BEFORE THE PUBLIC UTILITIES COMMISSION OF NEVADA

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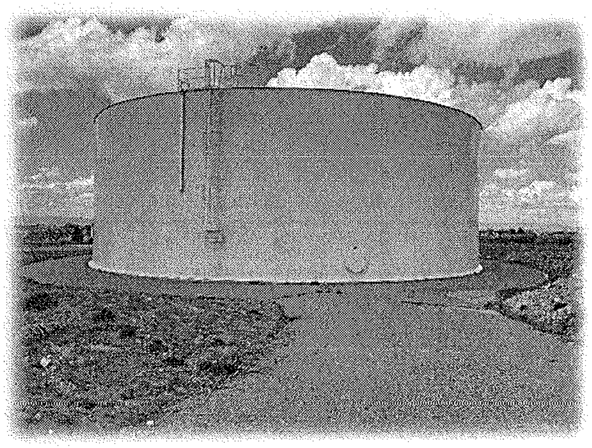
In the Matter of: Application of Great Basin Water Co., Pahrump, Spring Creek, Cold Springs, Pahrump, and Spanish Springs Divisions for Approval of its 2024 Integrated Resource Plan and to designate certain system improvement projects as eligible projects for which a system improvement rate may be established, and for relief properly related thereto.	Docket No. 24-______________

VOLUME 3 OF 18

Great Basin Water Co.

2024 Integrated Resource Plan
Volume III: Spring Creek Division

March 1, 2024



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2-29-24

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List of Abbreviations

ADD	Average Day Demand
ADF	Average Daily Flow
ADMM	Average Day Maximum Month
AFMM	Average Flow Maximum Month
AF	Acre Feet
AFA	Acre Feet Annually
AFUDC	Allowance for Funds Used During Construction
AL	Active Level
AMI	Advanced Metering Infrastructure
AMP	Alternative Monitoring Plan
AMR	Automatic Meter Reading
amsl	Above Mean Sea Level
AWWA	American Water Works Association
bgl	Below Ground Level
BOD	Biological Oxygen Demand
BSDW	Bureau of Safe Drinking Water
CDP	Census Designated Place
cfm	Cubic Feet per Minute
CIP	Capital Improvement Project
CPC	Certificate of Public Convenience and Necessity
CU	Color Units
DU	Dwelling Units
EPA	Environmental Protection Agency
FMEA	Failure Mode and Effects Analysis
ft	Feet or Foot
GBWC	Great Basin Water Co.
GBWC-SCD	Great Basin Water Co. - Spring Creek Division
gpd	Gallons per day
gpdpc	Gallons per day per connection
gpm	Gallons per Minute
GIS	Geographical Information System
HAA5	Haloacetic acids
Housing Section	100, 300 and 400 Tracts, collectively
HP	Horse Power
IFC	International Fire Code
IRP	Integrated Resource Plan
IWA	International Water Association
kW	Kilowatt

List of Abbreviations – cont.

LF	Linear Feet
LOS	Level of Service
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
MG/Y	Million Gallons per Year
mL	Milliliters
MPN	Most Probable Number
NAC	Nevada Administrative Code
ND	Non-Detect
NDEP	Nevada Division of Environmental Protection
NDMC	National Drought Mitigation Center
NDWR	Nevada Division of Water Resources
NRS	Nevada Revised Statutes
NRW	Non-Revenue Water
O&M	Operations and Maintenance
OMS	Operation Maintenance Support
OSHA	Occupational Safety and Health Administration
pCi/L	Picocurie per Liter
PCWCD	Pershing County Water Conservation District
PF	Peaking Factor
pH	Potential of Hydrogen
PHD	Peak Hour Demand
PLC	Programmable Logic Controller
ppb	Parts per Billion
ppm	Parts per Million
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
psig	Pounds per Square Inch Gauge
PUCN	Public Utilities Commission of Nevada
PVC	Polyvinyl Chloride
RAA	Running Annual Average
RPM	Revolutions per Minute
SCA	Spring Creek Association
SCADA	Supervisory Control and Data Acquisition
SIR	System Improvement Rate

List of Abbreviations – cont.

SCUC	Spring Creek Utilities Co.
TBP	Twin Booster Pumps
TDH	Total Dynamic Head
TDS	Total Dissolved Solids
TON	Threshold Odor Number
TPH	Total Petroleum Hydrocarbon
TSS	Total Suspended Solids
TTHM	Trihalomethane
UFC	Uniform Fire Code
USGS	United States Geological Survey
VFD	Variable Frequency Drive
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

GBWC Spring Creek Division Overview

The rural community of Spring Creek, Nevada, is located approximately 10 miles southeast of Elko, Nevada, on Lamoille Highway (State Route 227) as shown in Figure E-1. The community covers an area of approximately 8 miles east-west by 9 miles north-south and was established around 1970 by the McCulloch Corp. The site was subdivided into 5,420 large lots, primarily residential, ranging in size from about one to ten acres. The GBWC-SCD maintains two public water systems, one serving the Mobile Home Section (the 200 Tract) with the service area shown in Figure E-2, and a separate water system serving the Housing Section (the 100, 300, and 400 Tracts) with the service area shown in Figure E-3. A total of approximately 5,066 connections are currently being served as of December 2022 meter counts. The legal descriptions of the water and sewer service areas for the GBWC-SCD are contained in GBWC's Tariff Rule No. 17, which is maintained on file in the office of the Public Utilities Commission of Nevada (PUCN) and at the GBWC offices in Spring Creek and Pahrump, as well as on the GBWC website at www.GreatBasinWaterCo.com.

The Spring Creek water system consists of more than 149 miles of piping. Generally, transmission piping is 6 to 12 inches in diameter, however, a large portion of the distribution piping in the two Spring Creek water systems are 2-inch, 3-inch and 4-inch diameter polyvinyl chloride (PVC) pipe. Twelve (12) groundwater wells supply water to the system, and storage is contained in ten (10) water tanks of which 9 are operational. Most of the use is residential, although the system serves several large commercial/other water users, including a golf course, a marina, and a sports complex.

The Spring Creek wastewater collection system in the 100 Tract consists of approximately 3.5 miles of gravity sewer mains and approximately 56 manholes.

The purpose of this IRP is intended to balance the needs of the system, environment, and customers over the next 20 years. The Action Plan is a 3-year plan. The purpose of the Action Plan is to:

- Identify current major assets that may have exceeded or are near the end of their useful life;
- Identify insufficiencies in the system;
- Promote water system innovations that will provide efficiency in operations and maintenance; and
- Continue to maintain and improve the Level of Service to the customer.

By working through the Action Plan, GBWC-SCD will be able to develop a plan for the next three years balancing the objectives of minimizing cost, mitigating risk, and maximizing service reliability. The planning horizon for the IRP is 20 years, from 2025 to 2044. NAC 704.5654. Historical production data presented in this IRP covers the 10-year period preceding 2023 pursuant to NAC 704.5668.

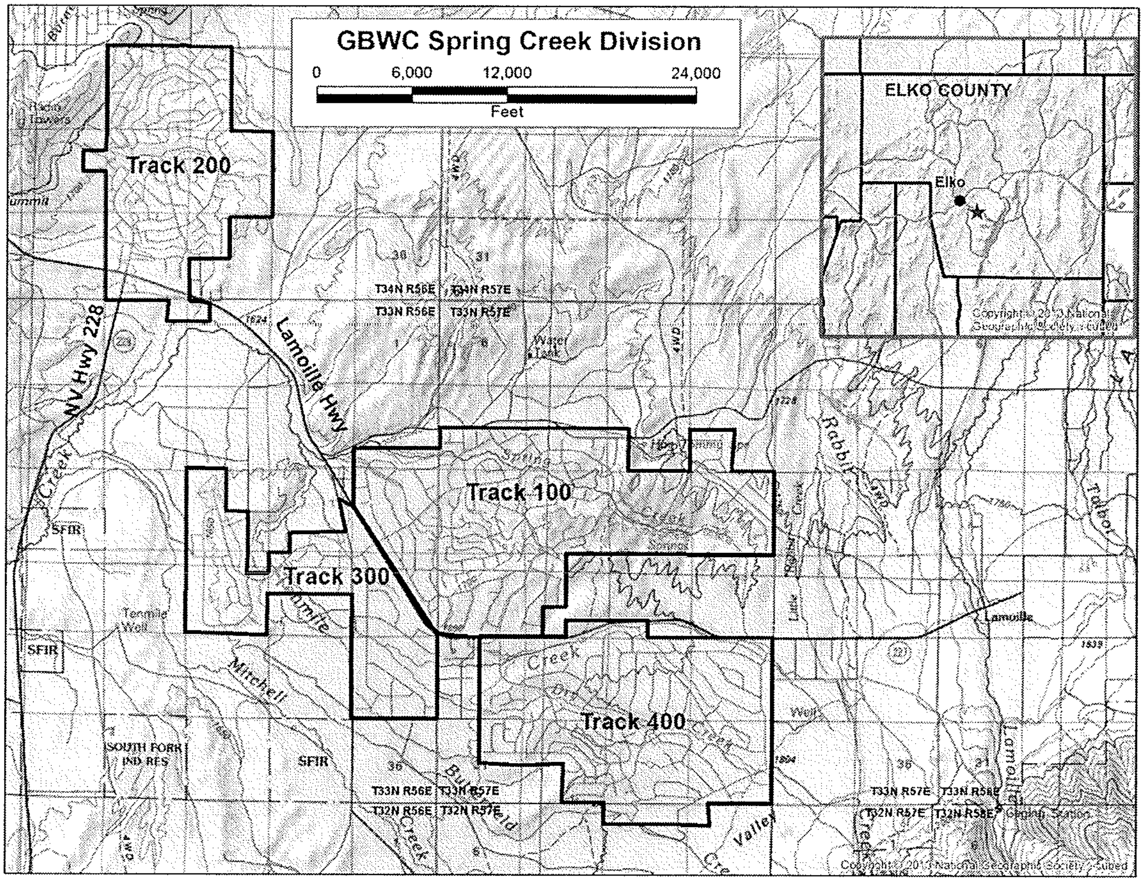

Figure E-1: Overview of the Existing Water Service Boundaries

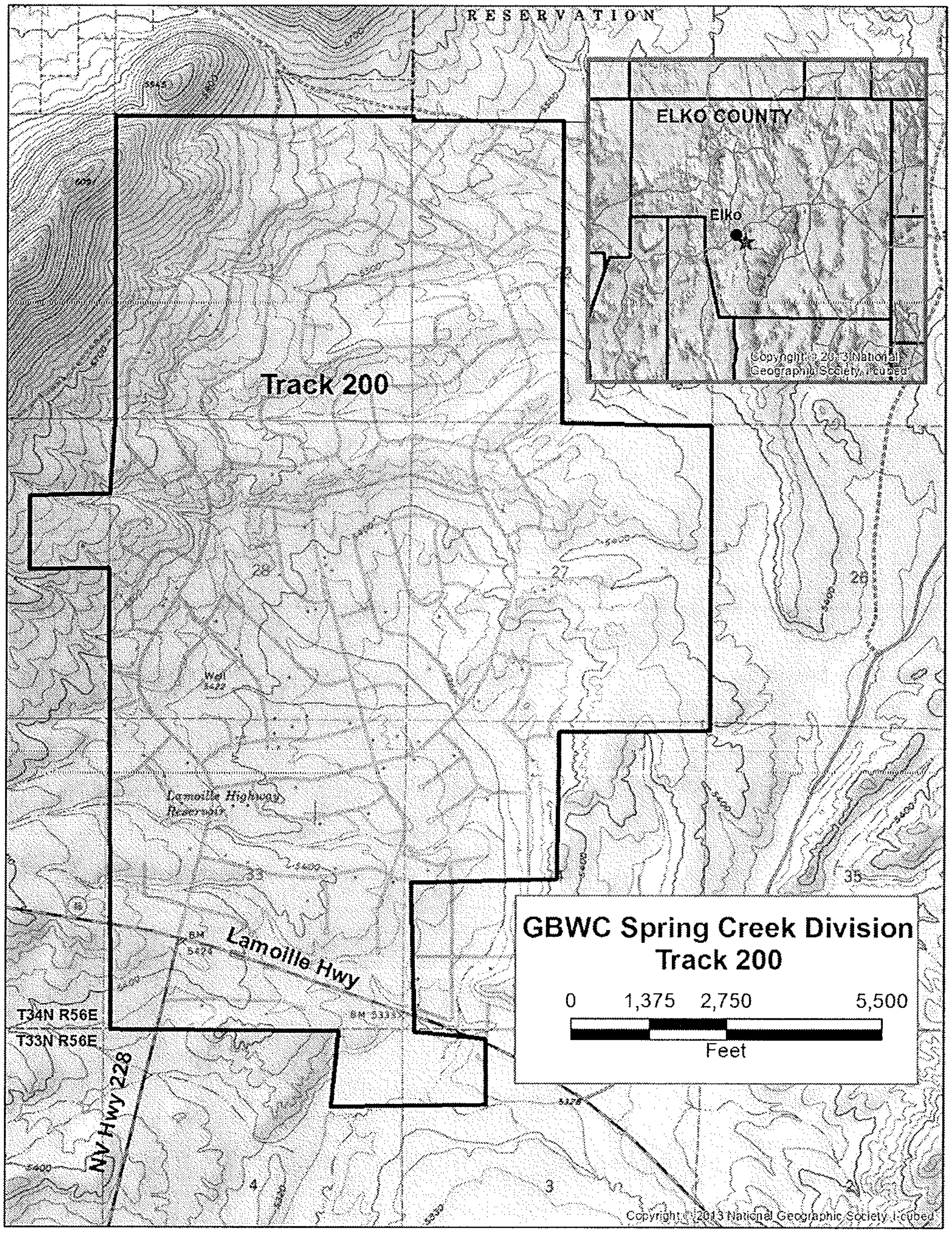

Figure E-2: Existing Water Service Boundaries for 200 Tract

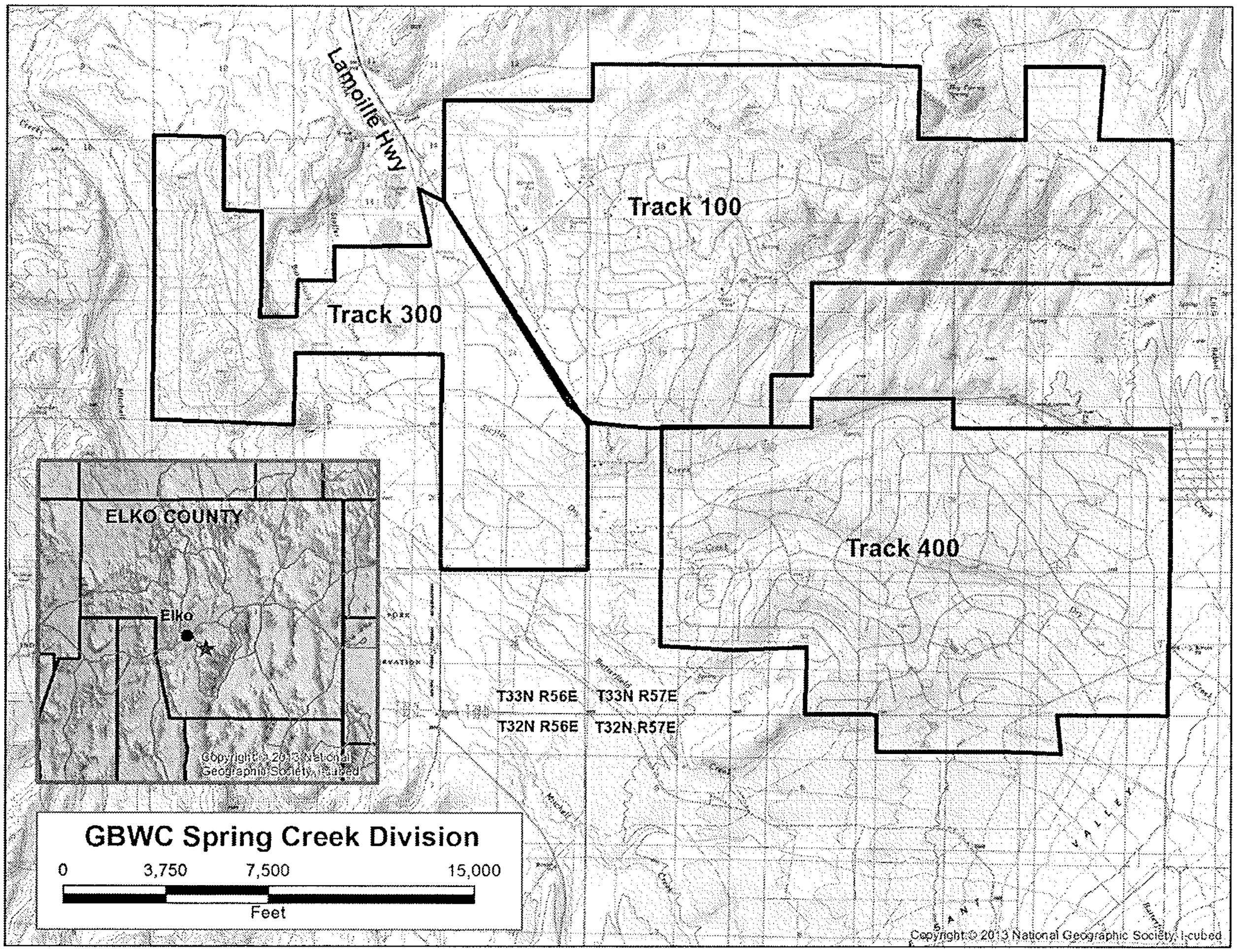

Figure E-3: Existing Water Service Boundaries for Housing Section

Current Level of Service

In December 2013, a workshop was conducted to develop a "Level of Service" (LOS) assessment for the GBWC-SCD. The objective was to assess all the major service aspects of the water and sewer utilities (including Regulatory, Contractual, Quality, Reliability, Customer Service (and others) and identify the service aspects that need improvement and will have the most beneficial impacts to the systems and their customers.

Primary LOS improvement priorities were identified during the 2013 workshop and have been updated below with current information as reflected in this 2024 IRP:

- Non-Revenue Water: Based on well production records and customer meter readings, a large volume of water remains unaccounted for throughout the system. Non-Revenue Water (NRW) for the three-year period from 2020-2022 ranged from 26-27% for the 200 Tract per Table 3.10, a slight decrease from previous years (ranged from 26-31% from 2017-2019). NRW for the Housing Section ranged from 2-14% for the same period per Table 3.11, which is also a decrease, on average, from previous years (ranged from 11-15% from 2017-2019).

- Water Pressure: In the system, there are areas of high and low water pressures due to a variety of factors including undersized distribution lines, dead-end water mains, need for additional pressure reducing valves between pressure zones, and high discharge pressures from well and booster pump station facilities. High water pressure is believed to contribute to the NRW and loss of service due to waterline breaks.

- Fire Flow: The original water system was not installed in accordance with current design and construction standards, including fire protection requirements (instead fire protection was to be provided by pumper truck). Subsequently, as GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to meet fire flow requirements of 1,000 gallons per minute (gpm) for 2-hours for residential and 1,500 gpm for 2-hours for commercial. Older infrastructure does not meet requirements of the International Fire Code (IFC) as adopted by reference in NAC 704.569, and community members have expressed the desire that fire flow capacity be increased.

- Hydrant Spacing: Fire hydrant spacing does not meet the Uniform Fire Code (UFC). The original water system was not installed in accordance with current design and construction standards, including fire protection requirements (instead fire protection was to be provided by pumper truck). Similar to fire flow needs, as GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to meet minimum fire hydrant spacing of 500 feet per the UFC and the community has expressed an interest in having older infrastructure upgraded.

- Storage: Because of the addition of backup generators at several well sites over the past few years, there is sufficient storage in the water systems when considering alternative pumping capacity. To maintain adequate storage, several storage tanks will require improvements, rehabilitation, or replacement during the 20-year planning period based on tank inspections and ongoing monitoring. The existing High Tank (500,000-gallon capacity) is in need of replacement/rehabilitation to continue serving as a fire protection source to protect the health and safety of existing customers in the 200 Tract.

- Breakage/Reliability: There are numerous waterline breaks resulting from aging and undersized infrastructure which causes disruption in reliable water supply. Additionally, some disruptions have been caused by the expansion of fiber and natural gas infrastructure into Spring Creek, resulting in an increase of water line breaks and reporting. Over the past three years GBWC has conducted pipeline replacement projects, targeting the poorest conditional pipelines.

- Wells: Historical poor well designs, screen plugging, and dewatering of wells is causing air entrainment in the distribution system. Air entrainment issues have been addressed in some wells through rehabilitations but will need continued monitoring to address well needs in the future. This will require additional rehabilitations and redrilling wells over the 20-year planning period.

Since this workshop, many LOS issues have been addressed including, but not limited to:

- Non-Revenue Water: In recent years, NRW has decreased for the Housing Section to an average of 8%. GBWC continues to monitor NRW for each water system and is using monitoring tools to prioritize pipeline replacement projects.

- Wells: To address well capacity and air entrainment issues, multiple wells have been rehabilitated and equipped with variable frequency drives (VFDs). This includes Wells 9 and 12 which were rehabilitated in 2017, and more recently Wells 1, 3, 5 (upgraded VFD), 7 (upgraded VFD), 10 (existing VFD reused), and 14, all of which were rehabilitated in 2019-2020. Well 101 was rehabilitated in 2022. Wells 4 (new VFD), 11, and 12 were rehabilitated in 2023.

- Reliability: Cathodic protection was installed in most of the storage tanks prior to the 2018 IRP (except for those scheduled for replacement/removal) to prevent corrosion and extend the useful service life of the tanks, thereby improving water system reliability. Backup generators have been installed at multiple sites to improve system reliability; these sites include the Tank 103 Booster Site (2016), Well 1 (2019), Well 3 (2019), Well 7 (2019), and Well 14 (2019). In addition, Lift Station 1 in the 100 Tract was replaced and equipped with a generator in 2017 to address aging infrastructure and to add pumping redundancy.

Current Project Requirements

Growth Projections

The existing GBWC-SCD service area has been fully subdivided. Therefore, unless additional developments are annexed into the service area, all future developments will be infill.

The *Nevada County Population Projections 2022 to 2041* dated October 1, 2022, prepared by the Nevada State Demographer's Office, was used as the latest available data to develop the future population and connection projections in the existing GBWC-SCD service area. The U.S. Census Bureau American Factfinder was also used to provide past and current population information for the Spring Creek CDP. The GBWC-SCD service area is contained within the Spring Creek CDP.

Based on population data analyzed in the 2015, 2018, and 2021 IRPs, the Spring Creek area has generally followed the growth/decline rate of Elko County as a whole. As such, population projections for the Spring Creek CDP and service connection estimates for the GBWC-SCD service area will be based on growth/decline rates from the State Demographer's Office for the planning period. The report *Nevada County Population Projections 2022 to 2041* shows a population of

54,959 in Elko County for 2022 and an increase to a population of 65,916 by 2041 with annual rates of population increase ranging from 0.8% to 1.2%. This equates to an average annual population growth rate of 0.96%. The population growth rate of 1.2% in 2041 as projected by the State Demographer's Office was extended through the end of the planning period resulting in an Elko County population of 68,312 in 2044. Although the State Demographer's projections are being used for the 2024 IRP, GBWC-SCD is also monitoring economic trends that suggest its service territory may not experience the same population increase projected for Elko County. Even so, the potential discrepancy in projected growth rates does not affect the Action Plan projects proposed in the 2024 IRP.

In estimating population growth specific to the GBWC-SCD service area, an occupancy density of 3.19 people per household was used (per U.S. Census Bureau American Factfinder for Spring Creek CDP). This occupancy density is based on 2020 census data for the Spring Creek CDP and provides a reasonable projection of future population in the GBWC-SCD service area. Table 3.01E-1 includes the GBWC-SCD population estimates for the planning period.

Table E-1: Population Projections

Year	Elko County Population	% Change	SCD Service Area Estimated Population
2021	54,546	-	14,967
2022	54,959	0.76%	15,080
2023	55,314	0.65%	15,178
2024	55,643	0.59%	15,268
2025	55,902	0.47%	15,339
2026	56,230	0.59%	15,429
2027	56,630	0.71%	15,539
2028	57,039	0.72%	15,651
2029	57,521	0.85%	15,783
2030	58,065	0.95%	15,933
2031	58,661	1.03%	16,096
2032	59,318	1.12%	16,276
2033	60,004	1.16%	16,465
2034	60,713	1.18%	16,659
2035	61,433	1.19%	16,857
2036	62,160	1.18%	17,056
2037	62,897	1.19%	17,258
2038	63,627	1.16%	17,459
2039	64,372	1.17%	17,663
2040	65,136	1.19%	17,873
2041	65,916	1.20%	18,087
2042	66,705	1.20%	18,303
2043	67,504	1.20%	18,523
2044	68,312	1.20%	18,744

The GBWC-SCD has been approached by two developers (Ruby Vista Ranch and Ridgecrest) that have expressed interest in eventually being annexed into the GBWC-SCD service area. Even though these annexation agreements have yet to be filed, the GBWC-SCD has included these projects in the future projections and project needs. However, potential consolidation options for GBWC-SCD's existing water and wastewater systems with Ruby Vista Ranch's future water and wastewater systems are currently being explored.

Water System Forecasting

The existing GBWC-SCD service area has been fully subdivided. Therefore, unless additional developments are annexed into the service area, all future developments will be infill. Table 3.02E-2 shows the historical connection increase for the GBWC-SCD for the period 2020 to 2022 as well as the 20-year projections from 2023 to 2044. Based on the State Demographer's increasing population rates projected for Elko County during the planning period, the total number of equivalent GBWC-SCD water connections would increase to 5,935 by the end of the planning period. As stated previously, the number of water system connections would not actually increase; rather, the increase in connection counts is a representative way to reflect the impacts of population increase as it equates to future demand projections.

Table E-2: GBWC-SCD Water Connections

Year	200 Tract Service Connections	Housing Section Service Connections	Total SCD Service Connections
2020	1,422	3,567	4,989
2021	1,425	3,617	5,042
2022	1,426	3,640	5,066
2023	1,435	3,662	5,097
2024	1,443	3,682	5,125
2025	1,449	3,698	5,147
2026	1,457	3,718	5,175
2027	1,467	3,743	5,210
2028	1,469	3,768	5,237
2029	1,469	3,798	5,267
2030	1,469	3,832	5,301
2031	1,469	3,869	5,338
2032	1,469	3,910	5,379
2033	1,469	3,952	5,420
2034	1,469	3,996	5,465
2035	1,469	4,041	5,510
2036	1,469	4,086	5,555
2037	1,469	4,132	5,601
2038	1,469	4,177	5,646
2039	1,469	4,223	5,691
2040	1,469	4,270	5,739
2041	1,469	4,318	5,787

2042	1,469	4,367	5,836
2043	1,469	4,416	5,885
2044	1,469	4,466	5,935

Water and Wastewater System Analysis

Water Rights

GBWC-SCD holds nineteen (19) permits in the Dixie Creek-Tenmile Creek Area (Basin 48) of the Humboldt River Basin Region with an authorized total combined duty of 7,103.27 acre-feet annually (AFA). All the water rights are in good standing with the State Engineers Office.

Water System Capacity Analysis

The GBWC-SCD water system capacity was evaluated based on available well capacities compared to the current and projected future water demands. The 200 Tract was evaluated separately from the Housing Section because they are not interconnected and are considered separate licensed water systems by the NDEP, BSDW. The criteria for evaluating adequate supply capacity is based on NAC 445A.6672, which requires a system that relies exclusively on wells to provide a total well capacity sufficient to meet the MDD when all wells are operational, or the ADD with the most productive well out of service.

Table E-3 provides a summary of available well capacity versus existing and projected water demands for the 200 Tract. As shown in Table E-3, the 200 Tract water supply can meet existing and future demands in accordance with the requirements of NAC 445A.6672. However, it should be noted that Well 1 and Well 3 are at the end of their useful life expectancy and replacement capacity will be needed in the years to come.

Table E-3: 200 Tract Well Capacity versus Demand

System Well Capacity			
Wells	**Backup Power?**		**Capacity (gpm)[1]**
Well 1	Yes		300
Well 3	Yes		680
Well 11	Yes		720
		Total, All Wells in Service	**1,700**
		Total, Well 11 Out of Service	**980**
System Demand			
Year	**Well Supply Required for ADD (gpm)[2]**	**Projected MDD (gpm)**	**Can Well Supply[3] Meet MDD?**
2022	404	917	Yes
2044	415	942	Yes

Notes:
(1) Capacities are verified by GBWC Staff (see Table 2.07).
(2) Well supply figures were grossed up to accommodate for 27% NRW in the 200 Tract.
(3) Total well supply must be able to accommodate MDD.

Table E-4 provides a summary of the Housing Section water supply which can meet existing and future demands in accordance with the requirements of NAC 445A.6672. However, it should be noted that some of the Housing Section wells are at the end of their useful life expectancies and replacement capacity will be needed in the years to come. The replacement of Well 8, as approved in the 2018 IRP, is currently underway. An 8-inch test well has been completed and currently a plan set for the construction of a new well house and discharge assembly has been approved by NDEP. Re-drilling Well 12 is in the Action Plan. Well 12 was rehabbed in May 2023 with the hope to extend its useful life for an additional 3 to 4 years.

Table E-4: Housing Section Well Capacity versus Demand

System Well Capacity		
Wells	**Backup Power?**	**Capacity (gpm)[1]**
Well 4	Yes	800
Well 5	Yes	950
Well 10	Yes	300
Well 101	Yes	1000
Well 7	Yes	300
Well 14	Yes	275
Well 8	Yes	400[4]
Well 9	Yes	400
Well 12	Yes	350
	Total, All Wells in Service	4,775
	Total, Well 101 Out of Service	3,775[5]

System Demand			
Year	Well Supply Required for ADD (gpm)(2)	Projected MDD (gpm)	Can Well Supply(3) Meet MDD?
2022	1,171	3,232	Yes
2044	1,484	4,096	Yes

Notes:
(1) Capacities confirmed by GBWC Staff (see Table 2.11).
(2) Well supplies required were grossed up to accommodate for 8% NRW in the Housing Section.
(3) Total well supply must be able to accommodate MDD.
(4) Quantities in parentheses represent reliable capacities (reduced pumping capacities).
(5) Estimated reliable capacities reflected in totals.

Water Storage Analysis

Water storage was evaluated based on operational, emergency, and fire flow storage needs using NAC 445A requirements. The GBWC-SCD system analysis was based on total system storage which includes both available above-ground storage and alternative pumping capacity as defined by NAC. Available pumping capacity includes wells equipped with an emergency backup power supply and adds to the effective storage of the system.

As of the 2024 IRP, the System Capacity Analysis will include an additional scenario to check the total capacity of the GBWC-SCD water system, as defined by NAC 445A.6672. Since this system relies exclusively on groundwater wells as its source of water, it was determined that incorporating a more robust analysis would be the most conservative approach to ensure the system could successfully provide capacity for the following two scenarios:

- Scenario A: Total system capacity requirements for one day of MDD, emergency reserves, and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service with an alternative power source.

- Scenario B: Total system capacity requirements for one day of ADD, emergency reserves, and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells with an alternative power source in service except for the largest producing well.

The 200 Tract has four storage facilities: the Twin Tanks (Twin Tank A and Twin Tank B), the High Tank, and the 200-2 Tank. The total existing storage capacity for the 200 Tract is 2,250,000 gallons. In 2022, a hole in the floor of Twin Tank A was noted and since then, Twin Tank A has been empty. This has reduced the total storage volume in the 200 Tract to 2,000,000 gallons. The recent inspection report found that Twin Tank A could be rehabilitated, however it would be more cost effective to replace the tank. If the High Tank failed before Twin Tank A could be replaced, the total storage capacity would be reduced to 1,500,000 gallons.

Table Error! Reference source not found.E-5a, Storage Capacity Analysis, identifies the minimum amount of storage required and the available storage capacity for existing conditions, including alternative pumping capacity (wells with backup power). The 200 Tract can currently meet its storage requirements as of 2022.

Table E-5a: 200 Tract Storage Existing (2022) System Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	1,677,200	Required Storage (gal)	1,095,680
Total Capacity (gal)	4,448,000	Total Capacity (gal)	3,411,200
Difference (gal)	**2,770,800**	**Difference (gal)**	**2,315,520**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-5b, Storage Capacity Analysis, identifies the minimum amount of storage required and the available storage capacity for projected future conditions (2044), including alternative pumping capacity (wells with backup power). The 200 Tract can meet its storage requirements as projected for 2044.

Table E-5b: 200 Tract Storage Projected (2044) System Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	1,721,500	Required Storage (gal)	1,122,770
Total Capacity (gal)	4,448,000	Total Capacity (gal)	3,411,200
Difference (gal)	**2,726,500**	**Difference (gal)**	**2,288,430**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

The Housing Section currently has six storage facilities: Tanks 103A, 103B, and 106 in the 100 Tract and Tanks 8A, 8B, and 9 in the 400 Tract. The Housing Section, as a whole, has a total of 3,030,000 gallons of storage capacity. However, there are issues with several of the storage tanks in the Housing Section that will affect available capacity in the years to come. Tank 103A is currently in service but is in poor condition and will eventually need to be decommissioned. Tank 8 was previously scheduled for decommissioning and removal but this project is currently on hold due to a drop in the value of scrap metal. If Tanks 103A and 8 were decommissioned in the future, the total storage capacity in the Housing Section would be reduced to 2,560,000 gallons.

It is evident that the Housing Section cannot meet its total storage capacity required based on storage tanks alone. Adding alternative pumping capacity to the available storage, the Housing Section (as a whole) has enough storage capacity for both the existing and future conditions as shown in Table E-6a & 6b. Tables E-7a & E-7b, E-8a & E-8b, E-9a & E-9b, and E-10a & E-10b provide segregations and combinations for each of the Housing Tracts storage scenarios.

Table E-6a: Housing Section (All Tracts) Existing (2022) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	7,549,900	Required Storage (gal)	4,380,988
Total Capacity (gal)	9,376,600	Total Capacity (gal)	7,936,600
Difference (gal)	**1,826,700**	**Difference (gal)**	**3,555,612**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-6b: Housing Section (All Tracts) Projected (2044) Storage Capacity

Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	8,067,900	Required Storage (gal)	4,656,534
Total Capacity (gal)	9,376,600	Total Capacity (gal)	7,936,600
Difference (gal)	**1,308,700**	**Difference (gal)**	**3,280,066**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-7a: 100 Tract Existing (2022) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	4,257,700	Required Storage (gal)	2,629,830
Total Capacity (gal)	5,129,000	Total Capacity (gal)	3,686,000
Difference (gal)	**871,300**	**Difference (gal)**	**1,059,170**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-7b: 100 Tract Projected (2044) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	4,519,200	Required Storage (gal)	2,768,932
Total Capacity (gal)	5,129,000	Total Capacity (gal)	3,689,000
Difference (gal)	**609,800**	**Difference (gal)**	**920,068**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-8a: 300 Tract Existing (2022) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	1,037,100	Required Storage (gal)	656,962
Total Capacity (gal)	828,000	Total Capacity (gal)	396,000
Difference (gal)	**-209,100**	**Difference (gal)**	**-260,962**
Meets NAC Requirements?	**NO**	**Meets NAC Requirements?**	**NO**

Table E-8b: 300 Tract Projected (2044) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	1,055,400	Required Storage (gal)	645,630
Total Capacity (gal)	828,000	Total Capacity (gal)	396,000
Difference (gal)	**-277,400**	**Difference (gal)**	**-249,630**
Meets NAC Requirements?	**NO**	**Meets NAC Requirements?**	**NO**

Table E-9a: 400 Tract Existing (2022) Storage Capacity Requirements

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	2,660,100	Required Storage (gal)	1,499,196
Total Capacity (gal)	3,419,600	Total Capacity (gal)	2,119,600
Difference (gal)	**759,500**	**Difference (gal)**	**620,404**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-9b: 400 Tract Projected (2044) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	2,853,400	Required Storage (gal)	1,601,972
Total Capacity (gal)	3,419,600	Total Capacity (gal)	2,119,600
Difference (gal)	**566,200**	**Difference (gal)**	**517,628**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-10a: 300/400 Tracts Combined Existing (2022) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	3,472,200	Required Storage (gal)	1,931,158
Total Capacity (gal)	4,247,600	Total Capacity (gal)	2,947,600
Difference (gal)	**775,400**	**Difference (gal)**	**1,016,442**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Table E-10b: 300/400 Tracts Combined Projected (2044) Storage Capacity

Storage/Capacity Comparison			
Scenario A = MDD + FF (All Wells)		**Scenario B = ADD + FF - Well (Largest Producing Well Out of Service)**	
Required Storage (gal)	3,728,700	Required Storage (gal)	2,067,602
Total Capacity (gal)	4,247,600	Total Capacity (gal)	2,947,600

Difference (gal)	**518,900**	**Difference (gal)**	**879,998**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Transmission and Distribution System

The GBWC-SCD water systems were analyzed using Bentley WaterCAD modeling software for existing conditions, the 3-Year Action Plan (2027) conditions, and future conditions (2044). The goal of the analysis was to determine weaknesses in the network that would lead to unacceptable pressure conditions, reduced fire-flow capacity, and energy waste through high head losses. Several areas in both the 200 Tract and the Housing Section were found to have high pressures. High pressures are known to increase the rate of main breaks in a water distribution system as well as the amount of water loss (NRW) associated with leaks and breaks. Similarly, many low-pressure areas were also identified. This could result in intermittent denial of service to customers and reduced flow to areas of the distribution system. Finally, many parts of the system have pipelines which are undersized, some as small as 2-inch to 4-inch diameter, which do not meet NAC 445A standards for minimum pipeline sizes. This prevents sufficient fire protection and wastes energy in many areas where friction losses are higher than necessary. Improvements are recommended in the Action Plan and Preferred Plan to address pressure and flow issues including pipeline replacement projects, and the addition of PRVs.

Fire Flows

The fire flow criteria used in the system evaluations presented in the GBWC-SCD 2024 IRP are 1,000 gpm in residential areas per the Elko County Fire Protection District and 1,500 gpm in commercial areas as historically directed by Nevada Division of Forestry. Fire flow requirements are currently met by a combination of flow from storage tanks, wells, and/or booster pumps. For hydraulic model evaluations, it was assumed that fire flows are to be delivered in addition to the MDD. Water model results for both the 200 Tract and the Housing Section indicate insufficient fire flow deliveries and pressures at many locations, especially in areas with small pipe dimeters (e.g. 2-inch to 4-inch). The undersized pipes cause excessive friction and inhibit the delivery of fire flow. Improvements are recommended in the Action Plan and Preferred Plan to address fire flow issues including pipeline replacement projects.

Fire Hydrants

Fire hydrant spacing has been an issue in Spring Creek since the original development. There are many long streets with no hydrants and other streets with more than a mile between hydrants. Pipeline replacement projects recommended in the Action Plan and Preferred Plan will include fire hydrant additions and/or replacements to achieve a maximum fire hydrant spacing of 500 feet per the UFC.

Wastewater Treatment

GBWC-SCD has one wastewater treatment plant; the Mar-Wood wastewater treatment plant (WWTP), a conventional activated sludge treatment plant with a leach field located in the 100 Tract; and two septic systems: Septic #2, a septic tank system in the 200 Tract designed for a maximum of 10 customers; and Septic #3, another septic tank system in the 400 Tract designed for a maximum of 10 customers.

The septic tank systems in the 200 and 400 Tracts are small systems and are not anticipated to serve more than a few additional customers. As of end of 2022, the septic tank systems in the 200 Tract (Septic #2) and 400 tract (Septic #3) were serving six (6) and ten (10) customers.

The 100 Tract sewer service area of GBWC-SCD serves residential and commercial customers within an area of approximately 250 acres and includes a total of 204 parcels. As of end of 2022, the Mar-Wood WWTP was serving 142 total customers (125 active accounts and 17 inactive accounts). The average daily flow (ADF) to the WWTP from 2020-2022 was 38,700 gpd. The average flow during the maximum month (AFMM) for the same period averaged 42,100 gpd. One of the proposed Action Plan projects in the 2021 IRP was the replacement/expansion of the existing Mar-Wood WWTP. The proposed Action Plan project was withdrawn without prejudice as part of a stipulated agreement. Changes have occurred since submission of the 2021 IRP that further support the need for the project. These changes include additional deterioration of the treatment plant (discussed in Section 2.4.2.1), a moratorium on new connections, and forecasting methods that predict the average daily flow (new flow meter) to exceed the 85% design capacity trigger (see Table 3.16). Sewer flow projections are described in the sections to follow which are based on meter readings from the new magnetic flow meter.

In 2018, a preliminary design report (PER) was prepared by Lumos & Associates to evaluate WWTP replacement alternatives and to recommend a preferred alternative. The report was submitted to NDEP in December 2018 and an approval letter was received by NDEP in January 2019 for the preferred alternative. The preferred alternative identified in the PER was a new 75,000 gpd Aero-Mod WWTP (with in-basin equalization and surge capacity) to replace the existing 50,000 gpd Mar-Wood WWTP. An additional 25,000 gpd leach field capacity will also be required for a total disposal capacity of 75,000 gpd to match the treatment plant capacity. The Mar-Wood WWTP Replacement Project is included in the Preferred Plan for the 2024 IRP. A summary of existing, 3-year, and buildout flow projections are summarized in Table E-11. As shown, the maximum monthly flow (AFMM) could exceed the 50,000 gpd design flow capacity of the WWTP in the next 3-years.

Table E-11: 100 Tract – Summary of Existing and Projected Wastewater Flows

Timeline	ADF (gpd)	AFMM w/Peaking Factor 1.09 (gpd)
Existing Flows	38,700	42,570
3-Year Flow Projection	50,200	54,718
Buildout Flow Projections	70,100	76,409

Wastewater Reclamation

GBWC-SCD has no projections for use of reclaimed water during the 3-Year Action Plan or 20-Year Preferred Plan. Of the three existing wastewater systems, the only one with any potential for wastewater reclamation is the Mar-Wood WWTP located in the 100 Tract. Currently, the 100 Tract WWTP generates an ADF of approximately 38,700 gpd (2020-2022 average). The other two systems (Septic #2 and #3) were serving only six (6) and ten (10) customers as of end of 2022 and do not have sufficient flow to justify the costs of treatment to reclaimed water levels.

Potential uses of reclaimed water from the Mar-Wood WWTP include the Spring Creek Golf Course, Spring Creek Marina and surrounding park, Ray Schuckmann's Sports Complex, and dual-plumbed residential use. However, with the low volume of effluent produced by the treatment plant, recycling water and delivering to these potential customers is not cost-effective. Overall, it is concluded that as long as sufficient water is available from wells, there is little justification for the expenses (both capital and operating) that would be required to operate a wastewater reclamation system, especially given the relatively small quantity of water available for reclamation. This may change in the future with the possibility of new development being annexed into the GBWC-SCD system. GBWC-SCD will investigate the potential use of reclaimed water as projects develop.

Emergency Response Plan

Section 5 of Volume I (Introduction) provides a generalized explanation of the Emergency Response Plan for the four divisions. Appendix J contains the Emergency Response Plan for GBWC-SCD.

Water Conservation Plan

GBWC has developed a Water Conservation Plan pertinent to all their divisions. Appendix K contains the Water Conservation Plan. Please refer to Section 6 of Volume I.

Preferred Plan

The 2024 IRP preferred plan for GBWC-SCD is intended to provide a list of necessary projects over the next 20-year planning period for GBWC-SCD to continue to provide the current LOS to their customers. With the integration of the asset management plan, the Preferred Plan also includes recommendations associated with monitoring, maintenance, and inspections for several of the more critical assets of the water and wastewater systems. The purpose for these recommendations is to extend the useful life of the asset prolonging the need for replacement or refurbishment. A condition assessment of several assets over the past year has identified some of the larger assets that have reached the end of their useful lives and will need to be replaced and/or refurbished. The capital projects provided in this preferred plan are at a planning level guideline based on current demand and growth projections and should be reviewed periodically and updated in future IRPs.

The Preferred Plan addresses the system, compliance, environmental, and conservation needs at a capital spending and monitoring schedule, which GBWC staff believes are prudent. The asset maintenance, monitoring, and smaller capital project recommendations are provided in the plan with the goal of extending the assets' useful lives beyond their nominal life expectancies. This will help to push out some of the larger capital projects for replacement or refurbishing of specific assets. With this strategy in mind, the objective of this Preferred Plan is to make the necessary investments to maintain the customer's existing LOS while ensuring NAC compliance of the GBWC-SCD water and wastewater systems.

The timing of the project improvements have been assessed extensively by GBWC staff and their engineers to ensure the most cost-effective results are captured for the ratepayers, while sustaining their existing LOS. While the improvements will be presented separately for each water and wastewater system, the scheduling for the capital improvements have been designed in a manner that brings about the least cost with the highest benefit to the company and its ratepayers. The CIPs have been developed based on the best information available. CIPs for the Preferred Plan include the following:

Water Resources

- Future Well Replacements (starting in 2028, every 3 years)
- Well Rehabilitations (starting in 2030, every 3 years)

Water Distribution

- Pipeline Replacement Projects (Annually)
- Booster Station Rehab/Replace (starting in 2034, every 10 years)
- AMI Installation (starting in 2028, over a 5 year period)

Water Storage

- Water Tank Rehabilitation (starting in 2030, every 3 years)
- Water Tank Replacements (one (1), every 20 years)

Wastewater

- Sewer line rehab/replace and manhole lining to reduce I&I (2028-2029)
- 100 Tract WWTP Replacement (2028 – 2031)

The Preferred Plan also includes replacement or refurbishment of major assets based on age and nominal useful life expectancy. The goal with many of these assets, through appropriate monitoring and maintenance, is to extend their useful lives beyond the nominal useful life expectancy for replacement. Many of the recommended monitoring, maintenance, and inspection recommendations have been designed to maximize asset life.

Action Plan

The GBWC-SCD 2024 IRP (Volume III) requests the approval of seven (7) Action Plan Projects, which are needed for the improvement, and compliance of the GBWC-SCD water system. The recommended Action Plan projects for GBWC-SCD target the water and wastewater systems in a way that helps maintain and improve the customer's LOS, provide reliability and redundancy for the system, and ensure compliance with NAC regulations.

The 3-year Action Plan projects are focused on immediate asset concerns that have been identified through the development of the asset management component, NAC compliance, and staff recommendations. The Action Plan project list includes:

Water Resources

- Well 12 Replacement (2026-2027)

Water Distribution

- 2025 Pipeline Replacement Project
- 2026 Pipeline Replacement Project
- 2027 Pipeline Replacement Project

Water Storage

- High Tank Rehabilitation (2025-2026)

Wastewater

- WWTP Lift Station Rehabilitation and De-Ragging System (2026)
- WWTP SCADA System Upgrades (2026)

Funding Plan

Volume I (Introduction) contain the Funding Plan analysis for the recommended Action Plan projects in the GBWC-SCD 2024 IRP (Volume III). Please refer to Volume I for information related to the Action Plan project funding plan. The project list in Section 9.1 *et seq.* will be funded through a traditional funding source using GBWC's parent company, Corix Regulated Utilities (US) Inc. debt and equity investment.

System Improvement Rate Request

GBWC-SCD is requesting that the following projects described in the Action Plan be designated as eligible for a System Improvement Rate (SIR) under Nevada Revised Statutes (NRS) 704.663(3), and Nevada Administrative Code (NAC) 704.6339: (i) Well-12 Replacement; (ii) 2025 Pipeline Replacement Project; (iii) 2026 Pipeline Replacement Project; (iv) 2027 Pipeline Replacement Project; (v) High Tank Rehabilitation/Replacement/Booster Modification Project;; and (vi) WWTP Lift Station Rehabilitation and De-Ragging System.

SECTION 1.0: INTRODUCTION

1.1 Report Organization

Summary	The Executive Summary provides an overview of the study and the recommended capital improvement plan.
Section 1.0	Introduction. This section provides background information on the Great Basin Water Co. – Spring Creek Division (GBWC-SCD), a description of Hydrographic Basin 48, and a discussion of the objectives of the Integrated Resource Plan (IRP).
Section 2.0	Existing Conditions. This section presents a complete description of the service area, existing facilities, condition of the major assets and remaining useful life, and their operation and control.
Section 3.0	Historical Data and Forecasting. This section presents an evaluation of the historical population and connections to the existing system. This data is used and presented as a basis for the population and demand forecasting for the utility.
Section 4.0	Water Supply and Wastewater Treatment Plan. This section presents the analysis of the existing water and wastewater systems with regards to how they will be impacted by the demand forecasting presented in Section 3.0.
Section 5.0	Emergency Response Plan. This section provides a reference to GBWC's Emergency Response Plan discussed in Volume I (Introduction).
Section 6.0	Water Conservation Plan. This section provides a reference to GBWC's Water Conservation Plan discussed in Volume I (Introduction).
Section 7.0	Preferred Plan. This is a 20-year projected evaluation which includes a preferred plan for the necessary improvements over the 20-year planning period. This preferred plan is a planning level guideline based on current demands, growth projections, and remaining useful life of major assets.
Section 8.0	Action Plan. This section is a summary subset of the Preferred Plan detailing the improvements which are recommended for implementation in the 3 years following approval of the 2024 GBWC Consolidated IRP.
Section 9.0	Funding Plan. This section details the financing impacts and strategies for meeting the needs addressed in the GBWC-SCD Action Plan.
Section 10.0	System Improvement Rate Request. This section outlines the information required by Nevada Administrative Code (NAC) 704.6339 to support a request to designate water and sewer projects in the Action Plan as eligible for a System Improvement Rate.
Technical Appendices	This section is part of the comprehensive technical appendix that will support all of the specific resource plan volumes which will contain the complete details of the methodologies used in developing the resource plan along with all of the basic data used in the study.

1.2 Background

1.2.1 Spring Creek Division Overview

The rural community of Spring Creek, Nevada, is located approximately 10 miles southeast of Elko, Nevada, on Lamoille Highway (State Route 227) as shown in Figure 1.01. The community covers an area of approximately 8 miles east-west by 9 miles north-south and was established around 1970 by the McCulloch Corp. The site was subdivided into 5,420 large lots, primarily residential, ranging in size from about one to ten acres. The GBWC-SCD maintains two public water systems, one serving the Mobile Home Section (the 200 Tract) with the service area shown in Figure 1.2, and a separate water system serving the Housing Section (the 100, 300, and 400 Tracts) with the service area shown in Appendix D. A total of approximately 5,066 connections are currently being served as of December 2022 meter counts. The legal descriptions of the water and sewer service areas for the GBWC-SCD are contained in GBWC's Tariff Rule No. 17, which is maintained on file in the office of the Public Utilities Commission of Nevada (PUCN) and at the GBWC offices in Spring Creek and Pahrump, as well as on the GBWC website at www.GreatBasinWaterCo.com.

The Spring Creek water system consists of more than 149 miles of piping. Generally, transmission piping is 6 to 12 inches in diameter, however, a large portion of the distribution piping in the two Spring Creek water systems are 2-inch, 3-inch and 4-inch diameter polyvinyl chloride (PVC) pipe. Twelve (12) groundwater wells supply water to the system, and storage is contained in ten (10) water tanks, with one tank out of service. Most of the use is residential, although the system serves several large commercial/other water users, including a golf course, a marina, and a sports complex.

The Spring Creek wastewater collection system in the 100 Tract consists of approximately 3.5 miles of gravity sewer mains and approximately 56 manholes.

The purpose of this IRP is intended to balance the needs of the system, environment, and customers over the next 20 years. The Action Plan is a 3-year plan. The purpose of the Action Plan is to:

- Identify current major assets that may have exceeded or are near the end of their useful life;
- Identify insufficiencies in the system;
- Promote water system innovations that will provide efficiency in operations and maintenance; and
- Maintain or improve the customer's existing LOS.

By working through the Action Plan, the GBWC-SCD will be able to develop a plan for the next three years balancing the objectives of minimizing cost, mitigating risk, and maximizing service reliability. The planning horizon for the IRP is 20 years, from 2025 to 2044. NAC 704.5654. Historical production data presented in this IRP covers the 10-year period preceding 2023 pursuant to NAC 704.5668.

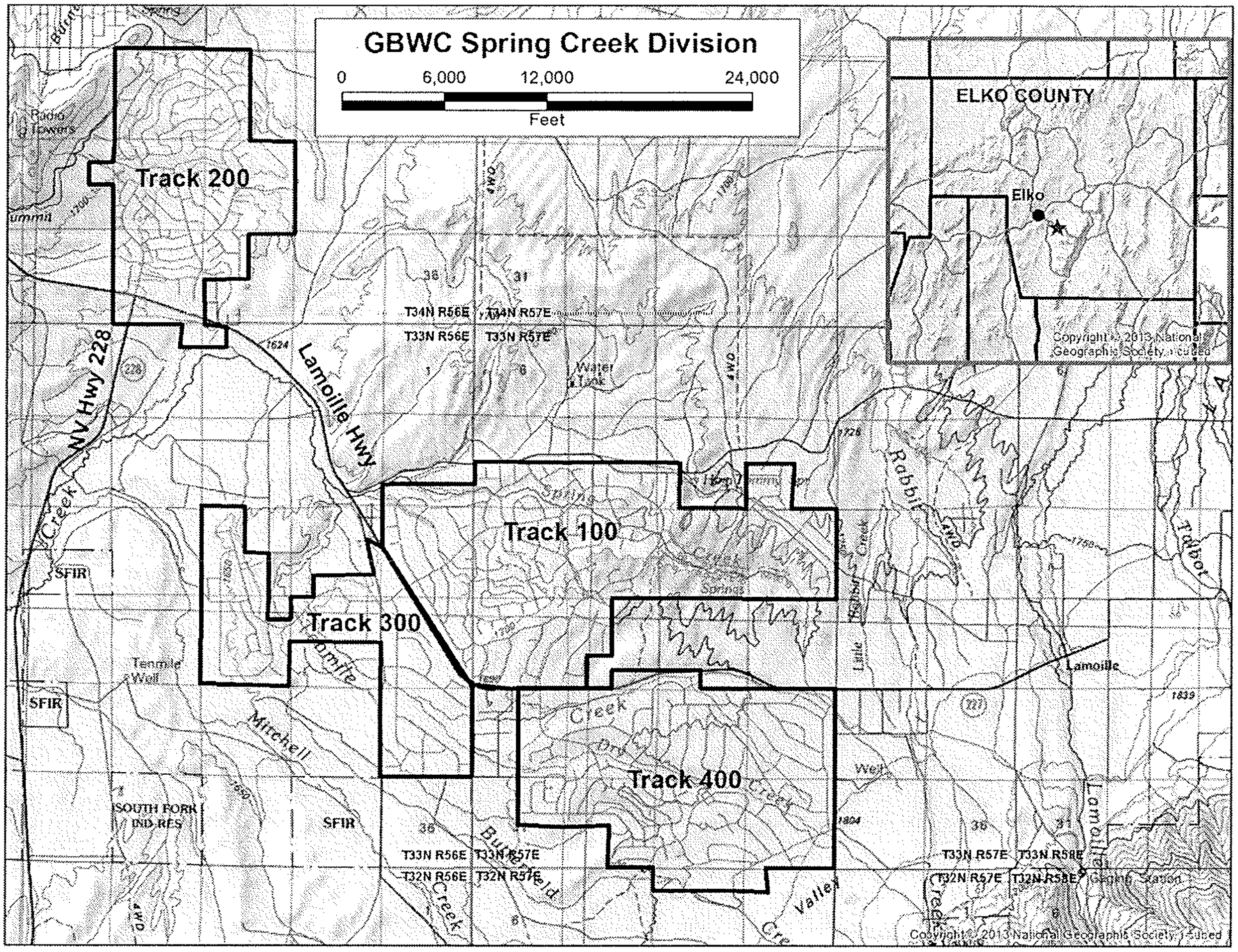

Figure 1.1: Overview of the Existing Water Service Boundaries

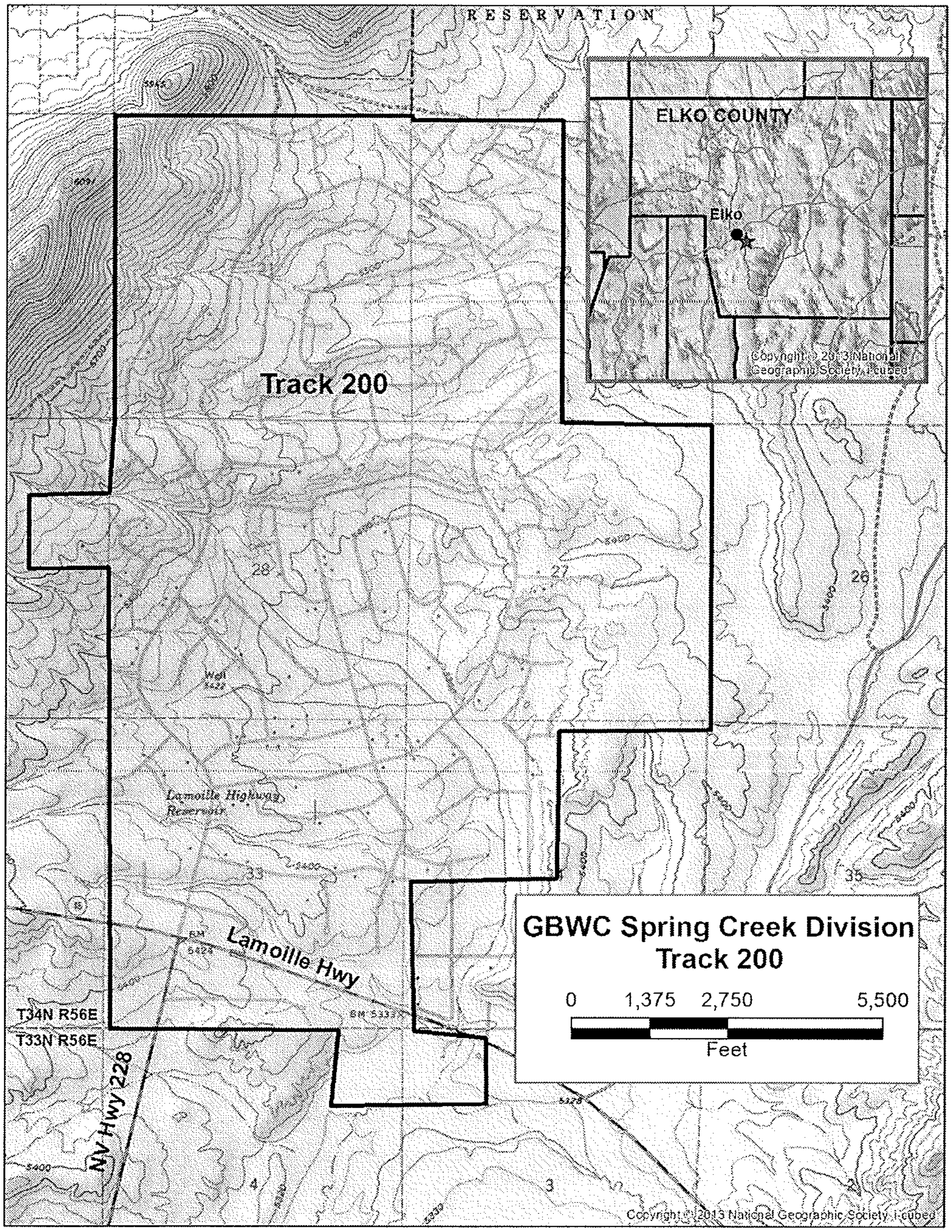

Figure 1.2: Existing Water Service Boundaries for 200 Tract

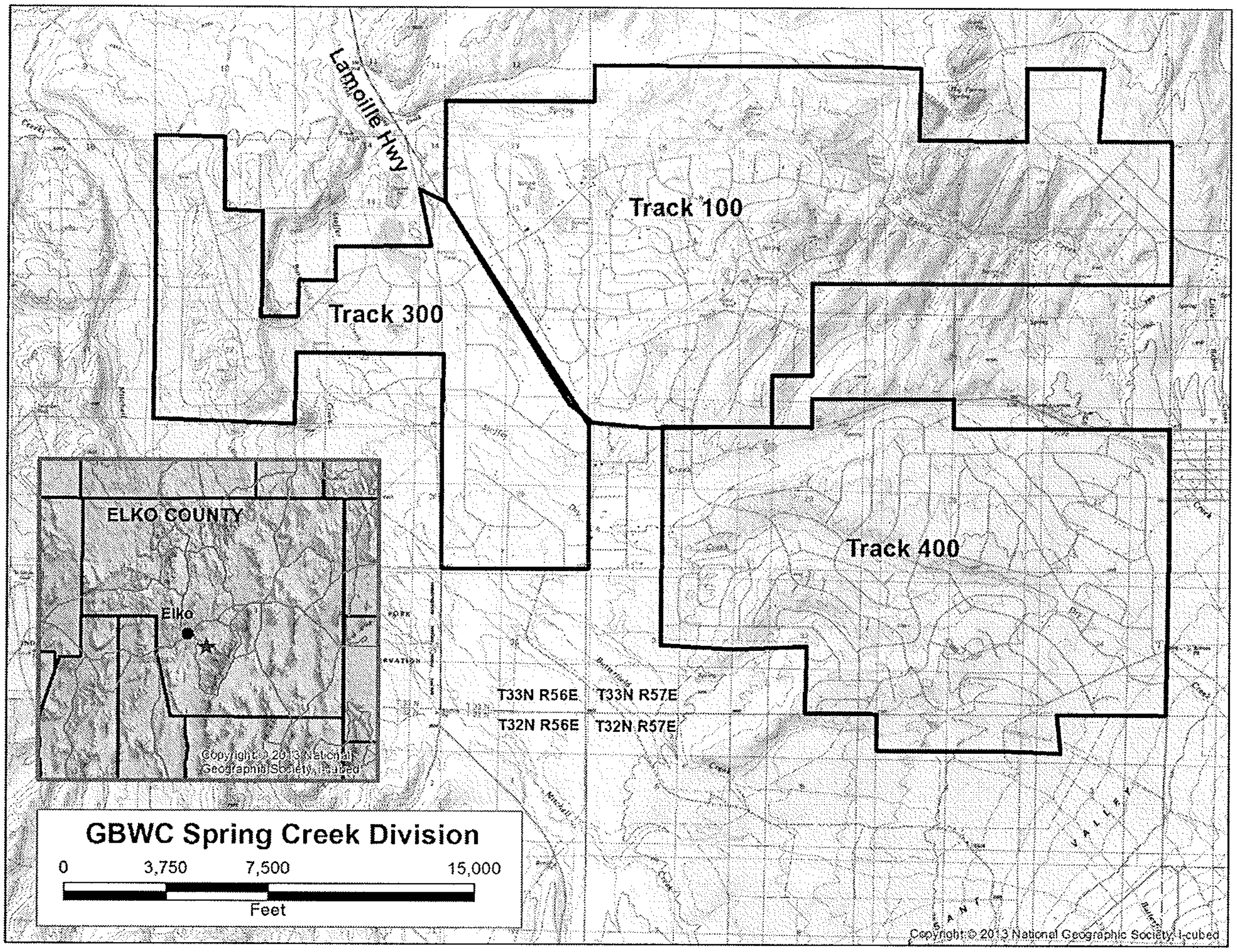

Figure 1.3: Existing Water Service Boundaries for Housing Section

1.2.2 Basin 48 (Dixie Creek Valley – Tenmile Creek Subarea) Overview

The GBWC-SCD is in the Dixie Creek-Tenmile Creek Area (Basin 48) of the Humboldt River Basin Region (Region 4). The Humboldt River Decree, as defined, includes the Bartlett Decree, the Intervening Orders, the Edwards Decree, the Later Orders, the Alternative Writ of Prohibition in Carpenter V. District Court, and Decision of the Supreme Court as compiled by Mashburn, G., and Mathews, W.T., State of Nevada publication, 1943.

Basin 48 consists of a variety of "Manner of Use" with the top four being municipal, recreation, mining, and irrigation. In 1984 (Order 848), the State Engineer elevated Basin 48 to a "designated basin" status. A basin is usually elevated to a designated status when water rights in the basin have reached or exceeded the perennial yield. A designated basin allows the State Engineer additional authority in the administration of the water resources in the form of restricting specific uses and/or subdividing a basin for better management of the water resource. Currently, there are approximately 20,196-acre feet of water rights appropriated in Basin 48 with a perennial yield of 13,000-acre feet annually (AFA) available. This volume of appropriated water rights does not include the hundreds of domestic well owners in Basin 48, of which each is entitled to 2.0 AFA for domestic use. This situation suggests that Basin 48 is over-appropriated.

In August 2015, the Pershing County Water Conservation District (PCWCD) filed a lawsuit in the 11th Judicial District Court demanding the State Engineer establish a critical management area over all over-appropriated groundwater basins within the Humboldt River Region. PCWCD, who owns a substantial number of senior decreed water rights in the lowest reaches of the Humboldt River System, accused the State Engineer of not taking action to curtail water right appropriations in groundwater basins that drain into the Humboldt River System resulting in inadequate allocations of surface water causing detriment to the PCWCD stakeholders and their senior water rights. PCWCD also accused the State Engineer of allowing over-appropriation of these adjacent groundwater basins, which diverts water away from the river. The lawsuit demanded that the critical management area contain the following three elements:

1. Bring all over-appropriated groundwater basins surrounding the Humboldt River back to their perennial yield;
2. Eliminate the cone of depression caused by over-appropriation of groundwater pumping causing interference with surface water flows in the Humboldt River; and
3. Regulate water used by mining and milling pursuant to Nevada law.

The State Engineer's response to the lawsuit by initially denying all new water right applications for groundwater appropriation and heavily scrutinizing all water right change applications that requested point of diversion changes for existing water rights. This scrutiny included a groundwater/surface water hydraulic analysis using a model known as the Glover Analysis. The Glover Analysis was developed for large river systems associated with unconfined groundwater aquifers and is a poor application for many of the groundwater aquifers in the adjacent groundwater basins, since many contain confined aquifer systems.

In 2017, the State Engineer developed draft regulations for the conjunctive management of the waters of the Humboldt River Basin and conducted public meetings with local stakeholders for comments. The objectives of the proposed regulations were to:

1. Establish rules for a Mitigation Program for the Humboldt River and its tributaries as identified in the Humboldt River Decree, and hydrologically connected groundwater.
2. Establish rules for mitigation of conflicts through water replacement or other mitigation measures.
3. Maximize beneficial use of the water resources of the Humboldt River Basin.
4. Identify those water rights that are subject to or exempt from these regulations.

The proposed regulations did not gain sufficient support in the 2019 Session of the Nevada Legislature. Since the 2019 Legislative Session, a proposed interim order has been developed by the State Engineer to "establish procedures for the review of applications to appropriate groundwater in the Humboldt River Region with regard to the potential for capture of and conflict with decreed rights to the waters of the Humboldt River and tributaries"[1]. A public hearing was held on April 2, 2021, by the Nevada Division of Water Resources (NDWR) to provide notice and take public comment on the proposed interim order. In December 2021, the State Engineer established interim procedures for managing groundwater while long-term management strategies are being finalized.

The State Engineer has written numerous other Orders affecting the Humboldt River Basin. A copy of previously adopted Orders, the petition from PCWCD (2015), the draft of the conjunctive management regulations (2017), documents from the 2019 Nevada Legislative Session, the hearing notice for the proposed interim order (2021), and the establishment of interim procedures for managing groundwater appropriations (2021) are available for review in Appendix B as it pertains to Basin 48. The PCWCD lawsuit and the responses by the State Engineer have made it very difficult to strategically move and manage the GBWC-SCD water rights in Basin 48.

1.3 Objective

The objective of this IRP is to develop a plan that will ensure that GBWC-SCD's customers receive reliable water and sanitary sewer service, while balancing the goals of minimizing costs, mitigating risks, and increasing efficiencies. The IRP will provide guidance to GBWC in providing adequate water and sanitary sewer service to their customers in the GBWC-SCD service area over the next 20 years. This includes identifying any current system insufficiencies and needed improvements, identifying innovative tools and systems for improving operation and maintenance efficiencies, projecting growth over the next 20 years, and determining the facilities needed to provide adequate service for growth. An asset management framework has been integrated into the IRP to identify and determine when existing critical assets will need to be replaced or rehabilitated in the future. A detailed Action Plan is provided identifying the needed and recommended improvements over the next three (3) years, and the timing of those improvements. Additional sections of this IRP address water conservation and reclamation to limit water demand and protect the groundwater resource, a funding plan for each of the proposed improvements, and the estimated financial impacts on the customers.

1.3.1 Current Level of Service

In December 2013, a workshop was conducted to develop a "Level of Service" (LOS) assessment for the GBWC-SCD. The objective was to assess all the major service aspects of the water and sewer utilities (including Regulatory, Contractual, Quality, Reliability, Customer Service, and others) and identify the service aspects that need improvement and will have the most beneficial impacts to the systems and their customers.

[1] "Notice of Hearing on Proposed Interim Order within the Humboldt River Region". State of Nevada Division of Water Resources, http://water.nv.gov/documents/Humboldt%20Modeling%20Annual%20Update%20Feb_4_2021.pdf.

Primary LOS improvement priorities were identified during the 2013 workshop and have been updated below with current information as reflected in this 2024 IRP:

- Non-Revenue Water: Based on well production records and customer meter readings, a large volume of water remains unaccounted for throughout the system. Non-Revenue Water (NRW) for the three-year period from 2020-2022 ranged from 26-27% for the 200 Tract per Table 3.10, a slight decrease from previous years (ranged from 26-31% from 2017-2019). NRW for the Housing Section ranged from 2-14% for the same period per Table 3.11, which is also a decrease, on average, from previous years (ranged from 11-15% from 2017-2019).

- Water Pressure: In the system, there are areas of high and low water pressures due to a variety of factors including undersized distribution lines, dead-end water mains, need for additional pressure reducing valves between pressure zones, and high discharge pressures from well and booster pump station facilities. High water pressure is believed to contribute to the NRW and loss of service due to waterline breaks.

- Fire Flow: The original water system was not installed in accordance with current design and construction standards, including fire protection requirements (instead fire protection was to be provided by pumper truck). Subsequently, as GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to meet fire flow requirements of 1,000 gallons per minute (gpm) for 2-hours for residential and 1,500 gpm for 2-hours for commercial. Older infrastructure does not meet requirements of the International Fire Code (IFC) as adopted by reference in NAC 704.569, and community members have expressed the desire that fire flow capacity be increased.

- Hydrant Spacing: Fire hydrant spacing does not meet the Uniform Fire Code (UFC). The original water system was not installed in accordance with current design and construction standards, including fire protection requirements (instead fire protection was to be provided by pumper truck). Similar to fire flow needs, as GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to meet minimum fire hydrant spacing of 500 feet per the UFC and the community has expressed an interest in having older infrastructure upgraded.

- Storage: Because of the addition of backup generators at several well sites over the past few years, there is sufficient storage in the water systems when considering alternative pumping capacity. To maintain adequate storage, several storage tanks will require improvements, rehabilitation, or replacement during the 20-year planning period based on tank inspections and ongoing monitoring. The existing High Tank (500,000-gallon capacity) is in need of replacement/rehabilitation to continue serving as a fire protection source to protect the health and safety of existing customers in the 200 Tract.

- Breakage/Reliability: There are numerous waterline breaks resulting from aging and undersized infrastructure which causes disruption in reliable water supply. Additionally, some additional disruptions have been caused by the expansion of fiber and natural gas infrastructure into Spring Creek, resulting in an increase of water line breaks and reporting.

- Wells: Historical poor well designs, screen plugging, and dewatering of wells is causing air entrainment in the distribution system. Air entrainment issues have been addressed in some wells through rehabilitations but will need continued monitoring to address well needs in the future. This will require additional rehabilitations and redrilling wells as needed.

Since this workshop, many LOS issues have been addressed including, but not limited to:

- Non-Revenue Water: In recent years, NRW has decreased for the Housing Section to an average of 8%. GBWC continues to monitor NRW for each water system and is using monitoring tools to prioritize pipeline replacement projects.

- Wells: To address well capacity and air entrainment issues, multiple wells have been rehabilitated and equipped with variable frequency drives (VFDs). This includes Wells 9 and 12 which were rehabilitated in 2017, and more recently Wells 1, 3, 5 (upgraded VFD), 7 (upgraded VFD), 10 (existing VFD reused), and 14, all of which were rehabilitated in 2019-2020. Well #\101 was rehabilitated in 2022. Wells 4 (new VFD), 11, and 12 were rehabilitated in 2023.

- Reliability: Cathodic protection was installed in most the storage tanks prior to the 2018 IRP (with the exception of those scheduled for replacement/removal) to prevent corrosion and extend the useful service life of the tanks, thereby improving water system reliability. Backup generators have been installed at multiple sites to improve system reliability; these sites include the Tank 103 Booster Site (2016), Well 1 (2019), Well 3 (2019), Well 7 (2019), and Well 14 (2019). In addition, Lift Station 1 in the 100 Tract was replaced and equipped with a generator in 2017 to address aging infrastructure and to add pumping redundancy.

1.3.2 Asset Registry Condition Assessment

Please refer to Volume I of the 2024 Consolidated IRP for a general description and history of the Asset Registry Condition Assessment.

1.3.3 Failure Mode and Effects Analysis

Please refer to Volume I of the 2024 Consolidation IRP for a general description and history of the Failure Mode and Effects Analysis.

SECTION 2.0: EXISTING CONDITIONS

2.1 Spring Creek Division

2.1.1 Location

The GBWC-SCD service area is in northeastern Nevada, approximately 10 miles southeast of Elko, Nevada, along State Route 227, Lamoille Highway in Elko County. Legal maps and descriptions of the existing service area boundaries for the GBWC-SCD water and sewer utilities, effective January 12, 2017, can be found in Appendix D.

2.1.2 History

The Certificate of Public Convenience and Necessity (CPC) was granted by the PUCN in 1978 to the Spring Creek Utilities Co. (SCUC) through Docket No. 1396. The water systems serving Spring Creek were developed by prior owner(s) with inadequate storage, supply, and distribution systems. The historical development of the water system to subpar conditions has caused numerous service issues involving flows, pressure issues, water outages, and undesirably high NRW. At the time the CPC was granted, the water system consisted of approximately 144 miles of Class 160 PVC pipe ranging from 2-inch to 8-inch diameter. Today there are over 149 miles of pipe sized up to 12-inch diameter, but much of the legacy pipe is still comprised of the old undersized Class 160 PVC pipe from the original developer.

Fire hydrant spacing has been an issue in Spring Creek since the original development. There are many long streets with no hydrants and other streets with more than a mile between hydrants. In the original CPC (Docket No. 1396), the approved fire protection method for SCUC was recognized to be through the Nevada Division of Forestry by pumper truck. This method was approved due to the large lot sizes in the rural community of Spring Creek and the lack of adequate infrastructure for fire protection (e.g. hydrants and undersized piping).

2.1.3 Service Territory

The GBWC-SCD water service area covers approximately 23 square miles and consists of two separate water systems: the 200 Tract, sometimes referred to as the Mobile Home Section, and the 100, 300, and 400 Tracts, referred to collectively in this report as the Housing Section. For the purposes of evaluations in the 2024 GBWC Consolidated IRP, there are 1,426 existing connections in the 200 Tract and 3,640 existing connections in the Housing Section for a total of 5,066 existing connections based on December 2022 connection counts (excludes hydrant meters). There are a total of 1,469 available lots in the 200 Tract (97.1% currently served) and 3,951 available lots in the Housing Section (94.1% currently served) for a total of 5,420 lots. The water systems for the 200 Tract and Housing Section are not physically connected. Each area has its own independent water supply, pumping, distribution, and storage facilities.

Within the GBWC-SCD water service area there are three small sewer service areas. The sewer connection data indicated hereafter is based on the number of connections as of December 2022. The 100 Tract (Mar-Wood Wastewater Treatment Plant [WWTP]) serves 142 customers (125 active accounts and 17 inactive accounts) as of the end of 2022, the 200 Tract (Septic #2) serves 6 customers (including 1 inactive), and the 400 Tract (Septic #3) serves 10 customers (including 2 inactive customer). The remainder of the service area is served by private septic systems owned and maintained by the individual property owners.

The legal descriptions of the water and sewer service territories for GBWC-SCD are contained in GBWC's Tariff Rule No. 17, which is maintained on file in the office of the PUCN and at the GBWC offices in Spring Creek and Pahrump, as well as on the GBWC website at www.GreatBasinWaterCo.com. Refer to Appendix D for the legal descriptions of each service area.

2.1.4 Maps

The location and general overview of GBWC-SCD's water service territory is shown in Figure 1.2, and Appendix D. The locations of the existing water facilities within the 200 Tract and the Housing Section (100, 300, and 400 Tracts) are shown on maps within Appendix D. The wastewater service areas for the 100, 200, and 400 Tracts are also included on maps in Appendix D.

2.1.5 Geography and Climate

The service territory terrain in Spring Creek is generally hilly. Approximately 500 feet of topographic relief exists in the 200 Tract, ranging from 5,800 feet above mean sea level (amsl) to approximately 5,300 feet amsl. The Housing Section includes about 700 feet of topographic relief, ranging from 6,000 feet amsl to 5,300 feet amsl.

Summers in Elko County are characterized by hot, dry afternoons with temperatures in the 90s, cooling to the low 40s and 50s by morning. Average winter temperatures range from highs in the mid-30s to low 40s to lows in the 10s, frequently falling below zero. Snowfall averages 28.7 inches per year and generally melts quickly. Annual precipitation averages 9.8 inches per year throughout the region. Sunny or partly sunny skies are predominant. Table 2.01 includes average monthly data for the Elko Airport, the nearest station for which long-term records are available.

Table 2.01 Spring Creek Average Monthly Weather Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max. Temp. (°F)	36.8	42.4	51.1	59.9	69.4	80.1	91.1	88.9	78.9	65.8	50.2	38.9	62.8
Min. Temp. (°F)	10.9	17.4	23.7	29.1	35.6	42.3	48.3	45.8	36.8	28.1	20.4	13.1	29.3
Total Precip. (in.)	1.3	0.9	0.9	0.9	0.9	0.9	0.4	0.4	0.5	0.7	0.9	1.1	9.8
Total Snowfall (in.)	7.8	4.6	3.9	1.8	0.5	0.0	0.0	0.0	0.0	0.5	3.2	6.4	28.7

ELKO WB AIRPORT, NEVADA (262573)
Period of Record: 1888 to 2016
Source: Western Regional Climate Center

2.1.6 Land Use

Land use within the service territory is primarily residential with some light commercial and public facilities. Within the service area there are two elementary schools, a day care center, a golf course, marina, parks, and an equestrian center. Commercial uses include one major grocery store, pharmacy, post office, credit union, dental office, barbers, beauty salon, hardware store, variety store, gas stations/convenience stores, restaurants, lounges, gaming, fitness centers, legal services, pet grooming, car washes, florist, realty office, manufactured home sales, and a feed store.

2.1.7 Population

The U.S. Census Bureau reported a population in the Spring Creek 2020 (most recent) Census Designated Place (CDP) of 14,967 people with an average household size of 3.19 persons per household. The U.S. census data for the Spring Creek CDP showed a population of 12,361 in 2020. This equates to an annual growth rate of 2.1% over the 10-year period. The Spring Creek CDP includes some population outside the GBWC-SCD service area. Census data specifically for the GBWC-SCD service area is not available.

2.1.8 Water Supply and Quality

The water supply for the GBWC-SCD is groundwater from twelve (12) wells: three (3) wells in the 200 Tract, four (4) wells in the 100 Tract, two (2) wells in the 300 Tract, and three (3) wells in the 400 Tract.

Water quality data from the 2022 Consumer Confidence Reports for the 200 Tract and Housing Section are provided in Table 2.02 and Table 2.03, respectively. Contaminants not tested in 2022 are also included in the tables from previous reports. The Consumer Confidence Reports illustrate that no regulated contaminates exceeded primary Maximum Contaminant Levels (MCLs) in 2022.

The MCL for arsenic of 10 parts per billion (ppb) is a primary drinking water standard. The Environmental Protection Agency (EPA) Arsenic Rule establishing the 10 ppb MCL became effective on February 22, 2002.

Wells 1, 3, and 11 in the 200 Tract have raw water arsenic concentrations which exceed the EPA MCL of 10 ppb. However, the 200 Tract water system includes package arsenic treatment plants at each of the wells and the treated water is currently in compliance with the Arsenic Rule as shown in Table 2.02.

Wells 4 and 10 in the 100 Tract have exceeded the arsenic MCL on some occasions. To maintain compliance with the Arsenic Rule, GBWC-SCD chose to implement an Alternative Monitoring Plan (AMP), which was approved by Nevada Division of Environmental Protection (NDEP) on December 8, 2008. The AMP moved the sample point from the wellhead to a sample point in the distribution system before the first connection to reflect the actual water quality more accurately being received by customers in the affected area. NDEP approved these sampling sites for determining the running annual average (RAA) for compliance. The RAA states that the average concentration of arsenic from a source collected quarterly must not exceed the MCL of 10 ppb. Nevertheless it is possible to have a quarterly sample that exceeds the arsenic level of 10 ppb, but as an average throughout that year, still be below the MCL. Individual arsenic sample results for Wells 4 and 10 and the corresponding RAA are shown in Table 2.04 from 2020 - 2023. As shown in Table 2.04, a few of the samples from Well 10 in the 100 Tract were at or above the MCL for arsenic of 10 ppb, but the overall RAAs for arsenic are below the MCL. Based on trends observed with the RAAs for Wells 4 and 10, both wells are anticipated to remain in compliance with the Arsenic Rule in the future.

Table 2.02: Water Quality Data (2022) - 200 Tract
Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No detected Microbiological Contaminants were found in 2022 calendar year.					
Inorganic Contaminants					
Arsenic	N**	2022	ppb	10	2.4 - 9.4
Barium	N	2022	ppm	2	0.10 - 0.16
Cadmium	N	2011	ppm	0.005	<0.001
Chromium	N	2011	ppm	0.1	<0.005
Fluoride	N	2022	ppm	4	0.37 - 0.69
Mercury	N	2011	ppm	0.002	<0.0001
Nitrate	N	2022	ppm	10	0.31 - 2.4
Selenium	N	2022	ppb	50	ND
Radioactive Contaminants					
Gross Alpha incl. Radon & Uranium	N	2014	pCi/L	15	2.6 - 2.7
Gross Beta Particle Activity	N	2008	pCi/L	30	2.09 - 15
Radium 226 & 228	N	2008	pCi/L	5	ND - 0.43
Combined Uranium	N	2017	ppb	30	1.8 – 2.5
Disinfection By-Products					
Chlorine	N	2022	ppm	4	0.24 - 0.96
HAA5	N	2022	ppb	60	2.5
TTHM	N	2022	ppb	80	5.9
Lead and Copper					
Copper	N	2022	ppm	AL-1.3	ND - 0.039
Lead	N	2022	ppb	AL-15	ND – 3.1
Secondary Contaminants					
Chloride	N	2022	ppm	400	39 - 120
Iron	N	2016	ppm	0.6	ND - 0.026
Magnesium	N	2022	ppm	150	5.7 - 14
Manganese	N	2010	ppm	150	3.6 - 12
pH	N	2022	ppm	6.5-8.5	7.17 - 7.92
Sodium	N	2022	ppm	N/A	37 - 61
Sulfate	N	2022	ppm	500	26 - 35
TDS	N	2022	ppm	1,000	260 - 430
Zinc	N	2010	ppm	5	<0.01

Odor	**Y**	2016	TON	3	0 - 35

Notes:
HAA5 = Haloacetic Acid, TTHM = Trihalomethane, AL = Active Level, ND = Non-Detect, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, TON = Threshold Odor Number, pH = Potential of Hydrogen, TDS = Total Dissolved Solids.
**Arsenic compliance is based on running annual average, which is well below the MCL of 10 ppb.

Table 2.03: Water Quality Data (2022) - Housing Section Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No detected Microbiological Contaminants were found in 2022 calendar year.					
Inorganic Contaminants					
Arsenic	N**	2022	ppb	10	4.5 - 10
Barium	N	2022	ppm	2	0.096
Cadmium	N	2011	ppm	0.005	<0.001
Chromium	N	2022	ppm	0.1	ND
Fluoride	N	2022	ppm	4	ND - 0.34
Mercury	N	2011	ppm	0.002	<0.0001
Nitrate	N	2022	ppm	10	ND - 0.76
Selenium	N	2011	ppb	50	<5
Radioactive Contaminants					
Gross Alpha incl. Radon & Uranium	N	2019	pCi/L	15	0.7
Combined Radium	N	2019	pCi/L	5	0.9
Radium 226	N	2018	pCi/L	5	ND - 0.5
Uranium	N	2022	ug/L	30	21
Disinfection By-Products					
Chlorine	N	2022	ppm	4	0.21 - 1.29
HAA5	N	2012	ppb	60	ND
TTHM	N	2012	ppb	80	ND
Lead and Copper					
Copper	N	2021	ppm	AL-1.3	0.016 - 0.40
Lead	N	2018	ppb	AL-15	ND – 5.2
Secondary Contaminants					
Chloride	N	2022	ppm	400	2.9 - 36
Color	N	2016	CU	15	0
Iron	N	2016	ppm	0.6	ND
Magnesium	N	2022	ppm	150	1.9 - 14

Manganese	N	2011	ppm	0.1	<0.005
pH	N	2022	ppm	6.5-8.5	7.31 - 8.15
Sodium	N	2022	ppm	200	6.4 - 32
Sulfate	N	2022	ppm	500	3.1 - 66
TDS	N	2022	ppm	1,000	100 - 400
Zinc	N	2013	ppm	5	ND - 0.74

Notes:
HAA5 = Haloacetic Acid, TTHM = Trihalomethane, AL = Active Level, ND = Non-Detect, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = color units, pH = Potential of Hydrogen, TDS = Total Dissolved Solids.
**Arsenic compliance is based on running annual average, which is below the MCL of 10 ppb.

Table 2.04: Well 4 and 10 Water Quality Data
Running Annual Average for Arsenic

Well 4			Quarterly Avg.	RAA	Well 10			Quarterly Avg.	RAA
3/14/2023	5.9	ppb	5.3	6.8	3/14/2023	6.7	ppb	5.7	7.7
2/6/2023	5.0	ppb			2/6/2023	5.0	ppb		
1/4/2023	4.9	ppb			1/4/2023	5.0	ppb		
12/1/2022	6.4	ppb	6.3	7.2	12/1/2022	7.9	ppb	8.0	8.1
11/8/2022	7.2	ppb			11/8/2022	6.8	ppb		
10/5/2022	5.2	ppb			10/5/2022	9.4	ppb		
9/1/2022	10.0	ppb	8.7	7.1	9/1/2022	9.4	ppb	9.5	8.0
8/2/2022	6.6	ppb			8/2/2022	9.7	ppb		
7/6/2022	9.6	ppb			7/6/2022	9.3	ppb		
6/7/2022	10.0	ppb	6.8	7.3	6/7/2022	9.9	ppb	7.6	8.2
5/4/2022	4.5	ppb			5/4/2022	6.7	ppb		
4/18/2022	5.8	ppb			4/18/2022	6.3	ppb		
3/17/2022	6.8	ppb	6.8	7.8	3/17/2022	6.6	ppb	7.2	8.4
2/7/2022	5.8	ppb			2/7/2022	6.3	ppb		
1/13/2022	7.9	ppb			1/13/2022	8.6	ppb		
12/9/2021	6.1	ppb	6.1	7.7	12/9/2021	9.9	ppb	7.9	8.0
11/10/2021	6.2	ppb			11/10/2021	6.7	ppb		
10/6/2021	6.1	ppb			10/6/2021	7.1	ppb		
9/14/2021	10.0	ppb	9.6	8.5	9/14/2021	10.0	ppb	10.0	8.7
8/3/2021	10.0	ppb			8/3/2021	10.0	ppb		
7/12/2021	8.9	ppb			7/12/2021	10.0	ppb		
6/8/2021	10.0	ppb	8.6	8.6	6/8/2021	10.0	ppb	8.5	8.7
5/11/2021	11.0	ppb			5/11/2021	11.0	ppb		
4/12/2021	4.7	ppb			4/12/2021	4.4	ppb		
3/4/2021	6.4	ppb	6.6	8.2	3/4/2021	6.1	ppb	5.4	8.9
2/16/2021	8.7	ppb			2/16/2021	5.2	ppb		

1/6/2021	4.8	ppb			1/6/2021	5.0	ppb		
12/14/2020	7.4	ppb	9.1	8.2	12/14/2020	11.0	ppb	10.7	9.1
11/5/2020	10.0	ppb			11/5/2020	10.0	ppb		
10/20/2020	10.0	ppb			10/20/2020	11.0	ppb		
9/16/2020	11.0	ppb	10.2	7.5	9/16/2020	11.0	ppb	10.1	8.3
8/5/2020	9.7	ppb			8/5/2020	10.0	ppb		
7/28/2020	10.0	ppb			7/28/2020	9.4	ppb		
6/9/2020	6.9	ppb	6.9	6.7	6/9/2020	11.0	ppb	9.3	7.9
5/18/2020	6.7	ppb			5/18/2020	10.0	ppb		
4/8/2020	7.2	ppb			4/8/2020	7.0	ppb		
3/17/2020	6.9	ppb	6.6	6.4	3/17/2020	6.6	ppb	6.3	6.9
2/6/2020	6.7	ppb			2/6/2020	6.7	ppb		
1/16/2020	6.2	ppb			1/16/2020	5.5	ppb		

2.2 200 Tract Existing Conditions

2.2.1 Distribution Piping (Pressure Zones)

The 200 Tract distribution piping consists of 2-, 3-, 4-, 6-, 8-, and 12-inch diameter piping. The hydraulic model indicates that many segments of distribution piping are undersized and unable to provide sufficient fire flow. A majority of these instances occur in the 200 Tract lower zones in sections with 4-inch piping, and in dead-end areas. Recent pipeline replacement projects have replaced approximately 21,800 linear feet (LF) of undersized/leaky piping. Table 2.05 is a list of the pipe diameters and total linear footage for each within the 200 Tract.

Table 2.05: Pipe Sizes and Lengths for 200 Tract

Pipe Size	Pipe Length (ft.)
2-inch	660
3-inch	4,440
4-inch	70,974
6-inch	47,024
8-inch	49,127
12-inch	28,045
Total (rounded)	**200,300**

2.2.1.1 Distribution Piping Existing Condition Assessment

To the best of GBWC's knowledge, most of the distribution piping in the 200 Tract was completed in the 1970s (Property Report, 1978, pg. 13). The original water system was not installed in accordance with current design or construction standards. Some of the piping has reached the end of its useful life as evidenced by the ongoing mapping of breaks and leaks. Several portions of the system are experiencing multiple breaks which is likely one of the causes of the historically high NRW percentages observed in the system. The approach for addressing pipeline breaks and leaks has moved from a historically reactive basis to a proactive basis with a series of phased pipeline replacement projects underway as approved in the 2018 IRP Action Plan. In addition, GBWC-SCD can reference the pipeline matrix rating system to instruct on-call contractors during emergency repairs to either patch or replace pipe segments based on condition ratings.

An asset management condition assessment matrix was developed in 2014 to better categorize the condition of the existing distribution piping. To develop the matrix, the distribution piping was divided into segments and a numerical value was assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand (ADD). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe. Appendix A contains snapshots of the distribution pipe condition assessment matrix for the 200 Tract along with detailed descriptions for the criteria ranking matrix. The four matrix tiers used to evaluate the condition of the pipe segments are good, fair, poor, and very poor. Depending on the number of breaks that occur in segments of pipe, the pipe is either replaced or repaired.

A sanitary survey was performed on October 3, 2017, by the NDEP Bureau of Safe Drinking Water (BSDW). Corrective actions listed in the inspection letter, dated November 30, 2017, related to the distribution system are as follows:

- Continue to identify and replace substandard pipes including undersized, leaking, and/or aging infrastructure.
- Continue attempts to reduce high pressures in system as finances allow (NAC 445A.6711).
- Equip dead end lines with flushing devices and hydrants (NAC 445A.6712).
- Use materials in distribution system that meet appropriate construction standards and American Water Works Association (AWWA) standards to ensure delivery of water with sufficient volume, quality, and pressure (NAC 445A.67105 and 445A.67125).

The most recent sanitary survey was performed on December 17, 2020, by NDEP BSDW. Fire flow capacity, among other items, was noted as a significant deficiency for the Housing Section water system and NDEP is requiring a timeline be submitted by GBWC-SCD for addressing the deficiency. The following comment was included in the sanitary survey inspection letter, dated January 6, 2021, regarding the significant deficiency:

> *"The water system continues to have an excessive amount of line breaks and pressure losses. Multiple boil water orders (in different portions of the distribution system) are often in place at the same time. BSDW understands that the most problematic portions of the distribution system consist of PVC pipe that is not appropriately sized to ensure proper pressures and flows. Frequent pipe breaks and pressure losses increase the probability of*

distribution system contamination. In addition to potential health hazards, the undersized PVC pipe could hinder firefighting efforts."

This significant deficiency highlights the severity of the distribution system deficiencies and the importance of continuing and prioritizing pipeline replacement projects for the GBWC-SCD water systems as proposed in the Preferred Plan (Section 7) and Action Plan (Section 8). As GBWC-SCD has made repairs and improvements to the distribution system, the newer infrastructure has been designed and constructed to current standards.

From 2020 to 2023, five phases of pipeline replacement have been completed in the 200 Tract as detailed below.

Phase 1

Phase 1 Project is located in the lower pressure zone along Brent Drive, Spring Valley Parkway, Berry Creek Place, Berry Creek Court, and Berry Creek Drive, which includes approximately 6,257 feet of new 8-inch and 12-inch water main. Phase 1 improvements replaced 6,257 feet of 4-inch, 6-inch, and 8-inch pipelines. Phase 1 improvements were completed in October 2021.

Phase 1A

Phase 1A Project consisted of the installation of a new 8-inch secondary interconnection from Well 11 to the new 8-inch main in Berry Creek Drive for added redundancy (approximately 571 feet in length). Construction of Phase 1A started on October 4, 2021, and was completed by October 26, 2021.

Phase 2

Phase 2 Project is located in the upper pressure zone at Hayland Drive and Spring Valley Parkway and includes approximately 1,544 feet of new 8-inch and 12-inch water main. Phase 2 improvements replaced 1,544 feet of 6-inch and 8-inch pipeline. Phase 2 improvements were completed in October 2021.

Phase 3

Phase 3 Project is located in the lower pressure zone along Spring Valley Parkway and includes approximately 2,950 feet of new 12-inch water main. The Phase 3 Project replaced the existing 6-inch pipeline with the new 12-inch water main. The construction of Phase 3 improvements were completed in February 2022.

Phase 4

Phase 4 Project is located in the upper pressure zone along Hayland Drive and includes approximately 10,550 feet of new 8-inch water main. Phase 4 improvements replaced the existing 4-inch and 6-inch pipeline with 8-inch water main. The Phase 4 Project also included abandonment of an existing 4-inch interconnect from Hayland Drive to Smokey Drive, the placement of new 8-inch interconnects at new more accessible locations (from Hayland Drive to Smokey Drive and Spring Valley Parkway), and the connection of dead-end piping between upper and lower pressure zones., The project also included the addition of a new pressure reducing valve (PRV) station along Hayland Drive. Phase 4 improvements began in June 2023, and were completed in December 2023.

2.2.1.2 Pressure Zone Existing Condition Assessment

The 200 Tract has two distinct pressure zones. The Upper Zone is situated in the northwest sections of the tract where all the storage tanks are located. The Lower Zone is situated in the southeastern sections where all the wells reside. Maximum Day Demand (MDD) pressures in each zone are listed below in Table 2.06. The original water system was not installed in accordance with current design or construction standards. Subsequently, as the GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to current standards. However, based on the available modeling results, pressures in certain segments still exceed the maximum allowable delivery pressure of 100 pounds per square inch (psi) per NAC 445A.6711(2). A schematic diagram and map, included in Appendix C shows the location of pressure zones and other infrastructure.

Table 2.06: 200 Tract Pressure Zones

Tract	Pressure Zone	Supply	Hydraulic Model MDD Pressures (psi)
200	Upper	200-2 Tank, High Tank, and Twin Tanks A & B with Twin Tanks Booster PS	75.3 to ~148.0 psi
	Lower	200-2 Tank, High Tank, and Twin Tanks A & B through Lily/Sterling and Karvel PRVs	40.8 to ~123.2 psi

2.2.1.3 Pressure Reducing Valve Existing Condition Assessment

The 200 Tract pressure zones are controlled by three pressure reducing valves (PRVs). The first PRV is located between Lily and Sterling Drives and is believed to be part of the original water infrastructure installed in the 1970's. A secondary bypass was installed on the PRV in 2014. The high side pressure averages 135 pounds per square inch gauge (psig). The low side pressure is set to 50 psig. A picture of this PRV, with the secondary bypass, is located in Appendix E. The asset registry "condition assessment" spreadsheet classifying the PRV is located in Appendix A.

The second PRV, known as the Karvel PRV or the Buffside PRV, is located off Buffside Street and was installed in 2008. The Karvel PRV is in good condition. The high side pressure averages 111 psig and the low side pressure is set to 43 psig. A picture of this PRV, with the secondary bypass, is located in Appendix E. The asset registry "condition assessment" spreadsheet is located in Appendix A.

The third PRV is on Hayland Drive and was installed at the end of 2023 to help with pressures and fire flow in the 200 Tract. The new PRV station includes an 8-inch diameter hydraulically controlled PRV, an 8-inch flow meter, and a 4-inch bypass line also equipped with a PRV, all of which are in a concrete vault. The pressure setting on the PRV will be adjustable. The addition of the new PRV eliminates a very long dead-end main along Hayland Drive.

2.2.2 Water Supply

A summary of well information for the 200 Tract is provided in Table 2.07. All the water supply for the 200 Tract comes from three wells located in the Lower Zone including Wells 1, 3, and 11 as shown on the 200 Tract map in Appendix D. It should be noted that the well capacities are based on recently completed well rehabilitations in 2019-2023 and review of monthly well logs. As of 2019, all three wells in the 200 Tract are equipped with backup power.

Table 2.07: 200 Tract Wells

Well	Year Drilled	Pressure Zone	Depth (ft)	Casing Dia.	Motor Size (HP)	Capacity (gpm)	Backup Power	VFD
1	1971	Lower Zone	322	12"	50	300 (1)	Yes	Yes
3	1972	Lower Zone	500	12"	100	680 (2)	Yes	Yes
11	1992	Lower Zone	440	12"	150	720(3)	Yes	Yes
Total						**1,700**		

Notes:

(1) Capacity identified in GBWC-SCD Well 1 Rehabilitation Close Out Report dated March 2020.
(2) Capacity identified in GBWC-SCD Well 3 Rehabilitation Close Out Report dated November 2019.
(3) Capacity identified in GBWC-SCD Well 11 Rehabilitation Close Out Report dated May 2023.

2.2.2.1 Water Supply Well Existing Condition Assessment

Well 1

Well 1, originally drilled in 1971, was constructed with a 12-inch diameter steel casing to a total depth of 322 feet below ground level (bgl). The screen interval consists of mill slots from 122-322 feet bgl. The original static water level after completion was 4 feet bgl. The well was rehabilitated in 2019-2020 to maintain production capacity as well as to remove mineral deposits and biofouling from the well screen. Holes in the well casing were identified and sealed off during the rehabilitation work. Following rehabilitation of the well which involved a shock chlorination and swabbing pretreatment, acid main cleaning treatment, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Grundfos model 300S400-11, 11-stage submersible pump, with a Franklin 50-HP, 460 Volt, 3-phase "Sandfighter" submersible motor, and 6-inch epoxy coated/lined column pipe. Other improvements in 2019-2020 included the addition of a 150-kilowatt (kW) Kohler backup generator, a VFD for operational efficiency, and discharge assembly upgrades. The most recent video log of the well taken after the rehabilitation revealed that the well screen was successfully cleaned. After rehabilitation, the static water level was observed at 87 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 52 years old.

During the 2016/2017 winter season, GBWC used sandbags as a temporary means to prevent flooding of the wellhead and arsenic treatment facilities due to surface water runoff from adjacent land. A permanent form of flood protection may be needed in the future at the Well 1 site to prevent submergence of facilities during heavy rain events. Despite the heavy snowfall experienced during winter of 2023, no flooding occurred at Well 1 as of early May 2023.

Well 3

Well 3, originally drilled in 1972, was constructed with a 12-inch diameter steel casing to a total depth of 500 feet bgl. The screen interval consists of louvers from 145-500 feet bgl. The original static water level after completion of the well was 60 feet bgl. The well was rehabilitated in 2019 to maintain production capacity and remove mineral deposits and biofouling from the well screen. Following rehabilitation of the well, which involved a shock chlorination and swabbing pretreatment, acid main cleaning treatment, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Goulds 8RJHC, 5-stage submersible pump, with a 100-HP Franklin submersible motor and 340 feet of 6-inch pumping column pipe. Other improvements in 2019 included the addition of a 200 kW Kohler backup generator and a VFD for operational efficiency. The most recent video log of the well taken after the rehabilitation revealed that the well screen was successfully clean. After rehabilitation, the static water level was observed at 66 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 51 years old.

Well 11

Well 11, originally drilled in 1992, was constructed with a 12-inch diameter steel casing to a total depth of 440 feet bgl. The screen intervals consist of wire wrap screen at 150-200 feet bgl and mill slot perforations at 200-320 feet; 350-360 feet; and 370-440 feet bgl. The original static water level after completion of the well was 28 feet bgl. A new submersible pumping system and VFD was installed in the well in 2013. The well is also equipped with a 200-kW backup generator.

In December 2021, Well 11 ceased functioning and was assessed by a local electrical contractor. The assessment identified a ground fault with the motor, which usually indicates a motor failure. On January 11, 2022, the submersible pumping system was pulled out of the well and a video survey was conducted on January 13, 2022. The video survey showed that the integrity of the well casing appeared to be in good condition. However, the upper screen interval, consisting of wire wrap screen (150-200 feet), appeared very heavily plugged. The second screen interval, consisting of mill slots (200-320 feet), is also very heavily plugged. The two lower screen zones (350- 360 feet and 370-440 feet) are so heavily coated with nodules that the mill slots could not be visually distinguished between the screen intervals and blank casing. A full rehabilitation of the well was recommended.

The well was rehabilitated in May 2022. A video survey was recorded on May 5, 2022, after the shock chlorination of the well, which showed that 11 feet of fill was removed as compared to the first video survey completed in January 2022. The screen and slots were still significantly plugged after chlorination and a full acid treatment was deemed necessary based on the high amount mineral buildup viewed during the video survey. The well was then acid treated and on May 15, 2022, a third video survey was recorded which revealed that the screen and slots were still heavily plugged with mineral buildup. Further rehabilitation, utilizing Cotey Chemicals and double swabbing, showed that the well still had significant mineral buildup. The screen interval of the casing was still severely plugged by mineral scale and the video showed several screen intervals in the well where there is little to no flow.

A video survey of the well on January 23, 2023, showed multiple holes throughout the well casing. Based on the new video findings, a series of rehabilitations were completed. Swage patches were installed on April 6, 2023, from 313 to 317 feet and 419 to 423 feet, to cover large holes observed in the casing. Well 11 was shock chlorinated and permanent pumping equipment was installed. The new pumping system is a Berkley 10T150-750 with a Hitachi 150 HP 3 phase motor.

The well is equipped with a level transducer connected to the SCADA system. As of 2023, this well is 31 years old.

2.2.2.2 Arsenic Treatment Facility Existing Condition Assessment

Each well in the 200 Tract is equipped with its own "package" WaterPOD "containerized" arsenic treatment system manufactured by AdEdge Water Technologies, LLC out of Buford, Georgia. Each treatment facility includes a coagulation/filtration system with several treatment vessels, backwash/recycle tanks, sediment holding basins, and sediment drying beds. Along with sodium hypochlorite injection to achieve the correct pH and ensure total oxidation of all constituents in the water, a ferric-chloride injection augmentation system has been installed in each of the well houses to supplement the raw water iron concentration to aid in arsenic removal.

The arsenic treatment process used at each well site in the 200 Tract is described below.

Basic Arsenic Treatment Process

*Raw **Water Feed**:* The treatment systems receive raw water when the wells are operational.

Chemical Feed: The process utilizes a continuous feed of sodium hypochlorite and ferric chloride to achieve the designed treatment goals. Chemicals are injected well in advance of the filters to allow proper mixing with the raw water and for adequate contact time to oxidize the arsenic, iron, and manganese. Chemical injections take place inside the existing well houses upstream of the treatment vessels to accommodate the required contact time. An inline static mixer is located just downstream from the injection points to uniformly distribute the chemicals.

The sodium hypochlorite is fed prior to the injection of the ferric chloride to oxidize any arsenic for more optimal removal. Oxidized precipitated iron, manganese, and arsenic are removed from the water in the filter vessels.

Filtration Media and Under Bedding: The water treatment system contains AdEdge Water Technologies ADGS+ media over a gravel under-bedding. Each filter vessel contains 26 cubic feet of ADGS+ media, 13 cubic feet of anthracite, and 8.5 cubic feet of gravel under-bedding. Expansion space in the top of the vessel is required during backwash to allow the media to rise and evacuate accumulated solids without loss of media from the vessels.

Process Controller: The treatment controllers utilize an Allen-Bradley Micrologix 1400 programmable logic controller (PLC) to perform the automatic control of system valving. The PLCs are for local control only and are not integrated with GBWC-SCD's SCADA system.

Process Vessels and Internal Components: Each AdEdge AD26 system is designed with six (6) 48-inch diameter by 60-inch side shell height filtration vessels filled with ADGS+ and anthracite filtration media. The well water enters the system through a 6-inch diameter header and the water flows in parallel through each of the vessels. Water in each vessel flows from the upper distributor downward through the media and the treated water is collected in the bottom through a schedule 80 PVC slotted hub and lateral assembly.

Backwashing System: Backwashing occurs routinely in the AdEdge AD26 systems to remove suspended solids which may accumulate in the filter bed and to hydraulically fluff the filter bed to prevent channeling. Backwashing occurs every 2-3 days depending upon raw water throughout. The system's backwash rate for each vessel is approximately 151 gpm. A single backwash event takes approximately 11-12 minutes per vessel. Each AdEdge treatment module contains six vessels and generates approximately 10,000 gallons of backwash per cycle. Each AdEdge treatment module is included in a skid mounted sea-crate with one backwash waste/recycle tank and an associated PLC. Wells 3 and 11 contain two complete treatment modules and require twice the time to completely backwash the full treatment system and generate twice the volume of backwash water per cycle. Well 1 only contains one treatment module at the well site.

Sediment Removal: Sediment is drawn from the backwash tank into a sediment-holding basin which allows the sludge to settle further. Sludge is then pumped to a dewatering tank (Flo-Trend Box) or directly to a sludge drying bed for further processing. The geo-fabric in the dewatering tank (Flo-Trend Box) tends to plug easily, not allowing the sludge to completely dewater. To address the dewatering issues, GBWC-SCD designed, constructed, and tested temporary drying beds at each of the well locations as a trial project to better complete the drying process. The trial project proved to be very successful in that sludge volumes hauled off-site have decreased significantly and the associated sludge-hauling and disposal costs have been reduced Currently, the sludge in the holding basins is manually pumped to the temporary drying beds. The process may become more automated with time as the operations are refined.

Each of the arsenic treatment facilities at Wells 1, 3, and 11 were installed and operating by the end of 2011 and beginning of 2012. GBWC-SCD has been working to improve the efficiency of the operations and reduce operational costs. The new drying beds installed at Well 11 helped to reduce operational costs and are twice the size of the original temporary drying beds. Currently, all three AdEdge Water Technologies treatment systems are functioning properly. A breakdown of the major process system assets have been categorized in the asset registry which can be found in Appendix A. The major components and equipment at each of the arsenic treatment facilities are in relatively good condition and, as of 2023, are anticipated to last approximately 9 additional years assuming a useful life expectancy of 20 years. As of 2023, the smaller working components such as valving, motors, and pumps are past the end of their useful life (assuming a useful life expectancy of 8 years) and will need to be replaced on a case-by-case basis based on routine maintenance.

The existing/temporary drying beds at Well 1 and Well 3's treatment facilities are made of wood and plastic and should be replaced with permanent concrete/steel drying beds to improve their reliability and extend their useful service life. The drying bed at Well 11 is a permanent metal frame drying bed lined with geotextile cloth. A sanitary survey was performed in October 2017 by NDEP BSDW and one of the corrective actions listed in the inspection letter, dated November 30, 2017, was to construct a suitable building for each of the arsenic treatment facilities when finances allow. A building will help ensure long-term protection of the treatment equipment. There are several other upgrades and repairs needed for the arsenic treatment facilities at each site to address deficiencies, improve operations, and add remote monitoring capabilities as listed below:

- Piping between filter units is experiencing leaks and need to be repaired and/or replaced.
- Pressure gauges for individual filter units are manual read only; pressure sensors need to be added upstream and downstream of the filter units for remote monitoring.
- PLCs at each site are for local controls only and need to be integrated with GBWC's SCADA for remote monitoring of operations and alarms.
- Recycle pumps are below grade in a deep vault and are difficult to access for routine inspections and maintenance; recycle pumps need to be relocated above grade for ease of access and to remove confined space requirements.

Additional information and an overall condition assessment for each treatment facility is provided below.

Well 1 Treatment
The AdEdge Water Technologies treatment system at Well 1 can receive up to 450 gpm of raw water. It utilizes one treatment module with 6 filter vessels, a 30,000-gallon backwash tank, one 20 cubic yard sludge holding tank, and two 5.5 ft. by 28 ft. wooden drying beds along with additional ancillary system components. The arsenic treatment facilities at the Well 1 site are in good condition, with the exception of the temporary wooden sludge drying beds that are beginning to degrade and are in need of replacement. Photos of the treatment facilities are located in Appendix E.

Well 3 Treatment
The AdEdge Water Technologies treatment system at Well 3 can receive up to 900 gpm of raw water. It utilizes two treatment modules with 6 filter vessels each, a 40,000-gallon backwash tank, one 20 cubic yard sludge holding tank, and two 7.5 ft. by 35 ft. wooden drying beds along with additional ancillary system components. The arsenic treatment filter media was replaced in

2021. The arsenic treatment facilities at the Well 3 site are in good condition with the exception of the temporary wooden sludge drying beds that are beginning to degrade and are in need of replacement. Photos of the treatment facilities are located in Appendix E.

Well 11 Treatment

The AdEdge Water Technologies treatment system at Well 11 can receive up to 900 gpm of raw water. It utilizes two treatment modules with 6 filter vessels each, a 40,000-gallon backwash tank, one 20 cubic yard sludge holding tank, and two permanent metal drying beds lined with geotextile fabric along with additional ancillary system components. The arsenic treatment filter media was replaced in 2021 and the need to top off the filter vessels again in 2023. Well 11 was offline for a good portion of 2023 due to issues with the arsenic treatment pods, which needed some replacement media and piping repairs. The treatment facility has since been repaired and Well 11 came back online in the fall of 2023. Photos of the treatment facilities are located in Appendix E.

2.2.3 Storage

There are four (4) water tanks used for water storage in the 200 Tract as listed in Table 2.08.

Table 2.08: Water Storage Tanks in the 200 Tract

Tank	Year Built	Volume (MG)	Base Elevation (ft.)	Diameter (ft.)	Height (ft.)	Material
Twin Tank A(1)	1973	0.25	5,600	41	24	Welded Steel
Twin Tank B	1983	0.50	5,600	58	24	Welded Steel
High Tank	1970	0.50	5,800	56	26	Welded Steel
200-2 Tank	2008	1.00	5,735	78	28	Welded Steel
Total(2)		**2.00**				

Notes:
(1) Twin Tank A is empty due to a hole in the floor.
(2) Total excludes Twin Tank A as it is currently empty.

2.2.3.1 Storage Tank Existing Condition Assessment

Condition assessments for the existing storage tanks are based on routine tank inspections performed by tank inspection companies. The inspections include the use of ultrasound equipment to measure steel thickness and assessment of the interior/exterior condition of each tank through observations, photos, and video. For more extensive details on the tank inspections summarized below, the tank inspection reports can be found in Appendix F.

Twin Tank A

Twin Tank A is a 250,000-gallon welded steel tank originally erected in 1973 and does not have cathodic protection. Twin Tank A has reached the end of its useful life based on a nominal life expectancy of 45 years. The exterior of the tank was power-washed and recoated in May 2019. A tank inspection and assessment report were also completed in May 2019. During the inspection, the exterior walls, roof, and tank accessories were noted to be in good to excellent condition. The interior tank walls and floor, however, were observed to be in fair to poor condition with heavy de-lamination, 33% uniform surface corrosion, and 50% rust noduling. The support column was found to be in fair condition with 3% uniform surface corrosion and 33% rust noduling. During the assessment, the tank inspection, the company removed 3 to 6 inches of sediment (iron, manganese, and clay) from the tank floor. Recommendations in the tank inspection report include blasting and recoating the interior of the tank and installing a new water level marker, cables, and float. The access ladder on Twin Tank A does not meet the updated OSHA standards as it does not have fall protection. Fall protection should be added during the next rehabilitation of the tank if GBWC plans to keep the tank in use.

In 2022, a significant leak was discovered in Twin Tank A. The tank was drained and cleaned, and a 3-to-4-foot crack in the floor plate along with penetrations and apparent aggressive corrosion was discovered. Due to the crack in the floor, a tank inspection was performed on January 25, 2023. The tank inspection found the exterior coating of Twin Tank A to be in fair condition. Due to snow, the roof and foundation of the tank were unable to be inspected. The interior coating on the roof, shell, and floor of the tank failed inspection and require replacement. Corrosion was noted on the roof, and tank floor, and massive pitting was noted on the shell and tank floor. Additionally, it was found that the floor plates do not overlap in several areas as is standard in tank bottom construction. It was concluded that the large crack in the tank floor was due to improper construction and poor welding. It was also noted that the rafters were distorted and active corrosion is present at the bolted connection points. A number of recommendations were made including addressing the interior and exterior coating deficiencies, replacing any deformed rafters, and installing a new floor. As of May 2023, Twin Tank A has remained offline.

Twin Tank B

Twin Tank B is a 500,000-gallon welded steel tank originally erected in 1983 and does not have cathodic protection. Twin Tank B is estimated to have 5 years of remaining useful life based on a nominal life expectancy of 45 years. A tank inspection and assessment report were completed in February 2014 that deemed this tank to be in poor condition and provided a recommendation to blast and recoat or re-inspect in 3-5 years.

A second in-depth tank inspection was conducted in December 2015 (corresponding inspection report is dated February 2016). Ultrasound measurements for structural integrity of the tank floor, shell, and roof showed acceptable amounts of material loss ranging from 18-30%. However, the interior and exterior surfaces were observed to be in poor condition and a recommendation was provided to blast and recoat to extend the life of the tank, similar to the 2014 tank inspection recommendations. Other recommendations from the 2015 inspection included:

- Seal roof openings/penetrations, gaps in roof plates, and at roof stiffener angles/beams.

- Remove surface imperfections.
- Add an interior safety ladder.
- Install frost free roof vents in accordance with AWWA standards.
- Replace gaskets and locks for roof hatches.
- Replace shell manway bolts and gaskets.
- Install new locking ladder shield.
- Remove existing level indicator.

The above recommendations were completed in 2016, including sand blasting and recoating the interior and exterior of the tank. Appendix F contains the 2014 and 2015 tank inspection reports.

The access ladder on Twin Tank B does not have proper fall protection. Fall protection should be added the next time Twin Tank B is rehabilitated.

High Tank

The High Tank is a 500,000-gallon welded steel tank originally erected in 1970 and does not have cathodic protection. The High Tank has reached the end of its useful life based on a nominal life expectancy of 45 years. Overall, the tank is in poor condition and the recommendation has been made in inspection reports and past IRPs to decommission and replace the tank as it is beyond rehabilitation.

The tank assessment conducted in July 2014 indicated there was overall degradation of the steel. The inspector was concerned about the integrity of the tank such that they recommended the tank not be cleaned. Significant nodules and rust were detected throughout the tank.

An in-depth tank inspection was conducted in December 2015 to better assess the structural integrity of the tank. The inspector noted unacceptable amounts of material loss from corrosion on the tank floor, shell, and roof ranging from 28-54% based on ultrasound measurements. The following structural deficiencies were also observed and noted in the tank inspection report dated February 2016:

- Roof vents are not frost free in accordance with AWWA standards and allow material/insects to enter the tank.
- Level indicator is inoperable.
- Manways are not in compliance with AWWA and Occupational Safety and Health Administration (OSHA) standards.
- Overflow discharge does not have an air gap or a splash plate.

- Bottom steel flange at the footing is damaged in multiple locations.

The tank inspection conducted in May 2019, as with past inspections, indicates there is an overall degradation of the steel. The exterior walls, roof, and tank accessories were noted to be in good to fair condition. The interior tank walls, roof, and floor were found to be in fair to poor condition with heavy de-lamination, greater than 50% uniform surface corrosion and rust noduling, and moderate to heavy cracking in the walls. The six support columns were found to be in fair to poor condition with heavy cracking, de-lamination, 33% uniform surface corrosion, and 50% rust noduling. Sediment was not removed from the tank during the 2019 inspection due to the poor condition of the tank floor (estimated at 1-inch depth).

Another tank inspection was performed in December 2020. Similar observations were made during the 2020 inspection as with previous tank inspections, with an overall recommendation to decommission and replace the tank due to heavy amounts of metal loss and coating failure.

In November 2021, the High Tank was inspected again. The exterior walls, roof, and tank accessories were found to be in good condition. The interior tank walls, roof, and floor were found to be in fair to poor condition with heavy blistering and corrosion noted. The six support columns were found to be in fair condition with moderate sags and runs in the coating, heavy de-lamination, cracking, and corrosion. The overall recommendation was to blast and recoat the interior of the tank as soon as budgets allows. The inspection also noted that if the recoating is not completed in three (3) years, a follow-up cleaning and inspection should be scheduled.

The most recent tank inspection was conducted in May 2023. This tank inspection found the exterior of the tank, roof, and tank accessories to be in fair to good condition with minor pinholes, minor to moderate de-lamination, graffiti, moderate to heavy staining, heavy sags and runs in the coating, and some corrosion. The access hatch was found to be in poor condition with corrosion and de-lamination present. The interior tank walls, roof, and floor were found to be in poor to fair condition with heavy corrosion, de-lamination, and an average of 7 inches of sediment present.

Appendix F contains 2014, 2015, 2019, 2020, and 2021 tank inspection reports.

In addition, a sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated November 30, 2017, noted that the High Tank is at or beyond its useful life with a possible leaking floor due to healthy vegetation observed near the base of the tank. The most recent sanitary survey was performed on December 17, 2020, by NDEP BSDW. In the subsequent inspection letter, dated January 6, 2021, NDEP carried forward the 2017 comment that the "tank is at or beyond its useful life" and elevated it to a "significant deficiency". This significant deficiency highlights the severity of tank condition and the importance of replacing the tank, especially when noting that fire flow capacity was also noted as a significant deficiency for the 200 tract (as discussed in Section 2.2.1.1).

The High Tank needs to be replaced/rehabilitated to continue to serve as a fire protection source to the 200 Upper Zone and is included in the Action Plan (Section 8).

200-2 Tank

The 200-2 Tank is a 1.0 MG welded steel tank originally erected in 2008. As of 2023, the 200-2 Tank is estimated to have 30 years of remaining useful life based on a nominal life expectancy of 45 years. Passive cathodic protection was installed in the 200-2 Tank in May 2016. A tank inspection and assessment report were completed in May 2019. The interior and exterior of the tank were observed to be in good condition with minimal corrosion and de-lamination overall. During the inspection, the tank inspection company removed approximately 1/16th-inch of sediment (iron and manganese) from the tank floor. With proper operation and maintenance, the 200-2 Tank should have a remaining useful life that well exceeds the 20-year planning horizon for this IRP. Appendix F contains the 2019 tank inspection report.

The 200-2 Tank lacks fall protection on the access ladder. Fall protection should be added the next time the tank is rehabilitated.

2.2.4 Booster Pumps

Water is boosted from the Lower Zone to the Upper Zone and to the 200-2 Tank via the Twin Tanks booster pumps located at the Twin Tanks site. The booster pump station has three pumps and is equipped with a standby generator for continued operation in the event of a power failure. A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated November 30, 2017, included a corrective action to place a pressure gauge on the high side of the booster pumps which has been completed. The three booster pumps include two Goulds pumps and one Berkeley pump as described in more detail below.

2.2.4.1 Pump and Motor Existing Condition Assessment

Twin Booster Pump 1 (TBP1)

The TBP1 booster pump is a Goulds Model 3656 rated for 750 gpm at a total dynamic head (TDH) of 250 feet with a 3,540 RPM 75-HP Baldor/Reliance motor. The TBP1 pump assembly was installed in 2008 and is in good condition. The pump and motor assembly has reached the end of its useful life based on a nominal life expectancy of 10 years but is not in need of replacement yet and will continue to be monitored.

Twin Booster Pump 2 (TBP2)

The TBP2 booster is also a Goulds Model 3656 pump but is rated for 500 gpm at a TDH of 250 feet with a 3,540 RPM 50-HP Baldor/Reliance motor. Like TBP1, the TBP2 assembly was installed in 2008 and is in good condition. The pump and motor assembly has reached the end of its useful life based on a nominal life expectancy of 10 years but is not in need of replacement yet and will continue to be monitored.

Twin Booster Pump 3 (TBP3)

The TBP3 booster pump is a Berkeley Model B3ZPBH5 rated for 700 gpm at a TDH of 250 feet with a 3,540 RPM 60-HP Baldor/Reliance motor. The TBP3 assembly was installed in 2014 and is in good condition. As of 2023, this pump and motor assembly is estimated to have approximately one year of remaining useful life based on a nominal life expectancy of 10 years.

2.2.5 Back-Up Power Supply

The Twin Booster Pumps 1 and 2 (TBP1 & TBP2) are equipped with a backup generator that is in fair condition, but its age is unknown.

Well 11 is equipped with a 200 kW Kohler diesel generator that was installed in 2013 and is in good condition. As of 2023, the generator is estimated to have a remaining useful life of 10 years based on a nominal life expectancy of 20 years.

Wells 1 and 3 were equipped with backup generators in 2019. Well 1 is equipped with a 150 kW Kohler diesel generator. Well 3 is equipped with a 200 kW Kohler diesel generator. In addition, two 22 kW Guardian generators were installed at the Well 1 site in 2019 for the GBWC-SCD office building to provide 24-hour uninterruptable SCADA communications to all the critical water and wastewater system components in case of emergencies (e.g. power outages). As of 2023, the new generators at the Well 1 and 3 sites are estimated to have a remaining useful life of 17 years based on a nominal life expectancy of 20 years.

2.2.6 System Operation and Control

The Twin Tanks booster pump station is controlled by the water level in the High Tank. When the water level drops to a preset level (see below), the pumps turn on and begin filling both the High Tank and the 200-2 Tank. An altitude valve in the 200-2 Tank is set to close when the tank water level reaches a set elevation. The 200-2 Tank is also fed directly from the High Tank. The well pumps are operated based on the level in the Twin Tanks.

The 200-2 Tank is approximately 65 feet lower than the High Tank and the altitude valve closes when the tank is full which allows flows from the booster pump station to be diverted to the High Tank. The 200-2 Tank can supply the Upper Zone if the High Tank is not functional. However, because of its lower elevation, the 200-2 Tank is not adequately able to continuously serve the Upper Zone because of insufficient delivery pressures and flows at higher demands, especially during fire flow conditions.

The Upper Zone supplies the Lower Zone through the Lily/Sterling PRV, Karvel PRV and the new Hayland PRV. Refer to Appendix D for a map of the 200 Tract system.

Although all the wells and booster pumps operate on tank levels, the pumps can also be operated manually either locally or from a remote location (the GBWC-SCD office) via the SCADA system.

The well start and stop points based on Twin Tanks level (as of May 2023) are as follows:

- Well 1 starts at 18 ft., off at 21 ft.
- Well 3 start at 17 ft., off at 20 ft.
- Well 11 starts at 5 ft., off at 7 ft.

The booster station starts and stop points based on High Tank level (as of May 2023) are set as follows:

- One pump starts at 19 ft., off at 21 ft.

Typically, only one booster pump runs at a time; however, all three can be operated simultaneously. The booster station has an emergency generator on site, which will operate two of the booster pumps in the event of a power failure.

It should be noted that the set points above are summertime set points and are typically adjusted for other seasons based on demand and operational conditions.

2.2.6.1 SCADA Existing Condition Assessment

The SCADA system was initially installed in 2005, with initial upgrades completed in 2014 and additional upgrades after completion of the 2015 IRP. Most recent SCADA upgrades were completed in 2022, as approved in the 2018 IRP. Upgrades include enclosures, PLCs, radios, power supplies and UPSs. The current SCADA system monitors the following aspects: storage tank level, pump status at each well and booster station, discharge pressure at select wells, chemical feed pump status, and power/standby generator status. All monitoring equipment uses unlicensed FM radio frequency to communicate with the receiving equipment at the GBWC-SCD office. The receiver at the GBWC-SCD office displays and stores data on a desktop computer/monitor using VT SCADA platform software. The current system has alert capabilities to notify operators when monitoring set points and/or alarms occur at each facility. Capabilities of the current system include:

- Central Monitoring: Upgrades to the SCADA software and new hardware were installed at the GBWC-SCD office. The computer and related software monitor and store data received from remote monitoring equipment;
- Discharge/Distribution Pressure at each Well: Equipment was installed to monitor the discharge pressure when pump(s) are running and monitor system pressures at each well;
- Flow at Each Well: Flow meters with real-time data were installed on all wells;
- Chemical Feed Equipment: Installed equipment that monitors the chemical feed pump status;
- Chlorine Scale Monitoring: Installed equipment to monitor chlorine scale;
- Facility Security Conditions: A Security Audit needs to be performed to evaluate the various security options and which equipment may be needed and installed to monitor security at each facility, including the well houses;
- Pressure Regulating Stations: Pressure monitoring equipment was installed on all PRVs to receive real-time pressure data and valve status;
- Support System: Ongoing technical and maintenance support is available to the system;
- Tank Levels: The SCADA system provides water storage tank levels;
- Pump On/Off Positions: The SCADA system provides information as to whether the pumps are on or off;

- Remote Control: The SCADA system base can operate many facilities via the computer;
- Environmental Monitoring/Temperature Status: Sensors and alarms were installed in all the well houses. Temperature status is monitored and, if the heaters go out and the temperatures in the well houses drop to possible freezing levels, the SCADA will alert operations of the issue; and
- Generator Monitoring: The status of the generators and alarm conditions at each facility are monitored.

2.3 Housing Section Existing Conditions

2.3.1 Distribution Piping

The Housing Section distribution piping consists of 2-, 3-, 4-, 6-, 8-, 10 and 12-inch diameter piping. The hydraulic model indicates that many segments of the Housing Section's distribution piping are still undersized and unable to provide sufficient fire flows. Table 2.09 is a list of the pipe diameters and total linear footage for each pipe size within the Housing Section.

Table 2.09: Pipe Sizes and Lengths for Housing Section

Pipe Size	Length (ft.)
2-inch	7,010
3-inch	78,750
4-inch	208,820
6-inch	109,910
8-inch	79,270
10-inch	220
12-inch	54,480
Total (rounded)	**538,500**

2.3.1.1 Distribution Piping Existing Condition Assessment

As in the 200 Tract, much of the original piping in the Housing Section was installed in the 1970's. The Housing Section water system was not installed in accordance with current design or construction standards and the bulk of the old piping has reached the end of its useful life. As such, there are portions of the system that are likely experiencing leaks, which could be a contributing factor to the NRW in the system. The approach for addressing pipeline breaks and leaks has moved from a historically reactive basis to a proactive basis with a series of phased pipeline replacement projects underway as approved in the 2018 IRP Action Plan. In addition, GBWC-SCD can reference the pipeline matrix rating system to instruct on-call contractors during emergency repairs to either patch or replace pipe segments based on condition ratings.

As with the 200 Tract, an asset management condition assessment matrix was developed to better categorize the condition of the existing distribution piping. In developing the matrix, distribution piping was divided into segments and a numerical value was assigned to each segment based on the number of breaks experienced and hydraulic pressures at ADD. The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe. Appendix A contains snapshots of the distribution pipe condition assessment matrix for the Housing Section along with detailed descriptions for the criteria ranking matrix. The four matrix tiers used to evaluate the condition of the pipe segments are good, fair, poor, and very poor.

A sanitary survey was performed on October 4, 2017, by the NDEP BSDW. Corrective actions listed in the inspection letter, dated December 5, 2017, related to the distribution system are as follows:

- Continue to seek funding to make necessary piping improvements.
- Use materials in the distribution system that meet appropriate construction standards and AWWA standards to ensure delivery of water with sufficient volume, quality, and pressure (NAC 445A.67105 and 445A.67125).

The most recent sanitary survey was performed on December 17, 2020, by NDEP BSDW. The distribution system leaks were noted as a significant deficiency for the Housing Section water system and NDEP is requiring a timeline be submitted by GBWC-SCD for addressing the deficiency. The following comment was included in the sanitary survey inspection letter, dated January 6, 2021, regarding the significant deficiency:

> *"The water system continues to have an excessive amount of line breaks and pressure losses. Multiple boil water orders (in different portions of the distribution system) are often in place at the same time. BSDW understands that the most problematic portions of the distribution system consist of PVC pipe that is not appropriately sized to ensure proper pressures and flows. Frequent pipe breaks and pressure losses increase the probability of distribution system contamination. In addition to potential health hazards, the undersized PVC pipe could hinder firefighting efforts."*

This significant deficiency highlights the severity of the distribution system deficiencies and the importance of continuing and prioritizing pipeline replacement projects for GBWC-SCD water systems as proposed in the Preferred Plan (Section 7) and Action Plan (Section 8). As GBWC-SCD completes repairs and improvements to the distribution system, the newer infrastructure has been designed and constructed to current standards.

2.3.1.2 Pressure Zone Existing Condition Assessment

The Housing Section consists of three separate tracts which contain a total of six distinct pressure zones. The northern area of the Housing Section, the 100 Tract, has three pressure zones: the 100 Northwest Zone, the 100 Northeast Zone, and the 100 Southeast Zone. The western area of the Housing Section, the 300 Tract, has two pressure zones: the 300 Northwest and 300 West Zones. The 300 Northwest Zone is the same pressure zone as the 100 Northwest Zone. The southern area of the Housing Section, the 400 Tract, has three pressure zones: the 400 Upper Zone, the 400 Lower Zone, and the 400 Southeast Zone. The 400 Southeast Zone is the same pressure zone as the 100 Southeast Zone. The Housing Section pressure zones, as well as the storage tanks, that supply each zone are shown in Table 2.10. Maps included in Appendix D show the locations of the existing pressure zones. Section 2.3.6, System Operation and Control, provides a narrative description of how the wells and pump stations are operated within the Housing Section.

The original water system was not installed in accordance with current design or construction standards. Subsequently, as GBWC-SCD has made repairs and improvements, the newer infrastructure has been designed and constructed to current standards. Based on the available modeling results, it appears that the delivery pressures in certain areas exceed the maximum allowable delivery pressure of 100 psi per NAC 445A.6711(2).

Table 2.10: Housing Section Pressure Zones

Tract	Pressure Zone	Supply	Hydraulic Model MDD Pressures (psi)
100 400	Southeast	Tanks 103A & 103B with Booster Pumps 3 & 4 at the Tank 103 Booster Site	43.2 to ~157.0 psi
100	Northeast	Tank 106 with Booster Pumps 1 & 2 at Tank 106 Booster Site	78.0 to ~164.0 psi
100 300	Northwest	Tanks 103A & 103B and Tank 106	41.0 to ~172.0 psi
300	West	Tanks 103A & 103B and Tank 106 through Licht Parkway PRV during normal operation; Well #7 during MDD	136.3 to ~202.9 psi
400	Upper	Tank 9; can also be supplied by Tanks 8 & 8A through Booster Pumps 1 & 2 at Tank 8 Booster Site	72.4 to ~ 119.5 psi
400	Lower	Tanks 8 & 8A	30.1 to ~124.2 psi

2.3.1.3 Pressure Reducing Valve Existing Condition Assessment

In the 300 Tract, there is one PRV located near the intersection of Licht Parkway and Silver State Drive. The high side pressure averages 155 psig and the low side pressure is set to 100 psig. The Licht Parkway PRV appears to be in excellent condition, it was upgraded from a 4 inch to an 8-inch PRV vault in 2023 to provide proper fire flow to the new Boys & Girls Facility. Refer to Appendix E for a photo of this PRV.

There are two PRVs in the 400 Tract: the Oakmont PRV and the Willington PRV. The Willington PRV is located at the northern intersection of Willington and Wolcott Drives. The high side pressure averages 145 psig and the low side pressure is set to 82 psig. The Willington PRV is equipped with a bypass and is in fair condition, but the age of the PRV is unknown. Refer to Appendix E for a photo of this PRV.

The Oakmont PRV is located near the intersection of Oakmont and Cripple Creek Drives. The high side pressure averages 70 psig and the low side pressure is set to 46 psig. The Oakmont PRV appears to be in fair working condition, but its age is also unknown. Refer to Appendix E for a photo of this PRV.

A new PRV was installed in 2021 at the terminus of Scrub Oak Drive and allows automatic supply of water from the 400 Tract to the 300 and 100 Tracts to supplement peak demands at a controlled pressure. The pressure reducing station includes a SCADA controlled valve tied to the Tank 103B level sensors to prevent tank overflows.

There are no PRVs in the 100 Tract.

2.3.2 Water Supply

The 100 Tract contains four wells: Wells 4, 5, 10, and 101 which are all located in the 100 Northwest Zone as shown on the map in Appendix D. All four wells in the 100 Tract are equipped with backup power.

The 300 Tract contains two wells: Well 7 in the 300 West Zone and Well 14 in the 300 Northwest Zone as shown on the map in Appendix D. The 300 Northwest Zone is interconnected with the 100 Northwest Zone and the 400 Lower Zone. The two wells in the 300 Tract were equipped with backup power in 2019.

The 400 Tract contains three wells: Wells 8, 9, and 12 which are all located in the 400 Upper Zone as shown on the map in Appendix D. All three wells in the 400 Tract are equipped with backup power.

A summary of well information for the Housing Section is provided in

Table 2.11. It should be noted that the well capacities are based on recently completed well rehabilitations in 2019-2023, review of monthly well logs, as well as communication with the Area Manager. The reliable capacity of Wells 8 and 12 are reduced in the summer months due to well interference, therefore, the reliable system capacity to meet MDD is based on a reduced pumping rate for these wells. As of 2019, all nine wells in the Housing Section are equipped with backup power. The replacement of Well 8, as approved in the previous IRP, is currently underway. An 8-inch test well has been completed and currently a plan set for the construction of a new well house and discharge assembly has been approved for construction by NDEP.

Table 2.11: Housing Section Wells

Well	Tract	Pressure Zone	Depth (ft.)	Casing Dia.	Motor Size (HP)	Capacity (gpm) (1)	Backup Power	VFD
4	100	100 Northwest Zone	435	12"	100	800(2)	Yes	No
5		100 Northwest Zone	444	12"	150	950(3)	Yes	Yes
10		100 Northwest Zone	440	12"	60	300(4)	Yes	Yes
101		100 Northwest Zone	410	16"	200	1,000	Yes	Yes
7	300	300 West Zone	500	12"	75	300(5)	Yes	Yes
14		300 Northwest Zone	180	8"	50	275(6)	Yes	Yes
8	400	400 Upper Zone	408	12"	75	400(7)	Yes	No
9		400 Upper Zone	802	16"	75	400	Yes	Yes
12		400 Upper Zone	820	12"	150	350 (8)	Yes	Yes
Total						**4,775 gpm(9)**		

Notes:
(1) Well capacities were verified by the GBWC-SCD Area Manager.
(2) Capacity identified in GBWC-SCE Well 4 Rehabilitation Close Out Report dated February 2023.
(3) Capacity identified in GBWC-SCD Well 5 Rehabilitation Close Out Report dated December 2020.
(4) Capacity identified in GBWC-SCD Well 10 Rehabilitation Close Out Report dated November 2019.
(5) Capacity identified in GBWC-SCD Well 7 Rehabilitation Close Out Report dated December 2020.
(6) Capacity identified in GBWC-SCD Well 14 Rehabilitation Close Out Report dated April 2020.
(7) Maximum pumping capacities are shown in addition to estimated reliable capacities in parentheses.
(8) Capacity after 2023 rehabilitation.
(9) Total capacity reflects estimated reliable capacities (reduced pumping capacity) for Wells #8 and #12.

2.3.2.1 Water Supply Well Existing Condition Assessment

100 TRACT

Well 4

Well 4, originally drilled in 1971, was constructed with a 12-inch diameter steel casing to a total depth of 435 bgl. The screen interval consists of mill slot perforations from 134-434 feet bgl. The original static water level after completion was 17 feet bgl. The well is equipped with a Grundfos

800S125-5-AA submersible pump with a Franklin 125 HP motor which was installed in 2023. As of 2023, the well is 52 years old.

The 2018 IRP Action plan included rehabilitation/cleaning of Well 4 and installation of a VFD. The well was rehabilitated and video surveyed in 2022. The rehabilitation work consisted of a shock chlorination, acid treatment, redevelopment, pump testing, and the design of a new pumping system and installation. The work was completed in early 2023. During the video survey, no major integrity issues were observed, although substantial scaling and mill slot plugging was observed in portions of the well. During the video survey, a blockage was encountered and the video was halted. After bailing and cleaning the well, a second video survey was conducted. During the second video survey, it was noted that the blockage was removed. The well integrity appeared to be in good condition and did not reveal any damaged sections.

Well 5

Well 5, originally drilled in 1971, was constructed with a 12-inch diameter steel casing to a total depth of 444 feet bgl. The screen intervals consist of wire wrap at 224-234 feet; 262-267 feet; 313-323 feet; 331-336 feet; and 339-344 feet bgl. The original static water level after completion was 52 feet bgl. A video log conducted in 2014 revealed a static water level of 90 feet bgl. The well was recently rehabilitated in 2020 to maintain production capacity and remove mineral deposits and biofouling. Following rehabilitation of the well, which involved a shock chlorination and swabbing pretreatment, acid main cleaning treatment, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Goulds 10DHHC, 13-stage pump, 6.37-inch impeller trim, with a 150 HP, 460 volt, 3-phase turbine motor, and a water lube pump assembly. Other improvements completed in 2020 included the addition of an upgraded VFD for operational efficiency, minor grading improvement to improve vehicle access, and new pump-to-waste drainage. The most recent video log of the well taken after the rehabilitation revealed that the well screen was successfully clean. After rehabilitation, the static water level was observed at 100.4 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 52 years old.

Sanitary surveys were performed by NDEP BSDW in 2017 and 2023, which included recommendations to provide security fencing around the well site to prevent vandalism and tampering. These deficiencies were addressed at the end of 2023.

Well 10

Well 10, originally drilled in 1971, was constructed with a 12-inch diameter steel casing to a total depth of 440 feet bgl. The screen intervals consist of mill slot perforations from 182-202 feet and 294-416 feet bgl. The original static water level after completion was 86 feet bgl. The well was recently rehabilitated in 2019 to maintain production capacity and remove mineral deposits and biofouling from the well screen. During well rehabilitation the casing was observed to be in poor and fragile condition with several small holes and heavy corrosion of the casing seams. The rehabilitation and cleaning work was performed with caution to avoid any additional damage to the well. Following rehabilitation of the well, which involved a shock chlorination and swabbing pretreatment, acid main cleaning treatment, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Goulds 7WAHC, 5-stage submersible pump, 5.25-inch impeller trim, with a Centri Pro 60-HP submersible motor, and 360 feet of 6-inch epoxy coated/lined column pipe. The existing VFD was not modified. The most recent video log of the well taken after the rehabilitation revealed that the well cleaning was moderately successful. After rehabilitation, the static water level was observed at 88 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 52 years old.

Sanitary surveys were performed by NDEP BSDW in 2017 and 2023, which included recommendations to provide security fencing around the well site to prevent vandalism and tampering. These deficiencies were addressed at the end of 2023.

Well 101

Well 101, originally drilled in 2006, was constructed with a 16-inch diameter steel casing to a total depth of 410 feet bgl. The screen intervals consist of stainless-steel Moscoe-Ross "Ful Flo Louver" (shutter screen) at 210-235 feet; 255-270 feet; and 340-390 feet bgl. All the blank casing sections are low-carbon steel. The original static water level after completion was 78 feet bgl. The well pump was replaced in 2022 and is now equipped with a Goulds Model 12CHC 7-st NSF-61 certified pump. The motor was installed new in 2009 and the well is also equipped with a 230-kW backup generator. A video log conducted of the well in 2014, revealed a static water level at 76 feet bgl. The screen intervals all appear relatively clean with no appearance of build-up from mineralization or biofouling on the screen. The seams between the stainless-steel screen intervals and low-carbon steel blank casing are showing evidence of dielectric corrosion. The blank casings in these areas are heavily pitted, suggesting that the well may need to be lined in the future. An insulated building was constructed in recent years to provide soundproofing around the well. The well is equipped with a level transducer connected to the SCADA system. The well is also equipped with a VFD for operation based on system pressures. As of 2023, the well is 17 years old.

On October 23, 2020, Well 101 malfunctioned and was taken offline. Removing the pumping equipment revealed that the pumping system had been producing excessive sand and had worn holds in the discharge bowl and column pipe. A video survey revealed that the gravel pack had entered the well in the 50-foot zone of fill and the integrity of Well 101 is rapidly degrading and will need a liner in the future. GBWC plans to delay liner installation until additional well capacity is added to the system with the completion of the new Well 8. A new pumping system was installed on February 18, 2022.

300 Tract

Well 7

Well 7, originally drilled in 1972, was constructed with a 12-inch diameter steel casing to a total depth of 500 feet bgl. The screen interval consists of a louver (shutter screen) from 160-500 feet bgl. The original static water level after construction was 38 feet bgl. The well was recently rehabilitated in 2020 to maintain production capacity and remove mineral deposits and biofouling that were observed to be heavily plugging the well screen during prior video inspections. During the rehabilitation efforts, it was discovered that the well casing was open-ended which was causing a significant amount of material accumulation in the well. A 5-foot cement plug was installed at the bottom of the well and a series of mechanical and chemical cleaning treatments were used to remove the buildup of debris and mineral scale. Following rehabilitation of the well, which involved a shock chlorination/swabbing pretreatment, acid main cleaning treatment, high pressure jetting, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Grundfos SP385S500-6, 6-stage submersible pump, with a Hitachi 50-HP, 460 volt, 3-phase submersible motor (shrouded), and a 6-inch epoxy coated/lined column pipe. Other improvements completed in 2019-2020 included the addition of a 125-kW Kohler backup generator, an upgraded VFD for operation based on system pressures, and installation of a new security fence around the well site. The most recent video log of the well taken after the rehabilitation revealed that the well cleaning was moderately successful. After rehabilitation, the static water level was observed at 48 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 51 years old.

Well 14

Well 14, originally drilled in 1988, was constructed with an 8-inch diameter steel casing to a total depth of 180 feet bgl. The screen interval consists of mill slot perforations from 100-180 feet bgl. The original static water level after completion was 19 feet bgl. The well was recently rehabilitated in 2019-2020 as an emergency response to a well pump failure. During the rehabilitation efforts, a break was found in the well casing and repaired. Following rehabilitation of the well, which involved a shock chlorination and swabbing pretreatment, acid main cleaning treatment, redevelopment, pump testing, and design of a new pumping system, a new pump and motor were installed. The new well pump is a Grundfos SP300S500-11, 11-stage submersible pump, with a Franklin 50-HP, 460 volt, 3-phase "Sandfighter" submersible motor (shrouded), and a 3-inch epoxy coated/lined column pipe. Other improvements completed in 2019-2020 included the addition of a VFD for operational efficiencies and the addition of a 48-kW mobile Kohler generator, which is stored at the GBWC-SCD office due to lack of space at the Well 14 site. The most recent video log of the well taken after the rehabilitation revealed that the well screen was successfully clean. After rehabilitation, the static water level was observed at 31 feet bgl. The well is equipped with a level transducer connected to the SCADA system. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. As of 2023, this well is 35 years old.

Well 14 discharge piping and instrumentation are located underground in a vault with confined space entry requirements. GBWC-SCD would like to place a building over the well discharge piping and instrumentation for ease of access, improved security and protection of the equipment, and elimination of the confined space entry. In addition, a sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, included a recommendation to provide security fencing around the well site to prevent vandalism and tampering.

It should be noted that the Well 14 rehabilitation was an emergency project that replaced the Well 4 Rehabilitation Project that was approved in the 2018 IRP.

400 Tract

Well 8

Well 8, originally drilled in 1981, was constructed with a 12-inch diameter steel casing to a total depth of 408 feet bgl. The screen interval consists of louvers (shutter screen) from 192-408 feet bgl. The original static water level after completion was 94 feet bgl. The well is equipped with a Goulds 7CLC, 6-stage pump with a 75-HP Franklin submersible motor. The well is also equipped with a 150-kW backup generator and a level transducer connected to the SCADA system. A video log conducted of the well in 2011 revealed that the static water level had lowered to 184 feet bgl. This level is only 8 feet above the top of the screen interval. During the middle and late summer months, this well loses production and has air entrainment problems. The video also revealed air bubbles coming out of the screen interval suggesting dewatering of the screen. Deeper down into the screen interval, the screen appears moderately damaged and moderately to heavily coated with mineralization and biofouling. As of 2023, this well is 42 years old. Well 8 is planned for replacement, and a test well was drilled at the terminus of Scrub Oak Drive in 2021.

A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, included recommendations to alter the pump-to-waste piping to meet NAC standards.

Well 9

Well 9, originally drilled in 2005, was constructed with a 16-inch diameter steel casing to a total depth of 802 feet bgl. The screen intervals consist of stainless-steel wire wrap screen at 236-319 feet; 337-378 feet; 428-449 feet; 569-590 feet; and 718-780 feet bgl. The original static water level after completion was 180 feet bgl. The well was rehabilitated in May 2017 and the static water level was 191 feet bgl. Following rehabilitation of the well, the original pump and motor were inspected and reinstalled. The well pumping system is a Berkeley 8T100-500 pump with a 125-HP Franklin submersible motor. The most recent video log of the well taken after the rehabilitation revealed that the well screen has been successfully cleaned. The well is also equipped with a 150-kW backup generator and a level transducer connected to the SCADA system. Some air entrainment issues have been noted at Well 9.The standard useful life of a well that has good quality construction is roughly 40 (±5) years. As of 2023, this well is 18 years old.

Well 12

Well 12, originally drilled in 1995, was constructed with a 12-inch diameter steel casing to a total depth of 820 feet bgl. According to the well Log (Well Log 49433) the screen intervals consist of wire wrap screen at 180-260 feet; 350-370 feet; 390-400 feet; 440-480 feet; and 740-800 feet bgl. The original static water level after completion was 138 feet bgl. Well 12 has had issues with the pumping water level being drawn below the upper screened interval causing problems with the well such as air entrainment, which can lead to customer service issues, additional wear and tear on equipment, and lower water production. In May 2017 the well underwent a rehabilitation that included the installation of patches to repair holes identified in the screen interval. The well was brought back online with the original pump (rebuilt) and motor which is a FlowServe Model 10EMM turbine pump assembly and a 150-HP U.S. vertical turbine hollow shaft motor. A VFD was also installed in 2017, which has helped address the air entrainment issues. The well is equipped with a 150-kW backup generator and a level transducer connected to the SCADA system. The final video log of the well after the rehabilitation indicated that the well cleaning was moderately successful. Future rehabilitations are not recommended due to the poor integrity of the screen intervals. As of 2023, the well is 28 years old.

On April 27, 2022, Well 12 went down. The pump was removed and a video survey revealed the portions of the screen are heavily plugged starting at 180 feet below ground surface. The well appeared to need a full cleaning and rehabilitation. GBWC identified Well 12 as a critical well to the system. Customers in the lower pressure zone reported complaints of milky water as a result of relying on Well 8 with Well 12 being offline. Given Well 12's critical importance, cleaning and rehabilitation were postponed to the fall when demand was less.

In the beginning of May 2023, Well 12 underwent another rehabilitation. The well was video surveyed, shock chlorinated, double acid treated and swabbed with redevelopment by airlifting after each acid treatment. The pump assembly was rebuilt and installed with the replacement of some of the column pipe and shaft. The rehabilitation was completed at the end of May 2023. Currently, the well has 7 swage patches in it. The objective is to try and get 3-4 more years out of the well and then redrill the same location.

2.3.3 Storage

There are three storage tanks in the 100 Tract. Tank 103A is a welded steel tank while both Tank 103B and Tank 106 are bolted steel tanks. All three tanks are located at an elevation of about 5,700 feet. Tanks 103A and 103B supply the 100 Southeast and 100 Northwest Zones. Tank 106 supplies the 100 Northeast Zone through Booster Pumps 1 and 2 at the Tank 106 Booster Site. These booster pumps are equipped with VFDs. Refer to the map in Appendix D for the tank locations in the 100 Tract.

There are no storage tanks located in the 300 Tract; all water supply in the 300 Tract is from Well 7, Well 14, and from storage tanks in the other Housing Section Tracts through PRVs.

The 400 Tract contains three water storage tanks: Tanks 8A and 8B supply the 400 Lower Zone and Tank 9 supplies the 400 Upper Zone. Tanks 8A and 8B can also supply water to the Upper Zone through Booster Pumps 1 and 2 at Tank 8A Booster Site. Refer to the map in Appendix D for the tank locations in the 400 Tract.

A summary of storage tanks in the Housing Section is provided in

Table 2.12.

Table 2.12: Water Storage Tanks in the Housing Section

Tank	Tract	Volume (MG)	Base Elevation (ft. amsl)	Diameter (ft.)	Height (ft.)	Material
Tank 103A	100	0.25	5,700	39	24	Welded Steel
Tank 103B	100	0.50	5,700	60	24	Bolted Steel
Tank 106	100	0.21	5,700	41	28	Bolted Steel
Tank 8A	400	0.22	5,912	37	28	Welded Steel
Tank 8B	400	1.30	5,912	89	26	Welded Steel
Tank 9	400	0.55	6060	65	20	Welded Steel
Total		**3.03**				

2.3.3.1 Storage Tank Existing Condition Assessment

The condition assessments for the existing storage tanks are based on routine tank inspections performed by tank inspection companies. The inspections include the use of ultrasound equipment to measure steel thickness and assessment of the interior/exterior condition of each tank through observations, photos, and video. For more extensive details on the tank inspections summarized below, the tank inspection reports can be found in Appendix F.

100 Tract

Tank 103A

Tank 103A is a 250,000-gallon welded steel storage tank, originally erected in 1975, which has reached the end of its nominal useful life. A tank assessment conducted in February 2014 deemed this tank to be in overall poor condition with a recommendation to decommission and replace the tank. The tank was recommended for decommissioning in the 2015 IRP due to a very large leak, observed by Lumos staff on May 29, 2014, in the tank's main outlet pipe. The GBWC-SCD Area Manager and Operator of Record were concerned that the loss of the tank capacity might result in a deficiency in the 100 Tract. A contractor was brought in to conduct a closer assessment of the leak and it was decided the existing leak should be patched. A few other minor repairs were made to the tank in 2014 and the tank was placed back in service.

A tank inspection and assessment report were also completed in May 2019. During the inspection, the exterior walls, roof, and tank accessories were noted to be in good to fair condition with moderate de-lamination of the exterior of the walls and heavy de-lamination and 50% uniform surface corrosion of the exterior of the roof. The interior tank walls, roof, and floor were observed to be in poor condition with rust nodules and 50% uniform surface corrosion. The support column was found to be in fair to poor condition with greater than 50% uniform surface corrosion and rust nodules. During the assessment, the tank inspection company removed approximately 1/16th-inch of sediment (iron and manganese) from the tank floor. Recommendations in the tank inspection report include blasting and recoating the interior of the tank. Appendix F contains the 2014 and 2019 tank inspection reports.

A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, included corrective actions to repair the sight gauge and cap openings at two locations at the top of the tank to prevent contamination (opening in the pulley elbow of the sight gauge and a 1-inch pipe opening near the tank ladder). The recommended corrective actions have been completed by GBWC-SCD.

Tank 103B

Tank 103B is a 500,000-gallon bolted steel storage tank, originally erected in 1997. As of 2023, the tank is anticipated to have 19 years of remaining useful life based on a nominal life expectancy of 45 years with proper preventive maintenance. Cathodic protection was installed in Tank 103B in May 2016. A tank assessment conducted in May 2019 determined that Tank 103B was in good condition with a recommendation to schedule future inspections every 3-5 years. Appendix F contains the 2019 tank inspection report.

A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, included a corrective action to repair the screen on the center vent piping to prevent contamination in the tank (screen appeared to be separated at top).The recommended corrective action has been completed by GBWC-SCD.

Security fencing needs to be installed around the tank site to prevent vandalism and tampering and has been completed as of the end of 2023. Fall protection for the tank should be added during the next rehabilitation.

Tank 106

Tank 106 is a 266,619-gallon bolted steel tank, erected in 2022. The tank is 40 feet in diameter and 28 feet tall. The tank is in excellent condition and should have 44 years of remaining useful life based on a nominal life expectancy of 45 years with proper preventative maintenance. As of 2023, cathodic protection was not installed in Tank 106 as it was suggested by the tank builder to wait until 1 year after the tank inspection to install cathodic protection.

400 Tract

Tank 8A

Tank 8A is a 220,000-gallon welded steel storage tank, originally erected in 1971. The tank is in poor condition and has reached the end of its useful life based on a nominal life expectancy of 45 years. A tank assessment completed in February 2014 determined that the floor of the tank was too corroded to clean. As a result of the inspection, the tank was deemed to be in poor condition with a recommendation to either sand blast and recoat or decommission the tank. A recommendation was made in the 2015 IRP to decommission the tank. As of the 2018 IRP, decommissioning of the tank was on hold due to a drop in value of scrap metal, which was going to be sold to offset tank demolition costs. In the meantime, the tank has remained in service.

A tank inspection and assessment report were also completed in May 2019. During the inspection, the exterior walls, roof, and tank accessories were noted to be in good to fair condition with moderate de-lamination of the roof. However, the interior tank walls, roof, and floor were observed to be in fair to poor condition with rust noduling and greater than 50% uniform surface corrosion. During the assessment, the tank inspection company removed 7 to 15 inches of sediment from the tank floor. Recommendations in the tank inspection report include blasting and recoating the interior of the tank and installing a new float. Appendix F contains the 2014 and 2019 tank inspection reports.

A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, noted problems with the tank foundation, which still appears to be settling.

A sanitary survey performed by NDEP BSDW in January 2021 further noted problems with the tank foundation, citing this as a significant deficiency.

Tank 8B

Tank 8B is a 1,300,000-gallon welded steel storage tank, originally erected in 2008. As of 2023, the tank is in good condition and is anticipated to have 30 years of remaining useful life based on a nominal life expectancy of 45 years with proper preventive maintenance. The tank is equipped with cathodic protection. A tank assessment, completed in May 2019, determined that the tank was in overall good condition with only minor epoxy repairs needed on the interior floor to address localized corrosion. During the assessment, the tank inspection company removed approximately 1/8th-inch of sediment (iron and sand) from the tank floor. The inspector recommended scheduling future inspections every 3-5 years. Appendix F contains the 2019 tank inspection report. Fall protection to the tank should be added during the next rehabilitation.

Tank 9

Tank 9 is a 550,000-gallon welded steel storage tank, originally erected in 2003. The tank is currently in good condition and, as of 2023, is anticipated to have 25 years of remaining useful life based on a nominal life expectancy of 45 years with proper preventive maintenance. The tank is equipped with cathodic protection. A tank assessment, completed in May 2019, determined that the tank was in overall good condition. The inspector recommended scheduling future inspections every 3-5 years and the installation of a gasket on the tank access hatch, which has been completed by GBWC-SCD. During the assessment, the tank inspection company removed approximately 1/16th-inch of sediment (iron and manganese) from the tank floor. The inspector recommended scheduling future inspections every 3-5 years. Appendix F contains the 2019 tank inspection report.

A sanitary survey was performed by NDEP BSDW in October 2017 and the inspection letter, dated December 5, 2017, included a corrective action to seal an opening in the sight gauge piping to prevent contamination. The recommended corrective action has been completed by GBWC-SCD.

A loss of trees at the Tank 9 site has affected aesthetics in the area. Since completion of the 2018 IRP, GBWC-SCD planted redwoods and installed irrigation piping to restore aesthetics. To minimize the loss of trees, cattle fencing has been installed around the tank as well. Tree loss continues to be a problem and additional steps may need to be taken to correct this issue. Fall protection to the tank should be added during the next rehabilitation.

2.3.4 Booster Pumps

At the Tank 103 site, there is a booster pump station which pumps from Tanks 103A and 103B to the 100 Southeast Zone of the 100 Tract and the 400 Southeast Zone of the 400 Tract. Any excess flow from the booster pump station goes to Tanks 8 and 8A in the 400 Tract. The booster pump station has two twin 600 gpm centrifugal Berkeley pumps equipped with 30-HP motors (one for redundancy). Each pump is equipped with a VFD. The pumps are designated Booster Pumps 3 and 4. A 80 kW diesel backup generator was installed at the booster pump station in 2016. GBWC is planning on the roof replacement due to age and continued loss of shingles after storm events, which is a safety hazard.

At the Tank 106 site, there is a booster pump station that pumps from Tank 106 to the 100 Northeast Zone of the 100 Tract. The booster pump station has two twin Berkeley pumps (one for redundancy), each equipped with 30-HP motors and VFDs. The pumps are designated Booster Pumps 1 and 2 and each have a 600-gpm capacity. The booster pump station is also equipped with a 60-kW diesel backup generator.

At the Tank 8A site, there is a booster pump station which pumps from Tanks 8A and 8B to Tank 9. The booster pump station has two Berkeley pumps (one for redundancy), each equipped with 30-HP motors. One of the pumps is equipped with a VFD. The pumps are designated Booster Pumps 1 and 2 with capacities of 750 gpm and 500 gpm, respectively. The booster pump station is also equipped with a 150-kW diesel backup generator.

2.3.4.1 Pump and Motor Existing Condition Assessment

100 Tract

Booster pumps at the Tank 103 site (Booster Pumps 3 and 4) are each a Berkeley, Model BK H689, centrifugal pump (600 gpm) equipped with a U.S. 30-HP motor. Both assemblies were installed in 2014 and are in good condition. As of 2023, it is anticipated that the pump and motor assemblies have approximately 1 year of remaining useful life based on a nominal life expectancy of 10 years. An additional VFD needs to be installed at the booster station so that each pump can operate independently of the other. Pump controls will also need to be integrated with SCADA for automatic operation in alternating lead-lag mode (pumps are currently alternated with a manual switch at the pump station site).

Booster pumps at the Tank 106 site (Booster Pumps 1 and 2) are each a Berkeley, Model BK H689, centrifugal pump (600 gpm) equipped with a Pentair 30-HP close-coupled motor. Both assemblies were installed in 2014 and are in good condition. As of 2023, it is anticipated that the pump and motor assemblies have approximately 1 year of remaining useful life based on a nominal life expectancy of 10 years. The Tank 106 Booster Site is equipped with two VFDs. The pump operates automatically in alternating lead-lag mode.

400 Tract

Booster Pump 1 at the Tank 8A site is a Berkeley, Model H 689 CW, centrifugal pump (500 gpm) equipped with a Baldor 30-HP 3500 RPM motor. This pump assembly appears to be in fair condition, but its age is unknown.

Booster Pump 2 is a Berkeley Model B3ZPL, centrifugal pump (750 gpm) equipped with a US 30-HP 3500 RPM motor. This pump assembly appears to be in fair working condition, but its age is also unknown.

An additional VFD should be installed at the booster station so that each pump can operate independently of the other when the transmission line to Tank 9 is down to provide redundancy to customers in the upper pressure zone of the 400 Tract. The booster pumps are located within an existing building, and GBWC-SCD plans to install the VFD in the coming years.

2.3.5 Back-Up Power Supply

100 Tract

All wells in the 100 Tract are equipped with backup generators. The generators have an estimated nominal life expectancy of 20 years with proper maintenance. Wells 4 and 5 each have a 180-kW Kohler diesel generator which are in good condition and were installed in 2004. Well 5 has a 150 kW Kohler diesel generator and Well 101 has a 230-kW Kohler diesel generator, but their ages are unknown.

Booster Pumps 1 and 2 at the Tank 106 site are equipped with a 60-kW Olympian diesel generator. The age of the generator is unknown. Booster Pumps 3 and 4 at the Tank 103 site were equipped with an 80-kW Kohler diesel generator in 2016.

300 Tract

Wells 7 and 14 in the 300 Tract were equipped with backup generators in 2019. As of 2023, the generators have an estimated nominal life expectancy of 16 years with proper maintenance. Well 7 was equipped with a 125-kW Kohler backup generator and Well 14 was equipped with a 48-kW mobile Kohler generator, which is stored at the GBWC-SCD office.

400 Tract

All wells in the 400 Tract are equipped with backup generators. The generators have an estimated nominal life expectancy of 20 years with proper maintenance. Wells 8, 9, and 12 each have a 150-kW Kohler diesel generator which are in good condition, but the ages are unknown.

Booster Pumps 1 and 2 at Tank 8A site share the 150-kW generator with Well 8.

2.3.6 System Operation and Control

The water systems for the 100, 300, and 400 Tracts are interconnected but also operate independently from each other as described below.

The 100 Tract has four wells (4, 5, 10, and 101) which are controlled by Tank 103B levels. The 100 Tract wells also pump to Tank 106, which operates on an electric motorized valve that opens and closes based on the level in Tank 106. At the Tank 106 site, there are two booster pumps equipped with VFDs to maintain pressure and flow to the homes built above the storage tank. Tank 103B also has a booster pump system which operates based on system pressures in the 100 Southeast Zone of the 100 Tract. At the Tank 103 site, one of the two booster pumps is equipped with a VFD. All wells in the 100 Tract operate on tank levels, including Well 101 which has a VFD and can also operate based on system pressures. All wells in the 100 Tract and the Tank 106 booster pump station are equipped with backup generators.

The 300 Tract has two wells (7 and 14). Well 14 operates based on Tank 103B levels. Well 7 operates during periods of high demands (i.e., MDD) based on system pressures and is equipped with a VFD to maintain minimum pressures in the higher elevation areas of the 300 Tract. The Well 7 VFD and the Licht PRV are set up to maintain a pressure of 100 psi at the wellhead and help reduce water hammering in the distribution line which has resulted in water main breaks in the past. Wells 7 and 14 were recently equipped with backup generators. A VFD was also recently installed for Well 14 for operational efficiency.

The 400 Tract has three wells (8, 9, and 12). This Tract is divided into two pressure zones. The 400 Upper Zone is served by Well 9 and Tank 9. Well 9 operates on Tank 9 levels. The 400 Lower Zone is served by Wells 8 and 12 which pump to Tanks 8A and 8B. Wells 8 and 12 operate on Tank 8A levels. All the wells in the 400 Tract can be operated manually from a remote location (GBWC-SCD office) via the SCADA system. At the Tank 8A site there are two booster pumps which can pump water from the 400 Lower Zone to the 400 Upper Zone in the event that Well 9 is offline. The booster pumps are controlled by the Tank 9 levels and one of the booster pumps is equipped with a VFD. The 400 Upper Zone can feed the 400 Lower Zone through an interconnection located near the Horse Palace.

Set points for the 100 Tract wells controlled by the level in Tank 103B (as of May 2023) are as follows:

- Well 4 starts at 9 ft., off at 12 ft.
- Well 5 starts at 18 ft., off at 21 ft.
- Well 10 starts at 17 ft., off at 20 ft.
- Well 101 starts 4 ft., off at 9 ft.

Set points for the 300 Tract wells are as follows (as of May 2023):

- Well 7 operates on pressure, to maintain a discharge pressure of 90 to 100 psi.
- Well 14 starts at 3 ft., off at 10 ft. (controlled by Tank 103B level)

Set points for the 400 Tract wells are as follows (as of May 2023):

- Well 8 starts at 19 ft., off at 26 ft. (controlled by Tank 8A level)
- Well 9 starts at 18 ft., off at 20 ft. (controlled by Tank 9 level)

- Well 12 starts at 20 ft., off at 26 ft. (controlled by Tank 8A level)

The booster station at the Tank 8A site pumps to Tank 9 and the Upper Zone has set points as follows (as of May 2023):

- One pump starts at 15 ft., off at 18 ft. (controlled by the Tank 9 level)

It should be noted that the set-points above are summertime set points and vary with other seasons based on demand and operational conditions.

2.3.6.1 SCADA Existing Condition Assessment

The SCADA system was installed in 2005 with initial upgrades completed in 2014 and additional upgrades after completion of the 2015 IRP. Additional SCADA upgrades were completed in 2022 as approved in the 2018 IRP. The current SCADA system monitors the following aspects: storage tank level, pump status at each well and booster station, discharge pressure at select wells, and power/standby generator status. All monitoring equipment uses unlicensed FM radio frequency to communicate with the receiving equipment at the GBWC-SCD office. The receiver at the GBWC-SCD office displays and stores data on a desktop computer/monitor using the new VT software. The current system has alert capability to notify operators when changes/problems occur at each facility. SCADA upgrades completed in 2014 and after the 2018 IRP (2022) included the following:

- Central Monitoring: Upgrades to the SCADA software and new hardware were installed at the GBWC-SCD office. The upgrades replaced an 8-year-old computer and 5-year old software. The computer and related software will adequately monitor and store data received from remote monitoring equipment;
- Discharge/Distribution Pressure at each Well: Equipment was installed to monitor the discharge pressure when pump(s) are running and monitor system pressures at each well;
- Flow at Each Well: Flow meters with real-time data were installed on all wells;
- Chlorine Scale Monitoring: Installed equipment to monitor chlorine scale;
- Facility Security Conditions: Installed equipment to monitor security at each facility including the well houses;
- Pressure Regulating Stations: Pressure monitoring equipment was installed on all PRVs to receive real-time pressure data and valve status;
- Lift Station 1: Equipment was installed to monitor pump status, high and low water level alarm status, and generator status;
- Mar-Wood WWTP and Lift Station: Equipment was installed to monitor pump status, high and low water level alarm status, blower status, and generator status;
- Wastewater System Levels: Levels can be monitored through SCADA and wet well alarms were installed so that if levels exceed a high set point, operations will be alerted to a potential spill;

- Support System: Ongoing technical and maintenance support is available to the system;
- Tank Levels: The SCADA system monitors water storage tank levels;
- Pump On/Off Positions: The SCADA system provides information as to whether the pumps are on or off;
- Remote Control: The SCADA system base can operate many facilities via the computer;
- Environmental Monitoring/Temperature Status: Sensors and alarms were installed in all the well houses. Temperature status is monitored and if the heaters go out and the temperatures in the well houses drop to possible freezing levels, the SCADA will alarm operations of the issue; and
- Generator Monitoring: The status of the generators at each facility are monitored.

The SCADA upgrades completed in 2022 included upgrades to enclosures, PLCs, radios, power supplies and UPSs.

2.4 Wastewater Treatment and Disposal

Within the GBWC-SCD water service area, there are three small sewer service areas: one in the 100 Tract (Mar-Wood WWTP) with 138 customers (124 active accounts and 14 inactive accounts), one in the 200 Tract (Septic #2) serving six (6) customers (including 1 inactive), and one in the 400 Tract (Septic #3) serving ten (10) customers (including 2 inactive). Customer counts are current as of December 2022. Sewer service area maps are included in Appendix D. The remainder of the water service area is served by individual septic systems which are maintained by the property owners.

100 Tract: Mar-Wood WWTP

The 100 Tract sewer service area of GBWC-SCD serves residential and commercial customers within an area of approximately 250 acres. Wastewater treatment and disposal for the 100 Tract sewer service area includes a single-sludge type activated sludge package plant with extended aeration and anoxic denitrification (the Mar-Wood WWTP) and groundwater disposal via infiltration in leach fields. The Mar-Wood WWTP is operated under NDEP Permit No. NS2002511. Wastewater is treated to secondary effluent standards. The permit type is groundwater discharge with flow and quality limits as summarized in

Table 2.13. The Mar-Wood WWTP has an average design flow capacity of 50,000 gallons per day (gpd). See Section 2.4.2.1 for a condition assessment of the Mar-Wood WWTP.

Table 2.13: Mar-Wood WWTP Permit Limits

Parameter	Permit Limit	Monitoring Frequency
Flow Rate (30-day Average)	50,000 gpd	Continuous
Effluent Biochemical Oxygen Demand (BOD_5)	30 mg/L	Monthly
Effluent Total Suspended Solids (TSS)	30 mg/L	Monthly
Effluent Total Nitrogen-N	10 mg/L	Monthly
Effluent pH	6.5 – 9.0	Monthly

2.4.1 Collection System and Lift Stations (100 Tract)

The collection system for the Mar-Wood WWTP (100 Tract) consists of approximately 56 manholes and approximately 18,350 linear feet (LF) of sewer main (sizes unknown) located in Spring Creek Parkway, from just east of Flora Drive to the intersection of Spring Creek Parkway and Bluecrest Drive. Additional infrastructure is located south along Country Club Parkway through Parkchester Drive. Refer to Appendix D for a map of the 100 Tract sewer infrastructure.

Wastewater collected in the system is pumped to the Mar-Wood WWTP via two lift stations: Lift Station 1 and the WWTP Lift Station. Lift Station 1 was replaced in August 2017 with a Flygt pre-engineered, packaged, fiberglass lift station. The lift station is a duplex system equipped with two submersible Flygt Model NP 3085 SH 169 gpm pumps, each with a 5-HP submersible motor. It is located northeast of the intersection of Spring Creek Parkway and Brooklawn Drive. A backup generator was also installed in 2017 for Lift Station 1.

The WWTP Lift Station is a duplex lift station located just south of the entrance to the Mar-Wood WWTP. The wet well is equipped with two submersible Flygt Model NS 3085 SH 150 gpm pumps, each with a 5-HP Franklin submersible motor. A backup generator is stationed next to the lift station in case of a power outage.

From the WWTP Lift Station, raw sewage is pumped to the Mar-Wood WWTP (just north of the lift station) through a manually cleaned bar screen and then to the anoxic zone of the treatment system.

2.4.1.1 Collection Piping Existing Condition Assessment

GBWC-SCD staff indicated that there are no current issues with the existing sewer collection system piping in the 100 Tract sewer service area. The entire collection system was cleaned and video inspected in 2018 with all noted issues being promptly remediated. The collection system should be scheduled for routine video inspections and cleaning/repairs as necessary.

2.4.1.2 Lift Station Existing Condition Assessment

Pumps and motors in the WWTP Lift Station were replaced in 2013 and the pump assembly is in good condition. As of 2023, the pumps and motors have approximately 5 years of remaining useful life based on a nominal life expectancy of 15 years with proper maintenance. Although the on-site generator is in good working condition, the age of the generator is unknown. The generator must manually be turned on and cannot be started remotely. The concrete wet well was installed in 2003 and should have another 15 years of useful life based on a standard nominal life expectancy of 35 years. The interior of the concrete wet well is showing signs of deterioration (e.g. exposed aggregates) from the damaging effects of hydrogen sulfide gas generated in the sewer collection system. If not addressed within the Action Plan, a full replacement of the lift station may be necessary. An interior lining system needs to be installed to protect the concrete from any additional corrosion and to maintain the structure for the full duration of its useful service life. Some of the internal components of the lift station are also showing signs of corrosion (e.g. metal hardware) and need to be replaced with a more corrosion resistant material such as stainless steel. The lift station also experiences issues with rags and often the rags need to be removed manually from the lift station and WWTP. GBWC removes approximately 70 pounds of wipes weekly from the facilities. Rehabilitation of the WWTP Lift Station and a new dual auger screening system are included in the Action Plan (Section 8).

Lift Station 1 was replaced in 2017 with a new duplex pumping system. As of 2023, the fiberglass wet well has approximately 29 years of remaining useful life based on a nominal life expectancy of 35 years. The pumps and motors have approximately 10 years of remaining useful life based on a nominal life expectancy of 15 years with proper maintenance. Security fencing was recently installed around the lift station site to prevent vandalism and tampering; however the security fencing sits approximately 1 to 2 feet above the ground and should be extended.

200 Tract: Septic #2

The septic system serving the 200 Tract (Septic #2) has the potential to serve 16 connections total, of which five (5) are being served based on December 2022 sewer connection records. Existing connections for the Septic #2 system include a home, gym, bar, carwash, and a restaurant). The car wash is closed and has been disconnected from the system. The 200 Tract system consists of a septic tank and leach field with a rated capacity of 6,000 gpd. The system was upgraded in 2007 with a new leach field. There are no sewer flow meters for the Septic #2 system; however, water usage data for the customers is provided in Section 3 (See Table 3.31).

Sampling has detected petroleum hydrocarbons (TPH) above the permitted limit of 1.0 mg/L. This contaminant was initially identified in the 2019 inspection report by NDEP. To address this deficiency, GBWC has videoed and cleaned the main lines on two different occasions, cleaned the septic and effluent tanks twice, verified whether certain service lines were connected to the system, and are currently using SEP-700 and microbes in the septic tank on a monthly basis. Additionally, TPH is tested on a monthly basis. Trends in the data show that TPH concentrations tend to be lower in the summer months and higher in the winter months.

400 Tract: Septic #3
The septic system serving the 400 Tract (Septic #3) has the potential to serve 10 connections total, of which eight (8) are being served based on 2022 sewer connection records. The 400 Tract system consists of a septic tank and leach field. There are no sewer flow meters connected with this system, however, average water usage for the customers for 2022 is provided in Section 3 (See Section 3.4.3).

2.4.2 Treatment Plant Process (100 Tract)

The treatment process at the Mar-Wood WWTP is described below.

Screening and Anoxic Zone
From the WWTP Lift Station, raw sewage is pumped via a 4-inch sewer force main to the anoxic zone of the Mar-Wood WWTP which contains a manual bar screen. The anoxic zone reduces nitrogen in the wastewater by eliminating the oxygen supply. The sewage is slowly mixed within this zone using a slow-speed mixer to keep the solids in suspension.

Aeration basin
Following the anoxic zone, the sewage flows to the aeration basin where it is aerated continuously to maintain a dissolved oxygen concentration at a minimum level of 2.0 milligrams per liter (mg/L). Aeration is provided by two blowers and diffused air assemblies. The existing blowers are located within a three-walled shed.

Clarifiers
Following the aeration basin, aerated sewage flows to a clarifier for sedimentation. The sewage separates behind a baffle and stabilized sludge settles to the bottom to be returned through the air lift pumps to the inlet of the plant. A portion of the aerated sewage rises behind the baffle and must be hosed or agitated to cause it to settle. This material is partially treated, air-filled and greasy, and sometimes requires skimming. The clear liquid rising on the opposite side of the baffle is further filtered by a layer of biological sludge in the final settling compartment. The clear liquid then flows over a weir to the plant effluent pipe.

Aerobic Sludge Digestion
Excess sludge is removed from the extended aeration system and processed in an aerobic sludge digester which is integral to the package plant system. Sludge is removed from the aerobic sludge digester 3-4 times per year by a pumper truck and hauled offsite.

2.4.2.1 Treatment Plant Existing Condition Assessment

The Mar-Wood WWTP (package plant model 1-7-50DL) was installed in 2003. The air blowers and blower motors are rated at 845 cubic feet per minute (cfm) with 15-HP motors. The Mar-Wood WWTP is contained in a below-grade concrete structure with shared walls between treatment zones. Overall, the mechanical equipment at the Mar-Wood WWTP is in good working condition and is operating efficiently. Treatment plant mechanical components have been replaced as needed over the years and typically have a nominal life expectancy of 10-25 years depending on the type of equipment (e.g. 10-15 years for pumps, 25 years for blowers). However, the concrete structures, walkways, and encasements are showing cracks, damage, and deterioration.

An existing condition assessment was performed by Lumos & Associates in September 2017 for the 2018 IRP. Photos taken during the assessment show significant deterioration of the concrete treatment structures including cracks, spalling, exposed aggregate, and exposed rebar. In April 2018, a Spill Report Form was prepared by GBWC-SCD and submitted to NDEP to document wastewater seeping through two hairline cracks in the concrete walls at the aeration basin and at the clarifier (see Appendix M). These cracks were repaired with a sealant and continue being monitored to prevent further leaks. A follow up site visit performed by Lumos in November 2018 revealed that the aggregate exposure area and depth had increased since the previous site visit in September 2017, with additional rebar visible. In addition, a NDEP inspection was performed on April 18, 2019, which noted the concrete deterioration (for inspection report, see Appendix M). Additional inspections were completed by Lumos & Associates in 2018, 2019, and 2020 (the most recent site visit was performed in May 2023). On the May 2023 site visit, it was noted that the concrete above the mixer in the aeration basin was moving slightly due to the added weight of the mixer from rags. Concrete deterioration has continued to accelerate each year. The progression of the deterioration is documented in a series of photos from 2017 to 2020 in Appendix M.

With growing concerns over the structural integrity and remaining useful life of the existing concrete treatment basins, GBWC contracted a structural engineer from Lumos & Associates to perform an inspection. Because treatment operations needed to remain active during the inspection work, only the exposed portions of the existing structures were inspected (i.e., portions above the surface water level). The structural inspection was completed on April 15, 2019, and the assessment report, including photos, is included in Appendix M. A summary of the findings from the structural assessment is provided below:

- Several areas of the exposed portion of concrete are in poor physical condition with spalling, cracks, and exposed aggregate and rebar. The north walkway has the most significant deterioration and the exposed rebar at this location is corroded.
- The cementitious overlay on the top of the concrete structures is separating from the underlying slabs and has cracking at several locations.
- Evidence of prior leaks are visible along the east side of the concrete structure. The leaks could be related to a lack of waterstops at the joints between the walkways and walls. The original design plans do not include specific details of the joints so the potential lack of waterstops cannot be confirmed.
- The cause of deterioration is due to the frequent exposure to freeze-thaw cycles, which is likely exacerbated by corrosion of the reinforcing steel. Deterioration will continue unless extensive repair work is performed.

Mitigation measures to prevent future structural concrete work from damage due to freeze-thaw conditions may include, but not be limited to, the following:

- Require design and installation in accordance with American Concrete Institute (ACI) Standard 350 – Code Requirements for Environmental Engineering Concrete Structures. The ACI Standard 350 includes stringent mix design standards for structural concrete subject to severe exposure conditions. It is unknown whether this standard, originally published in 2001, was available during the design of the existing Mar-Wood WWTP. In addition, the ACI Standard 350 is more applicable to cast-in-place concrete whereas the Mar-Wood WWTP structures consist primarily of precast concrete.
- Develop a stringent technical specification for the structural concrete to be used on the project and enforce quality control during construction (testing and inspection).
- Require cast-in-place concrete with a high compressive strength and air-entraining admixtures for the concrete mix design.
- Avoid large, flat slab areas and walkways in the design where water can collect and freeze which then require the use of deicing chemicals; instead extend basin walls 40-inches minimum above the ground with finish grade around the perimeter as exterior walkways as well as metal grating and hand railing for internal walkways.
- Seal or coat concrete to prevent absorption of water.

2.4.3 Disposal (100 Tract)

From the plant effluent pipe, treated effluent flows to a 3,500-gallon dosing tank which has alternating siphon batches to two different leach fields via 4-inch gravity sewer pipelines. Each leach field has a disposal capacity of approximately 25,000 gpd. Recent pictures of the disposal leach field are available in Appendix E.

2.4.3.1 Disposal Existing Condition Assessment

The original leach field was installed in 1988 and a second leach field was added in 2003 during the construction of the Mar-Wood WWTP. The original leach field is a traditional perforated pipe and drain rock arrangement with 7-foot sidewall trenches. The second leach field uses infiltrator chambers. The original leach field is 33 years old and the second leach field is 18 years old. In 2018, a berm was constructed around the primary leach field to mitigate flooding issues. Because the leach field systems are underground and not accessible for inspection, a condition assessment was not performed on the leach fields.

2.4.4 Back-Up Power Supply

A transportable 40-kW MQ Power Corp generator serves the WWTP Lift Station and the Mar-Wood WWTP. The age of the generator is unknown. Lift Station 1 has a 16 kW Guardian generator that was installed with the new lift station in 2017.

SECTION 3.0: HISTORICAL DATA AND FORECASTING

3.1 Planning Period

The planning period for this 2024 Consolidated IRP is from 2025 to 2044 with an emphasis on the full three years' data compilation for 2020, 2021, and 2022. Demand projections and buildout estimates extend to 2044. The existing GBWC-SCD service area has been fully subdivided into 5,420 lots. This includes a total buildout count of 1,469 lots in the 200 Tract and 3,951 lots in the Housing Section. As of end of 2022, there were 1,426 existing connections in the 200 Tract representing 97.1% of buildout and 3,640 existing connections in the Housing Section representing 92.8% of buildout for a total of 5,066 connection counts (includes both active and inactive accounts). Annual growth projections presented in this section are based on the Nevada State Demographer's Office growth rates.

3.2 Population Projections

The *Nevada County Population Projections 2022 to 2041* dated October 1, 2022, prepared by the Nevada State Demographer's Office, was used as the latest available data to develop the future population and connection projections in the existing GBWC-SCD service area. The U.S. Census Bureau American Factfinder was also used to provide past and current population information for the Spring Creek CDP. The GBWC-SCD service area is contained within the Spring Creek CDP.

Based on population data analyzed in the 2015, 2018, and 2021 IRPs, the Spring Creek area has generally followed the growth/decline rate of Elko County as a whole. As such, population projections for the Spring Creek CDP and service connection estimates for the GBWC-SCD service area will be based on growth/decline rates from the State Demographer's Office for the planning period. The report *Nevada County Population Projections 2022 to 2041* shows a population of 54,959 in Elko County for 2022 and an increase to a population of 65,916 by 2041 with annual rates of population increase ranging from 0.8% to 1.2%. This equates to an average annual population growth rate of 0.96%. The population growth rate of 1.2% in 2041 as projected by the State Demographer's Office was extended through the end of the planning period resulting in an Elko County population of 68,312 in 2044. Although the State Demographer's projections are being used for the 2024 IRP, GBWC-SCD is also monitoring economic trends that suggest its service territory may not experience the same population increase projected for Elko County. Even so, the potential discrepancy in projected growth rates does not affect the action plan projects proposed in the 2024 IRP.

In estimating population growth/decline specific to the GBWC-SCD service area, an occupancy density of 3.19 people per household was used (per U.S. Census Bureau American Factfinder for Spring Creek CDP). This occupancy density is based on 2020 census data for the Spring Creek CDP and provides a reasonable projection of future population in the GBWC-SCD service area. Table 3.01 includes the GBWC-SCD population and service connection estimates for the planning period. Because the population is projected to increase, the equivalent connection counts are shown to be increasing in Table 3.01.

Table 3.01: Population and Service Connection Projections

Year	Elko County Population(1)	% Change(1)	SCD Service Area Estimated Population(2)	200 Tract Service Connections(3)	Housing Section Service Connections(3)	Total SCD Service Connections(3)
2021	54,546	-	14,967	1,425	3,617	5,042
2022	54,959	0.76%	15,080	1,426	3,640	5,066(4)
2023	55,314	0.65%	15,178	1,435	3,662	5,097
2024	55,643	0.59%	15,268	1,443	3,682	5,125
2025	55,902	0.47%	15,339	1,449	3,698	5,147
2026	56,230	0.59%	15,429	1,457	3,718	5,175
2027	56,630	0.71%	15,539	1,467	3,743	5,210
2028	57,039	0.72%	15,651	1,469	3,768	5,237
2029	57,521	0.85%	15,783	1,469	3,798	5,267
2030	58,065	0.95%	15,933	1,469	3,832	5,301
2031	58,661	1.03%	16,096	1,469	3,869	5,338
2032	59,318	1.12%	16,276	1,469	3,910	5,379
2033	60,004	1.16%	16,465	1,469	3,952	5,421
2034	60,713	1.18%	16,659	1,469	3,996	5,465
2035	61,433	1.19%	16,857	1,469	4,041	5,510
2036	62,160	1.18%	17,056	1,469	4,086	5,555
2037	62,897	1.19%	17,258	1,469	4,132	5,601
2038	63,627	1.16%	17,459	1,469	4,177	5,646
2039	64,372	1.17%	17,663	1,469	4,223	5,692
2040	65,136	1.19%	17,873	1,469	4,270	5,739
2041	65,916	1.20%	18,087	1,469	4,318	5,787
2042	66,705	1.20%	18,303	1,469	4,367	5,836
2043	67,504	1.20%	18,523	1,469	4,416	5,885
2044	68,312	1.20%	18,744	1,469	4,466	5,935

Notes:

(1) Elko County population projections and percent change based on Nevada County Population Projections 2022 to 2041 dated October 1, 2022, prepared by the Nevada State Demographer's Office. The percentage change for 2041 was extended through 2044 to estimate populations through the planning period.

(2) The 2021 population of 15,918 persons was estimated by the U.S. Census Bureau for Spring Creek CDP. Population projections from 2021 to 2041 were estimated using percent change for Elko County per Nevada State Demographer's Office and extended through 2044 per Note (1).

(3) Actual connection data is used for 2022 based on meter records through end of December 2022 (excluding hydrant meters). Connection counts for 2023 to 2044 were projected using estimated population divided by household density of 3.19 persons/household. The change in connection counts was distributed proportionally between the 200 Tract and Housing Section.

(4) Total existing connection count of 5,066 is based on meter records through end of December 2022 and includes non-residential connections such as commercial, irrigation, and schools (but excludes hydrant meters). Total residential-only meter count through end of December 2022 is 4,990.

3.2.1 Future Development

GBWC-SCD has been approached by two developers (Ruby Vista Ranch and Ridgecrest) expressing interest in eventually being annexed into the GBWC-SCD service area. These developments would include hundreds of new residences and may affect the rate of development in the 200 Tract and/or Housing Section. Because annexation agreements have yet to be filed for either development, the likelihood/timing of these developments moving forward and the associated impacts on the GBWC-SCD water and wastewater systems are yet to be determined. As such, the GBWC-SCD has not included these projects in the future projections and project needs. If annexation plans move forward for either development, an annexation docket will be used to address the development before the Commission and the associated water and wastewater needs will be captured in the next IRP update. Each development is described further in the sections to follow.

The existing GBWC-SCD service area has been fully subdivided. Additional areas could be annexed into the service area, only the 20-year projects in the Preferred Plan show representation for more than just infill development. One potential infill development is Brentwood Estates, which is also discussed further below.

3.2.1.1 Ruby Vista Ranch

Ruby Vista Ranch has potential to move forward in the near-term planning horizon; planning-level discussions and coordination are ongoing between the developer and GBWC-SCD. The proposed development consists of approximately 1,438 acres of land and includes single-family residential, multi-family residential, commercial (office space, shopping, and restaurants), light industrial, public facilities, and green spaces. It is the developer's intention to annex the proposed development into the GBWC-SCD service territory. Exact quantities and types of occupancy are preliminary in nature and have not been finalized by the developer at this time, however, it is anticipated that the first phase will include 420 single-family residences, 320 multi-family residences, and 34.2 acres of commercial. The Ruby Vista Ranch development will require water supply, storage, and distribution facilities as well as wastewater collection, conveyance, treatment, and disposal facilities.

Based on the time required for annexation to occur (including memorandums of understanding, developer's agreements, the need for wastewater treatment, permitting, Commission approval, etc.), this project may fall outside the 3-Year Action Plan time frame. Some preliminary analyses are underway to determine the impacts that this development may have on the GBWC-SCD's existing water and wastewater systems and potential consolidation options. Potential options for the water system include interconnection of the future Ruby Vista Ranch water system with GBWC-SCD's 200 Tract and Housing Section water systems. Potential options for the wastewater system include conveying wastewater from GBWC-SCD's 100 Tract sewer service area to a new consolidated wastewater treatment and disposal facility in the Ruby Vista Ranch area. The final determination of impacts cannot be made until an annexation plan is submitted which addresses Ruby Vista Ranch's water and wastewater needs. GBWC-SCD will address water and wastewater system impacts with the PUCN when this information becomes available through an annexation docket.

3.2.1.2 Ridgecrest

The second development, Ridgecrest, is anticipated to consist of approximately 900 acres of property for the development of 300 single-family residences and approximately 175 acres of commercial uses. The Ridgecrest development area is located near the 200 Tract, between Buffside Drive and Lamoille Highway. The extent of this development is currently unknown and will likely fall outside the 3-Year Action Plan time frame. The GBWC-SCD will address water and wastewater system impacts when this information becomes available. The incorporation of Ridgecrest into GBWC-SCD service territory will require an annexation docket before the PUCN.

3.2.1.3 Brentwood Estates

Brentwood Estates is a small-scale residential development planned in the 300 Tract of the Housing Section. The proposed project area is located on approximately 13.66 acres off Licht Parkway and is within the existing service territory of GBWC-SCD. The development will include approximately 25 single-family residential lots on half-acre lots. Sewer service will be provided with individual septic systems. The water service will be provided by GBWC-SCD; a waterline extension will be required to serve the development. Water rights are currently under review for the Brentwood Estates Project and the timing of the development is unknown.

3.3 Water System Forecasting

3.3.1 Water System Connection Projections

The existing GBWC-SCD service area has been fully subdivided. Therefore, unless additional developments are annexed into the service area, all future developments will be infill. Table 3.02 shows the historical connection increase for the GBWC-SCD for the period 2020 to 2022 as well as the 20-year projections from 2023 to 2044. Based on the State Demographer's increasing population rates projected for Elko County during the planning period, the total number of equivalent GBWC-SCD water connections would increase to 5,935 by the end of the planning period. As stated previously, the number of water system connections would not actually increase; rather, the increase in connection counts is a representative way to reflect the impacts of population increase as it equates to future demand projections.

GBWC-SCD has been filing IRPs for several years, and hereby incorporates relevant historical system data contained in those IRPs in addition to the data provided in this filing.

Table 3.02: GBWC-SCD Water Connections

Year	200 Tract Service Connections	Housing Section Service Connections	Total SCD Service Connections
2020[1]	1,422	3,567	4,989
2021[1]	1,425	3,617	5,042
2022[1]	***1,426***[2]	***3,640***[3]	5,066
2023	1,435	3,662	5,097
2024	1,443	3,682	5,125
2025	1,449	3,698	5,147
2026	1,457	3,718	5,175
2027	1,467	3,743	5,210
2028	**1,469**	3,768	5,237
2029	1,469	3,798	5,267
2030	1,469	3,832	5,301
2031	1,469	3,869	5,338
2032	1,469	3,910	5,379
2033	1,469	3,952	**5,420**
2034	1,469	3,996	5,465
2035	1,469	4,041	5,510
2036	1,469	4,086	5,555
2037	1,469	4,132	5,601
2038	1,469	4,177	5,646
2039	1,469	4,223	5,691
2040	1,469	4,270	5,739
2041	1,469	4,318	5,787
2042	1,469	4,367	5,836
2043	1,469	4,416	5,885
2044	1,469	4,466	5,935[4]

Notes:

(1) Actual meter data is used for 2020-2022 connection counts.

(2) The max connection count of 1,469 in the planning period represents 100% of buildout in the 200 Tract (out of 1,469 possible connections).

(3) The max connection count of 3640 in the planning period represents 100% of buildout in the Housing Tracts (out of 3640 possible connections).

(4) The max connection count of 5,935 in the planning period exceeds the actual count of 4,520. The assumption is by 2033 more lands will be annexed into the service area (Housing).

3.3.2 Water Usage

3.3.2.1 Recorded Water Production

Table 3.03 includes historical water production data for each water system from the 12 existing groundwater wells during the 10-year period from 2013 to 2022 based on monthly production reports.

Total annual water production during the 10-year period for the 200 Tract ranged from a high of 245 million gallons per year (MG/Y) in 2013 to a low of 181 MG/Y in 2019. The overall decrease in production over the 10-year period is likely due to conservation efforts by GBWC-SCD as well as the effects of rate increases. Additionally, the pipeline replacement projects conducted in the 200 Tract in 2021 and 2022 reduced the number of breaks and leaks in those areas, which also helps reduce the volume of water pumped from the wells.

Total annual water production during the 10-year period for the Housing Section ranged from a high of 731 MG/Y in 2020 to a low of 538 MG/Y in 2015. Over the last 5 years annual water production in the Housing Section has remained somewhat consistent with the exception of a 17% increase in water production in 2020. This could be related to the worsening drought in the area and the COVID-19 Pandemic which resulted in people spending more time at home.

The total water production for all Tracts in the GBWC-SCD ranged from 2.05 to 2.63 million gallons per day (MGD) in 2013 to 2022 respectively.

Table 3.03: Historical Annual Water Production for GBWC-SCD Systems

Year	200 Tract		Housing Section		Total	
	(MG/Y)	(MGD)	(MG/Y)	(MGD)	(MG/Y)	(MGD)
2013	245.13	0.67	700.94	1.92	946.06	2.59
2014	223.05	0.61	613.36	1.68	836.41	2.29
2015	211.78	0.58	537.66	1.47	749.45	2.05
2016	209.16	0.57	566.43	1.55	775.59	2.12
2017	216.17	0.59	559.76	1.53	775.93	2.12
2018	206.86	0.57	608.77	1.67	815.63	2.24
2019	181.48	0.50	572.61	1.57	754.09	2.07
2020	228.96	0.63	730.94	2.00	959.89	2.63
2021	222.97	0.61	667.26	1.83	890.23	2.44
2022	216.38	0.59	686.38	1.88	902.76	2.47

Historical water production data by well is summarized Table 3.04a-d. to show annual demand patterns by Tract for the 10-year period from 2013 to 2022. Monthly well production data is included in Appendix G.

Table 3.04a: 200 Tract Historical Annual Water Production by Well

200 Tract Wells (gallons)								
Year	Well #1		Well #3		Well #11		200 Tract Total	
	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD
2013	82.91	0.23	97.68	0.27	64.53	0.18	245.13	0.67
2014	60.60	0.17	97.58	0.27	64.87	0.18	223.05	0.61
2015	35.94	0.10	79.42	0.22	96.42	0.26	211.78	0.58
2016	38.81	0.11	93.47	0.26	76.88	0.21	209.16	0.57
2017	49.08	0.13	88.66	0.24	78.43	0.21	216.17	0.59
2018	45.72	0.13	91.80	0.25	69.35	0.19	206.86	0.57
2019	48.13	0.13	63.81	0.17	69.54	0.19	181.48	0.50
2020	57.92	0.16	102.91	0.28	68.13	0.19	228.96	0.63
2021	63.95	0.18	95.06	0.26	63.96	0.18	222.97	0.61
2022	84.46	0.23	110.12	0.30	21.80	0.06	216.38	0.59

Table 3.04b: 100 Tract Historical Annual Water Production by Well

100 Tract Wells (gallons)										
Year	Well #4		Well #5		Well #10		Well #101		100 Tract Total	
	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD
2013	65.03	0.18	268.70	0.74	30.34	0.08	133.77	0.37	497.84	1.36
2014	72.71	0.20	125.71	0.34	38.46	0.11	187.58	0.51	424.45	1.16
2015	47.34	0.13	113.57	0.31	15.91	0.04	168.60	0.46	345.41	0.95
2016	52.90	0.14	94.38	0.26	30.40	0.08	176.24	0.48	353.92	0.97
2017	26.21	0.07	77.34	0.21	28.16	0.08	181.92	0.50	313.63	0.86
2018	34.44	0.09	77.37	0.21	31.39	0.09	210.13	0.58	353.33	0.97
2019	49.64	0.14	30.95	0.08	36.43	0.10	249.03	0.68	366.05	1.00
2020	82.27	0.23	116.36	0.32	91.45	0.25	135.59	0.37	425.67	1.17
2021	81.39	0.22	91.17	0.25	56.94	0.16	134.03	0.37	363.53	1.00
2022	50.10	0.14	94.93	0.26	71.72	0.20	138.13	0.38	354.89	0.97

Table 3.04c: 300 Tract Historical Annual Water Production by Well

300 Tract Wells (gallons)						
Year	Well #7		Well #14		300 Tract Total	
	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD
2013	0.06	0.00	24.06	0.07	24.13	0.07
2014	5.41	0.01	19.78	0.05	25.19	0.07
2015	16.30	0.04	8.40	0.02	24.70	0.07
2016	6.74	0.02	30.49	0.08	37.23	0.10
2017	27.56	0.08	45.26	0.12	72.82	0.20
2018	30.83	0.08	34.53	0.09	65.36	0.18
2019	24.31	0.07	0.22	0.00	24.53	0.07
2020	22.24	0.06	40.85	0.11	63.09	0.17
2021	38.15	0.10	51.39	0.14	89.54	0.25
2022	17.84	0.05	96.52	0.26	114.36	0.31

Table 3.04d: 400 Tract Historical Annual Water Production by Well

400 Tract Wells (gallons)								
Year	Well #8		Well #9		Well #12		400 Tract Total	
	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD	MG/Y	MGD
2013	32.35	0.09	72.33	0.20	74.30	0.20	178.97	0.49
2014	41.11	0.11	68.49	0.19	54.11	0.15	163.71	0.45
2015	39.09	0.11	80.02	0.22	48.44	0.13	167.55	0.46
2016	52.28	0.14	73.49	0.20	49.50	0.14	175.28	0.48
2017	23.11	0.06	60.60	0.17	89.59	0.25	173.30	0.47
2018	38.91	0.11	74.19	0.20	76.98	0.21	190.08	0.52
2019	31.30	0.09	83.00	0.23	67.73	0.19	182.03	0.50
2020	30.07	0.08	112.42	0.31	99.68	0.27	242.17	0.66
2021	21.45	0.06	108.14	0.30	84.61	0.23	214.19	0.59
2022	52.56	0.14	103.75	0.28	60.84	0.17	217.14	0.59

To determine peak demands, monthly well production data was analyzed. Using the maximum month production, the average day of the maximum month (ADMM) was calculated. MDD was calculated by multiplying the ADMM by 1.25 (a standard of the AWWA). The ratio of MDD to ADD is typically referred to as the MDD/ADD Peaking Factor (PF). According to the AWWA criteria, the peaking factor typically ranges from 1.2 to 3.0. The 3-year average peaking factor derived from the 2020-2022 well production data equates to 2.27 for the 200 Tract and 2.76 for the Housing Section, which is within or close to the typical range. The months with maximum well production were generally July or August. A PF of 1.75 was applied to the MDD to calculate a peak hour demand (PHD) for each system for use in the hydraulic model system analyses. Table 3.0 show the ADD, ADMM, MDD, PFs, and PHD values for 2020-2022 based on well production data.

Table 3.05: Historical Maximum Daily Production and Peaking Factors

200 Tract									
Year	**ADD(1) (MGD)**	**ADMM(1) (MGD)**	**ADMM/ ADD**	**MDD/ ADMM**	**MDD (MGD)**	**MDD/ ADD**	**PHD/ MDD**	**PHD (MGD)**	**PHD (gpm)**
2020	0.63	1.09	1.73	1.25	1.37	2.17	1.75	2.39	1,659
2021	0.61	1.12	1.84	1.25	1.40	2.30	1.75	2.45	1,704
2022	0.59	1.10	1.86	1.25	1.37	2.33	1.75	2.40	1,670
MDD/ADD Average for 2020, 2021, & 2022						**2.27**			
Housing Section									
Year	**ADD(1) (MGD)**	**ADMM(1) (MGD)**	**ADMM/ ADD**	**MDD/ ADMM**	**MDD (MGD)**	**MDD/ ADD**	**PHD/ MDD**	**PHD (MGD)**	**PHD (gpm)**
2020	2.00	4.29	2.14	1.25	5.36	2.68	1.75	9.38	6,513
2021	1.83	3.84	2.10	1.25	4.80	2.62	1.75	8.40	5,834
2022	1.88	4.46	2.37	1.25	5.58	2.97	1.75	9.76	6,777
MDD/ADD Average for 2020, 2021, & 2022						**2.76**			

Notes:
(1) Historical data based on annual and monthly well production records per Table 3.03 and Appendix G.

Historical seasonal well production data is summarized in Table 3.0. As stated previously, months with maximum well production have historically occurred in July or August. The maximum demands can be correlated to the seasonal changes in the system. For GBWC-SCD, maximum demands have historically always occurred in the summer months when the weather is warmest and outdoor water demands are at their peak. Based on a review of well production data, the peak demand season can be defined as May to September. The lower demand seasons generally include months outside of this period from October to April (referred to as "winter production" in Table 3.0). The seasonal peaking factor is the peak season production divided by the winter production. Approximately 66-72% of water used during the year occurs during the peak season months.

Table 3.06: Historical Seasonal Average Well Production

Year	Annual Production (12 Month Total) MG	Peak Season Production (May-September) MG	Winter Production (October-April) MG	Seasonal Peaking Factor (Peak/ Winter)	Peak Month Production MG	Peak Month Factor (Peak Month/ Average Annual Month)
2013	946.06	646.59	299.47	2.20	169.85	2.15
2014	836.41	549.88	286.53	1.90	143.43	2.06
2015	749.45	494.51	254.94	1.90	125.92	2.02
2016	775.59	549.66	225.92	2.40	152.70	2.36
2017	775.93	554.61	221.32	2.50	149.73	2.32
2018	815.63	589.38	226.26	2.60	158.32	2.33
2019	754.09	527.81	226.29	2.30	148.28	2.36
2020	959.89	675.83	284.07	2.40	166.76	2.08
2021	890.23	638.45	251.78	2.50	153.83	2.07
2022	902.76	636.02	266.74	2.40	142.82	1.90

3.3.2.2 Recorded Consumption

Historical water consumption data from customer meter records for the 10-year period from 2013 to 2022 is summarized in Table 3.0. The total amount of water consumed during this period ranged from a high of 852 MG/Y in 2020 and a low of 614 MG/Y in 2015. Overall water consumption has decreased over the last 10 years. In 2020, water usage increased 26% and 38% from the previous year for the 200 Tract and Housing Section, respectively, and then decreased by 3% and 4% in the 200 Tract and Housing Section, respectively, in 2021 and continued to decline in 2022. Water usage fluctuations from year to year are heavily impacted by customer counts, water conservation efforts, water rates, and wet years versus dry years.

Table 3.07: Historical Metered Water Use in GBWC-SCD System

Year	200 Tract (gallons)	Housing Section (gallons)	Total (gallons)	Total (AF)
2013	179,718,994	558,074,906	737,793,900	2,264
2014	152,744,760	480,891,190	633,635,950	1,945
2015	145,517,040	468,762,040	614,279,080	1,885
2016	151,465,130	465,071,990	616,537,120	1,892
2017	148,908,430	473,696,680	622,605,110	1,911
2018	149,209,830	543,791,750	693,001,580	2,127
2019	134,720,560	494,592,380	629,312,940	1,931
2020	169,954,290	682,520,620	852,474,910	2,616
2021	163,346,050	651,862,260	815,208,310	2,502
2022	156,916,470	589,126,860	746,043,330	2,290

The metered water usage data can be broken down further to show the historical metered water usage by class of service. Table 3.0 and Table 3.0 present the metered data, by class of service, for the 200 Tract and Housing Section for the past 3-years (2020–2022). As is evident, the single-family residential class of service is by far the predominant service class for GBWC-SCD. For commercial connections, approximately 80-85% of the water usage is from large-scale irrigation connections (golf course, marina, sports complex). It should be noted that only residential customers with 10 months or more of data are presented in Tables 3.09 and 3.10 for a more accurate calculation of water demand factors on a per connection basis (i.e., to account for vacant homes and inactive accounts with little to no water usage). In addition, only the past 3-years of data will be used in determining water demand factors to reflect current trends in water usage (see Table 3.a-b for calculations of water demand factors).

Table 3.08: Historical Metered Water Use by Class or Service – 200 Tract

Year	Single-Family Residential (10+ Months Data)		Commercial		Total for 200 Tract(1)
	Annual (gallons)	% of Total	Annual (gallons)	% of Total	
2020	160,904,472	97.3%	4,496,260	2.7%	165,400,732
2021	147,234,722	96.9%	4,742,028	3.1%	151,976,750
2022	146,568,290	97.5%	3,702,350	2.5%	150,270,640

Notes:
(1) Total water use excludes residential customers with less than 10 months of data. The 200 Tract does not include any school connections or hydrant meters.

Table 3.09: Historical Metered Water Use by Class of Service – Housing Section

Year	Single-Family Residential (10+ Months Data)		Commercial		Multi-Family Residential (10+ Months Data)		Total for Housing Section(1)
	Annual (gallons)	% of Total	Annual (gallons)	% of Total	Annual (gallons)	% of Total	
2020	565,039,298	97.2%	11,822,590	2.0%	4,496,490	1%	581,358,378
2021	543,951,679	96.6%	13,158,440	2.3%	5,840,710	1%	562,950,829
2022	526,679,022	97.5%	8,726,350	1.6%	4,764,720	1%	540,170,092

Notes:
(1) Total water use excludes residential customers with less than 10 months of data. Water usage from hydrant meters and schools in the Housing Section is excluded from this table.

3.3.2.3 Non-Revenue Water

The International Water Association (IWA) and AWWA define non-revenue water (NRW) as equal to the total amount of water flowing into the potable water supply network from the source (wells) minus the total amount of water that industrial and domestic consumers are authorized to use (metered/billed authorized consumption). There are two broad types of losses that occur in drinking water utilities, which include apparent losses and real losses.

Apparent losses: non-physical losses that occur in utility operations due to customer meter inaccuracies, systematic data handling errors in customer billing systems, and unauthorized consumption. In other words, this water is consumed but is not properly measured, accounted for by the utility, or paid for by the customers. As a result, these losses cost the utilities revenue and distort data on customer consumption patterns.

Real Losses: physical losses of water from the distribution system, including main breaks, leaks, and storage overflows. These losses inflate the water utility's production costs and stress water resources since they represent water that is extracted (and/or possibly treated), yet never reaches beneficial use.

Table 3. and Table 3. present the difference between historical water production and actual water usage for the past 10-years from 2013 to 2022 for the 200 Tract and the Housing Section. This comparison uses the well production data from Table 3.03 and the metered water use from Table 3.0. The NRW for the 200 Tract averaged approximately 27% over the last 3 years, while the Housing Section averaged 8% for the same period.

Table 3.10: Historical Non-Revenue Quantities – 200 Tract

Year	Water Production(1) (MG/Y)	Water Consumption(2) (MG/Y)	Gross Non-Revenue Water(3) (MG/Y)	% Gross Non-Revenue Water(3)
2013	245	180	65	27%
2014	223	153	70	32%
2015	212	146	66	31%
2016	209	151	58	28%
2017	216	149	67	31%
2018	207	149	58	28%
2019	181	135	47	26%
2020	229	170	59	26%
2021	223	163	60	27%
2022	216	157	59	27%
			3-Yr Average	**27%**

Notes:
(1) Historical water production data from Table 3.03.
(2) Historical metered water usage data from Table 3.0.
(3) Non-revenue water is the difference between water production and water consumption.

Table 3.11: Historical Non-Revenue Quantities – Housing Section

Year	Water Production(1) (MG/Y)	Water Consumption(2) (MG/Y)	Gross Non-Revenue Water(3) (MG/Y)	% Gross Non-Revenue Water(3)
2013	701	558	143	20%
2014	613	481	132	22%
2015	538	469	69	13%
2016	566	465	101	18%
2017	560	474	86	15%
2018	609	544	65	11%
2019	573	495	78	14%
2020	731	683	48	7%
2021	667	652	15	2%
2022	686	589	97	14%
--	--	--	**3-Yr Average**	**8%**

Notes:
(1) Historical water production data from Table 3.03.
(2) Historical metered water usage data from Table 3.0.
(3) Non-revenue water is the difference between water production and water consumption.

AWWA has been working over the past two decades to change the perception of what is considered an acceptable industry water loss percentage standard for NRW. Publications on water loss that refer to the "AWWA" Standard have ranged from 5% to 20% NRW. These misrepresentations, often derived anecdotally, come from technology and service providers, regulatory agencies, environmental groups, and water utilities. Since 2003, AWWA has recommended that it is in the best interest of utilities to set system-specific loss targets and not use the prescribed "one size fits all" mentality. While in past IRP documents NRW has always been presented as a percentage loss with a goal of targeting 10% or less, it would be best to refrain from this type of objective and instead transition to the AWWA "Key Performance Indicators" (KPI) as provided in the "Non-Revenue Water AWWA Loss Control Committee Report" (AWWA Report) dated November 2019. A copy of the AWWA Report can be found in Appendix M. In order to meet the NAC 704.567 regulation, percentages for NRW are provided similar to previous IRP documents. However, for future analyses, it is recommended that GBWC work with the PUCN and other regulators to develop their own NRW targets by implementing the AWWA KPI as provided in the AWWA Report. For the 200 Tract, the NRW exceeds the previously indicated 10% industry standard. The following measures can be conducted by GBWC-SCD as an ongoing effort to reduce real water losses from the water production process to the water delivery point and apparent losses in the utility operations as outlined in the AWWA Report:

- Annual water audits should be performed using the AWWA Free Water Audit Software.
- Well production meters should be regularly tested, monitored, and maintained.
- Storage tanks should be inspected at regular intervals to assure integrity against leakage.
- High system pressures should be reduced by implementation of system improvement projects including, but not limited to, the addition of VFDs on wells and booster pumps, more pressure reducing stations, and pipeline improvements.

- GBWC-SCD's continued diligence in repairing all pipeline leaks and breaks in a timely manner.
- Ensure that automatic meter reading/advanced metering infrastructure (AMR/AMI) are working properly.
- Continue tracking waterline breaks and leaks as a tool to prioritize and target pipeline system improvements.
- Install water meters at PRVs to monitor water flowing between Tracts. The installation of flow meters at the existing and future PRVs will allow for better delineation of NRW between Tracts and pressure zones.

GBWC-SCD performed a detailed water loss study in 2007. As part of the water loss study, a leak detection survey was performed by M.E. Simpson Co. on water mains in the system. A total of 12 active leaks were located during this survey with an estimated total leakage rate of 108,000 gpd, or approximately 40 MG/Y. After the leak detection survey was performed, the identified leaks were repaired and no other leak surveys have been conducted to date.

On May 29, 2014, a large leak under Tank 103A's main outlet pipe (100 Tract) was identified. The tank leak may have contributed to a percentage of the historically high NRW in the Housing Section prior to 2014. The leak was repaired and Tank 103A was placed back in service.

GBWC maintains a log of water system repairs. In 2019, there were 46 water main breaks and leaks identified and repaired. It is estimated that these breaks and leaks account for less than 0.5% of NRW from 2017–2019 because of GBWC's timely response in performing system repairs.

In 2022, there were 46 water main breaks and leaks identified and repaired per GBWC logs.

3.3.3 Water Usage Forecasting

As discussed previously, the existing GBWC-SCD service area has been fully subdivided. Therefore, unless additional areas are annexed into the service area (e.g. Ruby Vista Ranch and Ridgecrest developments), all future development will be infill dispersed throughout the existing tracts for the remaining permitted lots. In addition, it is anticipated that future infill connections will consist primarily of residential with few additional commercial connections. Annual projections for future population and connection counts in the GBWC-SCD service area are detailed in Table 3.01 and Table 3.02 for the 20-year planning period. The projected service connections are summarized in Table 3.2 at 5-year intervals through 2044. Based on the State Demographer's increasing population rates projected for Elko County during the planning period, the total number of equivalent GBWC-SCD water connections is shown as increasing during planning period.

Table 3.12: Water Connection Projection Summary

Year	200 Tract Connections	Housing Section Connections	Total SCD Service Connections
Historical			
2020	1,422	3,567	4,989
2021	1,425	3,617	5,042
2022	1,426	3,640	5,066
Projected			
2023	1,435	3,662	5,097
2028	1,469	3,768	5,237
2033	1,469	3,952	5,421
2038	1,469	4,177	5,646
2044	1,469	4,466	5,935

Historical water consumption data for the past 3-years was used to determine water demand factors by customer class for each water system. Table 3.a-b summarize average water demand data as provided by GBWC-SCD for the 200 Tract. To obtain more accurate residential water demand factors, only metered residential connections with 10 months of meter data or more were used to determine the average water demand per connection.

Table 3.13a: Water Demands for 200 Tract Residential

Year	Metered Use w/10+ Months Data (gallons/year)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	160,904,472	1,331	331
2021	147,234,722	1,304	309
2022	146,568,290	1,321	304
		Average Use	**315**

Table 3.13b: Water Demand for 200 Tract Commercial

Year	Metered Use (gallons/year)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	4,496,260	10	1,232
2021	4,742,028	10	1,299
2022	3,702,350	10	1,014
		Average Use	**1,180**

Table 3.144a-f summarizes the water demand data as provided by GBWC-SCD for the Housing Section.

Table 3.14a: Water Demands for Housing Section Residential

Year	Metered Use w/10+ Months Data (gallons/year)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	565,039,298	3,336	464
2021	543,951,679	3,393	439
2022	526,679,022	3,399	425
		Average Use	**443**

Table 3.14b: Water Demands for Housing Section Multi-Family

Year	Metered Use w/10+ Months Data (gallons/year)	Avg. Connections[(1)]	Avg. Unit Count[(1)]	Avg. Demand Factor (gpdpc)	Avg. Demand Factor (gpd/unit)
2020	4,496,490	18	54	684	228
2021	5,840,710	23	69	696	232
2022	4,764,720	16	48	816	272
			Average Use	**732**	**244**

Notes:
(1) Number of individual multi-family units per water service connection ranges from 1-8 units per water connection.

Table 3.14c: Water Demand for Housing Section Commercial

Year	Metered Use (gallons/year)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	11,822,590	40	810
2021	13,158,440	40	901
2022	8,726,350	40	598
		Average Use	**770**

Table 3.14d: Water Demand for Housing Section Irrigation (Large Scale)

Year	Metered Use(1) (gallons/year)	Avg. Connections(1)	Avg. Demand Factor (gpdpc)
2020	81,062,882	6	37,015
2021	70,818,938	6	32,337
2022	25,703,990	5	14,084
		Average Use	**27,810**

Notes:
(1) Metered water use and connection counts include two irrigation accounts for the golf course in the 100 Tract. Irrigation demands at golf course totaled 53.1 MG/Y in 2020, 44.8 MG/Y in 2021, and 17.9 MG/Y in 2022. Other large-scale irrigation accounts include a marina and a sports complex.

Table 3.14e: Spring Creek Elementary School (300 Tract)

Year	Metered Use(1) (gallons/year)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	6,516,840	4	4,464
2021	7,334,180	4	5,023
2022	7,081,170	4	4,850
		Average Use	**4,780**

Notes:
(1) Includes indoor and outdoor water use at the Spring Creek Elementary School and the day care center (Creative Kids Co-Op).

3.14f: Liberty Peak Elementary School (100 Tract)

Year	Metered Use (gallons)	Avg. Connections	Avg. Demand Factor (gpdpc)
2020	296,000	1	1,622
2021	375,000	1	2,055
2022	466,000	1	2,553
		Average Use	**2,080**

For the 200 Tract, an average residential water usage of 315 gallons per day per customer (gpdpc) was calculated per Table 3.3a. The 200 Tract commercial demands averaged 1,180 gpdpc per Table 3.3b.

For the Housing Section, residential uses were combined for all the Tracts (100, 300, and 400) because the usage appeared relatively uniform between the three areas. The Housing Section's residential water usage averaged 443 gpdpc per Table 3.144a. Multi-family users in the 100 Tract averaged 732 gpdpc, however each multi-family "connection" can represent multiple individual units (ranging from 1-8 units per connection). On a per unit basis, multi-family residential water usage averaged 244 gpd/unit per Table 3.144b.

Commercial connections were also combined for all Tracts of the Housing Section with demands averaging 770 gpdpc per Table 3.144c. The commercial demand factor excludes large-scale irrigation accounts for the golf course, marina, and sports complex. Large-scale irrigation accounts in the Housing Section had a total demand ranging from 25.7 MG/Y to 81.1 MG/Y for the past 3 years with an average demand factor of 27,810 gpdpc per Table 3.144d.

For the Spring Creek Elementary School in the Housing Section's 300 Tract, the water usage averaged 4,780 gpdpc per Table 3.144e; this includes both indoor and outdoor water usage for the school and the adjacent day care. A new elementary school, Liberty Peak Elementary School, was constructed in the 100 Tract and completed in 2019. The water usage averaged 2,080 gpdpc per Table 3.144f for Liberty Peak Elementary School.

Table 3.15 provides both average day and maximum day projected future water demands for the GBWC-SCD service area. Actual demands were used for 2020-2022 based on historical consumption data from Table 3.0. In estimating future ADD, the incremental change in connection counts based on the Nevada State Demographer's population increasing rates from Table 3.01 and Table 3.02 were multiplied by the average residential water demand factors from 2020-2022. For the 200 Tract, a residential water demand factor of 315 gpdpc was used per Table 3.3a; for the Housing Section, a residential factor of 443 gpdpc was used per Table 3.144a. To calculate future MDD, an MDD/ADD peaking factor of 2.27 was used for the 200 Tract and an MDD/ADD peaking factor of 2.76 was used for the Housing Section based on actual demand data (per Table 3.05). System losses are not accounted for in Table 3.155.

Table 3.15: Projected Future Water Demand

Year	Total Water Demand (MGD)		Total Water Demand (AFA)	200 Tract Demands (MGD)		Housing Section Demands (MGD)		% Change(1)
	ADD	MDD		ADD	MDD	ADD	MDD	
2020	2.34	6.03	2,621	0.47	1.02	1.87	5.01	-
2021	2.24	5.72	2,509	0.45	1.04	1.79	4.69	-
2022	2.04	5.78	2,285	0.43	1.00	1.61	4.78	0.76%
2023	2.04	5.42	2,286	0.43	0.98	1.61	4.44	0.65%
2024	2.05	5.45	2,299	0.44	0.99	1.62	4.46	0.59%
2025	2.06	5.48	2,309	0.44	0.99	1.62	4.48	0.47%
2026	2.07	5.51	2,322	0.44	1.00	1.63	4.51	0.59%
2027	2.08	5.54	2,335	0.44	1.00	1.64	4.54	0.71%
2028	2.10	5.57	2,348	0.44	1.00	1.66	4.57	0.72%
2029	2.11	5.60	2,362	0.44	1.00	1.67	4.60	0.85%
2030	2.12	5.65	2,379	0.44	1.00	1.68	4.65	0.95%
2031	2.14	5.69	2,398	0.44	1.00	1.70	4.69	1.03%
2032	2.16	5.74	2,418	0.44	1.00	1.72	4.74	1.12%
2033	2.18	5.79	2,439	0.44	1.00	1.74	4.79	1.16%
2034	2.20	5.85	2,461	0.44	1.00	1.76	4.85	1.18%
2035	2.22	5.90	2,483	0.44	1.00	1.78	4.90	1.19%
2036	2.24	5.96	2,505	0.44	1.00	1.80	4.96	1.18%
2037	2.26	6.01	2,528	0.44	1.00	1.82	5.01	1.19%
2038	2.28	6.07	2,550	0.44	1.00	1.84	5.07	1.16%
2039	2.30	6.12	2,573	0.44	1.00	1.86	5.12	1.17%
2040	2.32	6.18	2,597	0.44	1.00	1.88	5.18	1.19%
2041	2.34	6.24	2,620	0.44	1.00	1.90	5.24	1.20%
2042	2.36	6.30	2,645	0.44	1.00	1.92	5.30	1.20%
2043	2.38	6.36	2,669	0.44	1.00	1.94	5.36	1.20%
2044	2.40	6.42	2,694	0.44	1.00	1.96	5.42	1.20%

Notes:
(1) Elko County population projections and percent change based on Nevada County Population Projections 2022 to 2041 dated October 1, 2022, prepared by the Nevada State Demographer's Office per Table 3.01.

The 200 Tract currently has a total well capacity of 1,700 gpm, or 2.45 MGD. The Housing Section currently has a total capacity of 4,775 gpm, or 7.00 MGD. It appears that the existing well production capacity within each water system (e.g. the Housing Section on a "whole" basis, not by each Tract) will meet MDD projections in Table 3.15. However, the projected future water demands in Table 3.15 do not account for the following: system-wide losses (NRW), continued savings associated with GBWC-SCD's Water Conservation Plan and Water Meter Replacement Program, and minimization of water losses with GIS/mapping tools and infrastructure improvements.

NRW averaged 27% for the 200 Tract and 8% for the Housing Section over the last 3 years (per Table 3. and Table 3.1). GBWC-SCD's water production (well supply) must be able to accommodate for the two types of NRW losses, which are apparent losses and real losses, to ensure that system demands are met. The amount realized NRW is a product of the amount of water delivered (Apparent and Real Losses). To calculate the total amount of water that needs to be treated and delivered, an adjustment to recognize NRW is needed. This "gross-up" adjustment is intended to reflect the total amount of water production to be treated and delivered to compensate for both water consumption and NRW. The total required water production may decrease in future years with GBWC-SCD's ongoing efforts to reduce apparent and real losses as discussed in Section 3.3.2.3.

Existing and future water demands (averages) are provided/projected in the tables to follow based on the calculated water demand factors for residential and commercial service classes for each water system. Table 3.46 identifies existing demands as estimated by 2020-2022 consumption data. Table 3.46 identifies the grossed-up well production required to provide anticipated water service and accommodate for NRW. The well production required was inflated by a factor of 27% and 8% for the 200 Tract and the Housing Section, respectively.

Table 3.7 provides a projection of future 20-year demands in 2044. Table 3.7 includes the minimum well production required to accommodate for NRW and are therefore higher than the future projections provided in Table 3.155. Future water demands in Table 3. for the Housing Section are also higher than Table 3.155 because some additional growth is assumed for the commercial customer class whereas the growth assumed in Table 3.155 is only for the residential customer class.

Table 3.4: Existing Demands and Existing Well Production Required

200 TRACT - EXISTING DEMANDS					200 TRACT WELL PRODUCTION REQUIRED to Accommodate for Demands and Anticipated System-Wide Losses		
Customer Class	**No. of Customers**	**Average Daily Demand (gpdpc)**	**Total Average Demand per Day (gpd)**	**Average Daily Demand TOTAL SYSTEM (gpm)**	**ADD REQUIRED (gpm) including Unaccounted-for Losses (27% NRW)**	**SYSTEM MDD Required (gpm) (ADD x 2.27)**	**SYSTEM PHD Required (gpm) (MDD x 1.75)**
Single-Family Residential	1,416	315	446,040	310	394	894	1,565
Commercial	10	1,180	11,800	8	10	23	40
TOTAL	**1,426**	**-**	**457,840**	**318**	**404**	**917**	**1,605**
The 200 Tract has 1,426 existing connections as of 2022 (per Table 3.01). At buildout, the 200 Tract will have approximately 1,469 connections.							

HOUSING SECTION - EXISTING DEMANDS					HOUSING SECTION EXISTING WELL PRODUCTION REQUIRED to Accommodate for Demands and Anticipated System-Wide Losses		
Customer Class	**No. of Customers**	**Average Daily Demand (gpdpc)**	**Total Average Demand per Day (gpd)**	**Average Daily Demand TOTAL SYSTEM (gpm)**	**ADD REQUIRED (gpm) including Unaccounted-for Losses (8% NRW)**	**SYSTEM MDD Required (gpm) (ADD x 2.76)**	**SYSTEM PHD Required (gpm) (MDD x 1.75)**
Single-Family Residential	3,524	443	1,561,132	1,084	1,171	3,232	5,656
Multi-Family Residential	66	732	48,312	34	37	102	179
Commercial	40	770	30,800	21	23	63	110
Irrigation (Large-Scale)	5	27,810	139,050	97	105	290	508
Spring Creek Elementary School (300 Tract)	4	4,780	19,120	13	14	39	68
Liberty Peak Elementary School (100 Tract)	1	2,080	2,080	1	1	3	5
TOTAL	**3,640**	**-**	**1,800,494**	**1,250**	**1,351**	**3,729**	**6,526**
The Housing Section has 3,640 existing connections as of 2022 (per Table 3.01). Current multi-family count of 66 connections is equivalent to 150 individual units. At buildout, the Housing Section will have approximately 3,951 connections. Large-scale irrigation includes the golf-course, marina, and sports complex							

Table 3.17: Future Demands and Existing Well Production Required

200 TRACT - FUTURE DEMANDS					200 TRACT FUTURE WELL PRODUCTION REQUIRED to Accommodate for Demands and Anticipated System-Wide Losses		
Customer Class	**No. of Customers**	**Average Daily Demand (gpdpc)**	**Total Average Demand per Day (gpd)**	**Average Daily Demand Total System (gpm)**	**ADD REQUIRED (gpm) including Unaccounted-for Losses (27% NRW)**	**SYSTEM MDD Required (gpm) (ADD x 2.27)**	**SYSTEM PHD Required (gpm) (MDD x 1.75)**
Single-Family Residential	1,459	315	459,585	319	405	919	1,608
Commercial	10	1,180	11,800	8	10	23	40
TOTAL	**1,469**	-	**471,385**	**327**	**415**	**942**	**1,648**
Total connection count projected for 2043 is 1469 connections per Tables 3.01-3.02. Changes to connection counts applied to residential only for analysis purposes.							

HOUSING SECTION - FUTURE DEMANDS					HOUSING SECTION FUTURE WELL PRODUCTION REQUIRED to Accommodate for Demands and Anticipated System-Wide Losses		
Customer Class	**No. of Customers**	**Average Daily Demand (gpdpc)**	**Total Average Demand per Day (gpd)**	**Average Daily Demand Total System (gpm)**	**ADD REQUIRED (gpm) including Unaccounted-for Losses (8% NRW)**	**SYSTEM MDD Required (gpm) (ADD x 2.76)**	**SYSTEM PHD Required (gpm) (MDD x 1.75)**
Single-Family Residential	4,466	443	1,978,438	1,374	1,484	4,096	7,168
Multi-Family Residential	66	732	48,312	34	37	102	179
Commercial	40	770	30,800	21	23	63	110
Irrigation (Large-Scale)	5	27,810	139,050	97	105	290	508
Spring Creek Elementary School (300 Tract)	4	4,780	19,120	13	14	39	68
Liberty Peak Elementary School (100 Tract)	1	2,080	2,080	1	1	3	5
TOTAL	**4,582**	-	**2,217,800**	**1,540**	**1,664**	**4,593**	**8,038**
Total connection count projected for 2044 is 4,466 per Table 3.01 and Table 3.02 (assuming annexations) Changes to connection counts applied to single-family residential only for analysis purposes.							

3.4 Wastewater Flows

GBWC-SCD has 3 wastewater treatment facilities; the Mar-Wood WWTP, a conventional activated sludge treatment plant with effluent disposal via leach fields located in the 100 Tract; Septic #2, a small-scale septic tank system in the 200 Tract; and Septic #3, another small-scale septic tank system in the 400 Tract. The septic tank systems in the 200 and 400 Tracts are small systems and are not anticipated to serve more than a few additional customers. Each wastewater facility is discussed in further detail below.

3.4.1 100 Tract: Mar-Wood WWTP

3.4.1.1 Recorded Wastewater Flows

The Mar-Wood WWTP serving the 100 Tract sewer service area is a single-sludge type activated sludge package plant with extended aeration and anoxic denitrification. The WWTP has a permitted design capacity of 50,000 gpd based on 30-day average flow (per Table 2.14). Existing land uses within the 100 Tract sewer service area include multi-family residential, single-family residential, and commercial (e.g. gas station, food establishments, and small-scale retail shops). As of end of 2022, the Mar-Wood WWTP was serving 142 total customers (125 active accounts and 17 inactive accounts). Historical wastewater flows from 2013-2022 for the Mar-Wood WWTP are summarized in Table 3.5 based on influent flow meter recordings.

Table 3.5: Mar-Wood WWTP Wastewater Flow Data (100 Tract)

Year	Number of Active Connections(1)	Average Daily Flow(2), ADF		Average Flow Maximum Month(3), AFMM		AFMM/ ADF Peaking Factor
		(gpd)	(gpdpc)	(gpd)	(gpdpc)	
2013	96	32,967	343	37,900	395	1.15
2014	106	35,808	338	40,600	383	1.13
2015	106	31,550	298	34,700	327	1.10
2016	107	35,714	334	39,129	366	1.10
2017	110	34,246	311	47,875	435	1.40
2018	111	34,001	306	36,888	332	1.08
2019	116	34,617	298	37,994	328	1.10
2020	121	33,981	281	37,109	307	1.09
2021	123	41,888	341	45,411	369	1.08
2022	125	40,320	325	43,876	354	1.09
3-Year Average (2020-2022)	-	38,700	316	42,100	343	1.09

Notes:

(1) Estimated number of connections excluding inactive accounts (e.g. vacant homes).

(2) Flow data in this table 2013-2019 is from an old flow meter, which was replaced in May 2019 to address meter inaccuracies. Flows from this period were adjusted by 2,100 gpd based on a previous analysis done for the 2021 IRP.

(3) Flow data for 2015 has been updated to correct for a data entry correction. The correction eliminated the AFMM/ADF peaking factor of 1.30 as previously used in the 2018 IRP and the PER.

The previous influent flow meter at the WWTP was an ultrasonic Doppler flow meter, which was in service from 2012-2019. Because the accuracy of ultrasonic Doppler flow meters can be affected by internal piping variables, velocities, and other factors, a new magnetic flow meter was installed in May 2019 for flow comparisons with the existing meter. Flow comparisons were obtained from June to December of 2019 and were analyzed in the 2021 IRP. There was an average difference of 2,100 gpd between meter recordings for the period observed. Because of the high accuracy of the magnetic flow meter, this data suggests that a correction factor needs to be applied to all past meter readings and that actual flows to the WWTP are higher than were initially shown. The correction factor was applied to all measurements from 2013–2019. Measurements from 2020–2022 were recorded with the new flow meter.

As shown in Table 3.5, the average daily flow (ADF) from 2020-2022 was 38,700 gpd. The average flow during the maximum month (AFMM) for the same period averaged 42,100 gpd. The ADF on a connection basis averaged 318 gpdpc. The maximum daily flow on record was 156,159 gpd in February 2017 due to extreme wet weather and flooding. The next highest daily flow was 59,649 gpd in December 2022. Based on the flows presented in Table 3.5, the AFMM/ADF peaking factor averaged 1.09. For future flow projections, it is recommended that the peaking factor of 1.09 be used. Wastewater flows from the most recent 3-year period from 2020-2022 as summarized in Table 3.5 will be used for future flow projections to reflect current trends in sewer generation.

The NDEP Permit No. NS2002511 states "the Permittee shall notify the Administrator [NDEP], by letter, not later than ninety (90) days after the 30-day average daily influent flow rate first equals or exceeds 85% of the design treatment capacity for the Permittee's facility". The Permittee is required to summarize the flow rates, provide an estimate of when the flow rate will exceed the design capacity, as well as provide a status report and schedule for increasing the capacity of the treatment facility. In February 2017 the AFMM was unusually high at 156,169 gpd due to heavy inflow and infiltration from wet weather. The high flow event was reported to NDEP but was an exception to the 85% design capacity trigger. In February, September, October, and November of 2020, the AFMM was unusually high due to power failure at a lift station and surpassed 85% of the design capacity. The AFMM surpassed 85% of the design capacity every month in 2021 and every month except for July in 2022.

3.4.1.2 Service Area Growth and Flow Projections

One of the proposed Action Plan projects in the 2021 IRP was the replacement/expansion of the existing Mar-Wood WWTP. The proposed Action Plan project was withdrawn without prejudice as part of a stipulated agreement. Changes have occurred since submission of the 2021 IRP that further support the need for the project. These changes include additional deterioration of the treatment plant (discussed in Section 2.4.2.1), a moratorium on new connections, and forecasting methods that predict the average daily flow (new flow meter) to exceed the 85% design capacity trigger (see Table 3.16). Sewer flow projections are described in the sections to follow which are based on meter readings from the new magnetic flow meter.

Updated Methodology

In the 2021 IRP, more detailed sewer flow calculations based on existing and future land uses such as those completed for the 2018 PER were used. This type of flow projection is especially helpful in estimating the near-term flow projections based on the actual type of development being planned and requesting service (single-family homes versus multi-family apartments and duplexes versus commercial). Although there are 125 active connections, as of 2022, in the 100 Tract sewer service area the number of multi-family residential dwelling units (DUs) represented by each connection vary. Detailed sewer flow calculations were repeated for the 2024 IRP.

Although sewer flows are not metered for each connection in the 100 Tract, wastewater generation factors by land use type can be estimated based on the influent flow meter records at the WWTP, water meter records for the service area and/or for similar land use types, engineering references, and industry standards. Development of wastewater generation factors for each land use type are described in the subsections to follow, as presented in the PER approved by NDEP.

Existing Connection Count

The 100 Tract sewer service area is composed of 142 existing connections, which includes 125 active accounts and 17 inactive accounts as of the end of 2022. Based on existing GBWC-SCD sewer connection records and a review of Elko County parcel data, a breakdown of the existing active and inactive connections by land use type and DU counts was prepared.

A breakdown of active connections is included in Table 3.6. As shown, the 125 active connection count comprises 131.8 parcels, some of which are partially developed, and includes 35 single-family residential connections, 73 multi-family residential connections, 16 commercial connections, and one school connection. For multi-family residential, the number of DUs served by each connection varies. Each "connection" can actually represent anywhere from one (1) DU up to 12 DUs. For the 73 active multi-family residential connections, there are a total of 165 DUs which is an average of 3.1 multi-family DUs per parcel. The Liberty Peak Elementary School was completed and in service for school in fall 2019.

Table 3.6: 100 Tract Sewer Service Area – Existing Active Connections Summary

Connection Type	No. of Parcels(1)	No. of Connections	DU Count	Average DU/Parcel
Single-Family Residential	35	35	35	-
Multi-Family Residential	53.8	73	165	3.1
Commercial	12.0	16	-	-
School (Liberty Peak Elementary)	31.0	1	-	
Total	131.8	125	200	-

Notes:
(1) Fractions of parcels represent partially developed lots.
(2) The school is located on two (2) parcels but the area was originally planned for 31 total parcels.

A breakdown of the inactive connections is included in Table 3.7. Inactive connections may include vacant homes, vacant businesses, second/vacation homes, and unfinished lots under construction with connections already in place. As shown, the inactive connection count of 17 comprises 9.3 parcels and includes a total of 3 single-family residential connections (unfinished lots), 11 multi-family residential connections (4 recently constructed units that are not yet active and 7 units currently under construction), and 3 commercial connections (existing buildings that are currently vacant).

Table 3.7: 100 Tract Sewer Service Area – Existing Inactive Connections Summary

Connection Type	No. of Parcels	No. of Inactive Connections	DU Count
Single-Family Residential	2	3	3
Multi-Family Residential	3.3	11	9
Commercial	4	3	-
Total	9.3	17	12

Residential Wastewater Generation

NAC Section 445A.284(2) states, "As a minimum, sewerage system designs must be based on 100 gallons per person per day and 3.5 persons per lot or dwelling unit and peak flows, unless the design engineer can demonstrate validity of other design criteria...". Using this NAC standard with 200 existing and active residential DUs (per Table 3.6) would result in a total ADF of 70,000 gpd which is 181% higher than the actual ADF of 38,700 gpd (per Table 3.5) observed at the WWTP and does not account for commercial wastewater flows. As such, other design criteria will be used to determine more representative residential flow factors for the 100 Tract sewer service area as outlined below.

The engineering reference *Wastewater Engineering: Treatment and Resource Recovery*[2] provides recommended wastewater generation factors for residential land uses as follows:

- Multi-family residential: 32-45 gpd/person
- Single-family residential: 63-68 gpd/person

The average household density in the Spring Creek area is 3.19 persons per home based on the 2020 U.S. Census Bureau for the Spring Creek CDP. Based on the 2020 Census data and the household size referenced in NAC 445A.284(2), it is reasonable to assume an average density of 3.5 persons per household for single-family residential and 2.5 persons per household for multi-family residential.

Combining household densities and the conservative end of the range for flow factors, the estimated sewer flows for residential land uses in the 100 Tract are as follows:

- Multi-family residential: 113 gpd/DU (assuming 45 gpd/person and 2.5 persons/DU)
- Single-family residential: 245 gpd/DU (assuming 70 gpd/person and 3.5 persons/DU)

Commercial Wastewater Generation

There are 14 active commercial connections in the 100 Tract sewer service area, per Table 3.6. Sewer flows can vary greatly for different types of commercial land uses. To determine an average wastewater generation factor for commercial land use, average water demands for the commercial users in the 100 Tract sewer service area were reviewed from 2020-2022. During the period, the ADD was 1,036 gpdpc. Sewer flows typically range from 60-80% of water demands[3], which would equate to 622 to 830 gpd (60-80% of 1,036 gpd). For the purposes of estimating sewer flows from existing and future commercial connections in the 100 Tract sewer service area, a wastewater generation factor of 726 gpdpc will be assumed (equates to approximately 70% of the 2020-2022 water demand).

Elementary School Wastewater Generation

A new elementary school, Liberty Peak Elementary School, was constructed in the 100 Tract and completed in fall of 2019. Wastewater generation from schools can be difficult to determine and can vary greatly by school size, school amenities, fixture types, schedules, events, etc. Wastewater generation rates can be developed from numerous sources including guidelines from codes adopted by the NDEP, engineering references/manuals, and water meter records for similar sized schools in the area. Wastewater generation factors based on each of these sources are discussed below.

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[2] *Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, 5th ed., McGraw-Hill Education, 2014.*
[3] *Crites and Tchobanoglous, Small and Decentralized Wastewater Management Systems, The McGraw-Hill Companies, Inc., 1998*

- The 2012 Uniform Plumbing Code (UPC) is adopted by reference in NAC 445A.6663. Appendix H of the UPC includes estimated wastewater flow rates for elementary schools at 20 gpd/staff and 15 gpd/student.
- The engineering reference *Wastewater Engineering: Treatment and Resource Recovery*[4] includes typical wastewater flow rates for elementary schools with cafeterias only (no gym or showers) at a range of 8-15 gpd/student.
- A meeting with NDEP was held on October 3, 2018, to discuss planning and design of the WWTP expansion with attendees from GBWC, the PUCN, and Lumos & Associates. During the meeting, wastewater generation rates for elementary schools were discussed and NDEP stated that a factor of 10 gpd/person would be a conservative wastewater generation factor to use for the new elementary school unless information from existing schools in the area validated a lower factor.
- Indoor water meter records were reviewed for several schools in the Northern Nevada area including Spring Creek Elementary School (Spring Creek, NV), West Wendover Elementary (West Wendover, NV), Riverview Elementary School (Dayton, NV), and Mark Twain Elementary School (Carson City, NV). Average indoor water use for these schools ranged from 1.2-3.6 gpd/person; however this includes months when school is not in service. Maximum water usage months for the periods reviewed ranged from 2.5-6.3 gpd/person, which is more representative of months when school is in service. If wastewater flows are assumed at 80% of water usage, which (typically ranges from 60-80%[5],, then the estimated sewer flows would be 2.0-5.0 gpd/person.

Based on the above sources there is a wide range of factors that could be used for flow projections at the new elementary school from as low as 2.0 gpd/person to as high as 15 gpd/student and 20 gpd/staff. For an estimated 500 students and 50 staff, this would translate into an ADF ranging from as low as 1,100 gpd to as high as 8,500 gpd.

The wastewater generation factor for Liberty Peak Elementary School was calculated using flows from 2020-2022 and is included in Table 3.8. The calculated value of 2.5 gpd/person is half of what the wastewater generation factor was estimated to be in the 2021 IRP. The data was limited due to the COVID-19 Pandemic closing schools for the end of the 2019-2020 school year and the majority of the 2020 – 2021 school year. The 2021-2022 school year attendance would have been affected by COVID-19 Pandemic as well. Despite the limited data, the calculated generation factor of 2.5 gpd/person falls within the range of expected generation factors which are 2.0 gpd/person to 15 gpd/person.

[4] *Metcalf and Eddy, Wastewater Engineering: Treatment and Resource Recovery, 5th ed., McGraw-Hill Education, 2014.*
[5] *Crites and Tchobanoglous, Small and Decentralized Wastewater Management Systems, The McGraw-Hill Companies, Inc., 1998.*

Table 3.8: Elementary School Wastewater Generation Factor

Year	Average Flow[1] (gpd)	Number of Students[2]	Wastewater Generation Factor[3] (gpd/person)
2020[4]	1,951	598	2.6
2021[4]	1,468	495	2.4
2022	1,838	595	2.5
		Average	**2.5**

Notes:
(1) The average flow was calculated using Jan-May and Sep-Dec flows to account for students being on summer vacation. Summer vacation months found on Elko County School District website.
(2) The number of students were found on Cleargov.com, as directed by the Elko County School District website. The student counts were pulled for the Fiscal Years 2019-2020, 2020-2021, and 2021-2022. Liberty Peak High School was opened in 2019 and thus, has no historic data.
(3) Wastewater flows typically range from 60-80% of water usage. The wastewater generation factors were multiplied by 80% to provide a conservative estimate of sewer flows.
(4) Flows from April 2020–August 2021 are excluded from this analysis due to the COVID-19 Pandemic closing schools.

Summary of Wastewater Generation Factors

A summary of recommended wastewater generation factors by connection type is provided in Table 3.9. These factors are recommended for projecting future wastewater flows in the 100 Tract sewer service area.

Table 3.9: 100 Tract – Recommended Wastewater Generation Factors

Connection Type	Wastewater Generation Factor		
	(gpd/ DU)	(gpd/ connection)	(gpd/student or staff)
Single-Family Residential	245	-	-
Multi-Family Residential	113	-	-
Commercial	-	726	-
School	-	-	2.5

To check the validity of the recommended wastewater generation factors, the factors were multiplied against the corresponding active connection or DU counts from Table 3.6 to see if the resulting flows are similar to actual flows observed over the past 3 years. A summary of the validity check is provided in Table 3.10 and shows that the recommended factors result in an estimated ADF of 40,315 gpd, which is within 4.0% of the actual 2020-2022 ADF of 38,700 gpd.

Table 3.10: 100 Tract – Validity Check of Wastewater Generation Factors

Connection Type	No. of Active Connections	Active DU Count	Student/ Staff Count	Recommended Wastewater Generation Factor	Units	Estimated ADF (gpd)
Single-Family Residential	35	35		245	gpd/DU	8,575
Multi-Family Residential	73	165		113	gpd/DU	18,645
Commercial	16	-		726	gpdpc	11,616
School	1	-	595	2.5	gpd/person	1,479
Total	125	200				40,315
						Vs
				Actual 2020-2022 ADF		38,700
				% Difference		4.0%

Buildout Connection Count

There are a total of 204 parcels in the 100 Tract sewer service area which is based on the original count for the school property at 31 parcels. For undeveloped parcels the assumed connection type was based on Elko County land use zoning. Counts for undeveloped parcels are as follows:

- Single-Family Residential: Total of 25 potential DUs.
- Multi-Family Residential: Total of 65.1 potential DUs based on 21 undeveloped parcels zoned multi-family residential and an average of 3.1 DUs per parcel based on existing active connections.
- Commercial: Total of 18 potential connections based on 18 undeveloped parcels zoned commercial and assuming one connection per parcel.

A summary of buildout counts by land use type is provided in Table 3.11 including all existing active connections, existing inactive connections, and all undeveloped parcels. A service area map by land use type is included in Appendix M and shows the existing and future land uses in the 100 Tract sewer service area as of end of 2022 (the map is an updated version of 2018 Wastewater Treatment Plant Expansion PER Figure 2).

Table 3.11: 100 Tract Sewer Service Area – Buildout Connections Summary

Connection Type	No. of Parcels	Estimated No. of Connections(1)	Estimated DU Count(1)	Student/ Staff Count
Single-Family Residential	61	61	61	-
Multi-Family Residential	78	111	238	-
Commercial	34	37	-	-
School	31	1	-	550
Total	204	210	299	550

Notes:
(1) The actual number of connection and DU counts at buildout is unknown because the number of multi-family DUs per connection and per lot varies and is estimated for future lots based on existing lot densities.

Near-Term Growth

Over the next several years, growth rates in the 100 Tract sewer service area of Spring Creek may be much higher than projected in Table 3.01. Over the next three years (2023 to 2026), the State Demographer growth projections provided in Table 3.01 predict one new single family home service request, two new multi-family home service requests, and one new commercial service request. As shown in Table 3.7, the number of inactive connections for each of the aforementioned connection types either meet or exceed the number of new connections predicted by the State Demographer growth rates.

Sewer Flow Projections

Sizing of the WWTP should consider ultimate buildout wastewater flows anticipated for the 100 Tract sewer service area. Near-term and buildout flow projections are summarized below.

Near-Term Flow Projections

Flow projections for near-term growth anticipated in the next 3-years are summarized in Table 3.12. The projections include the 17 existing inactive accounts that are already connected to the sewer collection system and could become active at any time, especially homes under construction that are near completion or recently constructed homes pending sale. Flow projections for near-term growth through 2024 are estimated at an ADF of 46,960 gpd and an AFMM of 51,186 gpd. This is based on a historical monthly peaking factor of 1.09, which exceeds the design and permit capacity of the existing Mar-Wood WWTP of 50,000 gpd. It should be noted that the existing Mar-Wood WWTP does not include flow equalization, with the exception of approximately 10,000 gallons of emergency storage in the old septic tank. Peak flows are handled with shorter detention times through the plant and the effluent quality is negatively affected, especially when influent concentrations remain the same but at higher flows.

Table 3.12: 100 Tract – Near Term (3-Year) Wastewater Flow Projections

Connection Type	No. of Parcels	Estimated No. of Connections	DU Count	Student/ Staff Count	ADF(1) (gpd)	AFMM w/Peaking Factor 1.09 (gpd)
Existing Connections (Active)						
Single-Family Residential	35	35	35	-	8,580	9,350
Multi-Family Residential	57.0	73	165	-	18,650	20,330
Commercial	16.0	16	-	-	11,620	12,670
School	31	1	-	550	1,367	1,367
Subtotal	**139.0**	**125**	**200**	**550**	**40,217**	**43,717**
Existing Connections (Inactive)						
Single-Family Residential	3	3	3	-	740	810
Multi-Family Residential	3.3	11	12	-	1,360	1,480
Commercial	4	3	-	-	2,180	2,380
Subtotal	**10**	**17**	**15**		**4,280**	**4,665**
Total	**149**	**142**	**215**	**550**	**44,497**	**50,672**

Notes:
(1) Using recommended wastewater generation factors from Table 3.21.
(2) Monthly peaking factor not applied for elementary school because infiltration chambers were installed at the site to offset impact of wet weather conditions.

Buildout Flow Projections
Flow projections for buildout of the 100 Tract sewer service area are summarized in Table 3.13 using buildout connection counts from Table 3.11 and recommended wastewater generation factors from Table 3.9. Buildout flows are estimated at an ADF of 70,069 gpd and an AFMM of 76,947 gpd.

Table 3.13: 100 Tract – Buildout Wastewater Flow Projections

Connection Type	No. of Parcels	Estimated No. of Connections	Estimated DU Count	Student/ Staff Count	ADF(1) (gpd)	AFMM w/Peaking Factor 1.09 (gpd)
Single-Family Residential	61	61	61	-	14,950	16,450
Multi-Family Residential	78	111	238	-	26,890	29,580
Commercial	34	37	-	-	26,862	29,550
School	31	1	-	550	1,367	1,367
Total	**204**	**210**	**299**	**550**	**70,069**	**76,947**

Notes:
(1) Using recommended wastewater generation factors from Table 3.22.
(2) Monthly peaking factor not applied for elementary school because infiltration chambers were installed at the site to offset impact of wet weather conditions.

Summary of Flows
A summary of existing, 3-year, and buildout flow projections rounded to the nearest hundred gallons are summarized in Table 3.14.

Table 3.14: 100 Tract – Summary of Existing and Projected Wastewater Flows

Timeline	ADF (gpd)	AFMM w/Peaking Factor 1.09 (gpd)
Existing Flows	38,700	42,570
3-Year Flow Projection	50,200	54,718
Buildout Flow Projections	70,100	76,409

Long-Term Growth
The *Nevada County Population Projections 2022 to 2041* shows an increasing population for Elko County at rates ranging from 0.47% to 1.20%. This equates to an increase in equivalent connections in the 100 Tract sewer service area of a rate of less than one (1) connection per year.

Past connection count data also shows that the 100 Tract sewer service area is growing at a higher rate than Elko County. A summary of connection count data for the past 10 years is summarized in Table 3.15. The average growth over the past 10 years equates to 3.3 new sewer connections per year. If growth in the 100 Tract sewer service area continues at this rate, buildout could be reached in the next 20 years. It should be noted that GBWC-SCD began closely monitoring the new sewer connections in the 100 Tract in 2018-2019 and continues to monitor because of concerns with having sufficient wastewater treatment and disposal capacity.

Table 3.15: 100 Tract – Historical Sewer Connection Counts

Year	New Connections per Year	Total No. of Connections
2013	1	110
2014	6	116
2015	4	120
2016	1	121
2017	1	122
2018	1	123
2019	10	133
2020	2	135
2021	2	137
2022	5	142
10-Yr Average	3.3	-

Table 3.16 provides projected wastewater flows through 2044, assuming an average of 3.3 new connections per year per Table 3.15. An ADF per connection of 318 gpdpc and an AFMM/ADF peaking factor of 1.09 were used to roughly estimate projected flows based on 2020-2022 wastewater flow data per Table 3.5. It should be noted that this simplified/generalized estimate of future wastewater flows does not account for requested services for the near-term and variations by land use type as with the detailed analysis in Table 3.6 through Table 3.14. Even so, this simplified approach still demonstrates that the maximum monthly flow could exceed the 50,000 gpd design flow capacity of the WWTP in the next 3-years with an AFMM of 51,186 gpd in 2024.

Table 3.16: 100 Tract Sewer – Projected Wastewater Connections and Flows

Year	Total Equivalent Connections(1)	Change in Connections(2)(3)	Projected WWTP Flow, ADF (gpd)	Projected WWTP Flow, AFMM (gpd)
2022	142.0	-	44,870	48,908
2023	145.3	3.3	45,910	50,042
2024	148.6	3.3	46,960	51,186
2025	151.9	3.3	48,000	52,320
2026	155.2	3.3	49,040	53,454
2027	158.5	3.3	50,090	54,598
2028	161.8	3.3	51,130	55,732
2029	165.1	3.3	52,170	56,865
2030	168.4	3.3	53,210	57,999
2031	171.7	3.3	54,260	59,143
2032	175.0	3.3	55,300	60,277
2033	178.3	3.3	56,340	61,411
2034	181.6	3.3	57,390	62,555
2035	184.9	3.3	58,430	63,689
2036	188.2	3.3	59,470	64,822
2037	191.5	3.3	60,510	65,956
2038	194.8	3.3	61,560	67,100
2039	198.1	3.3	62,600	68,234
2040	201.4	3.3	63,640	69,368
2041	204.7	3.3	64,690	70,512
2042	208.0	3.3	65,730	71,646
2043	210.0	0	66,360	72,332
2044	210.0	0	66,360	72,332

Notes:
(1) Current number of connections based on 2022 connection counts (includes 125 active and 17 inactive accounts).
(2) Change in connection count per Table 3.29.
(3) Growth in the near term is associated with individual septic systems due to the existing plant capacity and subsequent moratorium on new connection to the plant. See tariff sheet 141 B (effective 7/18/22)

3.4.2 200 Tract: Septic #2

The Septic #2 system in the 200 Tract consists of a septic tank and leach field with a rated capacity of 6,000 gpd. There are five (5) existing residential/commercial connections (includes 1 inactive) served by Septic #2 including a home, gym, bar, carwash, and a restaurant (restaurant connection has been inactive for approximately 10 years). Septic #2 has the potential to serve up to 16 connections total. There are no sewer flow meters for this system; however, water usage for the five existing connections is monitored by GBWC-SCD as an approximation of wastewater flows. Water demands for the past 10 years from 2013 to 2022 are summarized in Table 30. The ADD from the most recent 3-years (2020-2022) averaged 925 gpd, which equates to 185 gpdpc. The ADMM for the same period averaged 1,531 gpd with an ADMM/ADD peaking factor of 1.61. Even if 100% of the water usage were discharged as sewer flow to the septic system, the 925 gpd would equate to only 15% of the Septic #2 capacity of 6,000 gpd. This conservative comparison indicates there is sufficient capacity in the Septic #2 system to accommodate additional connections. Sewer flows typically range from 60-80% of water demands[6], which would equate to a sewer flow of 555 to 740 gpd for the Septic #2 service area (60-80% of 925 gpd water demand). This estimated sewer flow is equivalent to 111 to 148 gpdpc.

Table 3.17: Septic #2 Customer Water Usage Data (200 Tract)

Year	Number of Active Connections(1)	ADD		ADMM		ADMM/ ADD Peaking Factor
		(gpd)	(gpdpc)	(gpd)	(gpdpc)	
2013	4	1,754	438	3,234	809	1.84
2014	4	2,020	505	3,861	965	1.91
2015/2016(2)	4	2,529	632	4,269	1,067	1.69
2017	4	1,404	351	2,945	736	2.10
2018	4	781	195	1,268	317	1.62
2019	4	641	160	781	195	1.22
2020	5	570	114	751	150	1.32
2021	5	887	177	1,634	327	1.84
2022	5	1,318	264	2,207	441	1.67
3-Year Average (2017-2019)	-	**925**	**185**	**1,531**	**306**	**1.61**

Notes:
(1) There are five existing active connections for Septic #2, one of which has been inactive from 2013 to May 2022.
(2) The ADD was combined for 2015-2016 to account for a meter read error in December 2015. The ADMM excludes values from December 2015 and January 2016.

3.4.3 400 Tract: Septic #3

The Septic #3 system serving the 400 Tract consists of a septic tank and leach field. As of end of 2022, there were seven (7) existing residential connections served by Septic #3 with potential to serve up to ten (10) connections total. There are no sewer flow meters for this system. However, water usage for the five (5) active existing connections totaled 294,150 gallons in 2022, which averages to approximately 806 gpd or 161 gpdpc.

[6] *Crites and Tchobanoglous, Small and Decentralized Wastewater Management Systems, The McGraw-Hill Companies, Inc., 1998.*

3.4.4 Reclaimed Water Sold or Used

Reclaimed water is highly treated wastewater that could be used for irrigation and other purposes to extend current potable water supplies. However, costs to treat effluent to reclaimed standards can be expensive. The amount of discharge generated from the Mar-Wood WWTP does not warrant the cost of treating the effluent for reclaimed water uses. As such, there is no reclaimed water used within GBWC-SCD's service area. As GBWC-SCD's commercial and recreational areas grow through infill and/or annexations, costs to generate reclaimed water can be revisited to determine the benefits through a cost-benefit analysis.

SECTION 4.0: WATER SUPPLY AND WASTEWATER TREATMENT PLAN

4.1 Water Supply

The 200 Tract and Housing Section water systems were evaluated based on GBWC-SCD's total capacity for each system, which includes wells and storage, compared to the existing and projected water demands. Existing and projected water demands are presented in Table 3.4 and Table 3. of Section 3.3.3. The water supply plan is based on the production and storage facilities defined previously in Section 2 of this report.

4.1.1 Water Rights

The water in Nevada on the surface and below the ground surface belongs to the people of the State. Entities within the State can apply for the right to use that water. Nevada Water Law is founded on the doctrine of prior appropriation – "first in time, first in right." Under the appropriation doctrine, the first user of water from a watercourse acquired a priority right to the use and to the extent of its use.

A review of the water rights held by GBWC-SCD indicates that sufficient water rights exist for the foreseeable future. GBWC-SCD holds nineteen (19) permits with an authorized total combined duty of 7,103.27 AFA. All the water rights are in good standing with the State Engineer's Office. Note that this total is less than the total sum of all the individual permitted duties, which was a term of the most recent permit, No. 79834. Appendix B contains a hydrographic summary of the water right manner of uses for the basin.

Current water rights are sufficient for the present level of occupancy. During the past 3 years, water usage was highest in 2020. Water production from well meter records in 2020 totaled 703 AFA in the 200 Tract and 2,243 AFA in the Housing Section for a total of 2,946 AFA which is well within the total combined duty of 7,103.27 AFA for water rights owned by GBWC-SCD.

The 200 Tract is 97.1% built out as of 2022 connection counts. Based on the 20-year demand projections provided in Section 3.3, Table 3., the total production rate required for the 200 Tract in 2044 will be approximately 670 AFA, assuming a population increase per the State Demographer's projections, see Table 3.01.

The Housing Section is 92.1% built out as of 2022 connections counts. Based on the 20-year demand projections provided in Section 3.3, Table 3., the total production rate required for the Housing Section in 2044 would be approximately 2,340 AFA, assuming a population increase per the State Demographer's projections, see Table 3.01.

4.1.2 Water Supply Evaluation

The GBWC-SCD water system capacity was evaluated based on available well capacities compared to the current and projected future water demands. The 200 Tract was evaluated separately from the Housing Section because they are not interconnected and are considered separate licensed water systems by the NDEP, BSDW. The criteria for evaluating adequate supply capacity is based on NAC 445A.6672, which requires a system that relies exclusively on wells to provide a total well capacity sufficient to meet the MDD when all wells are operational, or the ADD with the most productive well out of service.

200 Tract Water Supply

The 200 Tract has three active wells (Wells 1, 3, and 11) with a total pumping capacity of 1,700 gpm. This pumping capacity accounts for the arsenic treatment facilities at each well site. An analysis of the 200 Tract well capacity versus existing and projected demands is presented in Table 4.01, which shows the available pumping capacity (i.e., the arsenic treatment facility capacity) with all wells in service of 1,700 gpm. Well 11 is the largest producer at 720 gpm. If Well 11 is out of service, the available pumping capacity decreases to 980 gpm. Existing and future well production required for the 200 Tract are estimated in Table 3.4 and Table 3.. To accommodate for system losses in the 200 Tract, water demand estimates from Table 3.4 and Table 3. were grossed up by 27% (3-year average for NRW). This results in a total ADD of 404 gpm for existing conditions and an anticipated ADD of 415 gpm in 2044. The MDD is calculated at 2.27 times the ADD for the 200 Tract, which results in a MDD of 917 gpm for existing conditions and an anticipated MDD of 942 gpm in 2044. No additional water supplies are anticipated to be needed for the 200 Tract.

As shown in Table 4.01, the 200 Tract water supply can meet existing and future demands in accordance with the requirements of NAC 445A.6672. However, it should be noted that Well 1 and Well 3 are at the end of their useful life expectancy and replacement capacity will be needed in the years to come.

Table 4.01: 200 Tract Well Capacity versus Demand

System Well Capacity			
Wells	**Backup Power?**		**Capacity (gpm)(1)**
Well #1	Yes		300
Well #3	Yes		680
Well #11	Yes		720
		Total, All Wells in Service	**1,700**
		Total, Well #11 Out of Service	**980**
System Demand			
Year	**Well Supply Required for ADD (gpm)(2)**	**Projected MDD (gpm)**	**Can Well Supply(3) Meet MDD?**
2022	404	917	Yes
2044	415	942	Yes

Notes:
(4) Capacities are verified by GBWC Staff (see Table 2.07).
(5) Well supply figures were grossed up to accommodate for 27% NRW in the 200 Tract.
(6) Total well supply must be able to accommodate MDD.

Housing Section Water Supply

The Housing Section has nine water supply wells with a total pumping capacity of 4,775 gpm. The water supply wells include Wells 4, 5, 10, and 101 in the 100 Tract; Wells 7 and 14 in the 300 Tract; and Wells 8, 9, and 12 in the 400 Tract. An analysis of the Housing Section well capacity versus existing and projected demands is presented in Table 4.02. As shown in Table 4.02, the reliable capacities of Wells 8 and 12 are reduced in the summer months due to issues such as air entrainment which lowers water production (see Section 2.3.2.1).

Table 4.02 shows the available pumping capacity with all wells in service at 4,775 gpm (total reliable capacity). With Well 101 out of service, the largest producer at 1,000 gpm, the total available pumping capacity is at 3,775 gpm. Existing and future well production required for the Housing Section are estimated in Table 3.4 and Table 3.. To accommodate for system losses in the Housing Section, the water demand estimates from Table 3.4 and Table 3. were grossed up by 8% (3-year average NRW). This results in a total ADD of 1,171 gpm for existing conditions and an anticipated ADD of 1,484 gpm in 2044. The MDD is calculated at 2.76 times the ADD for the Housing Section, which results in a MDD of 3,232 gpm for existing conditions and an anticipated MDD of 4,096 gpm in 2044.

As shown in Table 4.02, the Housing Section water supply can meet existing and future demands in accordance with the requirements of NAC 445A.6672. However, it should be noted that some of the Housing Section wells are at the end of their useful life expectancies and replacement capacity will be needed in the years to come. The replacement of Well 8, as approved in the 2018 IRP, is currently underway. An 8-inch test well has been completed and currently a plan set for the construction of a new well house and discharge assembly has been approved by NDEP. Re-drilling Well 12 is in the Action Plan. Well 12 was rehabbed in May 2023 with the hope to extend its useful life for an additional 3 to 4 years. Future well replacements are budgeted for in the

Preferred Plan (Section 7). In addition, the cleaning and rehabilitation of additional wells is planned for the Housing Section as described in the Preferred Plan (Section 7). These projects will help maintain a reliable water supply.

Table 4.02: Housing Section Well Capacity versus Demand

System Well Capacity			
Wells	**Backup Power?**		**Capacity (gpm)$^{(1)}$**
Well 4	Yes		800
Well 5	Yes		950
Well 10	Yes		300
Well 101	Yes		1000
Well 7	Yes		300
Well 14	Yes		275
Well 8	Yes		400$^{(4)}$
Well 9	Yes		400
Well 12	Yes		350
		Total, All Wells in Service	4,775
		Total, Well 101 Out of Service	3,775$^{(5)}$
System Demand			
Year	**Well Supply Required for ADD (gpm)$^{(2)}$**	**Projected MDD (gpm)**	**Can Well Supply$^{(3)}$ Meet MDD?**
2022	1,171	3,232	Yes
2044	1,484	4,096	Yes

Notes:
(6) Capacities confirmed by GBWC Staff (see Table 2.11).
(7) Well supplies required were grossed up to accommodate for 8% NRW in the Housing Section.
(8) Total well supply must be able to accommodate MDD.
(9) Quantities in parentheses represent reliable capacities (reduced pumping capacities).
(10) Estimated reliable capacities reflected in totals.

4.1.3 System Capacity Analysis

Water storage and overall system capacity is regulated by the Nevada Administrative Code (NAC), Sections 445A.6672, 445A.6674, 445A.66745, 445A.6675 and 445A.66755. Key definitions that are used for the Water Storage Evaluation are listed below:

- Total Storage Capacity – Includes operating storage, emergency storage, and fire flow storage.
- Operating Storage – Operating storage is provided as MDD. The MDD for each of the pressure zones in the GBWC-CSD Water System were calculated by applying a peaking factor to the ADD. The ADD was calculated from meter data provided for years 2020, 2021, and 2022.

- Emergency Storage – The NAC states that emergency storage can either be determined by the engineer or is 75% of the amount of operating storage. Lumos has provided emergency storage equivalent to ADD.

- Fire Flow Storage: The Elko County Fire Protection District requires a minimum fire flow of 1,000 gpm for 1 hour for structures up to 3,600 square feet in size, per letter dated October 28, 2020, as included in Appendix M. Per previous IRPs, GBWC-SCD uses 1,500 gpm for 2 hours for commercial areas, including the existing elementary school, as historically required by the Nevada Division of Forestry. For the new elementary school in the 100 Tract, a fire flow of 3,250 gpm for 4 hours will be used in accordance with the IFC, which includes 50% reduction for sprinklers.

As of the 2024 IRP, the System Capacity Analysis will include an additional scenario to check the total capacity of the GBWC-SCD water system, as defined by NAC 445A.6672. Since this system relies exclusively on groundwater wells as its source of water, it was determined that incorporating a more robust analysis would be the most conservative approach to ensure the system could successfully provide capacity for the following two scenarios:

- Scenario A: Total system capacity requirements for one day of MDD, emergency reserves, and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
- Scenario B: Total system capacity requirements for one day of ADD, emergency reserves, and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.

It is important to note that the System Capacity Analysis performed in the previous versions of the GBWC IRP is still being performed in the 2024 IRP under Scenario A. The only modification to this analysis was to add Scenario B, per NAC 445A.6672, to provide additional insight into possible system vulnerabilities. Explanations of how ADD, MDD, and emergency reserves were calculated are listed in each storage capacity table in the following sub-sections. Each pressure zone's storage capacity was analyzed separately.

200 Tract Storage

The 200 Tract has four storage facilities: the Twin Tanks (Twin Tank A and Twin Tank B), the High Tank, and the 200-2 Tank. The total existing storage capacity for the 200 Tract is 2,250,000 gallons. In 2022, a hole in the floor of Twin Tank A was noted and since then, Twin Tank A has been empty. This has reduced the total storage volume in the 200 Tract to 2,000,000 gallons. The recent inspection report found that Twin Tank A could be rehabilitated, however it would be more cost effective to replace the tank. If the High Tank failed before Twin Tank A could be replaced, the total storage capacity would be reduced to 1,500,000 gallons.

Table 4.03aError! Reference source not found., Storage Capacity Analysis, identifies the minimum amount of storage required and the available storage capacity, including alternative pumping capacity (wells with backup power). The 200 Tract currently has 1,426 existing customers representing 97.1% of buildout. The total required storage capacity for the 200 Tract considering operational storage, emergency reserve, and fire flow is 1,677,200 gallons for existing conditions and 1,721,500 gallons for future conditions (2044). The total available storage capacity including alternative pumping capacity is 4,448,000 gallons, excluding Twin Tank A capacity. Table 4.03b shows that the 200 Tract has sufficient storage capacity for both existing and future conditions (2044).

Table 4.03a: 200 Tract Existing Conditions (as of 2022) System Capacity Analysis

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	1,039,297	Operating Storage for ADD(3) (gal)	457,840
Emergency Reserve(4) (gal)	457,840	Emergency Reserve(4) (gal)	457,840
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**1,677,200**	**Required Storage (gal)**	**1,095,680**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Twin Tank B (gal)	500,000	Twin Tank B (gal)	500,000
High Tank (gal)	500,000	High Tank (gal)	500,000
200-2 Tank (gal)	1,000,000	200-2 Tank (gal)	1,000,000
Well #1	432,000	Wells #1	432,000
Well #3	979,200	Wells #3	979,200
Well #11	1,036,800	Wells #11	1,036,800
Total Capacity (gal) All Wells in Service	**4,448,000**	**Total Capacity (gal) Largest Producer Out of Service**	**3,411,200**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	1,677,200	Required Storage (gal)	1,095,680
Total Capacity (gal)	4,448,000	Total Capacity (gal)	3,411,200
Difference (gal)	**2,770,800**	**Difference (gal)**	**2,315,520**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 27% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.27 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

Table 4.03b: 200 Tract Projected Conditions (as of 2044)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	1,070,044	Operating Storage for ADD(3) (gal)	471,385
Emergency Reserve(4) (gal)	471,385	Emergency Reserve(4) (gal)	471,385
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**1,721,500**	**Required Storage (gal)**	**1,122,770**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Twin Tank B (gal)	500,000	Twin Tank B (gal)	500,000
High Tank (gal)	500,000	High Tank (gal)	500,000
200-2 Tank (gal)	1,000,000	200-2 Tank (gal)	1,000,000
Wells #1	432,000	Wells #1	432,000
Wells #3	979,200	Wells #3	979,200
Wells #11	1,036,800	Wells #11	1,036,800
Total Capacity (gal) All Wells in Service	**4,448,000**	**Total Capacity (gal) Largest Producer Out of Service**	**3,411,200**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	1,721,500	Required Storage (gal)	1,122,770
Total Capacity (gal)	4,448,000	Total Capacity (gal)	3,411,200
Difference (gal)	**2,726,500**	**Difference (gal)**	**2,288,430**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Projected ADD was determined through analysis of 2022 meter data provided by GBWC and population projections (determined in previous sections). The ADD was increased by 27% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.27 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

Housing Section Storage

The Housing Section, as a whole, currently has a total of 3,030,000 gallons of storage capacity. However, there are issues with several of the storage tanks in the Housing Section that will affect available capacity in the future. Tank 103A is currently in service but is in poor condition and will eventually need to be decommissioned. Tank 8 was previously scheduled for decommissioning and removal, but this project is currently on hold due to a drop in the value of scrap metal. As of May 2023, Tank 8 remains in service.

It is evident that the Housing Section cannot meet total storage capacity required based on storage tanks alone. To assess the total storage capacity, existing wells with backup power were included. Adding this alternative pumping capacity to the available storage, the Housing Section as a whole has enough storage capacity for both the existing and future conditions (2044).

Table 4.04, Storage Capacity Analysis, provides a review of total storage capacity required and total storage capacity available for the Housing Section, both on a "whole" system basis and by Tract. The Housing Section meter data provided by GBWC can be separated into the 100 Tract and the 300/400 Tracts combined. To review each Tract in the Housing Section separately, assumptions were made as to the number of existing connections in the 300 Tract using GIS mapping. Average demands were estimated for the 300 Tract using the water demand factors estimated in Table 3.14. Existing connection counts and water demands for the 400 Tract were estimated by subtracting the 300 Tract estimates from the combined 300/400 Tract data.

Table 4.04a: Housing Division - All Tracts (100, 300, and 400 Tracts) Existing Conditions (as of 2022)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	4,969,363	Operating Storage for ADD(3) (gal)	1,800,494
Emergency Reserve(4) (gal)	1,800,494	Emergency Reserve(4) (gal)	1,800,494
Fire Flow (gal) 3,250 gpm for 4 hours	780,000	Fire Flow (gal) 3,250 gpm for 4 hours	780,000

Required Storage (gal)	**7,549,900**	**Required Storage (gal)**	**4,380,988**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 103B	500,000	Tank 103B	500,000
Tank 106	237,000	Tank 106	237,000
Tank 8A	1,300,000	Tank 8A	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #4	1,152,000	Well #4	1,152,000
Well #5	1,368,000	Well #5	1,368,000
Well #10	432,000	Well #10	432,000
Well #101	1,440,000	Well #101	1,440,000
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**9,376,600**	**Total Capacity (gal) Largest Producer Out of Service**	**7,936,600**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	7,549,900	Required Storage (gal)	4,380,988
Total Capacity (gal)	9,376,600	Total Capacity (gal)	7,936,600
Difference (gal)	**1,826,700**	**Difference (gal)**	**3,555,612**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

Table 4.04b: Housing Division - All Tracts (100, 300, and 400 Tracts) Projected Conditions (as of 2044)

System Requirements			
Scenario A[(1)] = MDD + FF		Scenario B[(2)] = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD[(3)] (gal)	5,349,617	Operating Storage for ADD[(3)] (gal)	1,938,267
Emergency Reserve[(4)] (gal)	1,938,267	Emergency Reserve[(4)] (gal)	1,938,267
Fire Flow (gal) 3,250 gpm for 4 hours	780,000	Fire Flow (gal) 3,250 gpm for 4 hours	780,000
Required Storage (gal)	**8,067,900**	**Required Storage (gal)**	**4,656,534**
System Storage Capacity			
Scenario A[(1)] = MDD + FF		Scenario B[(2)] = ADD + FF - Well (Largest Producer)	
Tank 103B	500,000	Tank 103B	500,000
Tank 106	237,000	Tank 106	237,000
Tank 8A	1,300,000	Tank 8A	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #4	1,152,000	Well #4	1,152,000
Well #5	1,368,000	Well #5	1,368,000
Well #10	432,000	Well #10	432,000
Well #101	1,440,000	Well #101	1,440,000
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**9,376,600**	**Total Capacity (gal) Largest Producer Out of Service**	**7,936,600**
Storage/Capacity Comparison			
Scenario A[(1)] = MDD + FF		Scenario B[(2)] = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	8,067,900	Required Storage (gal)	4,656,534
Total Capacity (gal)	9,376,600	Total Capacity (gal)	7,936,600
Difference (gal)	**1,308,700**	**Difference (gal)**	**3,280,066**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

100 Tract Storage

The 100 Tract has three storage facilities with a total capacity of 960,000 gallons: Tank 103B, Tank 103A, and Tank 106. If Tank 103A were decommissioned due to concerns with overall poor condition and structural integrity, the total storage capacity would be reduced to 766,000 gallons.

Table 4.05 identifies a total required storage capacity for the 100 Tract, including operational, emergency reserve, and fire flow, of 4,257,700 gallons for existing demands and 4,519,200 gallons for future demands (2044). With alternative pumping capacity (wells with backup power), the 100 Tract has an additional capacity of 4,392,000 gallons from wells, providing a total storage capacity of 5,102,000 gallons (excludes Tank 103A). Based on the analysis, the 100 Tract has sufficient storage capacity to accommodate for both existing and future demands (2044).

Table 4.05a: Housing Section - 100 Tract Only Existing Conditions (as of 2022)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	2,552,765	Operating Storage for ADD(3) (gal)	924,915
Emergency Reserve(4) (gal)	924,915	Emergency Reserve(4) (gal)	924,915
Fire Flow (gal) 3,250 gpm for 4 hours	780,000	Fire Flow (gal) 3,250 gpm for 4 hours	780,000
Required Storage (gal)	**4,257,700**	**Required Storage (gal)**	**2,629,830**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 103B	500,000	Tank 103B	500,000
Tank 106	237,000	Tank 106	237,000
Well #4	1,152,000	Well #4	1,152,000
Well #5	1,368,000	Well #5	1,368,000
Well #10	432,000	Well #10	432,000
Well #101	1,440,000	Well #101	1,440,000

Total Capacity (gal) All Wells in Service	**5,129,000**	**Total Capacity (gal) Largest Producer Out of Service**	**3,689,000**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	4,257,700	Required Storage (gal)	2,629,830
Total Capacity (gal)	5,129,000	Total Capacity (gal)	3,689,000
Difference (gal)	**871,300**	**Difference (gal)**	**1,059,170**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

Table 4.05b: Housing Section - 100 Tract Only Projected Conditions (as of 2044)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	2,744,726	Operating Storage for ADD(3) (gal)	994,466
Emergency Reserve(4) (gal)	994,466	Emergency Reserve(4) (gal)	994,466
Fire Flow (gal) 3,250 gpm for 4 hours	780,000	Fire Flow (gal) 3,250 gpm for 4 hours	780,000
Required Storage (gal)	**4,519,200**	**Required Storage (gal)**	**2,768,932**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 103B	500,000	Tank 103B	500,000
Tank 106	237,000	Tank 106	237,000
Well #4	1,152,000	Well #4	1,152,000
Well #5	1,368,000	Well #5	1,368,000
Well #10	432,000	Well #10	432,000
Well #101	1,440,000	Well #101	1,440,000
Total Capacity (gal) All Wells in Service	**5,129,000**	**Total Capacity (gal) Largest Producer Out of Service**	**3,689,000**
Storage/Capacity Comparison			

Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	4,519,200	Required Storage (gal)	2,768,932
Total Capacity (gal)	5,129,000	Total Capacity (gal)	3,689,000
Difference (gal)	**609,800**	**Difference (gal)**	**920,068**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

300 Tract Storage

The 300 Tract currently has no storage facilities, but Wells 7 and 14 were equipped with backup power and can be considered alternative pumping capacity. Although the 300 Tract receives water from Wells 7 and 14 and from the 100 Tract via a PRV, there is difficulty meeting fire flows as a stand-alone water system. Fire flow delivery to the 300 Tract has been improved with the addition of a PRV between the 400 Tract and 300 Tract at Scrub Oak Drive, however, based on the hydraulic model, there are still sections of the 300 Tract that are unable to meet fire flow. Most of the areas within the 300 Tract that are unable to meet fire flow occur in the West 300 Tract in areas with 4-inch piping, and at dead ends. Additionally, the areas near the park behind the Boys and Girls Club are unable to meet fire flow.

Consumption data for the 300 and 400 Tracts were lumped together in the 2020–2022-meter data provided by GBWC-SCD. Based on GIS data, it is estimated that the 300 Tract currently contains approximately 441 existing connections.

Table 4.06 estimates a total required storage capacity for the 300 Tract (operational, emergency reserve, and fire flow) of 992,100 gallons for existing demands and 1,055,400 gallons for future demands (2044). The 300 Tract has an alternative pumping capacity of 828,000 gallons. Based on the analysis, the 300 Tract does not have sufficient alternative pumping capacity to accommodate both existing and future demands (2044). Since the 2021 IRP, well capacities have declined and water consumption has increased, which has resulted in insufficient pumping capacity for the 300 Tract to meet the existing demands. However, the 300 Tract is connected to the 100 and 400 Tract and can receive flow from these Tracts. Both Tracts have excess capacity (exceeding the 300 Tract deficit) that can supplement the 300 Tract, and thus bring it into compliance.

Table 4.06a: Housing Section - 300 Tract Only Existing Conditions (as of 2022)

System Requirements			
Scenario A[1] = MDD + FF		Scenario B[2] = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD[3] (gal)	596,108	Operating Storage for ADD[3] (gal)	215,981
Emergency Reserve[4] (gal)	215,981	Emergency Reserve[4] (gal)	215,981
Fire Flow (gal) 1,875 gpm for 2 hours	225,000	Fire Flow (gal) 1,875 gpm for 2 hours	225,000
Required Storage (gal)	**1,037,100**	**Required Storage (gal)**	**656,962**
System Storage Capacity			
Scenario A[1] = MDD + FF		Scenario B[2] = ADD + FF - Well (Largest Producer)	
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Total Capacity (gal) All Water Supply in Service	**828,000**	**Total Capacity (gal) Largest Producer Out of Service**	**396,000**
Storage/Capacity Comparison			
Scenario A[1] = MDD + FF		Scenario B[2] = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	1,037,100	Required Storage (gal)	656,962
Total Capacity (gal)	828,000	Total Capacity (gal)	396,000
Difference (gal)	**-209,100**	**Difference (gal)**	**-260,962**
Meets NAC Requirements?[5]	**NO**	**Meets NAC Requirements?[5]**	**NO**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.
(5) While the 300 Tract has deficient storage capacity to meet system requirements, the 300 Tract can receive additional capacity from the 100 and 400 Tracts.

Table 4.06b: Housing Section - 300 Tract Only Projected Conditions (as of 2044)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	642,569	Operating Storage for ADD(3) (gal)	232,815
Emergency Reserve(4) (gal)	232,815	Emergency Reserve(4) (gal)	232,815
Fire Flow (gal) 3,250 gpm for 4 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**1,055,400**	**Required Storage (gal)**	**645,630**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Total Capacity (gal) **All Water Supply in Service**	**828,000**	**Total Capacity (gal)** **Largest Producer Out of Service**	**396,000**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	1,055,400	Required Storage (gal)	645,630
Total Capacity (gal)	828,000	Total Capacity (gal)	396,000
Difference (gal)	**-227,400**	**Difference (gal)**	**-249,630**
Meets NAC Requirements?(5)	**NO**	**Meets NAC Requirements?(5)**	**NO**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.
(5) While the 300 Tract has deficient storage capacity to meet system requirements, the 300 Tract can receive additional capacity from the 100 and 400 Tracts.

400 Tract Storage

The 400 Tract has three storage facilities with a total capacity of 2,070,000 gallons: Tank 8A, Tank 8B, and Tank 9. Tank 8A was previously scheduled for decommissioning and removal, but this project is currently on hold due to a drop in the value of scrap metal. With Tank 8A removed, the total storage capacity would be reduced to 1,850,000 gallons.

Table 4.07 identifies a total required storage capacity for the 400 Tract (operational, emergency reserve, and fire flow) of 2,660,100 gallons for existing demands and 2,853,400 gallons for future demands (2044). With alternative pumping capacity (wells with backup power), the 400 Tract has an additional capacity of 1,569,600 gallons from wells, providing a total storage capacity of 3,419,600 gallons (excludes Tank 8A). Based on the analysis, the 400 Tract has sufficient storage capacity to accommodate for both existing and future demands (2044).

Table 4.07a: Housing Section - 400 Tract Only (Adjusted from 300 Tract) Existing Conditions (as of 2022)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	1,820,490	Operating Storage for ADD(3) (gal)	659,598
Emergency Reserve(4) (gal)	659,598	Emergency Reserve(4) (gal)	659,598
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**2,660,100**	**Required Storage (gal)**	**1,499,196**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 8B	1,300,000	Tank 8B	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**3,419,600**	**Total Capacity (gal) Largest Producer Out of Service**	**2,119,600**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	2,660,100	Required Storage (gal)	1,499,196
Total Capacity (gal)	3,419,600	Total Capacity (gal)	2,119,600
Difference (gal)	**759,500**	**Difference (gal)**	**620,404**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

Table 4.07b: Housing Section - 400 Tract Only (Adjusted from 300 Tract) Projected Conditions (as of 2044)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	1,962,321	Operating Storage for ADD(3) (gal)	710,986
Emergency Reserve(4) (gal)	710,986	Emergency Reserve(4) (gal)	710,986
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**2,853,400**	**Required Storage (gal)**	**1,601,972**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 8B	1,300,000	Tank 8B	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**3,419,600**	**Total Capacity (gal) Largest Producer Out of Service**	**2,119,600**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	2,853,400	Required Storage (gal)	1,601,972
Total Capacity (gal)	3,419,600	Total Capacity (gal)	2,119,600
Difference (gal)	**566,200**	**Difference (gal)**	**517,628**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

300/400 Tract Combined Storage

Table 4.08 provides a storage analysis of 300 and 400 Tracts combined. The analysis shows that the 300 and 400 Tracts combined can meet storage requirements for existing and future conditions (2044).

Table 4.08a: Housing Section - 300-400 Combined Existing Conditions (as of 2022)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	2,416,598	Operating Storage for ADD(3) (gal)	875,579
Emergency Reserve(4) (gal)	875,579	Emergency Reserve(4) (gal)	875,579
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**3,472,200**	**Required Storage (gal)**	**1,931,158**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 8B	1,300,000	Tank 8B	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**4,247,600**	**Total Capacity (gal) Largest Producer Out of Service**	**2,947,600**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	3,472,200	Required Storage (gal)	1,931,158
Total Capacity (gal)	4,247,600	Total Capacity (gal)	2,947,600
Difference (gal)	**775,400**	**Difference (gal)**	**1,016,442**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:

(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.

(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.

(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).

(4) Emergency reserve is defined as one day of ADD.

Table 4.08b: Housing Section - 300-400 Combined Projected Conditions (as of 2044)

System Requirements			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Operating Storage for MDD(3) (gal)	2,604,891	Operating Storage for ADD(3) (gal)	943,801
Emergency Reserve(4) (gal)	943,801	Emergency Reserve(4) (gal)	943,801
Fire Flow (gal) 1,500 gpm for 2 hours	180,000	Fire Flow (gal) 1,500 gpm for 2 hours	180,000
Required Storage (gal)	**3,728,700**	**Required Storage (gal)**	**2,067,602**
System Storage Capacity			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Tank 8B	1,300,000	Tank 8B	1,300,000
Tank 9	550,000	Tank 9	550,000
Well #7	432,000	Well #7	432,000
Well #14	396,000	Well #14	396,000
Well #8	576,000	Well #8	576,000
Well #9	648,000	Well #9	648,000
Well #12	345,600	Well #12	345,600
Total Capacity (gal) All Wells in Service	**4,247,600**	**Total Capacity (gal) Largest Producer Out of Service**	**2,947,600**
Storage/Capacity Comparison			
Scenario A(1) = MDD + FF		Scenario B(2) = ADD + FF - Well (Largest Producer)	
Required Storage (gal)	3,728,700	Required Storage (gal)	2,067,602
Total Capacity (gal)	4,247,600	Total Capacity (gal)	2,947,600
Difference (gal)	**518,900**	**Difference (gal)**	**879,998**
Meets NAC Requirements?	**YES**	**Meets NAC Requirements?**	**YES**

Notes:
(1) Scenario A is described in NAC 445A.6672.3.(a) and is a required storage analysis for well-reliant systems. In Scenario A, required storage is defined as one day of MDD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service.
(2) Scenario B is described in NAC 445A.6672.3.(b) and is a required storage analysis for well-reliant systems. In Scenario B, required storage is defined as one day of ADD (see note 3), emergency reserve (see note 4), and the most extreme fire flow/demand required in the system area. The system capacity includes any storage tanks and all wells in service except for the largest producing well.
(3) Operating storage is per scenario as ADD for Scenario A and MDD for Scenario B, as allowed by NAC 445A.6672 and NAC445A.66745. Existing ADD was determined through analysis of 2022 meter data provided by GBWC (determined in previous sections). The ADD was increased by 8% to account for system losses (determined in previous sections). MDD was determined by applied the MDD/ADD factor of 2.76 (determined in previous sections).
(4) Emergency reserve is defined as one day of ADD.

4.2 Water Distribution System Criteria

The water distribution system was analyzed by hydraulically modeling the 200 Tract and Housing Section water systems. The hydraulic models were analyzed on an existing demand basis for

ADD, MDD, PHD, and fire flow conditions. The pipeline network was evaluated based on flow velocities and head losses as related to pressures throughout the distribution system.

The goal for determining solutions for problematic sections of the distribution network was to improve efficiency by making the minimum changes necessary to correct each deficiency. Consideration was also given to the most pressing problems and those that affect the greatest number of customers. The overall objective was to produce a fully functional and compliant system at the lowest cost to rate payers.

Design criteria is outlined in NAC 445A.6672 and is summarized in Table 4.09.

Table 4.09: Design Criteria

Parameter	Criteria
Pressure/Flow Requirements	
Minimum Pressure at Peak Hour Demand(1)	30 psi
Minimum Pressure at Maximum Day Demand(1)	40 psi
Maximum Pressure(1)	100 psi
Maximum Flow Velocity in Pipe(1)	< 8 feet per second
Maximum Head Loss(2)	10 feet per 1,000 feet
Fire Flow Requirements	
Minimum Residual Pressure during Fire Flow(1)	20 psi
Minimum Fire Flow for Residential (<3,600 square foot homes)(3)	1,000 gpm for 1 hour
Minimum Fire Flow for Commercial/Industrial(4)	1,875 gpm for 2 hours
Minimum Fire Flow for Boys and Girls Club (300 Tract)(4)	1,500 gpm for 2 hours
Minimum Fire Flow for new Liberty Peak Elementary School (100 Tract)(5)	3,250 gpm for 4 hours

Notes:
(1) Provisions of NAC 445A.6672.
(2) AWWA standard.
(3) Per letter from Elko County Fire Protection District dated 10/28/20 (see Appendix M). No update letter has been provided even after multiple email requests from Lumos and GBWC.
(4) Per GBWC-SCD.
(5) Per IFC includes 50% reduction for sprinklers.

Model Selection and Development

The GBWC-SCD hydraulic water model was analyzed using Bentley WaterCAD v8i modeling software. The existing models for the 200 Tract and Housing Section were updated to reflect current conditions, including updating system demands and peaking factors based on 2020-2022 water usage analyses, updating the distribution network with pipeline improvement projects, and updating the status of open and closed valves to reflect current operational strategy.

Existing Demands Update

Based on available information, the method used in updating the model demands was a multi-step process. The following summary outlines how the models were updated.

- New demands were distributed to account for growth since the models were last analyzed. This process included identification of new service connections between 2020 and 2022.

Once identified, these demands were distributed to nodes adjacent to the new service connections, incorporating 2020-2022 water meter billing data.

- The updated average day system demands developed in the previous step were globally adjusted to the existing MDD for each water system. This was done by applying the MDD/ADD peaking factor based on 2020-2022 well production data. PHD was incorporated into the model by multiplying the MDD by 1.75.
- To adjust the models for the 3-Year Action Plan and 2044 Future Demands, each Tract was regionally adjusted based on the estimated ADD for each scenario. The ADD was then globally adjusted to the estimated MDD using the MDD/ADD peaking factors.

Table 4.10 presents the existing and anticipated demands used in the hydraulic model.

Table 4.10: Hydraulic Model Loading

Area	ADD (gpm)	MDD (gpm)	PHD (gpm)
Existing 200 Tract	318	722	1,263
Existing Housing Section	1,250	3,450	6,038
Action Plan (2027) 200 Tract	327	742	1,299
Action Plan (2027) Housing Section	1,282	3,538	6,192
Preferred Plan (2044) 200 Tract	327	742	1,299
Preferred Plan (2044) Housing Section	1,489	4,110	7,192

The hydraulic modeling scenarios performed include:

- Existing MDD
- Existing MDD with fire flow
- Existing PHD
- 3-Year Action Plan (2027) MDD
- 3-Year Action Plan (2027) MDD with fire flow
- 3-Year Action Plan (2027) PHD
- Future (2044) MDD
- Future (2044) MDD with fire flow
- Future (2044) PHD

4.2.1 Distribution System Evaluation

The GBWC-SCD water systems for both the 200 Tract and Housing Section were evaluated using Bentley WaterCAD v8i software and carefully applied data, assumptions, and operating conditions. The goal of the analysis was to determine weaknesses in the network that would lead to unacceptable pressure conditions, reduced fire-flow capacity, and energy waste from high head losses. Several areas in each tract were found to have high pressures. High pressures are known to increase the rate of main breaks and leaks in a water distribution system and the associated water losses. Areas with low pressures were also identified. This could result in intermittent denial of service to customers and reduced flow to areas of the distribution system. In addition, many parts of the system have undersized distribution pipelines, some as small as 2-inch to 4-inch diameter, which do not meet NAC 445A standards for minimum pipeline sizes. Undersized pipelines result in insufficient fire flow deliveries, high head losses, and low system pressures.

The 200 Tract distribution piping is currently divided into two pressure zones. Due to elevation changes, the pressure zones cover more than one hundred feet of elevation change. This gives rise to a static pressure range of greater than 40 psi from the low boundary to the high boundary of the pressure zones. The largest pressure differences in the system are observed when the wells are pumping water into the system. This leads to high pressures throughout the distribution system that exceed 100 psig in many areas. VFDs recently installed on Wells 1, 3, and 11 have helped alleviate high pressures when the well pumps are operating, but not completely.

The undersized distribution pipelines, 2-inch to 4-inch diameter in many areas, cannot deliver sufficient fire flows at any pressure. There is also severe head loss along the primary transmission line serving the Twin Tanks. Throughout the 200 Tract, there are several other prominent areas of primary transmission mains which are undersized, the most noticeable being the waterlines to and from the PRV at the north end of the 200 Tract (Lily/Sterling PRV). A new PRV on Hayland Drive was installed as part of the Phase 4 pipeline replacement project to address this issue (completed in 2023). Even after four (4) phases of pipeline replacement projects since 2022, pressures range from 41 – 117 psi and 115 – 148 in the Lower and Upper pressure zones. Similarly, fire flow deficiencies are 61 and 16 nodes in the Lower and Upper pressure zones.

The Housing Section consists of three separate tracts and six distinct pressure zones. The Housing Section tracts are interconnected with PRVs and/or isolation valves. Section 2.3 provides a detailed description of the Housing Section pressure zones. The pressure zones generally cover too much of an elevation range to provide proper pressures throughout the zones. Similar to the 200 Tract, high discharge pressures for wells in the 100 Tract result in high distribution system pressures when the well pumps are operating (above 120 psig). The majority of the distribution pipelines in the 400 Tract are smaller than 6-inch diameter, which results in a reduced ability to serve both peak demands and fire flows throughout much of the area.

The recommended improvements to the GBWC-SCD water systems are summarized in the sections to follow and are detailed in the Preferred Plan (Section 7) and Action Plan (Section 8).

4.2.2 System Deficiencies and Alternatives for Improvements

The GBWC-SCD water models were analyzed for existing conditions, the 3-Year Action Plan (2027), and future conditions (2044). Model results are presented in Appendix H and deficiencies within each water system and tract are discussed in the sections to follow. Recommended improvements to address deficiencies are prioritized in the Preferred Plan (Section 7) and Action Plan (Section 8).

4.2.2.1 200 Tract

Issues

Distribution Pressures
There are two pressure zones in the 200 Tract (Upper and Lower). There are many areas in the distribution system with high pressures exceeding 100 psi when the well pumps are operating. Fire flow deficiencies in the water model nodes exceed 77 for both the Upper and Lower pressure zones.

Distribution Piping
In the 200 Tract, there are many areas with undersized piping, pipe diameters less than 8-inches, and dead ends. Some of the pipelines have been rated as being in "poor" and "very poor" condition according to the pipe rating matrix developed in 2014. The undersized pipes cause excessive friction losses during peak flows and also inhibit the delivery of fire flows. Fire flow deficiencies in the water model nodes exceed 77 for both the Upper and Lower pressure zones. The piping rated "poor" and "very poor" continue to contribute to system losses (NRW) due to pipe breaks and leaks.

Storage
The High Tank is in need of replacement/rehabilitated to maintain adequate pressures and fire flow protection in the distribution system. Although the 200-2 Tank can provide water to the 200 Upper Zone, the lower elevation of this tank cannot support proper distribution pressures and flows for the 200 Upper Zone, especially under fire flow conditions. The Twin Tank A has been disconnected from the water system due to a leak identified in 2022. Both the Twin Tank A and High Tank are probably contributing to a portion of the system losses (NWR) due to leaks over the past years.,

Wells and Production
Wells 1 and 3 were recently rehabilitated to optimize production capacities; however, both wells have exceeded the standard nominal useful life of 40 (±5) years and will eventually need to be replaced to maintain adequate production capacity in the 200 Tract. Well 11 was recently rehabilitated in May 2022. An acid cleaning of Well 11 was completed in May 2023, but to the extreme mineral buildup on the screen interval, only a portion of the buildup was removed. Well 11 is showing an improvement in capacity after the cleaning but will need to be monitored closely and may need to be placed on a replacement schedule.

Arsenic Treatment
Wellhead arsenic treatment is provided at Wells 1, 3 and 11 in the 200 Tract. Buildings are needed for each arsenic treatment system to protect the equipment. In addition, permanent prefabricated steel sludge drying beds are needed to replace temporary wooden/plastic beds at Wells 1 and 3. Facility upgrades and repairs are also needed to address deficiencies, improve operations, and add remote monitoring capabilities as outlined in Section 2.2.2.2. Additionally, the Schedule 80 PVC piping in the treatment vessels continues to break and require repair.

Non-Revenue Water

Well production records versus customer meter readings for the 200 Tract show greater water system losses than desired. An average of 27% NRW has been observed for the 200 Tract in the last 3 years. GBWC-SCD will need to continue to reduce this water loss through system maintenance, annual water audits, storage tank inspections, and capital improvement projects to replace pipe segments in poor condition.

200 Tract Recommended Solutions

Distribution Pressure

All three wells in the 200 Tract are now equipped with VFDs, which has helped alleviate some of the high pressures in the system. As needed, GBWC-SCD can make operational adjustments to help alleviate high pressures in the system such as seasonal adjustments to VFD and PRV settings to match system demands. A complete calibration of the hydraulic model should be conducted to validate the results of the model, which will help to ensure the integrity of the model over time in simulating actual operational conditions.

Distribution Piping

A significant portion of the distribution piping in the 200 Tract is in either "poor" or "very poor" condition, which has contributed to multiple breaks and leaks, or is undersized and cannot meet fire flow. The 2021 IRP Action Plan projects approved by the PUCN included an annual budget for replacement of "poor" or "very poor" pipelines. A two-phase pipeline replacement project in the 200 Tract was completed in October 2021, which addressed piping along Brent Drive, Spring Valley Parkway, Berry Creek Place, Berry Creek Court, Berry Creek Drive, and Hayland Drive. A third phase of the pipeline replacement project was completed in 2022 and addressed piping along Spring Valley Parkway. The fourth phase of the pipeline replacement project, which addresses piping along Hayland Drive and includes the installation of a PRV along Hayland Drive, began in June 2023 and was completion in December 2023. The remaining two phases, phases five and six, are still in the planning/design stages. By continuing a systematic approach for replacing this distribution pipe with the appropriate minimum 8-inch diameter, per GBWC standard, and replacing fire hydrants to meet fire flow, the distribution system will better evolve and provide a LOS that is more desired by customers and GBWC-SCD staff. The Preferred Plan (Section 7) and Action Plan (Section 8) provide a strategic approach for continued replacement of this pipe with annual allocations for prioritized replacement projects.

Storage

The High Tank is recommended for rehabilitation in the Action Plan (Section 8) to support fire protection and deficiency needs and the rehabilitated tank will be equipped with cathodic protection. Based on the storage analysis in Table 4.03a. Storage capacity in the 200 Tract is sufficient for existing and future demand projections.

Wells and Production

The ongoing rehabilitation and cleaning of wells is included in the Preferred Plan (Section 7). In addition, well replacement projects are included in the Action and Preferred Plans to replace aging infrastructure such as Wells 1 and 3.

Arsenic Treatment

Replacement of the temporary sludge drying beds with concrete drying beds are recommended for Well sites 1, and 3 as part of the general ledger items. Consideration of the addition of buildings around each arsenic treatment pod would help to better provide protection of the facilities in the harsh environment. Ongoing replacement of the Schedule 80 PVC within the treatment pods with metal or ductile iron piping will continue to occur to help extend the useful life of the facilities.

Non-Revenue Water

In addition, the following measures are being implemented by GBWC-SCD as an ongoing effort to limit water losses from the water production process to the water delivery point:

- Annual water audits using the AWWA Free Water Audit Software.
- Well production meters should be regularly tested, monitored, and maintained.
- Storage tanks should be inspected at regular intervals to assure integrity against leakage.
- High system pressures should be reduced by implementation of system improvement projects including, but not limited to, the addition of VFDs on wells and booster pumps, the addition of more pressure reducing stations, and pipeline improvements.
- GBWC-SCD's continued diligence in repairing all pipeline leaks and breaks in a timely manner.
- Ensure that automatic meter reading/advanced metering infrastructure (AMR and future AMI) are working properly.
- Continue tracking waterline breaks and leaks as a tool to prioritize and target pipeline system improvements.
- Install water meters at PRVs to monitor water flowing between Tracts. The installation of flow meters at the existing and future PRVs will allow for better delineation of NRW between Tracts and pressure zones.

4.2.2.2 100 Tract

Issues

Distribution Pressures

The 100 Tract currently contains three pressure zones: the 100 Northwest Zone supplied by Tank 103A, 103B and 106; the 100 Northeast Zone supplied by Tank 106 and its associated booster pump station; and the 100 Southeast Zone supplied by Tanks 103A, 103B, and the associated booster pumps. There are two main problems with the existing distribution system. The first problem is that during most of the day, the pressures in the 100 Northwest Zone are too high. These high pressures occur because the wells in the 100 Tract pump to Tanks 103A, 103B, and 106, which are located at higher elevations than needed for the pressure zones. Similar to the 200 Tract, the high pressures can exceed 100 psi when the wells come online. The second problem is that during peak demands from 5:00 p.m. to 6:00 p.m., the pressures within the 100 Southeast Zone are too low.

Distribution Piping

There are many undersized pipelines in the 100 Tract and some pipelines have been rated "very poor" according to the pipe condition rating matrix. The undersized pipelines cause excessive friction and inhibit the delivery of fire flow. "Very poor" rated piping increases NRW from water losses due to breaks and leaks.

Storage

Tank 103A is currently in service but is in poor condition and will eventually need to be decommissioned and potentially replaced.

Wells and Production

The four wells within the 100 Tract have all been rehabilitated recently. Wells 4 was recently rehabilitated in 2023, Well 5 was rehabilitated in 2020, and Well 10 was rehabilitated in 2019. Well 101 was rehabilitated in 2020 due to loss of gravel pack and a new pumping system was installed in 2022. Although rehabilitation work helps extend the useful life of the wells, Wells 4, 5, and 10 are each 50 years old and will eventually need to be replaced to maintain adequate production capacity in the 100 Tract.

Non-Revenue Water

NRW for the Housing Section averaged 8% over the last 3 years, which is a decrease from the previous 3-year average of 13% observed in the 2021 IRP. Although NRW has decreased over recent years, GBWC-SCD should continue to reduce water loss through system maintenance, meter replacements, and capital improvement projects to replace pipe segments in poor condition.

100 Tract Recommended Solutions

Distribution Pressure

The installation of VFDs in wells in the 100 Tract has helped alleviate high system pressures. Low pressures can be addressed with the continued replacement of undersized pipelines as part of the annual pipeline replacement projects.

Distribution Piping

A recommendation is to replace the undersized pipe with the appropriate diameter pipe, minimum 8-inch diameter per GBWC standard, and with the appropriate number of valves and fire hydrants. A large portion of the distribution piping in the 100 Tract is in "very poor" condition, contributing to multiple breaks, or undersized and cannot meet fire flow. By continuing to schedule pipeline replacement projects as currently underway in the 200 Tract, fire flow deliveries can be improved and system losses decreased. The Preferred Plan (Section 7) and Action Plan (Section 8) provide a strategic approach with annual allocations for prioritized replacement projects. An annual budget to be used for pipeline replacement projects within the 200 and 100 Tracts is included in the Action Plan (Section 8).

A previously approved action plan project for the 100 Tract was installation of an 8-inch liner in the 12-inch water main under Lamoille Highway; this project was recommended because multiple breaks and leaks were being observed in the area. Since approval of the liner project, GBWC-SCD has continued to enhance the tracking of breaks and leaks and has found this area to be lower priority due to less frequent breaks as compared to other locations in the distribution system with significantly more breaks. To minimize impacts to customer rates, GBWC-SCD does not plan to move forward with the liner project at this time and will instead focus their resources on the prioritized pipeline replacement projects as budgeted in the Preferred Plan (Section 7) and Action Plan (Section 8). If breaks become more frequent near the Lamoille Highway water main in the future, the project can be reprioritized and accommodated with the annual pipeline replacement budget.

Storage
Tank 103A should be considered for decommissioning in the years to come. Based on the storage analysis in Table 4.05a, the 100 Tract will still have sufficient storage for existing and future demand projections considering alternative pumping capacities from the wells with backup power sources.

Wells & Production
Wells 4, 5, and 10 have all recently been rehabilitated. Future cleanings for these wells should be scheduled based on targeted specific capacity declines in each well. This is included in the Preferred Plan. Well cleaning may be prompted for several reasons including water level dropping into the screen interval, significant capacity loss, and/or inability to meet system demands. At a minimum, wells should be evaluated for rehabilitation at least every seven (7) years.

Non-Revenue Water
GBWC-SCD replaced all old meters with new AMR type meter as part of the Water Meter Management Replacement Program. In addition, the following measures are being implemented by GBWC-SCD as an ongoing effort to limit water losses from the water production process to the water delivery point:

- NRW is monitored on an annual basis to observe trends and identify problematic areas.
- Storage tanks are inspected at routine intervals to assure integrity against leakage.
- Customer meters are reviewed and monitored for consumption anomalies. Meters with anomalies are tested and if not within 2% accuracy, the meters are repaired or replaced.
- Well production meters are calibrated and tested annually for accuracy.
- Pipeline breaks and leaks are fixed in a timely manner with water losses estimated for each occurrence for tracking purposes.
- Asset management programs are used as a proactive tool in identifying and replacing old infrastructure. Water main repairs and replacements are prioritized based on condition assessments to target areas of the system more susceptible to breaks and leaks.

4.2.2.3 300 Tract

Issues

Distribution Pressure
There are two pressure zones in the 300 Tract: 300 Northwest Zone and 300 West Zone. The model indicates that delivery pressures in the 300 Northwest Zone are acceptable. Delivery pressures in the 300 West Zone are higher due to elevation differences.

Water from the 400 Tract can be supplied to the 300 Tract and 100 Tract via an existing 12-inch main along East Verdes Drive. This interconnection between the 400 Tract and 300 Tract is normally kept closed through a manually operated isolation valve at the terminus of Scrub Oak Drive because there is no mechanism to prevent Tank 103B from overflowing when the high-water level is reached. In addition, when the valve at Scrub Oak Drive is opened, pressures in the 300 Tract exceed 100 psi. This deficiency was addressed by the installation of a new PRV on Scrub Oak Drive, which allows the automatic supply of water at the interconnection.

Distribution Piping
There are many undersized pipes in the 300 Tract. The undersized piping causes excessive friction and inhibits delivery of fire flow.

Storage
The 300 Tract does not have any storage tanks specifically dedicated to the tract. Although the 300 Tract can receive storage capacity from the 100 and 400 Tracts, the interconnection with the 100 Tract is limited and isolated by the Licht Parkway PRV (sole feed to the 300 West Zone) and the interconnection with the 400 Tract is isolated by the Scrub Oak Drive PRV. In the absence of a storage tank or secondary connection for the 300 West Zone, fire flow deliveries are limited in the area. The PRV at Licht Parkway (which was recently upgraded to an 8-inch) is necessary to reduce high delivery pressures from the 100 Tract to the 300 Tract during normal operations.

Wells and Production
Wells 7 and 14 were rehabilitated and equipped with backup generators. Although rehabilitation work helps extend the useful life of the wells, as of 2023, Well 7 is 51 years old and will eventually need to be replaced to maintain adequate production capacity in the 300 Tract. As of 2023, Well 14 is 35 years old, with all associated controls and piping located underground in a vault. The controls and piping should be moved above ground to eliminate the confined space issue at the well head.

Non-Revenue Water
As discussed for the 100 Tract, NRW for the Housing Section averaged 8% over the last 3 years, which is a decrease from the previous 3-year average of 13% as observed in the 2021 IRP. Although NRW has decreased over recent years, GBWC-SCD should continue to reduce water loss through system maintenance, meter replacements, and capital improvement projects to replace pipe segments in poor condition.

300 Tract Recommended Solutions

Distribution Pressure
The installation of an upgraded VFD for Well 7 and a new VFD for Well 14 has helped alleviate high system pressures. In addition, the new PRV installed at the terminus of Scrub Oak Drive allows automatic supply of water from the 400 Tract to the 300 and 100 Tracts to supplement peak demands at a controlled pressure. The pressure reducing station includes a SCADA controlled valve tied to the Tank 103B level sensors to prevent tank overflows.

Distribution Piping
A recommendation is to replace the undersized piping with the appropriate diameter pipe, minimum 8-inch diameter per GBWC standard, including associated valves and fire hydrants. A portion of the distribution piping in the 300 Tract is undersized and cannot meet fire flow. By continuing to schedule pipeline replacement projects as currently underway in the 200 Tract, fire flow deliveries can be improved and system losses decreased. The Preferred Plan (Section 7) and Action Plan (Section 8) provide a strategic approach with annual allocations for prioritized replacement projects.

It should be noted that although pipeline replacements in the 300 West Zone would help improve fire flow deliveries, the fire flow deficiencies would not be eliminated. This is because there is only one direct feed to the 300 West Zone of the 300 Tract, via the Licht Parkway PRV on Licht Drive. It is recommended that an additional interconnection be constructed between the 300 West Zone and an adjacent pressure zone to provide a secondary feed to the area and to assist in providing fire flows to homes at higher elevations. An additional interconnection to serve the 300 West Zone could potentially be achieved with the integration of future developments such as Ruby Vista Ranch.

Storage
Based on the storage analysis in Table 4.03, the 300 Tract does not have sufficient capacity for existing and future demand projections as a stand-alone system. There is not sufficient alternative pumping capacity from Wells 7 and 14 to meet peak demands. Deficiencies with fire flow deliveries to the 300 West Zone can be addressed through undersized pipeline replacements and a secondary feed to the pressure zone. Fire flow delivery to the 300 Tract will be improved with the addition of a PRV between the 400 Tract and 300 Tract at Scrub Oak Drive. The PRV project was approved by the PUCN as part of the in the 2018 IRP Action Plan and was completed in 2021. Potential interconnections between the 200 Tract and Housing Section are also being explored with the future Ruby Vista Ranch development and could support fire flow needs.

Wells & Production
Well replacement projects are included in the Preferred Plan (Section 7) to replace aging infrastructure such as Well 7. It will be prioritized based on need with the other Housing Tract wells.

Non-Revenue Water
All meters in the 300 Tract were replaced with new AMR type meters. In addition, the following measures are being implemented by GBWC-SCD as an ongoing effort to limit water losses from the water production process to the water delivery point:

- Annual water audits using the AWWA Free Water Audit Software.
- Well production meters should be regularly tested, monitored, and maintained.
- Storage tanks should be inspected at regular intervals to assure integrity against leakage.
- High system pressures should be reduced by implementation of system improvement projects including, but not limited to, the addition of VFDs on wells and booster pumps, the addition of more pressure reducing stations, and pipeline improvements.
- GBWC-SCD's continued diligence in repairing all pipeline leaks and breaks in a timely manner.
- Ensure that automatic meter reading/advanced metering infrastructure (AMR/AMI) are working properly.
- Continue tracking waterline breaks and leaks as a tool to prioritize and target pipeline system improvements.
- Install water meters at PRVs to monitor water flowing between Tracts. The installation of flow meters at the existing and future PRVs will allow for better delineation of NRW between Tracts and pressure zones.

4.2.2.4 400 Tract

Issues

Distribution Pressure
The 400 Tract currently contains three pressure zones: 400 Upper Zone, 400 Lower Zone, and 400 Southeast Zone. The hydraulic model indicates that the 400 Tract contains high pressures when the 100 Tract wells come online. High pressures have resulted in more frequent water main breaks and customer complaints from service interruptions. To address this issue, valves are opened to help with the demand that created some of the high pressure. Some of the high pressures should be alleviated once Well 8 test well is brought online.

Distribution Piping
There are many undersized pipes in the 400 Tract and some of the pipe conditions have been rated as "poor" and "very poor" according to the pipe condition rating matrix. The undersized piping causes excessive friction and inhibits delivery of fire flow. The piping rated "poor" and "very poor" increases NRW due to breaks and leaks.

In addition, the original distribution system in the 400 Tract was constructed without any air valves at the high points. This lack of air valves results in the accumulation of air bubbles at localized high points in the system which can cause water delivery issues, cloudy water at the tap, water hammer, pressure surges, and overall hydraulic inefficiencies such as more pumping energy to overcome air in the system. During system repairs, it has also been discovered that older service line taps were installed with the service saddle-oriented vertically at the top of the water main instead of at a 45-degree angle above horizontal per GBWC standards. This vertical orientation has intensified the air accumulation issues for customers located near high points in the system.

Storage

Tank 8 was scheduled for decommissioning and demolition but the project is currently on hold due to a drop in value of scrap metal, which was going to be sold to offset tank demolition costs.

Wells and Production

The static water level in Well 8 has dropped considerably over the years, affecting well capacity. The lowering of the static water level in Well 8 is drawing the pumping water level into the screen interval causing cascading water in the well and customer complaints of air-entrainment and cloudy water during the high-demand summer season. The replacement of Well 8, as approved in the 2018 IRP Actin Plan, is currently underway and is scheduled for completion in 2024.

Well 9 was rehabilitated in 2017 and the original pump and motor were replaced at that time. Well 12 was rehabilitated in May 2023 with the goal to keep the well online for an additional 3 to 4 years before re-drilling a well in the same location.

Non-Revenue Water

As discussed previously, NRW for the Housing Section averaged 8% over the last 3 years, which is a decrease from the previous 3-year average of 13% as observed in the 2021 IRP. The NRW has decreased over recent years but should continue to reduce water loss through system maintenance, meter replacements, and capital improvement projects to replace pipe segments in poor condition.

400 Tract Recommended Solutions

Distribution Pressure

Potential solutions to alleviate high pressures may include adding new PRVs, looping dead-end mains and or flush values, altering zone boundaries, and adjusting control/PRV settings. For example, the addition of a new PRV at the interconnection between the 100 Tract and 400 Tract would help reduce high pressures associated in the 400 Southeast Zone.

Distribution Piping

One recommendation is to replace the undersized piping with the appropriate diameter pipe, minimum 8-inch diameter per GBWC standard, and with the appropriate number of valves and fire hydrants. A portion of the distribution piping in the 400 Tract is in either "poor" or "very poor" condition, contributing to multiple breaks, or undersized and cannot meet fire flow. By continuing to schedule pipeline replacement projects as currently underway in the 200 Tract, fire flow deliveries can be improved and system losses decreased. The Preferred Plan (Section 7) and Action Plan (Section 8) provide a strategic approach with annual allocations for prioritized replacement projects.

To address issues caused by air in the system, the two-phase pressure analysis and optimization project mentioned above will also include the addition of air valve assemblies at high points in the system and service tap modifications.

Storage
Tank 8 was previously planned for decommissioning and demolition but the project is currently on hold due to a drop in value of scrap metal, which was going to be sold to offset tank demolition costs. Decommissioning of Tank 8 would leave the 400 Tract with 1,850,000 gallons of storage. Based on the storage analysis in Table 4.03, the 400 Tract will still have sufficient storage considering alternative pumping capacities from the wells with backup power sources.

Wells and Production
As mentioned, the replacement of Well 8 is currently underway and is scheduled for completion in 2024. Also the replacement of Well 12 will be underway over the next 3 years (Action Plan item).

Non-Revenue Water
Water meters in the 400 Tract were replaced with new AMR type meters. In addition, the following measures are being implemented by GBWC-SCD as an ongoing effort to limit water losses from the water production process to the water delivery point:

- Annual water audits using the AWWA Free Water Audit Software.
- Well production meters should be regularly tested, monitored, and maintained.
- Storage tanks should be inspected at regular intervals to assure integrity against leakage.
- High system pressures should be reduced by implementation of system improvement projects including, but not limited to, the addition of VFDs on wells and booster pumps, the addition of more pressure reducing stations, and pipeline improvements.
- GBWC-SCD's continued diligence in repairing all pipeline leaks and breaks in a timely manner.
- Ensure that automatic meter reading/advanced metering infrastructure (AMR/AMI) are working properly.
- Continue tracking waterline breaks and leaks as a tool to prioritize and target pipeline system improvements.
- Install water meters at PRVs to monitor water flowing between Tracts. The installation of flow meters at the existing and future PRVs will allow for better delineation of NRW between Tracts and pressure zones.

4.3 Water Transfer Possibilities

Three potential community systems could be involved with a water transfer to or from GBWC-SCD. The largest community is the City of Elko, Nevada. The City of Elko is located approximately 10 miles west of the 200 Tract. The second system is run by a private entity and supplies water to the Spring Creek High School. The third system is the community of Lamoille located to the east of the 400 Tract, which is serviced by the Lamoille Water Association.

Currently, no interconnection exists between the GBWC-SCD system and these utilities. For transfers to take place with the City of Elko or Lamoille Water Association, significant infrastructure would need to be constructed.

It is geographically possible to connect the Spring Creek High School to the system. There have been discussions regarding interconnection with the school in relation to the Ruby Vista Ranch development. If an interconnection is a possibility, it will be further discussed with this development in an annexation docket before the Commission.

4.4 Water Reliability

The GBWC-SCD service area relies entirely on groundwater. Several factors that would affect the reliability of GBWC-SCD's groundwater include droughts, which can affect water quality and quantity, and catastrophic interruptions.

The wells in the 200 Tract have levels of arsenic that exceed the MCL. Arsenic treatment plants are located at each well site (Wells 1, 3, and 11) to provide water that meets the arsenic MCL.

4.4.1 Historical Effects of Drought

One factor affecting reliability of the groundwater supply is the trend in pumping water levels. The National Drought Mitigation Center (NDMC) monitors drought conditions throughout the United State and classifies drought conditions based on intensity and percent of an area affected by the drought. The NDMC has a website that records drought conditions several times per month, every month of the year. The website is:

Reference: http://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Figure 4.01 is an example of the data provided on the website. Over the past year, the drought circumstances have decreased due to the very wet winter during 2023.

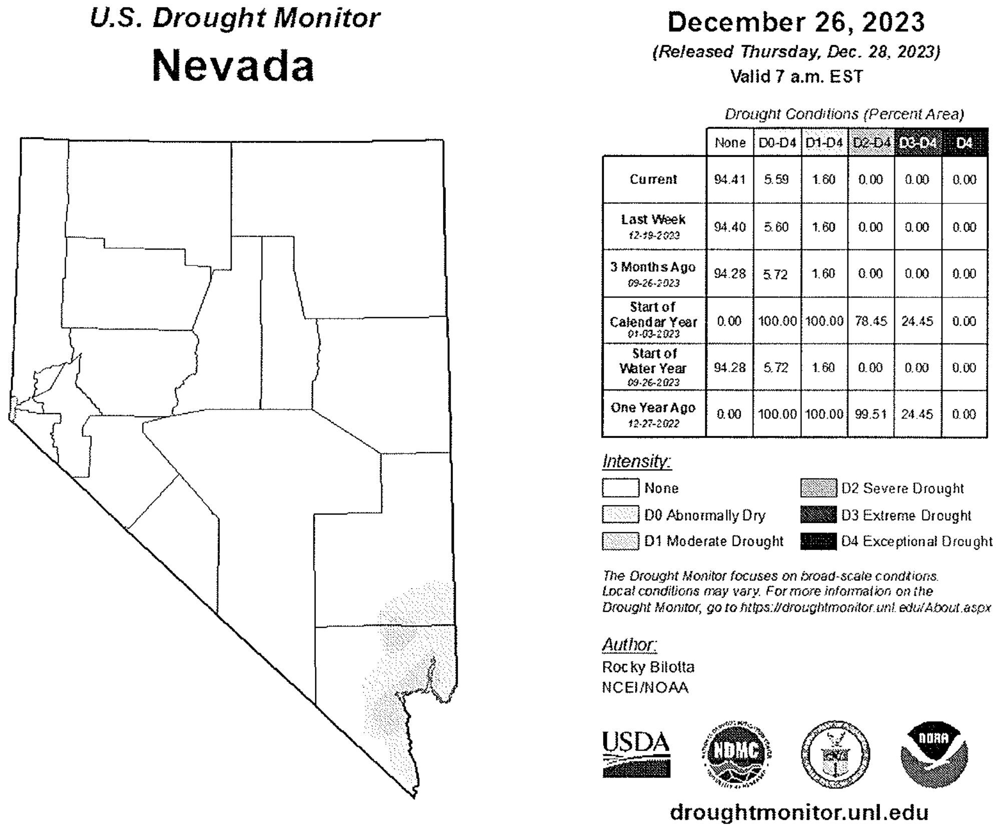

Figure 4.01: Drought Conditions Map for Nevada
(Source: http://droughtmonitor.unl.edu/Maps/MapArchive.aspx)

4.4.2 Maintenance Program

GBWC-SCD has an active preventative maintenance program. Outages due to equipment breakdowns have not been frequent enough to affect the water supply. Long-term maintenance practices are being implemented, such as tank inspections and assessments, well inspections and cleanings, and replacement of equipment that is beyond its serviceable life. An asset management framework has been established and identifies that several wells in the GBWC-SCD system are beyond their useful service life.

4.4.3 Catastrophic Interruption

GBWC-SCD has an Emergency Response Plan as discussed in Volume I and provided in Appendix J, and a Vulnerability Assessment ("VA") on file with the State of Nevada Department of Public Safety and Division of Emergency Management. In addition, GBWC-SCD also has an Emergency Response Manual. All three of these documents are updated annually. They are kept in the GBWC-SCD office and the Area Manager is responsible for updating them as necessary to accommodate new facilities, equipment, and technologies. In addition, all maps and schematics are kept secured at the office. The Emergency Response Manual, backflow program, valve maintenance program, and well and storage site inspection procedures are designed to assure that, in the event of an emergency, an affected location can be isolated and appropriate measures can be taken to minimize the time that a customer may be left without safe drinking water.

The plan, assessment, and manuals also provide consolidated access to emergency response teams, public notification partners, county, and city officials, 24-hour response contractors, and other local support. The procedures for response are recorded for different categories of emergencies, be it natural or man-made.

4.4.3.1 Regional Power Outage

Large-capacity storage tanks and backup power supplies protect the GBWC-SCD water systems from emergencies resulting from power outages. All wells in the 200 Tract and the Housing Section are equipped with generators (a portable generator serves Well 14 due to site constraints). The booster pump stations are also equipped with backup generators.

The Mar-Wood WWTP serving the 100 Tract and the WWTP Lift Station share a portable generator. Lift Station 1 is equipped with a permanent generator.

All generators are exercised and maintained according to the GBWC Generator Operation and Exercising Standard Operating Procedure, which is a part of the Emergency Response Manual.

4.4.3.2 Earthquake or Other Natural Disaster

Earthquakes and severe storms are a possibility for GBWC-SCD. In the event of an unforeseeable natural disaster, pre-event planning is done with all GBWC-SCD operators and other key staff to coordinate the emergency response.

The most likely damage to occur from natural disaster is main breaks. Disruption of service due to main breaks is lessened by having a contractor on call 24 hours a day, 7 days a week for emergency line repairs. Breaks are isolated through the operation of valves and repaired.

If pressures drop below 20 psi, a precautionary boil order is issued as discussed in the Emergency Response Manual (refer to Section 5 of Volume 1) and the repaired main is disinfected and flushed per AWWA Standard C601. Two successive bacteriological samples are taken to ensure safe drinking water.

Should loss of storage occur from an earthquake (or any other reason), the affected tank can be isolated from the distribution system and the wells can pump directly into the system. Should the loss of a well occur due to the well casing collapsing in an earthquake (or any other reason), GBWC-SCD has other wells in service that are available to be called into service.

In the event that GBWC-SCD is not able to fulfill all the system requirements with available resources, reduction of non-essential system needs is possible for construction, irrigation, and commercial customers. Procedures for curtailment are in the Emergency Response Manual provided in Appendix J, and is discussed in Section 5, Volume 1 of this 2024 IRP.

4.4.3.3 Man-Made Disaster

Man-made disasters can come in many forms. Fortunately, GBWC-SCD has never experienced civil riots or acts of terrorism. Minor acts of vandalism have occurred, such as graffiti and theft. Should a man-made disaster affect the infrastructure, the same procedures are followed with local law enforcement being notified.

With the rise of the 2020 Pandemic (COVID-19) in the country, GBWC-SCD has had to adapt their operational procedures to ensure the health and safety of their employees. GBWC-SCD was identified as an "Essential Business" and continued to provide services to their customers. Social distancing and facemasks were introduced as new protocols to reduce the spread of the virus within the GBWC-SCD. When available, most of the employees were working remotely and all meetings were converted to virtual meetings. When utilizing vehicles for travel to company-owned facilities, only one employee was allowed to be in a company-owned vehicle at a time. The Center for Disease Control (CDC) provided safety protocols, which were integrated into GBWC-SCD's everyday operations of their facilities. As of 2023 we are out of the pandemic phase of COVID-19; however, GBWC-SCD is prepared with experience and protocols to continue providing services to customers in the event of another pandemic level event.

The most likely sources of contamination of water supplies are because of backflow from loss of pressure in the system, through unprotected cross connections or after a break in a main.

Purposeful intrusion into the system is guarded through fences, lighting, inspections, and locks. Contamination of the water supply is protected by:

- Frequent monitoring and testing of water for bacterial contamination.
- Recording customer complaints regarding water quality.
- Working chlorinators at the well sites.
- Active backflow prevention requiring routine monitoring of all new customer service applications and backflow prevention assemblies for potential cross connections.
- Ability to isolate segments of the water distribution system through use of valves.

GBWC has created a Cross-Connection Control program and corresponding manual for all systems in the State of Nevada. Cross-connections between a potable water system and non-potable sources of contamination represent a threat to public health. This program is designed to maintain the safety and quality of the water in the supply and distribution system by preventing the introduction, by backflow, of any foreign liquids, gases, or other substances into the supply system. Cross connection control is addressed in GBWC's tariff and the GBWC Standards and Specifications for Water Distribution System Construction for new development.

GBWC Tariff Rule No. 15, Section G (effective July 2019) and Section H (effective October 2019) provide for Cross-Connection Control and penalties for violation. Per Section G:

- "Where any water pipe on a Customer's premises is cross-connected to another source or water supply, the Utility may refuse or discontinue service until there shall be installed at the expense of the Customer a suitable protective device, approved by the Utility, to protect against back-flow into the Utility's system, as required by the governmental authorities having jurisdiction. Customer or Applicant will own and maintain said cross-connection protective device(s) and provide to Utility each year the annual inspection report by a licensed cross-connection inspector and follow the Utility's State approved Cross Connection Control Plan and this Section G can cause the imposition of penalties set forth in the following Section H."

In accordance with Section H, penalties are assessed for violations of the Cross-Connection Plan, with the penalties increasing with each offense. The addition of violation fees and a structure for notifying customers in violation with the Cross Connection Control Program are greatly assisting in protecting the potable water system.

4.4.3.4 Conclusion

The best defense against emergencies is to avoid them through daily inspections, routine equipment maintenance, long-term equipment maintenance, comprehensive sampling plans, security, usage checks, and communication.

In all cases of disaster, natural or man-made, the best response to a catastrophic interruption of service is to be prepared. Staff is trained for emergency response in OSHA safety, Electrical Safety, Lock Out / Tag Out, Generator Operation, and recognizing chemicals in an uncontrolled environment.

Public notification procedures are established with contact numbers. Communication procedures and equipment are in place. Primary and secondary emergency responders are designated.

During a dire emergency, an uncontaminated and undamaged well will be disconnected from the distribution system and used to distribute water to the public. GBWC-SCD will provide staff personnel to partner with the local fire department to distribute drinking water. In the worst-case scenario, where GBWC-SCD wells and storage tanks cannot supply safe drinking water, bottled water must be provided. Should a catastrophic disaster occur in Spring Creek, GBWC-SCD has put the plans and resources together to respond quickly and efficiently to ensure safe drinking water.

4.5 Wastewater Treatment

GBWC-SCD maintains three wastewater treatment systems. The two septic leach field systems, Septic #2 in the 200 Tract and Septic #3 in the 400 Tract, are currently sized for each tariff service area and no further improvements need to be made. Wastewater collection and treatment for the 100 Tract are discussed below.

4.5.1 100 Tract Wastewater Collection

Lift Station 1 was replaced in August 2017 with a new wet well and duplex pumping system. Replacement of the Lift Station 1 has addressed previous issues with the old simplex pumping system that lacked reliability and was difficult to maintain during a pump failure.

The WWTP Lift Station is showing signs of deterioration in the concrete wet well. An interior lining system needs to be installed to protect the concrete from any additional corrosion. Some of the internal metal components of the lift station are also showing signs of corrosion and need to be replaced. Rehabilitation of the WWTP Lift Station is included in the Action Plan (Section 8).

The 100 Tract sewer collection system should be scheduled for routine video inspections to identify sources of inflow and infiltration that can be reduced (e.g. root intrusions and pipeline breaks/voids).

4.5.2 100 Tract Mar-Wood WWTP

Issues and Resolutions

NDEP requires that planning for expansion of the Mar-Wood WWTP start when average daily flows reach 85% of the 50,000 gpd design capacity (42,500 gpd). Based on the projected wastewater flows shown in Table 3.30, the maximum monthly flow has already exceeded the 85% flow trigger. As a proactive approach, GBWC-SCD prepared a PER (as completed by Lumos & Associates in December 2018 and approved by NDEP in January 2019, see Appendix M) and included the replacement/expansion of the Mar-Wood WWTP in the 2021 IRP Action Plan. The replacement/expansion of the Mar-Wood WWTP was withdrawn without prejudice by GBWC as part of the stipulation in the 2021 IRP Action Plan. If development continues in the 100 Tract sewer service area in accordance with the recent requests for service, the maximum monthly flow will likely exceed the 50,000 gpd design flow capacity of the WWTP by 2025. A total plant capacity of 75,000 gpd will be needed to accommodate buildout of the service area as recommended in the PER. The preferred alternative identified in the PER is a new 75,000 gpd Aero-Mod WWTP, with in-basin equalization and surge capacity, to replace the existing 50,000 gpd Mar-Wood WWTP. An additional 25,000 gpd leach field capacity will also be required for a total disposal capacity of 75,000 gpd to match the treatment plant capacity.

Additionally, a dedicated building is needed at the WWTP site for routine sampling and logging activities. The only covered space at the WWTP is an open shed containing the aeration blowers. However, this space is not enclosed and does not provide protection against weather for the operators, nor does it have sufficient space for sampling work. Note that if the Mar-Wood WWTP Replacement Project is constructed, a blower building is included for installation of the blowers and compressors under a roofed structure. This space could serve as a safe working environment during cold weather extremes and could serve as a space for sampling activities instead of a separate building as included in the Preferred Plan.

4.5.3 Wastewater Reclamation

Of the three existing wastewater systems, the only one with any potential for wastewater reclamation is the Mar-Wood WWTP located in the 100 Tract. Currently, the 100 Tract WWTP generates an ADF of approximately 38,700 gpd per Table 3.5 based on a 2020-2022 average. The other two systems, Septic #2 and #3, are too small-scale to be developed as a source of reclaimed wastewater.

Potential uses of reclaimed water from the Mar-Wood WWTP include the Spring Creek Golf Course, Spring Creek Marina and surrounding park, Ray Schuckmann's Sports Complex, and dual-plumbed residential use. However, with the low volume of effluent produced by the treatment plant, recycling water and delivering to these potential customers is not cost effective.

Per NAC 445A.275 regulations, the effluent quality required for reuse is secondary treatment defined as meeting 30 mg/L of total suspended solids (TSS), 30 mg/L of biochemical oxygen demand (BOD), pH ranging between 6-9, and a varying bacteriological quality based on intended use.

The various potential uses for reclaimed water at GBWC-SCD require bacteriological quality ranging between Reuse Category A to C. Categories D and E apply to uses with lower quality requirements such as agricultural irrigation, dust control, and other uses where access by the public is prohibited. Such uses are not considered applicable to Spring Creek.

Category A is the most stringent and requires a 30-day geometric mean bacterial count of less than or equal to 2.2 most probable number (MPN) per 100 milliliters (mL) (total coliforms), and a maximum daily count of 23 MPN/100 mL (total coliforms). Reclaimed wastewater meeting Category A is suitable for irrigation of a golf course, park, or greenbelt where public access is not restricted and human contact with the reclaimed water is expected.

Category B is the next most stringent and requires a 30-day geometric mean bacterial count of less than or equal to 2.2 MPN/100 mL (fecal coliforms), and maximum daily count of 23 MPN/100 mL (fecal coliforms). Reclaimed wastewater meeting Category B is suitable for irrigation of a golf course, park, or greenbelt where public access is controlled and human contact with the reclaimed water is not expected.

Category C requires a 30-day geometric mean bacterial count of less than or equal to 23 MPN/100 mL (fecal coliforms), and maximum daily count of 240 MPN/100 mL (fecal coliforms). Reclaimed wastewater meeting Category C is suitable for irrigation of a golf course or greenbelt (not a park) where public access is controlled and human contact with the reclaimed wastewater does not occur. In addition, a buffer zone of not less than 100 feet must be maintained around the irrigation area. Other potential uses include an impoundment where public access is controlled and human contact is not likely to occur.

The WWTP effluent typically meets the 30/30 effluent criteria for TSS/BOD and 6-9 pH range criteria. Bacterial quality is not being monitored; however, if reclamation of wastewater were to occur, a disinfection process would need to be added to the extended aeration treatment plant to meet Category C bacteriological requirements. Meeting Categories A or B would require the addition of a tertiary system prior to disinfection to consistently meet bacteriological requirements.

Along with the required WWTP upgrades, storage would be required for reclaimed water uses that do not coincide with wastewater production. Since irrigation with reclaimed wastewater coincides with the normal irrigation season (summer months), winter/wet weather storage would be needed. Also, GBWC-SCD would need to construct a pipeline of approximately 1,250 LF from the WWTP to the closest point of delivery. Overall, it is concluded that as long as sufficient water is available from wells, there is little justification for the expenses (both capital and operating) that would be required to operate a wastewater reclamation system, especially given the relatively small quantity of water available for reclamation. This may change in the future with the possibility of new development being annexed into the GBWC-SCD system. GBWC-SCD will investigate the potential use of reclaimed water as projects develop.

SECTION 5.0: EMERGENCY RESPONSE PLAN

Volume I of this IRP provides a generalized explanation of the Emergency Response Plan for the four divisions, and the Emergency Response Plan for GBWC-SCD is provided in Appendix J.

SECTION 6.0: WATER CONSERVATION PLAN

The Water Conservation Plan is discussed in Section 6 of Volume I of this IRP and the full Water Conservation Plan is included as Appendix K. GBWC-SCD has no deviations from the Water Conservation Plan provided in Volume I.

SECTION 7.0: PREFERRED PLAN

The purpose of a utility's Preferred Plan is to set forth the "utility's selection of its preferred options for meeting the water demand and requirements for wastewater treatment for the term of the resource plan." The Preferred Plan must "include an explanation of the criteria that the utility used to select its preferred options" in "sufficient detail to enable the Commission to determine whether the utility's selection is justified." NAC 704.5674.

The 2024 IRP Preferred Plan for GBWC-SCD is intended to provide a list of necessary projects over the next 20-year planning period to continue to provide the current LOS to their customers. With the integration of the asset management plan, the Preferred Plan also includes recommendations associated with monitoring, maintenance, and inspections for several of the more critical assets of the water and wastewater systems. The purpose of these recommendations is to extend the useful life of the assets, prolonging the need for replacement or refurbishment. A condition assessment of several assets over the past year have identified some of the larger assets that have reached the end of their useful lives and will need to be replaced and/or refurbished. The capital projects provided in this Preferred Plan are at a planning level guideline based on current demand and growth projections and should be reviewed periodically and updated in future IRPs.

The Preferred Plan addresses the system, compliance, environmental, and conservation needs at a capital spending and monitoring schedule, which GBWC staff believes are prudent. The asset maintenance, monitoring, and smaller capital project recommendations are provided in the plan with the goal of extending the assets' useful lives beyond their nominal life expectancies. This will help to push out some of the larger capital projects for replacement or refurbishing of specific assets.

With this strategy in mind, the objective of this Preferred Plan is to make the necessary investments to maintain the customer's existing LOS while ensuring NAC compliance of the GBWC-SCD water and wastewater systems.

7.1 CIP Organization And Description

The Capital Improvement Project (CIP) sections describe capital improvements, maintenance, and monitoring recommendations to the systems to maintain the customer's existing LOS while ensuring NAC compliance. The timing of the project improvements have been assessed extensively by GBWC staff and their engineers to ensure the most cost-effective results are captured for the ratepayers, while sustaining their existing LOS. While the improvements will be presented separately for the water and wastewater system, the scheduling for the capital improvements were designed in a manner that brings about the least cost with the highest benefit to the company and its ratepayers. The CIPs have been developed based on the best information available.

It should be noted that the CIPs are conceptual plans, and no topographic surveys, site inspections, or other field investigations have been conducted at this time. It should also be noted that no easements or sites have been obtained for facilities that are planned outside the public right of way. It is possible that when such investigations are conducted at the time of design, changes in pipeline alignments, lengths, facilities siting, or other changes may be required. All estimated costs in the 2024 IRP were developed from actual costs from third parties. The estimates provided in this section include GBWC-SCD capitalized time, but do not include allowance for funds used during construction (AFUDC).

The following sections describe the capital improvement projects, monitoring, maintenance, and inspection recommendations necessary to maintain and improve the customer's LOS for the 200 Tract and Housing Sections, while ensuring NAC 445A compliance. All of the recommendations are provided to:

1. Replace assets that are at the end of their useful lives;
2. Extend the useful life of an asset;
3. Improve low and high distribution system pressure issues;
4. Reduce the amount of pipe leaks and breaks over time;
5. Replace undersized distribution piping for improved system hydraulics (reduce excessive friction losses, increase fire flow deliveries, etc.); and
6. Ensure that a reliable supply of water is conveyed to the customers.

A detailed breakdown of the construction and non-construction costs for each CIP can be found in Appendix I.

7.2 Water Resources (All Tracts)

Well Replacements

There are several wells in the GBWC-SCD system that have exceeded (or will soon exceed) their useful service life and are in need of replacement. Well replacements will need to be scheduled on an ongoing basis to address aging infrastructure and to maintain production capacity in the water systems serving the 200 Tract and Housing Section. There are approximately 6 wells due for replacement in the next 20 years based on age and/or condition as demonstrated in the fixed asset registry contained in Appendix A. To address the aging assets, a well replacement project has been scheduled and budgeted for every 4 years in the Preferred Plan. The specific well to be replaced will be identified in future IRP action plans based on well inspections and ongoing monitoring of production capacities and performance with consideration for added service life resulting from successful well rehabilitations. Budgetary capital costs for ongoing well replacement projects are as follows:

- Well Replacement (Every 4 Years)
  Estimated Cost: $1,600,000 budget per project.
  Project Years: 2028, 2032, 2036, 2040, 2044

Well Rehabilitations

Well rehabilitations have been successfully completed for many of the GBWC-SCD wells, bringing back lost well capacity to the water systems. On average, wells should undergo rehabilitations once every 7-10 years. With the current cycle of well rehabilitation work near completion, it is anticipated that the next round of well rehabilitations will begin in about 7 years (unless dictated otherwise by ongoing monitoring of production capacities and well performance). As a tentative schedule, GBWC-SCD should begin planning and budgeting for the next round of well rehabilitations starting in 2030 (on an annual basis). Rehabilitation and cleaning work helps to restore and optimize production capacities and extends the useful service life of the wells. In addition, the rehabilitation work allows for inspection of the pumping system with repair or replacement of the pump and/or motor assemblies as needed. The total budgetary capital costs associated with these annual projects are as follows:

- Well Rehabilitations (Annual starting 2030)
  Estimated Cost: $350,000 budget per project.
  CIP Year: 2030-2044

7.3 Water Distribution (All Tracts)

Distribution Piping Replacements
It is recommended that GBWC-SCD continue with pipeline replacement projects for both the 200 Tract and the Housing Section in the Action Plan and the Preferred Plan. Pipelines to be considered for replacement are those that have poor condition ratings, are undersized, and/or are subject to frequent breaks and leaks.

The condition rating matrix system developed in the GIS Mapping Database provided GBWC-SCD with a tool for assessing the condition of the existing distribution piping for the 200 Tract and Housing Section. Approximately 140 miles of distribution pipelines in the two water systems were segmented into approximately 1,000-foot lengths. Based on the Tract and pressure zone locations, each segment was given a unique 10-digit ID for tracking the condition assessment. Each segment ID contains numerical codes identifying its Tract number (100, 200, 300, or 400), object ID, and pressure zone. The condition rating for each segment was then developed using the ADD pressure (with wells operating) and number of recorded breaks for each segment. A detailed explanation for the condition rating is available in Appendix A. The criteria for assigning ratings based on pressures and number of breaks is provided in Table 7.01. The overall condition rating was calculated using the criteria presented in Table 7.02.

Table 7.01: Pressure and Break Values for Ratings

ADD Pressure Rating (P)		Break Rating (B)	
(psi)	Rating	# Breaks	Rating
40 < P ≥ 100	1	B = 0	1
0 ≤ P ≤ 40	2	B = 1	2
100 < P ≤ 120	3	B = 2	3
120 < P ≤ 140	4	B = 3 or 4	4
140 < P	5	B = 5 or 6	5

Table 7.02: Condition Rating for Pipe

Condition Rating (Pressure Rating X Break Rating)
1 – 9 = Good
10 – 14 = Fair
15 – 19 = Poor
20 – 25 = Very Poor

As in the prior Consolidated IRP's, it is recommended that pipelines with condition ratings of "very poor" and "poor" (red and orange in distribution piping network/database, respectively) be prioritized for replacement. Within the 200 Tract, the condition rating system identified 12,100 LF of "very poor" pipe and 13,244 LF of "poor" pipe. The condition rating system identified 10,050 LF of "very poor" pipe in the 100 Tract, 1,200 LF of "very poor" pipe in the 400 Tract, and 13,944 total LF of "poor" pipe for both the 100 and 400 Tracts. Over the course of the last 3 years, GBWC has replaced sections of the highest priority waterline in the 200 Tract.

In addition to poor condition ratings, there are also undersized pipelines in the 200 Tract and the Housing Section that require upsizing to a minimum 8-inch diameter pipe (per GBWC standards). This includes approximately 22,200 LF in the 200 Tract, 114,000 LF in the 100 Tract, 53,300 LF in the 300 Tract, and 127,600 LF in the 400 Tract. The undersized piping may not necessarily be classified as "very poor" or "poor" at the time of this IRP, but the condition ratings are expected to worsen as the pipelines age. The replacement of this distribution piping will extend beyond the 20-year planning period of the IRP but should continue being replaced over time according to the condition assessments and tracking tools.

To support the pipeline condition assessments, GBWC-SCD has also been documenting breaks and leaks in both tabular and map format. Tracking the location and frequency of breaks and leaks helps GBWC-SCD to identify critical areas in the distribution system that need to be prioritized for pipeline replacements. Distribution system leaks and fire flow capacity were noted as significant deficiencies for the GBWC-SCD distribution systems in the NDEP BSDW sanitary survey inspection letters dated January 6, 2021. This significant deficiency highlights the severity of the distribution system deficiencies and the importance of continuing and prioritizing pipeline replacement projects.

For pipeline replacement projects, all the recommended pipes to be replaced will be reconstructed with the appropriate pipe size (8-inch minimum per GBWC standards) to ensure proper hydraulic pressures and flows are achieved. When available, the projects would be coordinated with Elko County and the SCA to help reduce costs associated with road repairs and the associated impacts on ratepayers. Water system appurtenances will also be replaced or added to the system and will be included in the project design (e.g. isolation valves, water service connections, fire hydrants).

Replacement of "very poor" and "poor" pipe will help reduce pipe breaks and leaks, which in turn will reduce NRW in the system. Pipeline replacement projects will also help bring the system into conformance with NAC standards by using minimum water main diameters and by adding valves and fire hydrants as necessary to meet maximum spacing requirements. Prioritization and scheduling of replacement projects by GBWC will be coordinated with Elko County, the SCA, and other Utilities to coincide with annual road repair projects to reduce construction impacts and for cost efficiency. Right of way permits will first need to be approved by SCA and then the County in accordance with a Memorandum of Understanding between the two agencies.

To date, four (4) phased pipeline replacement projects in the 200 Tract have been completed as approved in previous IRP Action Plans. The projects address both undersized pipelines and pipelines that have been experiencing multiple breaks and leaks.

Costs for ongoing pipeline replacement projects will be allocated on an annual basis as follows:

- Pipeline Replacement Project (Annual)
  Estimated Cost: $1,500,000 per year (allocated for all Tracts)
  CIP Year: 2028-2044 (Also included in Action Plan Years 2025-2027)

Booster Station Rehabilitation/Replacement

Within the 20-year planning period, several of the booster stations will need to undergo either some type of rehabilitation or possibly a complete replacement. The Preferred Plan has budgeted for the rehabilitation/replacement of two of the booster stations in the next 20 years. The first is estimated in 2034 and the second in 2044. As these years approach and the condition assessments are monitored, a better understanding and priority will be delineated and the type of rehabilitation/replacement will be necessary.

- Booster Station Rehabilitation/Replacement
  Estimated Budgetary Cost: $500,000 each.
  CIP Year: 2034 & 2044

AMI Meter Installation

GBWC is planning to upgrade their current Automatic Meter Reading (AMR) System to Advanced Metering Infrastructure (AMI) System. An AMR System is the communication technology water utilities use to automatically collect water consumption and status data from water meters. AMR systems can be either walk-by or drive-by. An endpoint is connected to the meter's encoder register. The endpoint captures water flow and alarm data which is collected by utility personnel by walking or driving by with a data receiver in proximity to the device. After collection, the meter data is transferred to a database where utilities can monitor and analyze usage, troubleshoot issues, and bill customers based on actual consumption.

An AMI System is an integrated system of water meters, communication networks and data management systems that enables two-way communication between meter endpoints and utilities. Unlike AMR, AMI doesn't require utility personnel to collect the data. Instead, the system automatically transmits the data directly to the utility at predetermined intervals freeing up valuable time for operators to be proactive in conducting other critical activities. Meter data is sent to utilities via a fixed network. The utility can use the data to improve operational efficiencies and sustainability by effectively monitoring water usage and system efficiency, detecting malfunctions, and recognizing irregularities quicker. In today's world, the existing cellular networks designed to minimize downtime, can be used to make sure meter data is collected securely and without interruption.

GBWC is planning to conduct the upgrade using existing staff to cut down on costs. The upgrade will require the addition of a few strategically located towers and some software modifications. The preliminary plan is to conduct the transition over a 5-year period starting in January 2029 with the strategy to complete one Tract at a time. Based on current meter replacement costs, we have provided a budgetary estimate of the following:

- AMI Installation (5-year timeline)
  Estimated Cost: $1,630,600 (allocated for all Tracts)
  CIP Year: 2029-2034 (Towers and Software Modification completed year 1)

7.4 Water Storage (All Tracts)

Storage Tanks Rehabilitation/Replacements

There are several storage tanks in the GBWC-SCD system that have exceeded (or will soon exceed) their useful service life and are in need of rehabilitation or decommissioning and replacement. Tank rehabilitation/replacements will need to be scheduled on an ongoing basis to address aging infrastructure and to maintain adequate storage capacity in the systems. Tank decommissioning and replacement projects or rehabilitation projects will be scheduled and budgeted for every 3-years in the Preferred Plan. Potential tanks to be replaced based on useful service life include Twin Tank B and Tank 103A. However, the specific tank to be replaced will be identified in future IRP action plans based on ongoing tank inspections and budgeted costs will need to be adjusted for tank size accordingly. The frequency of the tank replacements may need to be increased in future IRPs if the current replacement schedule is insufficient. Budgetary capital costs for tank Rehabilitation/Replacements are listed below.

- Tank Rehabilitation/Replacements
  Estimated Cost: $500,000 budget (every 3-years)
  If a replacement is necessary, the cost will be closer to $2,000,000 (tank size/type dependent).
  Project Years: 2030, 2033, 2036, 2039, 2042

7.5 Maintenance/Monitoring/Inspections

Distribution System Monitoring

GBWC-SCD will use leak detection equipment and water loss audits in conjunction with the ongoing pipeline condition assessments to enhance distribution system monitoring. By closely monitoring the distribution systems, pipeline repair and replacement projects can be coordinated and scheduled prior to or in conjunction with annual road maintenance projects by Elko County and/or the SCA (when schedules allow). Projects by other dry utilities may also be taken into consideration for coordination. Coordination of improvements will reduce construction impacts and will be more cost effective. The cost for this effort is not included in the CIP because it should be budgeted separately for ongoing inspection and monitoring.

Storage Tank Inspections and Cleanings

To help ensure that the storage tanks remain in good condition, ongoing third-party tank inspections should be scheduled every 5 years along with routine maintenance for all storage tanks in the 200 Tract and the Housing Section. For the cathodic protection systems, this includes annual potential tests by a certified contractor to determine if the anodes are working properly. Regularly scheduled inspections and maintenance will help extend the useful lives of the tanks. The costs for the tank inspections and smaller-scale maintenance activities are not included in the CIP because it is budgeted for separately as ongoing inspection and maintenance.

Wire-to-Water Efficiency Tests/Well Monitoring

Due to the critical nature and dependency on groundwater, the wells should have a wire-to-water efficiency test conducted annually or bi-annually to determine the overall electrical efficiency of the pumping systems in the wells. Well hydraulic parameters are constantly changing, and these tests determine when a well needs cleaning (rehabilitation) due to plugging of the screens or a redesign of the pumping system to reduce annual electrical costs. Another option could be to integrate the SCADA System and Transducers with a program that extracts static water levels, pumping water levels and flow rates for each of the wells several time a month. The data can then be downloaded monthly into a spreadsheet and analyzed for changes in well parameter providing valuable insight for future well rehabilitations. A project cost is not being provided for this monitoring recommendation due to the nominal expense associated with them. For each well rehabilitation, it is also recommended that a wire-to-water efficiency test be conducted pre and post rehabilitation to determine the effectiveness of the rehabilitation and the resulting electrical cost savings.

7.6 Other Fixed Assets – Future Potential Replacement Needs

A fixed asset registry for GBWC-SCD is included in Appendix A and identifies assets that may need to be replaced or refurbished based on age, condition, and nominal useful life expectancy. The goal with these assets, through appropriate monitoring and maintenance (R&R program), is to extend their useful lives beyond the nominal useful life expectancy for replacement. Many of the monitoring, maintenance, and inspection recommendations will help maximize the life of the asset. For major assets such as storage tanks and wells, ongoing replacement projects have been scheduled and budgeted in the Preferred Plan.

7.7 Wastewater

Mar-Wood Wastewater Treatment Plant Replacement

The replacement and expansion of the existing Mar-Wood WWTP was proposed in the 2018 IRP Action Plan and then again in the 2021 IRP Action Plan. The proposed project was withdrawn without prejudice by GBWC as part of the stipulation. Since the submittal of the 2021 IRP, GBWC has had to implement a moratorium of new connections due to flow capacities to the Mar-Wood WWTP. Instead of allowing for new connections, GBWC is allowing new homeowners in the Mar-Wood WWTP service area to apply for permits for septic systems for their properties. GBWC also had a contractor repair the concrete catwalks around the Mar-Wood TWWTP due to safety concerns. The Mar-Wood WWTP continues to show evidence of deterioration and GBWC is planning to target the replacement and expansion of the Mar-Wood WWTP starting in 2028. A

Preliminary Design Report (PER) was completed, reviewed, and approved by NDEP in January 2019. The preferred alternative identified in the PER is a new 75,000 gpd Aero-Mod WWTP (with in-basin equalization and surge capacity) to replace the existing 50,000 gpd Mar-Wood WWTP.

- Mar-Wood WWTP Replacement
  Estimated Cost: $3,000,000
  CIP Year: 2031

Sewer Main Rehabilitation/Replacement/Manhole lining for I&I

The existing wastewater collection system in the 100 Tract is affected by infiltration and inflow (I & I). The more concerning of the two issues is increased flow to the Mar-Wood WWTP from stormwater events. The main source of the I & I is believed to be associated with the manholes in the system. GBWC wants to conduct an in-depth assessment of the collection system and create a condition assessment to start addressing the I & I and possible degrading collection mains. GBWC-SCD is proposing to first, inspect all the sewer mains and manholes and setup priorities for rehabilitation based on the condition assessment that is generated from the field work. They are proposing a budget of $500,000 initially in 2028 and continue to budget every other year until the rehabilitation of all the sewer mains and manholes that need repairs is complete.

- Sewer Main Rehabilitation/Replacement/Manhole lining for I&I
  Estimated Cost: $500,000 Budgeted (initially)
  CIP Year: 2028

7.8 Preferred Plan Project Timeline

Table 7.03 provides an estimated project schedule timeline for the recommended implementation of the Preferred Plan. Generally, this project schedule timeline only includes implementation of specific projects out to 2033 with a recommended budgetary cost estimate for ongoing replacement and rehabilitation of future linear and fixed assets. As previously mentioned, the scheduled timeline for replacement of assets beyond 2044 should be determined based on the ongoing monitoring, maintenance, and inspection protocols.

Table 7.03: Scheduled Timeline for Preferred Plan CIPs

<table>
<tr><th rowspan="2">Year</th><th colspan="2">200 Tract</th><th colspan="4">Housing Section</th><th rowspan="2">Total Annual CIP Cost</th></tr>
<tr><th>200 Tract Projects</th><th>Project Costs</th><th>100 Tract Projects</th><th>300 Tract Projects</th><th>400 Tract Projects</th><th>Project Costs</th></tr>
<tr><td>2025</td><td colspan="6">See Action Plan Timeline</td><td>$2,262,602</td></tr>
<tr><td>2026</td><td colspan="6">See Action Plan Timeline</td><td>$2,731,479</td></tr>
<tr><td>2027</td><td colspan="6">See Action Plan Timeline</td><td>$2,272,262</td></tr>
<tr><td rowspan="4">2028</td><td rowspan="2">-</td><td rowspan="2">-</td><td>Sewer Main Replace & Manhole Lining</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">$400,000</td><td rowspan="4">$2,700,000</td></tr>
<tr><td>Mar-Wood WWTP Replacement</td></tr>
<tr><td colspan="6">Pipeline Replacement Project: $1,500,000</td></tr>
<tr><td colspan="6">Well Replacements: $800,000</td></tr>
<tr><td rowspan="5">2029</td><td rowspan="2">-</td><td rowspan="2">-</td><td>Sewer Main Replacement & Manhole Lining</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">$700,000</td><td rowspan="5">$3,404,120</td></tr>
<tr><td>Mar-Wood WWTP Replacement</td></tr>
<tr><td colspan="6">Pipeline Replacement Project: $1,500,000</td></tr>
<tr><td colspan="6">AMI Installation: $404,120</td></tr>
<tr><td colspan="6">Well Replacements: $800,000</td></tr>
<tr><td rowspan="5">2030</td><td>-</td><td>-</td><td>Mar-Wood WWTP Replacement</td><td>-</td><td>-</td><td>$1,200,000</td><td rowspan="5">$4,006,120</td></tr>
<tr><td colspan="6">Pipeline Replacement Project: $1,500,000</td></tr>
<tr><td colspan="6">AMI Installation: $306,120</td></tr>
<tr><td colspan="6">Well Rehabilitation: $500,000</td></tr>
<tr><td colspan="6">Water Tank Rehabilitation/Replacement: $500,000</td></tr>
<tr><td rowspan="4">2031</td><td>-</td><td>-</td><td>Mar-Wood WWTP Replacement</td><td>-</td><td>-</td><td>$1,200,000</td><td rowspan="4">$3,506,120</td></tr>
<tr><td colspan="6">Pipeline Replacement Project: $1,500,000</td></tr>
<tr><td colspan="6">Well Rehabilitation: $500,000</td></tr>
<tr><td colspan="6">AMI Installation: $306,120</td></tr>
<tr><td rowspan="3">2032</td><td colspan="6">Pipeline Replacement Project: $1,500,000</td><td rowspan="3">$2,606,120</td></tr>
<tr><td colspan="6">Well Replacements: $800,000</td></tr>
<tr><td colspan="6">AMI Installation: $306,120</td></tr>
<tr><td rowspan="4">2033</td><td colspan="6">Pipeline Replacement Project: $1,500,000</td><td rowspan="4">$3,106,120</td></tr>
<tr><td colspan="6">Well Replacement: $800,000</td></tr>
<tr><td colspan="6">Water Tank Rehabilitation/Replacement: $500,000</td></tr>
<tr><td colspan="6">AMI Installation: $306,120</td></tr>
<tr><td rowspan="3">2034</td><td colspan="6">Pipeline Replacement Project: $1,500,000</td><td rowspan="3">$2,500,000</td></tr>
<tr><td colspan="6">Well Rehabilitation: $500,000</td></tr>
<tr><td colspan="6">Booster Station Rehab/Replace: $500,000</td></tr>
<tr><td>2035</td><td colspan="6">Pipeline Replacement Project: $1,500,000</td><td>$2,000,000</td></tr>
</table>

Year	200 Tract		Housing Section				Total Annual CIP Cost
	200 Tract Projects	Project Costs	100 Tract Projects	300 Tract Projects	400 Tract Projects	Project Costs	
	Well Rehabilitation: $500,000						
2036	Pipeline Replacement Project: $1,500,000						$2,800,000
	Water Tank Rehabilitation/Replacement: $500,000						
	Well Replacement: $800,000						
2037	Pipeline Replacement Project: $1,500,000						$2,300,000
	Well Replacements: $800,000						
2038	Pipeline Replacement Project: $1,500,000						$1,500,000
2039	Pipeline Replacement Project: $1,500,000						$2,000,000
	Water Tank Rehabilitation/Replacement: $500,000						
2040	Pipeline Replacement Project: $1,500,000						$2,300,000
	Well Replacements: $800,000						
2041	Pipeline Replacement Project: $1,500,000						$2,300,000
	Well Replacement: $800,000						
2042	Pipeline Replacement Project: $1,500,000						$2,000,000
	Water Tank Rehabilitation/Replacement: $500,000						
2043	Pipeline Replacement Project: $1,500,000						$4,300,000
	Well Replacements: $800,000						
	Water Tank Replacement: $2,000,000						
2044	Pipeline Replacement Project: $1,500,000						$2,800,000
	Booster Station Rehab/Replace: $500,000						
	Well Replacement: $800,000						
	20 Year Capital Improvement Project Cost Total						**$53,394,943**

SECTION 8.0: ACTION PLAN

The recommended Action Plan projects for GBWC-SCD target the water and sewer systems in a way that helps maintain and improve the customer's current level of service, provide redundancy to the system, free up staff time for monitoring and maintenance, and ensure compliance with NAC 445A "water works" regulations. GBWC-SCD has scaled its Action Plan to reflect projects that it can be reasonably complete within the 3-year Action Plan period. Where this Action Plan provides only a single option for a project, this represents the sole viable option for the project. For every action plan item related to a forecasted water demand or sewer flow deficiency, we have considered all relevant and required factors in reaching our determination.

It should be noted that the CIPs are conceptual plans, and no topographic surveys, site inspections or other field investigations have been conducted at this time. It should also be noted that no easements or sites have been obtained for facilities that are planned outside the public right of way. It is possible that when such investigations are conducted at the time of design, changes in pipe alignments, lengths, facility siting or other changes may be required. All estimated costs in this Volume (GBWC-SCD, Volume III) of the consolidated 2024 IRP were developed from costs from third parties and do not include items such as allowance for funds used during construction (AFUDC). The AFUDC is included in the Funding Plan (Appendix L).

A detailed breakdown of the construction and non-construction costs for each action plan project can be found in Appendix I.

8.1 Action Plan Projects

The three-year Action Plan projects are focused on immediate asset concerns that have been identified through the development of the asset management component, NAC compliance, and staff recommendations. The project list is as follows:

<u>WATER RESOURCE</u>

- Well 12 Replacement.

<u>WATER DISTRIBUTION</u>

- Pipeline Replacement Project (Annually).

<u>WATER STORAGE</u>

- Rehabilitation of High Tank; or
- Replacement of High Tank; or
- Booster Station Improvements in 200 Tract Upper Pressure Zone.

<u>WASTEWATER</u>

- Rehabilitation of WWTP Lift Station; or
- Rehabilitation of the WWTP Lift Station with a new De-Ragging System;
- SCADA Wastewater Upgrades.

8.2 Water Resources (All Tracts)

400 Tract Well 12 Replacement

Well 12 has had issues with the pumping water level drawing below the upper screened interval causing problems with the well such as air entrainment, which lowers water production. In May 2017 the well underwent a rehabilitation that included the installation of patches to repair holes identified in the screen interval. The well was brought back online with the original pump and motor which is a FlowServe Model 10EMM turbine pump assembly and a 150-HP U.S. vertical turbine hollow shaft motor. A VFD was also installed in 2017, which has helped address the air entrainment issues. The final video log of the well after the rehabilitation indicated that the well cleaning was moderately successful.

On April 27, 2022, Well 12 went down. The pump was removed and a video survey revealed the portions of the screen were heavily plugged starting at 180 feet below ground surface. The well appeared to need a full cleaning and rehabilitation. GBWC identified Well 12 as a critical well to the system. Customers in the lower pressure zone reported complaints of milky water as a result of relying on Well 8 with Well 12 being offline. Given Well 12's critical importance, cleaning and rehabilitation were postponed to the fall when demand was less.

In the beginning of May 2023, Well 12 underwent another rehabilitation. The well was video surveyed, shock chlorinated, double acid treated, and swabbed with redevelopment by airlifting after each acid treatment. The pump assembly was rebuilt and installed with the replacement of some of the column pipe and shaft. The rehabilitation was completed at the end of May 2023. Currently, the well has 7 swage patches in it. The objective is to try and get 3-4 more years out of the well and then re-drill in the same location. Pricing was assembled to construct a 14-inch well completion to a total depth of 900 feet. This project has been established as a high priority project because it is critical for continuing to meet production demand in the 400 Tract. The total budgetary capital cost to replace Well 12 and integrate it back into the existing discharge assembly is as follows:

- Well 12 Replacement Project.
  Estimated Cost: $1,542,524
  CIP Year: 2026
  Tier: High Priority

Anticipated Timeline for 400 Tract Well 12 Replacement

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	4 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	2 weeks
Pressure Analysis and Report	8 weeks
Design (geotech, survey, plans, and specifications)	12 weeks
Permit Submittals and Approvals	6 weeks
Bid Advertisement and Award	6 weeks
Construction	20 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**64 weeks**

8.3 Water Distribution (All Tracts)

Pipeline Replacement Projects

As discussed in the Preferred Plan (Section 7), it is recommended that GBWC-SCD continue with pipeline replacement projects for both the 200 Tract and the Housing Section in the Action Plan and the Preferred Plan. Pipelines to be considered for replacement are those that are undersized, are subject to frequent breaks and leaks, and/or have poor condition ratings (e.g. condition ratings of "very poor" and "poor", red and orange in the GIS Mapping Database, respectively). GBWC-SCD has been documenting breaks and leaks in both tabular and map format to help identify critical areas and prioritize pipeline replacement projects. A map showing the location of breaks and leaks from 2010-2022 is included in Appendix M. Distribution system leaks and fire flow capacity were noted as significant deficiencies for the GBWC-SCD distribution systems in the NDEP BSDW sanitary survey inspection letters, dated January 6, 2021. This significant deficiency highlights the severity of the distribution system deficiencies and the importance of continuing and prioritizing pipeline replacement projects.

The four-phase pipeline replacement project in the 200 Tract has already been approved in previous IRP Action Plans. The projects addressed both undersized pipelines and pipelines that have been experiencing multiple breaks and leaks. Hydraulic modeling report results showed that the pipeline replacement projects will significantly improve available flows and residual pressures near the project area during fire flow conditions. Available fire flows will continue to improve with additional pipeline replacement projects.

For pipeline replacement projects, all the recommended pipes to be replaced will be reconstructed with the appropriate pipe size (8-inch minimum per GBWC standards) to ensure proper hydraulic pressures and flows are achieved. The projects will be coordinated with Elko County and the SCA to help reduce costs associated with road repairs and the associated impacts on ratepayers. Water system appurtenances will also be replaced or added to the system and will be included in the project design (e.g. isolation valves, water service connections, fire hydrants).

Replacement of pipe in poor condition will help reduce pipe breaks and leaks, which in turn will reduce NRW in the system. Pipeline replacement projects will also help bring the system into conformance with NAC standards by using minimum water main diameters and by adding valves and fire hydrants as necessary to meet maximum spacing requirements. Prioritization and scheduling of replacement projects by GBWC will be coordinated with Elko County, the SCA, and other Utilities to coincide with annual road repair projects to reduce construction impacts and for cost efficiency. Right of way permits will first need to be approved by SCA and then the County in accordance with a Memorandum of Understanding between the two agencies. This project has been established as a medium priority project because continued replacement of poor and very poor pipelines should be of concern to reduce NRW and increase fire flow protection.

Cost allocations and anticipated timelines for the pipeline replacement projects are as follows:

- Pipeline Replacement Project (Annual).
  Estimated Cost: Total of $1,500,000 per year allocated for all Tracts.
  CIP Years: 2025, 2026, 2027
  Tier: Medium Priority

Anticipated Timeline for Each Pipeline Replacement Project

Tasks	Est. Time
Coordination with other Agencies (Elko County, SCA, Utilities)	6 weeks
Request for Engineering Services Proposal (develop, advertise, review)	8 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	4 weeks
Design (survey, plans, and specifications)	12 weeks
Permit Submittals and Approvals	6 weeks
Bid Advertisement and Award	6 weeks
Construction	25 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**73 weeks**

8.4 Water Storage (All Tracts)

High Tank Rehabilitation or Replacement, or Removal

The 500,000-gallon High Tank is 53 years old and is well beyond its useful service life. The High Tank is in need of replacement or rehabilitation to ensure adequate operational, emergency, and fire flow storage in the 200 Tract water system and to meet required system pressures in accordance with NAC standards. The rationale for the replacement or rehabilitation of the 500,000-gallon tank is outlined below.

Tank Condition

The High Tank was inspected in 2014, 2015, 2019, 2020 and 2023 and was observed to be in poor condition. Lumos structural engineer inspected the tank in preparation for the 2021 IRP and identified that the tank has a compromised structural integrity. GBWC-SCD is now having an inspection of the High Tank conducted annually due to its physical condition. In the 2015 inspection, the inspector noted unacceptable amounts of material loss from corrosion on the tank floor, shell, and roof ranging from 28-54% based on ultrasound measurements. The 2019 inspection also noted an overall degradation of the steel with moderate to heavy cracking in the walls. During the 2019 inspection, the tank floor was found to be in such poor condition that cleaning of sediment could not be performed without risk of further damage. The six structural support columns were also found to be in fair to poor condition with heavy cracking, de-lamination, 33% uniform surface corrosion, and 50% rust nodules. The overall recommendation in the 2020 tank inspection report was to decommission and replace the tank due to heavy amounts of metal loss and coating failure.

In addition to the tank inspections capturing the severe condition of the tank, a sanitary survey performed by NDEP BSDW in 2017 noted that the High Tank is at or beyond its useful life with a possible leaking floor because of healthy vegetation observed near the base of the tank. In the most recent sanitary survey inspection letter, dated January 6, 2021, NDEP carried forward the 2017 comment that the "tank is at or beyond its useful life" and elevated it to a "significant deficiency". This significant deficiency highlights the severity of tank condition and the importance of replacing the tank, especially when noting that fire flow capacity was also noted as a significant deficiency for the 200 Tract.

Fire Protection

In September 2017, a wildfire burned to the big Elko "E" signage, located on Lamoille Summit, which is located between Elko and Spring Creek, and was dangerously close to approaching homes in the 200 Tract. Wildfires are a major threat in Elko County, and the availability and access to fire flow storage in water storage tanks, such as the High Tank, are of critical importance for firefighting and protection of the community. Without the High Tank, the available fire flows would be reduced significantly in the 200 Upper Zone at several locations. Although the 200-2 Tank is also interconnected with the 200 Upper Zone, the base elevation of the 200-2 Tank (5,735 feet) is 65 feet lower than the base elevation of the High Tank (5,800 feet). Even though the 200-2 Tank can provide water to the 200 Upper Zone, the lower elevation of this tank cannot provide proper distribution pressure and flows to adequately support the 200 Upper Zone. The 200-2 Tank was not designed to provide fire storage for the 200 Upper Zone; rather, it was designed at a location to provide additional elevated storage for the 200 Lower Zone. Replacement/rehabilitation of the High Tank is needed to maintain the LOS for fire protection that is currently being provided to customers in the 200 Upper Zone.

There is also potential for a wildfire to damage other critical facilities such as the booster pumps at the Twin Tanks site. The booster station is the only means for supply water (from the three existing wells) to be conveyed from the 200 Lower Zone into the 200 Upper Zone. Damage to these pumps would reduce available fire flows and firefighting capabilities even more drastically. Lumos conducted three scenario hydraulic water model runs on the 200 Tract. They included the following:

- Scenario-1: Involves a fire flow and maximum day demand flow requirement with the High Tank operational.

- Scenario-2: Involves a fire flow and maximum day demand flow requirement with the High Tank not operational.

- Scenario-3: Involves a fire flow and maximum day demand flow requirement with the High Tank not operational and the booster station not operational.

In Scenario-1, the hydraulic water model identified 11 nodes in the Upper Zone that did not meet fire flow with a minimum residual pressure of 20 psi. In Scenario-2, the hydraulic water model identified 16 nodes in the Upper Zone that did not meet fire flow with a minimum residual pressure of 20 psi. In Scenarion-3, the hydraulic model identified 49 nodes in the Upper Zone that did not meet fire flow with a minimum residual pressure of 20 psi.

In all cases, the Upper Zone sees an increased deficiency in fire flow requirements without the use of the High Tank.

System Operations
Replacement/rehabilitation of the High Tank has many operational, health, and safety benefits including the following:

- Reduces strain on Wells 1, 3, and 11 in meeting maximum day and peak demands;
- Provides a reliable source of fire flow to the 200 Tract Upper Zone and protects the health and safety of residents in an area where wildfires are a major threat;
- Provides a source for fire protection in the event that a wildfire damages other critical infrastructure in the 200 Tract such as the booster pumps at the Twin Tanks site; and
- Provides reserve capacity to meet demand during an emergency event such as a waterline break, arsenic treatment plant failure, booster pump failure, or well pump failure.

Lumos is providing three alternatives for the High Tank issue with estimated costs. The first alternative is a rehabilitation using an internal liner material, the second is a complete replacement of the High Tank, and the third is to demolish the High Tank and make upgrades to the existing booster station at the Twin Tanks to provide a constant hydraulic pressure to the Upper Zone. Each of the alternatives is described below. GBWC is proposing the rehabilitation of the High Tank as its preferred alternative in its Action Plan.

High Tank Rehabilitation:
The High Tank would be rehabilitated using an internal NSF-61 liner material. A new steel floor would need to be installed as well as new roof supports. This would also include structural repairs to the tank prior to the liner installation, which addresses historical structural issues identified in previous engineering/inspection reports. New design plans would need to be generated and submitted to NDEP. The project would include the installation of cathodic protection to reduce corrosion and extend the service life of the new tank. This project has been established as a high priority project because it is critical for meeting fire flow storage requirements. The estimated costs and schedules for the High Tank rehabilitation are as follows:

- High Tank Rehabilitated (500,000 Gallons).

Estimated Cost: $613,622
Project Year: 2025-2026
Tier: High Priority (Preferred Alternative)

Anticipated Timeline for High Tank Rehabilitation

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	8 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	4 weeks
Project Design (plans, and specifications) –	15 weeks
Permit Submittals and Approvals – Completed (New Application)	4 weeks
Bid Advertisement and Award	6 weeks
Construction	25 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**68 weeks**

High Tank Replacement:

The High Tank would be removed and replaced with a new 500,000-gallon bolted steel tank. The design of the new tank has already been completed including a topographic survey, geotechnical investigation, and minor modifications to the contract documents to update them ready for bidding. Since the original design was for a welded steel tank, some design plan modifications and specification would need to be conducted before it could go out for bid. The project would include the installation of cathodic protection to reduce corrosion and extend the service life of the new tank. This project has been established as a high priority project because it is critical for meeting fire flow storage requirements. The estimated costs and schedules for the High Tank Replacement are as follows:

- High Tank Replacement (500,000 Gallons).
  Estimated Cost: $1,094,822
  Project Year: 2025-2026
  Tier: High Priority

Anticipated Timeline for High Tank Replacement

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review) – Completed	8 weeks
Capital Projects Review Team – Completed	2 weeks
Contract Negotiations – Completed	4 weeks
Design (survey, geotech, plans, and specifications) – Need modifications	15 weeks
Permit Submittals and Approvals – Completed (to be renewed)	4 weeks
Bid Advertisement and Award	6 weeks
Construction	32 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**75 weeks**

Booster Pump Modifications:

This alternative involves the complete demolition of the High Tank and modifications to the existing Twin Tank Booster Station to provide constant hydraulic pressure to the Upper Zone. The major modifications to the booster station would involve the integration of a maintenance pump, variable frequency drive, electrical upgrades, and reconfiguration of the piping systems. The way the booster station would operate is the maintenance pump would operate during times of very low demand to ensure the Upper Zone received constant hydraulic pressure. When there is an increase in demand, Pump 1 would turn on and run off the VFD until the demand reaches its full pumping capacity. Pump 1 would then be transferred to an alternative electrical starter system to run and the VFD would start to ramp up Pump 2 as water demand increases (the system would monitor pressures in the distribution waterlines). If Pump 2 reaches its full pumping capacity, it would also be switched over to an electrical starter system and Pump 3 would be started by the VFD and ramped up. This is the common operational system for booster pumps that provide hydraulic pressure to water systems. One concern with this alternative is it will need to be submitted to NDEP as a new water project for review. Since this alternative reduces fire flow in portions of the hydraulic water model (a hydraulic water model report is required with all the submittals), we don't believe that this project would be approved for construction by NDEP. Although this alternative is questionable, it has been established as a high priority project because it is critical for fire flow requirements in the Upper Zone. The estimated costs and schedules for the demolition of the High Tank and Booster Pump modifications are as follows:

- Twin Tank Booster Pump Modifications.
  Estimated Cost: $620,822
  Project Year: 2025-2026
  Tier: High Priority

Anticipated Timeline for Twin Tank Booster Pump Modifications

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	8 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	4 weeks
Project Design (plans, and specifications)	15 weeks
Permit Submittals and Approvals – Completed	4 weeks
Bid Advertisement and Award	6 weeks
Construction	32 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**75 weeks**

8.5 Maintenance/Monitoring/Inspection

Distribution System Monitoring

GBWC-SCD will use leak detection equipment and water loss audits in conjunction with the ongoing pipeline condition assessments to enhance distribution system monitoring. By closely monitoring the distribution systems, pipeline repair and replacement projects can be coordinated and scheduled prior to or in conjunction with annual road maintenance projects by Elko County and/or the SCA (when schedules allow). Projects by other dry utilities may also be taken into consideration for coordination. Coordination of improvements will reduce construction impacts and will be more cost effective. The cost for this effort is not included in the CIP because it should be budgeted separately for ongoing inspection and monitoring.

Storage Tank Inspections and Cleanings

To help ensure that the storage tanks remain in good condition, ongoing third-party tank inspections should be scheduled every 5 years along with routine maintenance for all storage tanks in the 200 Tract and the Housing Section. For the cathodic protection systems, this includes annual potential tests by a certified contractor to determine if the anodes are working properly. Regularly scheduled inspections and maintenance will help extend the useful lives of the tanks. The costs for the tank inspections and smaller-scale maintenance activities are not included in the CIP because it is budgeted for separately as ongoing inspection and maintenance.

Wire-to-Water Efficiency Tests/Well Monitoring

Due to the critical nature and dependency on groundwater, the wells should have a wire-to-water efficiency test conducted annually or bi-annually to determine the overall electrical efficiency of the pumping systems in the wells. Well hydraulic parameters are constantly changing, and these tests determine when a well needs cleaning (rehabilitation) due to plugging of the screens or a redesign of the pumping system to reduce annual electrical costs. Another option could be to integrate the SCADA System and Transducers with a program that extracts static water levels, pumping water levels and flow rates for each of the wells several time a month. The data can then be downloaded monthly into a spreadsheet and analyzed for changes in well parameter providing valuable insight for future well rehabilitations. A project cost is not being provided for this monitoring recommendation due to the nominal expense associated with them. For each well rehabilitation, it is also recommended that a wire-to-water efficiency test be conducted pre and post rehabilitation to determine the effectiveness of the rehabilitation and the resulting electrical cost savings.

8.6 Wastewater

WWTP Lift Station Rehabilitation

The interior of the concrete wet well for the WWTP Lift Station is showing signs of deterioration (e.g. exposed aggregates) from hydrogen sulfide gases generated from the sewer collection system. Rehabilitation of the concrete interior is needed to mitigate the corrosion damage, protect the concrete from further deterioration, and to extend the service life of the structure. Some of the internal metal components of the lift station are also in need of replacement due to corrosion. An interior liner system such as SprayWall, as manufactured by Sprayroq, is recommended for the concrete wet well (or an equal). SprayWall is a solvent-free, 100% solid, rigid polyurethane liner system that can provide structural reinforcement if needed in addition to corrosion protection. Rehabilitation work would include concrete surface repairs, spray application of the liner system, and bypass pumping while the station is out-of-service. As part of the project, the corroded internal metal components will be replaced with a corrosion resistant material such as stainless steel. Typically a 3–4-hour period is needed for installation of spray-on liner systems (concrete repairs, liner application, curing time, testing and inspection), but the total out-of-service duration will depend on the extent of repairs and also time for removal and reinstallation of the lift station pumps and internals (i.e., a 2-3+ day period total). Testing and inspection will be required by a third-party to ensure the integrity of the liner system and typically includes holiday/pinhole testing and adhesion testing. This project has been established as a high priority project because it is critical for ensuring conveyance of influent to the WWTP. The total budgetary capital cost for rehabilitation of the WWTP Lift Station is as follows:

- WWTP Lift Station Rehabilitation.
  Estimated Cost: $287,356
  CIP Year: 2025
  Tier: High Priority

Anticipated Timeline for WWTP Lift Station Rehabilitation

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	5 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	2 weeks
Project Design (plans, and specifications)	8 weeks
Permit Submittals and Approvals – Completed	4 weeks
Bid Advertisement and Award	6 weeks
Construction	12 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**43 weeks**

WWTP De-Ragging System Upgrades With WWTP Lift Station Rehabilitation

The increase in popularity of toilet wipes is creating mechanical and treatment issues at the Mar-Wood WWTP. The GBWC-SCD operators are removing approximately 70 pounds of wipes out of the Mar-Wood WWTP weekly. The existing de-ragging equipment was only designed to remove large rags and debris before entering the treatment train. Some research into de-ragging systems designed to remove these wipes has resulted in the Duperon Dual Auger System that can be installed into the WWTP Lift Station Inlet. A screen collects the wipes, and through an auger system, lifts the wipes out of the Lift Station and into a disposable bin that can be dumped periodically. This project can be incorporated into the Lift Station Rehabilitation Project thus providing cost savings for the two projects. This is the "preferred" alternative project in the Action Plan. This project has been established as a high priority project because it is critical for ensuring conveyance of rag/wipe free influent to the WWTP. The total budgetary capital cost to install the dual auger system with the WWTP Lift Station Rehabilitation is as follows:

- WWTP Lift Station De-Ragging System with WWTP Lift Station Rehabilitation.
  Estimated Cost: $609,196
  CIP Year: 2026
  Tier: High Priority (Preferred Alternative)

Anticipated Timeline for De-Ragging System and WWTP Lift Station Rehabilitation

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	8 weeks
Capital Projects Review Team	2 weeks
Contract Negotiations	2 weeks
Project Design (plans, and specifications)	8 weeks
Permit Submittals and Approvals – Completed	4 weeks
Bid Advertisement and Award	6 weeks
Construction	12 weeks
Project Closeout	4 weeks
Total Estimated Project Time	**46 weeks**

WWTP SCADA Upgrades

The current SCADA system associated with the Mar-Wood WWTP is very limited in its functions and ability to monitor critical components. An upgraded system is needed in order to better monitor the condition of the WWTP Lift Station and Mar-Wood WWTP. GBWC is looking to add RTU's to the WWTP Lift Station and Mar-Wood WWTP along with an upgraded SCADA system in order to monitor and control specific attributes in the systems. These would include flow rates, pumps (on/off), water levels, and call-out alarms in the WWTP Lift Station. Regarding the Mar-Wood WWTP, GBWC-SCD wants the ability to monitor dissolved oxygen, blowers (on/off), effluent pumps and flows, chlorine residual, and run times. This project has been established as a low priority project because, while additional monitoring of the WWTP facility would reduce physical inspections, it isn't necessary for day-to-day operation of the WWTP. Based on upgrades conducted to the GBWC-PD, the following cost estimate has been budgeted for the upgrades:

- WWTP SCADA Upgrades.
  Estimated Cost: $100,000
  CIP Year: 2026
  Tier: Low Priority

  Anticipated Timeline

Tasks	Est. Time
Request for Engineering Services Proposal (develop, advertise, review)	6 weeks
Capital Projects Team Review (develop, review, and approve)	2 weeks
Contract Negotiations	2 weeks
Study/Construction Timeframe	16 weeks
Project Close-Out	2 weeks
Total Estimated Project Time	**28 weeks**

8.7 Action Plan Project Timeline

Table 8.02 is a schedule of the project timeline for the water and wastewater projects proposed for the 3-year Action Plan.

Table 8.02: Scheduled Timeline for Action Plan Water & Wastewater Projects

Year	200 Tract		Housing Section				Total Annual CIP Cost
	200 Tract Projects	Project Costs	100 Tract Projects	300 Tract Projects	400 Tract Projects	Project Costs	
2025	High Tank Rehab*	$153,406	Rehab WWTP Lift Station & De-ragging	-	-	$609,196	$2,262,602
	Pipeline Replacement Project: $1,500,000						
2026	High Tank Rehab* (cont.)	$460,217	WWTP SCADA Upgrades	-	Well 12 Replacement	$1,231,479	$2,731,479
	Pipeline Replacement Project: $1,500,000						
2027	-	-	-	-	Well 12 Replacement	$771,262	$2,272,262
	Pipeline Replacement Project: $1,500,000						
3-Year Action Plan Total							**$7,266,343**
*Note: Action Plan CIP assumes the rehabilitation of the High Tank Cost.							

SECTION 9.0: FUNDING PLAN

The Funding Plan is detailed in Volume I, Section 9 of this 2024 IRP filing.

SECTION 10.0: SYSTEM IMPROVEMENT RATE REQUEST

GBWC-SCD is requesting that the following projects described in the Action Plan be designated eligible for a System Improvement Rate (SIR) under NRS 704.663(3) and NAC 704.6339: (i) Well-12 Replacement; (ii) 2025 Pipeline Replacement Project; (iii) 2026 Pipeline Replacement Project; (iv) 2027 Pipeline Replacement Project; (v) High Tank Rehabilitation/Replacement/Booster Modification Project; and (vi) WWTP Lift Station Rehabilitation and De-Ragging System.

NAC 704.6339 states that requests for SIR must include the following information:

(1) A description of the project.
(2) A statement explaining the necessity of the project.
(3) The resulting benefits of the project to the utility and the customers of the utility upon the completion of the project.
(4) A statement supported by written testimony that the project is not designed to increase revenues by connecting an improvement to a distribution system or wastewater system to new customers.
(5) A statement that the project was not included in the rate base of the utility in its most recent general rate case.
(6) A statement that the project costs for which recovery will be sought represent an investment to be made by the utility and which will not be paid by another funding source, including, without limitation, a grant, developer contribution or other form of reimbursement.
(7) If submittal to the Commission is not otherwise required by law or regulation, the utility's plan for construction and the proposed schedule for construction. A plan for construction and a proposed schedule for construction submitted pursuant to this paragraph must comply with the provisions of paragraph (a) of subsection 4 of NAC 704.568.
(8) If submittal to the Commission is not otherwise required by law or regulation, a budget of planned expenditures complies with the provisions of NAC 704.5681.

10.1 Description of Each SIR Project

10.1.1 Water Resources

Well 12 Replacement Project

Well 12 in the 400 Tract was recently rehabilitated in 2023. The well has multiple sweged patches in the screen intervals and is at the end of its useful life. The plan is to redrill the well site and abandon the old Well 12. See Section 8.2 (Water Resources) for additional details on the project.

10.1.2 Water Distribution

2025 Pipeline Replacement Project

This project involves the replacement of pipelines as prioritized by on-going pipeline condition monitoring and assessments. Pipelines to be considered for replacement are those that are undersized, are subject to frequent breaks and leaks, and/or have poor condition ratings (e.g.

condition ratings of "very poor" and "poor"). Pipeline replacements will be planned in coordination with Elko County and the SCA to coincide with annual road repair projects in 2025. See Section 8.3 (Water Distribution) for additional detail on the proposed project.

2026 Pipeline Replacement Project
This project involves the replacement of pipelines as prioritized by on-going pipeline condition monitoring and assessments. Pipelines to be considered for replacement are those that are undersized, are subject to frequent breaks and leaks, and/or have poor condition ratings (e.g. condition ratings of "very poor" and "poor"). Pipeline replacements will be planned in coordination with Elko County and the SCA to coincide with annual road repair projects in 2026. See Section 8.3 (Water Distribution) for additional detail on the proposed project.

2027 Pipeline Replacement Project
This project involves the replacement of pipelines as prioritized by on-going pipeline condition monitoring and assessments. Pipelines to be considered for replacement are those that are undersized, are subject to frequent breaks and leaks, and/or have poor condition ratings (e.g. condition ratings of "very poor" and "poor"). Pipeline replacements will be planned in coordination with Elko County and the SCA to coincide with annual road repair projects in 2027. See Section 8.3 (Water Distribution) for additional detail on the proposed project.

10.1.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project
This project involves decommissioning and either rehabilitating/replacing or modifying the Booster Station in the Upper Pressure Zone of 200 Tract. The preferred alternative is the rehabilitation of the 500,000-gallon High Tank. See Section 8.4 (Water Storage) for additional detail on the proposed project.

10.1.4 Wastewater

Wastewater Lift Station Rehabilitation and De-Ragging System Project
The interior of the concrete wet well for the WWTP Lift Station is showing signs of deterioration (e.g. exposed aggregates) from hydrogen sulfide gases generated from the sewer collection system. Rehabilitation of the concrete interior is needed to mitigate the corrosion damage, protect the concrete from further deterioration, and to extend the service life of the structure. Some of the internal metal components of the lift station are also in need of replacement due to corrosion. Additionally, the increase in popularity of toilet wipes is creating mechanical and treatment issues at the Mar-Wood WWTP. The GBWC-SCD operators are removing approximately 70 pounds of wipes out of the Mar-Wood WWTP weekly. The existing de-ragging equipment was only designed to remove large rags and debris before entering the treatment train. This is the preferred alternative to solve both issues. See Section 8.6 (Wastewater) for additional details on the proposed project.

10.2 Need for Each SIR Project

10.2.1 Water Resources

Well 12 Replacement Project
Well 12 is one of three wells located in the 400 Tract. In the summer months all three wells are utilized to meet the demand. The loss of Well 12 would result in a serious deficiency during the high summer months requiring water rationing. The production from this well provides approximately 1/3 of the summer demand. The replacement of Well 12 will ensure production needs are met in the 400 Tract. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.2 (Water Resources).

10.2.2 Water Distribution

2025 Pipeline Replacement Project
This project replaces aging and undersized pipelines and will materially improve service and reliability by reducing pipeline breaks, leaks, and NRW. Moreover, this project is also needed for statutory and regulatory compliance as NDEP identified the distribution system leaks and fire flow capacity as significant deficiencies in the January 6, 2021, sanitary survey letters. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2026 Pipeline Replacement Project
This project replaces aging and undersized pipelines and will materially improve service and reliability by reducing pipeline breaks, leaks, and NRW. Moreover, this project is also needed for statutory and regulatory compliance as NDEP identified the distribution system leaks and fire flow capacity as significant deficiencies in the January 6, 2021, sanitary survey letters. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2027 Pipeline Replacement Project
This project replaces aging and undersized pipelines and will materially improve service and reliability by reducing pipeline breaks, leaks, and NRW. Moreover, this project is also needed for statutory and regulatory compliance as NDEP identified the distribution system leaks and fire flow capacity as significant deficiencies in the January 6, 2021, sanitary survey letters. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

10.2.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project
This project rehabilitates or replaces the 500,000-gallon High Tank or modifies the existing booster station, to mitigate aging infrastructure. The High Tank is in poor structural condition, has exceeded its nominal useful life expectancy. This project is critical to continue supporting fire protection needs in the 200 Upper Zone of the 200 Tract. Moreover, this project is also needed for statutory and regulatory compliance as NDEP identified the poor condition of the existing tank

as a "significant deficiency" in its January 6, 2021, sanitary survey letter. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.4 (Water Storage).

10.2.4 Wastewater

WWTP Lift Station Rehabilitation and De-Ragging System Project

The WWTP Lift Station needs to be rehabilitated in order to ensure it extends out to the remaining of its useful life. The hydrogen sulfide gas corroding the metal equipment in the lift station and causing deterioration of the concrete walls needs to be mitigated. The de-ragging system will ensure proper operation of the treatment facility without clogging up the treatment processes. See Sections 2.4.1.2 and 2.4.2.1 (WWTP Lift Station Existing Conditions and WWTP Existing Conditions). See Section 8.6 (Wastewater).

10.3 Benefit of Each SIR Project

10.3.1 Water Resource

Well 12 Replacement Project

This project will ensure a reliable and consistent water supply to customers for years to come. See Section 4.2.2 (System Deficiencies and Alternatives for Improvement and Section 8.2 (Water Resources).

10.3.2 Water Distribution

2025 Pipeline Replacement Project

This project will improve service reliability to customers, reduce operating costs associated with repairing waterline breaks and leaks, and will reduce NRW in the system. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2026 Pipeline Replacement Project

This project will improve service reliability to customers, reduce operating costs associated with repairing waterline breaks and leaks, and will reduce NRW in the system. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2027 Pipeline Replacement Project

This project will improve service reliability to customers, reduce operating costs associated with repairing waterline breaks and leaks, and will reduce NRW in the system. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

10.3.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project

This project will ensure a reliable source for fire protection needs is maintained in the 200 Upper Zone and protects the health and safety of residents in an area where wildfires are a major threat. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.4 (Water Storage).

10.3.4 Wastewater

WWTP Lift Station Rehabilitation and De-Ragging System Project
The rehabilitation and installation of the De-Ragging system will ensure the reliability of the WWTP Lift Station continued operation and with rag-free influent to the wastewater treatment plant. See Sections 2.4.1.2 and 2.4.2.1 (WWTP Lift Station Existing Conditions and WWTP Existing Conditions). See Section 8.6 (Wastewater).

10.4 Project Supports Current Customers

The projects are not designed to increase revenues to existing customers by making improvements to a distribution system or wastewater system for new customers but would instead help to maintain or enhance the existing customers' LOS.

10.4.1 Water Resource

Well 12 Replacement Project
This project will continue to provide a reliable water supply to the customers in the 400 Tract. See Section 4.2.2 (System Deficiencies and Alternatives for Improvement) and Section 8.2 (Water Resources).

10.4.2 Water Distribution

2025 Pipeline Replacement Project
This project will benefit existing customers in all Tracts by improving water supply reliability, reducing service interruptions from water main breaks, and improving fire flow deliveries and pressures. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2026 Pipeline Replacement Project
This project will benefit existing customers in all Tracts by improving water supply reliability, reducing service interruptions from water main breaks, and improving fire flow deliveries and pressures. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

2027 Pipeline Replacement Project
This project will benefit existing customers in all Tracts by improving water supply reliability, reducing service interruptions from water main breaks, and improving fire flow deliveries and pressures. See Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and Section 8.3 (Water Distribution).

10.4.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project
This project will provide the necessary fire protection source to protect the health and safety of existing customers in the 200 Upper Zone and will help maintain the LOS for fire protection that is currently being provided. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.4 (Water Storage).

10.4.4 Wastewater

WWTP Lift Station Rehabilitation and De-Ragging System Project
This project will provide reliable and consistent conveyance of the 100 Tract customers influent to the treatment facility Tract by rehabilitating and modifying aging infrastructure. See Section 2.4.1.2 and 2.4.2.1 (WWTP Lift Station and WWTP Existing Conditions), Section 8.6 (Wastewater).

10.5 Statement that Each Project is not Included in Rate Base

The projects listed in Section 10.1 are not included in the Company's current rate base and are, therefore, not included in the Company's current rates. See the Direct Testimony of Terry J. Redmon.

10.6 Funding by Utility Investment

The projects listed in Section 10.1 will be entirely funded through traditional funding sources using GBWC's debt and equity investment resources and will not be paid by another funding source including, without limitation, a grant, developer contribution, or other form of reimbursement. See Section 9.0 (Funding Plan).

10.7 Construction Schedule for Each Project

10.7.1 Water Resource

Well 12 Replacement Project
This project is scheduled for construction in 2026-2027. See Section 8.2 (Water Resource).

10.7.2 Water Distribution

2025 Pipeline Replacement Project
This project is scheduled for construction in 2025. See Section 8.3 (Water Distribution).

2026 Pipeline Replacement Project
This project is scheduled for construction in 2026. See Section 8.3 (Water Distribution).

2027 Pipeline Replacement Project
This project is scheduled for construction in 2027. See Section 8.3 (Water Distribution).

10.7.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project
This project is scheduled for construction in 2025 – 2026. See Section 8.4 (Water Storage).

10.7.4 Wastewater

WWTP Lift Station Rehabilitation and De-Ragging System Project
This project is scheduled for construction in 2026. See Section 8.6 (Wastewater).

10.8 Project Budget for Each Project

10.8.1 Water Resource

Well 12 Replacement Project
The total estimated cost for this project is $1,542,524 (including construction and non-construction costs). See Section 8.2 (Water Resource), Section 9.1 of Volume I (Introduction), and Appendix I.

10.8.2 Water Distribution

2025 Pipeline Replacement Project
The total estimated cost for this project is $1,500,000 per year allocated for all Tracts (includes construction and non-construction costs). See Section 8.3 (Water Distribution), Section 9.1 of Volume I (Introduction), and Appendix I.

2026 Pipeline Replacement Project
The total estimated cost for this project is $1,500,000 per year allocated for all Tracts (includes construction and non-construction costs). See Section 8.3 (Water Distribution), Section 9.1 of Volume I (Introduction), and Appendix I.

2027 Pipeline Replacement Project
The total estimated cost for this project is $1,500,000 per year allocated for all Tracts (includes construction and non-construction costs). See Section 8.3 (Water Distribution), Section 9.1 of Volume I (Introduction), and Appendix I.

10.8.3 Water Storage

High Tank Rehabilitation/Replacement/Booster Modification Project
The total estimated cost for this project is $613,622 (includes construction and non-construction costs). See Section 8.4 (Water Storage), Section 9.1 of Volume I (Introduction), and Appendix I.

10.8.4 Wastewater

WWTP Lift Station Rehabilitation and De-Ragging System Project
The total estimated cost for this project is $609,196 (including construction and non-construction costs). See Section 8.6 (Wastewater), Section 9.1 of Volume I (Introduction), and Appendix I.