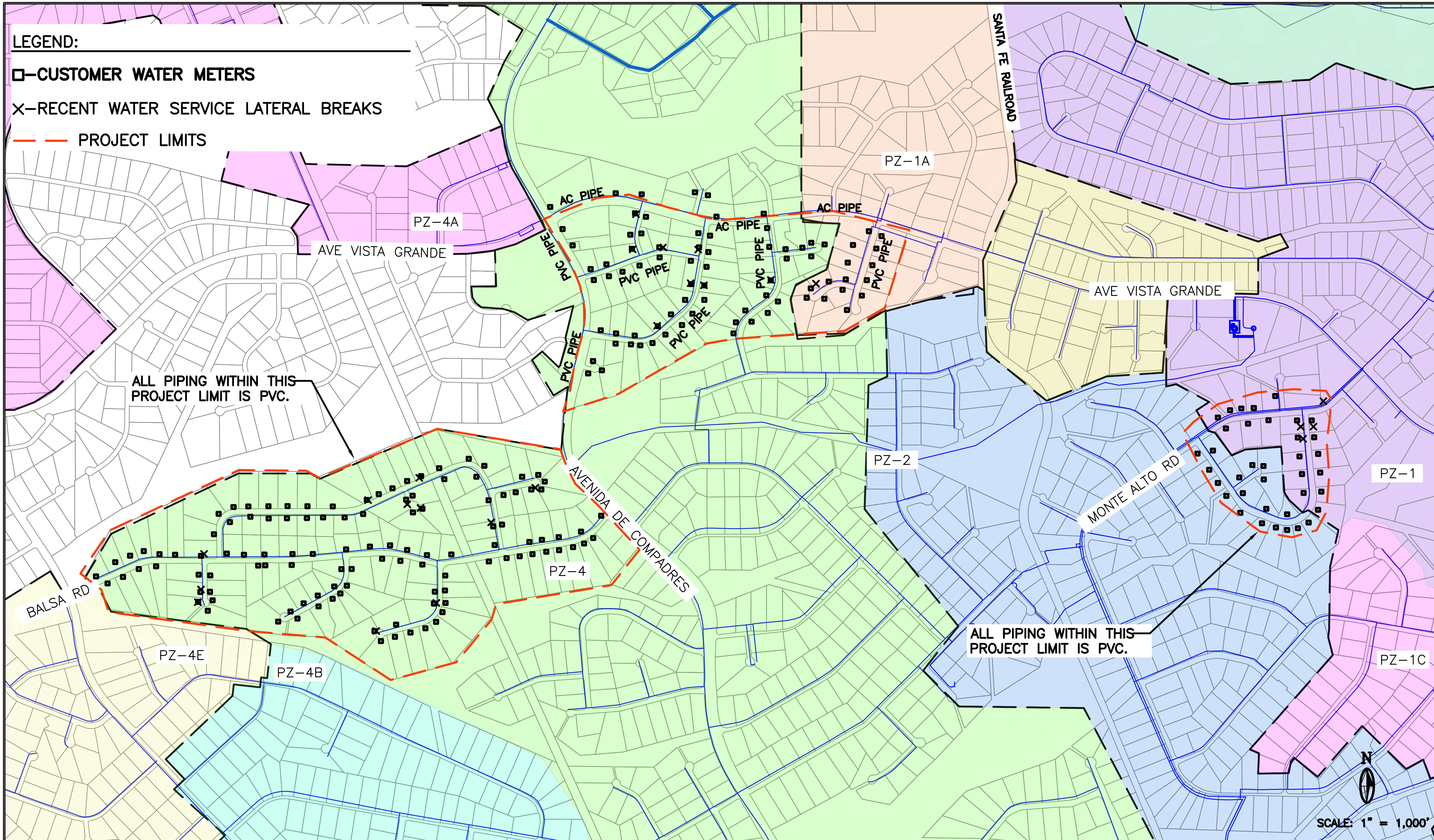

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Figure 6-4
SERVICE LATERAL REPLACEMENTS

6.4.2 Design Criteria

Pipe design would consider acceptable velocities (between 2 to 5 fps), pressure rating, and adequate isolation and other appurtenances. Where high spots exist air / vacuum valves would be constructed to allow release of entrained air and prevent vacuum conditions if the line were to experience a major break nearby. Isolation valves would be installed at least every 800 feet, and DR 18 C900 pipe (rated for 235 psi and typically used for waterline) would be used. Service laterals throughout the project area will be replaced with SDR 9 HDPE.

6.4.3 Environmental Impacts

Construction would take place within easements that have already been disturbed, so environmental impacts are expected to be minimal. No arroyo crossing are apparent within the project area. A SWPPP would be required for all instances where disturbance is to exceed 1 acre.

The project does not involve replacing AC pipe so no special measures to handle asbestos are needed.

6.4.4 Land Requirements and Permitting

No new easements are required because these projects are replacing existing pipes and service connectors within existing utility easements. Work within County roads will require coordination with the County. The Contractor will need excavation permits from the County prior to starting work.

The NMED DWB would need to review the project prior to bidding and construction.

6.4.5 Potential Construction Problems

The project is within well-established residential neighborhoods with significant landscaping and trees which often are located within easements and ROW. The contractor will have to take special care to avoid damaging existing features, or where this is not possible, to rehabilitate damaged areas. Depending on the number and condition of isolation valves and corporation stops, segments of the waterline may have be shut down to facilitate construction, which would interrupt water service. However, this also limits the footprint the contractor can occupy (especially if remaining in existing easements). Other potential construction problems include rock, maintaining residential access, and utility conflicts.

6.4.6 Sustainability Considerations

Allowing leaky and fragile lines to continue to break does not promote sustainable operation. The proposed line and service connection replacement would prevent leaks and breaks, conserve water, and minimize service interruptions.

6.4.7 Project Timeline

Table 6-4 presents a proposed project schedule for the design, bidding, and construction of the proposed improvement. Total project time to completion is expected to be 390 days or 13 months.

TABLE 6-4
PROJECT SCHEDULE FOR
SERVICE LATERAL REPLACEMENTS

TASKS	DURATION
Survey, Geotechnical Investigation, and SUE	60 Days
Design	90 Days
Bid and Award	90 Days
Construction	120 Days
Closeout	30 Days
TOTAL:	**390 DAYS**

6.4.8 Cost Opinion

The total estimated cost for this alternative is $1,330,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. No additional O&M costs are expected to be incurred by this alternative.

6.5 Tank Site Improvements and Mixers

6.5.1 Description

6.5.1.1 Tank Site Modifications

As identified in Section 5.2.3 of this planning document, the existing storage tanks within the service area are in a good condition for continued service into the future with the exception of the Tank 4 floor. Although the tanks themselves are in a reasonable condition to provide storage for the water system, there are some concerns regarding the site layout / drainage at two of the District's storage tanks, Tank 1 and Tank 4. Site improvements at these two storage tank locations would direct the storm water away from the tanks, provide a means for stormwater detention / conveyance, address erosion issues, and improve overall site layout for maintenance and operation purposes.

Tank 2 needs a more secure fence around the site. Without fence improvements it is possible for intruders and/or animals to enter the tank site and cause damage to the facilities. The installation of a perimeter fence around Tank 2 would allow the District to better secure this critical asset to their water system.

This alternative includes site grading and drainage improvements at Tanks 1 and 4, replacement of the Tank 4 floor, and installation of chain link fencing with three-strand barbed wire around the perimeter of the Tank 2 site.

6.5.1.2 Tank Mixers

The incorporation of mixers in potable water storage tanks has a direct impact on the quality of water in the storage tanks and throughout the entirety of the water system. Maintaining a consistent and effective active mixing regimen throughout the tank can eliminate the potential for thermal stratification. Thermal stratification has adverse impacts on the quality of the water due to inadequate mixing of the bulk solution, leading to short-circuiting of water out of the tank, inconsistent chlorine residuals, and poor sampling quality.

6.5.2 Design Criteria

This alternative entails the following project elements:

- Installation of solar powered tank mixers in five tanks.
- Grading and drainage improvements at Tank 1.
- Grading and drainage improvements at Tank 4.
- Replacement of Tank 4 floor.
- Installation of security fencing at Tank 2.

Figure 6-5 shows the location of proposed improvements.

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DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
DWG. NAME: FIGURE 6-5 Tank Site Mod's & Mixers.dwg

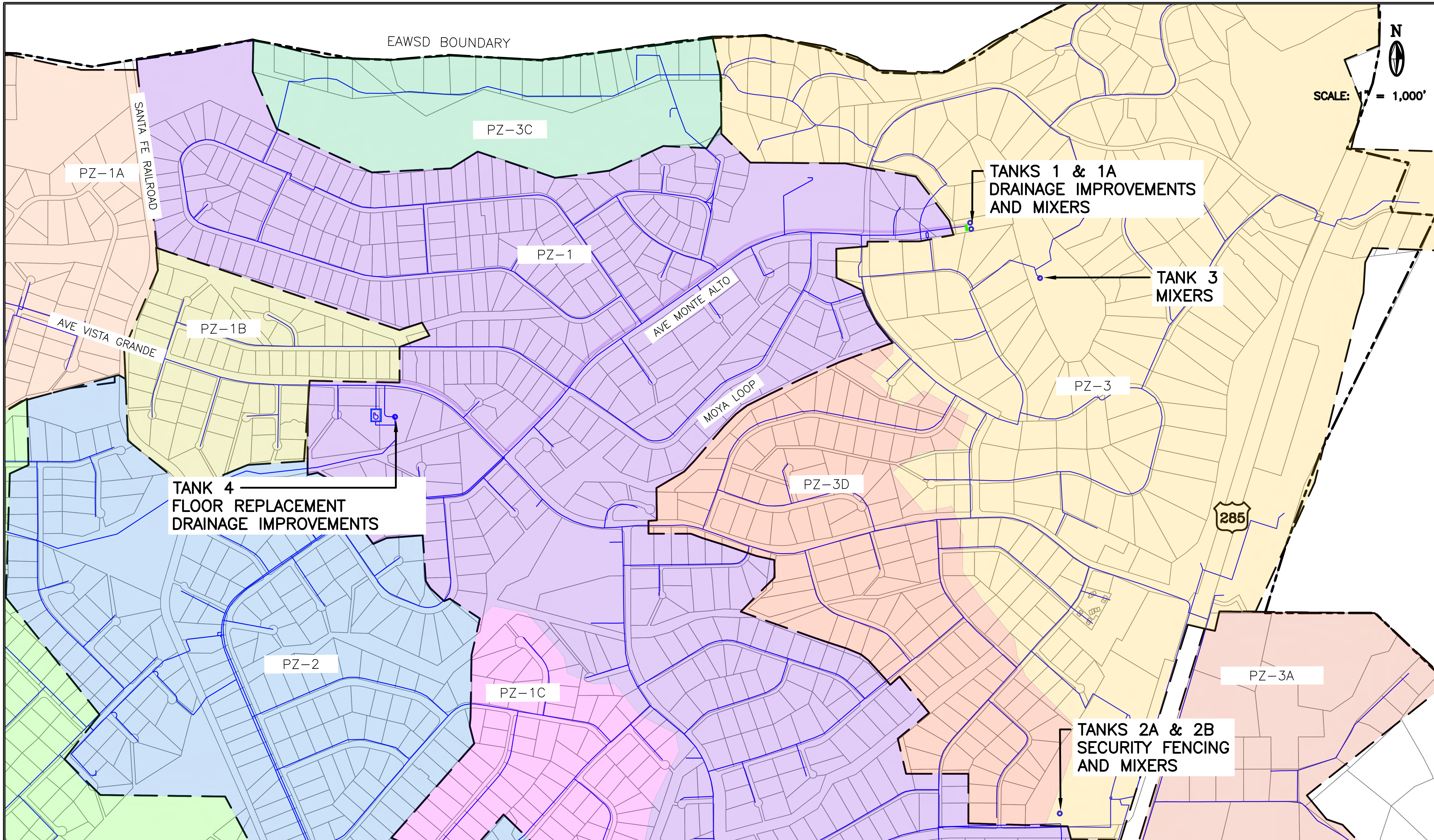

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Figure 6-5

TANK SITE MODIFICATIONS AND MIXER LOCATION INSTALLATIONS

The solar mixers can be installed through existing 3-foot square roof hatches, but must be assembled inside the tank. A better approach is to install a new 4-foot square hatch at each tank and a davit crane to facilitate installing and removing the mixer. The solar collection and control equipment can be installed on the tank roof. All work will need to be performed by a qualified tank contractor.

Grading and drainage improvements would follow standard civil design best practices for proper slopes and drainage features to convey storm water safely offsite. Unprotected slopes, such as those at Tank 4, would be stabilized with rip rap to prevent erosion. Grading will ensure that there is no standing water within 50 feet of the tank as recommended by the *Construction Programs Bureau Recommended Standards for Water Facilities*, 2006 Edition (NMED) and will provide a minimum 6 inches between ground and the top of the ringwall or foundation. Tanks can remain in service during site improvements.

Tank 4 floor replacement will require the tank to be removed from service, drained, and all equipment removed. The work will need to take place outside of peak demand season, most likely in late summer or fall. All work will conform to AWWA standards for potable water storage tanks.

The security fence at Tank 2 will be 6-foot tall chain link with three-strand barbed wire, similar to other facilities within the District. The fence will include a 16-foot double swing gate at the existing driveway and a 3-foot man gate.

6.5.3 Environmental Impacts

All work will take place within existing disturbed areas. No potential environmental impacts are contemplated.

6.5.4 Land Requirements and Permitting

As work will take place within existing easements. There are no anticipated land or permitting requirements associated with these improvements.

The NMED DWB would need to review the project prior to bidding and construction.

6.5.5 Potential Construction Problems

No potential construction problems are contemplated.

6.5.6 Sustainability Considerations

All equipment to be installed as part of this improvement project is planned to be powered with solar panels. Grading and drainage improvements will prevent erosion and sedimentation that would otherwise negatively impact the integrity of the storage tanks.

6.5.7 Project Timeline

Table 6-5 presents a proposed project schedule for the design, bidding, and construction of the proposed improvement. Total project time to completion is expected to be 330 days or 11 months.

TABLE 6-5
PROJECT SCHEDULE FOR TANK SITE MODIFICATIONS AND MIXER INSTALLATIONS

TASKS	DURATION
Survey, Geotechnical, and SUE	30 Days
Design	90 Days
Bid and Award	90 Days
Construction	90 Days
Closeout	30 Days
TOTAL	**330 DAYS**

6.5.8 Cost Opinion

The total estimated cost for this alternative is $1,653,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. No additional O&M costs are expected to be incurred by this alternative.

6.6 Demolition of Unused Facilities

6.6.1 Description

The EAWSD is responsible for operation and maintenance of all components within its water system, including any facilities that are no longer utilized or are completely abandoned altogether. To avoid any unnecessary operation and/or maintenance costs associated with this infrastructure, it is in the District's best interest to demolish these unused facilities. Additionally, removing these uninhabited buildings within the service area will eliminate any safety concerns associated with abandoned buildings. Some of the District's pumping stations and production wells that are proposed to be demolished are discussed in detail below.

Of the eight inactive wells that were identified in Section 3.3.3.2 of this 2022 UMP, there are five that are being considered for removal, including all associated facilities: Wells 1, 3, 4, 6, and 12. Well 1 completed in the Ancha-Tesuque Formation has been inactive since 2007 due to low production and high arsenic levels. Both Wells 3 and 4 are completed within the Madera Formation of fractured limestone and have been inactive for some time due to low water levels and overall low production rates. Wells 6 and 12 are no longer considered productive.

Identified in Section 5.2.3 of this 2022 UMP, there are three booster pumping stations within the service area that are considered for demolition, the Well 1 BPS, the Compadres / Vista Grande BPS, and a booster station near Cattle Drive and Bishop Lamp of unknow condition. Figure 6-6 shows the location of facilities planned for demolition.

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DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
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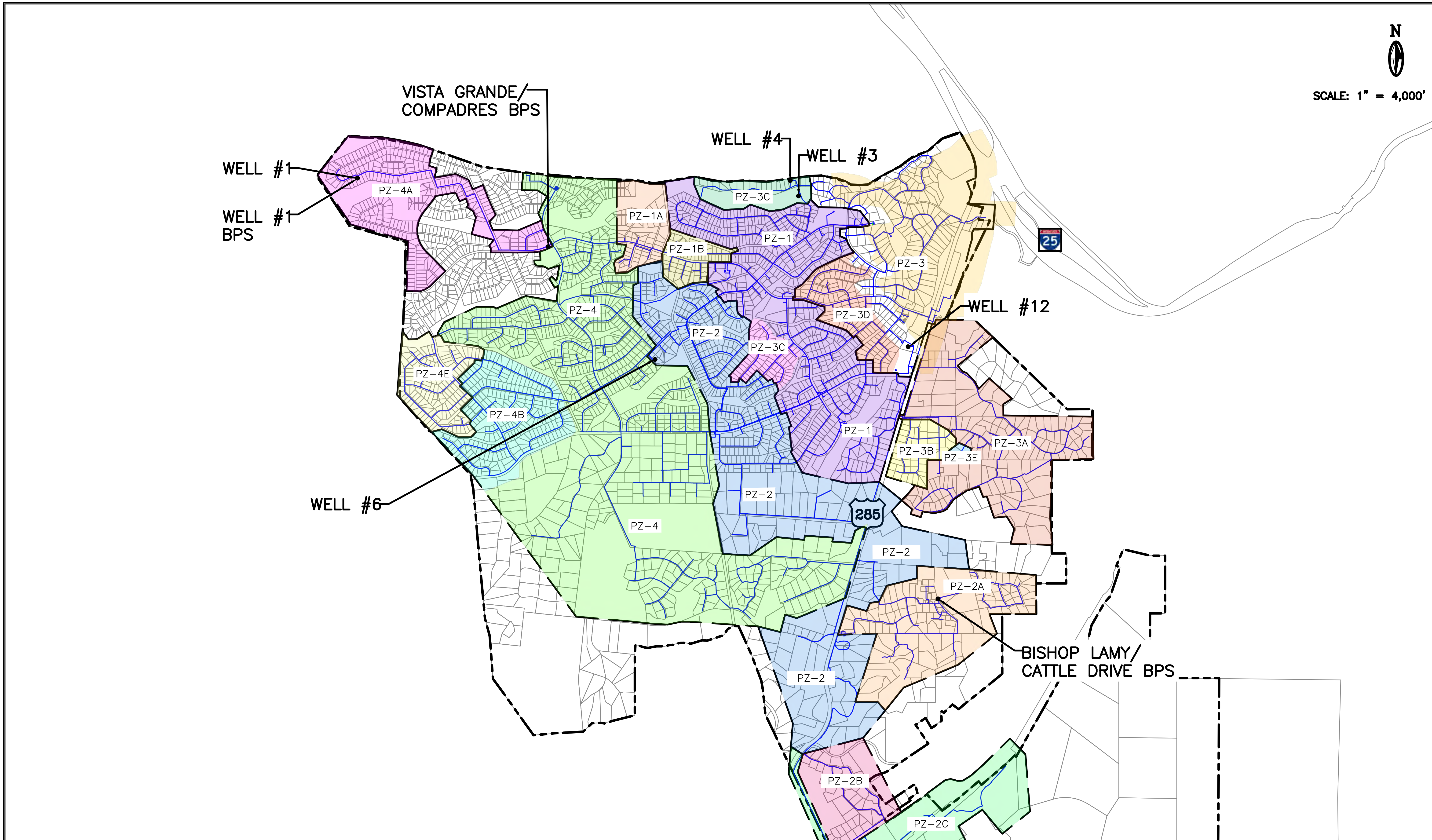

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Figure 6-6
DEMOLITION OF UNUSED FACILITIES

6.6.2 Design Criteria

Demolition of these facilities would entail the removal and disposal of building structures, below grade foundations, and all associated equipment and appurtenances. Any viable equipment (pumps, valves, etc.) would be turned over to the District for spares. The existing tank at Well 1 could be repurposed or sold. Each site would be graded and re-seeded following demolition. Any security fences currently in place would be left intact.

6.6.3 Environmental Impacts

No potential environmental impacts are contemplated. There are no known hazardous materials associated with these facilities. All materials and equipment removed would be disposed of in a local landfill in accordance with federal, state, and local regulations.

6.6.4 Land Requirements and Permitting

Each of the proposed demolitions will be completed within the boundaries of the existing utility easement or on District-owned property. No additional land requirements are contemplated for the demolition of these unused facilities. The District would need to file an application to the NMOSE to change the purpose of the wells to monitoring. It is recommended to keep these wells for monitoring and avoid the cost of plugging.

NMED DWB would not need to be notified for a project of this nature.

6.6.5 Potential Construction Problems

Potential construction problems that could arise when working on the demolition of these abandoned facilities could be related to the unknown condition and location of underground piping and equipment.

6.6.6 Sustainability Considerations

Removing unutilized infrastructure would have a direct impact on the District's responsibility to maintain these facilities, leading to a cost savings associated with the operation and maintenance of the overall water system. It would also free maintenance personnel to attend to more pressing needs.

6.6.7 Project Timeline

Table 6-6 presents a proposed project schedule for the design, bidding, and construction of the proposed improvement. Total project time to completion is expected to be 270 days or 9 months.

TABLE 6-6
PROJECT SCHEDULE FOR DEMOLITION OF UNUSED FACILITIES

TASKS	DURATION
Design	60 Days
Bid and Award	90 Days
Construction	90 Days
Closeout	30 Days
TOTAL:	**270 DAYS**

6.6.8 Cost Opinion

The total estimated cost for this alternative is $1,112,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. No additional O&M costs are expected to be incurred by this alternative.

6.7 Emergency Booster Pump Station (BPS) Generator Installations

6.7.1 Description

Because of increasing demand and aging infrastructure, the prospect for extended electrical outages is expected to worsen. As the first step in addressing this issue the District has or will soon be purchasing two mobile diesel generators to run one major well and one pump station, sufficient to maintain water deliveries of up to 200,000 gpd. This amount is adequate to meet minimum indoor water use demands indefinitely. To support higher rates of water deliveries during extended power outages will require additional emergency power supply. The District is considering installing emergency generators at booster pump stations critical to maintaining higher rates of water delivery. Investment in additional generators will be made over the next few years based on a hierarchy of need which has been accessed as follows (See Figure 6-7):

- Alcalde Pump Station as required for continued SFC water deliveries
- Tank 1 to Tank 3 Pump Station to provide water deliveries to the highest elevation Tank 3.
- Tank 4 to Tank 1 Pump Station to convey SFC and Well 2A/2B east.

Having permanent emergency power supply at key pump stations will free up mobile generators for use at wells. Each new source of emergency power will increase the overall reliability and the sustainable water delivery capacity of the system.

6.7.2 Design Criteria

These emergency diesel generators will be installed outdoors, within the existing utility easements and will be housed in outdoor rated enclosures. The generators will be sized to fully operate their respective pumping stations during a power outage and will be connected to the SCADA system for remote monitoring. The generators will be equipped with new automatic transfer switches (ATS) and all other associated appurtenances to allow for the transfer of power.

6.7.3 Environmental Impacts

No potential environmental impacts are contemplated.

6.7.4 Land Requirements and Permitting

As both of these emergency generators will be installed on property or easements already owned by the District, no additional land or permitting requirements will be necessary.

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DWG. LOCATION: C:\Users\pdelarosa\appdata\local\temp\AcPublish_25504\
DWG. NAME: FIGURE 6-7 Electrical Generators.dwg

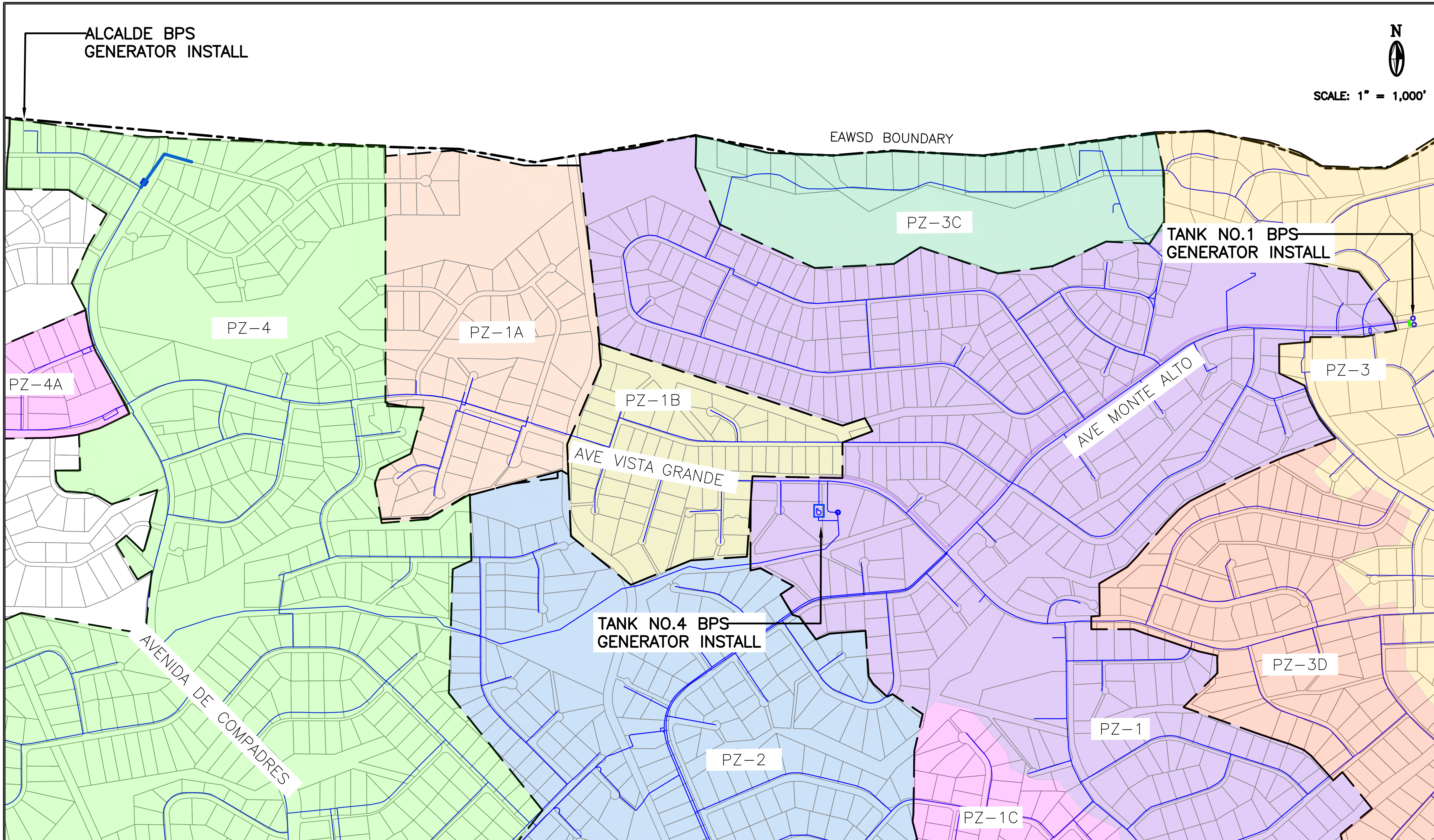

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Figure 6-7

EMERGENCY GENERATOR INSTALLATION

6.7.5 Potential Construction Problems

No potential construction problems are contemplated.

6.7.6 Sustainability Considerations

Once installed and operational, these emergency generators will provide the District with the capabilities to supply water to the service area in the event of a power outage.

6.7.7 Project Timeline

Table 6-7 presents a proposed project schedule for the design, bidding, and construction of the proposed improvement. Total project time to completion is expected to be 180 days or 5 months.

TABLE 6-7
PROJECT SCHEDULE FOR BPS EMERGENCY GENERATOR INSTALLATION

TASKS	DURATION
Design	60 Days
Bid and Award	60 Days
Construction	30 Days
Closeout	30 Days
TOTAL:	180 DAYS

6.7.8 Cost Opinion

The total estimated cost for each emergency generator if executed as a separate project is $210,000 including Professional Services, Construction, and NMGRT. Appendix J contains a detailed cost breakout. Additional O&M costs incurred by each additional emergency generator are estimated at $7,200 per year. Appendix K contains detailed O&M costs.

6.8 Other Project Considerations

The EAWSD supplies clean drinking water to approximately 92% of the citizens that reside within the District's service area. The remaining 8% of residents are served by privately owned or shared community wells, most of which are located in the northwestern portion of the service area often referred to as the "welled area". Due to concerns regarding the decline of groundwater levels in the area, the District has received several inquiries in recent years from private well owners regarding the likelihood and costs to provide EAWSD service to the "welled area." Benefits to new "welled area" customers would include an increase in the long-term reliability of water serve to these new customers. Benefits to existing EAWSD customers would include a reduction in groundwater use in this area which would conserve this limited resource thereby extending its useful life. Due primarily to its high cost, the equitable proportional sharing of which between new and existing customers would require detailed evaluation, implementation of an area wide EAWSD water supply project for the "welled area" is not considered feasible at this time. None the less, understanding the cost and scope of such a project is valuable in providing information to residents in the area interesting in such information. Details of the scope and costs to provide EAWSD service to the "welled area" are presented in Appendix L.

7.0 PROPOSED PROJECTS

Section 7.0 considers the benefits and drawbacks of the projects presented in Section 6.0. This section looks ahead for the next 20 years to 2040 in planning for the system. An emphasis is placed on the improvements to be accomplished over the next 5 years (short-term) with consideration of intermediate-term (6-10 year) projects and long-term (11-20 year) goals. Implementation plans have been developed to identify which projects are most suited for short-, intermediate-, and long-term timelines. Action items are provided to guide EAWSD's next steps.

7.1 Distribution and Transmission

The District's most pressing need as it transitions to supply from SFC is to improve the ability to move water eastward, particularly to Tank 2. With declining production in Wells 17 and 18, and infrequent use of Well 9, Tank 2 is in need of additional sources. Furthermore, improvements of water transmission and distribution will improve reliability, efficiency, and operational flexibility of the system. Much of the existing system is nearing the end of its design life and will need to be replaced to prevent frequent and potentially catastrophic failure of the system. Replacement of inferior lines and service connections are imperative to maintain reliability and reduce maintenance. The considerations in Table 7-1 for the distribution and transmission line upgrades will be used to guide project prioritization.

The following project implementation is proposed:

- Short-Term Projects:
  - Tank 4 to Tank 2 Transmission Line – This project is recommended to facilitate moving County water to Tank 2 and allow the fracture granite aquifer to recover. The work would include (1) design, (2) secure easements and permits, (3) construction application to NMED-DWB, and (4) construction.

- Service Lateral and Waterline Replacements – Next steps include (1) design, (2) construction application to NMED-DWB (notification only), and (3) construction.
- Tank 1 Transmission / Tank 2 Distribution Line Replacements – Next steps include (1) intensive SUE to determine location and interconnection of lines, (2) design, (3) construction application to NMED DWB, and (4) construction.

TABLE 7-1
CONSIDERATIONS FOR DISTRIBUTION SYSTEM AND TRANSMISSION LINE UPGRADES

ALTERNATIVE DESCRIPTION	PROS	CONS	ESTIMATED PROJECT DURATION
Tank 4 to Tank 2 Transmission Line	Operational flexibility for providing supply Tank 2.	None.	14 to 16 months for design and construction. High level of importance and urgency.
Service Lateral and Waterline Replacements	Replacement would reduce leaks / breaks.	Highly disruptive to residents during construction.	13 to 15 months for design and construction. High level of importance and urgency.
Tank 1 Transmission / Tank 2 Distribution Line Replacements	Reduce breaks, increase reliability.	None.	14 to 16 months for design and construction. High level of importance of urgency.
Wells 14 and 15 Transmission Line to Tank 2	Replacement would reduce frequent leaks / breaks.	None.	14 to 16 months for design and construction. Medium level of importance and urgency.

- Medium-Term Projects:
  - Wells 14 and 15 Transmission Line to Tank 2 – This project is recommended to provide another source of water to Tank 2, providing operational flexibility for supply to Tank 2 and allowing County water to be used elsewhere within the District if needed. Next steps include (1) design, (2) construction application to NMED-DWB and (3) construction.

7.2 System Operation and Maintenance (O&M) Improvements

O&M improvements will facilitate more efficient and cost effective operation of the system, as well as improving reliability and security of certain facilities. The considerations in Table 7-2 for the O&M improvements will be used to guide project prioritization.

TABLE 7-2
CONSIDERATIONS FOR SYSTEM
OPERATION AND MAINTENANCE IMPROVEMENTS

ALTERNATIVE DESCRIPTION	PROS	CONS	ESTIMATED PROJECT DURATION
Tank Site Improvements and Mixers	Provide enhanced security, resilience, and reliability of tanks.	Tank 4 floor replacement requires taking the tank out of service.	11 to 13 months for design and construction. High level of importance and medium level of and urgency.
Demolition of Unused Facilities	Reduce maintenance burdens, improve safety.	None.	9 to 11 months for design and construction. Medium level of importance and urgency.
BPS Emergency Generators	Provide continued operation of critical facilities during power outages.	None.	6 to 8 months for design and construction. High level of importance and medium level of urgency.

The following project implementation is proposed:

- Medium-Term Projects:
  - Tank Site Improvements and Mixers. Next steps include (1) design, and (2) construction.
  - Demolition of Unused Facilities – Next steps include: (1) design, and (2) construction.
  - BPS Emergency Generators – Next steps include: (1) design, and (2) construction.

7.3 Miscellaneous

Sections 7.1 through 7.2 discussed the timing of major system components that needed to be addressed in the Master Plan. There are numerous additional needs discussed in Section 5.0 for which projects are recommended, but were not evaluated in this 2022 UMP. The following considerations for these other projects are summarized in Table 7-3.

TABLE 7-3
MISCELLANEOUS PROJECTS

DESCRIPTION	IMPORTANCE	URGENCY	COMMENT
Additional US 285 Crossing	High	Medium	May be paid for by developers.
Abandon Well 7 Transmission Line	Medium	Medium	Reduce leakage and maintenance.
Additional Security at Monitoring Wells	Medium	Low	Improve security at wellheads.
Supplemental Well 9	High	Medium	Allow pumping of full Galisteo water rights during wet years.
Well 19 Iron-Manganese Filter	Medium	Medium	As required to meet future peak demands.
40-Year Water Plan	Medium	Medium	Recommended to allow longer timeframe to develop unused water rights than partial license currently provides.

These projects can be implemented and constructed in any order, as their sequence is not critical. As EAWSD has available funds, these projects should be implemented.

8.0 REFERENCES

1. New Mexico Environment Department, Construction Programs Bureau, "*Recommended Standards for Water Facilities*", 2006 Edition.
2. Southwest Environmental Finance Center, "Reference Guide For Asset Management Inventory and Risk Analysis (Drinking Water)", 2018 Edition.
3. Metcalf & Eddy / AECOM, *Wastewater Engineering Treatment and Resource Recovery,* Fifth Edition, 2014.
4. Molzen Corbin, *Eldorado Area Water & Sanitation District, Pressure Zone Optimization Study*, March 2014
5. David A. Chin, *Water-Resources Engineering*, Second Edition, 2007
6. Jacobs Engineering, Inc., *Asset Management Plan (AMP)*, June 2019
7. Jacobs Engineering, Inc., *Desktop Condition Assessment & 10 Year Leak Report*, August 2020
8. Jacobs Engineering, Inc., *Water System Risk and Resilience Assessment*, June 2021
9. Jacobs Engineering, Inc., *Emergency Response Plan*, December 2021
10. Molzen Corbin, *Water Utility Master Plan Preliminary Engineering Report Update*, October 2017
11. Souder Miller & Associates, *Water Utility Master Plan (UMP) Preliminary Engineering Report (PER)*, 2013
12. Glorieta Geoscience, Inc., *EAWSD Monitoring Plan Annual Report 2020*, October 2021
13. Southwest Environmental Finance Center, *Reference Guide For Asset Management Inventory and Risk Analysis,* undated
14. Jacobs Engineering, Inc., *EAWSD Asset Condition and Risk Assessment Report*, 2011

PLATES

(In the printed copy of this UMP see interior pocket for Plates 1 and 2.)

EAWSD WATER SYSTEM MAP

EAWSD WATER SYSTEM HYDRAULIC PROFILE

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Plate 2

Existing Water System Hydraulic Profile

APPENDIX A:

PLANNING MAPS

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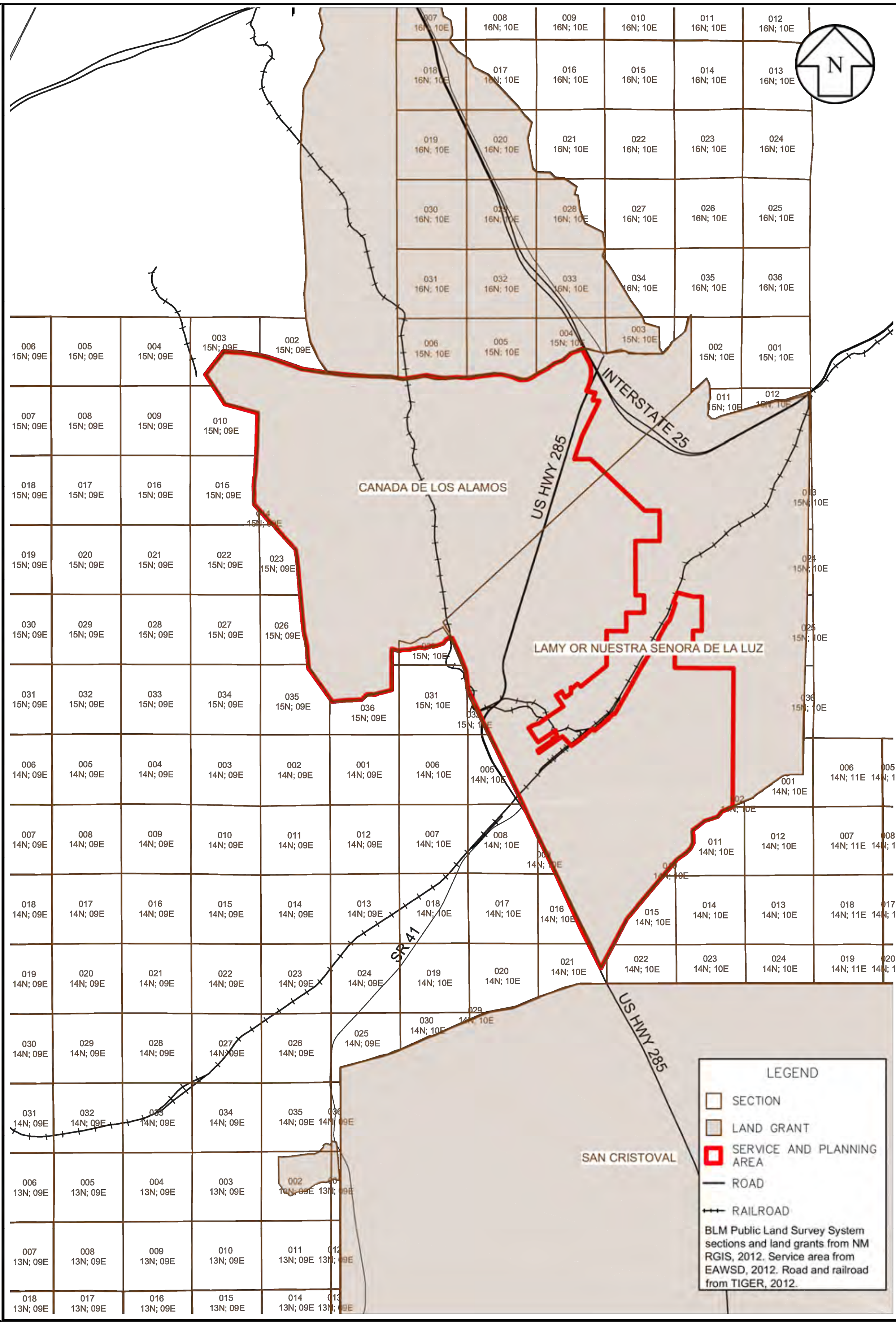

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PUBLIC LAND SURVEY SYSTEM

APPENDIX A - EXHIBIT 1

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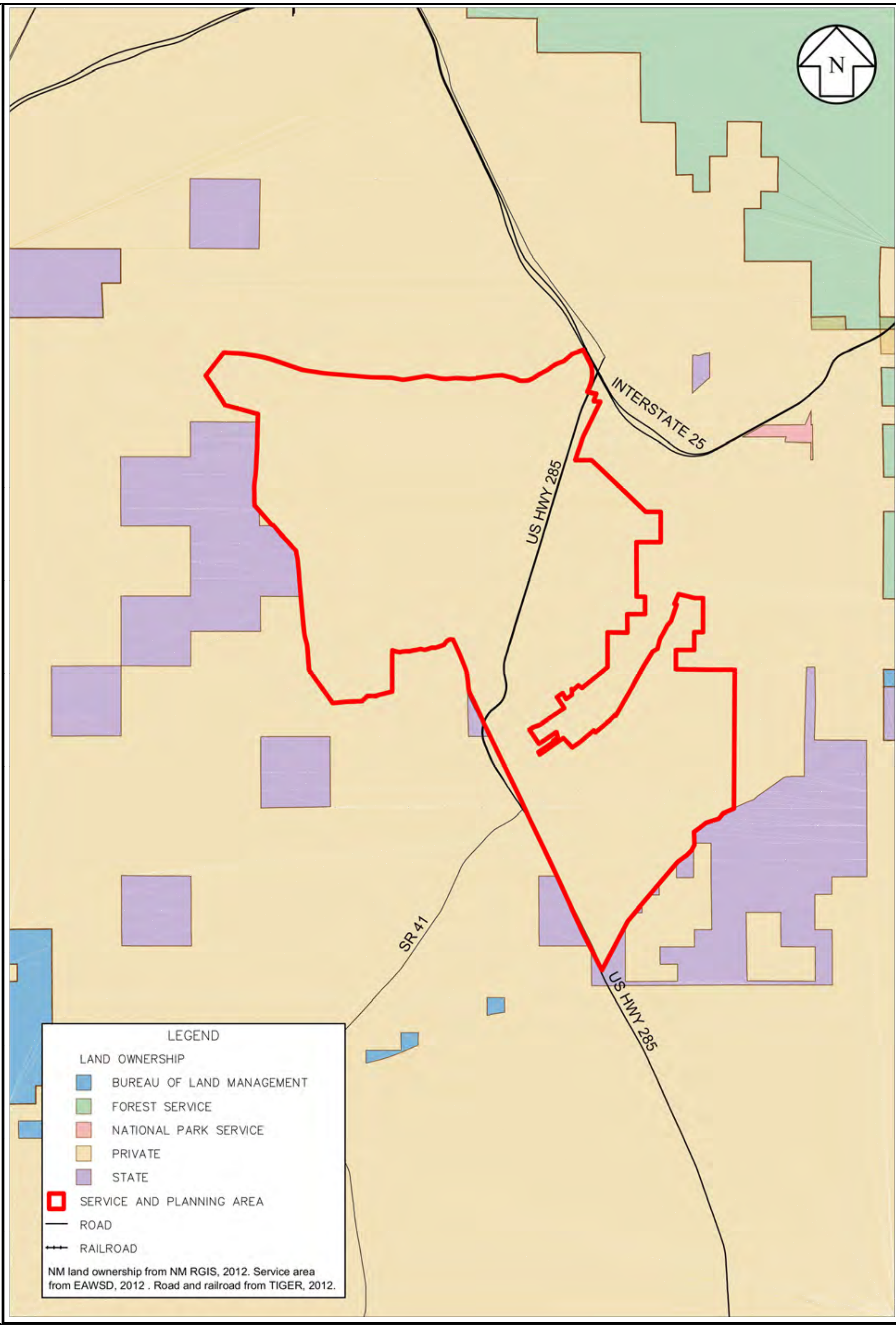

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LAND OWNERSHIP
APPENDIX A - EXHIBIT 2

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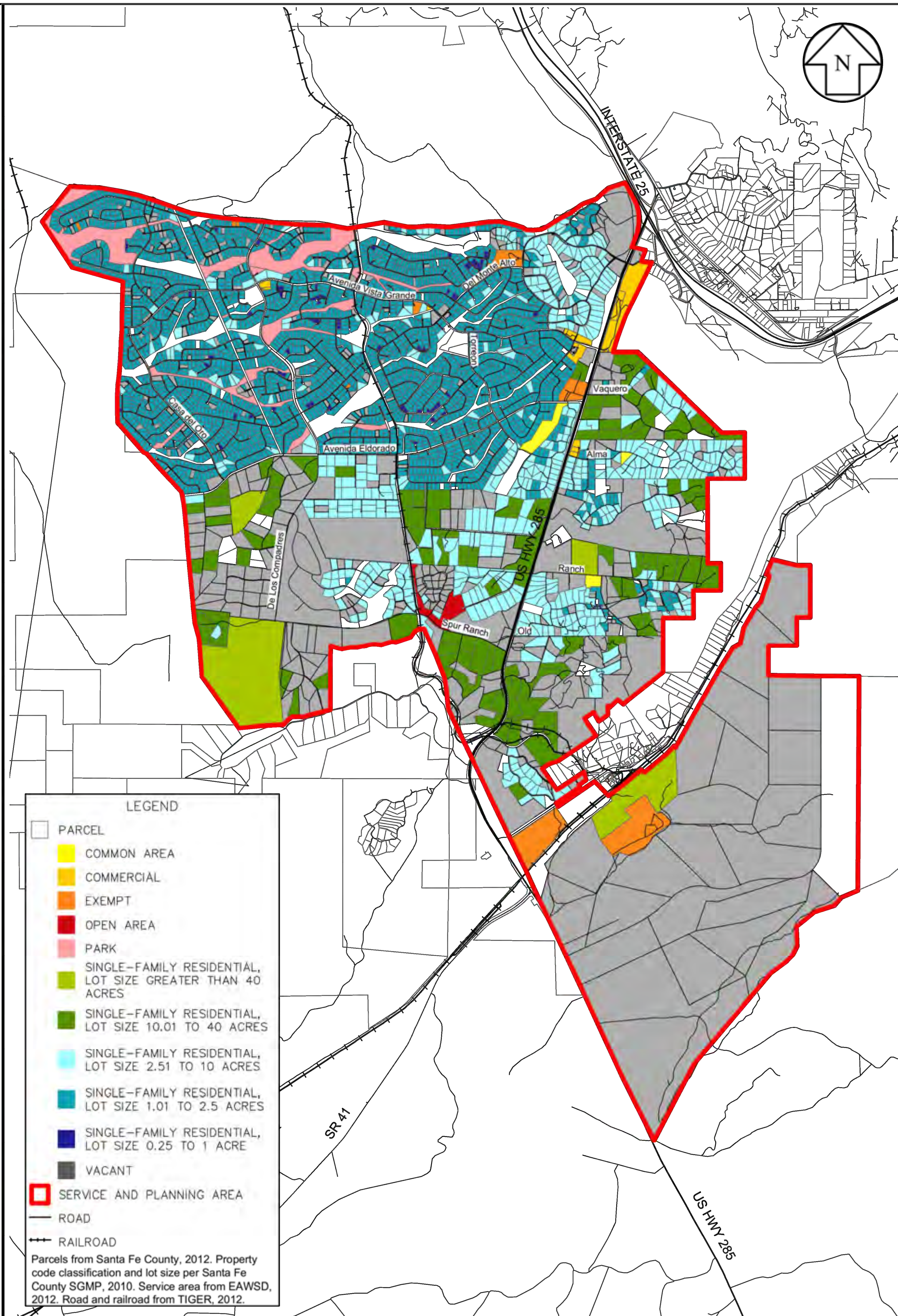

WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

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SFC SGMP EXISTING LAND USE

APPENDIX A - EXHIBIT 3

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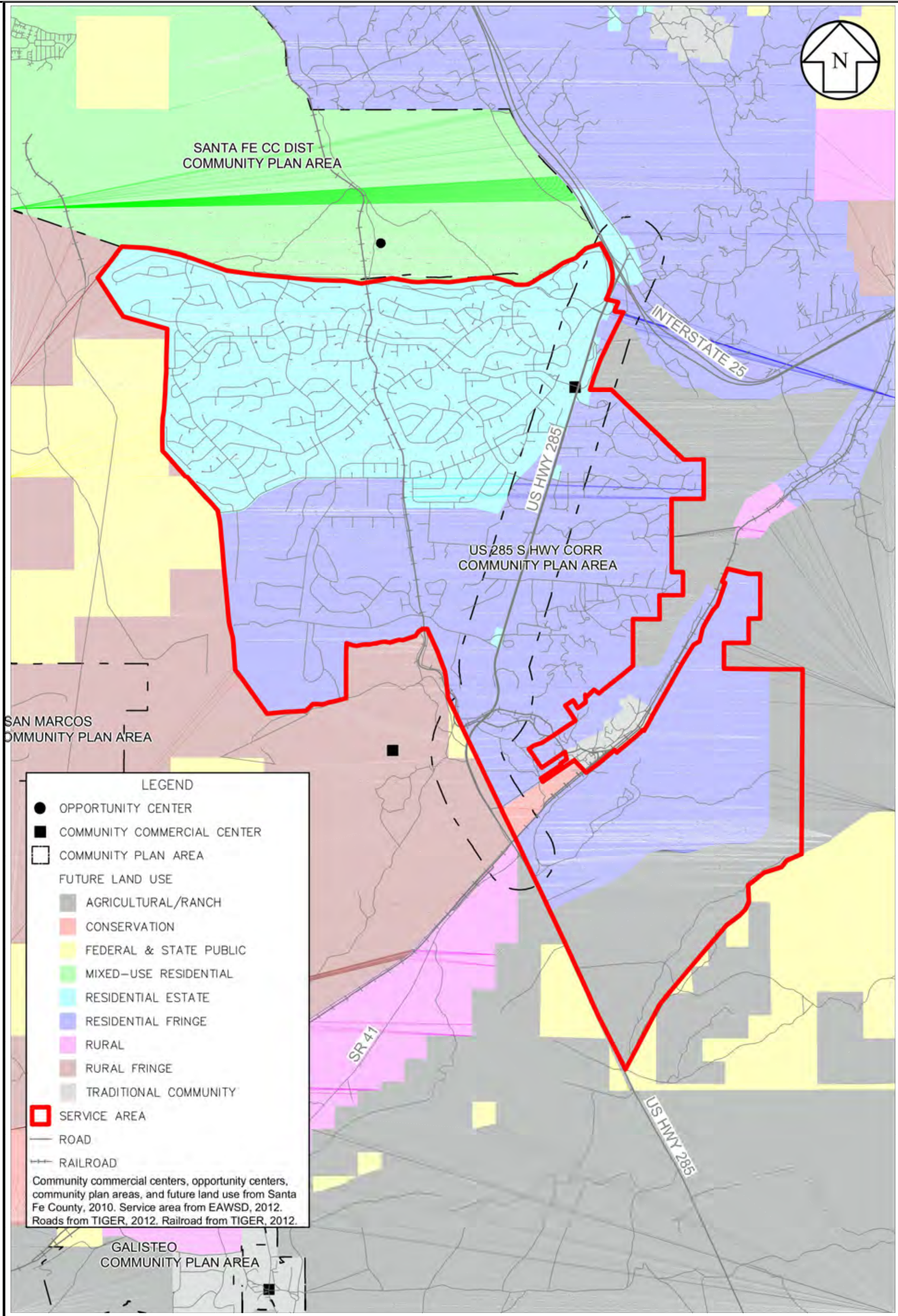

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SFC SGMP FUTURE LAND USE

APPENDIX A - EXHIBIT 4

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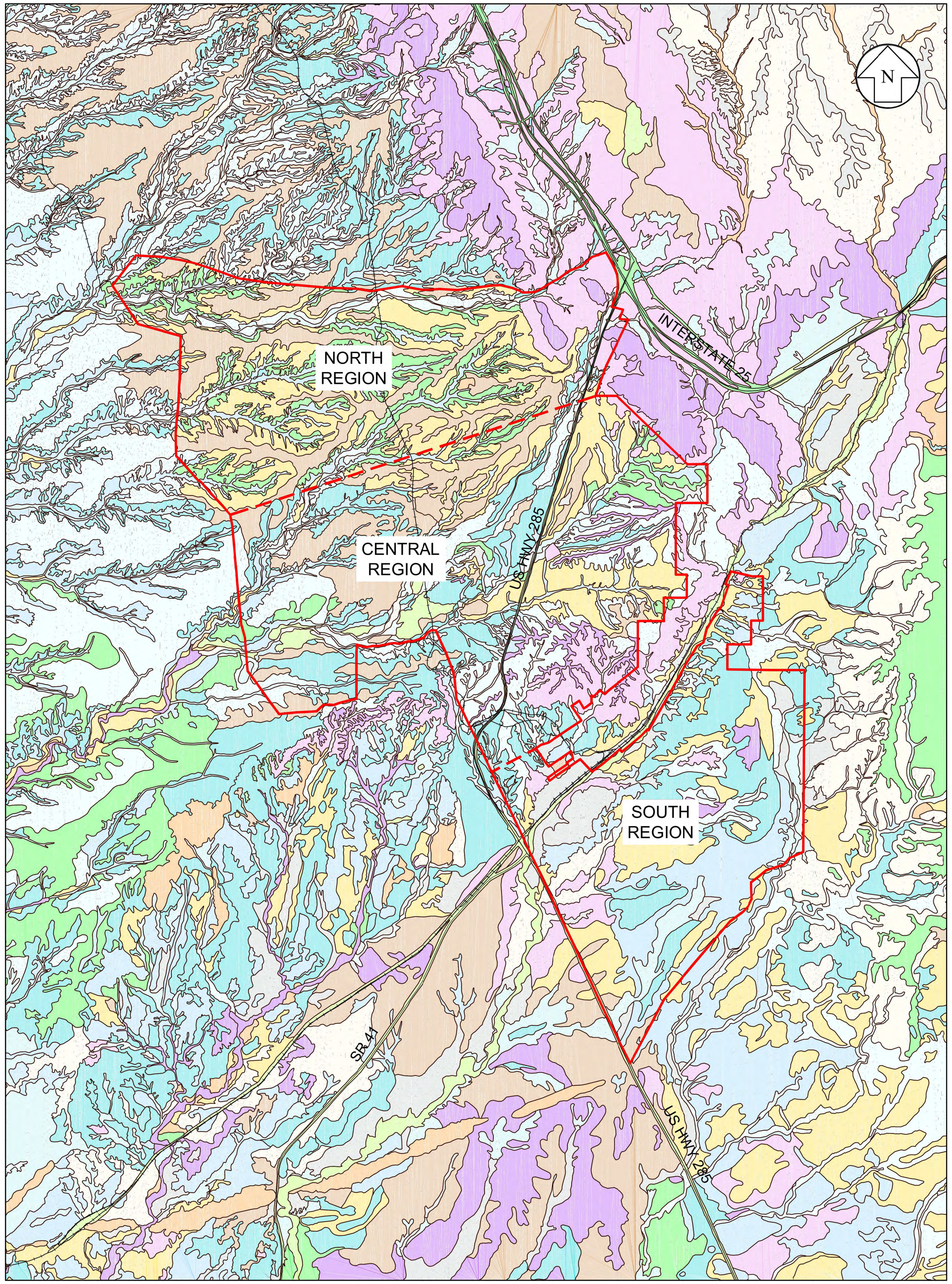

LEGEND

- SERVICE AREA
- ROAD
- RAILROAD

SOILS

- 100 Panky loam, 1 to 4 percent slopes
- 101 Zozobra–Jaconita complex, 5 to 25 percent slopes
- 102 Khapo sandy loam, 3 to 8 percent slopes
- 103 Zepol silt loam, 0 to 2 percent slopes, flooded
- 104 Chupe–Riverwash complex, 1 to 3 percent slopes, flooded
- 105 Dumps, sanitary landfill
- 108 Zia fine sandy loam, 0 to 2 percent slopes
- 111 Khapo fine sandy loam, 0 to 2 percent slopes
- 116 Arents–Urban land–Orthents complex, 1 to 60 percent slopes
- 117 Agua Fria–Paraje complex, 1 to 8 percent slopes
- 118 Golondrina–Paraje complex, 8 to 45 percent slopes
- 119 Vitrina–Haozous complex, 5 to 15 percent slopes, flooded
- 200 Predawn loam, 1 to 4 percent slopes
- 201 Tanoan–Encantado complex, 5 to 25 percent slopes
- 202 Alire loam, 2 to 6 percent slopes
- 203 Buckhorse–Altozano complex, 2 to 8 percent slopes, flooded
- 204 Altozano loamy sand, 0 to 2 percent slopes, flooded
- 205 Nazario gravelly loam, 2 to 8 percent slopes
- 206 Encantado very cobbly sandy loam, 25 to 45 percent slopes
- 207 Urban land
- 208 Alire–Urban land complex, 2 to 8 percent slopes
- 209 Dondiego–Urban land complex, 1 to 3 percent slopes
- 211 Tanoan–Encantado–Urban land complex, 5 to 25 percent slopes
- 213 Levante–Riverwash complex, 1 to 3 percent slopes, flooded
- 214 Nazario–Urban land complex, 2 to 8 percent slopes
- 215 Predawn–Urban land complex, 1 to 4 percent slopes
- 216 Dondiego loam, 1 to 3 percent slopes
- 217 Ohke sandy loam, 1 to 3 percent slopes
- 218 Pedregal very gravelly loam, 2 to 15 percent slopes
- 300 Arncr gravelly sandy loam, 2 to 8 percent slopes
- 301 Enmedio–Atalaya–Rock outcrop complex, 5 to 60 percent slopes
- 302 Setonville–Antonchico complex, 3 to 15 percent slopes
- 303 Morenda, Fiesta, and Espanola soils, 1 to 85 percent slopes, flooded
- 305 Chimayo–Rock outcrop–Quapaw complex, 50 to 90 percent slopes
- 306 Adelern gravelly sandy loam, 50 to 90 percent slopes
- 307 Urban land–Ustorthents–Ustarents complex, 1 to 65 percent slopes
- 308 Enmedio–Zafarano–Rock outcrop complex, 35 to 60 percent slopes
- 309 Lazaro complex, 5 to 45 percent slopes
- 310 Santa Fe–Rock outcrop complex, 25 to 45 percent slopes
- 500 Sedillo very gravelly loam, 2 to 6 percent slopes
- 501 Truehill extremely gravelly loam, 25 to 55 percent slopes
- 502 Khapo fine sandy loam, 1 to 3 percent slopes
- 503 Espinos very gravelly coarse sandy loam, 5 to 40 percent slopes
- 504 Sandoval–Badland complex, 15 to 45 percent slopes
- 505 Puertecito–Paraje complex, 15 to 50 percent slopes
- 506 Ildefonso–Sandoval complex, 5 to 35 percent slopes
- 507 Ildefonso extremely gravelly sandy loam, 5 to 15 percent slopes
- 508 Charalito–Riverwash complex, 1 to 3 percent slopes, flooded
- 515 Pastorius very cobbly loam, 3 to 5 percent slopes
- 516 Cerrillos fine sandy loam, 1 to 4 percent slopes
- 518 Rock outcrop–Skyvillage complex, 5 to 35 percent slopes
- 519 Cumacho fine sandy loam, 2 to 8 percent slopes
- 521 Devargas–Riovista–Riverwash complex, 0 to 5 percent slopes, flooded
- 522 Penistaja family fine sandy loam, 1 to 3 percent slopes
- 523 Kech–Cerropelon–Rock outcrop complex, 5 to 50 percent slopes
- 524 Zia–Gullied land complex, 2 to 10 percent slopes
- 525 Hagerman–Cabreros complex, 2 to 6 percent slopes
- 526 Penistaja family–Truehill complex, 3 to 15 percent slopes
- 527 Musofare–Asparas complex, 20 to 50 percent slopes
- 528 Penistaja family loam, 3 to 8 percent slopes
- 530 Jaralosa–Chupe–Riverwash complex, 0 to 1 percent slopes, flooded
- 531 Sena very fine sandy loam, 0 to 2 percent slopes
- 532 Galisteo silty clay loam, 0 to 2 percent slopes
- 534 Oelop–Charalito complex, 1 to 3 percent slopes
- 700 Aliante–Altega complex, 1 to 10 percent slopes
- 701 Sabroso–Verano complex, 35 to 65 percent slopes
- 702 Estrada–Chacuaco complex, 2 to 8 percent slopes
- 703 Estrada loam, 2 to 15 percent slopes
- 704 Aliante loam, 0 to 3 percent slopes
- 705 Margosa–Condesa complex, 2 to 8 percent slopes
- 706 Verano–Altezita complex, 45 to 90 percent slopes
- 707 Altezita–Esquila–Rock outcrop complex, 2 to 10 percent slopes
- 708 Uva–Herrcda complex, 3 to 15 percent slopes
- 709 Moriartche clay loam, 0 to 3 percent slopes
- 710 Predawn fine sandy loam, 1 to 4 percent slopes
- 711 Fangio–Ortiz complex, 15 to 50 percent slopes
- 712 Altega very fine sandy loam, 3 to 8 percent slopes
- 715 Lomapedro gravelly sandy clay loam, 25 to 50 percent slopes
- 717 Glorieta–Ribera complex, 1 to 15 percent slopes
- 718 Bernal–Cueva complex, 10 to 50 percent slopes

NCRS soils from NM RGIS, 2012. Service area from EAWSD, 2012. Road and railroad from TIGER, 2012.

MOLZENCORBIN

WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

NRCS SOIL SURVEY

APPENDIX A - EXHIBIT 5

LAST MODIFIED: Jan 24, 2022 - 2:07pm BY USER: ATrujillo
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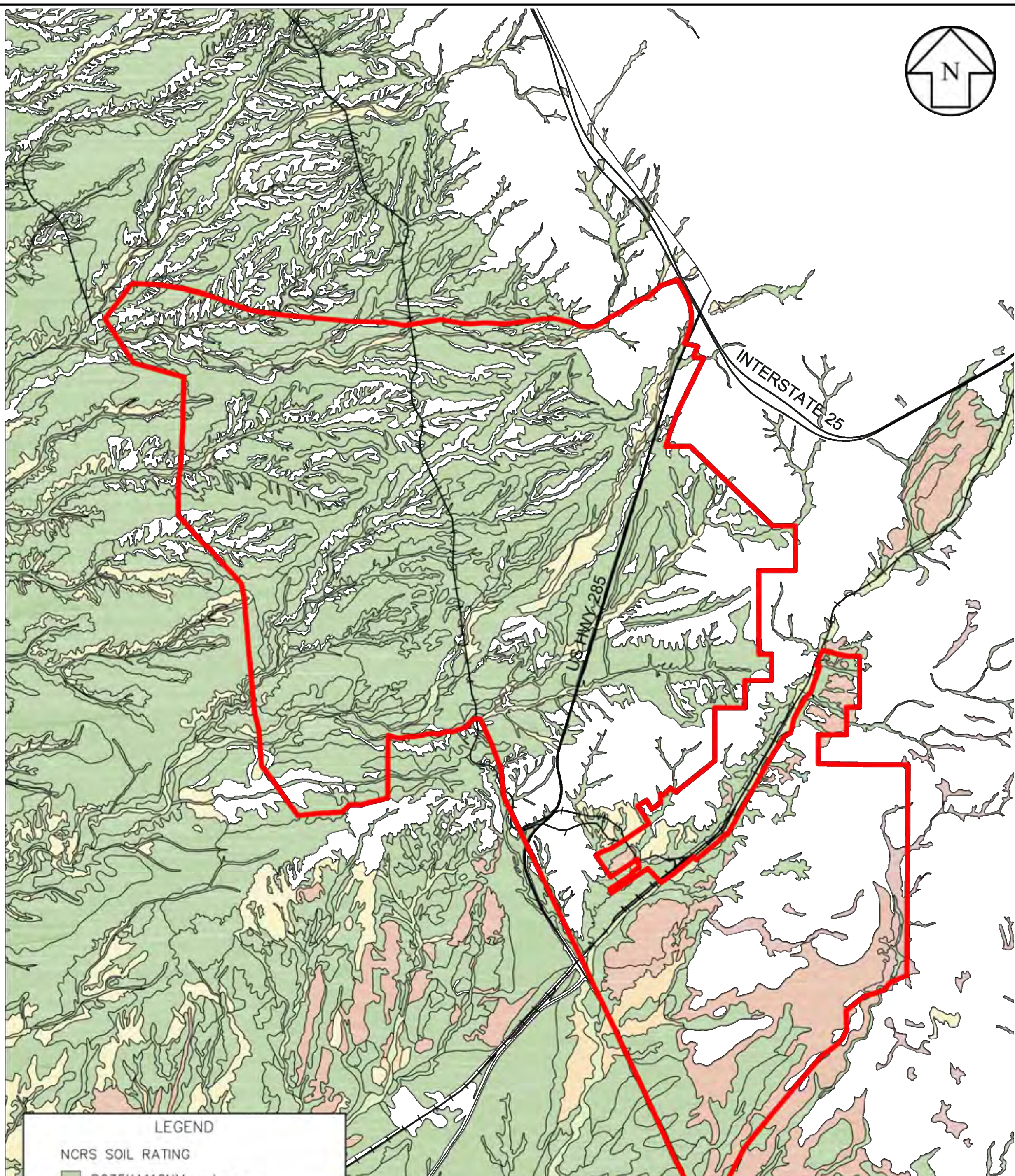

WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

MOLZENCORBIN

RANGE LAND

APPENDIX A - EXHIBIT 6

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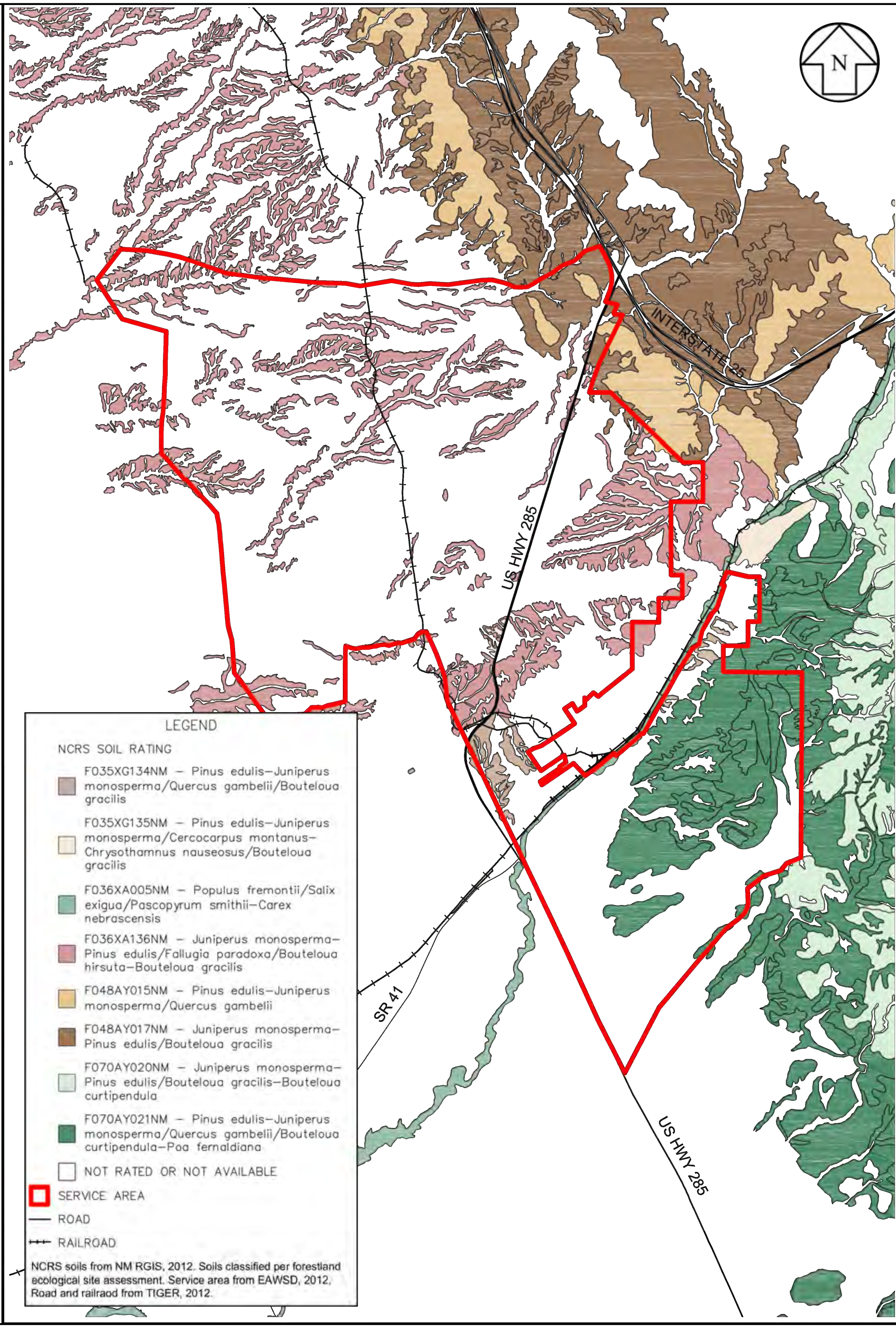

WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

MOLZENCORBIN

FOREST LAND

APPENDIX A - EXHIBIT 7

LAST MODIFIED: Jan 24, 2022 - 2:08pm BY USER: ATrujillo
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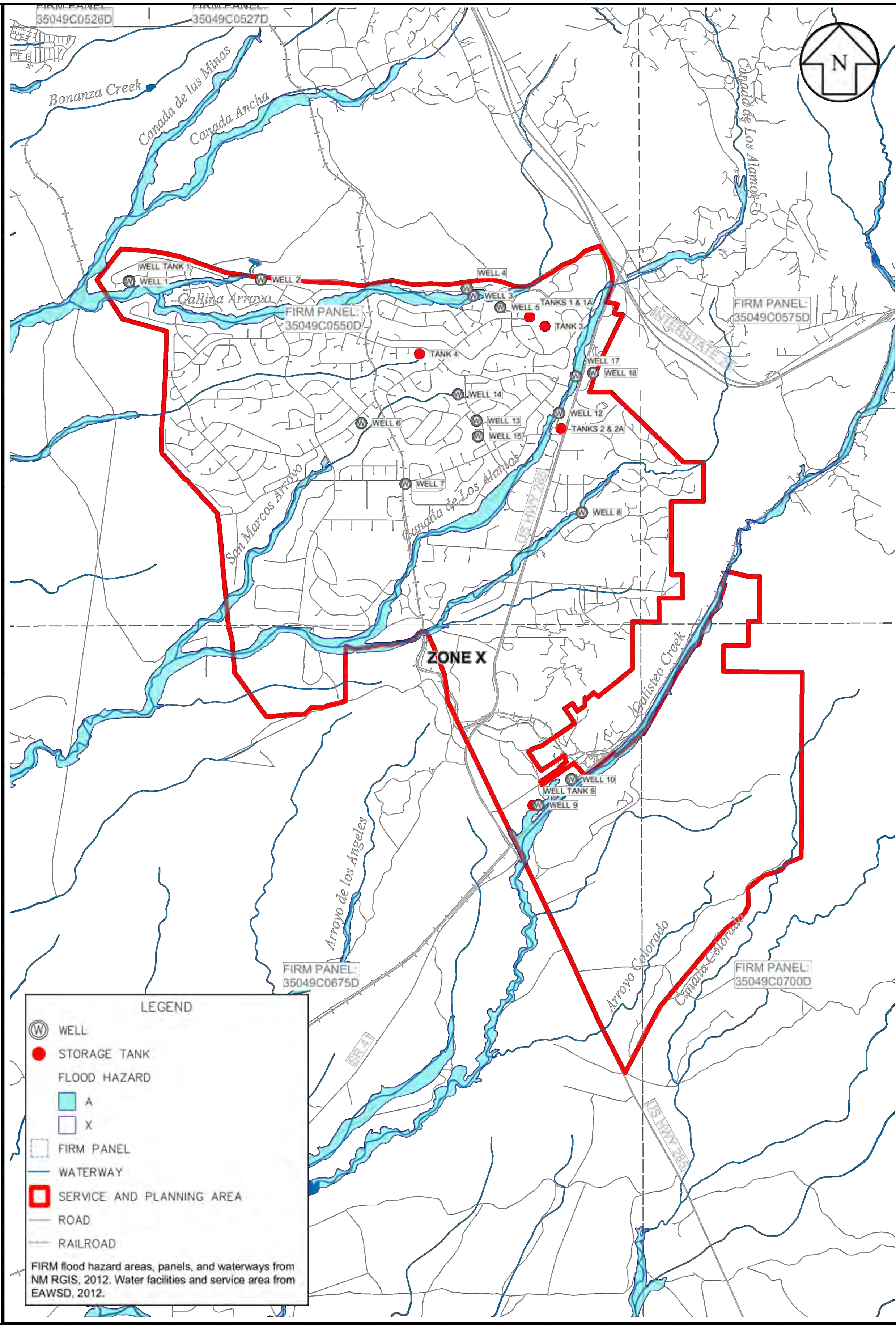
DWG. NAME: FIGURE-8.dwg

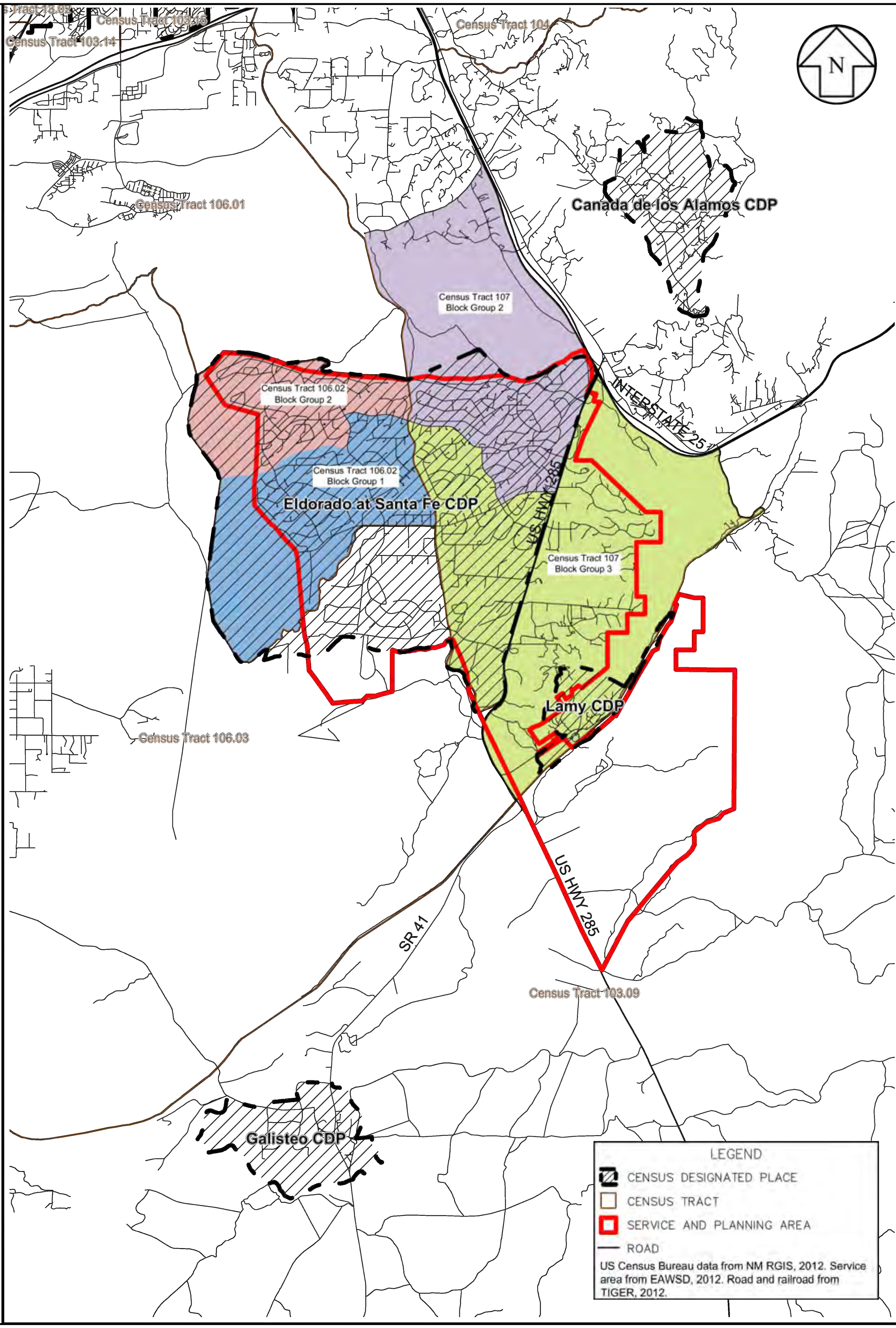


WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

MOLZENCORBIN

FLOOD HAZARD

APPENDIX A - EXHIBIT 8



WATER MASTER PLAN PER 2022 UPDATE - ELDORADO, NEW MEXICO

MOLZENCORBIN

US CENSUS BUREAU DATA

APPENDIX A - EXHIBIT 9

APPENDIX B:

VEGETATION AND BIOLOGICAL RESOURCES

Ecological site R035XG114NM
Gravelly

Accessed: 12/29/2021

General information

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua gracilis* (2) *Bouteloua curtipendula*

Physiographic features

The topography of this site ranges from gently to strongly sloping and may occur as low rolling hills and ridges dissected by natural arroyos or in combination with rock outcrop and badlands which are on very steep slopes. Average slopes are less than 35 percent, and aspect is variable. Elevation range from about 6,000 to 7,300 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Fan remnant (3) Stream terrace
Flooding frequency	None
Ponding frequency	None
Elevation	6,000–7,300 ft
Slope	0–35%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation varies from about 10 inches to just over 16 inches. Fluctuations ranging from about 5 inches to 25 inches are not uncommon. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. As much as half or more of the annual precipitation can be expected to come during the period of July through September. Thus, fall conditions are often more favorable for good growth of cool-season perennial grasses, shrubs, and forbs than are those of spring.

The average frost-free season is about 120 days and extends from approximately mid-May to early or mid September. Average annual air temperatures are 50 degrees F or lower and summer maximums rarely exceed 100 degrees F. Winter minimums typically approach or go below zero. Monthly mean temperatures exceed 70 degrees F for the period of July and August.

Rainfall patterns generally favor warm-season perennial vegetation, while the temperature regime tends to favor cool-season vegetation. This creates a somewhat complex community of plants on any given range site which is quite susceptible to disturbance and is at or near its productive potential only when both the natural warm/cool-season dominants are present.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	148 days
Freeze-free period (average)	174 days
Precipitation total (average)	16 in

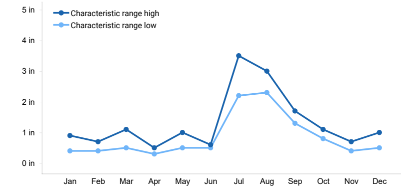


Figure 2. Monthly precipitation range

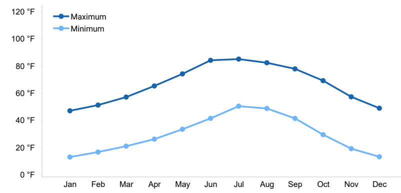


Figure 3. Monthly average minimum and maximum temperature

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

These soils are moderately deep to very deep. The surface and underlying layers are either gravelly or very gravelly loams, sandy loams, and fine sandy loams. The soils are well drained and moderately to rapidly permeable. The available water-holding capacity is moderate to low. Erosion is normally none to slight unless natural plant cover is seriously reduced.

Table 4. Representative soil features

Surface texture	(1) Gravelly sandy loam (2) Stony loam (3) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	20–80 in
Surface fragment cover <=3"	15–60%
Surface fragment cover >3"	5–15%
Available water capacity (0-40in)	3–6 in
Calcium carbonate equivalent (0-40in)	5–20%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	25–60%
Subsurface fragment volume >3" (Depth not specified)	10–20%

Ecological dynamics

Overview
This site occurs as gravelly stream or fan terraces or as low rolling gravelly hills and ridges dissected by natural drainages. It often occurs adjacent to Loamy sites or is interspersed with inclusions of loamy soils. The historic plant community of the Gravelly site is grass dominated and supports a mixture of warm and cool-season grasses, widely spaced shrubs/trees and a minor component of forbs. Blue grama is the dominant grass species. Winterfat, yucca, broom snakeweed, and rabbitbrush, are woody species typical of the site. The increase of rabbitbrush in response to fire, overgrazing, and decreased resource competition are factors that may facilitate the transition to the Shrub-Encroached state.

State and transition model

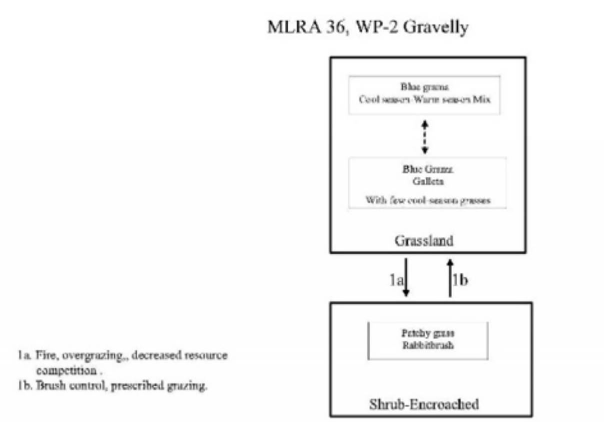


Figure 4. WP-2 36B Stae and Transition Gravelly Site

State 1
Historic Climax Plant Community

Community 1.1
Historic Climax Plant Community

State Containing Historic Climax Plant Community
Grassland: The historic plant community supports a mixture of warm and cool-season grasses, including blue grama, black grama, little bluestem, New Mexico feathergrass, western wheatgrass, bottlebrush squirreltail, Indian ricegrass, sideoats grama, and spike muhly. Although shrubs are a minor component, there is a wide variety of species adapted to this site. Some of the more common species include, winterfat, soapweed yucca, Apache plume, fourwing saltbush, rabbitbrush, Bigelow sagebrush, and broom snakeweed. Scattered piñon and juniper
may also occur. Heavy continuous use by livestock typically results in a decrease of many coolseason grasses, the more palatable warm season grasses, winterfat, and fourwing saltbush. A community dominated by blue grama with galleta occurring as the sub-dominant may result.

Diagnosis: Grass cover is fairly uniform with few large bare areas present. Shrubs and trees constitute a minor component of the site. Evidence of erosion such as pedestalling of grasses, rills and gullies are infrequent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	315	563	810
Forb	11	19	27
Total	**326**	**582**	**837**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	10-15%
Forb foliar cover	2-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-15%
Surface fragments >0.25" and <=3"	25-60%
Surface fragments >3"	10-20%
Bedrock	0%
Water	0%
Bare ground	10-20%

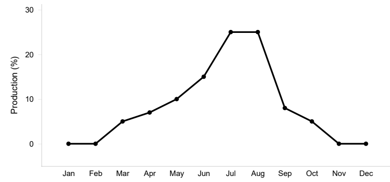


Figure 6. Plant community growth curve (percent production by month). NM0305, R035XG114NM-Gravelly-HCPC. Mixed warm/cool-season grassland w/shrub & half-shrub component..

State 2
Shrub-Encroached

Community 2.1
Shrub-Encroached

Additional States:
Shrub-Encroached: This state is characterized by the noticeable increase of rabbitbrush, and
decreased cover and production of grasses. Grass cover consists mainly of patchy blue grama, ring muhly, galleta, threeawns and dropseeds.

Diagnosis: Rabbitbrush is found at increased densities relative to the Grassland State. Grass cover is patchy with large bare areas present. Blue grama is typically the dominant grass. Evidence of erosion such as pedestalling of plants, rills and gullies may be common.

Transition to Shrub Encroached State (1a) Rabbitbrush is a fire adapted species and may
increase or quickly occupy burned areas.4 Seed production and seedling survival of rabbitbrush is believed to be sensitive to resource competition.2 During years of limited rainfall high grass cover may help to suppress shrub seedlings by competing directly for soil moisture. Overgrazing
can reduce grass cover and provide competition free areas for the establishment of rabbitbrush seedlings.

Key indicators of approach to transition:
* Decrease or change in composition or distribution of grass cover.
* Increase in size and frequency of bare patches.
* Increase in amount of rabbitbrush seedlings.

Transition back to Grassland (2b) Brush control is necessary to initiate the transition back to the Grassland state. Chemical control has been shown to be effective in the control of rabbitbrush.1,3 Due to its ability to vigorously resprout following disturbance, mechanical brush control methods are generally ineffective unless the plants are severed below the root crown. Prescribed grazing will help ensure adequate rest following brush control and will assist in the establishment and maintenance of grass cover.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				188–219	
	blue grama	BOGR2	*Bouteloua gracilis*	188–219	–
2				6–31	
	sideoats grama	BOCU	*Bouteloua curtipendula*	6–31	–
3				6–19	
	hairy grama	BOHI2	*Bouteloua hirsuta*	6–19	–
4				31–63	
	little bluestem	SCSC	*Schizachyrium scoparium*	31–63	–
5				31–63	
	common wolfstail	LYPH	*Lycurus phleoides*	31–63	–
	spike muhly	MUWR	*Muhlenbergia wrightii*	31–63	–
6				31–63	
	needle and thread	HECO26	*Hesperostipa comata*	31–63	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	31–63	–
7				31–63	
	western wheatgrass	PASM	*Pascopyrum smithii*	31–63	–
8				31–63	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	31–63	–
	squirreltail	ELEL5	*Elymus elymoides*	31–63	–
9				6–31	
	James' galleta	PLJA	*Pleuraphis jamesii*	6–31	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6–31	–
10				6–31	
	threeawn	ARIST	*Aristida*	6–31	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	6–31	–
11				31–94	
	black grama	BOER4	*Bouteloua eriopoda*	31–94	–
Forb					
12				6–31	
	Forb, perennial	2FP	*Forb, perennial*	6–31	–
13				6–13	
	Forb, annual	2FA	*Forb, annual*	6–13	–
Shrub/Vine					
14				6–31	
	winterfat	KRLA2	*Krascheninnikovia lanata*	6–31	–
15				6–19	
	soapweed yucca	YUGL	*Yucca glauca*	6–19	–
17				6–19	
	fourwing saltbush	ATCA2	*Atriplex canescens*	6–19	–
	Apache plume	FAPA	*Fallugia paradoxa*	6–19	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–19	–
	pale desert-thorn	LYPA	*Lycium pallidum*	6–19	–
18				6–19	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	6–19	–
	prairie sagewort	ARFR4	*Artemisia frigida*	6–19	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	6–19	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	6–19	–
19				6–19	
	Shrub, deciduous	2SD	*Shrub, deciduous*	6–19	–
Tree					
16				0–19	
	juniper	JUNIP	*Juniperus*	0–19	–
	twoneedle pinyon	PIED	*Pinus edulis*	0–19	–

Animal community

Habitat for Wildlife:
This site provides habitat which supports a resident animal community that is characterized by mule deer, bobcat, black-tailed jackrabbit, white-throated woodrat, Merriam's kangaroo rat, Botta's pocket gopher, brush mouse, sparrow hawk, Cassin's kingbird, meadowlark, common raven, chipping sparrow, leopard lizard, plateau whiptail, short-horned lizard, and black-tailed
rattlesnake.

Where cliffs and ledges are found associated with the site, golden eagle, great horned owl, prairie falcon, Say's phoebe, white-throated swift, and cliff swallow nest or hunt over the site. Mourning dove and black-chinned sparrow nest on the site. Large rocks or boulders, where found associated with the site, provide habitat for rock squirrels. Where it occurs adjacent to ponderosa pine forests, elk may range in to feed.

Hydrological functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations

Soil Series-----------------Hydrologic Group
Alegros-------------------------------C
Amenson-------------------------------D
Eldado--------------------------------B
Gatlin--------------------------------B
Gustspring----------------------------B
Guy-----------------------------------B
Ildefonso-----------------------------B
Jaconita------------------------------B
Lapdum--------------------------------B
Losmarios-----------------------------C
Majada--------------------------------B
Mulligan------------------------------B
Millett-------------------------------B
Pena----------------------------------B
Salas---------------------------------C
Sedillo-------------------------------B
Sipapu--------------------------------C
Tesajo--------------------------------B
Truehill------------------------------B
Xenmack-------------------------------C

Recreational uses

This site offers fair to good potential for hiking, horseback riding, nature observation, photography, camping and picnicking. It frequently provides good to excellent pronghorn antelope hunting.

Wood products

This site has little significant value for wood products.

Other products

Grazing:
This site is suitable for grazing by most kinds and classes of livestock in all seasons of the year, but is poorly suited to continuous yearlong use if potential natural vegetation is to be maintained. Under such use, cool-season grasses, such as New Mexico feathergrass, needleandthread, western wheatgrass, bottlebrush squirreltail, and Indian ricegrass, frequently decline or even
disappear. Prolonged heavy use will also cause the decline of such grasses as sideoats grama, spike muhly, and little bluestem, and the site may become characterized by a high density of low-vigor, sod-like blue grama that may make up to 90 percent of the species composition. Advanced deterioration is characterized by increases in ring muhly, threeawn spp., and rabbitbrush. Production in such instances may be cut to one-third or even one-fourth of the potential.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month
Similarity---------------------Index Ac/AUM
100 - 76------------------------3.4 – 4.7
75 – 51-------------------------4.5 – 6.9
50 – 26-------------------------6.7 – 11.0
25 – 0--------------------------11.0+

Type locality

Location 1: Catron County, NM
Location 2: Socorro County, NM

Other references

Data collection for this site was done in conjunction with the progressive soil surveys within the New Mexico and Arizona Plateaus and Mesas 36 Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys : McKinley, Cibola, Socorro, Catorn and Sandoval Counties.

1. Cluff, G.J., B.A. Roundy, R.A. Evans, and J.A. Young. 1983. Herbicidal control of greasewood (Sarcobatus vermiculatus) and salt rabbitbrush (Chrysothamnus nauseosus ssp. consimilis). Weed Science. 31: 275-279.

2. McKell, C. M., and W. W. Chilcote. 1957. Response of Rabbitbrush following removal of competing vegetation. Journal of Range Management. 10: 228-230

3. Whisenant, S.G. 1988. Control of threadleaf rubber rabbitbrush with herbicides. Journal of Range Management. 41: 470-472

4. Young, R. P. 1983. Fire as a vegetation management tool in rangelands of the Intermountain Region. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/[2004].

Characteristic Soils Are:
Majada Mulligan Pena

Other Soils included are:
Alegros, Amenson, Aridic Ustochrepts, Eldado Gatlin, Gustspring, Gustspring Rocky, Guy Ildefonso, Lapdum, Losmarios, Millett, Salas Sedillo, Tesajo, Typic Ustorthents

Contributors

Christine Bishop
David Trujillo
Don Sylvester
John Tunberg

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**

Ecological site F036XA136NM
Pinyon-Juniper-Apache Plume

Accessed: 12/29/2021

General information

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 036X–Southwestern Plateaus, Mesas, and Foothills

F036XA136NM Pinyon-Juniper-Apache Plume is an ecological site that is found on escarpments, fan remnants, mesas, hills, cuestas, benches, fan piedmonts, valley sides, eroded fan remnants, and mountain slopes in MLRA 36 (Southwestern Plateaus Mesas and Foothills). The southern portion MLRA 36 is illustrated yellow color on the map where this site occurs. The site concept was established in the Southwestern Plateaus. Mesas, and Foothills – Warm Semiarid Mesas and Plateaus LRU (Land Resource Area). This LRU has 10 to 16 inches of precipitation and has a mesic temperature regime. Lower part of MLRA 36 is dominated by summer precipitation for monsoons, unlike the upper part of MLRA 36 which is almost an equal split.

Classification relationships

NRCS & BLM:
Major Land Resource Area 36, Southwestern Plateaus Mesas and Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
313Bd Chaco Basin High Desert Shrubland and 313Be San Juan Basin North subsections < 313B Navaho Canyonlands Section < 313 Colorado Plateau Semi-Desert (Cleland, et al., 2007).

315Ha Central Rio Grande Intermontane, and 315Hb North Central Rio Grande Intermontane subsections <315H Central Rio Grande Intermontane Section < 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007).

315Ad Chupadera High Plains Grassland subsections <315A Pecos Valley Section < 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007).

331Jb San Luis Hills and 331Jd Southern San Luis Grasslands subsections <331J Northern Rio Grande Basin Section < 331 Great Plains- Palouse Dry Steppe (Cleland, et al., 2007).

M313Bd Manzano Mountains Woodland subsection < Sacramento-Monzano Mountains Section < M313 Arizona-New Mexico Mountains Semi-Desert - Open Woodland - Coniferous Forest - Alpine Meadow

M331Fg Sangre de Cristo Mountains Woodland and M331Fh Sangre de Cristo Mountains Coniferous Forest subsection < M331F Southern Parks and Rocky Mountain Range Section< M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331Gk Brazos Uplift and M331Gm Jemez and San Pedro Mountains Coniferous Forest subsections < M331G South Central Highlands Section < M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

EPA:
21d Foothill Shrublands and 21f Sedimentary Mid-Elevation Forests < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains (Griffith, 2006).

20c Semiarid Benchlands and Canyonlands < 20 Colorado Plateaus < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

22m Albuquerque Basin, 22i San Juan/Chaco Tablelands and Mesas, 22h North Central New Mexico Valleys and Mesas, 22f Taos Plateau, and 22g Rio Grande Floodplain, < 22 Arizona/New Mexico Plateau < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS:
Colorado Plateau Province (Navajo and Datil Section) Southern Rocky Mountains
Basin and Range (Mexican Highland and Sacramento Section)

Ecological site concept

F036XA136NM Pinyon-Juniper-Apache Plume ecological site was drafted from the existing F036XA136NM range site MLRA 36XB (NRCS, 2003). This site occurs on escarpments, fan remnants, mesas, hills, cuestas, benches, fan piedmonts, valley sides, eroded fan remnants, and mountain slopes. The soil surface is loamy textures. Common soil surface textures range from extremely gravelly loam, very gravelly loam, gravelly loam, very gravelly clay loam, extremely gravely coarse sandy loam, very gravelly coarse sandy loam, fine sandy loam, extremely cobbly fine sandy loam, very gravelly fine sandy loam, extremely gravelly sandy clay loam, loam, sandy loam, gravelly sandy loam, ashy loamy coarse sand, para-gravelly loam. The effective precipitation ranges from 10 to 16 inches.

Associated sites

F036XA001NM	**Pinyon Upland** Pinyon Upland (south of Gallup 13-16) - Slope 1-35%; Soils are very shallow to shallow and non-skeletal; soil surface is loam, channery loam or clay loam. Landforms are broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.
F036XA005NM	**Riverine Riparian** Riverine Riparian - Site has a water table at 12-36" Landforms are V-shaped valleys, U-shaped valleys and Overflow Stream (channel)
F036XB133NM	**Pinyon-Juniper/Skunkbush Sumac** Pinyon-Juniper/Skunkbush Sumac - Slopes are 1-65%; Soils are moderately deep to deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly sandy loam, very gravelly loam, loam, para-gravelly-ashy loamy coarse sand, and extremely cobbly coarse sandy loam with a sandy subsoil. Landform is mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges.
R036XB006NM	**Loamy** Loamy - Slopes are 1-15%; Soils are moderately deep to deep; soil surface range from loam, gravelly loam, loamy fine sand, fine sandy loam, sandy loam, silt loam and clay loam. Subsoil is loamy and range from loam to clay loam. Landforms are mesas, plateaus, fan remnant, terraces, dipslopes on cuestas, and broad upland valley sides.
R036XB011NM	**Sandy** Sandy - Slopes are 1-15%; soils are deep to very deep; Surface textures are loamy sand, gravelly loamy sand, loamy fine sand, fine sandy loam and sandy loam with sandy subsoil. Landforms are nearly level to gently sloping landscapes on dunes, fan remnant and alluvial fans.
R036XB132NM	**Gravelly Hills** Gravelly Hills - Slopes are (10-65%); Soils are very deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly fine sandy loam, very gravelly sandy loam, very cobbly loam, or gravelly loam with a sandy subsoil. Landforms are escarpments, fan piedmonts, mesas, hills, ridges and knolls.

Similar sites

F036XA001NM	**Pinyon Upland** Pinyon Upland (south of Gallup 13-16) - Slope 1-35%; Soils are very shallow to shallow and non-skeletal; soil surface is loam, channery loam or clay loam. Landforms are broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.
F036XB133NM	**Pinyon-Juniper/Skunkbush Sumac** Pinyon-Juniper/Skunkbush Sumac - Slopes are 1-65%; Soils are moderately deep to deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly sandy loam, very gravelly loam, loam, para-gravelly-ashy loamy coarse sand, and extremely cobbly coarse sandy loam with a sandy subsoil. Landform is mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges.

Table 1. Dominant plant species

Tree	(1) *Juniperus monosperma* (2) *Pinus edulis*
Shrub	(1) *Fallugia paradoxa*
Herbaceous	(1) *Bouteloua hirsuta* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on escarpments, fan remnants, mesas, hills, cuestas, benches, fan piedmonts, valley sides, eroded fan remnants, and mountain slopes. Slopes typically range from 1-35%, and elevations are generally 5500-8000 ft.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Mesa (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	5,500–8,000 ft
Slope	1–35%

Climatic features

This site has a semi-arid continental climate. There are distinct seasonal temperature variations. Mean annual precipitation varies from 10 to 16 inches. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. Wide yearly and seasonal fluctuations are common for this climatic zone which can range from 5 to 25 inches. Of this, approximately 25-35% falls as snow, and 65-75% falls as rain between April 1 and November 1. The growing season is April through September. As much as half or more of the annual precipitation can be expected to come during the period of July through September. August is typically the wettest month of the year. The driest period is usually from November to April; and February is normally the driest month. During July, August, and September, 4 to 6 inches of precipitation influence the presence and production of warm-season plants. Fall and spring moisture is conducive to the growth of cool-season herbaceous plants and maximum shrub growth. Growth usually begins in March and ends with plant maturity and seed dissemination when the moisture deficiency and warmer temperatures occur in early June. There is also a period of growth in the fall. Summer precipitation is characterized by brief thunderstorms, normally occurring in the afternoon and evening. Winter moisture usually occurs as snow, which seldom lies on the ground for more than a few days. The average annual total snowfall is 29.1 inches. The snow depth usually ranges from 0 to 1 inches during the winter months. The highest snowfall record is 57.1 inches during the 1993-1994 winter. The frost- free period typically ranges from 110 to 145 days and the freeze free period is from 140 to 170 days. The last spring freeze is the middle of April to the first week of May. The first fall freeze is the middle of October to the first week of November. Mean daily annual air temperature is about 29ºF to 69ºF, averaging about 37ºF for the winter and 67ºF in the summer. The coldest winter temperature recorded was -20ºF on January 6, 1971 and the warmest winter temperature recorded was 70ºF on February 28, 1965. The coldest summer temperature recorded was 26ºF on June 1, 1980. The hottest day on record is 100ºF on July 9, 2003 and June 21, 1968. Data taken from Western Regional Climate Center (2017) for El Rito, New Mexico Climate Station.

Table 3. Representative climatic features

Frost-free period (average)	126 days
Freeze-free period (average)	145 days
Precipitation total (average)	13 in

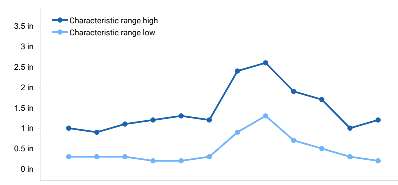


Figure 2. Monthly precipitation range

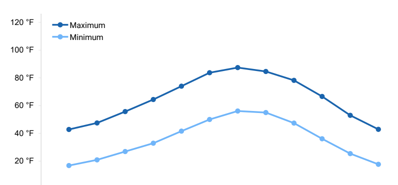


Figure 3. Monthly average minimum and maximum temperature

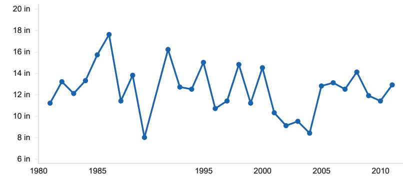


Figure 4. Annual precipitation pattern

Climate stations used

- (1) EL RITO [USC00292820], El Rito, NM
- (2) NAVAJO DAM [USC00296061], Navajo Dam, NM
- (3) SANTA FE 2 [USC00298085], Santa Fe, NM
- (4) COCHITI DAM [USC00291982], Pena Blanca, NM
- (5) ABIQUIU DAM [USC00290041], Gallina, NM
- (6) LYBROOK [USC00295290], Dulce, NM
- (7) CUBA [USC00292241], Cuba, NM

Influencing water features

This site is not associated with water from a wetland or stream.

Soil features

Soils are moderately deep to very deep in depth (20 to 60+ inches). The surface soils textures range from extremely gravelly loam, very gravelly loam, gravelly loam, very gravelly clay loam, extremely gravely coarse sandy loam, very gravelly coarse sandy loam, fine sandy loam, extremely cobbly fine sandy loam, very gravelly fine sandy loam, extremely gravelly sandy clay loam, loam, sandy loam, gravelly sandy loam, ashy loamy coarse sand, para-gravelly loam. Parent materials include: slope alluvium or fan alluvium from igneous and sedimentary rock; colluvium from shale; eolian deposits over colluvium derived from limestone; slope alluvium from tuff; slope alluvium from pumice; slope alluvium over residuum weathered from granite; eolian deposits derived from tuff and/or slope alluvium derived from tuff; alluvium derived from latite over dacite over tuff; colluvium derived from granite and/or gneiss and/or schist over granitic residuum weathered from conglomerate; or micaceous alluvium derived from sandstone and/or alluvium derived from siltstone and/or mudstone and/or fanglomerate.

Ecological dynamics

MLRA 36 occurs on the higher elevation portion of the Colorado Plateau. The Colorado Plateau is a physiographic province which exists throughout eastern Utah, western Colorado, western New Mexico and northern Arizona. It is characterized by uplifted plateaus, canyons and eroded features. The Colorado Plateau lies south of the Uintah Mountains, north of the Mogollon transition area, west of the Rocky Mountains, and east of the central Utah highlands. The higher elevation portion of the Colorado Plateau which is represented by MLRA 36 is characterize by broken topography, and lack of perennial water sources. This area has a long history of past prehistoric human use for years. MLRA 36 shows archaeological evidence indicating that pinyon-juniper woodlands where modified by prehistoric humans and not pristine and thus where altered at the time of European settlement (Cartledge & Propper, 1993). This area also included natural influences of herbivory, fire, and climate. This area rarely served as habitat for large herds of native herbivores or large frequent historic fires due to the broken topography. This site is extremely variable and plant community composition will vary with the water fluctuations on this site.

The lower part MLRA 36 developed under climatic conditions that include hot, dry summers with summer rains showers and little to no snow with the mild winter temperatures. This area has climatic fluctuations and prolonged droughts are common occurrences. Between an above average year and a drought year. Forbs are the most dynamic component of this community and can vary up to 4 fold (Passey et.al. 1982). The precipitation and climate of MLRA 36 are conducive to producing Pinyon/juniper, and sagebrush complexes with high productive sites in the bottoms of the canyons. Predominant species on the Colorado Plateau are Wyoming big sagebrush (*Artemisia tridentata* var. wyomingensis), mountain big sagebrush (*A. tridentata* var. vaseyana), and black sagebrush (*A. nova*), basin big sagebrush (*A. tridentata* var. tridentata), Utah juniper (Juniperus utahensis), one-seed juniper (*Juniperus monosperma*), and two-needle pinyon (*Pinus edulis*). One-seed juniper has the capability to discontinue active growth when moisture is limited but can resume growth when moisture availability improves. This growth pattern may represent an important adaptation allowing them to survive on very arid sites. It is possible that small trees may be killed by drought; mature one-seed junipers are resilient to drought, especially in comparison to two-needle pinyon (Johnsen, 1962).

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Fire is an important aspect of grassland dominated ecological sites. According to the Fire Effects System literature review of one seed juniper puts fire intervals are historically 5-100 years on desert grassland sites and 10 to 50 years on woodland sites with juniper and pinyon (Johnson, 2002). Modeling done with LANDFIRE successional modeling for southwestern pinyon-juniper communities which includes Pinyon-juniper shrubland and pinyon-juniper woodland on the Colorado Plateau that the Fire return interval is 10 to 203 years (USFS, 2012). Pinyon-Juniper woodland fires were of mixed types being both surface and crown fires. Periodic fire is believed to have played an important role in maintaining juniper savannas (Johnsen, 1962, Paysen, et. al., 2000) Mueggler (1976) stated that a fire-free period of 85 to 90 years was necessary for development of a mature juniper woodland. Recent decades of fire suppression have probably contributed to encroachment of juniper into grasslands (Lanner and Van Devender, 1998). Fires varied in intensity and frequency depending on the site's productivity. Fires were typically patchy, and formed mosaics on productive sites (Johnson, 2002, Gottgried, 1999, and Paysen, et.al, 2000). The time necessary for post-fire recovery of one-seed juniper has not been well documented. Data suggests that factors such as soil type and pre-burn community plant composition may influence the length of time required for recovery. Once established, one-seed juniper can bear seed as early as 10 years of age on some sites (Schott and Pieper, 1987). Shrub vegetation is able to reestablish from seed dispersal from the adjacent non burned sagebrush stands; however the process is relatively slow. Fire also decreases the extent of juniper/pinyon pine invasions, which allows the historic plant community to maintain integrity. When the plant community is burned shrubs decrease, while perennial and annual grasses increase. The perennial shrubs associated with this site are able to recover at a faster rate than the invading trees. When the site is degraded by the presence of invasive annuals, the fire return interval is shortened due to increased fuels. The shortened fire return interval is often sufficient to suppress the native plant community. Cheatgrass invaded one seed juniper stand has a fire return interval of < 10 years (Johnson, 2002).

Variability in climate, soils, aspect and complex biological processes will cause the plant communities to differ. These factors contributing to annual production variability include wildlife use, drought, and insects. Factors contributing to special variability include soil texture, depth, rock fragments, slope, aspect, and micro-topography. The species lists are representative and not a complete list of all occurring or potentially occurring species on this site. The species lists are not intended to cover the full range of conditions, species and responses of the site. The State & Transition model depicted for this site is based on available research, field observations and interpretations by experts and could change as knowledge increases. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. The following diagram does not necessarily depict all the transitions and states that this site may exhibit, but it does show some of the most common plant communities.

State and transition model

This ecological site has been used in the following Soil Surveys: NM678 Typical soils assigned to this ecological site are:
Clayey-Skeletal – Cochiti
Loamy-Skeletal - Resolana, Wauquie
Sandy-Skeletal – Encantado
Fine-Silty - Cucho, Elpedro
Fine-Loamy – Kachina, Navajita
Loamy - Puye
Ashy - Totavi

Table 4. Representative soil features

Surface texture	(1) Very gravelly fine sandy loam (2) Extremely gravelly loam (3) Extremely cobbly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	20–60 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–40%
Available water capacity (0-40in)	1–6 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Subsurface fragment volume <=3" (Depth not specified)	5–40%
Subsurface fragment volume >3" (Depth not specified)	0–15%

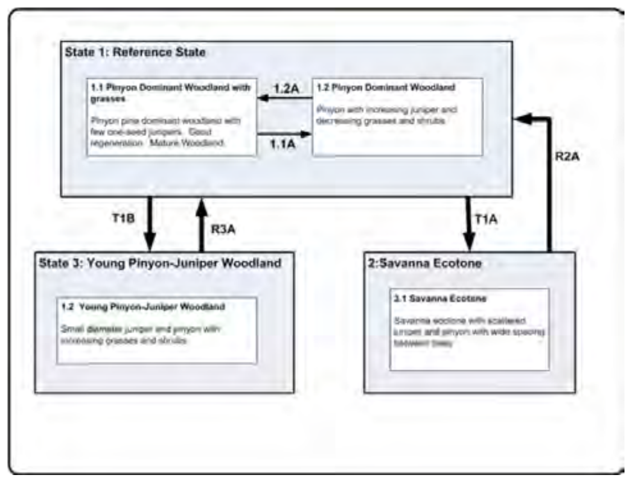


Figure 6. STM

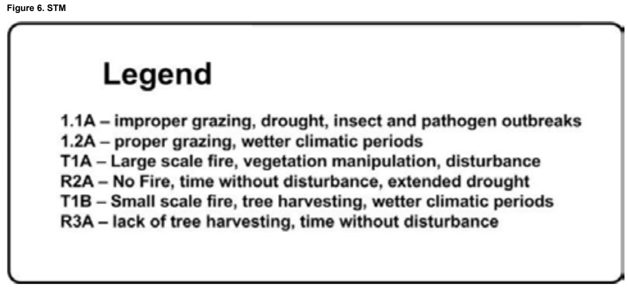


Figure 7. Legend

State 1
Reference State

This state represents the natural variability and dynamics of this site that occurred naturally. This state includes the dominant biotic communities that would have occurred on this ecological site prior to European Settlement. The dominant aspect of this site is Pinyon and one-seed Juniper with an understory of shrubs and associated grasses. Fluctuations in species compositions and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors. The primary disturbance mechanisms for this site in reference condition include drought, insects, and infrequent fire. The higher in elevation and higher precipitation area would burn more frequently as they would have more fine fuels in the understory. The timing of drought, and fire, coupled with surface disturbance can dictate whether the community can stay within the reference state or if the community transitions into another state.

Community 1.1
Pinyon Dominant Woodland with Grasses

This state represents the natural variability and dynamics of this site that occurred naturally. This state includes the dominant biotic communities that would have occurred on this ecological site prior to European Settlement. The dominant aspect of this site is Pinyon and one-seed Juniper with an understory of shrubs and associated grasses. Fluctuations in species compositions and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors. The primary disturbance mechanisms for this site in reference condition include drought, insects, and infrequent fire. The higher in elevation and higher precipitation area would burn more frequently as they would have more fine fuels in the understory. The timing of drought, and fire, coupled with surface disturbance can dictate whether the community can stay within the reference state or if the community transitions into another state.

Plant Species, Plant composition and pounds per acres was developed from data stored in NASIS at the time this site was written.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	250	400	500
Tree	125	175	250
Shrub/Vine	75	125	200
Forb	50	100	150
Total	**500**	**800**	**1100**

Community 1.2
Pinyon Dominant Woodland

A well-developed understory with a canopy of younger pinyon and juniper. At this stage juniper may be dominant over pinyon. Pinyon trees are more susceptible to drought, insects, and disease than juniper trees. In fact, it is difficult to identify methods beside fire that naturally reduce juniper. After long periods of drought weaken the pinyon trees, beetle kills can become quite extensive, especially after the droughts. Drought periods can also weaken and reduce the understory. Plant establishment is mainly limited by the available moisture. Biological crusts can be highly developed and diversified in the large interspaces between trees.

Pathway 1.1A
Community 1.1 to 1.2

This pathway occurs during and after events such as drought or insect/pathogen outbreaks that affect the herbaceous understory. Improper grazing on the herbaceous understory.

Pathway 1.2A
Community 1.2 to 1.1

This pathway occurs when events create a wetter climate cycle, favor pinyon and perennial bunch grass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial plants will reestablish. Proper grazing can help establishment and growth of the herbaceous plants.

State 2
Savanna Ecotone

The overall aspect of this community phase is grasses and shrubs with scattered pinyon and juniper. The herbaceous understory has a mix of grasses and forbs.

Community 2.1
Savanna Ecotone

This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state.

State 3
Young Pinyon-Juniper Woodland

The overall aspect of this community phase is grasses and shrubs with young pinyon and juniper. The herbaceous understory has a mix of grasses and forbs.

Community 3.1
Young Pinyon-Juniper Woodland

This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state.

Transition T1A
State 1 to 2

This pathway is very unlikely, but can occur when a fire is able to move through the community on a large scale basis. Two situations can make this occur: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires. Vegetation treatments can be used to mimic this pathway.

Transition T1B
State 1 to 2

Small scale fire (i.e. smaller lightning strike fires), vegetation treatments that removes trees (i.e. tree harvesting), and/or climatic periods that do not favor pinyon and juniper regeneration.

Restoration pathway R2A
State 2 to 1

This pathway occurs when the climate favors the establishment and growth of trees. Reduced influence from fire, insects, and drought could cause the tree canopy to close, effectively reducing the herbaceous understory thus facilitating the transition. More energy is taken-up and stored in the trees as the length between fires increase (lack of fire). Droughts are more frequent and are longer in length. Improper grazing and or increase surface disturbance combined with periods of drought can facilitate this transition.

Restoration pathway R3A
State 3 to 1

This pathway occurs when the climate favors the establishment and growth of mature trees. More energy is taken-up and stored in the trees as the length between fires and droughts increase. Time without disturbance and natural succession will cause this pathway.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				80–120	
	blue grama	BOGR2	*Bouteloua gracilis*	80–120	–
2				60–200	
	sideoats grama	BOCU	*Bouteloua curtipendula*	40–80	–
	squirreltail	ELEL5	*Elymus elymoides*	40–80	–
	James' galleta	PLJA	*Pleuraphis jamesii*	40–80	–
3				50–200	
	Grass, perennial	2GP	*Grass, perennial*	0–40	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–40	–
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	0–40	–
	needle and thread	HECO26	*Hesperostipa comata*	0–40	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–40	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–40	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–40	–
	littleseed ricegrass	PIMI	*Piptatheropsis micrantha*	0–40	–
	bluegrass	POA	*Poa*	0–40	–
Forb					
4				75–250	
	Forb, annual	2FA	*Forb, annual*	40–80	–
	Forb, perennial	2FP	*Forb, perennial*	40–80	–
	buckwheat	ERIOG	*Eriogonum*	40–80	–
Shrub/Vine					
5				10–40	
	Apache plume	FAPA	*Fallugia paradoxa*	10–40	–
6				0–60	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–40	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–40	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–40	–
	Gambel oak	QUGA	*Quercus gambelii*	0–40	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–40	–
Tree					
7				150–300	
	oneseed juniper	JUMO	*Juniperus monosperma*	80–160	–
	twoneedle pinyon	PIED	*Pinus edulis*	80–160	–
8				0–15	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–15	–

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 36 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

Acknowledgments

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**

Ecological site F036XA001NM
Pinyon Upland

Accessed: 12/29/2021

General information

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 036X–Southwestern Plateaus, Mesas, and Foothills

F036XA001NM Pinyon Upland (Formerly South Of Gallup 13-16) is an ecological site that is found on hills, ridges and knolls in MLRA 36 (Southwestern Plateaus Mesas and Foothills). The southern portion MLRA 36 is illustrated yellow color on the map where this site occurs. The site concept was established in the Southwestern Plateaus. Mesas, and Foothills – Warm Semiarid Mesas and Plateaus LRU (Land Resource Area). This LRU has 10 to 16 inches of precipitation and has a mesic temperature regime. Lower part of MLRA 36 is dominated by summer precipitation for monsoons, unlike the upper part of MLRA 36 which is almost an equal split.

Classification relationships

NRCS & BLM:
Major Land Resource Area 36, Southwestern Plateaus Mesas and Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
313Bd Chaco Basin High Desert Shrubland and 313Be San Juan Basin North subsections < 313B Navaho Canyonlands Section < 313 Colorado Plateau Semi-Desert (Cleland, et al., 2007).

315Ha Central Rio Grande Intermontane, and 315Hb North Central Rio Grande Intermontane subsections <315H Central Rio Grande Intermontane Section < 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007).

315Ad Chupadera High Plains Grassland subsections <315A Pecos Valley Section < 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007).

331Jb San Luis Hills and 331Jd Southern San Luis Grasslands subsections <331J Northern Rio Grande Basin Section < 331 Great Plains- Palouse Dry Steppe (Cleland, et al., 2007).

M313Bd Manzano Mountains Woodland subsection < Sacramento-Monzano Mountains Section < M313 Arizona-New Mexico Mountains Semi-Desert - Open Woodland - Coniferous Forest - Alpine Meadow

M331Fg Sangre de Cristo Mountains Woodland and M331Fh Sangre de Cristo Mountains Coniferous Forest subsection < M331F Southern Parks and Rocky Mountain Range Section< M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331Gk Brazos Uplift and M331Gm Jemez and San Pedro Mountains Coniferous Forest subsections < M331G South Central Highlands Section < M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

EPA:
21d Foothill Shrublands and 21f Sedimentary Mid-Elevation Forests < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains (Griffith, 2006).

20c Semiarid Benchlands and Canyonlands < 20 Colorado Plateaus < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

22m Albuquerque Basin, 22i San Juan/Chaco Tablelands and Mesas, 22h North Central New Mexico Valleys and Mesas, 22f Taos Plateau, and 22g Rio Grande Floodplain, < 22 Arizona/New Mexico Plateau < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS:
Colorado Plateau Province (Navajo and Datil Section) Southern Rocky Mountains
Basin and Range (Mexican Highland and Sacramento Section)

Ecological site concept

The 36XB Pinyon Upland (Formerly South Of Gallup 13-16) ecological site was drafted from the existing F036XA001NM - South of Gallup 13-16 range site MLRA 36XB (NRCS, 2003). This site occurs on escarpments, fan plateaus. mesas and cuestas. The soil surface is sandy in textures. Common soil surface textures are fine sandy loam, loam or sandy loam. The effective precipitation ranges from 10 to 16 inches.

Associated sites

F036XB133NM	**Pinyon-Juniper/Skunkbush Sumac** Pinyon-Juniper/Skunkbush Sumac - Slopes are 1-65%; Soils are moderately deep to deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly sandy loam, very gravelly loam, loam, sandy loam, paragravelly-ashy loamy coarse sand, and extremely cobbly coarse sandy loam with a sandy subsoil. Landform is mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges.
R036XB002NM	**Clayey** Clayey - Slopes are 0-15%; Soils are moderately deep to deep; soil surface loam, clay loam, silty clay loam, and silty clay over clayey subsoil with textures of clay loam, clay to silty clay loam or silty clay. Landforms are stream terraces, valley floors, fan remnants, alluvial fans, dipslopes on cuestas, mesas, hills, and valley floors.
R036XB005NM	**Limy** Limy - Slopes are 3-8%; Calcareous (very calcareous throughout the profile); soils are Non-skeletal and deep; surface is generally a silt loam and subsoil textures range from loam to silt loam. Landforms are gently alluvial fans and valley sides.
R036XB006NM	**Loamy** Loamy - Slopes are 1-15%; Soils are moderately deep to deep; soil surface range from loam, gravelly loam, loamy fine sand, fine sandy loam, sandy loam, silt loam and clay loam. Subsoil is loamy and range from loam to clay loam. Landforms are mesas, plateaus, fan remnant, terraces, dipslopes on cuestas, and broad upland valley sides.
R036XB010NM	**Salty Bottomland** Salty Bottomland - Water table 42-72" in depth; soils are deep, high in sodium, soils are gravelly to skeletal (15-35% rock fragments). Surface textures are loam, fine sandy loam, clay loam and silty clay loam with a subsoil of clay or clay loam. Landform is floodplain.
R036XB011NM	**Sandy** Sandy - Slopes are 1-15%; soils are deep to very deep; Surface textures are loamy sand, gravelly loamy sand, loamy fine sand, fine sandy loam and sandy loam with sandy subsoil. Landforms are nearly level to gently sloping landscapes on dunes, fan remnant and alluvial fans.
R036XB015NM	**Shallow Savanna** Shallow Savanna - Slopes 1-55%; very shallow to shallow soils and non-skeletal; very cobbly loam, very cobbly sandy loam, loam, cobbly clay loam, and channery clay loam over a clayey subsoil. Bedrock can be sandstone, shale or basalt. Landforms narrow ridges, hills, breaks and mesas of bedrock controlled landscapes.
R036XB017NM	**Swale** Swale - This site is enhanced by runoff during periods of high runoff (intermittent). The water table depth is greater than 6 ft. Soils are deep to very deep soils that have surface textures of loams, silt loams to clays with loamy subsoil. Landforms are broad valley bottoms, floodplains, and in depressions.

Similar sites

R036XB015NM	**Shallow Savanna** Shallow Savanna - Slopes 1-55%; very shallow to shallow soils and non-skeletal; very cobbly loam, very cobbly sandy loam, loam, cobbly clay loam, and channery clay loam over a clayey subsoil. Bedrock can be sandstone, shale or basalt. Landforms narrow ridges, hills, breaks and mesas of bedrock controlled landscapes.
F036XB133NM	**Pinyon-Juniper/Skunkbush Sumac** Pinyon-Juniper/Skunkbush Sumac - Slopes are 1-65%; Soils are moderately deep to deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly sandy loam, very gravelly loam, loam, sandy loam, paragravelly-ashy loamy coarse sand, and extremely cobbly coarse sandy loam with a sandy subsoil. Landform is mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Juniperus monosperma*
Shrub	(1) *Artemisia tridentata*
Herbaceous	Not specified

Physiographic features

The western plateau ranges from 6,000 – 8,000 feet. It consists of an area of broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mesa (3) Cuesta
Flooding frequency	None
Ponding frequency	None
Elevation	6,000–8,000 ft
Slope	1–35%
Aspect	Aspect is not a significant factor

Climatic features

This site has a semi-arid continental climate. There are distinct seasonal temperature variations. Mean annual precipitation varies from 10 to 16 inches. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. Wide yearly and seasonal fluctuations are common for this climatic zone which can range from 5 to 25 inches. Of this, approximately 25-35% falls as snow, and 65-75% falls as rain between April 1 and November 1. The growing season is April through September. As much as half or more of the annual precipitation can be expected to come during the period of July through September. August is typically the wettest month of the year. The driest period is usually from November to April; and February is normally the driest month. During July, August, and September, 4 to 6 inches of precipitation influence the presence and production of warm-season plants. Fall and spring moisture is conducive to the growth of cool-season herbaceous plants and maximum shrub growth. Growth usually begins in March and ends with plant maturity and seed dissemination when the moisture deficiency and warmer temperatures occur in early June. There is also a period of growth in the fall. Summer precipitation is characterized by brief thunderstorms, normally occurring in the afternoon and evening. Winter moisture usually occurs as snow, which seldom lies on the ground for more than a few days. The average annual total snowfall is 29.1 inches. The snow depth usually ranges from 0 to 1 inches during the winter months. The highest snowfall record is 57.1 inches during the 1993-1994 winter. The frost- free period typically ranges from 110 to 145 days and the freeze free period is from 140 to 170 days. The last spring freeze is the middle of April to the first week of May. The first fall freeze is the middle of October to the first week of November. Mean daily annual air temperature is about 29ºF to 69ºF, averaging about 37ºF for the winter and 67ºF in the summer. The coldest winter temperature recorded was -20ºF on January 6, 1971 and the warmest winter temperature recorded was 70ºF on February 28, 1965. The coldest summer temperature recorded was 26ºF on June 1, 1980. The hottest day on record is 100ºF on July 9, 2003 and June 21, 1968. Data taken from Western Regional Climate Center (2017) for El Rito, New Mexico Climate Station.

Table 3. Representative climatic features

Frost-free period (average)	126 days
Freeze-free period (average)	145 days
Precipitation total (average)	13 in

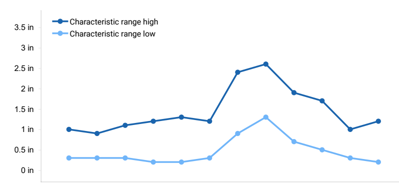

Figure 2. Monthly precipitation range

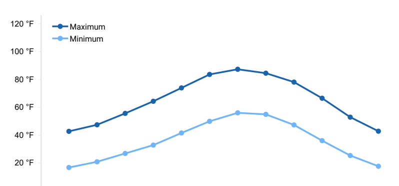

Figure 3. Monthly average minimum and maximum temperature

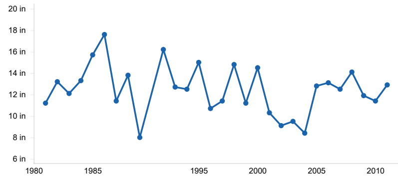

Figure 4. Annual precipitation pattern

Climate stations used

- (1) EL RITO [USC00292820], El Rito, NM
- (2) NAVAJO DAM [USC00296061], Navajo Dam, NM
- (3) COCHITI DAM [USC00291982], Pena Blanca, NM
- (4) SANTA FE 2 [USC00298085], Santa Fe, NM
- (5) ABIQUIU DAM [USC00290041], Gallina, NM
- (6) CUBA [USC00292241], Cuba, NM
- (7) LYBROOK [USC00295290], Dulce, NM

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

These soils are very shallow to shallow, well drained, and moderately slowly permeable. They formed in medium to moderately fine textured material and occur on mesas, cuestas, hillslopes, mesas, hills, plains, and terraces. Slopes range from 1 to 35 percent.

This ecological site is associated with the map units and soil components in the soil surveys listed below. Future updates to this soil survey may affect these associations. For up-to-date associations between soil components and this ecological site, refer to NASIS. Associations between ecological sites and soil components are maintained in NASIS via the ecological site ID.

Ecological dynamics

MLRA 36 occurs on the higher elevation portion of the Colorado Plateau. The Colorado Plateau is a physiographic province which exists throughout eastern Utah, western Colorado, western New Mexico and northern Arizona. It is characterized by uplifted plateaus, canyons and eroded features. The Colorado Plateau lies south of the Uintah Mountains, north of the Mogollon transition area, west of the Rocky Mountains, and east of the central Utah highlands. The higher elevation portion of the Colorado Plateau which is represented by MLRA 36 is characterize by broken topography, and lack of perennial water sources. This area has a long history of past prehistoric human use for years. MLRA 36 shows archaeological evidence indicating that pinyon-juniper woodlands where modified by prehistoric humans and not pristine and thus where altered at the time of European settlement (Cartledge & Propper, 1993). This area also included natural influences of herbivory, fire, and climate. This area rarely served as habitat for large herds of native herbivores or large frequent historic fires due to the broken topography. This site is extremely variable and plant community composition will vary with the water fluctuations on this site.

The lower part MLRA 36 developed under climatic conditions that include hot, dry summers with summer rains showers and little to no snow with the mild winter temperatures. This area has climatic fluctuations and prolonged droughts are common occurrences. Between an above average year and a drought year. Forbs are the most dynamic component of this community and can vary up to 4 fold (Passey et.al. 1982). The precipitation and climate of MLRA 36 are conducive to producing Pinyon/juniper, and sagebrush complexes with high productive sites in the bottoms of the canyons. Predominant species on the Colorado Plateau are Wyoming big sagebrush (*Artemisia tridentata* var. wyomingensis), mountain big sagebrush (*A. tridentata* var. vaseyana), and black sagebrush (*A. nova*), basin big sagebrush (*A. tridentata* var. tridentata), Utah juniper (Juniperus utahensis), one-seed juniper (*Juniperus monosperma*), and two-needle pinyon (*Pinus edulis*). One-seed juniper has the capability to discontinue active growth when moisture is limited but can resume growth when moisture availability improves. This growth pattern may represent an important adaptation allowing them to survive on very arid sites. It is possible that small trees may be killed by drought; mature one-seed junipers are resilient to drought, especially in comparison to two-needle pinyon (Johnsen, 1962).

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Fire is an important aspect of grassland dominated ecological sites. According to the Fire Effects System literature review of one seed juniper puts fire intervals are historically 5-100 years on desert grassland sites and 10 to 50 years on woodland sites with juniper and pinyon (Johnson, 2002). Modeling done with LANDFIRE successional modeling for southwestern pinyon-juniper communities which includes Pinyon-juniper shrubland and pinyon-juniper woodland on the Colorado Plateau that the Fire return interval is 10 to 203 years (USFS, 2012). Pinyon-Juniper woodland fires were of mixed types being both surface and crown fires. Periodic fire is believed to have played an important role in maintaining juniper savannas (Johnsen, 1962, Paysen, et. al., 2000) Mueggler (1976) stated that a fire-free period of 85 to 90 years was necessary for development of a mature juniper woodland. Recent decades of fire suppression have probably contributed to encroachment of juniper into grasslands (Lanner and Van Devender, 1998). Fires varied in intensity and frequency depending on the site's productivity. Fires were typically patchy, and formed mosaics on productive sites (Johnson, 2002, Gottgried, 1999, and Paysen, et.al, 2000). The time necessary for post-fire recovery of one-seed juniper has not been well documented. Data suggests that factors such as soil type and pre-burn community plant composition may influence the length of time required for recovery. Once established, one-seed juniper can bear seed as early as 10 years of age on some sites (Schott and Pieper, 1987). Shrub vegetation is able to reestablish from seed dispersal from the adjacent non burned sagebrush stands; however the process is relatively slow. Fire also decreases the extent of juniper/pinyon pine invasions, which allows the historic plant community to maintain integrity. When the plant community is burned shrubs decrease, while perennial and annual grasses increase. The perennial shrubs associated with this site are able to recover at a faster rate than the invading trees. When the site is degraded by the presence of invasive annuals, the fire return interval is shortened due to increased fuels. The shortened fire return interval is often sufficient to suppress the native plant community. Cheatgrass invaded one seed juniper stand has a fire return interval of < 10 years (Johnson, 2002).

Variability in climate, soils, aspect and complex biological processes will cause the plant communities to differ. These factors contributing to annual production variability include wildlife use, drought, and insects. Factors contributing to special variability include soil texture, depth, rock fragments, slope, aspect, and micro-topography. The species lists are representative and not a complete list of all occurring or potentially occurring species on this site. The species lists are not intended to cover the full range of conditions, species and responses of the site. The State & Transition model depicted for this site is based on available research, field observations and interpretations by experts and could change as knowledge increases. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. The following diagram does not necessarily depict all the transitions and states that this site may exhibit, but it does show some of the most common plant communities.

State and transition model

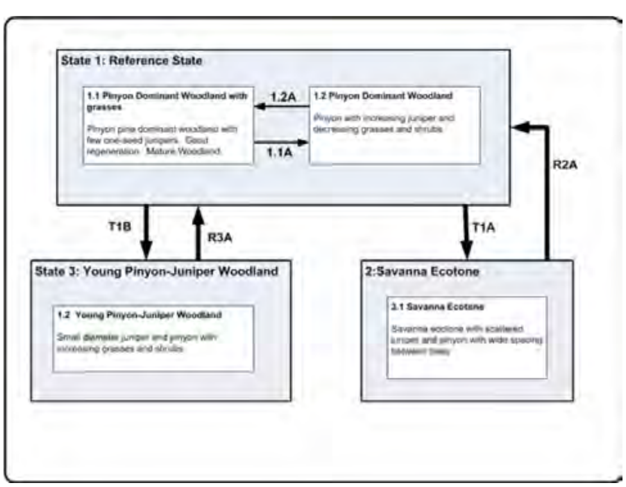

Figure 6. STM

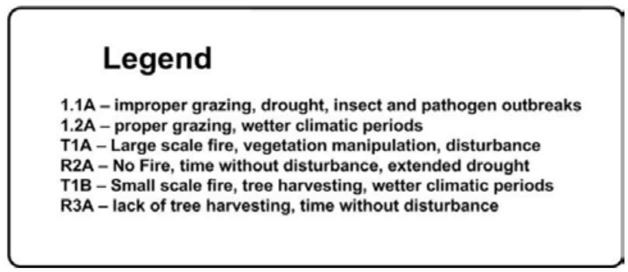

Figure 7. Legend

Soil survey; Map unit symbol; Soil components
NM678; BmF, MfD, MvE, OnC, PmF; Menefee
NM678; OCG, OjF; Montecito

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Slope alluvium–shale (3) Residuum–sandstone and shale
Surface texture	(1) Loam (2) Channery loam (3) Clay loam
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	4–20 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1.5–2.1 in
Calcium carbonate equivalent (0-40in)	5–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–10%

State 1
Reference State

This state represents the natural variability and dynamics of this site that occurred naturally. This state includes the dominant biotic communities that would have occurred on this ecological site prior to European Settlement. The dominant aspect of this site is Pinyon and one-seed Juniper with an understory of shrubs and associated grasses. Fluctuations in species compositions and relative production may change from year to year dependent upon abnormal precipitation or other climatic factors. The primary disturbance mechanisms for this site in reference condition include drought, insects, and infrequent fire. The higher in elevation and higher precipitation area would burn more frequently as they would have more fine fuels in the understory. The timing of drought, and fire, coupled with surface disturbance can dictate whether the community can stay within the reference state or if the community transitions into another state.

Community 1.1
Pinyon Dominant Woodland with Grasses

A well-developed understory with a canopy of younger pinyon and juniper. At this stage juniper may be dominant over pinyon. Pinyon trees are more susceptible to drought, insects, and disease than juniper trees. In fact, it is difficult to identify methods beside fire that naturally reduce juniper. After long periods of drought weaken the pinyon trees, beetle kills can become quite extensive, especially after the droughts. Drought periods can also weaken and reduce the understory. Plant establishment is mainly limited by the available moisture. Biological crusts can be highly developed and diversified in the large interspaces between trees.

Plant Species, Plant composition and pounds per acres was developed from data stored in NASIS at the time this site was written.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	195	250	350
Tree	75	175	225
Shrub/Vine	125	160	200
Forb	5	15	25
Total	**400**	**600**	**800**

Community 1.2
Pinyon Dominant Woodland

Mature pinyon and juniper woodland characterized this community phase. When weather patterns favor an increase of pinyon and juniper canopy with the associated understory of shrubs, grasses and forbs. Depending on the timing of precipitation, cool season grasses, like Indian ricegrass or warm season grasses like galleta could be dominant. Interspaces supporting highly developed biological crusts are common.

Pathway 1.1A
Community 1.1 to 1.2

This pathway occurs when events create a wetter climate cycle, favor pinyon and perennial bunch grass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial plants will reestablish.

Pathway 1.2A
Community 1.2 to 1.1

This pathway occurs during and after events such as drought or insect/pathogen outbreaks. Droughts and insects can kill the trees, increasing nutrient availability in the system. Due to the natural conditions of drought, grasses typically do not take up the extra nutrients in the long term. In the short term, grasses and forbs may increase for a few years until juniper and pinyon recover.

State 2
Savanna Ecotone

The overall aspect of this community phase is grasses and shrubs with scattered pinyon and juniper. The herbaceous understory has a mix of grasses and forbs.

Community 2.1
Savanna Ecotone

This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state.

State 3
Young Pinyon-Juniper Woodland

The overall aspect of this community phase is grasses and shrubs with young pinyon and juniper. The herbaceous understory has a mix of grasses and forbs.

Community 3.1
Young Pinyon-Juniper Woodland

This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state.

Transition T1A
State 1 to 2

This pathway is very unlikely, but can occur when a fire is able to move through the community on a large scale basis. Two situations can make this occur: 1) a fire can carry in the understory after several wet years allow fine fuels to accumulate, or 2) as the woodland approaches the later stages of development where canopies become dense and crown sizes have increased, and thus community phase becomes susceptible to crown fires. Vegetation treatments can be used to mimic this pathway

Transition T1B
State 1 to 3

Small scale fire (i.e. smaller lightning strike fires), vegetation treatments that removes trees (i.e. tree harvesting), and/or climatic periods that do not favor pinyon and juniper regeneration.

Restoration pathway R2A
State 2 to 1

This pathway occurs when the climate favors the establishment and growth of trees. Reduced influence from fire, insects, and drought could cause the tree canopy to close, effectively reducing the herbaceous understory thus facilitating the transition. More energy is taken-up and stored in the trees as the length between fires increase (lack of fire). Droughts are more frequent and are longer in length. Improper grazing and or increase surface disturbance combined with periods of drought can facilitate this transition.

Restoration pathway R3A
State 3 to 1

This pathway occurs when the climate favors the establishment and growth of mature trees. More energy is taken-up and stored in the trees as the length between fires and droughts increase. Time without disturbance and natural succession will cause this pathway.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				60–200	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	60–120	–
	blue grama	BOGR2	*Bouteloua gracilis*	60–120	–
2				30–60	
	James' galleta	PLJA	*Pleuraphis jamesii*	30–60	–
	Forb, annual	2FA	*Forb, annual*	0–25	–
3				10–60	
	Grass, annual	2GA	*Grass, annual*	0–30	–
	squirreltail	ELEL5	*Elymus elymoides*	0–30	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–30	–
Forb					
4				0–25	
	Forb, annual	2FA	*Forb, annual*	0–25	–
	Forb, perennial	2FP	*Forb, perennial*	0–25	–
Shrub/Vine					
5				30–100	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	30–60	–
	Gambel oak	QUGA	*Quercus gambelii*	30–60	–
6				10–100	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–30	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–30	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–30	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–30	–
	yucca	YUCCA	*Yucca*	0–30	–
Tree					
7				150–250	
	oneseed juniper	JUMO	*Juniperus monosperma*	60–120	–
	twoneedle pinyon	PIED	*Pinus edulis*	60–120	–
8				0–30	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–30	–

Wood products

Firewood

Other products

Pinyon nuts

Type locality

Location 1: McKinley County, NM	
Latitude	35° 13′ 25″
Longitude	108° 46′ 59″

Other references

Arnold, J. F. 1964. Zonation of understory vegetation around a juniper tree. Journal of Range Management. 17: 41-42.

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 36 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**

IPaC resource list

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

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

Location

Santa Fe County, New Mexico

Local office

New Mexico Ecological Services Field Office

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

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

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

Endangered species

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

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

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

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

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

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

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

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

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

Mammals

NAME	STATUS
New Mexico Meadow Jumping Mouse Zapus hudsonius luteus Wherever found This species only needs to be considered if the following condition applies: • If project affects dense herbaceous riparian vegetation along waterways (stream, seep, canal/ditch). There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/7965	Endangered

Birds

NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/8196	Threatened
Southwestern Willow Flycatcher Empidonax traillii extimus Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/6749	Endangered
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Rio Grande Cutthroat Trout Oncorhynchus clarkii virginalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/920	Candidate

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

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

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

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

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

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

Additional information can be found using the following links:

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

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

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

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Cassin's Finch Carpodacus cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Grace's Warbler Dendroica graciae This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 20 to Jul 20
Lewis's Woodpecker Melanerpes lewis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Olive-sided Flycatcher Contopus cooperi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31

Pinyon Jay *Gymnorhinus cyanocephalus* Breeds Feb 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9420

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

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

Probability of Presence Summary

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

Probability of Presence (■)

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

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

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

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

Breeding Season (■)

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

Survey Effort (|)

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

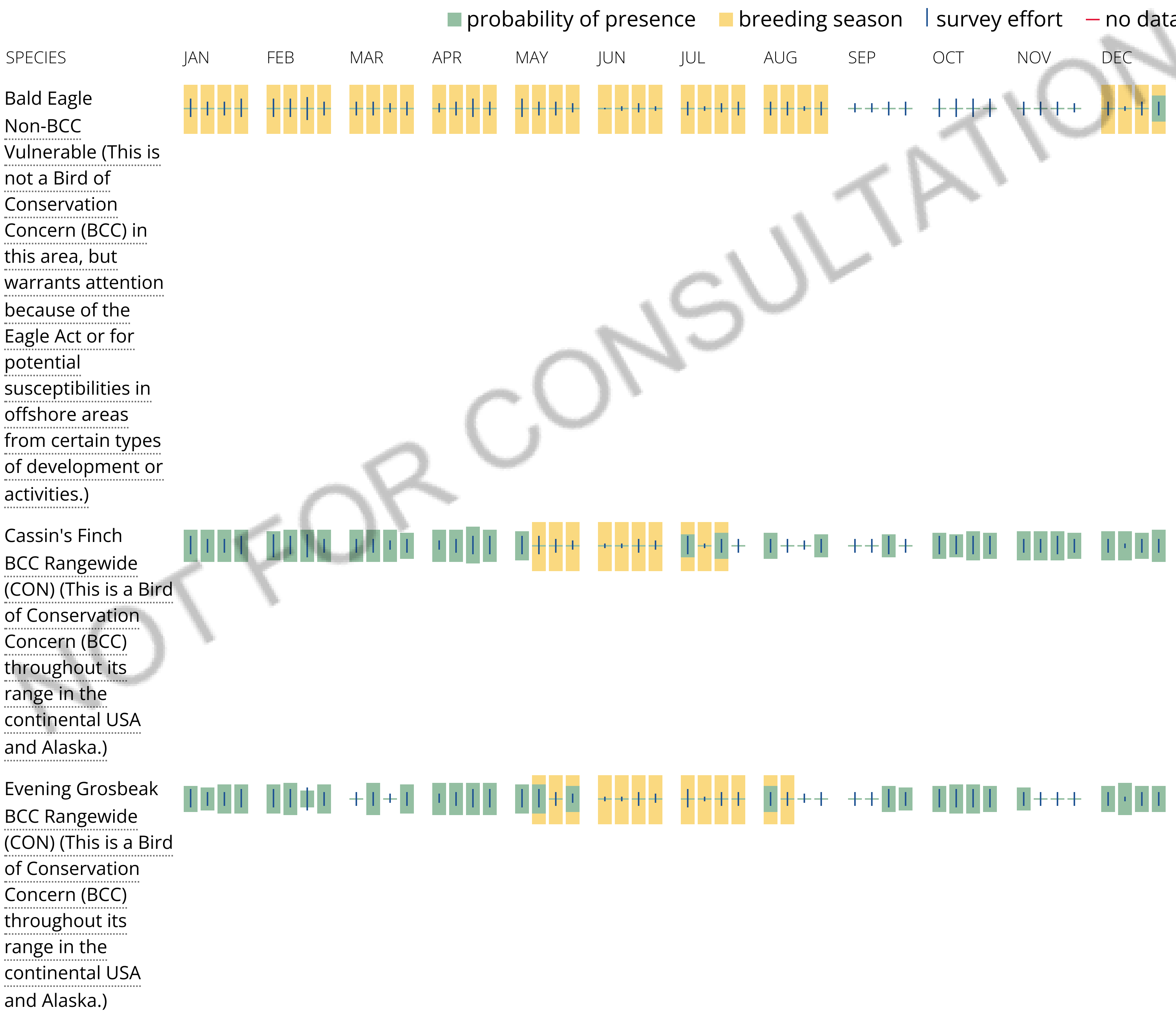
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

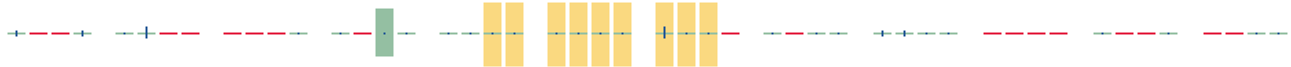
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

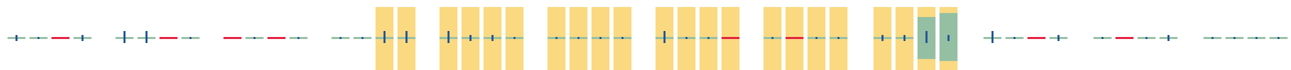
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



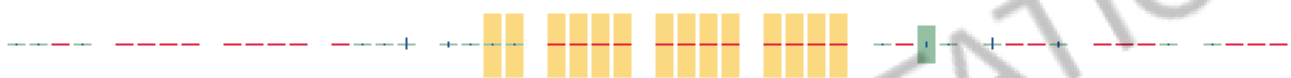
Grace's Warbler
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



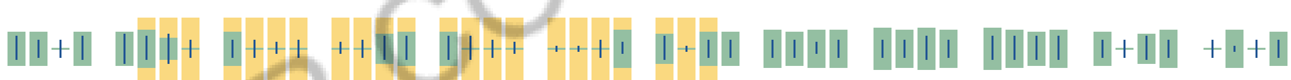
Lewis's Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



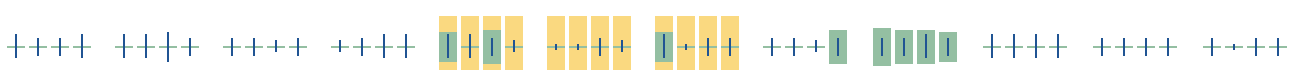
Olive-sided Flycatcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



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



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



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

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

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

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

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

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

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

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

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

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

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

What are the levels of concern for migratory birds?

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

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

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

Details about birds that are potentially affected by offshore projects

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

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

What if I have eagles on my list?

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

Proper Interpretation and Use of Your Migratory Bird Report

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

Facilities

National Wildlife Refuge lands

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

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

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

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

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

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

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

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

Data exclusions

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

Data precautions

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

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

Santa Fe

Taxonomic Group	# Species	Taxonomic Group	# Species
Birds	11	Mammals	3
Molluscs	1		

TOTAL SPECIES: 15

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Spotted Bat	Euderma maculatum	T			Y	View
Pacific Marten	Martes caurina	T			Y	View
Meadow Jumping Mouse	Zapus luteus luteus	E	E	Y	Y	View
White-tailed Ptarmigan	Lagopus leucura	E			Y	View
Yellow-billed Cuckoo (western pop)	Coccyzus americanus occidentalis		T	Y	Y	View
Violet-crowned Hummingbird	Leucolia violiceps	T			Y	View
Least Tern	Sternula antillarum	E			Y	View
Bald Eagle	Haliaeetus leucocephalus	T			Y	View
Mexican Spotted Owl	Strix occidentalis lucida		T	Y	Y	View
Boreal Owl	Aegolius funereus	T			Y	View
Peregrine Falcon	Falco peregrinus	T			Y	View
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y	Y	View
Gray Vireo	Vireo vicinior	T			Y	View
Baird's Sparrow	Centronyx bairdii	T			Y	View
Lilljeborg's Peaclam	Pisidium lilljeborgi	T			Y	No Photo

APPENDIX C:

GEOLOGY

Geology in the model area

Eldorado is located in the northeastern portion of the southern Santa Fe Embayment of the Española Structural Basin. This Embayment, also known as the Galisteo Basin, is located south of I-25 to Galisteo Creek and between the Sangre de Cristo Mountains and the Cerrillos Hills. This area is a relatively undeformed block of sedimentary rocks that is the northern extension of the Estancia Basin Syncline, with the Cañoncito-Tijeras Fault System separating the Estancia and Galisteo Basin depressions (Grant, 1998). The Cañoncito-Tijeras Fault System defines the Galisteo Creek valley through the Embayment and north to the community of Cañoncito. The Sangre de Cristo Mountains are bounded on the west by steeply dipping, north-northwest trending, down to the west normal faults (Figure 1). The Seton Village Fault and the Hondo Fault bound the southernmost exposures of the Precambrian crystalline basement rock. Cañada de Los Alamos arroyo is developed along a fault or fracture zone parallel to the trace of the arroyo. Aerial photography and local surface exposures of bedrock show strong northeast and northwest fracture patterns that relate to larger, regional scale structures.

Figure 2 shows two generalized geologic cross sections through the Eldorado area showing the distribution of the geologic units present at the subsurface[1]. The two section lines are also shown in Figure 1. The cross section line for A-A' starts and ends slightly outside of the geologic map extent. For simplicity, the Paleozoic formations were grouped together as one unit and the Mesozoic formations were grouped together as a second unit.

The undifferentiated Paleozoic formations (Pzu and Pm/Pzu) includes the following formations, from oldest to youngest: Mississippian Sandia Formation; Pennsylvanian Madera Formation (Pm); Pennsylvanian-Permian Sangre de Cristo Formation; and the Permian Yeso, Glorieta Sandstone, San Andres, and Artesia Formations. The undifferentiated Mesozoic unit (Mzu) includes the following formations, from oldest to youngest: Triassic Moenkopi Formation, and the Chinle Group, which includes the Santa Rosa Sandstone; Jurassic Entrada, Todilto and Morrison Formations; and Cretaceous Mancos Shale (Group) and Dakota Sandstone Formation.

The Tertiary Galisteo Formation is not separated into members. The Tertiary Galisteo and Espinaso Formations are assumed to pinch out toward the mountains. The Quaternary Ancha Formation and Quaternary alluvium in the Seton Village and Turquoise Hill quadrangles are grouped into one unit (Qa/Qal). The Quaternary alluvium of the Galisteo Creek and Bull Canyon are shown as alluvium only (Qal).

The sedimentary rocks of the Santa Fe Embayment range in age from Pennsylvanian to Quaternary and overlie Precambrian crystalline rocks (Figure 2). The Precambrian rocks are also exposed in the higher elevations of the Sangre de Cristo Mountains and the granite hills at the northern edge of the Embayment. However, most of the sedimentary rocks of the Embayment are not present in the Sangre de Cristo Mountains because they have either been entirely eroded during uplift of the mountains or were not originally deposited due to a preexisting topographic high.

The Pennsylvanian, Permian and Triassic section is exposed at the mountain front east of the Eldorado (Read et al., 1999a, Ilg et al, 1997) and the Jurassic-age Morrison Formation crops out approximately one mile south of RG-72559 at the escarpment above the creek. The Tertiary rocks are exposed in the Galisteo Creek valley south and west of Eldorado. The younger Tertiary sediments are exposed in Arroyo Hondo northwest of Eldorado and in the Santa Fe area (off of the map). Most of the Eldorado area is covered by Quaternary alluvial sediments that cover the older bedrock with up to ~200 feet of sand, gravel, silt and clay. These sediments are sometimes

[1] Figure 2 was compiled from the following sources: Spiegel and Baldwin (1963), Johnson (1973), Bachman (1975), Ilg et al. (1997), Grant (1998), Lisenbee (1999), Read et al. (1999a), Read et al., (1999b), Koning and Hallett (2000), Grauch and Bankey (2003) and Read and Koning (2004).

referred to as Ancha or Tesuque Formation, but are mapped as younger unnamed alluvium (Read et al, 1999a; Read and Koning, 2004)

Lisenbee's (1999) cross section A-A' was modified, simplified and extended to represent the subsurface geology of the Eldorado area. The section was extended northward using data from EAWSD Well 17, Well 15, and Well 13 (Figure 2). The remainder of the cross section was constructed using the well control described above and calculating apparent dips assuming an average east-west strike and 15° to 16° dip to the south. The northwest trending, down to the southwest Seton Village Fault was inferred to project between Well 13 and Well 17, which is also supported by aeromagnetic data interpretation (Grauch and Bankey, 2003, Grauch, 2007) (Figure 2). Minimum offset across the Seton Village Fault is estimated to be 500 feet based on the A-A' cross section constructed for this report.

Cross section B-B' was drawn from well RG-38073-X5 in Rancho Viejo to EAWSD Wells 1, 2, and 4. The cross section bends at Well 1. Cross section D-D' from Read and Koning (2004) crosses section B-B' just southeast of RG-38073-X5. The geologic unit thicknesses in the western part of section B-B' were taken from cross section D-D' (Read and Koning, 2004). The depth to the top of the Espinaso Formation and to the top of the Precambrian crystalline rock at the mountain front was interpreted from Grauch and Bankey (2003) aeromagnetic data interpretation and well log data from EAWSD wells 1, 2 and 4. There are no deep wells near the cross section line to determine formation thicknesses below the Tesuque and Ancha Formations. However, it is a reasonable assumption that these deeper units thin and pinch out toward the mountain front due to uplift and erosion and increase in distance from the source of some of the formations (i.e. Espinaso volcanic source is the Cerrillos Hills (Koning and Hallett, 2000). The interpreted faults from Grauch and Bankey (2003) and Read and Koning (2004) were incorporated into the cross section. In most cases the fault dip direction was inferred from the aeromagnetic data and the offset amount is not known (Read and Koning, 2004). Therefore, the amount of offset across the faults in cross section B-B' is inferred based on aeromagnetic and well log interpretation and is only a schematic representation of the subsurface structure.

Table 1 summarizes the aquifers into which each of the District wells are completed and the typical yields (in gallons per minute). The District wells are identified by their number and some of these wells are also shown in Figure 2. Well 19, if projected along strike onto cross section A-A' would fall at the same location and approximately the same depth as Well 13.

Table 1. Hydrologic characteristics of lithologic units in the Eldorado area

Geologic Age	Lithologic Unit	Estimated Saturated Thickness	Typical Well Yields (gpm)	District Wells
Quaternary	Alluvium (Galisteo Creek)	0 to 80 ft	25 to 200+	9, 10
Quaternary/ Tertiary	Ancha-Tesuque Fm.	0 to 100 ft	20 to 100+	1, 2, 6, 7
Tertiary	Espinaso/Galisteo Fm.	0 to 1000 ft	<1 to 25	6
Permian	Sangre de Cristo Fm.	0 to 500	<1 to 20	8
Pennsylvanian/ Permian	Madera Formation limestone - highly fractured	0 to 200 ft	25 to 250	13, 14, 15, 19
Pennsylvanian/ Permian	Madera Formation limestone – fractured	0 to 800 ft	<15	3, 4, 8
Precambrian	Crystalline Precambrian - Fractured	0 to 800	<1 to 15	5, 12
Precambrian	Crystalline Precambrian - highly fractured	0 to 600	80 to 120	17, 18

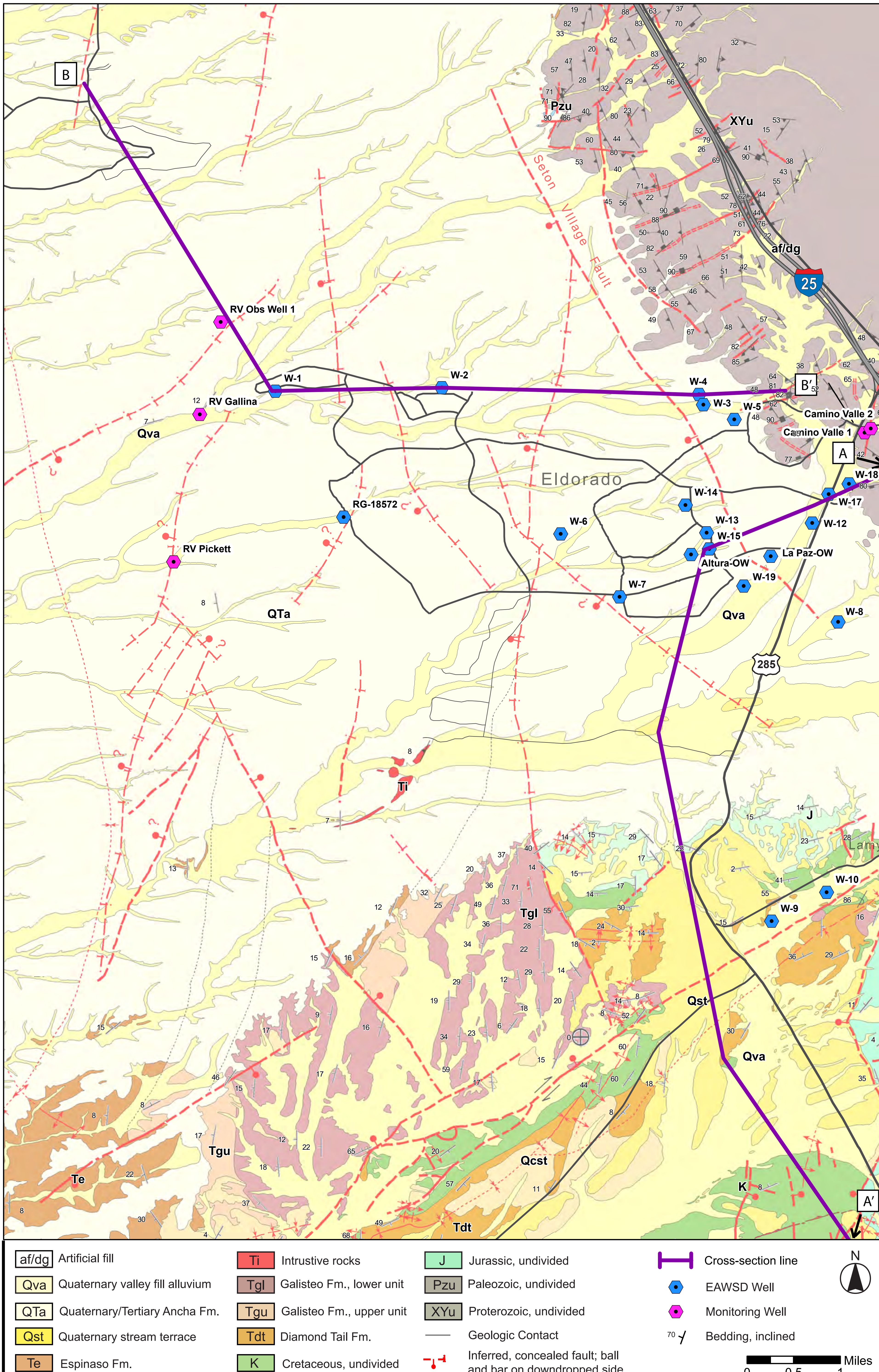
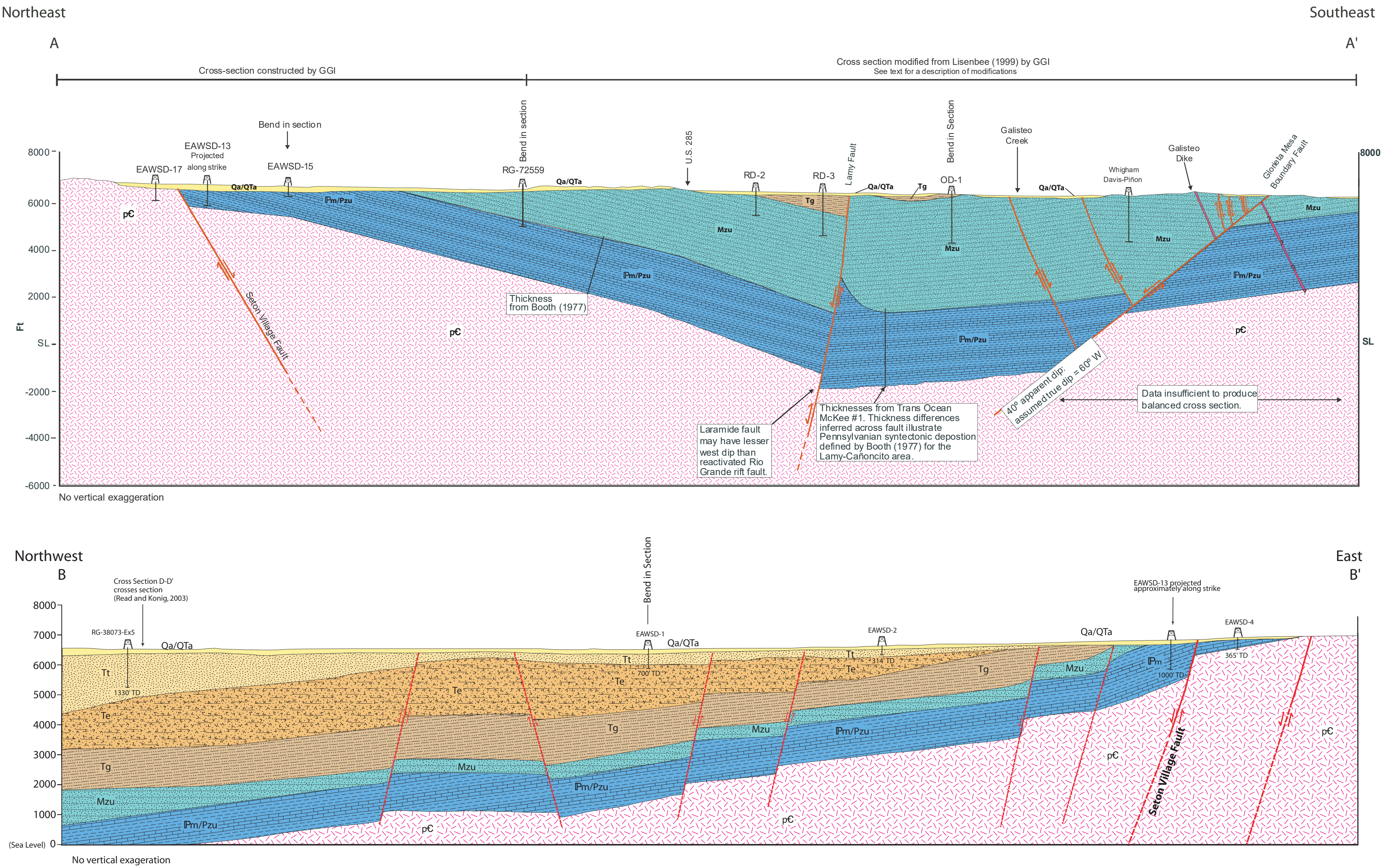


Figure 1. Geologic map of the EAWSD well field showing location of cross-section A-A′ and B-B′.

**Cross section line A-A′ starts and ends off of the map.*

GLORIETA GEOSCIENCE, INC.

Figure 2. Generalized geologic cross sections A-A' and B-B'



APPENDIX D:

PHOTOS OF SELECTED FACILITIES

Figure D1. Old Ranch Road Booster Pump Station

Figure D2. Torreon Booster Pump Station

Figure D3. Tank 1 Booster Pump Station

Figure D4. Tank 4 Booster Pump Station

Figure D5. Tanks1- 1A

Figure D6. Tank 3

Figure D7. Tank 4

Figure D8. Well 2A-2B

Figure D9. Well 9

Figure D10. Well 9 BPS and Tank

Figure D11. Well 9 Booster Pumps

Figure D12. Well 17

Figure D13. Well 18

Figure D14. Well 19

Figure D15. Well 19 Blend and Process Piping

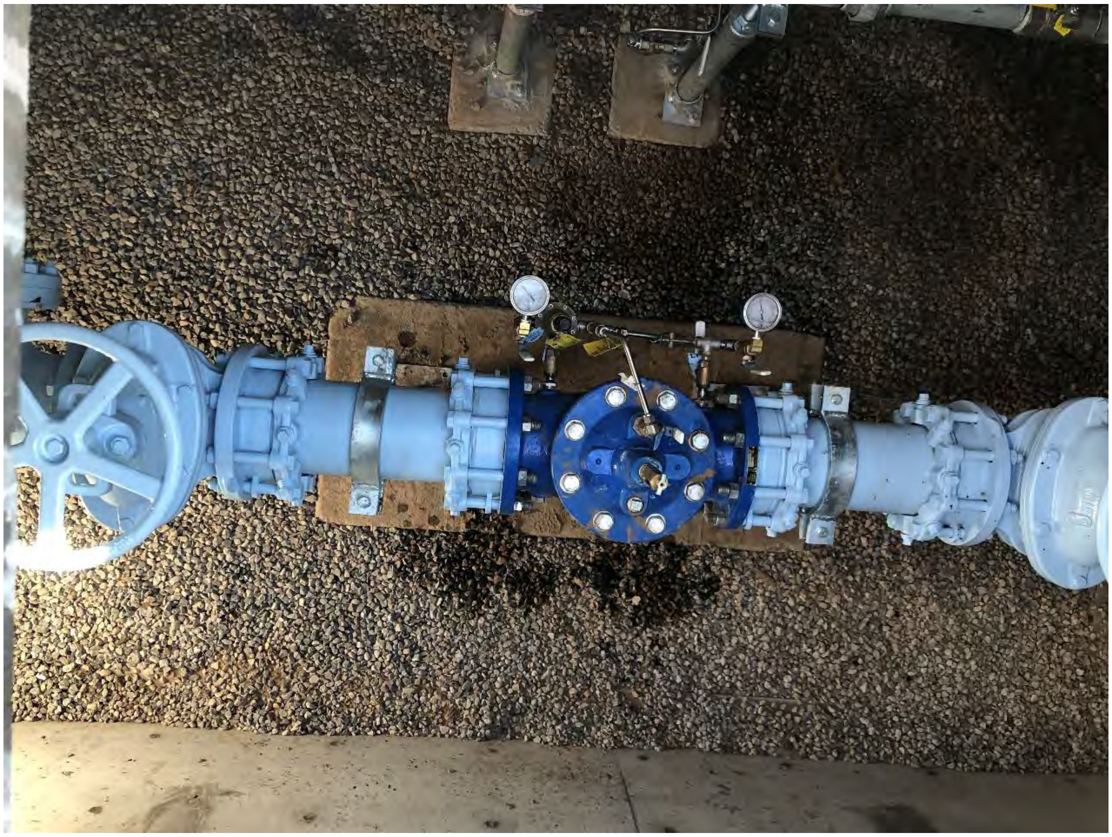
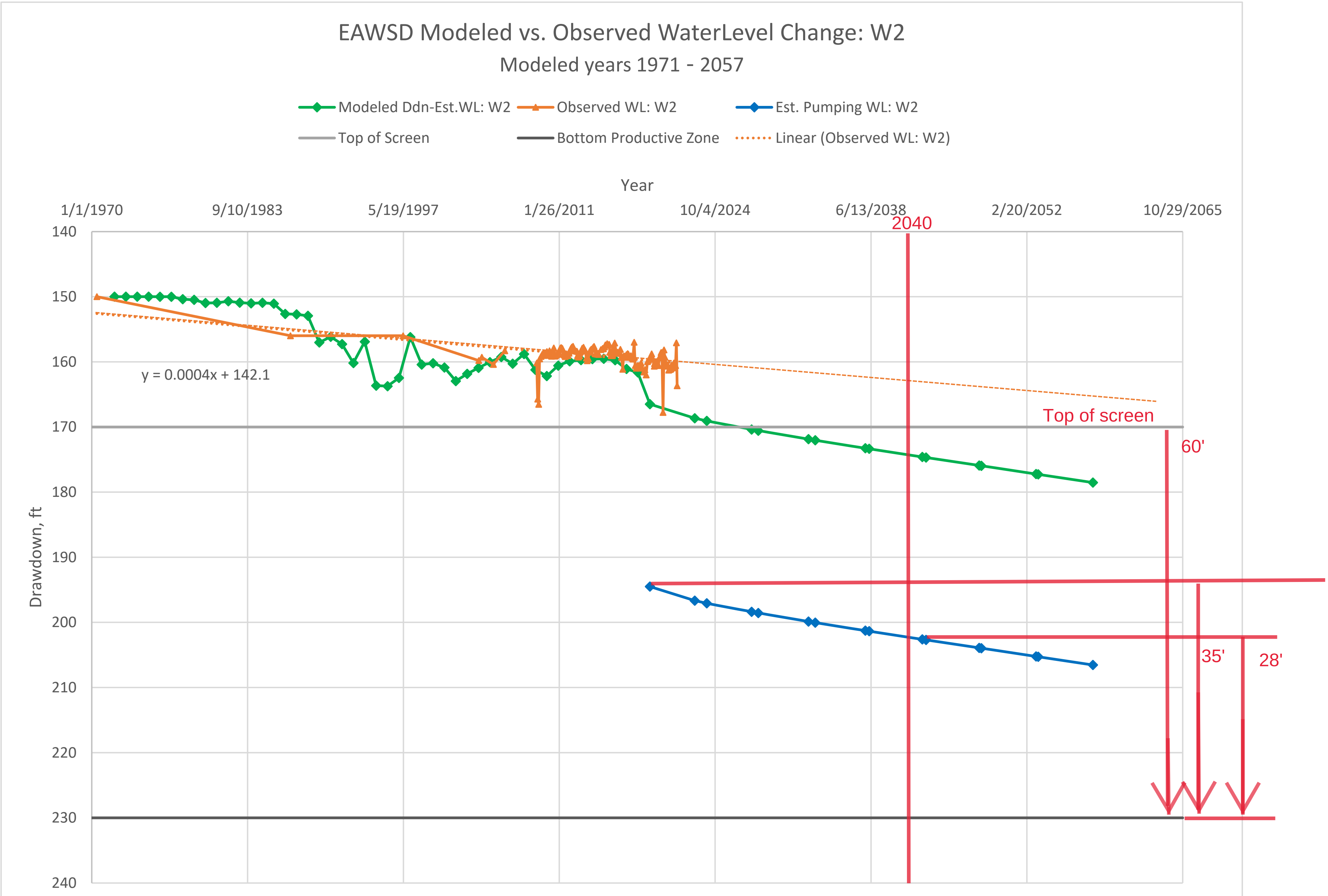


Figure D16. Typical Pressure Reducing Valve

Figure D17. PRV 23

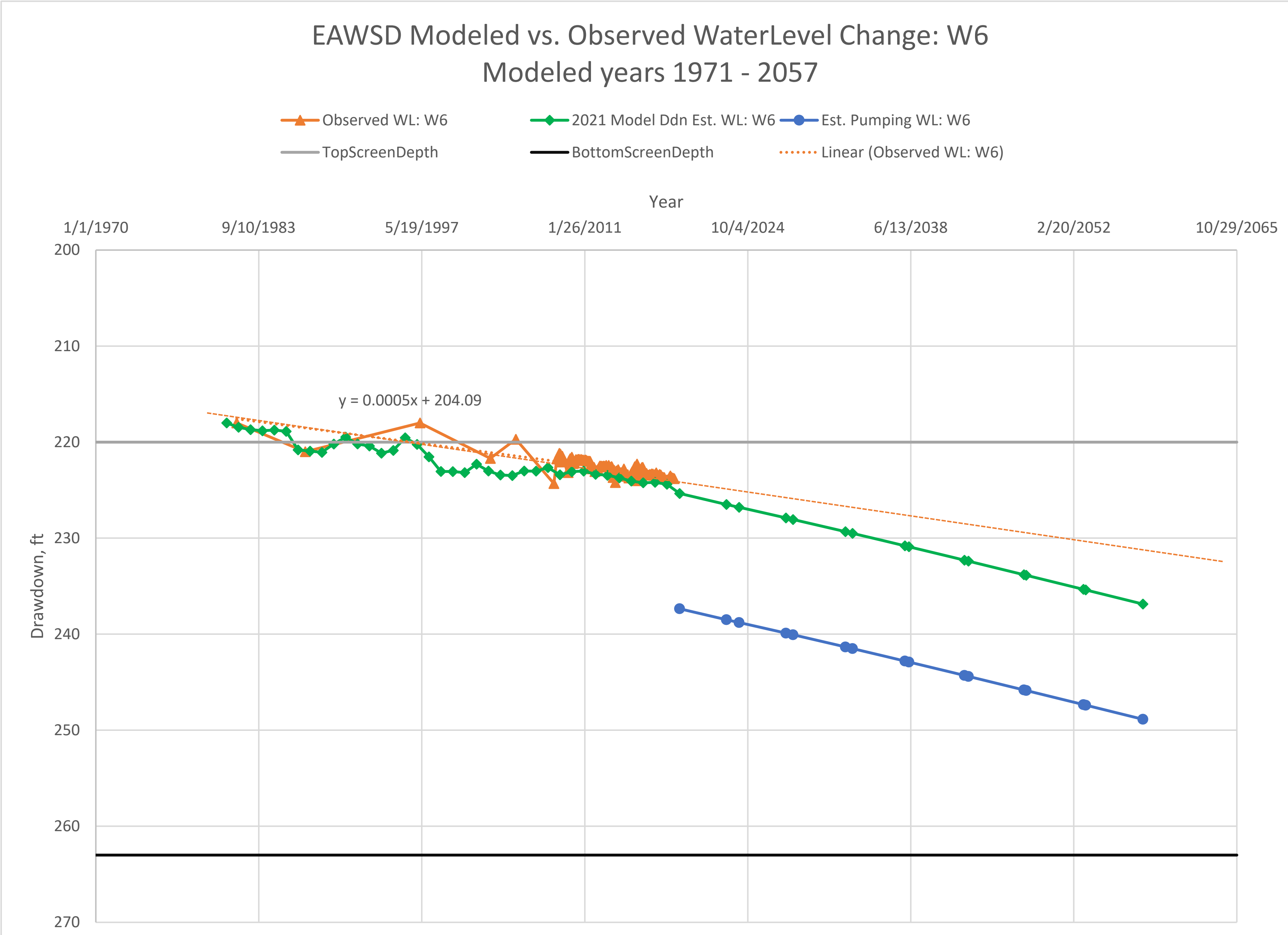
APPENDIX E:

WELL CAPACITY DECLINE PROJECTIONS

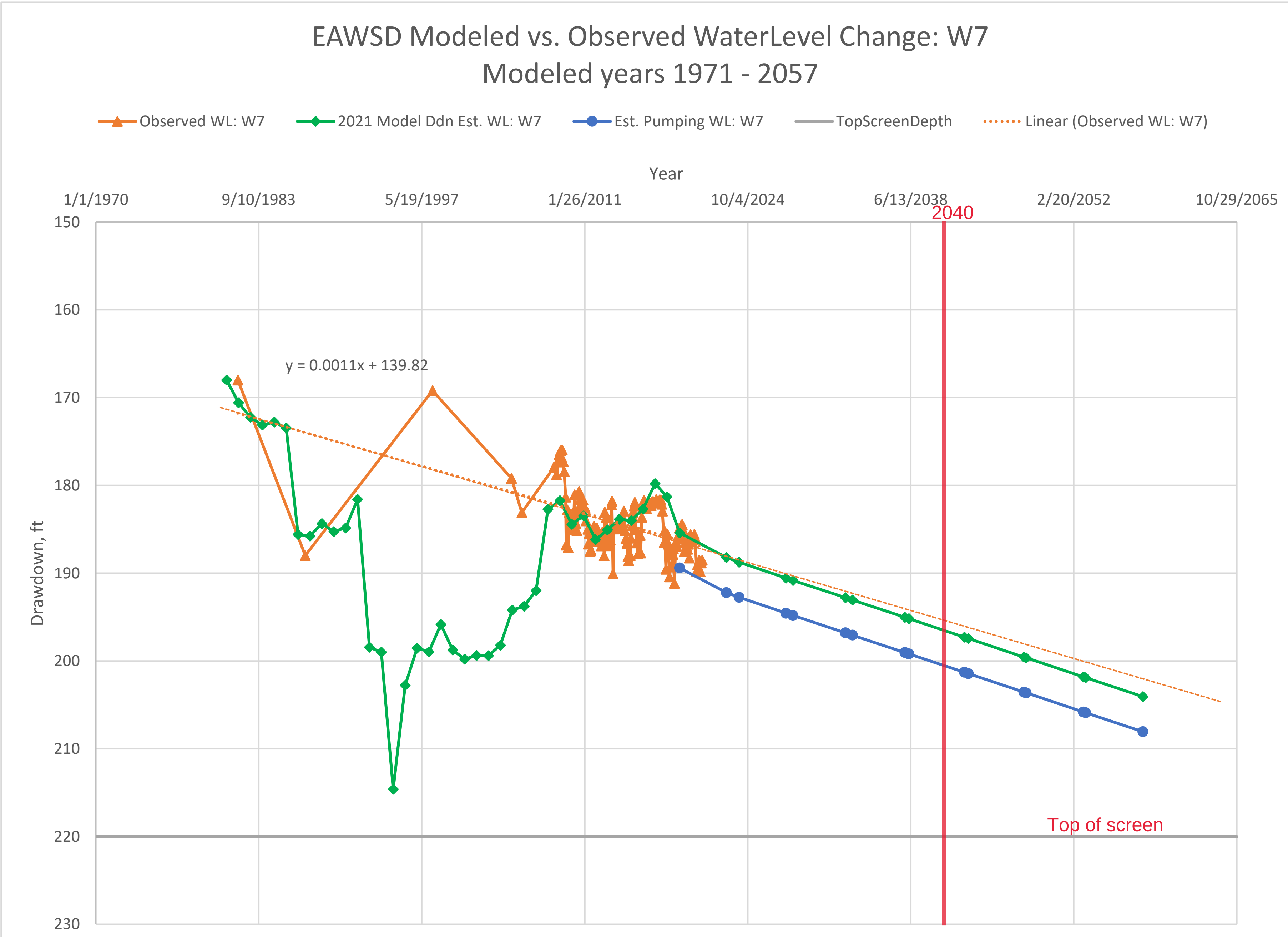


Current Available screen at PWL= 35'
Future Available screen at PWL= 28'

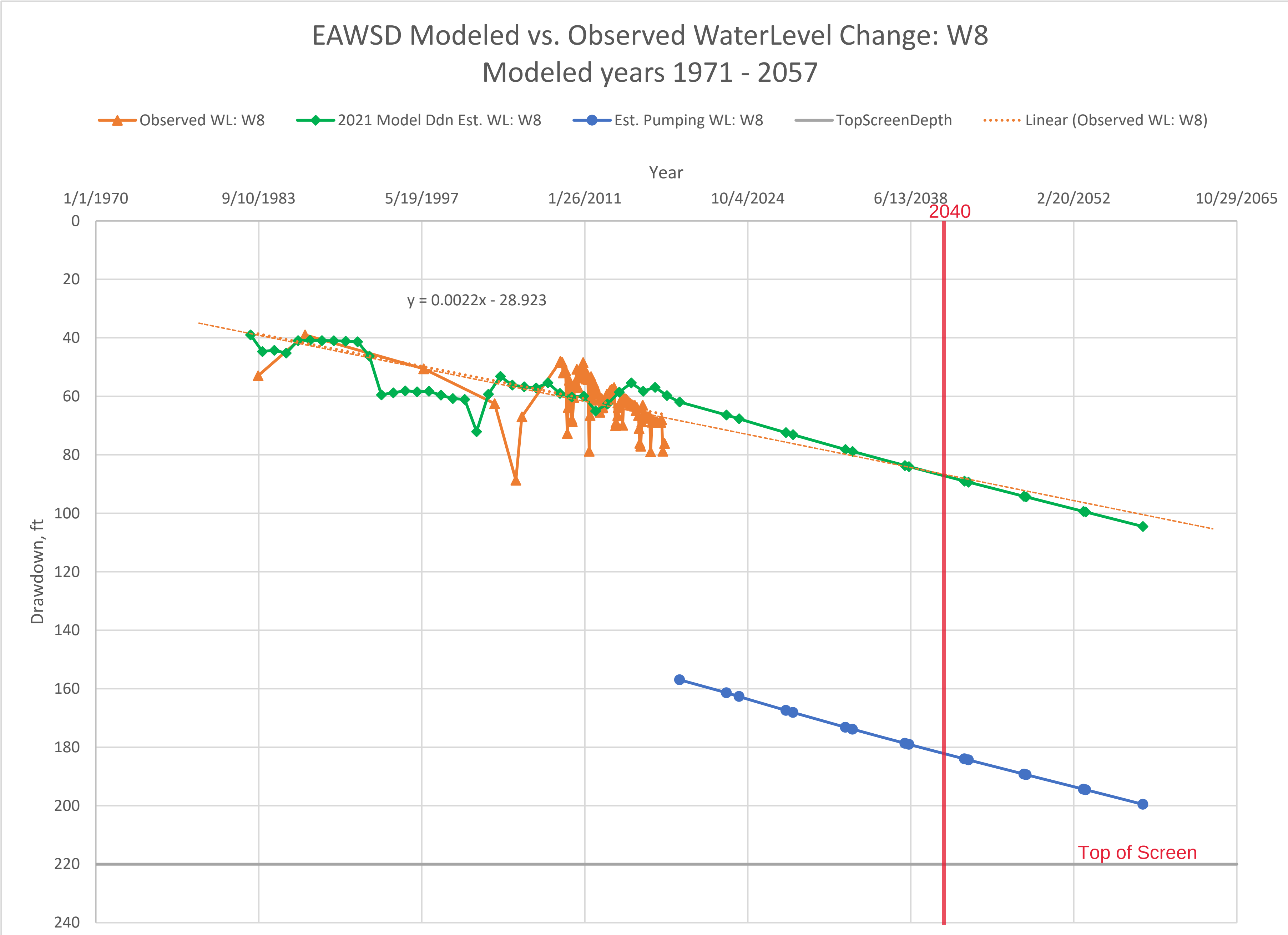
28/35 = 80%



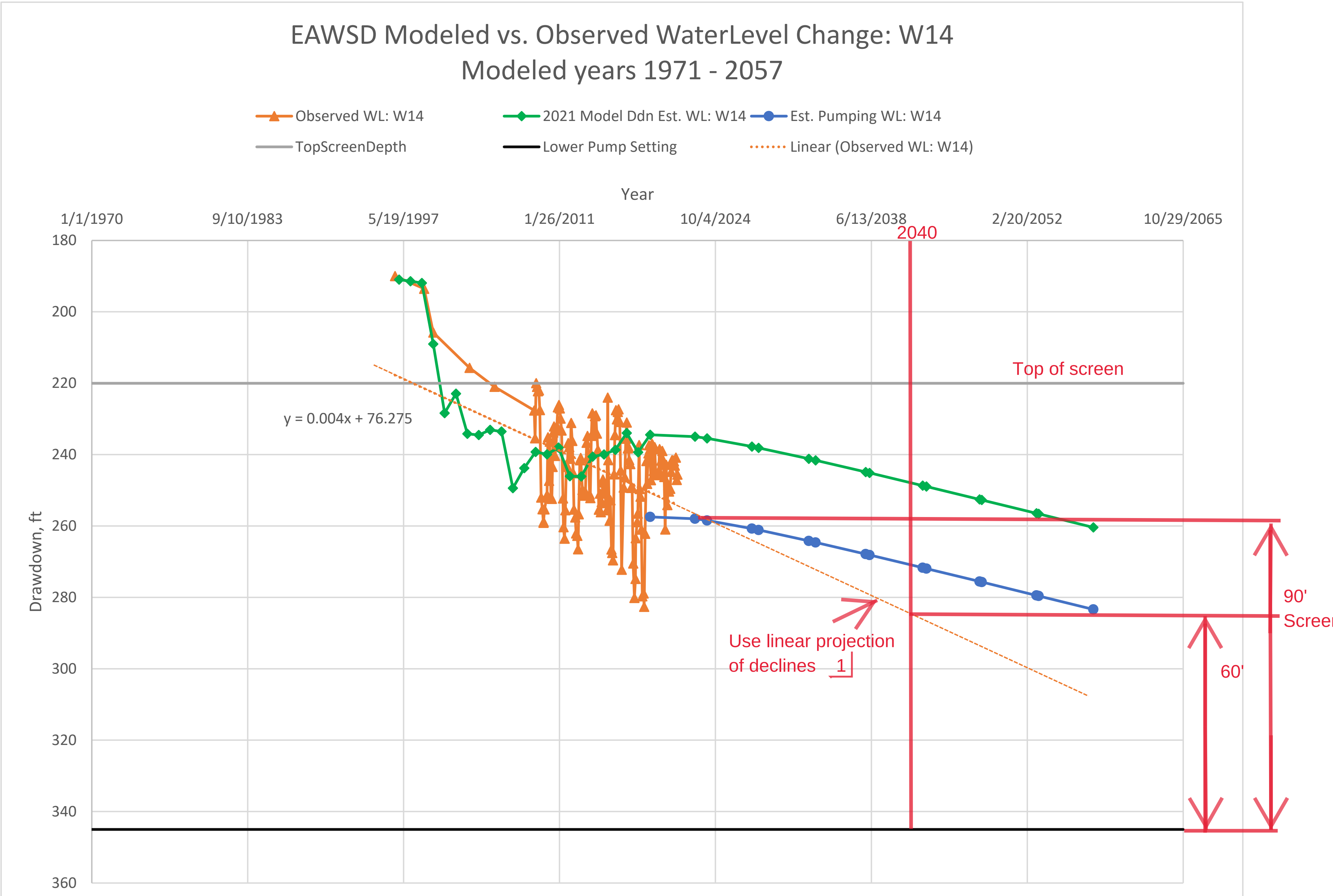
EAWSD Modeled vs. Observed WaterLevel Change: W6
Modeled years 1971 - 2057
Observed WL: W6
2021 Model Ddn Est. WL: W6
Est. Pumping WL: W6
TopScreenDepth
BottomScreenDepth
Linear (Observed WL: W6)
Year
1/1/1970
9/10/1983
5/19/1997
1/26/2011
10/4/2024
6/13/2038
2/20/2052
10/29/2065
200
210
220
230
240
250
260
270
Drawdown, ft
y = 0.0005x + 204.09



No change in capacity



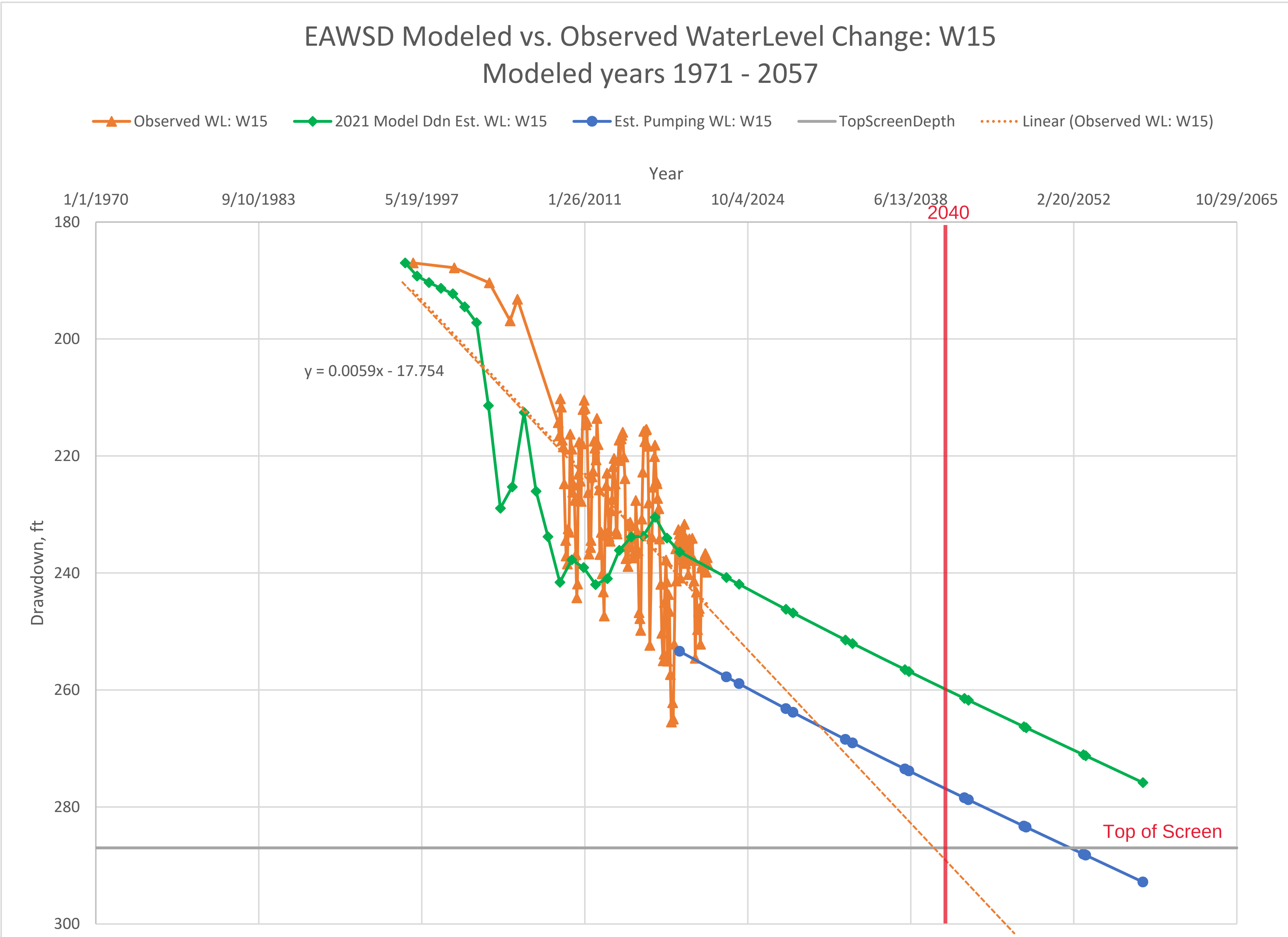
No change in capacity



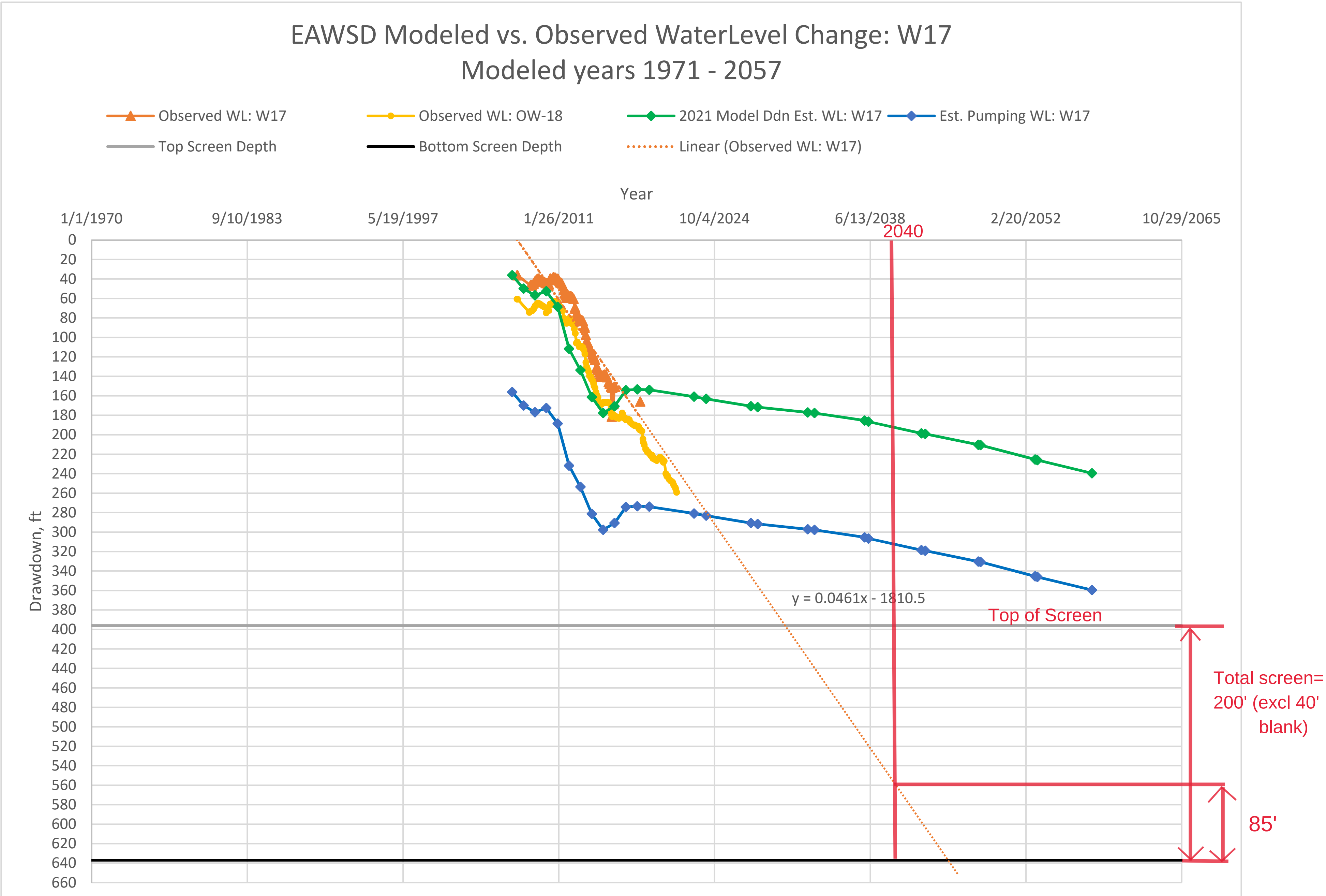
1 GGI says model underestimates
draw down for fractured systems

Current screen available at PWC= 90'
Future screen available at PWC = 60'

60/90 = 67%

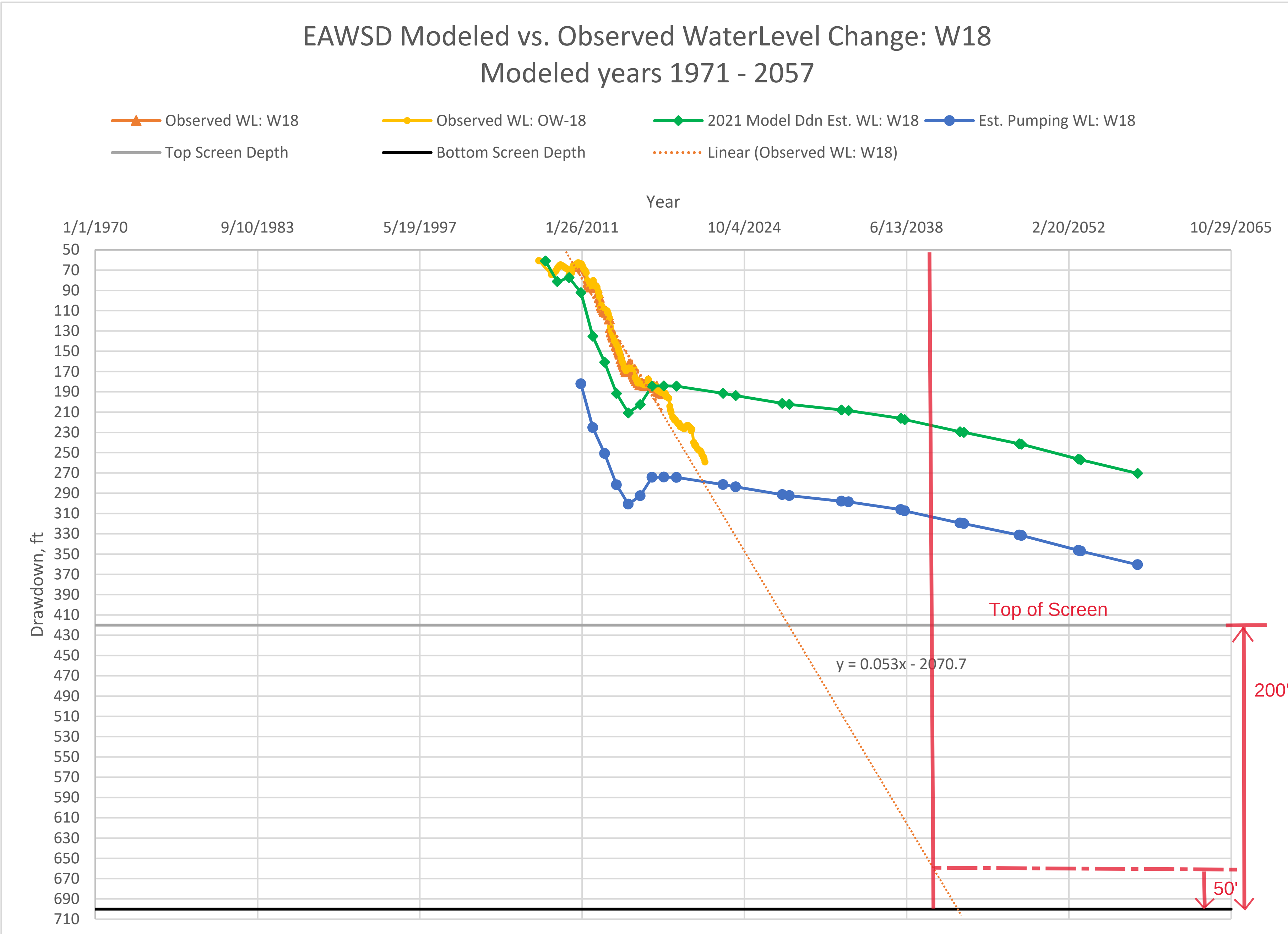

EAWSD Modeled vs. Observed WaterLevel Change: W15
Modeled years 1971 - 2057
Observed WL: W15
2021 Model Ddn Est. WL: W15
Est. Pumping WL: W15
TopScreenDepth
Linear (Observed WL: W15)
Year
1/1/1970
9/10/1983
5/19/1997
1/26/2011
10/4/2024
6/13/2038
2/20/2052
10/29/2065
2040
180
200
220
240
260
280
300
Drawdown, ft
y = 0.0059x - 17.754
Top of Screen

No change



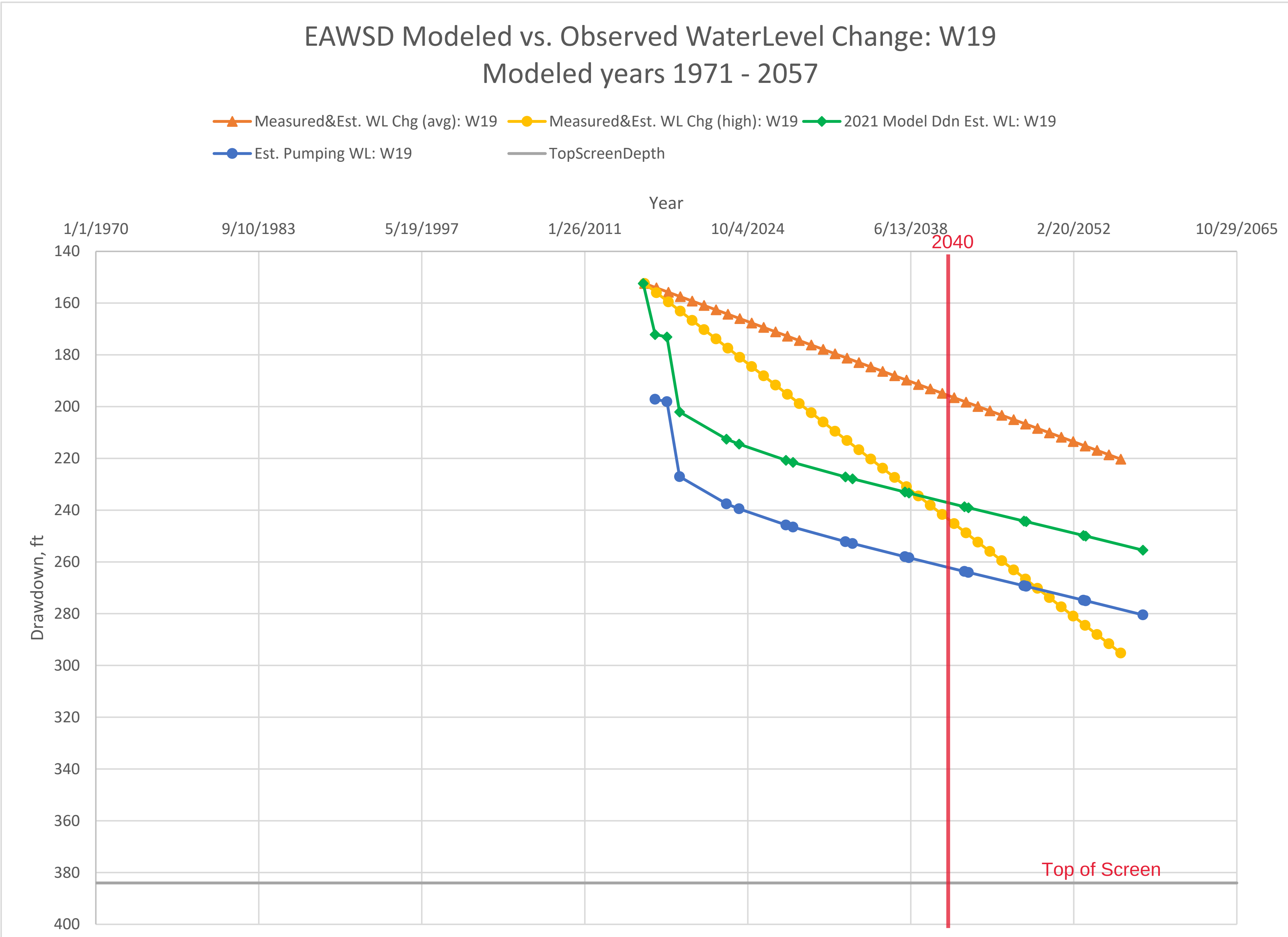
Current screen at PWL = 200'
Future screen available at PWL = 85'

85/200= 43 % capacity



Current available screen at PWL = 200'
Future available screen at PWL= 50'

50/200= 25% capacity



EAWSD Modeled vs. Observed WaterLevel Change: W19
Modeled years 1971 - 2057
Measured&Est. WL Chg (avg): W19
Measured&Est. WL Chg (high): W19
2021 Model Ddn Est. WL: W19
Est. Pumping WL: W19
TopScreenDepth
Year
1/1/1970
9/10/1983
5/19/1997
1/26/2011
10/4/2024
6/13/2038
2/20/2052
10/29/2065
2040
Drawdown, ft
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Top of Screen

No change

APPENDIX F:

WATER QUALITY RECORDS

(Appendix F will be included in the Final Draft for Agency Review.)

Eldorado Area Water and Sanitation District
2021 Water Quality Report
for water treated in 2020

Este informe contiene información muy importante sobre la calidad de su agua potable. Por favor lea este informe o comuníquese con alguien que pueda traducir la información.

Your drinking water meets state and federal regulations

Last year, (2020) EAWSD conducted 638 tests for over 75 drinking water contaminants. This report presents a snapshot of the quality of the water that was provided in 2020. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) standards. EAWSD is committed to providing you with this information because we want you to be informed about your drinking water quality. For more information about your water, call (505) 466-1085 to speak with a member of the EAWSD operations staff.

Special population advisory

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

Cryptosporidium and *Giardia,* two organisms commonly linked to water-borne illness, are found primarily in surface water(SW). EAWSD is an all groundwater system. Wells in the EAWSD system are generally well constructed and maintained. The construction of the wells along with the area geology, protects the groundwater from SW contamination.

Drinking water sources

Your drinking water comes from groundwater in the Rio Grande basin. A network of local production wells pumps water from underground aquifers. The water is disinfected and either distributed directly to the customer or pumped to storage tanks from which the water is sent through the distribution system to you. Source water assessment information may be obtained from the New Mexico Environment Department by calling (505) 827-7536 or (505) 476-8620

Public participation opportunities

The EAWSD Board of Directors schedules public meetings twice a month at which public attendance and participation is welcome and encouraged. EAWSD provides information and communication to customers through its website, monthly newsletter, and postings on community bulletin boards, email communications and direct mailings, as needed. Customers are also invited to call or visit the EAWSD office with questions or to obtain information about the water system.

Telephone: (505) 466-1085
Address: 2 North Chamisa Drive
Website: http://www.EAWSD.org

Contaminants in water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants,* such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- *Pesticides & herbicides,* which may come from a variety of sources such as agriculture and residential use.
- *Radioactive contaminants,* which are naturally occurring.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and also can come from gas stations, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Lead-Specific Information

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The EAWSD is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water is available from the Safe Drinking Water Hotline at (800) 426-4791 or at http://www.epa.gov/safewater/lead.

Additional Information for Arsenic

Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

TERMS AND ABBREVIATIONS

Term & Abbreviations	
µg/L: micrograms per liter, or parts per billion (ppb)	mg/L: milligrams per liter, or parts per million (ppm)
ppm: parts per million, or milligrams per liter (mg/L)	ppb: parts per billion, or micrograms per liter (µg/L)
ppt: parts per trillion or nanogram per liter (ng/L)	pCi/L: picocuries per liter (a measure of radioactivity)
NA: Not applicable	ND: Not detected
MCLG - Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.	MCL - Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MRDLG - Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.	MRDL - Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
AL - Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.	RAA - Running Annual Average: Calculated quarterly using monthly average for the last 12 months

DETECTED CONTAMINANTS

The table below lists all of the drinking water contaminants that we detected during the 2020 calendar year of this report. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The data presented in this table are from testing done in 2020 and years prior. The New Mexico Drinking Water Bureau requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. For this reason, some of the data, though representative of the water quality, are more than one year old.

Contaminants	MCLG or MRDLG	MCL or MRDL	Detected in your water	Range		Sample Date	Violation	Typical Source
				Low	High			
Disinfectants & Disinfectant By-Products (There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
TTHMs [Total Trihalomethanes] (ppb)	NA	80	4.9	2.2	4.9	2020	No	By-product of drinking water disinfection
Haloacetic Acids (HAA5) (ppb)	NA	60	1.1	ND	1.1	2020	No	By-product of drinking water chlorination
Chlorine (as Cl2) (ppm)	4	4	0.95 (0.45 RAA)	ND	0.95	2020	No	Water additive used to control microbes
Inorganic Contaminants								
Arsenic (ppb)	0	10	3.1	ND	3.1	2020	No	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production waste
Barium (ppm)	2	2	0.2	0.08	0.2	2020	No	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Fluoride (ppm)	4	4	0.9	0.4	0.9	2020	No	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories. *(EAWSD does not add fluoride to its drinking water)*
Nitrate [measured as Nitrogen] (ppm)	10	10	3.2	ND	3.2	2020	No	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium (ppb)	50	50	2.6	ND	2.6	2020	No	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines

Zinc (ppm)	NA	5	0.06	ND	0.06	2020	No	Runoff/leaching from natural deposits; industrial wastes.
Sodium (optional) (ppm)	NA	NA	27	14	27	2020	No	Erosion of natural deposits; Leaching
Radioactive Contaminants								
Radium (combined 226/228) (pCi/L)	0	5	2.5	0.8	2.5	2020	No	Erosion of natural deposits
Uranium (combined) (µg/L)	0	30	6	3	6	2020	No	Erosion of natural deposits
Gross Alpha (pCi/L)	0	15	4.8	2.5	4.8	2020	No	Erosion of natural deposits
Beta/Photon Emitters (pCi/L)	0	50	5.3	2.6	5.3	2020	No	Decay of natural and manmade deposits

Contaminants	MCLG	AL	90^{th} Percentile	Sample Date	# Samples Exceeding AL	Exceeds AL	Typical Source
Lead & Copper							
Copper - action level at consumer taps (ppm)	1.3	1.3	0.25	2018	0	No	Corrosion of household plumbing systems; erosion of natural deposits
Lead - action level at consumer taps (ppb)	0	15	3.9	2018	1	No	Corrosion of household plumbing systems; erosion of natural deposits

The following regulated contaminants were monitored for but not detected in your water:

Inorganic Contaminants (IOCs)		
Antimony	Cadmium	Mercury
Asbestos	Chromium	Nickel
Beryllium	Cyanide	Thallium

Volatile Organic Contaminants (VOCs)		
1,1- dichloroethylene	Carbon tetrachloride	Styrene
1,1,1- trichloroethane	Chlorobenzene	Tetrachloroethylene
1,1,2- trichloroethane	cis-1,2 dichloroethylene	Toluene
1,2-dichloroethane	Dichloromethane	trans-1,2 dichloroethylene
1,2-dichloropropane	Ethylbenzene	Trichloroethylene
1,2,4-trichlorobenzene	o-dichlorobenzene	Vinyl Chloride
Benzene	p-dichlorobenzene	Xylene (Total)

Synthetic Organic Contaminants (SOCs)		
1,2-Dibromo-3-chloropropane	di(2-ethylhexly)phthalate	Hexachlorocyclopentadiene
2,4-D	Dinoseb	Lasso
2,4,5-TP	Diquat	Methoxychlor
Atrazine	Endothall	Oxamyl
Benzo[a]pyrene	Endrin	Pentachlorophenol
BHC-Gamma	Ethylene dibromide	Picloram
Carbofuran	Glyphosate	Polychlorinated byphenyls
Chlordane	Heptachlor	Simazine
Dalapon	Heptachlor epoxide	Toxaphene
di(2-ethylhexyl)adipate	Hexachlorobenzene	Hexachlorocyclopentadiene

Monitoring and Reporting Violations

There were no violations in 2020.

WATER CONSERVATION TIPS

Did you know that the average U.S. household uses approximately 400 gallons of water per day or 100 gallons per person per day? Luckily, there are many low-cost and no-cost ways to conserve water. Small changes can make a big difference – try one today and soon it will become second nature.

- Take short showers - a 5-minute shower uses 4 to 5 gallons of water compared to up to 50 gallons for a bath.
- Shut off water while brushing your teeth, washing your hair and shaving and save up to 500 gallons a month.
- Use a water-efficient showerhead. They're inexpensive, easy to install, and can save you up to 750 gallons a month.
- Run your clothes washer and dishwasher only when they are full. You can save up to 1,000 gallons a month.
- Water plants only when necessary.
- Fix leaky toilets and faucets. Faucet washers are inexpensive and take only a few minutes to replace. To check your toilet for a leak, place a few drops of food coloring in the tank and wait. If it seeps into the toilet bowl without flushing, you have a leak. Fixing it or replacing it with a new, more efficient model can save up to 1,000 gallons a month.
- Adjust sprinklers so only your lawn is watered. Apply water only as fast as the soil can absorb it and during the cooler parts of the day to reduce evaporation.
- Teach your kids about water conservation to ensure a future generation that uses water wisely. Make it a family effort to reduce next month's water bill!
- Visit www.epa.gov/watersense for more information.

SOURCE WATER PROTECTION TIPS

Protection of drinking water is everyone's responsibility. You can help protect your community's drinking water source in several ways:

- Eliminate excess use of lawn and garden fertilizers and pesticides – they contain hazardous chemicals that can reach your drinking water source.
- Pick up after your pets.
- If you have your own septic system, properly maintain your system to reduce leaching to water sources.
- Dispose of chemicals properly; take used motor oil to a recycling center.
- Volunteer in your community. Find a watershed or wellhead protection organization in your community and volunteer to help. If there are no active groups, consider starting one. Use EPA's Adopt Your Watershed to locate groups in your community, or visit the Watershed Information Network's *How to Start a Watershed Team*.

This water quality report was prepared by Jacobs Engineering Group, as a service to the Eldorado Area Water and Sanitation District.

Eldorado Area Water and Sanitation District
Water Quality Report for Water Treated in 2021

Este informe contiene información muy importante sobre la calidad de su agua potable. Por favor lea este informe o comuníquese con alguien que pueda traducir la información.

Your drinking water meets state and federal regulations

Last year (2021) EAWSD conducted 122 tests for over 8 drinking water contaminants. This report presents a snapshot of the quality of the water that was provided in 2021. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) standards. EAWSD is committed to providing you with this information because we want you to be informed about your drinking water quality. For more information about your water, call (505) 466-1085 to speak with a member of the EAWSD operations staff.

Special population advisory

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

Cryptosporidium and *Giardia,* two organisms commonly linked to water-borne illness, are found primarily in surface water (SW). EAWSD is an all groundwater system. Wells in the EAWSD system are generally well constructed and maintained. The construction of the wells along with the area geology, protects the groundwater from SW contamination.

Drinking water sources

Your drinking water comes from groundwater in the Rio Grande basin. A network of local production wells pumps water from underground aquifers. The water is disinfected and either distributed directly to the customer or pumped to storage tanks from which the water is sent through the distribution system to you. Source water assessment information may be obtained from the New Mexico Environment Department by calling (505) 827-7536 or (505) 476-8620

Public participation opportunities

The EAWSD Board of Directors schedules public meetings twice a month at which public attendance and participation is welcome and encouraged. EAWSD provides information and communication to customers through its website, monthly newsletter, and postings on community bulletin boards, email communications and direct mailings, as needed. Customers are also invited to call or visit the EAWSD office with questions or to obtain information about the water system.

Telephone: (505) 466-1085
Address: 2 North Chamisa Road
Website: http://www.EAWSD.org

Contaminants in water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants,* such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- *Pesticides & herbicides,* which may come from a variety of sources such as agriculture and residential use.
- *Radioactive contaminants,* which are naturally occurring.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and also can come from gas stations, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Lead-Specific Information

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The EAWSD is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water is available from the Safe Drinking Water Hotline at (800) 426-4791 or at http://www.epa.gov/safewater/lead.

Additional Information for Arsenic

Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system and may have an increased risk of getting cancer.

TERMS AND ABBREVIATIONS

Term & Abbreviations	
µg/L: micrograms per liter, or parts per billion (ppb)	mg/L: milligrams per liter, or parts per million (ppm)
ppm: parts per million, or milligrams per liter (mg/L)	ppb: parts per billion, or micrograms per liter (µg/L)
ppt: parts per trillion or nanogram per liter (ng/L)	pCi/L: picocuries per liter (a measure of radioactivity)
NA: Not applicable	ND: Not detected
MCLG - Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.	MCL - Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MRDLG - Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.	MRDL - Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
AL - Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.	RAA - Running Annual Average: Calculated quarterly using monthly average for the last 12 months

DETECTED CONTAMINANTS

The table below lists all of the drinking water contaminants that we detected during the 2021 calendar year of this report. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The data presented in this table are from testing done in 2021 and years prior. The New Mexico Drinking Water Bureau requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. For this reason, some of the data, though representative of the water quality, are more than one year old.

Contaminants	MCLG or MRDLG	MCL or MRDL	Detected in your water	Range		Sample Date	Violation	Typical Source
				Low	High			
Disinfectants & Disinfectant By-Products (There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
TTHMs [Total Trihalomethanes] (ppb)	NA	80	7.6	3.6	7.6	2021	No	By-product of drinking water disinfection
Haloacetic Acids (HAA5) (ppb)	NA	60	1.9	1.2	1.9	2021	No	By-product of drinking water chlorination
Chlorine (as Cl2) (ppm)	4	4	1.17 (0.45 RAA)	0.03	1.17	2021	No	Water additive used to control microbes
Inorganic Contaminants								
Arsenic (ppb)	0	10	3.1	ND	3.1	2020	No	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production waste
Barium (ppm)	2	2	0.2	0.08	0.2	2020	No	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Fluoride (ppm)	4	4	0.9	0.4	0.9	2020	No	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories. *(EAWSD does not add fluoride to its drinking water)*
Nitrate [measured as Nitrogen] (ppm)	10	10	3.8	2.0	3.8	2021	No	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium (ppb)	50	50	2.6	ND	2.6	2020	No	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines

Zinc (ppm)	NA	5	0.06	ND	0.06	2020	No	Runoff/leaching from natural deposits; industrial wastes.
Sodium (optional) (ppm)	NA	NA	27	14	27	2020	No	Erosion of natural deposits; Leaching
Radioactive Contaminants								
Radium (combined 226/228) (pCi/L)	0	5	2.5	0.8	2.5	2020	No	Erosion of natural deposits
Uranium (combined) (μg/L)	0	30	6	3	6	2020	No	Erosion of natural deposits
Gross Alpha (pCi/L)	0	15	4.8	2.5	4.8	2020	No	Erosion of natural deposits
Beta/Photon Emitters (pCi/L)	0	50	5.3	2.6	5.3	2020	No	Decay of natural and manmade deposits

Contaminants	MCLG	AL	90th Percentile	Sample Date	# Samples Exceeding AL	Exceeds AL	Typical Source
Lead & Copper							
Copper - action level at consumer taps (ppm)	1.3	1.3	0.15	2021	0	No	Corrosion of household plumbing systems; erosion of natural deposits
Lead - action level at consumer taps (ppb)	0	15	1.1	2021	0	No	Corrosion of household plumbing systems; erosion of natural deposits

The following regulated contaminants were monitored for but not detected in your water:

Inorganic Contaminants (IOCs)		
Antimony	Cadmium	Mercury
Asbestos	Chromium	Nickel
Beryllium	Cyanide	Thallium

Volatile Organic Contaminants (VOCs)		
1,1- dichloroethylene	Carbon tetrachloride	Styrene
1,1,1- trichloroethane	Chlorobenzene	Tetrachloroethylene
1,1,2- trichloroethane	cis-1,2 dichloroethylene	Toluene
1,2-dichloroethane	Dichloromethane	trans-1,2 dichloroethylene
1,2-dichloropropane	Ethylbenzene	Trichloroethylene
1,2,4-trichlorobenzene	o-dichlorobenzene	Vinyl Chloride
Benzene	p-dichlorobenzene	Xylene (Total)

Synthetic Organic Contaminants (SOCs)		
1,2-Dibromo-3-chloropropane	di(2-ethylhexly)phthalate	Hexachlorocyclopentadiene
2,4-D	Dinoseb	Lasso
2,4,5-TP	Diquat	Methoxychlor
Atrazine	Endothall	Oxamyl
Benzo[a]pyrene	Endrin	Pentachlorophenol
BHC-Gamma	Ethylene dibromide	Picloram
Carbofuran	Glyphosate	Polychlorinated byphenyls
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Dalapon	Heptachlor epoxide	Toxaphene
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This water quality report was prepared by Jacobs Engineering Group, as a service to the Eldorado Area Water and Sanitation District.

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

June 07, 2016

Meghan Hodgins
Glorieta GeoScience
P.O. Box 5727
Santa Fe, NM 87502
TEL: (505) 983-5446
FAX (505) 983-6482

RE: EAWSD Well 19 OrderNo.: 1605C13

Dear Meghan Hodgins:

Hall Environmental Analysis Laboratory received 2 sample(s) on 5/25/2016 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Glorieta GeoScience | **Client Sample ID:** EAWSD-W19-052416
Project: EAWSD Well 19 | **Collection Date:** 5/24/2016 3:20:00 PM
Lab ID: 1605C13-001 | **Matrix:** AQUEOUS | **Received Date:** 5/25/2016 2:30:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS						Analyst:	**JLF**
Antimony	0.0098	0.0010	*	mg/L	1	6/6/2016 4:46:39 PM	B34718
EPA METHOD 6010B: DISSOLVED METALS						Analyst:	**MED**
Antimony	ND	0.050		mg/L	1	6/1/2016 8:22:04 AM	A34587
Iron	0.32	0.020		mg/L	1	6/1/2016 8:22:04 AM	A34587
EPA METHOD 8260B: VOLATILES						Analyst:	**AG**
Benzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Toluene	1.9	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Ethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Naphthalene	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1-Methylnaphthalene	ND	4.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Methylnaphthalene	ND	4.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Acetone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromodichloromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromoform	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromomethane	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Butanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Carbon disulfide	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Carbon Tetrachloride	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloroethane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloroform	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloromethane	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Chlorotoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Chlorotoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
cis-1,2-DCE	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Dibromochloromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Dibromomethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,4-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	D	Sample Diluted Due to Matrix	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
	ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Glorieta GeoScience		**Client Sample ID:**	EAWSD-W19-052416
Project: EAWSD Well 19		**Collection Date:**	5/24/2016 3:20:00 PM
Lab ID: 1605C13-001	**Matrix:** AQUEOUS	**Received Date:**	5/25/2016 2:30:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: **AG**
Dichlorodifluoromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloroethene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichloropropane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3-Dichloropropane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2,2-Dichloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Hexachlorobutadiene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Hexanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Isopropylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Isopropyltoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Methyl-2-pentanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Methylene Chloride	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
n-Butylbenzene	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
n-Propylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
sec-Butylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Styrene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
tert-Butylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
trans-1,2-DCE	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,1-Trichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,2-Trichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Trichloroethene (TCE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Trichlorofluoromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,3-Trichloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Vinyl chloride	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Xylenes, Total	ND	1.5		µg/L	1	6/1/2016 7:29:45 PM	B34608
Surr: 1,2-Dichloroethane-d4	99.6	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: 4-Bromofluorobenzene	99.3	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: Dibromofluoromethane	90.4	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: Toluene-d8	103	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608

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Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: GGI   Work Order Number: 1605C13   RcptNo: 1

Received by/date: RM 05/25/16

Logged By: Ashley Gallegos 5/25/2016 2:30:00 PM AG

Completed By: Ashley Gallegos 5/26/2016 10:14:13 AM AG

Reviewed By: JA 05/26/16

Chain of Custody

1. Custody seals intact on sample bottles? Yes [ ] No [ ] Not Present [x]
2. Is Chain of Custody complete? Yes [x] No [ ] Not Present [ ]
3. How was the sample delivered? Courier

Log In

4. Was an attempt made to cool the samples? Yes [x] No [ ] NA [ ]
5. Were all samples received at a temperature of >0° C to 6.0°C Yes [x] No [ ] NA [ ]
6. Sample(s) in proper container(s)? Yes [x] No [ ]
7. Sufficient sample volume for indicated test(s)? Yes [x] No [ ]
8. Are samples (except VOA and ONG) properly preserved? Yes [x] No [ ]
9. Was preservative added to bottles? Yes [ ] No [x] NA [ ]
10. VOA vials have zero headspace? Yes [x] No [ ] No VOA Vials [ ]
11. Were any sample containers received broken? Yes [ ] No [x]
12. Does paperwork match bottle labels? Yes [x] No [ ]
    (Note discrepancies on chain of custody)
13. Are matrices correctly identified on Chain of Custody? Yes [x] No [ ]
14. Is it clear what analyses were requested? Yes [x] No [ ]
15. Were all holding times able to be met? Yes [x] No [ ]
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 1
(<2 or >12 unless noted)
Adjusted? NO
Checked by: AJ

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes [ ] No [ ] NA [x]

Person Notified: Date:
By Whom: Via: [ ] eMail [ ] Phone [ ] Fax [ ] In Person
Regarding:
Client Instructions:

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.0	Good	Yes			

Chain-of-Custody Record

ient: Glorieta Geoscience Inc

ailing Address: ~~1723~~ PO Box 5727

Santa Fe NM 87505

none #: 505 983 5446

nail or Fax#: Hodgins@glorietageo.com

VQC Package:

☐ Standard ☐ Level 4 (Full Validation)

ccreditation

NELAP ☐ Other ____________

EDD (Type) ____________

Turn-Around Time:

☒ Standard ☐ Rush ____________

Project Name: EAWSD Well 19

Project #:

Project Manager: Meghan Hodgins

Sampler: MH

On Ice: ☒ Yes ☐ No

Sample Temperature: 2.0

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1605C13	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Dissolved Metals: Sb + Fe				Air Bubbles (Y or N)
5/24/16	1520	H_2O	EAWSD-W19-052416	3 VOA, 100ml Plastic	HNO_3	-001										X		X				
			Trip blank			-002																

Date:	Time:	Relinquished by:	Received by:	Date	Time
5/25/16		M Hodgins (Insw Delivery)	[signature]	05/25/16	1430
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

October 21, 2014

Bill Whaley
HydroGeologic Services, Inc.
P. O. Box 94716
Albuquerque, NM 87199-4716
TEL: (505) 856-6498
FAX (505) 856-6501

RE: Eldorado J & H OrderNo.: 1409C00

Dear Bill Whaley:

Hall Environmental Analysis Laboratory received 2 sample(s) on 9/24/2014 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8011/504.1: EDB							Analyst: **LRW**
1,2-Dibromo-3-chloropropane	ND	0.10		µg/L	1	9/25/2014 1:38:51 PM	15509
1,2-Dibromoethane	ND	0.010		µg/L	1	9/25/2014 1:38:51 PM	15509
EPA METHOD 8015D: DIESEL RANGE							Analyst: **BCN**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	9/26/2014 11:35:24 PM	15448
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	9/26/2014 11:35:24 PM	15448
Surr: DNOP	114	59-141		%REC	1	9/26/2014 11:35:24 PM	15448
EPA METHOD 8015D: GASOLINE RANGE							Analyst: **NSB**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	9/25/2014 11:34:12 PM	R21468
Surr: BFB	91.1	70.9-130		%REC	1	9/25/2014 11:34:12 PM	R21468
EPA METHOD 300.0: ANIONS							Analyst: **JRR**
Fluoride	0.72	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Chloride	15	0.50		mg/L	1	9/25/2014 2:12:38 AM	R21451
Nitrogen, Nitrite (As N)	ND	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Nitrogen, Nitrate (As N)	2.0	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Sulfate	25	0.50		mg/L	1	9/25/2014 2:12:38 AM	R21451
EPA METHOD 200.7: DISSOLVED METALS							Analyst: **JLF**
Aluminum	ND	0.020		mg/L	1	10/3/2014 12:20:11 PM	R21641
Barium	0.13	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Beryllium	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Cadmium	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Calcium	47	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Iron	0.022	0.020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Magnesium	9.6	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Manganese	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Nickel	ND	0.010		mg/L	1	9/26/2014 3:22:40 PM	R21505
Potassium	2.9	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Silver	ND	0.0050		mg/L	1	9/26/2014 3:22:40 PM	R21505
Sodium	20	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Zinc	ND	0.010		mg/L	1	9/26/2014 3:22:40 PM	R21505
EPA METHOD 200.7: METALS							Analyst: **JLF**
Barium	0.15	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Beryllium	ND	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Cadmium	ND	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Chromium	ND	0.0060		mg/L	1	9/30/2014 5:52:42 PM	R21558
EPA 200.8: DISSOLVED METALS							Analyst: **DBD**
Antimony	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

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E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc.
Project: Eldorado J & H
Lab ID: 1409C00-001 **Matrix:** AQUEOUS

Client Sample ID: Well 2 Replacement
Collection Date: 9/24/2014 11:00:00 AM
Received Date: 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS							Analyst: **DBD**
Arsenic	0.0032	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Copper	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Lead	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Selenium	0.0025	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Thallium	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Uranium	0.0023	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
EPA 200.8: METALS							Analyst: **DBD**
Antimony	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Arsenic	0.0032	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Lead	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Copper	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Selenium	0.0027	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Thallium	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Uranium	0.0023	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
EPA METHOD 245.1: MERCURY							Analyst: **MMD**
Mercury	ND	0.00020		mg/L	1	9/30/2014 1:44:48 PM	15578
SM2340B: HARDNESS							Analyst: **JLF**
Hardness (As CaCO3)	160	6.6		mg/L	1	9/26/2014 11:21:00 AM	R21505
SM 9223B TOTAL COLIFORM							Analyst: **SMS**
Total Coliform	Absent	0		P/A	1	9/25/2014 4:43:00 PM	15493
E. Coli	Absent	0		P/A	1	9/25/2014 4:43:00 PM	15493
PURGEABLE ORGANICS BY EPA 524							Analyst: **cadg**
Benzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Carbon tetrachloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Chlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
cis-1,2-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,4-Dichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichloropropane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Ethylbenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Methylene chloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Styrene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Tetrachloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Toluene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
trans-1,2-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471

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J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
PURGEABLE ORGANICS BY EPA 524						Analyst: **cadg**	
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1,1-Trichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1,2-Trichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Trichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Vinyl chloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Total Xylenes	ND	1.5		µg/L	1	9/25/2014 12:32:50 PM	R21471
Surr: Toluene-d8	84.3	70-130		%REC	1	9/25/2014 12:32:50 PM	R21471
Surr: 4-Bromofluorobenzene	83.4	70-130		%REC	1	9/25/2014 12:32:50 PM	R21471
EPA METHOD 8260B: VOLATILES						Analyst: **KJH**	
Benzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Toluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Ethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Naphthalene	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1-Methylnaphthalene	ND	4.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Methylnaphthalene	ND	4.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Acetone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromodichloromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromoform	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromomethane	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Butanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Carbon disulfide	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Carbon Tetrachloride	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloroethane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloroform	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloromethane	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Chlorotoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Chlorotoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
cis-1,2-DCE	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dibromochloromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dibromomethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **KJH**	
1,2-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,4-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dichlorodifluoromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloroethene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dichloropropane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3-Dichloropropane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2,2-Dichloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Hexachlorobutadiene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Hexanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Isopropylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Isopropyltoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Methyl-2-pentanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Methylene Chloride	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
n-Butylbenzene	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
n-Propylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
sec-Butylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Styrene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
tert-Butylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
trans-1,2-DCE	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,1-Trichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,2-Trichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Trichloroethene (TCE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Trichlorofluoromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,3-Trichloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Vinyl chloride	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Xylenes, Total	ND	1.5		µg/L	1	9/27/2014 1:28:17 AM	R21508
Surr: 1,2-Dichloroethane-d4	89.0	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: 4-Bromofluorobenzene	98.1	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: Dibromofluoromethane	89.0	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: Toluene-d8	89.7	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
	O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
SM2510B: SPECIFIC CONDUCTANCE							Analyst: **JRR**
Conductivity	410	0.010		µmhos/cm	1	9/29/2014 1:54:18 PM	R21535
SM4500-H+B: PH							Analyst: **JRR**
pH	7.96	1.68	H	pH units	1	9/29/2014 1:54:18 PM	R21535
SM2320B: ALKALINITY							Analyst: **JRR**
Bicarbonate (As CaCO3)	150	20		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
Carbonate (As CaCO3)	ND	2.0		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
Total Alkalinity (as CaCO3)	150	20		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
SM2540C MOD: TOTAL DISSOLVED SOLIDS							Analyst: **KS**
Total Dissolved Solids	264	20.0		mg/L	1	9/28/2014 6:40:00 PM	15511
EPA METHOD 180.1: TURBIDITY							Analyst: **KS**
Turbidity	ND	0.50		NTU	1	9/25/2014 11:33:00 PM	R21463

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-001
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001C / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2005	Endrin	ND	ug/L	2	0.02	EPA 505	10/8/2014	MAH	
2010	Lindane	ND	ug/L	0.2	0.02	EPA 505	10/8/2014	MAH	
2015	Methoxychlor	ND	ug/L	40	0.1	EPA 505	10/8/2014	MAH	
2020	Toxaphene	ND	ug/L	3	1	EPA 505	10/8/2014	MAH	
2034	Glyphosate	ND	ug/L	700	10	EPA 547	10/1/2014	JWC	
2065	Heptachlor	ND	ug/L	0.4	0.04	EPA 505	10/8/2014	MAH	
2067	Heptachlor Epoxide	ND	ug/L	0.2	0.02	EPA 505	10/8/2014	MAH	
2383	PCB's	ND	ug/L	0.5	0.01	EPA 505	10/8/2014	MAH	
2959	Chlordane	ND	ug/L	2	0.1	EPA 505	10/8/2014	MAH	
	Unregulated SOC Contaminants								
2356	Aldrin	ND	ug/L		0.2	EPA 505	10/8/2014	MAH	
2070	Dieldrin	ND	ug/L		0.2	EPA 505	10/8/2014	MAH	

Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-002
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001D / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2036	Oxamyl	ND	ug/L	200	4	EPA 531.2	10/7/2014	JWC	
2046	Carbofuran	ND	ug/L	40	2	EPA 531.2	10/7/2014	JWC	
	Unregulated SOC Contaminants								
2047	Aldicarb	ND	ug/L	3	2	EPA 531.2	10/7/2014	JWC	
2044	Aldicarb Sulfone	ND	ug/L		1	EPA 531.2	10/7/2014	JWC	
2043	Aldicarb Sulfoxide	ND	ug/L		1.8	EPA 531.2	10/7/2014	JWC	
2021	Carbaryl	ND	ug/L		2	EPA 531.2	10/7/2014	JWC	
2066	3-Hydroxycarbofuran	ND	ug/L		2	EPA 531.2	10/7/2014	JWC	
2022	Methomyl	ND	ug/L		1	EPA 531.2	10/7/2014	JWC	

Comments:

LAB FEDERAL ID#:	LAB SAMPLE NUMBER:
ID00013	140926058-003
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001E / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2035	Di(2-ethylhexyl)adipate	ND	ug/L	400	0.2	EPA 525.2	10/9/2014	TGT	
2037	Simazine	ND	ug/L	4	0.15	EPA 525.2	10/9/2014	TGT	
2042	Hexachlorocyclopentadiene	ND	ug/L	50	0.2	EPA 525.2	10/9/2014	TGT	
2050	Atrazine	ND	ug/L	3	0.1	EPA 525.2	10/9/2014	TGT	
2051	Alachlor	ND	ug/L	2	0.4	EPA 525.2	10/9/2014	TGT	
2274	Hexachlorobenzene	ND	ug/L	1	0.2	EPA 525.2	10/9/2014	TGT	
2039	Di(2-Ethylhexyl)phthalate	ND	ug/L	6	0.6	EPA 525.2	10/9/2014	TGT	
2306	Benzo(a)pyrene	ND	ug/L	0.2	0.02	EPA 525.2	10/9/2014	TGT	
	Unregulated SOC Contaminants								
2076	Butachlor	ND	ug/L		0.4	EPA 525.2	10/9/2014	TGT	
2045	Metolachlor	ND	ug/L		1	EPA 525.2	10/9/2014	TGT	
2595	Metribuzin	ND	ug/L		0.2	EPA 525.2	10/9/2014	TGT	
2077	Propachlor	ND	ug/L		0.2	EPA 525.2	10/9/2014	TGT	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-004
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001F / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2031	Dalapon	ND	ug/L	200	1	EPA 515.3	10/5/2014	MAH	
2033	Endothall	ND	ug/L	100	9	EPA 548.1	9/29/2014	JMI	
2040	Picloram	ND	ug/L	500	0.1	EPA 515.3	10/5/2014	MAH	
2041	Dinoseb	ND	ug/L	7	0.2	EPA 515.3	10/5/2014	MAH	
2105	2,4-D	ND	ug/L	70	0.1	EPA 515.3	10/5/2014	MAH	
2110	2,4,5-TP	ND	ug/L	50	0.2	EPA 515.3	10/5/2014	MAH	
2326	Pentachlorophenol	ND	ug/L	1	0.04	EPA 515.3	10/5/2014	MAH	
	Unregulated SOC Contaminants								
2440	Dicamba	ND	ug/L		0.2	EPA 515.3	10/5/2014	MAH	
	2,4-DB	ND	ug/L		1	EPA 515.3	10/5/2014	MAH	

Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-005
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001G / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2032	Diquat	ND	ug/L	20	0.8	EPA 549.2	9/29/2014	JWC	

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Lab Supervisor John W. Coddington

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4901 HAWKINS NE SUITE D
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Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-006
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001N / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Primary IOCs								
				Phase II					
1024	Cyanide	ND	mg/L	0.2	0.01	EPA 335.4	9/30/2014	CRW	

Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-008
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001R / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Secondary IOCs (optional)								
1905	Color(Cu)	ND @ 7.54	Color Units	15	5	SM 2120B	9/29/2014	KJS	
1920	Odor	ND	Ton	3	1	SM2150B	9/29/2014	KJS	

Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-009
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001S / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Secondary IOCs (optional)								
2905	Surfactants	ND	mg/L		0.05	SM5540C	10/7/2014	KJS	

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Lab Supervisor John Coll

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4901 HAWKINS NE SUITE D
ALBUQUERQUE, NM 87109

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#:	LAB SAMPLE NUMBER:
ID00013	140926058-007
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001Q / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Disinfection Byproduct (DBP) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
			Disinfection Residual						
0999	Chlorine (Cl2)	ND	mg/L	4	0.05	SM4500CLG	10/6/2014	KJS	
1006	Chloramine (Cl2)	ND	mg/L	4	0.05	SM4500CLG	10/6/2014	KJS	
1008	Chlorine Dioxide	ND	mg/L	0.8	0.25	SM4500CLG	10/6/2014	KJS	

Lab Supervisor John W. Coddington

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

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ALBUQUERQUE, NM 87109

Comments:

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Submitted To:	Andy Freeman Hall Environmental Analysis Laboratory 4901 Hawkins NE Albuquerque NM 87109	Test Report Page 1 of 2 10/2/14

REFERENCE DATA **Asbestos in Water by TEM**

Sample Type:	Drinking Water
Method Reference:	EPA Method 100.1
Client Sample No.:	Well 2 Replacement
Sample Location:	Hydrogeologic Services, Inc. - Eldorado J&H; Project No.: A1275
PO No.:	None Available
ALS Work Order No.:	1409782
ALS Sample No.:	1409782-01
Date Received:	9/25/2014
Filtration Date and Time:	9/25/2014 & 15:05
Preparation Date:	10/1/2014
Analysis Date:	10/2/2014

The samples indicated on the following pages were analyzed by Transmission Electron Microscopy (TEM) for asbestos using the method EPA Method 100.1 with EPA 1993 modifications. Sample collection performed by clients outside the laboratory should meet method requirements stipulated therein. If sample collection deviates from any EPA requirements, interpretation of the results under strict EPA regulations cannot be made.

Upon arrival at the laboratory, each sample was ultrasonically treated in its original container for 15 minutes to suspend the solids. Aliquots of this suspension were filtered onto 0.1 μm pore size polycarbonate filters. Whenever possible, a sufficient volume of sample is filtered to yield a Limit of Detection (LOD) of <0.20 MFL. The volumes filtered are based on the clarity of the sample and the number of grid openings analyzed is based on the volume of sample filtered and the current average grid opening area. Portions of selected filters are coated with carbon and mounted on grids for analysis by TEM. Analysis is performed on an FEI Tecnai Spirit G2 Twin TEM with EDAX Genesis System providing energy dispersive X-ray analysis (EDXA) capabilities.

Results apply only to portions of samples analyzed and are tabulated on the following data sheets. Representative EDXA spectra and selected area electron diffraction (SAED) measurements of asbestos types detected are included and are referenced to the fiber identification numbers listed on the count sheets. The limit of detection (LOD) for this method has been determined to be one confirmed asbestos fiber in the total number of grid openings analyzed.

Pamela Johnson Analyst	Shawn Smythe Project Manager

ALS Environmental
4388 Glendale-Milford Road, Cincinnati, Ohio 45242
Phone (513) 733 5336 Fax (513) 733 5347 www.alsenviro.com
A Campbell Brothers Limited Company

CLIENT: Hall Environmental Analysis Laboratory
SAMPLE LOCATION: Hydrogeologic Services, Inc. - Eldorado J&H; Project No.: A1275

SAMPLE PREP DATA

Date Received:	9/25/2014
Date Filtered:	9/25/2014
Time Filtered:	15:05
Filter Type:	PC, 0.1 µm
Filter Size:	47 mm
Collection Area:	1075 mm^2

ANALYSIS DATA

Date and Time Analyzed:	10/2/2014 & 15:00
Magnification:	9,700 X
Calibration Constant:	1 cm = 1.03 µm
EDXA Resolution:	<170.0 eV
Accelerating Voltage:	100 keV
Camera Constant:	129.25 mm-Å

SAMPLE IDENTIFICATION	
Client Sample No.:	Well 2 Replacement
ALS Sample No.:	1409782-01
Date Sampled:	9/24/2014
Time Sampled:	11:00
Volume Filtered (L):	0.100
No. Grid Openings Analyzed:	5
Average Grid Opening Area:	0.0109
LOD (MFL):	0.20
Asbestos Fibers ≥ 10 microns	
Chrysotile:	0
Amosite:	0
Crocidolite:	0
Actinolite-Tremolite:	0
Anthophyllite:	0
TOTAL ASBESTOS	
Count:	**0**
Concentration (MFL):	**<LOD**

ND= None Detected LOD= Limit of Detection MFL= Millions of Fibers per Liter

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

ALS Environmental
4388 Glendale-Milford Road, Cincinnati, Ohio 45242
Phone (513) 733 5336 Fax (513) 733 5347 www.alsenviro.com
A Campbell Brothers Limited Company

Chain-of-Custody Record

Client: Hydro Geologic Services Inc

Mailing Address: P.O. Box 94716
ABQ, NM 87199-4716

Phone #: 505-856-6498

email or Fax#: 505-856-6501

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other

☐ EDD (Type)

Turn-Around Time:
☒ Standard ☐ Rush

Project Name: Eldorado J+H

Project #: A1275

Project Manager: Bill Whaley

Sampler: Charles Madewell

On Ice: ☐ Yes ☐ No

Sample Temperature:

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Asbestos				Air Bubbles (Y or N)
9/24/14	1100	GW	Well 2 Replacement	L/1	None																	

DELIVERY METHOD: STD / PRTY MAIL UPS CLIENT DROP BOX FEDEX ALS COURIER OTHER:

COOLING METHOD: NONE COOLER WET ICE ICE PACK

CUSTODY SEALS: NONE COOLER PACKAGE SAMPLES

COOLER TEMP: 3.9 °C

Date:	Time:	Relinquished by:	Received by:	Date	Time
9/24/14	1400	[signature]	FedEx # 7712 6731 9872		
Date:	Time:	Relinquished by:	Received by: [signature]	9/25/14	1037

Remarks: Send Report & Invoice to HEAL.

GW: Groundwater

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

eurofins | Eaton Analytical

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South Bend, IN 46617
Tel: (574) 233-4777
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1 800 332 4345

Laboratory Report

Client:	Hall Environmental	Report:	326417
Attn:	Andy Freeman 4901 Hawkins NE Suite D Albuquerque, NM 87109	Priority:	Standard Written
		Status:	Final
		PWS ID:	Not Supplied
Copies to:	None		

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
3113116	1409C00-001O Well2 Replacement	317.0	09/24/14 11:00	Client	09/27/14 09:15
3113117	1409C00-001P Well2 Replacement	300.0	09/24/14 11:00	Client	09/27/14 09:15

Report Summary

Note: Sample containers were provided by the client.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Jim Vernon at (574) 233-4777.

Note: *This report may not be reproduced, except in full, without written approval from EEA.*

Jim Vernon A.S.M.
Jim Vernon
2014.10.13 09:23:28 -04'00'

Authorized Signature | Title | Date

Client Name: Hall Environmental
Report #: 326417

Client Name: Hall Environmental

Report #: 326417

Sampling Point: 1409C00-001O Well2 Replacement

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
15541-45-4	Bromate	317.0	10 *	1.0	< 1.0	ug/L	—	10/02/14 15:48	3113116

Sampling Point: 1409C00-001P Well2 Replacement

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
24959-67-9	Bromide	300.0	—	0.010	**0.27**	mg/L	—	10/03/14 08:38	3113117
14866-68-3	Chlorate	300.0	—	10	< 10	ug/L	—	10/03/14 08:38	3113117
14998-27-7	Chlorite	300.0	1000 *	10	< 10	ug/L	—	10/03/14 08:38	3113117

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

Pace Analytical™

Pace AnalyticalServices, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

Drinking Water Analysis Results
2,3,7,8-TCDD -- USEPA Method 1613B

Sample ID........... 1409C00-001L Well 2 Replacemen
Client.................. Hall Environmental
Lab Sample ID..... 10283129001-R

Date Collected.....09/24/2014
Date Received......09/26/2014
Date Extracted.....10/16/2014

	Sample 1409C00-001L We	Method Blank	Lab Spike	Lab Spike Dup
[2,3,7,8-TCDD]	**ND**	ND	--	--
RL	5.0 pg/L	5.0 pg/L	--	--
2,3,7,8-TCDD Recovery	--	--	102%	107%
Spike Recovery Limit	--	--	73-146%	73-146%
RPD			5.6%	
IS Recovery	**92%**	90%	102%	92%
IS Recovery Limits	31-137%	31-137%	25-141%	25-141%
CS Recovery	**96%**	93%	101%	99%
CS Recovery Limits	42-164%	42-164%	37-158%	37-158%
Filename	R141020A_07	R141020A_05	R141020A_03	R141020A_04
Analysis Date	10/20/2014	10/20/2014	10/20/2014	10/20/2014
Analysis Time	17:06	15:57	14:50	15:22
Analyst	SMT	SMT	SMT	SMT
Volume	0.926L	1.006L	0.999L	1.017L
Dilution	NA	NA	NA	NA
ICAL Date	07/19/2013	07/19/2013	07/19/2013	07/19/2013
CCAL Filename	R141020A_02	R141020A_02	R141020A_02	R141020A_02

! = Outside the Control Limits
ND = Not Detected
RL = Reporting Limit
Limits = Control Limits from Method 1613 (10/94 Revision), Tables 6A and 7A
RPD = Relative Percent Difference of Lab Spike Recoveries
IS = Internal Standard [2,3,7,8-TCDD-$^{13}C_{12}$]
CS = Cleanup Standard [2,3,7,8-TCDD-$^{37}Cl_4$]

Analyst: ____________

Project No.............10283129

Report No.....10283129_1613DW

Pace Analytical
www.pacelabs.com

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

Sample: 1409C00-001T Well 2 Replacemen **Lab ID: 30130580001** Collected: 09/24/14 11:00 Received: 09/26/14 10:15 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.288 ± 0.465 (0.812) C:NA T:87%**	pCi/L	10/10/14 11:53	13982-63-3	
Radium-228	EPA 904.0	**0.587 ± 0.317 (0.602) C:83% T:87%**	pCi/L	10/15/14 11:42	15262-20-1	

Sample: 1409C00-001U Well 2 Replacemen **Lab ID: 30130580002** Collected: 09/24/14 11:00 Received: 09/26/14 10:15 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Gross Alpha	EPA 900.0	**13.1 ± 3.07 (2.96) C:NA T:NA**	pCi/L	10/06/14 07:39	12587-46-1	
Gross Beta	EPA 900.0	**3.89 ± 1.04 (1.49) C:NA T:NA**	pCi/L	10/06/14 07:39	12587-47-2	

REPORT OF LABORATORY ANALYSIS

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(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21497 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30130580001

METHOD BLANK: 794552 Matrix: Water
Associated Lab Samples: 30130580001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.839 ± 0.472 (0.877) C:83% T:76%	pCi/L	10/15/14 11:23	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21513 Analysis Method: EPA 900.0
QC Batch Method: EPA 900.0 Analysis Description: 900.0 Gross Alpha/Beta
Associated Lab Samples: 30130580002

METHOD BLANK: 795212 Matrix: Water
Associated Lab Samples: 30130580002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	0.127 ± 0.510 (1.32) C:NA T:NA	pCi/L	10/05/14 11:08	
Gross Beta	-0.107 ± 0.827 (2.05) C:NA T:NA	pCi/L	10/05/14 11:08	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21495 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30130580001

METHOD BLANK: 794550 Matrix: Water
Associated Lab Samples: 30130580001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0992 ± 0.456 (0.864) C:NA T:95%	pCi/L	10/10/14 11:20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **HGS** Work Order Number: **1409C00** RcptNo: **1**

Received by/date: KMS 09/24/14

Logged By: **Ashley Gallegos** **9/24/2014 2:15:00 PM**

Completed By: **Ashley Gallegos** **9/24/2014 2:23:32 PM**

Reviewed By: CS 09/24/14

Chain of Custody

1. Custody seals intact on sample bottles? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
5. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
6. Sample(s) in proper container(s)? Yes ☑ No ☐
7. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
8. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
9. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
10. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
11. Were any sample containers received broken? Yes ☐ No ☑
12. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
13. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
14. Is it clear what analyses were requested? Yes ☑ No ☐
15. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 9 1
(<2 or >12 unless noted)
Adjusted? No
Checked by: my

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date:
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	9.9	Good	Not Present			

Chain-of-Custody Record

Client: Hydro Geologic Services Inc.

Mailing Address: P.O. Box 94716
ABQ, NM 87199-4716

Phone #: 505-856-6498

email or Fax#: 505-856-650

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other

☐ EDD (Type)

Turn-Around Time:
☒ Standard ☐ Rush

Project Name: Eldorado J+H

Project #: A1275

Project Manager: Bill Whaley

Sampler: Charles Madewell

On Ice: ☒ Yes ☐ No

Sample Temperature: 9.9

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1409C00
/24/14	1100	GW	Well 2 Replacement	40ml / 1/0.5L / 39	None, SOTH, HCL, HgCl2, HNO3, H2SO4, NaOH	-001
			Trip Blanks	40ml / 5	HgCl2 HCL	-002

Analysis Request

HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	See Attached List				Air Bubbles (Y or N)
-001												X				
-002												X				

Date:	Time:	Relinquished by:	Received by:	Date	Time
/24/14	1415	[signature]	[signature]	9/24/14	14:15

Remarks: GW : Groundwater

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

October 21, 2014

Bill Whaley
HydroGeologic Services, Inc.
P. O. Box 94716
Albuquerque, NM 87199-4716
TEL: (505) 856-6498
FAX (505) 856-6501

RE: Eldorado J & H OrderNo.: 1409C00

Dear Bill Whaley:

Hall Environmental Analysis Laboratory received 2 sample(s) on 9/24/2014 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Date Reported: **10/21/2014**

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8011/504.1: EDB						Analyst:	**LRW**
1,2-Dibromo-3-chloropropane	ND	0.10		µg/L	1	9/25/2014 1:38:51 PM	15509
1,2-Dibromoethane	ND	0.010		µg/L	1	9/25/2014 1:38:51 PM	15509
EPA METHOD 8015D: DIESEL RANGE						Analyst:	**BCN**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	9/26/2014 11:35:24 PM	15448
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	9/26/2014 11:35:24 PM	15448
Surr: DNOP	114	59-141		%REC	1	9/26/2014 11:35:24 PM	15448
EPA METHOD 8015D: GASOLINE RANGE						Analyst:	**NSB**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	9/25/2014 11:34:12 PM	R21468
Surr: BFB	91.1	70.9-130		%REC	1	9/25/2014 11:34:12 PM	R21468
EPA METHOD 300.0: ANIONS						Analyst:	**JRR**
Fluoride	0.72	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Chloride	15	0.50		mg/L	1	9/25/2014 2:12:38 AM	R21451
Nitrogen, Nitrite (As N)	ND	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Nitrogen, Nitrate (As N)	2.0	0.10		mg/L	1	9/25/2014 2:12:38 AM	R21451
Sulfate	25	0.50		mg/L	1	9/25/2014 2:12:38 AM	R21451
EPA METHOD 200.7: DISSOLVED METALS						Analyst:	**JLF**
Aluminum	ND	0.020		mg/L	1	10/3/2014 12:20:11 PM	R21641
Barium	0.13	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Beryllium	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Cadmium	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Calcium	47	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Iron	0.022	0.020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Magnesium	9.6	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Manganese	ND	0.0020		mg/L	1	9/26/2014 3:22:40 PM	R21505
Nickel	ND	0.010		mg/L	1	9/26/2014 3:22:40 PM	R21505
Potassium	2.9	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Silver	ND	0.0050		mg/L	1	9/26/2014 3:22:40 PM	R21505
Sodium	20	1.0		mg/L	1	9/26/2014 3:22:40 PM	R21505
Zinc	ND	0.010		mg/L	1	9/26/2014 3:22:40 PM	R21505
EPA METHOD 200.7: METALS						Analyst:	**JLF**
Barium	0.15	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Beryllium	ND	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Cadmium	ND	0.0020		mg/L	1	9/30/2014 5:52:42 PM	R21558
Chromium	ND	0.0060		mg/L	1	9/30/2014 5:52:42 PM	R21558
EPA 200.8: DISSOLVED METALS						Analyst:	**DBD**
Antimony	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS							Analyst: **DBD**
Arsenic	0.0032	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Copper	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Lead	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Selenium	0.0025	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Thallium	ND	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
Uranium	0.0023	0.0010		mg/L	1	10/6/2014 12:24:50 PM	R21702
EPA 200.8: METALS							Analyst: **DBD**
Antimony	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Arsenic	0.0032	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Lead	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Copper	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Selenium	0.0027	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Thallium	ND	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
Uranium	0.0023	0.0010		mg/L	1	10/6/2014 2:22:30 PM	R21702
EPA METHOD 245.1: MERCURY							Analyst: **MMD**
Mercury	ND	0.00020		mg/L	1	9/30/2014 1:44:48 PM	15578
SM2340B: HARDNESS							Analyst: **JLF**
Hardness (As CaCO3)	160	6.6		mg/L	1	9/26/2014 11:21:00 AM	R21505
SM 9223B TOTAL COLIFORM							Analyst: **SMS**
Total Coliform	Absent	0		P/A	1	9/25/2014 4:43:00 PM	15493
E. Coli	Absent	0		P/A	1	9/25/2014 4:43:00 PM	15493
PURGEABLE ORGANICS BY EPA 524							Analyst: **cadg**
Benzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Carbon tetrachloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Chlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
cis-1,2-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,4-Dichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,2-Dichloropropane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Ethylbenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Methylene chloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Styrene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Tetrachloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Toluene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
trans-1,2-Dichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
PURGEABLE ORGANICS BY EPA 524							Analyst: **cadg**
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1,1-Trichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
1,1,2-Trichloroethane	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Trichloroethene	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Vinyl chloride	ND	0.50		µg/L	1	9/25/2014 12:32:50 PM	R21471
Total Xylenes	ND	1.5		µg/L	1	9/25/2014 12:32:50 PM	R21471
Surr: Toluene-d8	84.3	70-130		%REC	1	9/25/2014 12:32:50 PM	R21471
Surr: 4-Bromofluorobenzene	83.4	70-130		%REC	1	9/25/2014 12:32:50 PM	R21471
EPA METHOD 8260B: VOLATILES							Analyst: **KJH**
Benzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Toluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Ethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Naphthalene	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1-Methylnaphthalene	ND	4.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Methylnaphthalene	ND	4.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Acetone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromodichloromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromoform	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Bromomethane	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Butanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Carbon disulfide	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Carbon Tetrachloride	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloroethane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloroform	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Chloromethane	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Chlorotoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Chlorotoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
cis-1,2-DCE	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dibromochloromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dibromomethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
	O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc.
Project: Eldorado J & H
Lab ID: 1409C00-001 **Matrix:** AQUEOUS

Client Sample ID: Well 2 Replacement
Collection Date: 9/24/2014 11:00:00 AM
Received Date: 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **KJH**	
1,2-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,4-Dichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Dichlorodifluoromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloroethene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2-Dichloropropane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,3-Dichloropropane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2,2-Dichloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Hexachlorobutadiene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
2-Hexanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Isopropylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Isopropyltoluene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
4-Methyl-2-pentanone	ND	10		µg/L	1	9/27/2014 1:28:17 AM	R21508
Methylene Chloride	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
n-Butylbenzene	ND	3.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
n-Propylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
sec-Butylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Styrene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
tert-Butylbenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
trans-1,2-DCE	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,1-Trichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,1,2-Trichloroethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Trichloroethene (TCE)	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Trichlorofluoromethane	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
1,2,3-Trichloropropane	ND	2.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Vinyl chloride	ND	1.0		µg/L	1	9/27/2014 1:28:17 AM	R21508
Xylenes, Total	ND	1.5		µg/L	1	9/27/2014 1:28:17 AM	R21508
Surr: 1,2-Dichloroethane-d4	89.0	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: 4-Bromofluorobenzene	98.1	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: Dibromofluoromethane	89.0	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508
Surr: Toluene-d8	89.7	70-130		%REC	1	9/27/2014 1:28:17 AM	R21508

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
	E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
	J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
	O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
	R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
	S	Spike Recovery outside accepted recovery limits		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: HydroGeologic Services, Inc. **Client Sample ID:** Well 2 Replacement
Project: Eldorado J & H **Collection Date:** 9/24/2014 11:00:00 AM
Lab ID: 1409C00-001 **Matrix:** AQUEOUS **Received Date:** 9/24/2014 2:15:00 PM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
SM2510B: SPECIFIC CONDUCTANCE							Analyst: **JRR**
Conductivity	410	0.010		µmhos/cm	1	9/29/2014 1:54:18 PM	R21535
SM4500-H+B: PH							Analyst: **JRR**
pH	7.96	1.68	H	pH units	1	9/29/2014 1:54:18 PM	R21535
SM2320B: ALKALINITY							Analyst: **JRR**
Bicarbonate (As CaCO3)	150	20		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
Carbonate (As CaCO3)	ND	2.0		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
Total Alkalinity (as CaCO3)	150	20		mg/L CaCO3	1	9/29/2014 1:54:18 PM	R21535
SM2540C MOD: TOTAL DISSOLVED SOLIDS							Analyst: **KS**
Total Dissolved Solids	264	20.0		mg/L	1	9/28/2014 6:40:00 PM	15511
EPA METHOD 180.1: TURBIDITY							Analyst: **KS**
Turbidity	ND	0.50		NTU	1	9/25/2014 11:33:00 PM	R21463

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	P	Sample pH greater than 2.
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	Spike Recovery outside accepted recovery limits		

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-001
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001C / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

Anatek Labs, Inc.

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2005	Endrin	ND	ug/L	2	0.02	EPA 505	10/8/2014	MAH	
2010	Lindane	ND	ug/L	0.2	0.02	EPA 505	10/8/2014	MAH	
2015	Methoxychlor	ND	ug/L	40	0.1	EPA 505	10/8/2014	MAH	
2020	Toxaphene	ND	ug/L	3	1	EPA 505	10/8/2014	MAH	
2034	Glyphosate	ND	ug/L	700	10	EPA 547	10/1/2014	JWC	
2065	Heptachlor	ND	ug/L	0.4	0.04	EPA 505	10/8/2014	MAH	
2067	Heptachlor Epoxide	ND	ug/L	0.2	0.02	EPA 505	10/8/2014	MAH	
2383	PCB's	ND	ug/L	0.5	0.01	EPA 505	10/8/2014	MAH	
2959	Chlordane	ND	ug/L	2	0.1	EPA 505	10/8/2014	MAH	
	Unregulated SOC Contaminants								
2356	Aldrin	ND	ug/L		0.2	EPA 505	10/8/2014	MAH	
2070	Dieldrin	ND	ug/L		0.2	EPA 505	10/8/2014	MAH	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#:		LAB SAMPLE NUMBER:	
ID00013		140926058-002	
DATE RECEIVED: 9/26/2014		DATE REPORTED BY LAB: 10/13/2014	
COMPLIANCE SAMPLE: YES		REPLACEMENT SAMPLE: NO	
COLLECTION DATE: 9/24/2014		COLLECTION TIME: 11:00 AM	
SAMPLE TYPE:			
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB		
SAMPLING POINT/LOCATION: 1409C00-001D / WELL 2 REPLACEMENT		TAG #/FACILITY ID:	
CONTACT NAME: ANDY FREEMAN		CONTACT PHONE: 505-345-3975	

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2036	Oxamyl	ND	ug/L	200	4	EPA 531.2	10/7/2014	JWC	
2046	Carbofuran	ND	ug/L	40	2	EPA 531.2	10/7/2014	JWC	
	Unregulated SOC Contaminants								
2047	Aldicarb	ND	ug/L	3	2	EPA 531.2	10/7/2014	JWC	
2044	Aldicarb Sulfone	ND	ug/L		1	EPA 531.2	10/7/2014	JWC	
2043	Aldicarb Sulfoxide	ND	ug/L		1.8	EPA 531.2	10/7/2014	JWC	
2021	Carbaryl	ND	ug/L		2	EPA 531.2	10/7/2014	JWC	
2066	3-Hydroxycarbofuran	ND	ug/L		2	EPA 531.2	10/7/2014	JWC	
2022	Methomyl	ND	ug/L		1	EPA 531.2	10/7/2014	JWC	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-003
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001E / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

Anatek Labs, Inc.

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2035	Di(2-ethylhexyl)adipate	ND	ug/L	400	0.2	EPA 525.2	10/9/2014	TGT	
2037	Simazine	ND	ug/L	4	0.15	EPA 525.2	10/9/2014	TGT	
2042	Hexachlorocyclopentadiene	ND	ug/L	50	0.2	EPA 525.2	10/9/2014	TGT	
2050	Atrazine	ND	ug/L	3	0.1	EPA 525.2	10/9/2014	TGT	
2051	Alachlor	ND	ug/L	2	0.4	EPA 525.2	10/9/2014	TGT	
2274	Hexachlorobenzene	ND	ug/L	1	0.2	EPA 525.2	10/9/2014	TGT	
2039	Di(2-Ethylhexyl)phthalate	ND	ug/L	6	0.6	EPA 525.2	10/9/2014	TGT	
2306	Benzo(a)pyrene	ND	ug/L	0.2	0.02	EPA 525.2	10/9/2014	TGT	
	Unregulated SOC Contaminants								
2076	Butachlor	ND	ug/L		0.4	EPA 525.2	10/9/2014	TGT	
2045	Metolachlor	ND	ug/L		1	EPA 525.2	10/9/2014	TGT	
2595	Metribuzin	ND	ug/L		0.2	EPA 525.2	10/9/2014	TGT	
2077	Propachlor	ND	ug/L		0.2	EPA 525.2	10/9/2014	TGT	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-004
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001F / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2031	Dalapon	ND	ug/L	200	1	EPA 515.3	10/5/2014	MAH	
2033	Endothall	ND	ug/L	100	9	EPA 548.1	9/29/2014	JMI	
2040	Picloram	ND	ug/L	500	0.1	EPA 515.3	10/5/2014	MAH	
2041	Dinoseb	ND	ug/L	7	0.2	EPA 515.3	10/5/2014	MAH	
2105	2,4-D	ND	ug/L	70	0.1	EPA 515.3	10/5/2014	MAH	
2110	2,4,5-TP	ND	ug/L	50	0.2	EPA 515.3	10/5/2014	MAH	
2326	Pentachlorophenol	ND	ug/L	1	0.04	EPA 515.3	10/5/2014	MAH	
	Unregulated SOC Contaminants								
2440	Dicamba	ND	ug/L		0.2	EPA 515.3	10/5/2014	MAH	
	2,4-DB	ND	ug/L		1	EPA 515.3	10/5/2014	MAH	

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-005
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001G / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

Anatek Labs, Inc.

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Public Drinking Water System Synthetic Organic Chemical (SOC) Analysis Report

FRDS	Compound	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Regulated SOC Contaminants								
2032	Diquat	ND	ug/L	20	0.8	EPA 549.2	9/29/2014	JWC	

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

Soil/solid results are reported on a dry-weight basis unless otherwise noted.

Lab Supervisor

ANDY FREEMAN
HALL ENVIRONMENTAL ANALYSIS LAB
4901 HAWKINS NE SUITE D
ALBUQUERQUE, NM 87109

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-006
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001N / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Primary IOCs								
				Phase II					
1024	Cyanide	ND	mg/L	0.2	0.01	EPA 335.4	9/30/2014	CRW	

Comments:

LAB FEDERAL ID#: ID00013		LAB SAMPLE NUMBER: 140926058-008
DATE RECEIVED: 9/26/2014		DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES		REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014		COLLECTION TIME: 11:00 AM
SAMPLE TYPE:		
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB	
SAMPLING POINT/LOCATION: 1409C00-001R / WELL 2 REPLACEMENT		TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN		CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Secondary IOCs (optional)								
1905	Color(Cu)	ND @ 7.54	Color Units	15	5	SM 2120B	9/29/2014	KJS	
1920	Odor	ND	Ton	3	1	SM2150B	9/29/2014	KJS	

Comments:

LAB FEDERAL ID#: ID00013	LAB SAMPLE NUMBER: 140926058-009
DATE RECEIVED: 9/26/2014	DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES	REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014	COLLECTION TIME: 11:00 AM
SAMPLE TYPE:	
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB
SAMPLING POINT/LOCATION: 1409C00-001S / WELL 2 REPLACEMENT	TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN	CONTACT PHONE: 505-345-3975

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Public Drinking Water System Inorganic Chemical (IOC) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Secondary IOCs (optional)								
2905	Surfactants	ND	mg/L		0.05	SM5540C	10/7/2014	KJS	

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

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Lab Supervisor John. Coll

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4901 HAWKINS NE SUITE D
ALBUQUERQUE, NM 87109

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

LAB FEDERAL ID#: ID00013		LAB SAMPLE NUMBER: 140926058-007
DATE RECEIVED: 9/26/2014		DATE REPORTED BY LAB: 10/13/2014
COMPLIANCE SAMPLE: YES		REPLACEMENT SAMPLE: NO
COLLECTION DATE: 9/24/2014		COLLECTION TIME: 11:00 AM
SAMPLE TYPE:		
PWS #:	PWS NAME: HALL ENVIRONMENTAL ANALYSIS LAB	
SAMPLING POINT/LOCATION: 1409C00-001Q / WELL 2 REPLACEMENT		TAG #/FACILITY ID:
CONTACT NAME: ANDY FREEMAN		CONTACT PHONE: 505-345-3975

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Public Drinking Water System Disinfection Byproduct (DBP) Analysis Report

FRDS	Contaminant	Result	Units	MCL	MDL	Method	Analysis Date	Analyst	Qualifier
	Disinfection Residual								
0999	Chlorine (Cl2)	ND	mg/L	4	0.05	SM4500CLG	10/6/2014	KJS	
1006	Chloramine (Cl2)	ND	mg/L	4	0.05	SM4500CLG	10/6/2014	KJS	
1008	Chlorine Dioxide	ND	mg/L	0.8	0.25	SM4500CLG	10/6/2014	KJS	

Lab Supervisor John W. Coldt

ND = Analyte Not Detected
----- = No Analysis Performed
MCL = Maximum Contaminant Level
MDL = Method Detection Limit

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The results reported relate only to the samples indicated.
Soil/solid results are reported on a dry-weight basis unless otherwise noted.

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ALBUQUERQUE, NM 87109

Comments:

Certifications held by Anatek Labs ID: EPA:ID00013; AZ:0701; CO:ID00013; FL(NELAP):E87893; ID:ID00013; MT:CERT0028; NM: ID00013; OR:ID200001-002; WA:C595
Certifications held by Anatek Labs WA: EPA:WA00169; ID:WA00169; WA:C585; MT:Cert0095; FL(NELAP): E871099

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Submitted To: Andy Freeman
Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque NM 87109

REFERENCE DATA	**Asbestos in Water by TEM**
Sample Type:	Drinking Water
Method Reference:	EPA Method 100.1
Client Sample No.:	Well 2 Replacement
Sample Location:	Hydrogeologic Services, Inc. - Eldorado J&H; Project No.: A1275
PO No.:	None Available
ALS Work Order No.:	1409782
ALS Sample No.:	1409782-01
Date Received:	9/25/2014
Filtration Date and Time:	9/25/2014 & 15:05
Preparation Date:	10/1/2014
Analysis Date:	10/2/2014

The samples indicated on the following pages were analyzed by Transmission Electron Microscopy (TEM) for asbestos using the method EPA Method 100.1 with EPA 1993 modifications. Sample collection performed by clients outside the laboratory should meet method requirements stipulated therein. If sample collection deviates from any EPA requirements, interpretation of the results under strict EPA regulations cannot be made.

Upon arrival at the laboratory, each sample was ultrasonically treated in its original container for 15 minutes to suspend the solids. Aliquots of this suspension were filtered onto 0.1 µm pore size polycarbonate filters. Whenever possible, a sufficient volume of sample is filtered to yield a Limit of Detection (LOD) of <0.20 MFL. The volumes filtered are based on the clarity of the sample and the number of grid openings analyzed is based on the volume of sample filtered and the current average grid opening area. Portions of selected filters are coated with carbon and mounted on grids for analysis by TEM. Analysis is performed on an FEI Tecnai Spirit G2 Twin TEM with EDAX Genesis System providing energy dispersive X-ray analysis (EDXA) capabilities.

Results apply only to portions of samples analyzed and are tabulated on the following data sheets. Representative EDXA spectra and selected area electron diffraction (SAED) measurements of asbestos types detected are included and are referenced to the fiber identification numbers listed on the count sheets. The limit of detection (LOD) for this method has been determined to be one confirmed asbestos fiber in the total number of grid openings analyzed.

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

CLIENT: Hall Environmental Analysis Laboratory
SAMPLE LOCATION: Hydrogeologic Services, Inc. - Eldorado J&H; Project
No.: A1275

SAMPLE PREP DATA

Date Received:	9/25/2014
Date Filtered:	9/25/2014
Time Filtered:	15:05
Filter Type:	PC, 0.1 µm
Filter Size:	47 mm
Collection Area:	1075 mm^2

ANALYSIS DATA

Date and Time Analyzed:	10/2/2014 & 15:00
Magnification:	9,700 X
Calibration Constant:	1 cm = 1.03 µm
EDXA Resolution:	<170.0 eV
Accelerating Voltage:	100 keV
Camera Constant:	129.25 mm-Å

SAMPLE IDENTIFICATION	
Client Sample No.:	Well 2 Replacement
ALS Sample No.:	1409782-01
Date Sampled:	9/24/2014
Time Sampled:	11:00
Volume Filtered (L):	0.100
No. Grid Openings Analyzed:	5
Average Grid Opening Area:	0.0109
LOD (MFL):	0.20
Asbestos Fibers ≥ 10 microns	
Chrysotile:	0
Amosite:	0
Crocidolite:	0
Actinolite-Tremolite:	0
Anthophyllite:	0
TOTAL ASBESTOS	
Count:	**0**
Concentration (MFL):	**<LOD**

ND= None Detected   LOD= Limit of Detection   MFL= Millions of Fibers per Liter

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

Chain-of-Custody Record

Client: Hydro Geologic Services Inc

Mailing Address: P.O. Box 94716
ABQ, NM 87199-4716

Phone #: 505-856-6498

email or Fax#: 505-856-6501

QA/QC Package: ☒ Standard ☐ Level 4 (Full Validation)

Accreditation ☐ NELAP ☐ Other

☐ EDD (Type)

Turn-Around Time: ☒ Standard ☐ Rush

Project Name: Eldorado J+H

Project #: A1275

Project Manager: Bill Whaley

Sampler: Charles Madewell

On Ice: ☐ Yes ☐ No

Sample Temperature:

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No.	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Asbestos				Air Bubbles (Y or N)
9/24/14	1100	GW	Well 2 Replacement	L/1	None																	

DELIVERY METHOD: STD / PRTY MAIL UPS CLIENT DROP BOX FEDEX ALS COURIER OTHER:

COOLING METHOD: NONE COOLER WET ICE ICE PACK

CUSTODY SEALS: NONE COOLER PACKAGE SAMPLES

COOLER TEMP: 3.9 °C

Date:	Time:	Relinquished by:	Received by:	Date	Time
9/24/14	1400	[signature]	FedEx # 771267319872		
Date:	Time:	Relinquished by:	Received by:	Date	Time
			[signature]	9/25/14	1037

Remarks: Send Report & Invoice to HEAL.

GW = Groundwater

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

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110 South Hill Street
South Bend, IN 46617
Tel: (574) 233-4777
Fax: (574) 233-8207
1 800 332 4345

Laboratory Report

Client: Hall Environmental

Attn: Andy Freeman
4901 Hawkins NE
Suite D
Albuquerque, NM 87109

Copies to: None

Report: 326417
Priority: Standard Written
Status: Final
PWS ID: Not Supplied

Sample Information

EEA ID #	Client ID	Method	Collected Date / Time	Collected By:	Received Date / Time
3113116	1409C00-001O Well2 Replacement	317.0	09/24/14 11:00	Client	09/27/14 09:15
3113117	1409C00-001P Well2 Replacement	300.0	09/24/14 11:00	Client	09/27/14 09:15

Report Summary

Note: Sample containers were provided by the client.

Detailed quantitative results are presented on the following pages. The results presented relate only to the samples provided for analysis.

We appreciate the opportunity to provide you with this analysis. If you have any questions concerning this report, please do not hesitate to call Jim Vernon at (574) 233-4777.

Note: *This report may not be reproduced, except in full, without written approval from EEA.*

Jim Vernon A.S.M.

Jim Vernon
2014.10.13 09:23:28 -04'00'

Authorized Signature | Title | Date

Client Name: Hall Environmental
Report #: 326417

Client Name: Hall Environmental

Report #: 326417

Sampling Point: 1409C00-001O Well2 Replacement

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
15541-45-4	Bromate	317.0	10 *	1.0	< 1.0	ug/L	—	10/02/14 15:48	3113116

Sampling Point: 1409C00-001P Well2 Replacement

PWS ID: Not Supplied

General Chemistry

Analyte ID #	Analyte	Method	Reg Limit	MRL†	Result	Units	Preparation Date	Analyzed Date	EEA ID #
24959-67-9	Bromide	300.0	—	0.010	**0.27**	mg/L	—	10/03/14 08:38	3113117
14866-68-3	Chlorate	300.0	—	10	< 10	ug/L	—	10/03/14 08:38	3113117
14998-27-7	Chlorite	300.0	1000 *	10	< 10	ug/L	—	10/03/14 08:38	3113117

† EEA has demonstrated it can achieve these report limits in reagent water, but can not document them in all sample matrices.

Reg Limit Type:	MCL	SMCL	AL
Symbol:	*	^	!

Lab Definitions

Continuing Calibration Check Standard (CCC) / Continuing Calibration Verification (CCV) / Initial Calibration Verification Standard (ICV) / Initial Performance Check (IPC) - is a standard containing one or more of the target analytes that is prepared from the same standards used to calibrate the instrument. This standard is used to verify the calibration curve at the beginning of each analytical sequence, and may also be analyzed throughout and at the end of the sequence. The concentration of continuing standards may be varied, when prescribed by the reference method, so that the range of the calibration curve is verified on a regular basis.

Internal Standards (IS) - are pure compounds with properties similar to the analytes of interest, which are added to field samples or extracts, calibration standards, and quality control standards at a known concentration. They are used to measure the relative responses of the analytes of interest and surrogates in the sample, calibration standard or quality control standard.

Laboratory Duplicate (LD) - is a field sample aliquot taken from the same sample container in the laboratory and analyzed separately using identical procedures. Analysis of laboratory duplicates provides a measure of the precision of the laboratory procedures.

Laboratory Fortified Blank (LFB) / Laboratory Control Sample (LCS) - is an aliquot of reagent water to which known concentrations of the analytes of interest are added. The LFB is analyzed exactly the same as the field samples. LFBs are used to determine whether the method is in control.

Laboratory Method Blank (LMB) / Laboratory Reagent Blank (LRB) - is a sample of reagent water included in the sample batch analyzed in the same way as the associated field samples. The LMB is used to determine if method analytes or other background contamination have been introduced during the preparation or analytical procedure. The LMB is analyzed exactly the same as the field samples.

Laboratory Trip Blank (LTB) / Field Reagent Blank (FRB) - is a sample of laboratory reagent water placed in a sample container in the laboratory and treated as a field sample, including storage, preservation, and all analytical procedures. The FRB/LTB container follows the collection bottles to and from the collection site, but the FRB/LTB is not opened at any time during the trip. The FRB/LTB is primarily a travel blank used to verify that the samples were not contaminated during shipment.

Matrix Spike Duplicate Sample (MSD) / Laboratory Fortified Sample Matrix Duplicate (LFSMD) - is a sample aliquot taken from the same field sample source as the Matrix Spike Sample to which known quantities of the analytes of interest are added in the laboratory. The MSD is analyzed exactly the same as the field samples. Analysis of the MSD provides a measure of the precision of the laboratory procedures in a specific matrix.

Matrix Spike Sample (MS) / Laboratory Fortified Sample Matrix (LFSM) - is a sample aliquot taken from field sample source to which known quantities of the analytes of interest are added in the laboratory. The MS is analyzed exactly the same as the field samples. The purpose is to demonstrate recovery of the analytes from a sample matrix to determine if the specific matrix contributes bias to the analytical results.

Quality Control Standard (QCS) / Second Source Calibration Verification (SSCV) - is a solution containing known concentrations of the analytes of interest prepared from a source different from the source of the calibration standards. The solution is obtained from a second manufacturer or lot if the lot can be demonstrated by the manufacturer as prepared independently from other lots. The QCS sample is analyzed using the same procedures as field samples. The QCS is used as a check on the calibration standards used in the method on a routine basis.

Reporting Limit Check (RLC) / Initial Calibration Check Standard (ICCS) - is a procedural standard that is analyzed each day to evaluate instrument performance at or below the minimum reporting limit (MRL).

Surrogate Standard (SS) / Surrogate Analyte (SUR) - is a pure compound with properties similar to the analytes of interest, which is highly unlikely to be found in any field sample, that is added to the field samples, calibration standards, blanks and quality control standards before sample preparation. The SS is used to evaluate the efficiency of the sample preparation process.

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Minneapolis, MN 55414

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Drinking Water Analysis Results
2,3,7,8-TCDD -- USEPA Method 1613B

Sample ID...........1409C00-001L Well 2 Replacemen
Client................... Hall Environmental
Lab Sample ID..... 10283129001-R

Date Collected.....09/24/2014
Date Received......09/26/2014
Date Extracted.....10/16/2014

	Sample 1409C00-001L We	Method Blank	Lab Spike	Lab Spike Dup
[2,3,7,8-TCDD]	**ND**	ND	--	--
RL	5.0 pg/L	5.0 pg/L	--	--
2,3,7,8-TCDD Recovery	--	--	102%	107%
Spike Recovery Limit	--	--	73-146%	73-146%
RPD			5.6%	
IS Recovery	**92%**	90%	102%	92%
IS Recovery Limits	31-137%	31-137%	25-141%	25-141%
CS Recovery	**96%**	93%	101%	99%
CS Recovery Limits	42-164%	42-164%	37-158%	37-158%
Filename	R141020A_07	R141020A_05	R141020A_03	R141020A_04
Analysis Date	10/20/2014	10/20/2014	10/20/2014	10/20/2014
Analysis Time	17:06	15:57	14:50	15:22
Analyst	SMT	SMT	SMT	SMT
Volume	0.926L	1.006L	0.999L	1.017L
Dilution	NA	NA	NA	NA
ICAL Date	07/19/2013	07/19/2013	07/19/2013	07/19/2013
CCAL Filename	R141020A_02	R141020A_02	R141020A_02	R141020A_02

! = Outside the Control Limits
ND = Not Detected
RL = Reporting Limit
Limits = Control Limits from Method 1613 (10/94 Revision), Tables 6A and 7A
RPD = Relative Percent Difference of Lab Spike Recoveries
IS = Internal Standard [2,3,7,8-TCDD-$^{13}C_{12}$]
CS = Cleanup Standard [2,3,7,8-TCDD-$^{37}Cl_4$]

Analyst: [signature]

Project No.............10283129

Report No.....10283129_1613DW

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

Sample: 1409C00-001T Well 2 Replacemen | **Lab ID: 30130580001** | Collected: 09/24/14 11:00 | Received: 09/26/14 10:15 | Matrix: Drinking Water
PWS: | Site ID: | Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.288 ± 0.465 (0.812) C:NA T:87%**	pCi/L	10/10/14 11:53	13982-63-3	
Radium-228	EPA 904.0	**0.587 ± 0.317 (0.602) C:83% T:87%**	pCi/L	10/15/14 11:42	15262-20-1	

Sample: 1409C00-001U Well 2 Replacemen | **Lab ID: 30130580002** | Collected: 09/24/14 11:00 | Received: 09/26/14 10:15 | Matrix: Drinking Water
PWS: | Site ID: | Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Gross Alpha	EPA 900.0	**13.1 ± 3.07 (2.96) C:NA T:NA**	pCi/L	10/06/14 07:39	12587-46-1	
Gross Beta	EPA 900.0	**3.89 ± 1.04 (1.49) C:NA T:NA**	pCi/L	10/06/14 07:39	12587-47-2	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21497 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30130580001

METHOD BLANK: 794552 Matrix: Water
Associated Lab Samples: 30130580001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.839 ± 0.472 (0.877) C:83% T:76%	pCi/L	10/15/14 11:23	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21513
QC Batch Method: EPA 900.0
Associated Lab Samples: 30130580002

Analysis Method: EPA 900.0
Analysis Description: 900.0 Gross Alpha/Beta

METHOD BLANK: 795212

Matrix: Water

Associated Lab Samples: 30130580002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Gross Alpha	0.127 ± 0.510 (1.32) C:NA T:NA	pCi/L	10/05/14 11:08	
Gross Beta	-0.107 ± 0.827 (2.05) C:NA T:NA	pCi/L	10/05/14 11:08	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Greensburg, PA 15601
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QUALITY CONTROL - RADIOCHEMISTRY

Project: 1409C00-001T Well 2 Replacemen
Pace Project No.: 30130580

QC Batch: RADC/21495 | Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 | Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30130580001

METHOD BLANK: 794550 | Matrix: Water
Associated Lab Samples: 30130580001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0992 ± 0.456 (0.864) C:NA T:95%	pCi/L	10/10/14 11:20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **HGS** Work Order Number: **1409C00** RcptNo: **1**

Received by/date: KMS 09/24/14

Logged By: **Ashley Gallegos** **9/24/2014 2:15:00 PM**

Completed By: **Ashley Gallegos** **9/24/2014 2:23:32 PM**

Reviewed By: CS 09/24/14

Chain of Custody

1. Custody seals intact on sample bottles? Yes ☐ No ☐ Not Present ☑
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? Client

Log In

4. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
5. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
6. Sample(s) in proper container(s)? Yes ☑ No ☐
7. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
8. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
9. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
10. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
11. Were any sample containers received broken? Yes ☐ No ☑
12. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
13. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
14. Is it clear what analyses were requested? Yes ☑ No ☐
15. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

\# of preserved bottles checked for pH: 9 1
(<2 or >12 unless noted)
Adjusted? No
Checked by: my

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date:
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	9.9	Good	Not Present			

Chain-of-Custody Record

Client: Hydro Geologic Services Inc.

Mailing Address: P.O. Box 94716
ABQ, NM 87199-4716

Phone #: 505-856-6498

email or Fax#: 505-856-6501

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation
☐ NELAP ☐ Other ______

☐ EDD (Type) ______

Turn-Around Time:
☒ Standard ☐ Rush ______

Project Name: Eldorado J+H

Project #: A1275

Project Manager: Bill Whaley

Sampler: Charles Madewell

On Ice: ☒ Yes ☐ No

Sample Temperature: 9.9

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1409C00	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	See Attached List				Air Bubbles (Y or N)
1/24/14	1100	GW	Well 2 Replacement	40ml 1/0.5L / 39	None, 50TH, HCL, $HgCl_2$, HNO_3, H_2SO_4, NaOH	-001												X				
			Trip Blanks	40ml / 5	$HgCl_2$ HCL	-002												X				

Date:	Time:	Relinquished by:	Received by:	Date	Time
1/24/14	1415	[signature]	[signature]	9/24/14	14:15
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: GW: Groundwater

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

June 07, 2016

Meghan Hodgins
Glorieta GeoScience
P.O. Box 5727
Santa Fe, NM 87502
TEL: (505) 983-5446
FAX (505) 983-6482

RE: EAWSD Well 19 OrderNo.: 1605C13

Dear Meghan Hodgins:

Hall Environmental Analysis Laboratory received 2 sample(s) on 5/25/2016 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0190

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Glorieta GeoScience | **Client Sample ID:** EAWSD-W19-052416
Project: EAWSD Well 19 | **Collection Date:** 5/24/2016 3:20:00 PM
Lab ID: 1605C13-001 | **Matrix:** AQUEOUS | **Received Date:** 5/25/2016 2:30:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS						Analyst:	**JLF**
Antimony	0.0098	0.0010	*	mg/L	1	6/6/2016 4:46:39 PM	B34718
EPA METHOD 6010B: DISSOLVED METALS						Analyst:	**MED**
Antimony	ND	0.050		mg/L	1	6/1/2016 8:22:04 AM	A34587
Iron	0.32	0.020		mg/L	1	6/1/2016 8:22:04 AM	A34587
EPA METHOD 8260B: VOLATILES						Analyst:	**AG**
Benzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Toluene	1.9	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Ethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Methyl tert-butyl ether (MTBE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,4-Trimethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3,5-Trimethylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Naphthalene	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1-Methylnaphthalene	ND	4.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Methylnaphthalene	ND	4.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Acetone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromodichloromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromoform	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Bromomethane	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Butanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Carbon disulfide	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Carbon Tetrachloride	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloroethane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloroform	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Chloromethane	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Chlorotoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Chlorotoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
cis-1,2-DCE	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
cis-1,3-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dibromo-3-chloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Dibromochloromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Dibromomethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,4-Dichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Glorieta GeoScience | **Client Sample ID:** EAWSD-W19-052416
Project: EAWSD Well 19 | **Collection Date:** 5/24/2016 3:20:00 PM
Lab ID: 1605C13-001 | **Matrix:** AQUEOUS | **Received Date:** 5/25/2016 2:30:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES							Analyst: **AG**
Dichlorodifluoromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloroethene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2-Dichloropropane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,3-Dichloropropane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2,2-Dichloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Hexachlorobutadiene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
2-Hexanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Isopropylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Isopropyltoluene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
4-Methyl-2-pentanone	ND	10		µg/L	1	6/1/2016 7:29:45 PM	B34608
Methylene Chloride	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
n-Butylbenzene	ND	3.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
n-Propylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
sec-Butylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Styrene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
tert-Butylbenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,1,2-Tetrachloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
trans-1,2-DCE	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
trans-1,3-Dichloropropene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,3-Trichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,4-Trichlorobenzene	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,1-Trichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,1,2-Trichloroethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Trichloroethene (TCE)	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Trichlorofluoromethane	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
1,2,3-Trichloropropane	ND	2.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Vinyl chloride	ND	1.0		µg/L	1	6/1/2016 7:29:45 PM	B34608
Xylenes, Total	ND	1.5		µg/L	1	6/1/2016 7:29:45 PM	B34608
Surr: 1,2-Dichloroethane-d4	99.6	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: 4-Bromofluorobenzene	99.3	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: Dibromofluoromethane	90.4	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608
Surr: Toluene-d8	103	70-130		%Rec	1	6/1/2016 7:29:45 PM	B34608

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: GGI   Work Order Number: 1605C13   RcptNo: 1

Received by/date: RM 05/25/16

Logged By: Ashley Gallegos 5/25/2016 2:30:00 PM

Completed By: Ashley Gallegos 5/26/2016 10:14:13 AM

Reviewed By: 05/26/16

Chain of Custody

1.	Custody seals intact on sample bottles?	Yes [ ]	No [ ]	Not Present [x]
2.	Is Chain of Custody complete?	Yes [x]	No [ ]	Not Present [ ]
3.	How was the sample delivered?	Courier		

Log In

4.	Was an attempt made to cool the samples?	Yes [x]	No [ ]	NA [ ]
5.	Were all samples received at a temperature of >0° C to 6.0°C	Yes [x]	No [ ]	NA [ ]
6.	Sample(s) in proper container(s)?	Yes [x]	No [ ]	
7.	Sufficient sample volume for indicated test(s)?	Yes [x]	No [ ]	
8.	Are samples (except VOA and ONG) properly preserved?	Yes [x]	No [ ]	
9.	Was preservative added to bottles?	Yes [ ]	No [x]	NA [ ]
10.	VOA vials have zero headspace?	Yes [x]	No [ ]	No VOA Vials [ ]
11.	Were any sample containers received broken?	Yes [ ]	No [x]	
12.	Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes [x]	No [ ]	# of preserved bottles checked for pH: 1 (<2 or >12 unless noted) Adjusted? NO
13.	Are matrices correctly identified on Chain of Custody?	Yes [x]	No [ ]	
14.	Is it clear what analyses were requested?	Yes [x]	No [ ]	
15.	Were all holding times able to be met? (If no, notify customer for authorization.)	Yes [x]	No [ ]	Checked by: AJ

Special Handling (if applicable)

16. Was client notified of all discrepancies with this order? Yes [ ] No [ ] NA [x]

Person Notified: Date:
By Whom: Via: [ ] eMail [ ] Phone [ ] Fax [ ] In Person
Regarding:
Client Instructions:

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	2.0	Good	Yes			

Chain-of-Custody Record

ient: Glorieta Geoscience Inc

ailing Address: ~~1723~~ PO Box 5727
Santa Fe NM 87505

none #: 505 983 5446

nail or Fax#: Hodgins@glorietageo.com

VQC Package:
Standard ☐ Level 4 (Full Validation)

ccreditation
NELAP ☐ Other ______

EDD (Type) ______

Turn-Around Time:
☒ Standard ☐ Rush ______

Project Name:
EAWSD Well 19

Project #:

Project Manager: Meghan Hodgins

Sampler: MH
On Ice: ☒ Yes ☐ No
Sample Temperature: 2.0

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1605C13	BTEX + MTBE + TMB's (8021)	BTEX + MTBE + TPH (Gas only)	TPH 8015B (GRO / DRO / MRO)	TPH (Method 418.1)	EDB (Method 504.1)	PAH's (8310 or 8270 SIMS)	RCRA 8 Metals	Anions (F,Cl,NO_3,NO_2,PO_4,SO_4)	8081 Pesticides / 8082 PCB's	8260B (VOA)	8270 (Semi-VOA)	Dissolved Metals: Sb + Fe				Air Bubbles (Y or N)
24/16	1520	H_2O	EAWSD-W19-052416	3 VOA, 100ml Plastic	HNO_3	-001										X		X				
			Trip blank			-002																

ate:	Time:	Relinquished by:	Received by:	Date	Time
25/16		M Hodgins (Inasw Delivery)	[signature]	05/25/16	1430
ate:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

Eldorado Area Water and Sanitation District

2021 Water Quality Report

for water treated in 2020

Este informe contiene información muy importante sobre la calidad de su agua potable. Por favor lea este informe o comuníquese con alguien que pueda traducir la información.

Your drinking water meets state and federal regulations

Last year, (2020) EAWSD conducted 638 tests for over 75 drinking water contaminants. This report presents a snapshot of the quality of the water that was provided in 2020. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) standards. EAWSD is committed to providing you with this information because we want you to be informed about your drinking water quality. For more information about your water, call (505) 466-1085 to speak with a member of the EAWSD operations staff.

Special population advisory

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

Cryptosporidium and *Giardia,* two organisms commonly linked to water-borne illness, are found primarily in surface water(SW). EAWSD is an all groundwater system. Wells in the EAWSD system are generally well constructed and maintained. The construction of the wells along with the area geology, protects the groundwater from SW contamination.

Drinking water sources

Your drinking water comes from groundwater in the Rio Grande basin. A network of local production wells pumps water from underground aquifers. The water is disinfected and either distributed directly to the customer or pumped to storage tanks from which the water is sent through the distribution system to you. Source water assessment information may be obtained from the New Mexico Environment Department by calling (505) 827-7536 or (505) 476-8620

Public participation opportunities

The EAWSD Board of Directors schedules public meetings twice a month at which public attendance and participation is welcome and encouraged. EAWSD provides information and communication to customers through its website, monthly newsletter, and postings on community bulletin boards, email communications and direct mailings, as needed. Customers are also invited to call or visit the EAWSD office with questions or to obtain information about the water system.

Telephone: (505) 466-1085
Address: 2 North Chamisa Drive
Website: http://www.EAWSD.org

Contaminants in water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants,* such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- *Pesticides & herbicides,* which may come from a variety of sources such as agriculture and residential use.
- *Radioactive contaminants,* which are naturally occurring.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and also can come from gas stations, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Lead-Specific Information

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The EAWSD is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water is available from the Safe Drinking Water Hotline at (800) 426-4791 or at http://www.epa.gov/safewater/lead.

Additional Information for Arsenic

Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

TERMS AND ABBREVIATIONS

Term & Abbreviations	
µg/L: micrograms per liter, or parts per billion (ppb)	mg/L: milligrams per liter, or parts per million (ppm)
ppm: parts per million, or milligrams per liter (mg/L)	ppb: parts per billion, or micrograms per liter (µg/L)
ppt: parts per trillion or nanogram per liter (ng/L)	pCi/L: picocuries per liter (a measure of radioactivity)
NA: Not applicable	ND: Not detected
MCLG - Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.	MCL - Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MRDLG - Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.	MRDL - Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
AL - Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.	RAA - Running Annual Average: Calculated quarterly using monthly average for the last 12 months

DETECTED CONTAMINANTS

The table below lists all of the drinking water contaminants that we detected during the 2020 calendar year of this report. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The data presented in this table are from testing done in 2020 and years prior. The New Mexico Drinking Water Bureau requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. For this reason, some of the data, though representative of the water quality, are more than one year old.

Contaminants	MCLG or MRDLG	MCL or MRDL	Detected in your water	Range		Sample Date	Violation	Typical Source
				Low	High			
Disinfectants & Disinfectant By-Products (There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
TTHMs [Total Trihalomethanes] (ppb)	NA	80	4.9	2.2	4.9	2020	No	By-product of drinking water disinfection
Haloacetic Acids (HAA5) (ppb)	NA	60	1.1	ND	1.1	2020	No	By-product of drinking water chlorination
Chlorine (as Cl2) (ppm)	4	4	0.95 (0.45 RAA)	ND	0.95	2020	No	Water additive used to control microbes
Inorganic Contaminants								
Arsenic (ppb)	0	10	3.1	ND	3.1	2020	No	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production waste
Barium (ppm)	2	2	0.2	0.08	0.2	2020	No	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Fluoride (ppm)	4	4	0.9	0.4	0.9	2020	No	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories. *(EAWSD does not add fluoride to its drinking water)*
Nitrate [measured as Nitrogen] (ppm)	10	10	3.2	ND	3.2	2020	No	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium (ppb)	50	50	2.6	ND	2.6	2020	No	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines

Zinc (ppm)	NA	5	0.06	ND	0.06	2020	No	Runoff/leaching from natural deposits; industrial wastes.
Sodium (optional) (ppm)	NA	NA	27	14	27	2020	No	Erosion of natural deposits; Leaching
Radioactive Contaminants								
Radium (combined 226/228) (pCi/L)	0	5	2.5	0.8	2.5	2020	No	Erosion of natural deposits
Uranium (combined) (µg/L)	0	30	6	3	6	2020	No	Erosion of natural deposits
Gross Alpha (pCi/L)	0	15	4.8	2.5	4.8	2020	No	Erosion of natural deposits
Beta/Photon Emitters (pCi/L)	0	50	5.3	2.6	5.3	2020	No	Decay of natural and manmade deposits

Contaminants	MCLG	AL	90th Percentile	Sample Date	# Samples Exceeding AL	Exceeds AL	Typical Source
Lead & Copper							
Copper - action level at consumer taps (ppm)	1.3	1.3	0.25	2018	0	No	Corrosion of household plumbing systems; erosion of natural deposits
Lead - action level at consumer taps (ppb)	0	15	3.9	2018	1	No	Corrosion of household plumbing systems; erosion of natural deposits

The following regulated contaminants were monitored for but not detected in your water:

Inorganic Contaminants (IOCs)		
Antimony	Cadmium	Mercury
Asbestos	Chromium	Nickel
Beryllium	Cyanide	Thallium

Volatile Organic Contaminants (VOCs)		
1,1- dichloroethylene	Carbon tetrachloride	Styrene
1,1,1- trichloroethane	Chlorobenzene	Tetrachloroethylene
1,1,2- trichloroethane	cis-1,2 dichloroethylene	Toluene
1,2-dichloroethane	Dichloromethane	trans-1,2 dichloroethylene
1,2-dichloropropane	Ethylbenzene	Trichloroethylene
1,2,4-trichlorobenzene	o-dichlorobenzene	Vinyl Chloride
Benzene	p-dichlorobenzene	Xylene (Total)

Synthetic Organic Contaminants (SOCs)		
1,2-Dibromo-3-chloropropane	di(2-ethylhexly)phthalate	Hexachlorocyclopentadiene
2,4-D	Dinoseb	Lasso
2,4,5-TP	Diquat	Methoxychlor
Atrazine	Endothall	Oxamyl
Benzo[a]pyrene	Endrin	Pentachlorophenol
BHC-Gamma	Ethylene dibromide	Picloram
Carbofuran	Glyphosate	Polychlorinated byphenyls
Chlordane	Heptachlor	Simazine
Dalapon	Heptachlor epoxide	Toxaphene
di(2-ethylhexyl)adipate	Hexachlorobenzene	Hexachlorocyclopentadiene

Monitoring and Reporting Violations

There were no violations in 2020.

WATER CONSERVATION TIPS

Did you know that the average U.S. household uses approximately 400 gallons of water per day or 100 gallons per person per day? Luckily, there are many low-cost and no-cost ways to conserve water. Small changes can make a big difference – try one today and soon it will become second nature.

- Take short showers - a 5-minute shower uses 4 to 5 gallons of water compared to up to 50 gallons for a bath.
- Shut off water while brushing your teeth, washing your hair and shaving and save up to 500 gallons a month.
- Use a water-efficient showerhead. They're inexpensive, easy to install, and can save you up to 750 gallons a month.
- Run your clothes washer and dishwasher only when they are full. You can save up to 1,000 gallons a month.
- Water plants only when necessary.
- Fix leaky toilets and faucets. Faucet washers are inexpensive and take only a few minutes to replace. To check your toilet for a leak, place a few drops of food coloring in the tank and wait. If it seeps into the toilet bowl without flushing, you have a leak. Fixing it or replacing it with a new, more efficient model can save up to 1,000 gallons a month.
- Adjust sprinklers so only your lawn is watered. Apply water only as fast as the soil can absorb it and during the cooler parts of the day to reduce evaporation.
- Teach your kids about water conservation to ensure a future generation that uses water wisely. Make it a family effort to reduce next month's water bill!
- Visit www.epa.gov/watersense for more information.

SOURCE WATER PROTECTION TIPS

Protection of drinking water is everyone's responsibility. You can help protect your community's drinking water source in several ways:

- Eliminate excess use of lawn and garden fertilizers and pesticides – they contain hazardous chemicals that can reach your drinking water source.
- Pick up after your pets.
- If you have your own septic system, properly maintain your system to reduce leaching to water sources.
- Dispose of chemicals properly; take used motor oil to a recycling center.
- Volunteer in your community. Find a watershed or wellhead protection organization in your community and volunteer to help. If there are no active groups, consider starting one. Use EPA's Adopt Your Watershed to locate groups in your community, or visit the Watershed Information Network's *How to Start a Watershed Team*.

This water quality report was prepared by Jacobs Engineering Group, as a service to the Eldorado Area Water and Sanitation District.

Eldorado Area Water and Sanitation District
Water Quality Report for Water Treated in 2021

Este informe contiene información muy importante sobre la calidad de su agua potable. Por favor lea este informe o comuníquese con alguien que pueda traducir la información.

Your drinking water meets state and federal regulations

Last year (2021) EAWSD conducted 122 tests for over 8 drinking water contaminants. This report presents a snapshot of the quality of the water that was provided in 2021. Included are details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) standards. EAWSD is committed to providing you with this information because we want you to be informed about your drinking water quality. For more information about your water, call (505) 466-1085 to speak with a member of the EAWSD operations staff.

Special population advisory

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

Cryptosporidium and *Giardia,* two organisms commonly linked to water-borne illness, are found primarily in surface water (SW). EAWSD is an all groundwater system. Wells in the EAWSD system are generally well constructed and maintained. The construction of the wells along with the area geology, protects the groundwater from SW contamination.

Drinking water sources

Your drinking water comes from groundwater in the Rio Grande basin. A network of local production wells pumps water from underground aquifers. The water is disinfected and either distributed directly to the customer or pumped to storage tanks from which the water is sent through the distribution system to you. Source water assessment information may be obtained from the New Mexico Environment Department by calling (505) 827-7536 or (505) 476-8620

Public participation opportunities

The EAWSD Board of Directors schedules public meetings twice a month at which public attendance and participation is welcome and encouraged. EAWSD provides information and communication to customers through its website, monthly newsletter, and postings on community bulletin boards, email communications and direct mailings, as needed. Customers are also invited to call or visit the EAWSD office with questions or to obtain information about the water system.

Telephone: (505) 466-1085
Address: 2 North Chamisa Road
Website: http://www.EAWSD.org

Contaminants in water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800) 426-4791.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- *Microbial contaminants*, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants,* such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- *Pesticides & herbicides,* which may come from a variety of sources such as agriculture and residential use.
- *Radioactive contaminants,* which are naturally occurring.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and also can come from gas stations, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Lead-Specific Information

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The EAWSD is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water is available from the Safe Drinking Water Hotline at (800) 426-4791 or at http://www.epa.gov/safewater/lead.

Additional Information for Arsenic

Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system and may have an increased risk of getting cancer.

TERMS AND ABBREVIATIONS

Term & Abbreviations	
µg/L: micrograms per liter, or parts per billion (ppb)	mg/L: milligrams per liter, or parts per million (ppm)
ppm: parts per million, or milligrams per liter (mg/L)	ppb: parts per billion, or micrograms per liter (µg/L)
ppt: parts per trillion or nanogram per liter (ng/L)	pCi/L: picocuries per liter (a measure of radioactivity)
NA: Not applicable	ND: Not detected
MCLG - Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.	MCL - Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
MRDLG - Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.	MRDL - Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
AL - Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.	RAA - Running Annual Average: Calculated quarterly using monthly average for the last 12 months

DETECTED CONTAMINANTS

The table below lists all of the drinking water contaminants that we detected during the 2021 calendar year of this report. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The data presented in this table are from testing done in 2021 and years prior. The New Mexico Drinking Water Bureau requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. For this reason, some of the data, though representative of the water quality, are more than one year old.

Contaminants	MCLG or MRDLG	MCL or MRDL	Detected in your water	Range		Sample Date	Violation	Typical Source
				Low	High			
Disinfectants & Disinfectant By-Products (There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
TTHMs [Total Trihalomethanes] (ppb)	NA	80	7.6	3.6	7.6	2021	No	By-product of drinking water disinfection
Haloacetic Acids (HAA5) (ppb)	NA	60	1.9	1.2	1.9	2021	No	By-product of drinking water chlorination
Chlorine (as Cl2) (ppm)	4	4	1.17 (0.45 RAA)	0.03	1.17	2021	No	Water additive used to control microbes
Inorganic Contaminants								
Arsenic (ppb)	0	10	3.1	ND	3.1	2020	No	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production waste
Barium (ppm)	2	2	0.2	0.08	0.2	2020	No	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Fluoride (ppm)	4	4	0.9	0.4	0.9	2020	No	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories. *(EAWSD does not add fluoride to its drinking water)*
Nitrate [measured as Nitrogen] (ppm)	10	10	3.8	2.0	3.8	2021	No	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium (ppb)	50	50	2.6	ND	2.6	2020	No	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines

Zinc (ppm)	NA	5	0.06	ND	0.06	2020	No	Runoff/leaching from natural deposits; industrial wastes.
Sodium (optional) (ppm)	NA	NA	27	14	27	2020	No	Erosion of natural deposits; Leaching
Radioactive Contaminants								
Radium (combined 226/228) (pCi/L)	0	5	2.5	0.8	2.5	2020	No	Erosion of natural deposits
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Copper - action level at consumer taps (ppm)	1.3	1.3	0.15	2021	0	No	Corrosion of household plumbing systems; erosion of natural deposits
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1,1,2- trichloroethane	cis-1,2 dichloroethylene	Toluene
1,2-dichloroethane	Dichloromethane	trans-1,2 dichloroethylene
1,2-dichloropropane	Ethylbenzene	Trichloroethylene
1,2,4-trichlorobenzene	o-dichlorobenzene	Vinyl Chloride
Benzene	p-dichlorobenzene	Xylene (Total)

Synthetic Organic Contaminants (SOCs)		
1,2-Dibromo-3-chloropropane	di(2-ethylhexly)phthalate	Hexachlorocyclopentadiene
2,4-D	Dinoseb	Lasso
2,4,5-TP	Diquat	Methoxychlor
Atrazine	Endothall	Oxamyl
Benzo[a]pyrene	Endrin	Pentachlorophenol
BHC-Gamma	Ethylene dibromide	Picloram
Carbofuran	Glyphosate	Polychlorinated byphenyls
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Dalapon	Heptachlor epoxide	Toxaphene
di(2-ethylhexyl)adipate	Hexachlorobenzene	Hexachlorocyclopentadiene

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This water quality report was prepared by Jacobs Engineering Group, as a service to the Eldorado Area Water and Sanitation District.

APPENDIX G:

WATER RIGHTS DOCUMENTS

STATE OF NEW MEXICO)
)
OFFICE OF THE STATE ENGINEER)

PARTIAL LICENSE

Licenses Nos. RG-18529 & RG-18556

Refers to OSE Permit Nos. RG 18528, RG 18529, RG 18543, RG 18550, RG 18515, RG 18571, RG 18595, RG 18531, RG 18517, RG-18556, RG-18524, RG 18529-S, (RG 18528, RG 18543, RG 18550)-S, (RG 18528, RG 18529,RG 18543, RG 18550, RG 18515, RG 18571, RG 18595, RG 18531)-S, (RG 18528, RG 18529,RG 18543, RG 18550, RG 18515, RG 18571, RG 18595, RG 18531, RG 18517)-S

FINDINGS

The State Engineer finds the following:

WHEREAS, prior to December 31, 1970, Eldorado at Santa Fe, Inc. had underway a program of drilling for exploration and/or production of underground water for subdivision and related purposes.

WHEREAS, on December 31, 1970, the New Mexico State Engineer issued Special Order No. 113, extending the boundaries of the Rio Grande Underground Water Basin to include the Eldorado at Santa Fe, Inc. subdivision.

WHEREAS, on March 9, 1971, Eldorado at Santa Fe, Inc. filed eighty-four (84) Declarations of Underground Ownership Rights with Office of the State Engineer declaring the following claims to water rights:

OSE File No.	Priority Date	Capacity GPM	Acre-feet Year Claimed
RG-18512	Pre-1969	3	4.8
RG-18513	Pre-1969	8	12.9
RG-18514	Pre-1969	3	4.8
RG-18515	Pre-1969	18	29.0
RG-18516	Pre-1969	4.5	7.2
RG-18517	Pre-1969	15	24.2

RG-18518	Pre-1969	3	4.8
RG-18519	Pre-1969	3	4.8
RG-18520	Pre-1969	8	12.9
RG-18521	Pre-1969	3	4.8
RG-18522	Pre-1969	3	4.8
RG-18523	Pre-1969	3	4.8
RG-18524	Pre-1969	3	4.8
RG-18525	Pre-1969	3	4.8
RG-18526	Pre-1969	3	4.8
RG-18527	Pre-1969	3	4.8
RG-18528	12-26-1969	94	151.3
RG-18529	12-26-1969	190	305.9
RG-18530	12-26-1969	3	4.8
RG-18531	03-11-1970	120	193.2
RG-18532	03-12-1970	50	80.5
RG-18533	03-18-1970	50	80.5
RG-18534	03-18-1970	50	80.5
RG-18535	03-19-1970	50	80.5
RG-18536	03-24-1970	50	80.5
RG-18537	03-31-1970	200	322.0
RG-18538	04-08-1970	200	322.0
RG-18539	04-10-1970	200	322.0
RG-18540	04-17-1970	3	4.8
RG-18541	04-18-1970	15	24.2
RG-18542	04-27-1970	8	12.9
RG-18543	04-30-1970	51	82.1
RG-18544	05-03-1970	100	161.0
RG-18545	05-04-1970	100	161.0
RG-18546	05-12-1970	50	80.5
RG-18547	05-13-1970	100	161.0
RG-18548	05-15-1970	100	161.0
RG-18549	05-26-1970	50	80.5
RG-18550	06-05-1970	51	82.1
RG-18551	06-15-1970	5	8.1
RG-18552	06-17-1970	5	8.1
RG-18553	06-19-1970	100	161.0
RG-18554	06-24-1970	100	161.0
RG-18555	06-29-1970	5	8.1
RG-18556	07-01-1970	500	805.0
RG-18557	07-07-1970	5	8.1
RG-18558	07-08-1970	250	402.5
RG-18559	10-02-1970	20	32.2
RG-18560	10-05-1970	20	32.2
RG-18561	10-06-1970	25	40.2
RG-18562	10-06-1970	15	24.2
RG-18563	10-07-1970	15	24.2

RG-18564	10-08-1970	15	24.2
RG-18565	10-09-1970	50	80.5
RG-18566	10-09-1970	15	24.2
RG-18567	10-12-1970	17	27.4
RG-18568	10-17-1970	14	22.5
RG-18569	10-22-1970	15	24.2
RG-18570	10-26-1970	6	9.7
RG-18571	10-29-1970	400	644.0
RG-18572	11-02-1970	99	159.4
RG-18573	11-05-1970	15	24.2
RG-18574	11-09-1970	15	24.2
RG-18575	11-26-1970	75	120.8
RG-18576	11-26-1970	75	120.8
RG-18577	11-26-1970	75	120.8
RG-18578	11-26-1970	75	120.8
RG-18579	11-27-1970	75	120.8
RG-18580	11-27-1970	75	120.8
RG-18581	11-27-1970	75	120.8
RG-18582	11-27-1970	75	120.8
RG-18583	11-30-1970	15	24.2
RG-18584	11-30-1970	15	24.2
RG-18585	12-01-1970	25	40.2
RG-18586	12-01-1970	25	40.2
RG-18587	12-02-1970	15	24.2
RG-18588	12-04-1970	300	483.0
RG-18589	12-04-1970	25	40.2
RG-18590	12-04-1970	15	24.2
RG-18591	12-08-1970	15	24.2
RG-18592	12-08-1970	25	40.2
RG-18593	12-08-1970	15	24.2
RG-18594	12-10-1970	25	40.2
RG-18595	12-17-1970	400	644.0

WHEREAS, on December 20, 1972, the State of New Mexico filed a complaint in the First Judicial District Court requesting that the Court "declare and determine the nature and extent of the rights, if any, of Eldorado at Santa Fe, Inc. to complete development and/or to divert and use the public waters of the Rio Grande Underground Water Basin." *State of New Mexico, ex rel., S.E. Reynolds, State Engineer and Eldorado at Santa Fe, Inc.*, Santa Fe County Cause No. 45612.

WHEREAS, on December 29, 1972 a Judgment was entered in the First Judicial District Court approving the stipulation between the State of New Mexico and Eldorado at Santa Fe, Inc., *Id.* ("1972 Judgment") whereby the following limitations were placed on the above declared water rights:

> 1. Eldorado at Santa Fe, Inc.... divert the underground water of the Rio Grande Underground Water Basin and apply them to beneficial use of domestic, municipal, construction and recreation purposes, by means of wells numbered RG-18528, RG-18529, RG-18543, and RG-18550, to the capacity of those wells as completed before December 31, 1970. ("Paragraph One Wells")
>
> 2. Eldorado at Santa Fe, Inc., has the right to complete the repair, rehabilitation and conversion of, but not to deepen or enlarge, those wells numbered consecutively from RG-18512 to and including RG-18527 and to divert the water of the Rio Grande Underground Water Basin therefrom, and to apply said water to beneficial use for domestic, municipal, industrial, recreational and construction purposes within a reasonable time, to the capacity those wells had on or before December 31, 1970. ("Paragraph Two Wells")
>
> 3. Eldorado at Santa Fe, Inc., may enlarge but may not deepen wells numbered RG-18531, RG-18556, RG-18561, RG-18563, RG-18567, RG-18568, RG-18570, RG-18571, RG-18572, RG-18591, RG-18594, and RG-18595; Eldorado at Santa Fe, Inc., may divert and place to beneficial use for domestic, municipal, industrial, recreation and construction purposes within a reasonable time, by means of said wells, the water Rio Grande Underground Water Basin, to the extent of the capacity of those wells as enlarged and equipped. ("Paragraph Three and Four Wells")
>
> 4. Eldorado at Santa Fe, Inc., may not change, partially or totally, the point of diversion or place or purpose of use of wells numbered RG-18531, RG-18556, RG-18561, RG-18563, RG-18567, RG-18568, RG-18570, RG-18571, RG-18572, RG-18591, RG-18594, and RG-18595 by means of replacement or supplemental wells except when and to the extent that the rights to said water rights have then been vested by actual beneficial use. ("Paragraph Three and Four Wells")
>
> 5. Eldorado at Santa Fe, Inc., does not own the right to use, develop or improve any holes or wells at Eldorado at Santa Fe, except as expressly decreed herein or as may be allowed by permit from the State Engineer. In particular, Eldorado at Santa Fe, Inc., does not own the right to use, develop or improve those holes or wells numbered RG-18530, RG-18532

through RG-18542; RG-18544 through RG-18549; RG-18552 through RG-18555; RG-18557 through RG-18560; RG-18562; RG-18564 through RG-18566; RG-18569, RG-18573, RG-18575 through RG-18590; and RG-18593. ("Paragraph Five Wells")

WHEREAS, on February 17, 1978, a Change of Ownership of Water Right was filed with the State Engineer conveying all of the water rights owned by Eldorado at Santa Fe, Inc. to El Dorado Utilities, Inc ("EUI").

WHEREAS, on May 11, 1983 an Application for Permit to Change Location of Well RG-18556 was filed with the State Engineer. On July 21, 1983 the application was conditionally approved by the State Engineer. The Galisteo Domestic Water Users Association sought and was granted a writ of certiorari in the First Judicial District Court for review of the State Engineer's action conditionally approving the change of location of well RG-18556. On December 14, 1988 the District Court voided the action of the State Engineer and remanded the matter to the State Engineer for new proceedings on the original application. *Galisteo Domestic Water Users Assn. v. Reynolds*, Santa Fe County Cause No. SF-86-473(c) (Dec. 14, 1988). On October 11, 1991 the New Mexico Court of Appeals affirmed the District Court's order of December 14, 1988. *Eldorado at Santa Fe, Inc. v. Cook*, 113 N.M. 33, 822 P.2d 672 (Ct. App. 1992). On December 16, 1992 the State Engineer entered an order denying the 1983 application for change of location of well. EUI was aggrieved by the State Engineer's denial and requested a hearing with the State Engineer. After a formal hearing, the Hearing Examiner entered a report and the State Engineer accepted the findings recommending the denial of the application to change point of diversion on September 8, 1993. On October 14, 1993 EUI filed an appeal from the State Engineer's decision with the First Judicial District. The District Court dismissed the appeal on March 24, 1994. On April 22, 1994 EUI appealed the

District Court's decision. The New Mexico Court of Appeals reversed and remanded the matter to the District Court on May 11, 1995. *El Dorado Utilities, Inc. v. Galisteo Domestic Water Users Association and New Mexico State Engineer,* 120 N.M. 165, 899 P. 2d 608 (Ct. App. 1995). On April 10, 1997 the District Court denied EUI's application to change location of well RG-18556 ordering that EUI shall cease and desist the diversion and use of ground water from the "move-to" location of well RG-18556 after sixty (60) days and that EUI is permanently enjoined from diverting ground water from and otherwise using the "move-to" location except as may be allowed by a permit issued by the State Engineer.

WHEREAS, on June 26, 1997, EUI filed Amended Declarations of Underground Water Rights for RG-18523 and RG-18524 amending the originally declared capacity of both wells from 4.8 acre-feet per year to 242 acre-feet per year each. The Amended Declarations were not accepted for filing by the State Engineer. EUI requested a hearing before the State Engineer. The State Engineer determined that he had the discretion to refuse to accept the amended declarations. EUI filed an appeal from the State Engineer's decision on November 9, 2000 in the First Judicial District Court. *In Re Eldorado Utilities Inc.*, D-101-CV-2002668 (Nov. 9, 2000). On October 6, 2003 the District Court entered a judgment affirming that the State Engineer acted within his discretion in refusing to accept the 1997 amended declarations for filing. EUI appealed this decision, and on February 23, 2005 the New Mexico Court of Appeals affirmed that the District Court did not err when it determined that the State Engineer had the authority to refuse to accept the 1997 amended declarations.

WHEREAS, on March 28, 1996 EUI filed an application for a permit to use emergency supplemental well RG-62602 Explore to supplement RG-18529 (RG-18529-S). The State Engineer partially approved this application on November 18, 1996. On January 22, 1997 the State Engineer amended his November 18, 1996 order. The November 18, 1996 order was set-aside on February 28, 1997 following the timely aggrieval of EUI. On August 30, 2001 the State Engineer re-instated permit RG-18529-S for the supplemental amount not to exceed 305.9 acre-feet per year from wells RG-18529 and RG-18529-S, combined.

WHEREAS, on March 5, 1999 EUI filed an application to supplement wells RG-18528, RG-18543, RG-18550 with RG-65707 exploratory-1. Supplemental well permit (RG-18528, RG-18543, RG-18550)-S was issued on July 1, 1999 limited to the diversion of water applied to beneficial use not to exceed 111.07 acre-feet per year combined.

WHEREAS, on April 10, 2000 EUI filed an application to supplement wells RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531. The permit for the use of supplemental well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S was issued on June 4, 2001, and amended on August 30, 2001. The permit allows for the supplemental right to divert and use ground water not to exceed diversions from the individual wells for the following amounts:

RG-18528	151.3 acre-feet per year
RG-18529	305.9 acre-feet per year
RG-18543	82.1 acre-feet per year
RG-18550	82.1 acre-feet per year
RG-18515	13.7 acre-feet per year
RG-18531	26.7 acre-feet per year
RG-18571	37.8 acre-feet per year
RG-18595	81.1 acre-feet per year

WHEREAS, In 2005, all of EUI's assets, including all water rights, were acquired by the Eldorado Area Water and Sanitation District ("EAWSD") through condemnation in *Eldorado Area Water and Sanitation District v. El Dorado Utilities, Inc.,* Case No. D-101-CV-200400276. EAWSD is successor in interest to EUI.

WHEREAS, On March 13, 2007 EAWSD filed an application for a permit to drill a supplemental well to supplement well Nos. RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531, and RG-18517. The State Engineer permitted the right to divert from this well not to exceed 115 acre-feet per year on April 27, 2010.

WHEREAS, EAWSD utilizes two distinct sources of underground water to supply its integrated water system. Wells RG-18524 and RG-18556 ("Galisteo Creek Wells") produce water from the buried alluvium beneath the Galisteo Creek. This alluvium is connected to stream flow within the Galisteo Creek. Wells RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531, and RG-18517 ("Central Well Field") produce water from the Santa Fe Group and older bedrock formations. The wells in the Central Well Field are located north of the escarpment overlooking the Galisteo Creek Valley, and south of Interstate 25, as described in the corresponding declarations and permits.

WHEREAS, pursuant to the 1972 Judgment, permits and other court orders, EAWSD has the recognized right to divert underground water not to exceed the following amounts:

<u>Central Well Field</u>

RG-18515 24.0 acre-feet per year

RG-18517	17.4 acre-feet per year
RG-18528	151.3 acre-feet per year
RG-18529	305.9 acre-feet per year
RG-18531	46.9 acre-feet per year
RG-18543	82.1 acre-feet per year
RG-18550	82.1 acre-feet per year
RG-18571	45.7 acre-feet per year
RG-18595	82.0 acre-feet per year
Total	837.4 acre-feet per year

Galisteo Creek Wells

RG-18524	4.8 acre-feet per year
RG-18556	195.4 acre-feet per year
Total	200.2 acre-feet per year

Total EAWSD Water Rights 1037.6 acre-feet per year

Pursuant to the laws of New Mexico and the conditions of the court orders and permits pertaining to each well.

WHEREAS, EAWSD, and its predecessors in interest have applied water to beneficial use within the integrated water delivery system and has filed a Proof of Application of Water to Beneficial Use, based upon actual meter readings, to the following extent:

Central Well Field

RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531, RG-18517, RG-18529-S, and (RG-18528, RG-18543, RG-18550)-S, (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531) - S

Total 583.23 acre-feet in 2003

Galisteo Creek Wells

RG-18524 and RG-18556, combined

Total 200.20 acre-feet in 2005

Total EAWSD Wells

Total	783.43 acre-feet per year

WHEREAS, in order to minimize future litigation and to conserve the resources of all interested entities, the partial license seeks to reflect the extent of existing water rights and rights to further develop ground water rights of EAWSD consistent with the 1972 Judgment in light of current legal, factual and scientific conditions.

WHEREAS, the purpose of this partial license is to provide certainty for EAWSD's water resource future as to how it may develop the 1972 Judgment acknowledged ground water rights, so as to minimize, if not reduce, the impacts on flows of the Galisteo Creek, and to set forth the existing points of diversion, amounts of water, conditions on such uses as well, amounts of water, and conditions on such development.

LICENSE Nos. RG-18529 and RG-18556[1]

NOW, THEREFORE, I, John D'Antonio, Jr., P.E., New Mexico State Engineer, by virtue of the authority vested in me by the laws of said State, do hereby grant to Eldorado Area Water and Sanitation District, 1 Caliente Road, Suite F, Santa Fe, State of New Mexico, License Nos. RG-18529 and RG-18556 to appropriate underground water.

License No. RG-18529: Central Well Field

1. **Amount of Water:** 583.23 acre-feet per year, combined, provided that the maximum amount of water diverted from each individual point of diversion listed below shall not exceed:

RG-18515	24.0 acre-feet per year
RG-18517	17.4 acre-feet per year
RG-18528	151.3 acre-feet per year

[1] The name for this License was chosen for ease of reference and shall not be construed to mean that EAWSD Well Nos. RG-18529 or RG-18556 must be active wells in order for this License to have effect.

<u>RG-18529</u>	305.9 acre-feet per year
<u>RG-18531</u>	46.9 acre-feet per year
<u>RG-18543</u>	82.1 acre-feet per year
<u>RG-18550</u>	82.1 acre-feet per year
<u>RG-18571</u>	45.7 acre-feet per year
<u>RG-18595</u>	82.0 acre-feet per year
<u>RG-18529-S</u>	305.9 acre-feet per year combined from RG-18529 and RG-18529-S

<u>(RG-18528, RG-18543, RG-18550)-S</u> 111.07 acre-feet per year as follows:

A. The diversion of water from well No. (RG-18528, RG-18543, RG-18550)-S to supplement well No. RG-18543 shall not exceed the difference between 65.344 acre-feet per year and the actual annual diversion amount from well No. RG-18528.
B. The diversion of water from well No. (RG-18528, RG-18543, RG-18550)-S to supplement well No. RG-18543 shall not exceed the difference between 15.39 acre-feet per year and the actual annual diversion amount from well No. RG-18543.
C. The diversion of water from well No. (RG-18528, RG-18543, RG-18550)-S to supplement well No. RG-18550 shall not exceed the difference between 30.336 acre-feet per year and the actual annual diversion amount from well No. 18550.

In no event shall the total diversion of water from well No. (RG-18528, RG-18543, RG-18550)-S exceed 111.07 acre-feet per year.

<u>(RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S</u> 780.7 acre-feet per year as follows:

A. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. (RG-18528, RG-18543, RG-18550)-S and well No. RG-18528, combined, shall not exceed 151.3 acre-feet per year.
B. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. RG-18529-S, and well No. RG-18529, combined, shall not exceed 305.9 acre-feet per year.
C. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. (RG-18528, RG-18543, RG-18550)-S and well No. RG-18543, combined, shall not exceed 82.1 acre-feet per year.
D. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. (RG-18528, RG-18543, RG-18550)-S and well No. (RG-18528, RG-18543, RG-18550)-S and well No. RG-18550, combined, shall not exceed 82.1 acre-feet per year.

E. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. RG-18515, combined, shall not exceed 13.7 acre-feet per year.
F. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. RG-18531, combined, shall not exceed 26.7 acre-feet per year.
G. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. RG-18571, combined, shall not exceed 37.8 acre-feet per year.
H. The diversion of water from well No. (RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S and well No. RG-18595, combined, shall not exceed 81.1 acre-feet per year.

<u>(RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531, RG-18517) – S</u> 115 acre-feet per year

2. **Priority Date:** declared initiation of claim to a water right:

RG-18515	December 31, 1968
RG-18517	December 31, 1968
RG-18528	December 26, 1969
RG-18529	December 26, 1969
RG-18531	March 11, 1970
RG-18543	April 30, 1970
RG-18550	June 5, 1970
RG-18571	October 29, 1970
RG-18595	December 17, 1970

3. **Points of Diversion:**

OSE Well No.	X	Y
RG-18515	1,744,033.52	1,655,457.13
RG-18517	1,747,643.034	1,649,614.646
RG-18528	1,722,808.653	1,656,995.242
RG-18529	1,730,509.193	1,657,197.583
RG-18531	1,748,859.277	1,644,027.293
RG-18543	1,742,583.229	1,656,271.569
RG-18550	1,742,393.982	1,656,859.856
RG-18571	1,736,030.755	1,648,956.374
RG-18595	1,738,760.094	1,645,503.057
RG-18529-S	1,742,774.701	1,649,054.443
(RG-18528, RG-18543, RG-18550)-S	1,741,781.056	1,650,636.692
(RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571 RG-18595, RG-18531)-S	1,742,867.970	1,648,148.818

(RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571 RG-18595, RG-18531, RG-18517)-S	1,748,419.320	1,651,334.069

Well Coordinates are New Mexico State Plane Grid Coordinate Central Zone, NAD, 1983 and are expressed in feet. Consistent with applicable law, EAWSD may construct additional points of diversion to divert the water identified in this license through the application and permit process.

4. **Place of Use:** The place of use shall be the service area of EAWSD, as shown on "plat of acreage reparcelization" at Eldorado at Santa Fe, comprising portions of Canada de Los Alamos and Bishop John Lamy Grants, Recorded October 15, 1981, under reception No. 486,453, Book 107, Plat Page 6-6C, Records of Santa Fe County, New Mexico. Attached as Exhibit I

5. **Purpose of Use:** Domestic, Commercial, Industrial, Recreational and Construction.

   Same to be used as above stated and can be changed only as provided by law, and provided that any future additional points of diversion constructed to divert water under this license shall not be exercised to the impairment of any other person having existing rights to the public waters of the State of New Mexico, or contrary to the conservation of water, or contrary to public welfare.

6. Diversion of water from all wells shall each be metered with a totalizing meter(s), of a type and at a location approved by, and acceptable to the State Engineer. EAWSD shall provide the make, model, serial number, initial reading, units, multiplier, and the dates of installation and any calibration of the meter(s) to the State Engineer.

7. Records of the total amount of water diverted from all wells shall be submitted to the District VI Office of the State Engineer, in writing, on or before the 10th day of each month for the preceding calendar month.

8. EAWSD shall utilize the highest and best technology available to ensure conservation of water to maximum extent practical.

9. EAWSD shall comply with requirements of the Monitoring Well Network and Groundwater Monitoring Plan, Eldorado Area Water and Sanitation District as approved by the State Engineer, attached as Exhibit 2, and any requirements contained in amended monitoring plans approved by the State Engineer.

10. The State Engineer shall retain jurisdiction over this license for the purpose of ensuring that the exercise of the license does not violate the foregoing conditions.

License No. RG-18556 : Galisteo Creek Wells

1. **Amount of Water:** 200.20 acre-feet per year, combined, provided that the maximum amount of water diverted from each individual point of diversion listed below shall not exceed:

RG-18524	4.8 acre-feet per year
RG-18556	195.4 acre-feet per year

2. **Priority Date:** declared initiation of claim to a water right:

RG-18524	December 31, 1968
RG-18556	July 1, 1970

3. **Points of Diversion:**

OSE Well No.	X	Y
RG-18524	1,748,393.685	1,628,753.373
RG-18556	1,745,852.741	1,627,108.831

Well Coordinates are New Mexico State Plane Grid Coordinate Central Zone, NAD, 1983 and are expressed in feet. Consistent with applicable law, EAWSD may construct additional points of diversion to divert the water identified in this license through the application and permit process.

4. **Place of Use:** The place of use shall be the service area of EAWSD, as shown on "plat of acreage reparcelization" at Eldorado at Santa Fe, comprising portions of Canada de Los Alamos and Bishop John Lamy Grants, Recorded October 15, 1981, under reception No. 486,453, Book 107, Plat Page 6-6C, Records of Santa Fe County, New Mexico. *See* Exhibit I

5. **Purpose of Use:** Domestic, Commercial, Industrial, Recreational and Construction.

Same to be used as above stated and can be changed only as provided by law, and provided that any future additional points of diversion constructed to divert water under this license shall not be exercised to the impairment of any other person having existing rights to the public waters of the State of New Mexico, or contrary to the conservation of water, or contrary to public welfare.

6. Diversion of water from all wells shall each be metered with a totalizing meter(s), of a type and at a location approved by, and acceptable to the State Engineer. EAWSD shall provide the make, model, serial number, initial reading, units, multiplier, and the dates of installation and any calibration of the meter(s) to the State Engineer.
7. Records of the total amount of water diverted from all wells shall be submitted to the District VI Office of the State Engineer, in writing, on or before the 10th day of each month for the preceding calendar month.
8. EAWSD shall utilize the highest and best technology available to ensure conservation of water to maximum extent practical.
9. The State Engineer shall retain jurisdiction over this license for the purpose of ensuring that the exercise of the license does not violate the foregoing conditions.

Additional Points of Diversion

EAWSD may construct additional points of diversion to divert the water identified in License Nos. 18529 and 18556 ("Licenses") through the application and permit process consistent with applicable law. Pumping from additional points of diversion cannot increase the overall depletions caused by EAWSD's current pumping on the Galisteo Creek.

Remaining Appropriative Rights in the Central Well Field under the 1972 Judgment

The appropriative water rights related to the wells specified in Paragraph One of the 1972 Judgment, RG-18528, RG-18529, RG-18543 and RG-18550 in the Central Well Field, that have not been licensed above, shall not exceed 254.37 acre-feet per year in addition to the amount of water under License No. RG-18529, described above. EAWSD has a period of twenty (20) years to perfect, by application to beneficial use within the EAWSD service area and delivered through the EAWSD integrated delivery system, 254.37 acre-feet per year of water rights within the Rio Grande Underground Water Basin from wells RG-18528, RG-18529, RG-18543, RG-18550 and permitted additional points of diversions to the water rights associated with wells RG-18528, RG-18529, RG-18543, RG-18550 in the Central Well Field. One-half of this amount, or 127.185 acre-feet per year, must be put to beneficial use within the first 10-year period and the other one-half, or 127.185 acre-feet per year, must be put to beneficial use within the next 10-year period from the date License No. RG-18529 is issued ("Development Schedule"). If the full amount allocated for development during either 10-year period is not put to beneficial use, the unused portion will be lost.[2] No requests for extension of time in which to perfect these water rights will be considered on either allocation. This

[2] For example, if EAWSD puts 89.185 acre-feet per year to beneficial use out of the allocation for the first 10-year period (127.185 acre-feet per year), the right for the total 20-year period will be reduced by 38 acre-feet per year. In this example, the total right remaining for use during the second 10-year period will be 127.185 acre-feet per year (new allocation) plus 89.185 acre-feet per year (perfected 1st 10-year allocation).

Development Schedule does not prevent EAWSD from perfecting the entire, or less than the, 254.37 acre-feet allocation in the first 10-year period.

EAWSD shall file with State Engineer its proof of beneficial use for the first 10-year period on or before January 31, 2021 and shall file with the State Engineer its proof of beneficial use for the second 10-year period on or before January 31, 2031. Once this process is complete, the State Engineer will issue a final license for EAWSD's entire water right. EAWSD shall install totalizing meters, of a type and at a location approved by, and acceptable to the State Engineer on every well.

If EAWSD severs, including leasing, any portion of the water rights licensed above or the water subject to the Development Schedule above, from the EAWSD service area or the EAWSD integrated delivery system or ownership of, EAWSD waives its right to further develop its appropriative rights under the 1972 Judgment as recognized under the Development Schedule. If EAWSD conveys the entire water utility, including the water rights, the right to develop water use subject to the Development Schedule will transfer subject to the terms of this partial license. EAWSD is forever barred from raising any claims to water rights subject to the 1972 Judgment that are not specifically referenced above.

Any increase in total diversion of water from the Central Well Field above 583.23 acre-feet per year shall be accomplished by utilizing additional points of diversion in the Central Well Field to the water rights associated with wells RG-18528, RG-18529, RG-18543, and RG-18550, and shall be done so by application to the State Engineer. The cumulative amount of water placed to beneficial use with water diverted from wells in the Central Well Field, including future additional points of diversion, will be the measurement by which development rights are accounted for under the Development Schedule. Applications for additional points of diversion shall be made in a manner consistent with the laws of New Mexico at the time of application. Each application for an additional point of diversion in the Central Well Field must include characterization information and assessment of drawdown and stream depletions due to the proposed well diversion and the impact of drawdown on existing well completions, a summary and analysis of all water level data collected to date, and proposed approach for revision of the most current monitoring plan approved in accordance with License RG-18529 based upon actual tests and data collected from an exploratory well that is acceptable to the State Engineer.

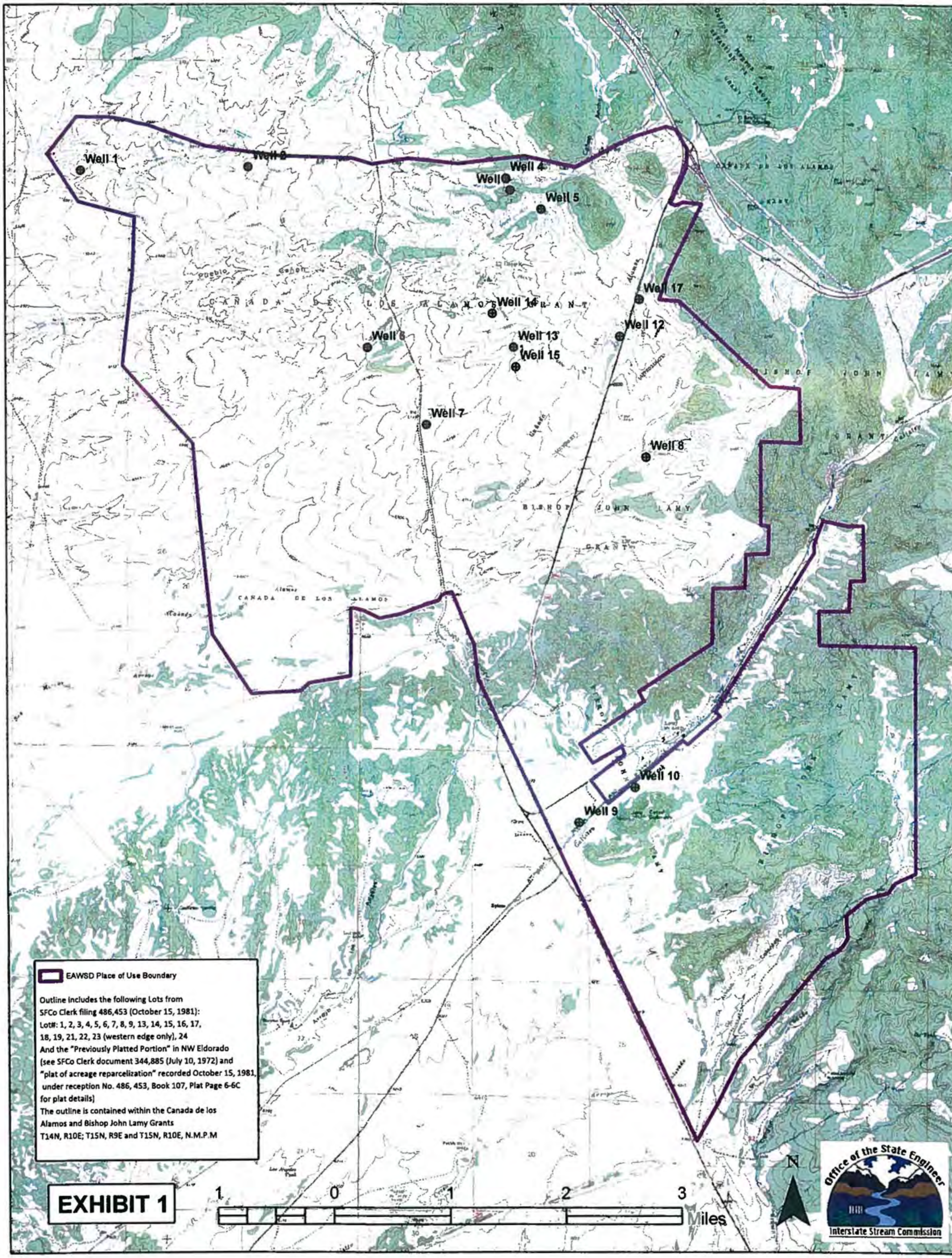
Limitations to Combine and Commingle Water Rights

The State Engineer further finds that the EAWSD may combine and commingle water rights from the Galisteo Creek Wells and the Central Well Field as follows: at no time can EAWSD divert more than 200.20 acre-feet per year from the Galisteo Creek Wells. Diversions from the Central Well Field cannot exceed the quantity of water recognized under License RG-18529 plus the amount of water developed pursuant to the Development Schedule, without filing an application consistent with New Mexico law and obtaining a permit to do so from the State Engineer.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 4th day of June 2010.

JOHN R. D'ANTONIO, JR. PE
NEW MEXICO
14846
STATE ENGINEER
REGISTERED PROFESSIONAL ENGINEER

John R. D'Antonio, Jr., P.E.
New Mexico State Engineer



Well 1
Well 2
Well 4
Well
Well 5
Well 17
Well 14
Well 12
Well 6
Well 13
Well 15
Well 7
Well 8
Well 10
Well 9
CAÑADA DE LOS ALAMOS GRANT
BISHOP JOHN LAMY GRANT
CANADA DE LOS ALAMOS
EAWSD Place of Use Boundary
Outline includes the following Lots from
SFCo Clerk filing 486,453 (October 15, 1981):
Lot#: 1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17,
18, 19, 21, 22, 23 (western edge only), 24
And the "Previously Platted Portion" in NW Eldorado
(see SFCo Clerk document 344,885 (July 10, 1972) and
"plat of acreage reparcelization" recorded October 15, 1981,
under reception No. 486, 453, Book 107, Plat Page 6-6C
for plat details)
The outline is contained within the Canada de los
Alamos and Bishop John Lamy Grants
T14N, R10E; T15N, R9E and T15N, R10E, N.M.P.M
EXHIBIT 1
1
0
1
2
3
Miles
N
Office of the State Engineer
Interstate Stream Commission

Scott A. Verhines, P.E.
State Engineer

Santa Fe Office
PO BOX 25102
SANTA FE, NM 87504-5102

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Trn Nbr: 482870
File Nbr: RG 18529

May. 01, 2012

DAVID DENIG-CHATROFF
ELDORADO WATER AND SAN. DIST.
1 CALIENTE RD, SUITE F
SANTA FE, NM 87508

Greetings:

Enclosed is your copy of the above numbered permit that has been approved subject to the conditions set forth on the approval page. Please review the conditions for any required submittals. If submittals are not made by the date(s) indicated in the conditions, your rights under this permit are subject to expiration unless a request for an Extension of Time is received in this office by that date and subsequently approved.

NOTE: Proof of Beneficial Use, if required, may need signature by an engineer or surveyor registered in the State of New Mexico for whom it is your responsibility to designate and pay. When ready for inspection, please contact this office for further instructions.

Proof of Completion of Well is due October 31, 2012.

Appropriate forms can be downloaded from the OSE website www.ose.state.nm.us or will be mailed upon request.

Sincerely,

Jerri L Trujillo

Jerri Trujillo
Water Resource Specialist
Upper Pecos Basin Manager
(505)827-6120

Enclosure

nonapprove

HC
6-33884
25-

File Number: RG-18529
(For OSE Use Only)

NEW MEXICO OFFICE OF THE STATE ENGINEER
APPLICATION FOR PERMIT TO ADD ADDITIONAL POINT OF DIVERSION UNDER PARTIAL LICENSE NOS. RG-18529 & RG-18556
AND REQUEST FOR EMERGENCY AUTHORIZATION

1. WATER RIGHT OWNER

Name: Eldorado Area Water & Sanitation District ("EAWSD")
Contact: c/o David Denig-Chakroff, Gen. Mgr. Work Phone: 505-466-2531
Address: 1 Caliente Rd, Suite F Cell Phone: 505-629-6958

City: Santa Fe State: NM Zip: 87508

2. QUANTITY

Consumptive Use: 200* acre-feet per annum**
Diversion Amount: 200* acre-feet per annum**

*** First from the 583.23 acre-feet per annum of rights recognized under the "License No. RG-18529: Central Well Field" portion of the Partial License Nos. RG-18529 & RG-18556, issued June 4, 2010 and, when that amount is met from this well and the other wells in the Central Well Field in a given year, from the 254.37 acre-feet per annum which EAWSD has a right to develop under the terms of the "Remaining Appropriative Right in the Central Well Field under the 1972 Judgment" section of the Partial License.**

**** Request for EMERGENCY Permit limited to 120 acre-feet for five months period.**

3. PURPOSE OF USE

Domestic: X Livestock: ___ Irrigation: ___ Municipal: ___ Industrial: X
Commercial: X Other (specify): Recreation and Construction
Specific use: ___

4. PLACE OF USE

___ acres of land described as follows:

The Service Area of EAWSD, as shown on "plat of acreage reparcelization" at Eldorado at Santa Fe, comprising portions of Cañada de Los Alamos and Bishop John Lamy Grants, Recorded October 15, 1981, under reception No. 486,453, Book 107, Plat Page 6-6C, Records of Santa Fe County, New Mexico. A map identifying the District's service area is attached hereto as Ex. A.

Who is the owner of the land? Various

If there are other sources of water for these lands, describe by file number:
See Partial License Nos. RG-18529 & RG-18556, issued June 4, 2010

RECEIVED
OFFICE OF STATE ENGINEER
SANTA FE NEW MEXICO
DATE May 03, 2011

2011 MAY -6 PM 12:54
OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

Do Not Write Below This Line

File Number: "RG-18529 etal" Trn Number: 482870
Form: wr-10

File Number: ______________
(For OSE Use Only)

NEW MEXICO OFFICE OF THE STATE ENGINEER
APPLICATION FOR PERMIT TO ADD ADDITIONAL POINT OF DIVERSION
UNDER PARTIAL LICENSE NOS. RG-18529 & RG-18556
*****AND REQUEST FOR EMERGENCY AUTHORIZATION*****

5. LOCATION OF EXISTING POINT OF DIVERSION (A, B, C, or D required, E or F if known)
(IF Surface Water Source, J also Required)

***** See Exhibit B *****

A. ____1/4 ____1/4 ____1/4 Section:____ Township:____ Range:____ N.M.P.M. in ______________________________ County.

B. X =____________ feet, Y = ______________ feet, N.M. Coordinate System __________ Zone in the ______________________________ Grant. U.S.G.S. Quad Map ____________

C. Latitude: ______d _____m _________s Longitude: ______d _____m _________s

D. East __________ (m), North __________ (m), UTM Zone 13, NAD __ (27 or 83)

E. Tract No. _____, Map No. _____ of the ______________ Hydrographic Survey

F. Lot No. _____, Block No. _____ of Unit/Tract ____________________ of the ____________________ Subdivision recorded in ____________________ County.

G. Other: ______________________________

H. Give State Engineer File Number if existing diversion: ______________

I. On land owned by (required): ______________________________

J. Source of surface water supply:
   a. Name of ditch, acequia, or spring: ______________________________
   b. Stream or water course: ______________________________
   c. Tributary of: ______________________________

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File Number: ______________ Trn Number: ______________

NEW MEXICO OFFICE OF THE STATE ENGINEER
APPLICATION FOR PERMIT TO ADD ADDITIONAL POINT OF DIVERSION UNDER PARTIAL LICENSE NOS. RG-18529 & RG-18556
AND REQUEST FOR EMERGENCY AUTHORIZATION

6. LOCATION OF ADDITIONAL POINT OF DIVERSION

A. LOCATION OF WELL (a, b, c, or d required, e or f if known)

a. ____1/4 ____1/4 ____1/4 Section:____ Township:____ Range:____N.M.P.M. in ______________________ County.

b. X = 1,749,331.97 feet, Y = 1,651,830.13 feet, N.M. Coordinate System Central Zone in the Cañada De Los Alamos Grant. U.S.G.S. Quad Map Seton Village

c. Latitude: ______d _____m _________s Longitude: ______d _____m _______s

d. East _________ (m), North _________ (m), UTM Zone 13, NAD __ (27 or 83)

e. Tract No. _____, Map No. _____ of the _____________ Hydrographic Survey

f. Lot No. _____, Block No. _____ of Unit/Tract ___________________ of the ____________________ Subdivision recorded in __________________ County.

g. Other: ______________________

h. Give State Engineer File Number if existing diversion: RG-92331

i. On land owned by (required): Joe Miller (easement granted to EAWSD; see Application for Exploratory Permit RG-92331).

j. If new well, give approximate depth(if known) 710 feet; Outside diameter of casing 8.5 inches. Name of driller and license number (if known) K.D. Huey WD-68

7. REASON FOR CHANGE

Application is made for an additional point of diversion for the following reasons:

See Exhibit C.

8. ADDITIONAL STATEMENTS OR EXPLANATIONS:

See Exhibits C & D.

**** Note that EAWSD has requested emergency authorization to pump 120 acre-feet of water from May 1, 2011, through October 1, 2011. ****

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File Number: ______________
(For OSE Use Only)

NEW MEXICO OFFICE OF THE STATE ENGINEER
APPLICATION FOR PERMIT TO ADD ADDITIONAL POINT OF DIVERSION
UNDER PARTIAL LICENSE NOS. RG-18529 & RG-18556
*****AND REQUEST FOR EMERGENCY AUTHORIZATION*****

ACKNOWLEDGEMENT

(I, ~~We~~) David Denig-Chakroff affirm that the
(Please Print)
foregoing statements are true to the best of (my, ~~our~~) knowledge and belief.

D Denig Chakroff, General Manager - EAWSD
Applicant Signature Applicant Signature

ACTION OF STATE ENGINEER

This application is approved/~~denied/partially approved~~ provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare; and further subject to the following conditions:

SEE ATTACHED CONDITIONS OF APPROVAL

Witness my hand and seal this 1st day of May, 20 12

Scott A. Verhines, P.E., State Engineer

By: Jerri L Trujillo

Jerri L. Trujillo
Upper Pecos Basin Manager
Water Rights Division-District VI

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File Number: ______________ Trn Number: 482870

This Application is approved in accordance with Partial License Nos. RG-18529 and RG-18556 in full as follows:

1. **Permittee:** Eldorado Area Water and Sanitation District (EAWSD)

   Permit No: Additional Point of Diversion under Partial License Nos. RG-18529 and RG-18556

   Priorities:

RG-18515	December 31, 1968
RG-18517	December 31, 1968
RG-18528	December 26, 1969
RG-18529	December 26, 1969
RG-18531	March 11, 1970
RG-18543	April 30, 1970
RG-18550	June 5, 1970
RG-18571	October 29, 1970
RG-18595	December 17, 1970

   Source: Underground Waters of the Rio Grande Basin

   Points of Diversion: Located in NM Coordinate System State Plane Central Zone, feet, NAD 83 all in within Santa Fe County:

OSE Well #	Permit #	EAWSD #	Renumbered	X	Y
RG-18515		5		1744033.520	1655457.130
RG-18517		12		1747643.034	1649614.646
RG-18528		1		1722808.653	1656995.242
RG-18529		2		1730509.193	1657197.583
RG-18531		8		1748859.277	1644027.293
RG-18543		3		1742583.229	1656271.569
RG-18550		4		1742393.982	1656859.856
RG-18571		6		1736030.755	1648956.374
RG-18595		7		1738760.094	1645503.057
RG-18529-S	RG-62602	13	RG-18529-S	1742774.701	1649054.443
RG-*	RG-65707-POD5	14	RG-18528-POD3	1741781.056	1650636.692
RG-**	RG-65707-POD6	15	RG-18528-POD4	1742867.970	1648148.818
RG-***	RG-88450-POD1	17	RG-18528-POD5	1748419.320	1651334.069
RG-92331	RG-92331-POD1	18	RG-18528-POD6	1749331.97	1651830.13

   Purpose of Use: Domestic, commercial, industrial, recreational, and construction

Place of Use: Eldorado Area Water and Sanitation District municipal water system service area, within and around Canada de Los Alamos and Bishop John Lamy Grants, in Santa Fe County

Amount of Water: 583.23 acre-feet per year, and the remaining 254.37 acre-feet per year Appropriative Rights in the Central Well Field as specified in Partial License RG-18529 & RG-18556 issued June 4, 2010

2. Under this permit, permitted well RG*[(RG-18528, RG-18543, RG-18550)-S] will be renumbered **RG-18528-POD3,** RG** [(RG-18528, RG-18529, RG-18543, RG-18550, RG-18515, RG-18571, RG-18595, RG-18531)-S] will be renumbered **RG-18528-POD4,** RG***[(RG18528, RG18529, RG18543, RG18550, RG18515, RG18571, RG18595, RG18531, RG18517) – S] will be renumbered **RG-18528-POD5, and** RG-92331-POD1 will be renumbered **RG-18528-POD6.**
3. Under this permit Well RG-92331-POD1 (renumbered RG-18528-POD6) will be limited to 200.0 acre-feet per annum. All previous diversion limits set on both individual wells and combinations of wells remain in force.
4. This Permit No. RG-18529 and RG-18556 shall not be exercised to the detriment of other valid existing water rights or in a manner that is contrary to the conservation of water within the state or detrimental to the public welfare of the state.
5. Diversion of water from all permitted wells shall be metered with a totaling meter(s), of a type and at a location approved by, and acceptable to the State Engineer. The permittee shall provide the make, model, serial number, initial reading, units, multiplier, and the dates of installation and any calibration of the meter(s) to the State Engineer prior to any diversion of water.
6. Records of the total amount of water diverted from all wells shall be submitted to the State Engineer, in writing, on or before the 10th day of each month for the preceding calendar month.
7. The Permittee shall utilize the highest and best technology available to ensure conservation of water to the maximum extent practical.
8. A Proof of Completion of Well (OSE form wr-22), which is available for download http://www.ose.state.nm.us/water_info_rights_apps_forms.html, shall be filed with the State Engineer on or before October 31, 2012.
9. A Final Inspection and Report of Beneficial Use of Underground Water shall be filed with the State Engineer on or before June 4, 2020 as specified in Partial License RG-18529 and RG-18556 issued June 4, 2010.
10. The Monitoring Plan and all other conditions as approved by Partial License RG-18529 and RG-18556 remain in effect.
11. The State Engineer retains jurisdiction over this permit.

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
CONCHA ORTIZ Y PINO BUILDING, 130 SOUTH CAPITOL, SANTA FE, NM 87501
TELEPHONE: (505) 827-6091 FAX: (505) 827-3806

TOM BLAINE, P.E.
STATE ENGINEER

Mailing Address:
P.O. Box 25102
Santa Fe, NM 87504-5102

August 19, 2016

File Number: RG-18529 et al., under partial License Nos. RG-18529 and RG-18556

Eldorado Water and Sanitation District
David Chakroff, General Manager
2 N Chamisa Dr, Suite A
Santa Fe NM 87508

Dear Mr. Chakroff,

Your Permit for an Additional Groundwater Point of Diversion has been approved and is enclosed. Approval is subject to the Conditions of Approval set forth on the approval page. A Final Report and Proof of Application of Water to Beneficial Use shall be filed with the State Engineer on or before June 4, 2020, as specified in Partial License RG-18529 & RG-18556, issued June 4, 2010.

Please refer to the subject file number in any future correspondence. If you have any questions, feel free to contact me at 505-827-6139.

Sincerely,

Doug Crosby
WRAP, District VI,
AWRM Supervisor

File Number: ____________
(For OSE Use Only)

RG-18529-POD3
~~RG-94087-POD2~~

NEW MEXICO OFFICE OF THE STATE ENGINEER
PROOF OF COMPLETION OF WELL

1. OWNER OF WELL (PERMITTEE)

Name: Eldorado Area Water and Sanitation District — Work Phone: 505-466-2531
Contact: David Chakroff, General Manager — Home Phone: ____
Address: 1 Caliente Road, Suite F
Eldorado
City: Santa Fe — State: NM Zip: 87508

2. LOCATION OF WELL ((A, B, C, or D required, E or F if known)

A. ___1/4 ___1/4 ___1/4 Section:___ Township:___ Range:___ N.M.P.M. in ____________ County.

B. X = 1,730,573 feet, Y = 1,657,173 feet, N.M. Coordinate System Central Zone in the Canada de los Alamos Grant.
U.S.G.S. Quad Map Seton Village, NM

C. Latitude: 35 d 33 m 15.47 s Longitude: 105 d 56 m 48.81 s

D. East ______ (m), North ______ (m), UTM Zone 13, NAD __ (27 or 83)

E. Tract No. ____, Map No. ____ of the ____________ Hydrographic Survey

F. Lot No. ____, Block No. ____ of Unit/Tract ____________ of the ____________ Subdivision recorded in ____________ County.

G. Other: ____________

H. Give State Engineer File Number if existing diversion: RG-18529-REPL

I. On land owned by (required): Eldorado Area Water and Sanitation District

3. WELL INFORMATION

Depth of well 290 feet; Is well cased: Y ;
Outside diameter of top casing (or hole if not cased) 8.125 inches;
If artesian, is well equipped with gate valve: ___;
Name of well driller and driller license number HydroGeologic Services, Inc., WD-1472 ;
Date well completed: 9/9/2014 .

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File Number: ____________ Trn Number: ____________

NEW MEXICO OFFICE OF THE STATE ENGINEER
PROOF OF COMPLETION OF WELL

4. PUMP TEST
(To be supplied by person or firm making test)

Name and address of the person making the test: Glorieta Geoscience, Inc., PO Box 5727, Santa Fe, NM 87502

Date of test 9/22/2014 ; Length of test 96 hours;
Depth to water before test 157.73 feet (above or below) land surface;
Depth to water after test 157.8 feet (above or below) land surface;
Average discharge 65 GPM;
Specific capacity of well 2.1 GPM per foot drawdown.

Please attach pump test data.

5. PERMANENT PUMP EQUIPMENT

A. DESCRIPTION OF PUMP

Make: Franklin Electric Co., Inc. ; Type: Submersible ;
Size of discharge: 3 inches;
If turbine type, give size of column N/A inches;
Diameter of bowls N/A inches; Number of bowls N/A ;
Length of suction pipe N/A feet;
Total length of column, bowls and suction pipe N/A feet;
If centrifugal type, give size of pump 6 inches;
Rated capacity of pump, if known 75 GPM; At ____ rev. per min.,
From a depth of 550 feet.

B. DESCRIPTION OF POWER PLANT

Make, type, horsepower, etc., of power plant: 15 hp
Type of drive connection to pump: direct .
(direct, gearhead, or belt)

C. DISCHARGE OF PUMP

Actual discharge of pump 70 GPM, at ____ rev. per min.,
From a depth of 189 feet; Date of test 9/25/2014 .

6. DESCRIPTION OF STORAGE RESERVOIR

Length ____ feet; Width ____ feet; Average depth ____ feet.

Do Not Write Below This Line

DRAWDOWN DATA FROM PRODUCTION WELL (Well 2B)

JOB: EAWSD Well 2B
LOCATION: Eldorado, Santa Fe, NM
CASING TYPE: Steel
CASING DIAMETER: 8 5/8"
COLUMN PIPE DIAMETER (OD): 2"

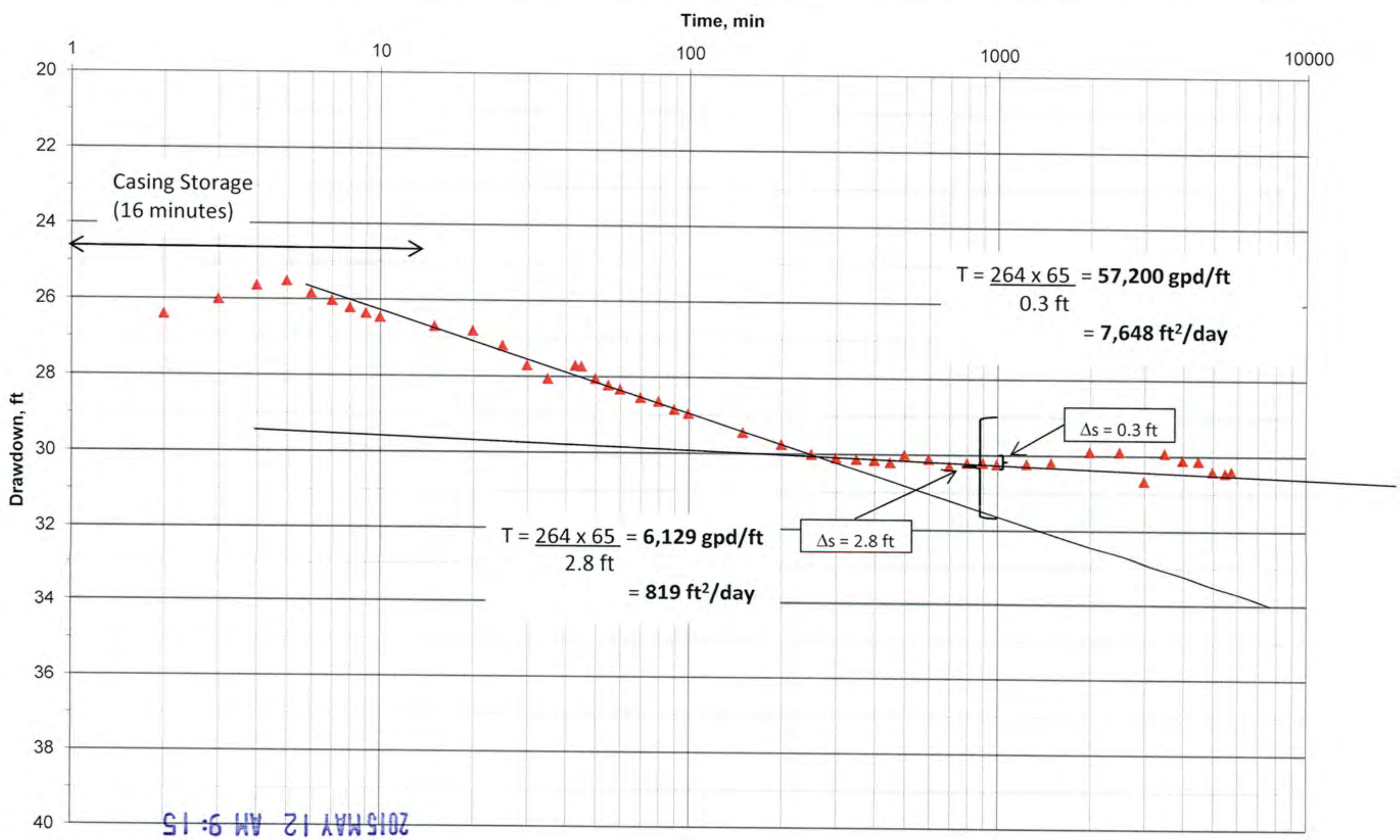
TECHNICIAN: RO
WELL DEPTH: 290
PUMP DEPTH: 252
MP COR: -1.95
Static WL 159.68

AVERAGE Q FOR TEST = 65 GPM

DATE	TIME	ELAPSED TIME, t	WATER LEVEL, ft	DRAWDOWN, s, in feet	Q, GPM *	Q/s gpm/ft	Weir inches	Weir, in. H2O	COMMENTS
9/22/2014	9:00	0	159.68		~100+				adjusting down - use instantaneous flow meter for Q, weir in inches = backup
	9:01	1	186.20	26.52					(note Rossum sand separator running between instantaneous and weir)
	9:02	2	186.10	26.42					
	9:03	3	185.70	26.02	70				*NOTE: instantaneous flow meter is reading high (70 gpm is actually ~ 65 gpm)
	9:04	4	185.33	25.65	70				
	9:05	5	185.21	25.53					
	9:06	6	185.53	25.85					
	9:07	7	185.72	26.04					
	9:08	8	185.91	26.23					
	9:09	9	186.05	26.37					
	9:10	10	186.15	26.47			14.50		weir 14.5", totalizing meter = 3213080
	9:15	15	186.38	26.70					
	9:20	20	186.50	26.82	70				69, adjust up to 70
	9:25	25	186.88	27.20					
	9:30	30	187.40	27.72	70				71, adjust down to 70
	9:35	35	187.75	28.07			14.50		14.5" = 62 gpm
	9:40	43	187.40	27.72					
	9:45	45	187.42	27.74					
	9:50	50	187.74	28.06					
	9:55	55	187.91	28.23					
	10:00	60	188.02	28.34					
	10:10	70	188.24	28.56	70				
	10:20	80	188.33	28.65	70				
	10:30	90	188.54	28.86	70		14.50		14.5" = 62 gpm
	10:40	100	188.65	28.97	70				
	11:30	150	189.14	29.46					
	12:20	200	189.45	29.77					
	13:10	250	189.70	30.02			14.50		weir 14.5" = 62 gpm
	14:00	300	189.79	30.11					
	14:50	350	189.82	30.14					
	15:40	400	189.85	30.17					
	16:30	450	189.90	30.22					
	17:20	500	189.70	30.02					
	19:00	600	189.81	30.13					
	20:40	700	189.99	30.31					
	22:20	800	189.90	30.22					
9/23/2014	0:00	900	189.90	30.22					9/23/14 8:00 dtw = 188.85 water rise caused sounder to go off, alerting RO
	1:40	1000	189.94	30.26			14.50		weir 14.5=62 gpm
	5:50	1250	189.92	30.24					
	10:00	1500	189.89	30.21					
	18:20	2000	189.59	29.91					
9/24/2014	2:40	2500	189.59	29.91				14.75"	9:30 PC on site, collect WQ samples with HGS, relieve RO for 3 hrs, re-level weir
	11:00	3000	190.36	30.68	70		14.75		9:30 meter 03402900 (63 gpm)
	19:20	3500	189.62	29.94					17:40 RO confirmed Q = 65 with timed bucket
9/25/2014	3:40	4000	189.80	30.12					9/24/14 18:04 pump breaker tripped, off for ~ 3 minutes before restarted by RO
	12:00	4500	189.82	30.14			15.50		weir = 64 gpm
	20:20	5000	190.10	30.42					
9/26/2014	4:40	5500	190.14	30.46					
	9:00	5760	190.10	30.42	70	2.1	15.00		weir =63 gpm; totalizer = 67 gpm; meter 03591100

Drawdown - EAWSD Well 2B 96-hr Pumping Test

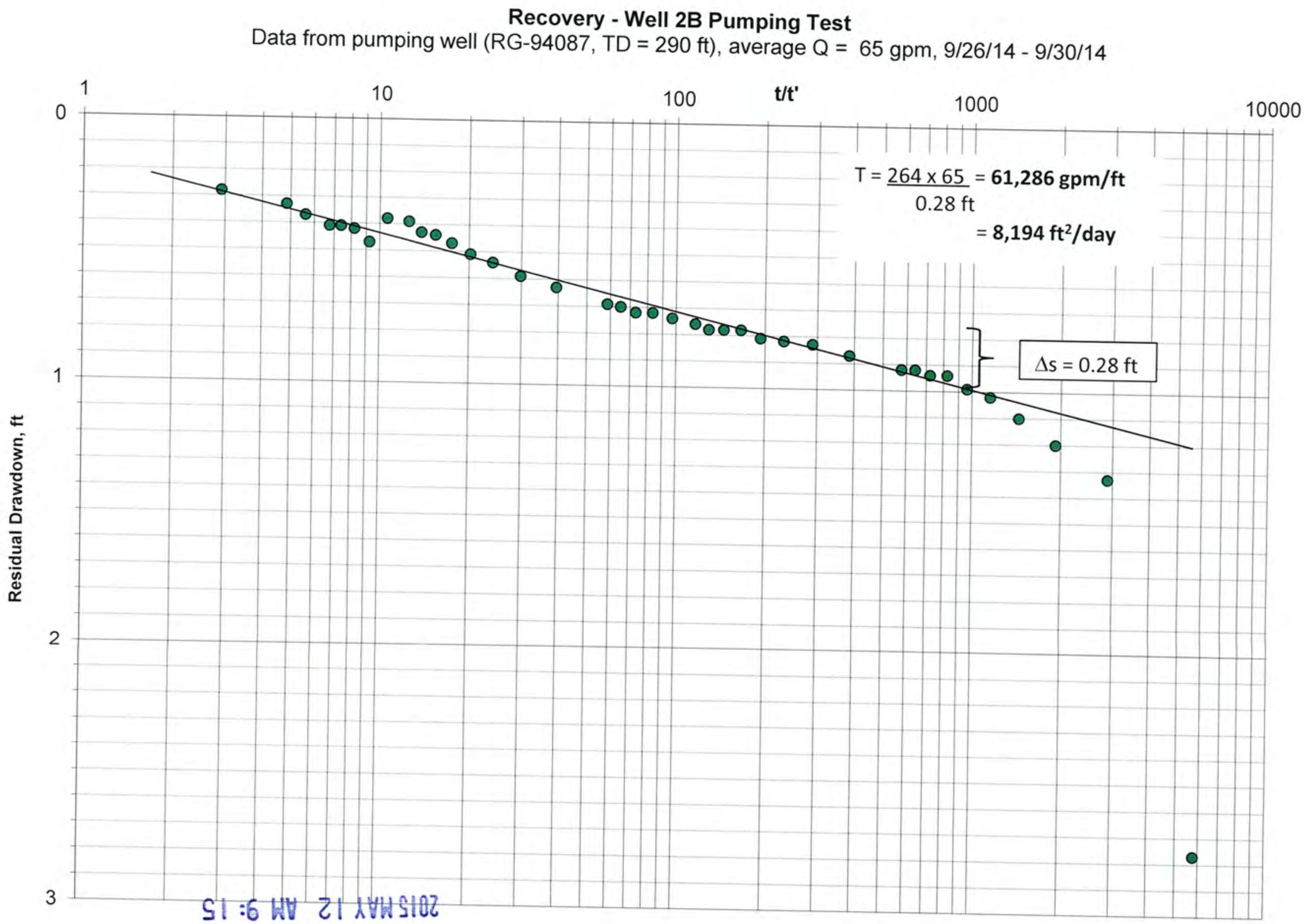
Data from Pumping Well (Well 2B) (RG-94087, TD = 290 ft), average Q = 65 gpm, 9/22/14 - 9/26/14



PUMPING TEST DATA SHEET: RECOVERY IN PRODUCTION WELL 2B

JOB: EAWSD Well 2B — TECHNICIAN: RO
LOCATION: Eldorado, Santa Fe, NM — WELL DEPTH: 290
CASING TYPE: Steel — PUMP DEPTH: 252
CASING DIAMETER: 8 5/8 — MP COR: -1.95
COLUMN PIPE DIAMETER (OD): 2 — Static WL 159.68

DATE	TIME	ELAPSED TIME, t	time, t', min	WATER LEVEL, ft	RESIDUAL DRAWDOWN, s', in feet	t/t'	COMMENTS
9/26/2014	9:00	5760	0	190.10	30.42		totalizing meter: 03591100
	9:01	5761	1	162.45	2.77	5761.00	
	9:02	5762	2	161.01	1.33	2881.00	
	9:03	5763	3	160.88	1.20	1921.00	
	9:04	5764	4	160.78	1.10	1441.00	
	9:05	5765	5	160.70	1.02	1153.00	
	9:06	5766	6	160.67	0.99	961.00	
	9:07	5767	7	160.62	0.94	823.86	
	9:08	5768	8	160.62	0.94	721.00	
	9:09	5769	9	160.60	0.92	641.00	
	9:10	5770	10	160.60	0.92	577.00	
	9:15	5775	15	160.55	0.87	385.00	
	9:20	5780	20	160.51	0.83	289.00	
	9:25	5785	25	160.50	0.82	231.40	
	9:30	5790	30	160.49	0.81	193.00	
	9:35	5795	35	160.46	0.78	165.57	
	9:40	5800	40	160.46	0.78	145.00	
	9:45	5805	45	160.46	0.78	129.00	
	9:50	5810	50	160.44	0.76	116.20	
	10:00	5820	60	160.42	0.74	97.00	
	10:10	5830	70	160.40	0.72	83.29	
	10:20	5840	80	160.40	0.72	73.00	
	10:30	5850	90	160.38	0.70	65.00	
	10:40	5860	100	160.37	0.69	58.60	
	11:30	5910	150	160.31	0.63	39.40	
	12:20	5960	200	160.27	0.59	29.80	
	13:10	6010	250	160.22	0.54	24.04	
	14:00	6060	300	160.19	0.51	20.20	
	14:50	6110	350	160.15	0.47	17.46	
	15:40	6160	400	160.12	0.44	15.40	
	16:30	6210	450	160.11	0.43	13.80	
	17:20	6260	500	160.07	0.39	12.52	
	19:00	6360	600	160.06	0.38	10.60	
	20:40	6460	700	160.15	0.47	9.23	
	22:20	6560	800	160.10	0.42	8.20	
9/27/2014	0:00	6660	900	160.09	0.41	7.40	
	1:40	6760	1000	160.09	0.41	6.76	
	5:50	7010	1250	160.05	0.37	5.61	
	10:00	7260	1500	160.01	0.33	4.84	
9/28/2014	11:00	8760	3000	159.96	0.28	2.92	
9/29/2014	14:00	10380	4620	159.73	0.05	2.25	


Recovery - Well 2B Pumping Test
Data from pumping well (RG-94087, TD = 290 ft), average Q = 65 gpm, 9/26/14 - 9/30/14
t/t'
1
10
100
1000
10000
0
1
2
3
Residual Drawdown, ft
T = 264 x 65 = 61,286 gpm/ft
0.28 ft
= 8,194 ft²/day
Δs = 0.28 ft

File No.

NEW MEXICO OFFICE OF THE STATE ENGINEER

Office of the State Engineer — Interstate Stream Commission

APPLICATION FOR PERMIT TO CHANGE AN EXISTING WATER RIGHT
(Non 72-12-1)

(check applicable boxes):

For fees, see State Engineer website: http://www.ose.state.nm.us/

☐ Change Purpose of Use ☐ Groundwater ☐ Surface Water ☐ Change Place of Use ☐ Groundwater ☐ Surface Water	☐ Change Point of Diversion (POD): From: ☐ Groundwater ☐ Surface Water To: ☐ Groundwater ☐ Surface Water	☒ Additional Groundwater Point of Diversion (POD) ☐ Additional Surface Water Point of Diversion (POD)
☐ Temporary Change, NMSA 1978, § 72-12-7(B) Requested Start Date: (Not to Exceed 3 ac-ft in One Year) ☐ Water Use Lease, NMSA 1978, §§ 72-6-1 to-7 Requested Start Date:		Requested End Date: Requested End Date:

1. APPLICANT(S) (Required) Note: water-right owner must be listed as an applicant.

Name: **Eldorado Area Water and Sanitation District**	Name:
Contact or Agent: check here if Agent ☐ **David Chakroff, General Manager**	Contact or Agent: check here if Agent ☐
Mailing Address: **1 Caliente Road, Suite F**	Mailing Address:
City: **Santa Fe**	City:
State: **NM** Zip Code: **87508**	State: Zip Code:
Phone: ☐ Home ☐ Cell Phone (Work): **505-466-2531**	Phone: ☐ Home ☐ Cell Phone (Work):
E-mail (optional): **general.manager@EAWSD.org**	E-mail (optional):

2. CURRENT OSE FILE INFORMATION (Required)

OSE File No(s): **RG-18529, RG-18529-S, RG-18529 REPL, RG-18529 (MW)**	Priority Date (if known): **December 26, 1969**	Subfile/Cause No. (if applicable):

3. CURRENT PURPOSE OF USE AND AMOUNT OF WATER (Required)

☒ Domestic ☐ Livestock ☐ Irrigation ☐ Municipal ☒ Industrial ☒ Commercial ☒ Other Use (specify): **Construction and Recreational** Describe a specific use If applicable (i.e. sand & gravel washing, dairy etc):	Amount of Water (acre-feet per annum): If more details are needed, type "See Comments" in "Other" field below, and explain in Additional Statements Section. Diversion: **305.9** Consumptive Use: **305.9** Other (include units):

FOR OSE INTERNAL USE

Application for Permit, Form wr-06, Rev 9/26/12

File No.:	Trn. No.:	Receipt No.: 6-39907
Trans Description (optional):		Sub-Basin:
PCW/LOG Due Date:	PBU Due Date:	

Tracking ID # 13984

4. COUNTY WHERE WATER RIGHT IS CURRENTLY USED **(Required)**

Santa Fe

5. ADDITIONAL STATEMENTS CONCERNING THE CURRENT WATER RIGHT

See Partial License No. RG-18529 & RG-18556

6. CURRENT or MOVE-FROM POINT(S) OF DIVERSION (POD) **(Required)**

☐ **Surface POD** **OR** ☒ **Ground Water POD (Well)**

Name of ditch, acequia, or spring:

Stream or water course: | Tributary of:

If application proposes a new point of diversion involving a diversion dam, storage dam, main canal, and/or pipeline, complete Attachment 2. ☐ Check here if Attachment 2 is included in this application packet.

POD Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), <u>or</u> Latitude/Longitude (Lat/Long - WGS84).
District II (Roswell) & District VII (Cimarron) customers, provide a PLSS location in addition to above.

☐ NM State Plane (NAD83) (Feet)
☐ NM West Zone
☐ NM East Zone
☐ NM Central Zone

☒ UTM (NAD83) (Meters)
☐ Zone 12N
☒ Zone 13N

☐ Lat/Long (WGS84) (to the nearest 1/10th of second)

POD Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (*Quarters or Halves , Section, Township, Range*) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
RG-18529-REPL	**414167.82**	**3934936.10**	**Canada de Los Alamos Grant**
RG-18529-S	**417866.69**	**3932406.9**	**Canada de Los Alamos Grant**
RG-18529(MW)	**414160.76**	**3934935.58**	**Canada de Los Alamos Grant**

NOTE: If more PODS need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional point of diversion descriptions are attached: ☐ **Yes** ☒ **No** **If yes, how many________**

Point of Diversion is on Land Owned by: **Eldorado Area Water and Sanitation District**

Other description relating point of diversion to common landmarks, streets, or other: **~100 feet north of Alcalde Rd, west of Avenida de Los Compadres at the northern terminus of the road**

2019 DEC -1 PM 2:29

OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

FOR OSE INTERNAL USE

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File Number:	Trn Number:

7. CURRENT or MOVE-FROM PLACE(S) OF USE (Required)

The land is legally described by (check all that apply):

- ☐ Public Land Survey System (PLSS) (quarters, section, township, range)
- ☐ Irrigation or Conservation District Map
- ☐ Hydrographic Survey Report or Map
- ☐ Subdivision
- ☒ Grant

Complete the blocks below for all tracts of land (more than one description can be provided for a tract if available):

PLSS Quarters or Halves, **and/or** Name of Hydrographic Survey, **and/or** Name of Irrigation or Conservation District, **and/or** Name and County of Subdivision **and/or** Grant	PLSS Section **and/or** Map No. **and/or** Lot No.	PLSS Township **and/or** Tract No. (Please list each tract individually) **and/or** Block No.	PLSS Range	Acres	Priority
Portions of Canada de Los Alamos and Bishop John Lamy Land Grants					
			Total Acres:		

Other description relating place of use to common landmarks, streets, or other: **The service area of the Eldorado Area Water and Sanitation District, as shown on "plat of acreage reparcelization" at Eldorado at Santa Fe, comprising portions of Canada de Los Alamos and Bishop John Lamy Grants, Recorded October 15, 1981, under reception No. 486,453, Book 107, Plat Page 6-6C, Records of Santa Fe County, New Mexico – See EXHIBIT A for map**

Place of use is on land owned by (required): **various**

Are there other sources of water for these lands? No ☐ Yes ☒ describe by OSE file number: **See Partial License RG-18529 & RG-18556**

Note: If on Federal or State Land, please provide copy of lease.

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OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

FOR OSE INTERNAL USE

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File Number:	Trn Number:

8. MOVE-TO PURPOSE OF USE AND AMOUNT OF WATER (Complete this section ONLY if the purpose of use is changing)

☐ Domestic ☐ Livestock ☐ Irrigation ☐ Municipal ☐ Industrial ☐ Commercial ☐ Other Use (specify): ____________ Describe a specific use If applicable (i.e. sand & gravel washing, dairy etc): ___________	Amount of Water (acre-feet per annum): If more details are needed, type "See Comments" in "Other" field below, and explain in Additional Statements Section. Diversion: ________________ Consumptive Use: ________________ Other (include units): ________________

9. MOVE-TO POINT(S) OF DIVERSION (POD) (Complete this section ONLY if adding or replacing a POD)

☐ **Surface POD** **OR** ☒ **Ground Water POD (Well)**

Name of ditch, acequia, or spring:

Stream or water course: | Tributary of:

If application proposes a new point of diversion involving a diversion dam, storage dam, main canal, and/or pipeline, complete Attachment 2. ☐ Check here if Attachment 2 is included in this application packet.

POD Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), or Latitude/Longitude (Lat/Long - WGS84).
District II (Roswell) & District VII (Cimarron) customers, provide a PLSS location in addition to above.

☐ NM State Plane (NAD83) (Feet)
- ☐ NM West Zone
- ☐ NM East Zone
- ☐ NM Central Zone

☒ UTM (NAD83) (Meters)
- ☐ Zone 12N
- ☒ Zone 13N

☐ Lat/Long (WGS84) (to the nearest 1/10th of second)

POD Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (*Quarters or Halves , Section, Township, Range*) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
RG-18529(MW)	**414160.76**	**3934935.58**	**Canada de Los Alamos Grant**

NOTE: If more PODS need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional POD descriptions are attached: ☐ **Yes** ☒ **No** **If yes, how many________**

Other description relating point(s) of diversion to common landmarks, streets, or other:

Point of Diversion is on Land Owned by: **Eldorado Area Water And Sanitation District**

Note: The following information is for wells only. If more than one (1) well needs to be described, provide attachment.

Approximate depth of well (feet): **311.00**	Outside diameter of well casing (inches): **10.75**
Driller Name: **EXISTING WELL**	Driller License Number:

If replacing the current well, is the current well to be plugged? ☐ Yes ☐ No ☒ Not Applicable
If No, state for what use it is retained:

FOR OSE INTERNAL USE

File Number:	Trn Number:

10. MOVE-TO PLACE(S) OF USE (Complete this section ONLY if adding or changing a place of use)

List each individually

The land is legally described by (check all that apply):

☐ Public Land Survey System (PLSS) (quarters, section, township, range)

☐ Irrigation or Conservation District Map

☐ Hydrographic Survey Report or Map

☐ Subdivision

☐ Grant

Complete the blocks below for all tracts of land (more than one description can be provided for a tract if available):

PLSS Quarters or Halves, **and/or** Name of Hydrographic Survey, **and/or** Name of Irrigation or Conservation District, **and/or** Name and County of Subdivision **and/or** Grant	PLSS Section **and/or** Map No. **and/or** Lot No.	PLSS Township **and/or** Tract No. (Please list each tract individually) **and/or** Block No.	PLSS Range	Acres	Priority
			Total Acres:		

Other description relating place of use to common landmarks, streets, or other:

Place of use is on land owned by (required):

Are there other sources of water for these lands? No ☐ Yes ☐ describe by OSE file number:

Note: If on Federal or State Land, please provide copy of lease.

2015 DEC -1 PM 2:29

OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

FOR OSE INTERNAL USE

Application for Permit, Form wr-06

File Number:	Trn Number:

11. ADDITIONAL STATEMENTS OR EXPLANATIONS

Well RG-18529(MW) (EAWSD Well 2) will be plumbed back into the EAWSD water system and made supplemental to the replacement well RG-18529-REPL (EAWSD Well 2B). There will be no increase in total diversion amount. The total diversion of all supplemental wells under permit RG-18529 will not exceed 305.9 acre-feet per year.

ACKNOWLEDGEMENT

I, We (name of applicant(s)), DAVID CHAKROFF, GENERAL MANAGER
Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

[signature]
Applicant Signature

Applicant Signature

ACTION OF THE STATE ENGINEER

This application is:

☒ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

See attached Conditions of Approval

Witness my hand and seal this 19th day of August 20 16 , for the State Engineer,

TOM BLAINE, PE , State Engineer

By: [signature] DOUG CROSBY
Signature Print

Title: AWRM SUPERVISOR
Print

2015 DEC -1 PM 2:29

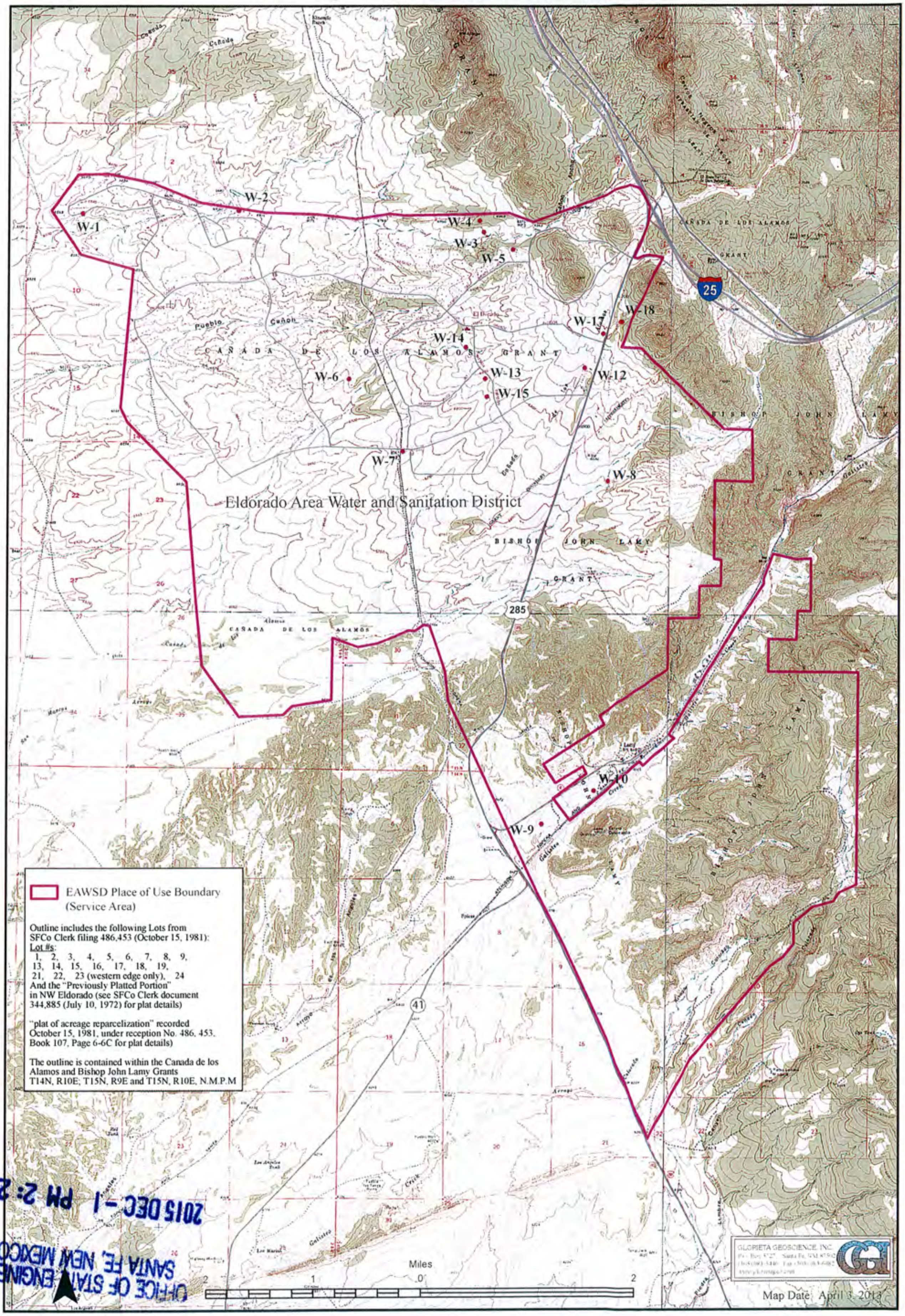
OFFICE OF STATE ENGINEER
SANTA FE, NEW MEXICO

FOR OSE INTERNAL USE Application for Permit, Form wr-06

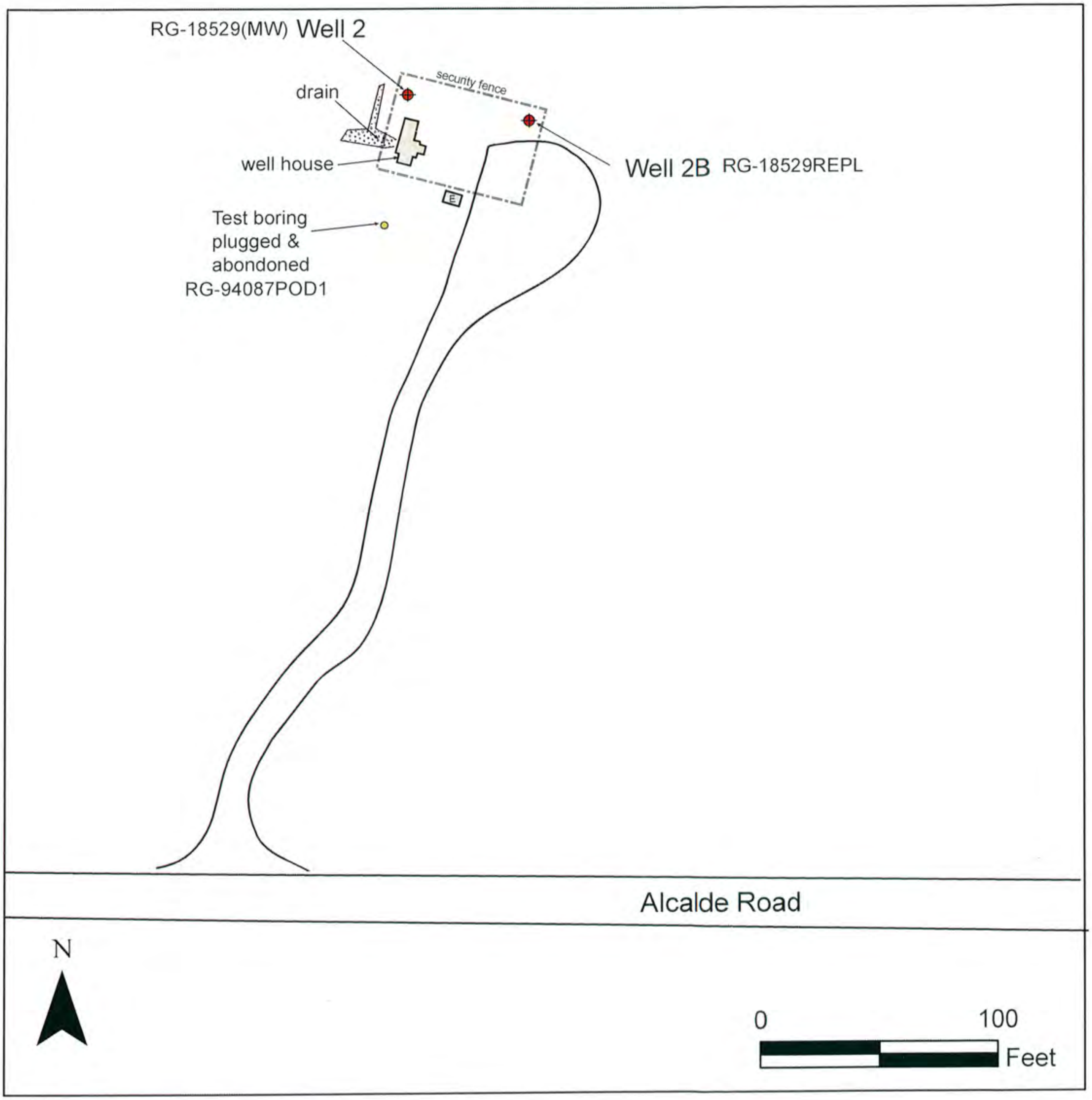
File Number:	Trn Number:

EXHIBIT A

Eldorado Area Water and Sanitation District Place of Use
for Water Rights under License Nos. RG-18529 and RG-18556



Well 2 & 2B Site Map



1. Application for Permit for an Additional Groundwater Point of Diversion is approved as follows:

Permittee: Eldorado Area Water and Sanitation District (EAWSD)

Permit No.: RG-18529 et al., under Partial License Nos. RG-18529 and RG-18556

Source: Rio Grande Underground Water Basin

Priority Date: December 26, 1969

Points of Diversion:

Move-from: RG-18529-S located at a point where X=1,742,774.701 feet and Y=1,649,054.443 feet, NMSP, NAD83, Central Zone

RG-18529-REPL located at a point where X=1,730,573 feet and Y=1,657,173 NMSP, NAD83, Central Zone

Move-to: RG-18529-POD1, [RG-18529(MW)], located at a point where X=1,730,509.193 feet and Y=1,657,197.583 feet, NMSP, NAD83, Central Zone

RG-18529-POD2, [RG-18529-S], located at a point where X=1,742,774.701 feet and Y=1,649,054.443 feet, NMSP, NAD83, Central Zone

RG-18529-POD3, [RG-18529-REPL], located at a point where X=1,730,573 feet and Y=1,657,173 NMSP, NAD83, Central Zone

All Points of Diversion are located within the Canada de Los Alamos Grant, located on land owned by EAWSD in Santa Fe County.

Purpose of Use:

Move-from: Well RG-18529-POD1 was most recently designated as "for monitoring purposes." Wells RG-18529-POD2 and RG-18529-POD3 were designated as for domestic, commercial, industrial, recreational, and construction purposes.

Move-to: ALL wells listed under Points of Diversion, Move-to will be used for domestic, commercial, industrial, recreational, and construction purposes.

Place of Use: Within the service area of EAWSD as shown on "plat of acreage reparcelization" at Eldorado at Santa Fe, comprising portions of Canada de Los Alamos and Bishop John Lamy Land Grants, in Santa Fe County

Amount of Water: Diversion amount of 305.9 acre-feet per annum (afa)

2. Under this permit, the point of diversion RG-18529(MW) will be renumbered to RG-18529-POD1. RG-18529-S will be renumbered to RG-18529-POD2. RG-18529-REPL will be renumbered to RG-18529-POD3.

3. Under this permit the combined diversion of groundwater from RG-18529-POD1, RG-18529-POD2, and RG-18529-POD3 for domestic, commercial, industrial, recreational and construction purposes shall not exceed a maximum diversion amount of 305.9 afa.

4. This permit No. RG-18529 et al., under Partial License Nos. RG-18529 and RG-18556, shall not be exercised to the detriment of other valid existing water rights or in a manner that is contrary to the conservation of water within the state or detrimental to the public welfare of the state.

5. All functioning wells under this permit (and specifically RG-18529-POD1) shall be equipped with a totalizing meter that shall be installed on the discharge line serving the Eldorado Area Water and Sanitation District service area. The type of meter, manner of installation, and meter location must be acceptable to the State Engineer. The permit holder shall provide the Office of the State Engineer in writing with the make, model, serial number, date of installation, initial reading units, and dates of recalibration for the meter, or replacement meter, used to measure the diversion of water. No water shall be diverted from the well RG-18529-POD1 or RG-18529-POD2 unless they are equipped with functional totalizing meters.

6. Monthly records of the amount of water diverted from RG-18529-POD1(EASWD #2), RG-18529-POD2 (EAWSD #13), and RG-18529-POD3 (EAWSD #2B) shall be submitted to the Water Rights District VI Office of the State Engineer in Santa Fe or to the OSE Website by the first of every month. The monthly records shall be in a form acceptable to the State Engineer.

7. This permit shall remain under the jurisdiction of the State Engineer and shall be subject to the same restrictions and limitations specified under Partial License Nos. RG-18529 and RG-18556.

8. The Monitoring Plan as approved by the Partial License shall remain in effect until the data collected is deemed sufficient to the State Engineer.

9. The highest and best technology available shall be used to ensure conservation of water to the maximum extent practicable.

10. Pursuant to NMSA 1978, § 72-8-1, the permittees shall allow the State Engineer and his representatives entry upon private property for the performances of their respective duties, including access to the well(s) for meter readings and water level measurements.

11. A Final Report and Proof of Application of Water to Beneficial Use shall be filed with the State Engineer on or before June 4, 2020, as specified in Partial License RG-18529 & RG-18556, issued June 4, 2010.

12. The State Engineer retains jurisdiction of this permit.

Witness my hand and seal this 19th day of August, 2016

Tom Blaine, P.E.
State Engineer

By: Douglas Crosby

Doug Crosby
AWRM Supervisor
Water Rights Division, District VI

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
District VI Office, Santa Fe, NM

JOHN R. D'ANTONIO JR., P.E.
STATE ENGINEER

PO Box 25102
Santa Fe, New Mexico 87501-5102
PHONE: (505) 827-6120
FAX: (505) 827-6682

February 19, 2021

Eldorado Area Water and Sanitation District (EAWSD)
Attn: Steve King, General Manager
2 North Chamisa Dr., Suite A
Santa Fe NM 87508

Re: Application No. RG-95577(T) for Permit to Pump Test Well RG-18529-POD4 (EAWSD Well 19)

Greetings:

The Office of the State Engineer has fully approved Application RG-95577(T) subject to the attached conditions of approval. Pursuant to Section 72-2-16, NMSA 1978, if you are aggrieved by this decision you may submit a request to this office asking for a hearing to be held. The request must be in writing and must be submitted no later than 30 days after receipt of the letter. Failure to request a hearing by such time will waive your right to request a hearing on this decision. In accordance with Subsection B of 19.25.2.10 NMAC, you will be required to pay a hearing fee when the hearing is announced by the OSE Hearings Unit. Aggrieval of the permit or any of the conditions of approval suspends the permit. No water may be diverted under an aggrieved permit until final resolution of the aggrieval with the Office of the State Engineer. Any water diverted while the aggrieval is pending will have to be repaid.

Please review the Conditions of Approval for the approved OSE Permit No. RG-95577(T) and abide by all reporting requirements.

Feel free to contact me if you have any questions or comments.

Sincerely,

Doug Crosby
AWRM Supervisor
Water Rights Division

File No. RG-95577(T)
[RG-18529-POD4]

NEW MEXICO OFFICE OF THE STATE ENGINEER

Office of the State Engineer
Interstate Stream Commission

WR-07 APPLICATION FOR PERMIT TO DRILL
A WELL WITH NO WATER RIGHT

(check applicable box):

For fees, see State Engineer website: http://www.ose.state.nm.us/

Purpose:	☐ Pollution Control And/Or Recovery	☐ Ground Source Heat Pump
☒ Exploratory Well (Pump test)	☐ Construction Site/Public Works Dewatering	☐ Other(Describe):
☐ Monitoring Well	☐ Mine Dewatering	

A separate permit will be required to apply water to beneficial use regardless if use is consumptive or nonconsumptive.

☒ Temporary Request - Requested Start Date: 2021-03-01 Requested End Date: 2021-04-30

Plugging Plan of Operations Submitted? ☐ Yes ☒ No

---

1. APPLICANT(S)

Name: Eldorado Area Water and Sanitation District	Name:
Contact or Agent: check here if Agent ☐ Steve King, General Manager	Contact or Agent: check here if Agent ☐
Mailing Address: 2 North Chamisa Dr, Suite A	Mailing Address:
City: Santa Fe	City:
State: NM Zip Code: 87508	State: Zip Code:
Phone: 505-466-2531 ☐ Home ☐ Cell Phone (Work):	Phone: ☐ Home ☐ Cell Phone (Work):
E-mail (optional): general.manager@EAWSD.org	E-mail (optional):

2021 FEB 18 AM 11:20

FOR OSE INTERNAL USE Application for Permit, Form WR-07, Rev 11/17/16

File No.: RG-95577(T)	Trn. No.:	Receipt No.: 6-46657
Trans Description (optional):		
Sub-Basin:	PCW/LOG Due Date:	

2. **WELL(S)** Describe the well(s) applicable to this application.

Location Required: Coordinate location must be reported in NM State Plane (NAD 83), UTM (NAD 83), <u>or</u> Latitude/Longitude (Lat/Long - WGS84).
District II (Roswell) and District VII (Cimarron) customers, provide a PLSS location in addition to above.

☐ NM State Plane (NAD83) (Feet)
☐ NM West Zone
☐ NM East Zone
☐ NM Central Zone

☒ UTM (NAD83) (Meters)
☐ Zone 12N
☒ Zone 13N

☐ Lat/Long (WGS84) (to the nearest 1/10th of second)

Well Number (if known):	X or Easting or Longitude:	Y or Northing or Latitude:	Provide if known: -Public Land Survey System (PLSS) (*Quarters or Halves*, *Section, Township, Range*) OR - Hydrographic Survey Map & Tract; OR - Lot, Block & Subdivision; OR - Land Grant Name
RG-18529-POD4	418379	3931481	

NOTE: If more well locations need to be described, complete form WR-08 (Attachment 1 – POD Descriptions)
Additional well descriptions are attached: ☐ Yes ☒ No **If yes, how many________**

Other description relating well to common landmarks, streets, or other:
NE corner of Ave Torreon and Carissa Rd

Well is on land owned by: Eldorado Area Water and Sanitation District

Well Information: NOTE: If more than one (1) well needs to be described, provide attachment. Attached? ☐ Yes ☒ No
If yes, how many________

Approximate depth of well (feet): 970	Outside diameter of well casing (inches): 6 5/8
Driller Name: Hydrogeologic Services, Inc.	Driller License Number: WD-1472

3. ADDITIONAL STATEMENTS OR EXPLANATIONS

EAWSD Well 19 (drilled under exploratory permit RG-95577, also referred to as RG-18529-POD4) will be pumped at a rate not to exceed 70 gpm for a maximum of 18 hours per day over a time period not to exceed 30 days. The total diversion for the 30-day test will not exceed 7.46 acre-feet. The discharge will be metered with a totalizing meter. The discharged water will be sampled during the test for analyses described in the attached document. This pumping test and associated discharge has been approved by NMED Groundwater Bureau (see attached description).

2021 FEB 18 AM 11: 29

FOR OSE INTERNAL USE

Application for Permit, Form WR-07

File No.:	Trn No.:

4. SPECIFIC REQUIREMENTS: The applicant must include the following, as applicable to each well type. Please check the appropriate boxes, to indicate the information has been included and/or attached to this application:

Exploratory / Monitoring	Pollution Control and/or Recovery	Construction De-Watering / Ground Source Heat Pump	Mine De-Watering
Exploratory: ■ Include a description of any proposed pump test, if applicable. **Monitoring:** ■ Include the reason for the monitoring well, and, ■ The duration of the planned monitoring.	**Pollution Control and/or Recovery:** ☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for the pollution control or recovery operation. ☐ The estimated maximum period of time for completion of the operation. ☐ The annual diversion amount. ☐ The annual consumptive use amount. ☐ The maximum amount of water to be diverted and injected for the duration of the operation. ☐ The method and place of discharge. ☐ The method of measurement of water produced and discharged. ☐ The source of water to be injected. ☐ The method of measurement of water injected. ☐ The characteristics of the aquifer. ☐ The method of determining the resulting annual consumptive use of water and depletion from any related stream system. ☐ Proof of any permit required from the New Mexico Environment Department. ☐ An access agreement if the applicant is not the owner of the land on which the pollution plume control or recovery well is to be located.	**Construction De-Watering:** ☐ Include a description of the proposed dewatering operation, ☐ The estimated duration of the operation, ☐ The maximum amount of water to be diverted, ☐ A description of the need for the dewatering operation, and, ☐ A description of how the diverted water will be disposed of. **Ground Source Heat Pump:** ☐ Include a description of the geothermal heat exchange project, ☐ The number of boreholes for the completed project and required depths. ☐ The time frame for constructing the geothermal heat exchange project, and, ☐ The duration of the project. ☐ Preliminary surveys, design data, and additional information shall be included to provide all essential facts relating to the request.	**Mine De-Watering:** ☐ Include a plan for pollution control/recovery, that includes the following: ☐ A description of the need for mine dewatering. ☐ The estimated maximum period of time for completion of the operation. ☐ The source(s) of the water to be diverted. ☐ The geohydrologic characteristics of the aquifer(s). ☐ The maximum amount of water to be diverted per annum. ☐ The maximum amount of water to be diverted for the duration of the operation. ☐ The quality of the water. ☐ The method of measurement of water diverted. ☐ The recharge of water to the aquifer. ☐ Description of the estimated area of hydrologic effect of the project. ☐ The method and place of discharge. ☐ An estimation of the effects on surface water rights and underground water rights from the mine dewatering project. ☐ A description of the methods employed to estimate effects on surface water rights and underground water rights. ☐ Information on existing wells, rivers, springs, and wetlands within the area of hydrologic effect.

ACKNOWLEDGEMENT

I, We (name of applicant(s)), Steve King, General Manager EAWSD

Print Name(s)

affirm that the foregoing statements are true to the best of (my, our) knowledge and belief.

Steve King

Applicant Signature

Applicant Signature

ACTION OF THE STATE ENGINEER

This application is:

☒ approved ☐ partially approved ☐ denied

provided it is not exercised to the detriment of any others having existing rights, and is not contrary to the conservation of water in New Mexico nor detrimental to the public welfare and further subject to the attached conditions of approval.

Witness my hand and seal this 19th day of February 20 21, for the State Engineer,

John R D'Antonio Jr., PE, State Engineer

By: [signature]

Signature

Print Douglas Crosby

Title: Supervisor

Print

FOR OSE INTERNAL USE

Application for Permit, Form WR-07

File No.:	Trn No.:

Conditions of Approval:

1. Permittee: Eldorado Area Water and Sanitation District (EAWSD)

Permit No.: RG-95577(T) (Under Partial License Nos. RG-18529 and RG-18556)

Source: Rio Grande Underground Water Basin

Priority Date: June 17, 2016 (for well RG-9577)

Point of Diversion: RG-18529-POD4 (EAWSD Well #19), formerly RG-95577-EXPL, located at a point where X=418,379 meters and Y= 3,931,481 meters, UTM, NAD83, Zone 13N

Purpose of Use: Pump Test

Place of Use: None, but test water from Well 19 will be discharged to a land application area in an open-space area adjacent to the Canada de los Alamos Arroyo

Amount of Water: Diversion of 7.46 acre-feet from Well RG-18529-POD4

2. The effective date of this permit is March 1, 2021 to April 30, 2021.

3. This permit authorizes diversion of water from EAWSD Well 19 (RG-18529-POD4) pumped at a rate of 50 to 75 gallons per minute for a maximum of 18 hours per day over a time period not to exceed 30 days. The total diversion for the 30-day test must not exceed 7.46 acre-feet.

4. This permit shall not be exercised to the detriment of other valid existing water rights or in a manner that is contrary to the conservation of water within the state or detrimental to the public welfare of the state.

5. Well RG-18529-POD4 shall be equipped with a totalizing meter that will record all water diverted from this well for this pump test. Diverted pump test water will be charged to the total EAWSD licensed and appropriative right under Partial License Nos. RG-18529 and RG-18556.

6. The type of meter, manner of installation, and meter location must be acceptable to the State Engineer. The permit holder shall provide the Office of the State Engineer in writing with the make, model, serial number, date of installation, initial reading units, and dates of recalibration for the meter, or replacement meter, used to measure the diversion of this pump test water. No water shall be diverted from well RG-18529-POD4 or any other EAWSD well unless it is equipped with a functional totalizing meter.

7. Monthly records of the amount of water diverted from RG-18529-POD4 (EASWD #19) shall be submitted to the Water Rights District VI Office of the State Engineer in Santa Fe or to the OSE Website by the first of every month. The monthly records shall be in a form acceptable to the State Engineer.

8. This permit shall remain under the jurisdiction of the State Engineer and shall be subject to the same restrictions and limitations specified under Partial License Nos. RG-18529 and RG-18556.

9. The Monitoring Plan as approved by the Partial License shall remain in effect until the data collected is deemed sufficient to the State Engineer.

10. The highest and best technology available shall be used to ensure conservation of water to the maximum extent practicable.

11. Pursuant to NMSA 1978, § 72-8-1, the permittees shall allow the State Engineer and his representatives entry upon private property for the performances of their respective duties, including access to the well(s) for meter readings and water level measurements.

12. The State Engineer retains jurisdiction of this permit.

Witness my hand and seal this 19th day of February 2021

John R. D'Antonio Jr., P.E.
State Engineer

By: ______________________

Doug Crosby
AWRM Supervisor
Water Rights Division, District VI

12 2/19/2021

UPDATED

EAWSD Well 19 Disinfection and 30-day Test Plan - January 29, 2021

Well 19 Disinfection and Testing Plan

EAWSD Well 19 (currently permitted under RG-95577, also referred to as RG-18529-POD4) will be disinfected and pumped for the purpose of removing iron-reducing bacteria, flushing the well and collecting water quality samples over the course of approximately 30 days to determine if iron and antimony concentrations decrease with pumping time. The data gathered during this test will be used to determine future pumping schedules, mixing and treatment options for the well.

Well 19 will be disinfected using sodium hypochlorite to a concentration of 100 ppm in the well. The well will be allowed to rest for approximately 24 hours over which time the chlorine concentration is expected to decrease to 50 ppm or less. The well will then be pumped into a discharge line that flows through a dechlorination tablet feeder using 0.923% sodium sulfite. The estimated chlorine residual after dechlorination will be approximately 0.2 mg/L. This dechlorinated water will be pumped into pipes to the land application area (see map attached to NOI). Chlorine residual will be measured at the end of the discharge pipe before the water enters the perforated pipe at the land application area. When the residual chlorine in the well water is less than 3 ppm and at least three borehole volumes have been discharged no more dechlorinating tablets will be added. After this minimum chlorine residual is reached the discharge will continue so that the well can be flushed and water quality measurements and samples can be collected over a period of up to 30 days. The estimated volume of water produced by the dechlorination process is approximately 2,000 gallons.

After the well is disinfected and dechlorinated it will be pumped at a rate between 50 to 75 gallons per minute (gpm) for a maximum of 18 hours per day over a time period not to exceed 30 days. The pumping rate will need to be adjusted to limit the discharge rate to avoid ponding water on the ground surface or causing runoff over the surface. The maximum diversion during the 30-day test will be 7.46 acre-feet. All well discharge will be measured using a totalizing meter.

The water pumped from Well 19 will be diverted to a land application area in an open-space area adjacent to the Canada de los Alamos arroyo (Figure 1 and attached map). The water will be used to seed the open-space area next to the community trails with native grass and wildflowers.

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January 28, 2021

Doug Crosby
AWRM Supervisor
Office of the State Engineer - Water Rights Division – District VI
P.O. Box 25102
Santa Fe NM 87504-5102

Re: Partial License Nos. RG-18529 & RG-18556 - Appropriative Water Rights in the Central Well Field – Proof of Beneficial Use

Dear Doug:

Partial License RG-18529&RG18556, dated June 4, 2010, for the Eldorado Area Water and Sanitation District (EAWSD) water rights includes appropriative rights in the Central Well Field under the 1972 District Court Judgement for a total amount of 254.37 acre-feet per year (afy). The Partial License determined that EAWSD has a 20-year period to perfect, by application to beneficial use, those water rights from wells within the Central Well Field. The schedule set out in the Partial License states that the first one-half of the appropriative water rights, 127.185 afy, must be put to beneficial use within 10 years of the date of the Partial License or that portion will be lost. EAWSD is required to file with the State Engineer its proof of beneficial use for the first 127.185 afy of appropriative water rights on or before January 31, 2021.

This letter is to inform the State Engineer that EAWSD has not yet proven any of the additional appropriate water rights and therefore will not be filing a proof of beneficial use before the deadline for the expiration of the first half of the water rights.

Please contact me with any questions.

Sincerely,

Meghan J Hodgins

Meghan Hodgins
Project Manager, Glorieta Geoscience, Inc.

CC: DougP.Crosby@state.nm.us
Steve King, General Manager, EAWSD

APPENDIX H:

WATER MODEL RESULTS

4.2.1 Current Average Day Demand with Largest Well Out of Service

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	92	73	55	-189,848	233,895	44,047
Tank 2/2A	95	85	41	-124,982	136,741	11,759
Tank 3	95	83	47	-129,099	179,274	50,175
Tank 4	92	91	47	-71,721	135,515	63,794

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	23.5	49	183,300
Well 7	13.3	28	19,875
Well 14	11.3	23	101,250
Well 15	11.3	23	162,000
Well 17	15.8	33	85,050
Well 18	15.8	33	189,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	3.3	7	35,100
Tank 2 BPS	8.8	18	131,250
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	0.0	0	0
Tank 4 BPS	0.0	0	0

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	23.5	49	70,500
Cañoncito CV	22.8	47	41,180

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.0	0	0	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	0.0	0	0	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	19,875	7.0%
Well 14	101,250	35.8%
Well 15	162,000	57.2%
TOTAL	283,125	

PZ2 Sources	Volume Produced	
Well 17	85,050	31.0%
Well 18	189,000	69.0%
TOTAL	274,050	

PZ3 Sources	Volume Produced	
Tank 1 BPS	35,100	21.1%
Tank 2 BPS	131,250	78.9%
TOTAL	166,350	

PZ4 Sources	Volume Produced	
Well 2A/2B	183,300	100.0%
TOTAL	183,300	

4.2.2 Current Peak Day Demand

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	89	74	55	-291,565	337,985	46,420
Tank 2/2A	95	70	41	-241,643	263,139	21,496
Tank 3	89	83	47	-118,751	195,378	76,627
Tank 4	90	77	47	-250,481	331,645	81,164

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	39.5	82	308,100
Well 7	36.8	77	55,125
Well 14	12.0	25	64,800
Well 15	12.0	25	103,680
Well 17	39.8	83	214,650
Well 18	39.8	83	477,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	4.8	10	51,300
Tank 2 BPS	22.8	47	341,250
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	39.5	82	592,500
Tank 4 BPS	12.0	25	288,000

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	0.0	0	0
Cañoncito CV	33.5	70	76,623

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.0	0	0	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	8.5	18	17,308	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	55,125	10.8%
Well 14	64,800	12.7%
Well 15	103,680	20.3%
Tank 4 BPS	288,000	56.3%
TOTAL	511,605	

PZ2 Sources	Volume Produced	
Well 17	214,650	31.0%
Well 18	477,000	69.0%

TOTAL	691,650

PZ3 Sources	Volume Produced	
Tank 1 BPS	51,300	13.1%
Tank 2 BPS	341,250	86.9%
TOTAL	392,550	

PZ4 Sources	Volume Produced	
Well 2A/2B	308,100	33.6%
Alcalde BPS	592,500	64.5%
PRV 24	17,308	1.9%
TOTAL	917,908	

4.3.1 Future Average Day Demand with Largest Well Out of Service

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	93	73	57	-189,136	222,979	33,843
Tank 2/2A	96	81	45	-102,307	125,709	23,401
Tank 3	95	83	56	-104,026	197,476	93,450
Tank 4	95	90	52	-77,851	122,066	44,215

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	33.8	70	210,600
Well 7	31.3	65	46,875
Well 14	23.8	49	142,500
Well 15	23.8	49	342,000
Well 17	36.0	75	82,080
Well 18	36.0	75	108,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	18.8	39	202,500
Tank 2 BPS	3.5	7	52,500
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	0.0	0	0
Tank 4 BPS	0.0	0	0

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	33.8	70	101,250
Cañoncito CV	28.8	60	129,057

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.0	0	0	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	0.0	0	0	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	46,875	8.8%
Well 14	142,500	26.8%
Well 15	342,000	64.4%
TOTAL	531,375	

PZ2 Sources	Volume Produced	
Well 17	82,080	43.2%
Well 18	108,000	56.8%
TOTAL	190,080	

PZ3 Sources	Volume Produced	
Tank 1 BPS	202,500	79.4%
Tank 2 BPS	52,500	20.6%
TOTAL	255,000	

PZ4 Sources	Volume Produced	
Well 2A/2B	210,600	100.0%
TOTAL	210,600	

4.3.2 Future Peak Day Demand

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	87	73	57	-383,078	444,717	61,639
Tank 2/2A	10	6	45	-42,279	487,051	444,772
Tank 3	95	83	56	-199,558	227,898	28,341
Tank 4	91	86	52	-268,837	335,041	66,204

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	33.8	70	210,600
Well 7	44.0	92	66,000
Well 14	22.5	47	81,000
Well 15	22.5	47	194,400
Well 17	44.0	92	100,320
Well 18	44.0	92	132,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	36.8	77	396,900
Tank 2 BPS	16.0	33	240,000
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	33.8	70	1,012,500
Tank 4 BPS	22.5	47	540,000

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	0.0	0	0
Cañoncito CV	33.8	70	174,193

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.8	2	111	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	19.3	40	47,633	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	66,000	7.5%
Well 14	81,000	9.2%
Well 15	194,400	22.1%
Tank 4 BPS	540,000	61.3%
TOTAL	881,511	

PZ2 Sources	Volume Produced	
Well 17	100,320	43.2%
Well 18	132,000	56.8%

TOTAL	232,320

PZ3 Sources	Volume Produced	
Tank 1 BPS	396,900	62.3%
Tank 2 BPS	240,000	37.7%
TOTAL	636,900	

PZ4 Sources	Volume Produced	
Well 2A/2B	210,600	16.6%
Alcalde BPS	1,012,500	79.7%
PRV 24	47,633	3.7%
TOTAL	1,270,733	

4.4.1.1 Service to Welled Area: Current Ave Day Demand with Largest Well Out of Service

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	89	73	55	-195,154	246,390	51,236
Tank 2/2A	95	85	41	-124,981	136,738	11,757
Tank 3	95	83	47	-126,397	178,641	52,243
Tank 4	95	89	47	-94,133	131,220	37,087

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	38.5	80	300,300
Well 7	13.3	28	19,875
Well 14	12.8	27	114,750
Well 15	12.8	27	183,600
Well 17	15.8	33	85,050
Well 18	15.8	33	189,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	3.0	6	32,400
Tank 2 BPS	8.8	18	131,250
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	0.0	0	0
Tank 4 BPS	0.0	0	0

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	38.5	80	115,500
Cañoncito CV	23.8	49	40,565

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.0	0	0	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	0.0	0	0	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	19,875	6.2%
Well 14	114,750	36.1%
Well 15	183,600	57.7%
TOTAL	318,225	

PZ2 Sources	Volume Produced	
Well 17	85,050	31.0%
Well 18	189,000	69.0%
TOTAL	274,050	

PZ3 Sources	Volume Produced	
Tank 1 BPS	32,400	19.8%
Tank 2 BPS	131,250	80.2%
TOTAL	163,650	

PZ4 Sources	Volume Produced	
Well 2A/2B	300,300	100.0%
TOTAL	300,300	

4.4.1.2 Service to Welled Area: Current Peak Day Demand

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	89	73	55	-291,618	337,971	46,352
Tank 2/2A	96	71	41	-248,135	262,551	14,416
Tank 3	89	83	47	-121,367	197,796	76,430
Tank 4	76	65	47	-192,760	379,375	186,615

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	45.3	94	352,950
Well 7	35.3	73	52,875
Well 14	12.0	25	64,800
Well 15	12.0	25	103,680
Well 17	44.0	92	237,600
Well 18	44.0	92	528,000
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	4.8	10	51,300
Tank 2 BPS	22.8	47	341,250
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	45.3	94	678,750
Tank 4 BPS	12.0	25	288,000

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	0.0	0	0
Cañoncito CV	34.5	72	76,583

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.0	0	0	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	28.3	59	83,736	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	52,875	10.4%
Well 14	64,800	12.7%
Well 15	103,680	20.4%
Tank 4 BPS	288,000	56.5%
TOTAL	509,355	

PZ2 Sources	Volume Produced	
Well 17	237,600	31.0%
Well 18	528,000	69.0%

TOTAL	765,600

PZ3 Sources	Volume Produced	
Tank 1 BPS	51,300	13.1%
Tank 2 BPS	341,250	86.9%
TOTAL	392,550	

PZ4 Sources	Volume Produced	
Well 2A/2B	352,950	31.6%
Alcalde BPS	678,750	60.9%
PRV 24	83,736	7.5%
TOTAL	1,115,436	

4.4.5.1 Future Peak Day Demand Well 17/18 Offline

Tank Name	End of Run Fill	Min Level	Reserve Level	Volume in	Volume out	Net Volume out
	%	%	%	gal	gal	gal
Tank 1/1A	92	73	57	-192,576	231,604	39,028
Tank 2/2A	89	75	45	-187,040	241,691	54,650
Tank 3	95	83	56	-201,345	229,271	27,926
Tank 4	91	84	52	-196,790	268,179	71,389

Well Name	Hours on	Run Time	Volume Produced
	hrs	%	gal
Well 2A/2B	40.8	85	254,280
Well 7	43.5	91	65,250
Well 14	43.5	91	156,600
Well 15	43.5	91	375,840
Well 17	0.0	0	0
Well 18	0.0	0	0
Well 19	0.0	0	0

Booster Pump	Hours on	Run Time	Volume Produced
	hrs	%	gal
Tank 1 BPS	35.3	73	380,700
Tank 2 BPS	12.5	26	187,500
Torreon BPS 1/2	0.0	0	0
Alcalde BPS	40.8	85	1,222,500
Tank 4 BPS	34.3	71	822,000

Control Valves	Hours Active	Run Time	Volume Allowed
	hrs	%	gal
Torreon BPS CV	0.0	0	0
Tank 4 CV	0.0	0	0
Cañoncito CV	34.3	71	176,591

PRVs	Hours Active	Run Time	Volume Allowed	Zone from	Zone to
	hrs	%	gal		
PRV 2	0.0	0	0	PZ-3	PZ-1
PRV 4	0.5	1	21	PZ-3	PZ-1
PRV 13	0.0	0	0	PZ-3	PZ-1
PRV 22	0.0	0	0	PZ-1	PZ-2
PRV 21	0.0	0	0	PZ-2	PZ-4
PRV 23	0.0	0	0	PZ-2	PZ-4
PRV 24	14.3	30	30,100	PZ-2	PZ-4

PZ1 Sources	Volume Produced	
Well 7	65,250	7.4%
Tank 4 BPS	822,000	92.6%
PRV 4	21	0.0%
TOTAL	887,271	

PZ2 Sources	Volume Produced	
Well 14	156,600	29.4%
Well 15	375,840	70.6%
TOTAL	532,440	

PZ3 Sources	Volume Produced	
Tank 1 BPS	380,700	67.0%
Tank 2 BPS	187,500	33.0%
TOTAL	568,200	

PZ4 Sources	Volume Produced	
Well 2A/2B	254,280	16.9%
Alcalde BPS	1,222,500	81.1%
PRV 24	30,100	2.0%
TOTAL	1,506,880	

APPENDIX I:

WELL REPLACEMENT EVALUATION

Well Replacement Discussion

Well 8 (RG-18531):

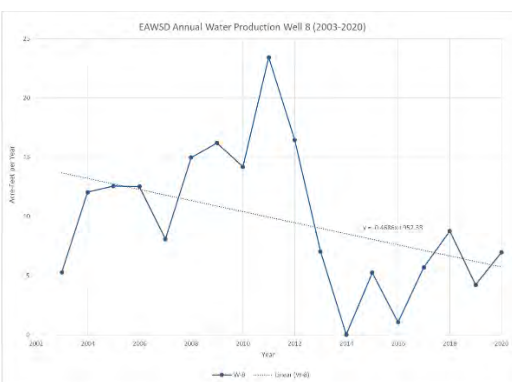
Currently, Well 8 has an issue with iron bacteria and Jacobs has been unable to reliably measure the depth to water in this well since November 2017. The annual production from Well 8 since 2013 has remained at approximately 7 afy. The annual production peaked in 2011 at 23 afy. The water level change during 2011 reflects the higher production with a sharp decline in water level. The water level trend (2008 – 2020) is a decline of 2.1 ft/year. This trend is very close to that in Well 12 and La Paz OW (unpumped observation wells), indicating that the decline in this portion of Eldorado is relatively consistent and the pumping in Well 8 is not increasing the rate of decline significantly.

EAWSD's water rights license (D'Antonio, 2010) does not have a depth restriction for Well 8. Since the PBU was filed with OSE in 2010 for the Central Well Field, Well 8 can now be replaced or supplemented.

GGI's interpretation of the geology in Well 8 is approximately 100 feet of alluvium/ QTa (Ancha) over Sangre de Cristo and Madera and/or Sandia Formation. The well completion was designed to screen the areas of sand/sandstone within the Madera or Sandia Formations.

The modeled decline in water level assumed a continued rate of pumping of 8 afy. At this rate the well pumping water level is not expected to reach the uppermost screen.

Well 8 is a candidate for replacement owing to the problems in the existing well. However, rather than drilling a new well in the same location it may be more useful to move the well down the arroyo approximately ¼ mile to try to get into a thicker section of the upper Madera over the Sandia. Issues with this move are 1) SFCo transfer station, 2) land ownership and new easement, 3) geology is not certain to improve, 4) hydrology also uncertain and may not be able to get a better well

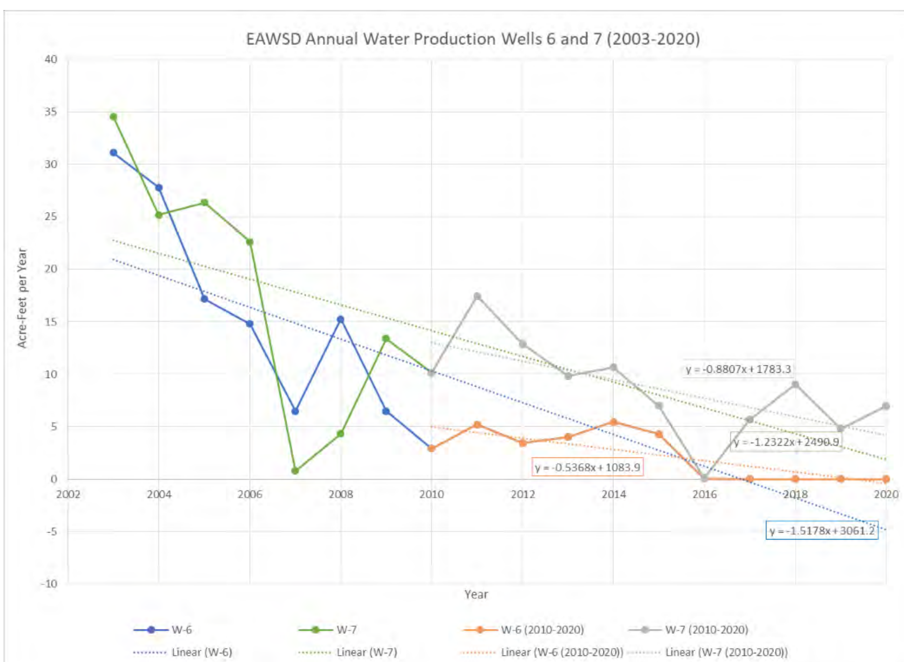


Well 7 (RG-18595):

Annual production from Well 7 since 2003 has decrease at a rate of ~0.9 to 1.2 afy/yr or approximately 20% from 2003 to 2020. The water level in this well is declining at a rate of 0.44 feet per year (2008 – 2020). The 2020 production from Well 7 was nearly 7 acre-feet. The well is capable of pumping at a rate of ~25 gpm, but is not used at a constant rate which results in the lower annual production. The well is mainly used to help meet the higher demand during summer months. The pumping rate is maintained at ~25 gpm to avoid rapid drawdown to the level of the pump resulting in the pump being shut off. During the winter (low water demand times) the well can be pumped for approximately 12 hours, but this time decreases to 6 hours or less during higher demand in the summer. The decline in Well 7 is ~ three times the regional drawdown as determined by RG-18572 OW (0.15 ft/yr). The higher rate of decline is likely due to the fact that this is a pumped well as compared to RG-18572 OW, which is not pumped and the effects of other wells pumping closer to Well 7, including pumping effects from EAWSD wells 14 and 15.

EAWSD's water rights license (D'Antonio, 2010) restricts Well 7 (RG-18595) from being deepened. The second restriction states that the well cannot be replaced or supplemented until the water rights have been put to beneficial use. Since a PBU has been filed with OSE for the entire well field, including Well 7, OSE should now allow the well to be supplemented or replaced. The 2003 central well field PBU amount was 583.23 afy. The License limits RG-18595 to 82 afy (from 1972 Ct Order). There are other restrictions for combined supplemental wells (e.g. Wells 13 – 19).

A supplemental well for Well 7 completed into the same formation may be a better solution than a replacement well in the same location as the existing well. Like well 2-2A a supplementary well may be able to replace the lost production that has occurred since 2003. A supplemental well can be drilled near the existing well so that the existing infrastructure could be used, but far enough away to reduce well interference.



Well 6 (RG-18571):

Well 6 was shut down in 2015 due to low production. The well was able to produce approximately 15 gpm for 6 to 8 hours before the drawdown reached the pump shut-off level. The well continued to be used as a monitoring well until ~2018 when the bio-film in the sounder tube became too thick and caused a blockage as well as concern for spreading iron and possibly manganese bacteria to other wells during water level measurements.

The water level trend in Well 6 is a decline of 0.22 ft/year, which is slightly higher than the regional trend as determined by RG-18572 OW (0.15 ft/yr).

The well is completed with 40 feet of stainless-steel screen and the current water level is approximately 4 feet into the screened zone. The well log indicates that the bottom of the aquifer that is penetrated by Well 6 is near the bottom of the well where the log indicates a change to red clay, possibly indicating Galisteo Formation, which underlies the alluvial aquifer that the well penetrates. The 1972 Court Order restricted Well 6 to the current aquifer and prohibits deepening this well into an underlying aquifer. Since a PBU has been filed with OSE for the entire well field, including Well 6, OSE should now allow the well to be supplemented or replaced.

GGI does not recommend replacing Well 6 at the current location of the well. An additional point of diversion ("supplemental well") can be drilled in another location near to either Well 6 or Well 7 to find a thicker, higher transmissivity section of the alluvial aquifer. An analysis of the existing domestic wells in the area near Wells 6 and 7 may be useful in determining thicker portions of the alluvium. A supplemental well in this area may be capable of making up to 25 to 30 gpm as is currently produced from Well 7.

An alternative plan would involve drilling into the Galisteo Formation below the alluvial aquifer to accumulate additional saturated sandstone layers. There are some wells located to the southwest of Well 7 drilled in two small subdivisions, Major Lado and Colinas del Sol. These wells have been discussed in the past as potential additions to the District in exchange for supplying water to the subdivisions. There are however, some water quality issues and generally low production capacity that made the District decide that the wells were not worth obtaining. These same issues will likely apply to any new wells to be drilled in the same aquifer in this area.

Well 1 (RG-18528):

We've discussed this well as an alternative every few years. The location may work for water rights, but the existing W-1 aquifer is not very productive. Well 1 was pumped at a higher rate when it was first drilled, but the aquifer is really ~30 gpm capacity long-term. The other issue is that Well 1 has had arsenic concentrations that exceed the EPA drinking water standards. The arsenic is assumed to be coming from either the basal Tesuque, which contains volcanic ash or the Espinaso Formation, which is volcaniclastic in origin. Arsenic is generally associated with volcanic rock aquifers. An exploratory well drilled at this location could be zone-tested using seals or inflatable packers to seal off suspected zone to determine where the arsenic concentrations are greatest. Then the final production well would be designed to seal off those zones containing arsenic. Sealing off zones due to water quality issues will likely reduce the yield of the final production well. Therefore, this well replacement has remained low on the list of potential new wells for the District.

Another granite well near Wells 17 and 18:

There is a non-EAWSD well north of Well 17 at Avenida Amistad. This well is owned by the Miller Trust and has been discussed from time to time as a potential monitoring point to be added to the EAWSD monitoring plan or as a location for an additional production well. The existing well is 5-inch PVC and does not appear to have a surface seal. It could be used as a monitoring well as-is, but an entirely new well would have to be drilled if the location were it to be used for a production well.

The issues with this location are 1) OSE-water rights would not allow any additional EAWSD pumping in this area due to the excessive drawdown that is already occurring due to Wells 17 and 18, 2) Land ownership – an easement at this location would mean a development deal for the Miller Trust that EAWSD may not be able to make with limited water rights and water going into the future, 3) any pumping in this area will affect existing Wells 17 and 18, increasing the rate of drawdown that is already unsustainable in the long-term.

If a new well was added at the Amistad site, this well could be used to supply water in conjunction with Wells 17 and 18 without increasing the total production, thus spreading out the effects among three wells. The issues listed above still apply when trying to get a new well approved and may lead to further restrictions on total pumping from Well 17 and 18.

References

D'Antonio, Jr., John. 2010. "Partial License Nos. RG-18529 & RG-18556." New Mexico Office of the State Engineer.

Judgement in State of New Mexico, ex rel., S.E. Reynolds, State Engineer, Plaintiff, vs. Eldorado at Santa Fe, Inc., a New Mexico Corporation, Defendant. No. 45612. 1972. First Judicial District Court.

APPENDIX J:

ESTIMATED CAPITAL COST OF ALTERNATIVES

6.1: Tank 4 to Tank 2 Transmission Line
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Tank 4 to Tank 2 Transmission Line					
1	8" C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	2,250	$110.00	$247,500.00
2	8" buried valves, including fittings, external restraint devices, valve box, and all incidental work to complete in place.	EA	3	$10,000.00	$30,000.00
3	2" Combination air and vacuum valve stations, including: precast manhole vault, piping, insulated wraps, all appurtenances, and all incidental work to complete in place.	EA	2	$15,000.00	$30,000.00
4	Flushing hydrant station, including vault, isolation valve, all earthwork, CIP	EA	1	$5,000.00	$5,000.00
5	Tank 4 Booster Pump Station control valve vault, including: two actuated control valves, all piping modifications, appurtenances, connections, vault, earthwork, and all incidental work to complete in place.	EA	1	$75,000.00	$75,000.00
6	Electrical Improvements	EA	1	$20,000.00	$20,000.00
7	HDD road and driveway crossings	LF	90	$100.00	$9,000.00
Other Project Construction Requirements					
8	Undefined Elements (15%)	LS	1	$62,475.00	$62,475.00
9	Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
10	SWPPP	LS	1	$10,000.00	$10,000.00
11	Construction Staking by New Mexico Registered Surveyor	LS	1	$25,000.00	$25,000.00
12	Reclamation seeding	LS	1	$30,000.00	$30,000.00
13	Utility Relocation Allowance	ALLOW	1	$50,000.00	$50,000.00
14	Material Testing Allowance	ALLOW	1	$25,000.00	$25,000.00
15	SCADA programming	ALLOW	1	$20,000.00	$20,000.00
16	Mobilization and Demobilization	LS	1	$21,000.00	$21,000.00
				SUBTOTAL	$679,975.00
				Construction Contingency	$21,000.00
				SUBTOTAL	$700,975.00
				NMGRT	$49,944.47
				TANK 4 TO TANK 2 TRANSMISSION LINE CONSTRUCTION COST TOTAL	**$751,000.00**

Professional Services	**Amount**
Permitting	$ 7,000.00
Engineering Design and Construction Fees	$ 136,000.00
Survey Fees	$ 14,000.00
Aerial	$ 10,000.00
Geotechnical Investigation Fees	$ 5,000.00
Subsurface Utility Engineering Fees	$ 25,000.00
Construction Observation Fees (Part time, 4 months at $14,000/mo)	$ 56,000.00
Subtotal Professional Services	$ 253,000.00
NMGRT	$ 19,923.75
PROFESSIONAL SERVICES COST TOTAL	**$273,000.00**
Construction Cost Opinion	$751,000.00
Professional Services Opinion	$273,000.00
TOTAL PROJECT COSTS AND FEES	**$1,024,000.00**

6.2: Wells 14 & 15 Transmission Line to Tank 2
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Well's 14 and 15 Connection to Tank 2					
1	8” C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	3,850	$110.00	$423,500.00
2	8" buried valves, including fittings, external restraint devices, valve box, and all incidental work to complete in place.	EA	3	$10,000.00	$30,000.00
3	2" Combination air and vacuum valve stations, including: precast manhole vault, piping, insulated wraps, all appurtenances, and all incidental work to complete in place.	EA	3	$15,000.00	$45,000.00
4	Flushing hydrant station, including isolation valve, rip-rap, all fittings, all trenching and backfill, CIP	EA	3	$5,000.00	$15,000.00
5	Well 14 modifications to include remove existing pump and motor, install new pump and 20 HP motor, connection to new 8" transmission line, all piping modifications, appurtenances, connections, and all incidental work, CIP.	EA	1	$40,000.00	$40,000.00
6	Well 15 modifications to include remove existing pump and motor, install new pump and 30 HP motor, connection to new 8" transmission line, all piping modifications, appurtenances, connections, and all incidental work, CIP.	EA	1	$45,000.00	$45,000.00
7	Electrical improvements	EA	2	$30,000.00	$60,000.00
8	HDD road and driveway crossings	LF	150	$1,000.00	$150,000.00
Other Project Construction Requirements					
9	Undefined Elements (15%)	LS	1	$121,275.00	$121,275.00
10	Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
11	SWPPP	LS	1	$10,000.00	$10,000.00
12	Construction Staking by New Mexico Registered Surveyor	LS	1	$25,000.00	$25,000.00
13	Reclamation seeding	LS	1	$30,000.00	$30,000.00
14	Utility Relocation Allowance	ALLOW	1	$50,000.00	$50,000.00
15	Material Testing Allowance	ALLOW	1	$25,000.00	$25,000.00
16	SCADA programming	ALLOW	1	$20,000.00	$20,000.00
17	Mobilization and Demobilization	LS	1	$41,000.00	$41,000.00
				SUBTOTAL	$1,150,775.00
				Construction Contingency	$35,000.00
				SUBTOTAL	$1,185,775.00
				NMGRT	$84,486.47
				WELLED AREA EXPANSION CONSTRUCTION COST TOTAL	**$1,271,000.00**

Professional Services	**Amount**
Permitting	$ 7,000.00
Engineering Design and Construction Fees	$ 230,000.00
Survey Fees	$ 24,000.00
Aerial	$ 9,000.00
Geotechnical Investigation Fees	$ 9,000.00
Subsurface Utility Engineering Fees	$ 29,000.00
Construction Observation Fees (Part time, 4 months at $14,000/mo)	$ 56,000.00
Subtotal Professional Services	$ 364,000.00
NMGRT	$ 28,665.00
PROFESSIONAL SERVICES COST TOTAL	**$393,000.00**
Construction Cost Opinion	$1,271,000.00
Professional Services Opinion	$393,000.00
TOTAL PROJECT COSTS AND FEES	**$1,664,000.00**

6.3: Tank 1 Transmission/Tank 2 Distribution Line Replacemetns
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Tank 1 Transmission/Tank 2 Distribution Line Replacements					
1	Installation of a new Tank 1 Transmission Line: 8” C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	9,650	$100.00	$965,000.00
2	Installation of a new Tank 2 Distribution Line: 8” C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	9,650	$100.00	$965,000.00
3	Connect proposed 8" lines to existing 8" waterlines on Avenida Eldorado, including all appurtenances.	EA	2	$10,000.00	$20,000.00
4	Connect proposed 8" lines to existing 8" waterlines on Avenida Vista Grande, including all appurtenances.	EA	2	$10,000.00	$20,000.00
5	Reconnect existing Residential Lateral Service Assemblies, Including Excavation, Backfill, All Associated Appurtenances, and All Incidental Work, Complete in Place (CIP).	EA	56	$1,500.00	$84,000.00
6	8" Buried Valves, including fittings, external restraint devices, valve box, and all incidental work to complete in place.	EA	20	$8,000.00	$160,000.00
7	Reconnect to existing Fire Hydrant assemblies including, piping, fittings, restraint devices, all appurtenances, and all incidental wrok to complete in place.	EA	11	$5,000.00	$55,000.00
8	Replace existing CAV station along Monte Alto Road.	EA	1	$15,000.00	$15,000.00
9	HDD road crossings	LF	1200	$100.00	$120,000.00
Other Project Construction Requirements					
10	Undefined Elements (15%)	LS	1	$370,000.00	$370,000.00
11	Temporary Traffic Control	LS	1	$100,000.00	$100,000.00
12	SWPPP	LS	1	$50,000.00	$50,000.00
13	Construction Staking by New Mexico Registered Surveyor	LS	1	$75,000.00	$75,000.00
14	Reclamation seeding	LS	1	$40,000.00	$40,000.00
15	Utility Relocation Allowance	ALLOW	1	$50,000.00	$50,000.00
16	Material Testing Allowance	ALLOW	1	$50,000.00	$50,000.00
17	Mobilization and Demobilization	LS	1	$97,000.00	$97,000.00
				SUBTOTAL	$3,236,000.00
				Construction Contingency	$98,000.00
				SUBTOTAL	$3,334,000.00
				NMGRT	$237,547.50
				Tank 1 Transmission/Tank 2 Distribution Line Replacements	**$3,572,000.00**

Professional Services	**Amount**
Permitting	$ 10,000.00
Engineering Design and Construction Fees	$ 647,000.00
Survey Fees	$ 68,000.00
Aerial	$ 24,000.00
Geotechnical Investigation Fees	$ 24,000.00
Subsurface Utility Engineering Fees	$ 100,000.00
Construction Observation Fees (Part time, 6 months at $14,000/mo)	$ 84,000.00
Subtotal Professional Services	$ 957,000.00
NMGRT	$ 75,363.75
PROFESSIONAL SERVICES COST TOTAL	**$1,033,000.00**
Construction Cost Opinion	$3,572,000.00
Professional Services Opinion	$1,033,000.00
TOTAL PROJECT COSTS AND FEES	**$4,605,000.00**

6.4: Service Lateral Replacements
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
	Balsa Road Service Lateral Replacements				
1	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Short side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	54	$2,000.00	$108,000.00
2	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Long Side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	58	$3,500.00	$203,000.00
3	Asphalt Removal and Replacement, Including 4-Inch Asphalt over 6-Inch Base Course over 12-Inch Compacted Subgrade.	SY	100	$70.00	$7,000.00
	Avenida Vista Grande Service Lateral Replacements				
4	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Short side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	41	$2,000.00	$82,000.00
5	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Long Side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	37	$3,500.00	$129,500.00
6	Asphalt Removal and Replacement, Including 4-Inch Asphalt over 6-Inch Base Course over 12-Inch Compacted Subgrade.	SY	100	$70.00	$7,000.00
	Valencia Loop Service Lateral Replacements				
7	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Short side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	19	$2,000.00	$38,000.00
8	Remove and Replace Existing Water Meter Box, Re-install Existing Meter, Service Line on the Long Side, Including all Piping and Materials, Surface and Landscaping Restoration, CIP.	EA	18	$3,500.00	$63,000.00
9	Asphalt Removal and Replacement, Including 4-Inch Asphalt over 6-Inch Base Course over 12-Inch Compacted Subgrade.	SY	100	$74.00	$7,400.00
Other Project Construction Requirements					
7	Undefined Elements (15%)	LS	1	$97,000.00	$97,000.00
8	Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
9	SWPPP	LS	1	$10,000.00	$10,000.00
10	Construction Staking by New Mexico Registered Surveyor	LS	1	$25,000.00	$25,000.00
11	Reclamation seeding	LS	1	$15,000.00	$15,000.00

12	Utility Relocation Allowance	ALLOW	1	$50,000.00	$50,000.00
13	Material Testing Allowance	ALLOW	1	$20,000.00	$20,000.00
14	SCADA programming	ALLOW	1	$15,000.00	$15,000.00
15	Mobilization and Demobilization	LS	1	$65,000.00	$65,000.00
				SUBTOTAL	$961,900.00
				Construction Contingency	$29,000.00
				SUBTOTAL	$990,900.00
				NMGRT	$70,601.63
				SERVICE LATERAL REPLACEMENT CONSTRUCTION COST TOTAL	**$1,062,000.00**

Professional Services	**Amount**
Engineering Design and Construction Fees	$ 144,000.00
Survey Fees	$ 20,000.00
Aerial	$ 7,000.00
Geotechnical Investigation Fees	$ 7,000.00
Subsurface Utility Engineering Fees	$ 14,000.00
Construction Observation Fees (Part time, 4 months at $14,000/mo)	$ 56,000.00
Subtotal Professional Services	$ 248,000.00
NMGRT	$ 19,530.00
PROFESSIONAL SERVICES COST TOTAL	**$268,000.00**

Construction Cost Opinion	$1,062,000.00
Professional Services Opinion	$268,000.00
TOTAL PROJECT COSTS AND FEES	**$1,330,000.00**

6.5: Tank Rehab and Mixers
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
	Tank Improvements				
1	Tank Mixer Installation, including: installation of solar powered mixer, control box, all associated appurtenances, and all incidental work to complete in place.	EA	5	$25,000.00	$125,000.00
2	Replacement of Tank 4 floor.	LS	1	$500,000.00	$500,000.00
	Tank Site Improvements				
3	Tank 1 Site Modifications and Drainage Improvements, including: site grading, detention pond excavation, storm water conveyance upgrades (swale), hauling and disposal of excess material, landscaping, slope stabilization, associated appurtenances, and all incidental work to complete in place.	LS	1	$150,000.00	$150,000.00
4	Tank 4 Site Modifications and Drainage Improvements, including: site grading, detention pond excavation, storm water conveyance upgrades (swale), hauling and disposal of excess material, landscaping, slope stabilization, associated appurtenances, and all incidental work to complete in place.	LS	1	$150,000.00	$150,000.00
5	Tank 2 Site Modifications, including: installation of perimeter fence and gate, site grading, hauling and disposal of excess material,	LF	550.00	$55.00	$30,250.00
Other Project Construction Requirements					
6	Undefined Elements (15%)	LS	1	$143,287.50	$143,287.50
7	Material Testing Allowance	ALLOW	1	$20,000.00	$20,000.00
8	Construction Staking by New Mexico Registered Surveyor	LS	1	$15,000.00	$15,000.00
9	Mobilization and Demobilization	LS	1	$48,000.00	$48,000.00
				SUBTOTAL	$1,181,537.50
				Construction Contingency	$36,000.00
				SUBTOTAL	$1,217,537.50
				NMGRT	$86,749.55
	TANK REHABILITATION AND MIXERS TOTAL CONSTRUCTION COST TOTAL				**$1,305,000.00**

Professional Services	**Amount**
Permitting	$ 7,000.00
Engineering Design and Construction Fees	$ 213,000.00
Geotechnical Investigation Fees	$ 10,000.00
Subsurface Utility Engineering Fees	$ 25,000.00
Construction Observation Fees (Part time, 3 months at $14,000/mo)	$ 42,000.00
Survey Fees	$ 25,000.00
Subtotal Professional Services	$ 322,000.00
NMGRT	$ 25,357.50
PROFESSIONAL SERVICES COST TOTAL	**$348,000.00**
Construction Cost Opinion	$1,305,000.00
Professional Services Opinion	$348,000.00
TOTAL PROJECT COSTS AND FEES	**$1,653,000.00**

6.6: Demolition of Unused Facilities
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Well #1 and Booster Pumping Station #1					
1	Deconstruction and Demolition of Well #1 Storage Tank and Well #1 Booster Pumping Station (BPS) including, removal of all process piping equipment, abondonment/plugging of all process piping, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$150,000.00	$150,000.00
2	Conversion of Well #1 to a monitoring well including, removal of pump, motor, and drop pipe and all incidental work to complete in place. All salvagable equipment to be turned over to the District.	LS	1	$20,000.00	$20,000.00
3	Demolition of well house including, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
4	Deconstruction and Demolition of below ground valve vault and appurtenances including, plugging and abondonment of process piping, removal of vault, backfill and compaction, and all incidental work to complete in place.	LS	1	$20,000.00	$20,000.00
Well #3					
5	Conversion of Well #3 to a monitoring well including, removal of pump, motor, and drop pipe and all incidental work to complete in place. All salvagable equipment to be turned over to the District.	LS	1	$20,000.00	$20,000.00
6	Demolition of well house including, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
7	Deconstruction and Demolition of below ground valve vault and appurtenances including, plugging and abondonment of process piping, removal of vault, backfill and compaction, and all incidental work to complete in place.	LS	1	$15,000.00	$15,000.00
Well #4					
8	Conversion of Well #4 to a monitoring well including, removal of pump, motor, and drop pipe and all incidental work to complete in place. All salvagable equipment to be turned over to the District.	LS	1	$20,000.00	$20,000.00
9	Demolition of well house including, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00

10	Deconstruction and Demolition of below ground valve vault and appurtenances including, plugging and abondonment of process piping, removal of vault, backfill and compaction, and all incidental work to complete in place.	LS	1	$15,000.00	$15,000.00
Well #6					
11	Conversion of Well #6 to a monitoring well including, removal of pump, motor, and drop pipe and all incidental work to complete in place. All salvagable equipment to be turned over to the District.	LS	1	$20,000.00	$20,000.00
12	Demolition of well house including, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
13	Deconstruction and Demolition of below ground valve vault and appurtenances including, plugging and abondonment of process piping, removal of vault, backfill and compaction, and all incidental work to complete in place.	LS	1	$15,000.00	$15,000.00
Well #12					
14	Conversion of Well #12 to a monitoring well including, removal of pump, motor, and drop pipe, demolition of well house, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place. All salvagable equipment to be turned over to the District.	LS	1	$20,000.00	$20,000.00
15	Demolition of well house including, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
16	Deconstruction and Demolition of below ground valve vault and appurtenances including, plugging and abondonment of process piping, removal of vault, backfill and compaction, and all incidental work to complete in place.	LS	1	$15,000.00	$15,000.00
Vista Grande/Compadres Booster Pumping Station (BPS)					
17	Deconstruction and Demolition of Vista Grande/Compadres Booster Pumping Station (BPS) including, removal of all process piping equipment, abondonment/plugging of all process piping, removal of site fencing, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
Bishop Lamy/Cattle Drive Booster Pumping Station (BPS)					

18	Deconstruction and Demolition of Bishop Lamy/Cattle Drive Booster Pumping Station (BPS) including, removal of all process piping equipment, abondonment/plugging of all process piping, removal of site fencing, hauling and disposal of demo material, all earthwork to return to natural grade, and all incidental work to complete in place.	LS	1	$50,000.00	$50,000.00
Other Project Construction Requirements					
19	Undefined Elements (15%)	LS	1	$102,000.00	$102,000.00
20	Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
21	Mobilization and Demobilization	LS	1	$34,000.00	$34,000.00
				SUBTOTAL	$836,000.00
				Construction Contingency	$26,000.00
				SUBTOTAL	$862,000.00
				NMGRT	$61,417.50
				WELLED AREA EXPANSION CONSTRUCTION COST TOTAL	**$924,000.00**

Professional Services	**Amount**
Permitting	$ 7,000.00
Engineering Design and Construction Fees	$ 125,000.00
Construction Observation Fees (Part time, 3 months at $14,000/mo)	$ 42,000.00
Subtotal Professional Services	$ 174,000.00
NMGRT	$ 13,702.50
PROFESSIONAL SERVICES COST TOTAL	**$188,000.00**

Construction Cost Opinion	$924,000.00
Professional Services Opinion	$188,000.00
TOTAL PROJECT COSTS AND FEES	**$1,112,000.00**

6.7: Emergency BPS Generators
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Emergency Booster Pump Station Generators					
1	Booster Pump Station (BPS) 277/480 V diesel generator installation including, equipment pad, replacement of existing service entrance equipment, new fused disconnect switch installation, new grounding electrode system, a new automatic transfer switch (ATS), SCADA, all associated appurtenances, and all incidental work to complete in place.	LS	1	$100,000.00	$100,000.00
Other Project Construction Requirements					
3	Undefined Elements (15%)	LS	1	$15,000.00	$15,000.00
4	Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
5	Mobilization and Demobilization	LS	1	$5,000.00	$5,000.00
				SUBTOTAL	$140,000.00
				Construction Contingency	$5,000.00
				SUBTOTAL	$145,000.00
				NMGRT	$10,331.25
				Emergency Booster Pump Station Generators	**$160,000.00**

Professional Services	**Amount**
Engineering Design and Construction Fees	$ 28,000.00
Construction Observation Fees (Part time, 1 months at $14,000/mo)	$ 14,000.00
Subtotal Professional Services	$ 42,000.00
NMGRT	$ 3,307.50
PROFESSIONAL SERVICES COST TOTAL	**$50,000.00**
Construction Cost Opinion	$160,000.00
Professional Services Opinion	$50,000.00
TOTAL PROJECT COSTS AND FEES	**$210,000.00**

APPENDIX K:

ESTIMATED O&M COSTS OF ALTERNATIVES

6.1: Tank 4 to Tank 2 Transmission Line - O&M Costs
Water Master Plan PER 2022 Update - Eldorado, New Mexico

1	Maintenance		
	Number of New Solenoid Valves & Vaults	1	Valves/Vaults
	Frequency of Site Visits	2	visits/week
	Duration of Visits	0.5	hr/visit
	Personnel	1	person
	Average Mileage to Tank Sites	8.0	miles RT each visit
	Manhour Cost	$ 65.00	per week
	Vehicle Cost	$ 9.28	per week
	Total Cost	$ 74.28	per week
	Annual Maintenance Cost (Rounded)	**$3,900**	**$/year**

6.7: Emergency Generator Installation - O&M Costs
2022 Water Master Plan PER - EAWSD, New Mexico

1	Maintenance		
	Number of New Generators	1	Generators
	Frequency of Site Visits	2	visits/week
	Duration of Visits	1	hr/visit
	Personnel	1	person
	Average Mileage to Tank Sites	8.0	miles RT each visit
	Manhour Cost	$ 130.00	per week
	Vehicle Cost	$ 9.28	per week
	Total Cost	$ 139.28	per week
	Annual Maintenance Cost (Rounded)	**$7,200**	**$/year**

APPENDIX L:

WATER SERVICE TO WELLED AREAS

System Expansion to Welled Area

Description

The EAWSD supplies clean drinking water to approximately 92% of the citizens that reside within the service area. The remaining 8% of residents are served by privately owned or shared community wells, all of which are located in the northeastern portion of the service area. The District is considering providing connection to the water system for the remaining 8% of residents who have not yet been connected. The desired outcome would be for welled area customers to use less water, since they would now have to pay for it, than they would have from their wells. The net reduction in water use would conserve groundwater and extend the life of the reserve. In the past, the NMOSE allowed domestic well permits to transfer to municipalities to which the well owner connected, with the condition that the well could not be used. However, the NMOSE no longer allows that practice. The details to facilitate the connection of the "welled area" to the rest of the water system is discussed in the following subsections.

Design Criteria

The connection of the "welled area" to the existing water system would require the installation of new transmission lines, isolation valves, service lines, water meters, fire hydrants, and PRVs to facilitate redundancy throughout the system. Figure L-1 shows a schematic layout of the proposed improvements. A summary of the materials necessary to facilitate this expansion is detailed in the list below:

- 6-inch C900 PVC transmission lines: Approximately 57,250 linear feet.
- 8-inch C900 PVC transmission lines: Approximately 10,850 linear feet.
- Service line connections and water meters: Approximately 240.
- 6-inch isolation gate valves: Approximately 40.
- 8-inch isolation gate valves: Approximately eight.
- Fire hydrants: Approximately 140.
- PRVs: One.

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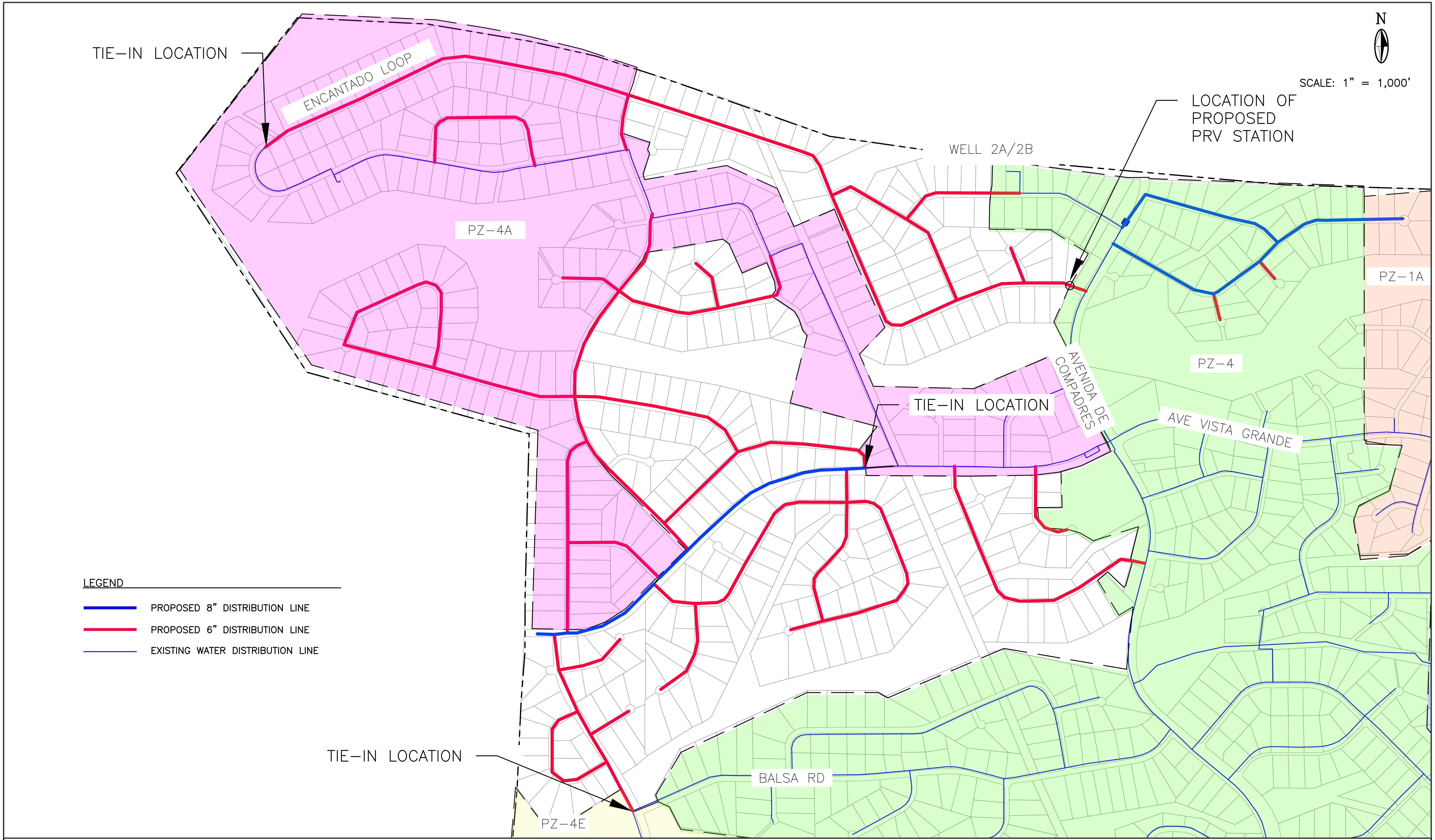
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE L-1 WELL FIELD EXPxx.dwg



Water Master Plan PER 2022 Update - Eldorado Area Water & Sanitation District, NM

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Figure L-1

WELLED AREA SYSTEM EXPANSION

Existing transmission lines in the area, near Avenida Vista Grande, Encantado Loop, and Avenida Casa Del Oro will serve as tie-in locations for the expansion. The design of the piping network would accommodate acceptable pipeline velocities (between 2 to 5 fps), pressure ratings and isolation capabilities, with other necessary appurtenances to get the system functional. Additionally, where high spots in the lines exist, air / vacuum relief valves would be installed to allow release of entrained air and prevent vacuum conditions if a line were to experience a major break nearby. Fire hydrants would be installed at least every 500 feet of transmission line. New piping would be constructed of DR18 C900 pipe rated for 235 psi.

Environmental Impacts

The majority of construction will take place within road easements that have already been disturbed. A SWPPP will likely be required during construction, as it is likely to disturb more than 1 acre of land.

Land Requirements and Permitting

This work will be completed in within existing road easements. No new easements are anticipated. Where construction is to take place along County roads, coordination with and possibly a development application to the County may be required.

The project construction documents would need to be reviewed and approved by the NMED DWB prior to bidding and construction.

Potential Construction Problems

As this expansion will be installed in areas where no previous water utilities exist, it allows for the complete installation of this project without taking the existing system offline, except for the final tie-ins to the system. Although there are no existing water utilities in the area, there are buried electrical, gas, and communication lines that may pose an issue when trenching for the pipeline. Potential construction problems may include trenching through rock, implementing traffic control and maintaining residential access during construction, and finding temporary space for trenchless crossing pits. Ensuring landscaping and existing trees are protected to the greatest extent possible will add a challenge. During the design phase geotechnical and SUE studies would be performed to assess the nature of soil and rock at the construction locations and identify any unforeseen utility conflicts.

Sustainability Considerations

Pipe sizes and materials would be verified in design and selected to minimize the head losses and save energy. Supplying the remainder of the population within the service area would provide an increase in the revenue generated. The system design will ensure adequate fire flow can be provided throughout the new network.

Project Timeline

Table L-1 presents a proposed project schedule for the Design, Bidding, and Construction of the proposed improvement. Total project time to completion is expected to be 630 days or 21 months.

TABLE L-1
PROJECT SCHEDULE FOR
SYSTEM EXPANSION TO WELLED AREAS

TASKS	DURATION
Geotechnical, SUE, and Survey	90 Days
Design	150 Days
Bid and Award	90 Days
Construction	270 Days
Closeout	30 Days
TOTAL	**630 DAYS**

Cost Opinion

The total estimated cost for this alternative is $17,676,000 including Professional Services and Construction. Appendix J contains a detailed cost breakout. Additional O&M costs incurred by this alternative are estimated at $31,100 per year. Appendix K contains detailed O&M costs.

Welled Area Expansion - O&M Costs

2022 Water Master Plan PER - EAWSD, New Mexico

1	Maintenance			
	Number of New Inspection Locations		4	Inspection Locations
	Frequency of Site Visits		2	visits/week
	Duration of Visits		1	hr/visit
	Personnel		1	person
	Average Mileage to Tank Sites		17.0	miles RT each visit
	Manhour Cost	$	520.00	per week
	Vehicle Cost	$	78.88	per week
	Total Cost	$	598.88	per week
	Annual Maintenance Cost (Rounded)		**$31,100**	**$/year**

Welled Area Expansion
2022 Water Master Plan PER - EAWSD, New Mexico

Item #	DESCRIPTION	UNIT	QUANT	UNIT PRICE	AMOUNT
Welled Area Expansion					
1	6” C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	57,250	$100.00	$5,725,000.00
2	8” C900 PVC DR 18, incl. all material, labor, joint restraints, fittings, detection tape, tracer wire, trenching, bedding, backfilling, and site restoration, CIP	LF	10,850	$110.00	$1,193,500.00
3	Connect proposed 6" line to existing 8" waterline on Encantado Loop, including all appurtenances.	EA	1	$10,000.00	$10,000.00
4	Connect proposed 8" line to existing 8" waterline on Avenida Vista Grande, including all appurtenances.	EA	1	$10,000.00	$10,000.00
5	Connect proposed 6" line to existing 8" waterline on Balsa Road, including all appurtenances.	EA	1	$10,000.00	$10,000.00
6	New Residential Lateral Service Assembly, Including Excavation, Backfill, Pavement Patching, New Saddle, Tap, Corporation Stop, Service Line, Tracer Wire, Meter Box, Angle Stop, Water Meters, All Associated Appurtenances, and All Incidental Work, Complete in Place (CIP).	EA	240	$3,000.00	$720,000.00
7	6" Buried Valves, including fittings, external restraint devices, valve box, and all incidental work to complete in place.	EA	40	$6,000.00	$240,000.00
8	8" Buried Valves, including fittings, external restraint devices, valve box, and all incidental work to complete in place.	EA	8	$8,000.00	$64,000.00
9	2" Combination air and vacuum valve stations, including: precast manhole vault, piping, insulated wraps, all appurtenances, and all incidental work to complete in place.	EA	15	$15,000.00	$225,000.00
10	Fire Hydrant assembly including, hydrant, isolation valve and box, piping, fittings, restraint devices, all appurtenances, and all incidental wrok to complete in place.	EA	140	$10,000.00	$1,400,000.00
11	Pressure reducing valve station	EA	1	$75,000.00	$75,000.00
12	HDD road crossings	LF	7200	$100.00	$720,000.00
13	Pavement Repair	SY	300	$70.00	$21,000.00
Other Project Construction Requirements					
14	Undefined Elements (15%)	LS	1	$1,562,025.00	$1,562,025.00
15	Temporary Traffic Control	LS	1	$100,000.00	$100,000.00
16	SWPPP	LS	1	$50,000.00	$50,000.00
17	Construction Staking by New Mexico Registered Surveyor	LS	1	$75,000.00	$75,000.00
18	Reclamation seeding	LS	1	$40,000.00	$40,000.00
19	Utility Relocation Allowance	ALLOW	1	$50,000.00	$50,000.00
20	Material Testing Allowance	ALLOW	1	$50,000.00	$50,000.00
21	Mobilization and Demobilization	LS	1	$417,000.00	$417,000.00

SUBTOTAL	$12,757,525.00
Construction Contingency	$383,000.00
SUBTOTAL	$13,140,525.00
NMGRT	$936,262.41
WELLED AREA EXPANSION CONSTRUCTION COST TOTAL	**$14,077,000.00**

Professional Services	**Amount**
Permitting	$ 7,000.00
Engineering Design and Construction Fees	$ 2,552,000.00
Survey Fees	$ 268,000.00
Aerial	$ 96,000.00
Geotechnical Investigation Fees	$ 96,000.00
Subsurface Utility Engineering Fees	$ 191,000.00
Construction Observation Fees (Part time, 9 months at $14,000/mo)	$ 126,000.00
Subtotal Professional Services	$ 3,336,000.00
NMGRT	$ 262,710.00
PROFESSIONAL SERVICES COST TOTAL	**$3,599,000.00**
Construction Cost Opinion	$14,077,000.00
Professional Services Opinion	$3,599,000.00
TOTAL PROJECT COSTS AND FEES	**$17,676,000.00**

Model Evaluation of Service to Welled Area

A significant number of homes of the northwest portion of the District are not serviced by the system, but instead use domestic wells for water supply (Figure 2-3). The District has considered extending service to this area in exchange for the homeowners ceasing well use to reduce demand on the Santa Fe Group aquifer and extend the life of the District wells completed therein. The District requested that MC perform a hydraulic analysis of supplying the "welled" area to determine if the water supply and storage are adequate to incorporate these customers. An inventory of rooftops indicates there are about 480 homes in the "welled" area that are not currently served by the District system. Addition of these homes to the system increases average day demand by 69,000 gpd and peak demand by 154,000 gpd.

We incorporated a schematic water distribution system into the current average day water model to service the welled area. In summary, the modeled welled area consists of a combination of 6-inch and 8-inch waterlines following the roadways in the northwest portion of Eldorado. The welled area would be serviced by PZ-4 and PZ-4A and is assumed to follow the same demand characteristics as the rest of Eldorado.

Average Demand with Largest Well out of Service

Using the scenario discussed in Section 4.2.1 as a baseline, the welled area users are assumed to have the same demand pattern as those in the EAWSD. Model results are presented in Figure L-2. Tanks 1 and 4 are most affected by the additional demands applied to PZ-4. Wells 2A / 2B and Tank 4 Control Valve are called to fill Tank 4 after approximately 5 hours instead of 8 hours. Despite the additional demands from the welled area, the tanks can refill during an average day scenario. To accomplish this Wells 2A /2B was required to run 80% of the scenario time, exceeding the desired 60% sustainable well use goal.

Peak Day

Despite the addition of welled area demands, well usage, and tank drain and fill are similar to the current peak day scenario. Model results are shown in Figure L-3. Wells 17 and 18 operate 92% of the runtime to maintain fill in Tank 2. Wells 2A / 2B operates 94% of the time due to Tank 4 emptying from Tank 4 BPS. All tanks are able to refill but at the expense of using Wells 2 / 2A, 17, and 18 over the preferred 80% run time assumed for periods of peak demand.

Storage

With the addition of the welled area demands, Tank 4 is most affected when comparing to the current day demand scenarios discussed in Section 4.2. Despite the additional demands, the tanks are still able to maintain levels above their reserve limits.

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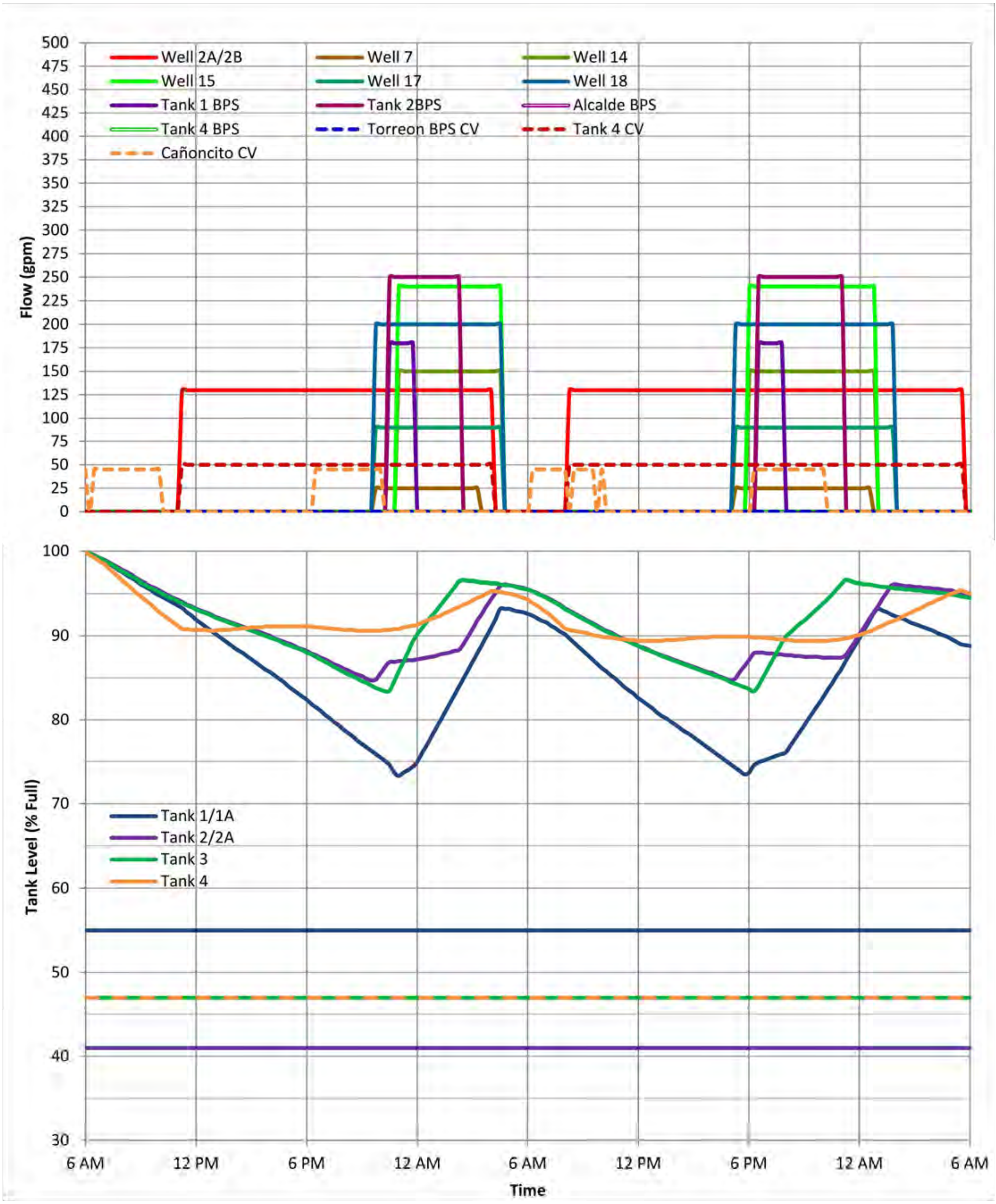
DWG. LOCATION: I:\Eldorado\ELD211-11 2021 Water Master Plan\DWG\
DWG. NAME: FIGURE L-2 Welled Area Ave Demand.dwg



Water Master Plan PER 2022 Update - Eldorado, NM

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Figure L-2: Model Results

Welled Area Average Day Demand with Largest Source Out of Service

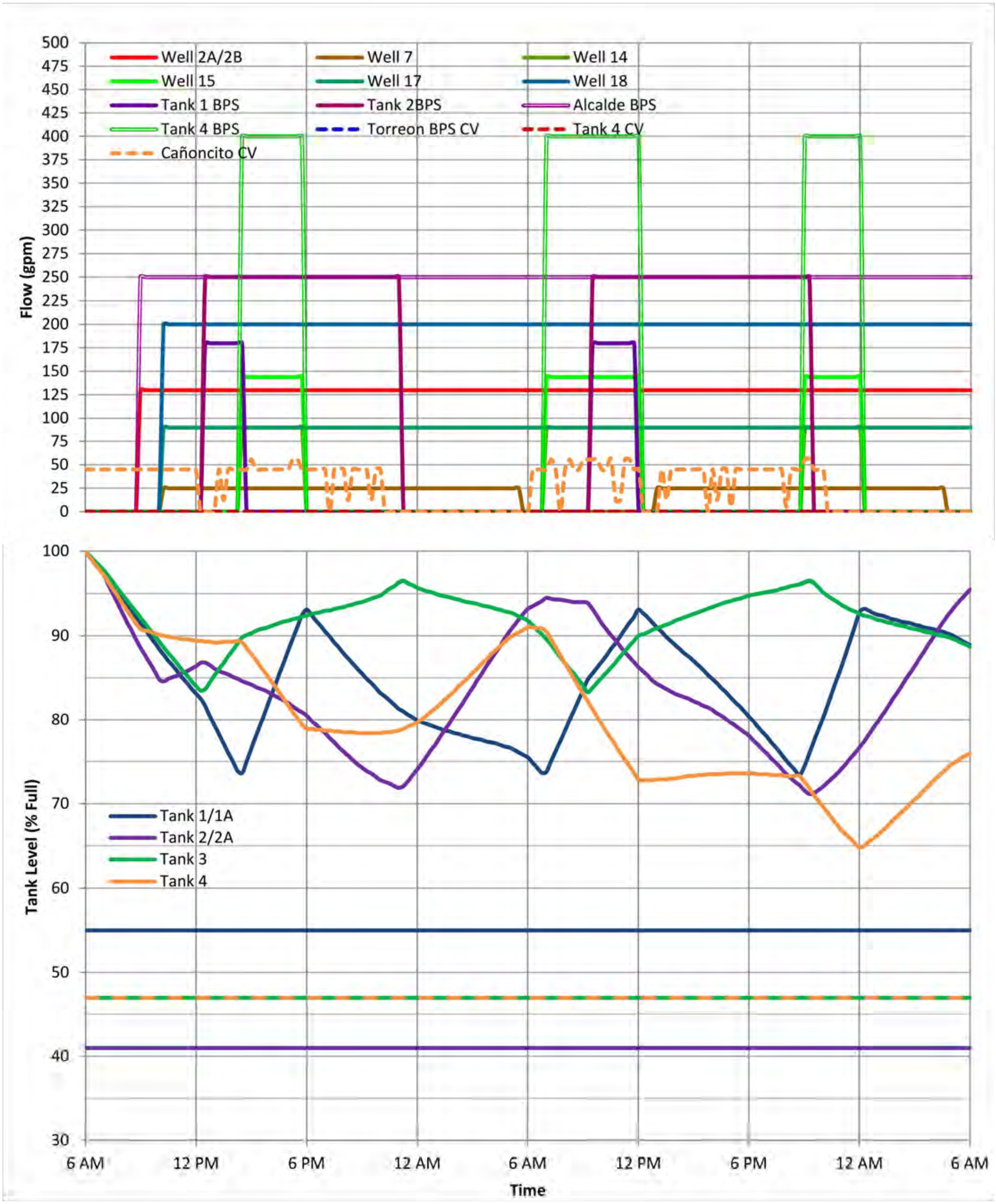

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Figure L-3: Model Results

Welled Area Peak Day Demand

Fire Flow

Because the homes in the welled area were built before 2013, the fire flow criteria will be 500 gpm with 20 psi residual. If an additional PRV is installed along Encantado Road to allow additional flow from PZ-4 during fire events, 500 gpm fire flow at 20 psi residual pressure is available at most welled nodes. The only exception to the fire flow requirement is located at the end of Fonda Court where model results show 454 gpm available fire flow at 20 psi residual. Fire flow can be achieved approximately 550 feet from the end of Fonda Court at an approximate elevation of 6,750 feet. Due to inaccuracies of elevation data used in this water model run, more accurate elevation information would be necessary to determine an exact location of fire flow availability.

Pressures

Most pressures within the welled area fall within the desirable range. High pressures exceeding 100 psi are simulated in the lower elevation areas near Casa de Oro Loop and Camerada Loop. These high-pressure areas could be alleviated by adding additional PRVs within the welled area or possibly adjusting the settings at PRV 8.