Final Report

City of Lander
2022 Water Master Plan
Level I Study

August 2, 2023

FINAL REPORT

For

CITY OF LANDER

Prepared for:

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ABBREVIATIONS

ADD – Average Day Demand

A&I-EAD - Wyoming Office of Administration & Information – Economic Analysis Division

CFS – Cubic Feet Per Second

CMP – Corrugated Metal Pipe

COLP – City of Lander Pipeline

CWC – Central Wyoming College

DIP - Ductile Iron Pipe

DWSRF – Drinking Water State Revolving Fund

EMAG - Electromagnetic

FPS – Feet Per Second

GPCD – Gallons Per Capita Per Day

GPD – Gallons Per Day

GPM – Gallons Per Minute

GPM/SF – Gallons Per Minute Per Square Foot

HDPE – High Density Polyethylene

HRI – Healthy Rivers Initiative

LCR – Lead and Copper Rule

MDD – Maximum Day Demand

MRI – Meurer Research Incorporated

NRCS – National Resources Conservation Service

PACD – Popo Agie Conservation District

PIFR – Preliminary Investigation Feasibility Report

PRV – Pressure Reducing Valve

PSI – Pounds per Square Inch

PVC – Polyvinyl Chloride

RCP – Reinforced Concrete Pipe

SEO – State Engineer's Office

SCFM/SF - Standard Cubic Feet Per Minute Per Square Foot

UNK – Unknown

USDA – United States Department of Agriculture

USEPA – United States Environmental Protection Agency

VFD – Variable Frequency Drive

WDEQ – Wyoming Department of Environmental Quality

WRM – Worthen Meadows Reservoir

WTP – Water Treatment Plant

WWDC – Wyoming Water Development Commission

WWDO – Wyoming Water Development Office

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1 Introduction

1.1 Background and Purpose

The City of Lander's (City) last Water Master Plan, completed in 2011, was primarily concerned with addressing significant hydraulic issues within the City's water transmission and distribution system. Since that time, construction projects implemented by the City have largely resolved the hydraulic issues identified in that report.

In anticipation of the next twenty years of goals for the City's municipal water system, the following have been identified as planning focus areas:

- Water Supply – Evaluating the adequacy of the City's water supply to meet future growth and expansion over an extended planning period up to 50 years.
- System Expansion – Establishing transmission main corridors, pressure zone limits, and pipeline size requirements for localized system expansion.
- Regionalization – Evaluating the possibility of teaming with other systems in Fremont County to withstand staffing, regulatory, funding, and supply challenges.
- Reliable Service – Ensuring dependability of the City's water system infrastructure.
- Fiscal Responsibility – Conducting sufficient financial planning to meet future demands and maintain system.

The purpose of this study is to provide recommendations for the City that are pertinent to the core areas listed above to help them successfully meet their goals.

1.2 Scoping and Project Meetings

A project kickoff meeting was held with the Wyoming Water Development Office (WWDO) Project Manager, City Engineer, and Consultant Project Manager on April 28th, 2021, in which information flow, Pay Requests, Tasks, Scoping, Next Steps, and Deliverables were discussed.

After a preliminary review of the existing information was made, a project scoping meeting was held at Lander City Hall on August 3rd, 2021. The meeting was well attended: two Wyoming Water Development Commissioners, two Wyoming Water Development Office staff (including the WWDO Project Manager), the City Engineer, City Assistant Mayor, and four (4) consultant staff from the project team (including the Consultant Project Manager). The project scope and schedule were reviewed, along with discussion of system regionalization options, growth areas, the expansion of Worthen Meadows Reservoir, integrating capital improvements projects with planned transportation, storm, and sanitary sewer projects, and topics of the three (3) planned public meetings.

Three public meetings were held for the project. Newspaper advertisements were published for all three meetings per the scope of services. The last two public meetings had social and digital media advertisements as well as print.

The first public meeting presenting an overview of the project as presented by Consultant Staff was held on December 16th, 2021. The meeting was attended by ten members of the public, including one Water Development Commissioner.

The second public meeting occurred on June 1st, 2022, and covered the Project Development Process, presented by the WWDO Project Manager; past, present, and future capital improvements projects, as presented by the Consultant Project Manager; and a presentation on different types of regional water system options available, as presented by Consultant Staff. The meeting was attended by twenty-eight individuals. A virtual attendance option was made available, and four members of the public utilized this method.

The third and final public meeting occurred on March 21st, 2023, and covered draft report recommendations. Prior to and around the time of the meeting for approximately a month, a hard copy of the draft master plan was made available for viewing at City Hall. Three members of the Consultant staff presented (two virtually) with focus given to water supply and rate setting recommendations. The meeting was attended by sixteen individuals and included a digital attendance option.

1.3 Summary of Recommendations

The 20-year capital improvements plan for this study is a blend of projects that address the City's goals of ensuring reliable water supply well into the future, providing a path for both local system expansion and regional partnerships, prioritizing existing system upgrades for failing elements, and enacting a financial plan that enables the accomplishment of all goals.

Recommendations ` from this study, including costs and schedule, are summarized in Table 1-1.

Table 1-1 - Summary of Recommendations

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
1	City of Lander Pipeline Condition Assessment	2024	$ 35,000.00	$ 36,050.00	cash
2	Worthen Meadows Outlet Gate Rehabilitation	2024	$ 100,000.00	$ 103,000.00	cash
3	PRV Station Metering	2024	$ 85,000.00	$ 87,550.00	cash
4	Planning Water Service Map	2025	$ 20,000.00	$ 21,218.00	cash
5	Worthen Meadows Enlargement Level II Study	2025	$ 450,000.00	$ 477,405.00	100% grant
6	Regionalization Level II Study	2025	$ 650,000.00	$ 689,585.00	100% grant
7	Distribution Metering and LCR Compliance Project	2026	$ 5,102,001.45	$ 5,575,094.74	debt
8	Non-Potable Water System Level II Study	2026	$ 150,000.00	$ 163,909.05	100% grant
9	High Pressure Zone Tank Rehabilitation	2026	$ 1,392,300.00	$ 1,521,403.80	debt
10	Intake Structure Rehabilitation	2027	$ 1,000,000.00	$ 1,125,508.81	67% grant, 33% debt
11	Lincoln Street Transmission Line	2027	$ 2,443,225.00	$ 2,749,871.26	67% grant, 33% debt
12	Distribution System Improvements Budgeting I	2028	$ 1,000,000.00	$ 1,159,274.07	debt
13	Lander Valley HS Raw Water Conversion	2028	$ 734,700.00	$ 851,718.66	67% grant, 33% cash
14	McFarland Drive Pipeline	2029	$ 682,500.00	$ 814,940.69	debt
15	Industrial Park Bulk Fill Station	2029	$ 554,872.50	$ 662,546.78	debt
16	WTP Improvements Phase I	2030	$ 1,379,762.50	$ 1,696,933.84	debt
17	5th Street Transmission Line	2030	$ 2,443,350.00	$ 3,005,012.31	67% grant, 33% debt

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
18	N. 5th Street Pipeline	2031	$ 1,442,805.00	$ 1,827,702.21	debt
19	Lander City Park Raw Water Conversion	2031	$ 432,250.00	$ 547,561.37	67% grant, 33% cash
20	Hillcrest Drive Transmission Line	2032	$ 1,162,400.00	$ 1,516,668.35	67% grant, 33% cash
21	Baldwin Creek Transmission Line	2032	$ 1,771,090.00	$ 2,310,870.74	67% grant, 33% debt
22	Mortimore Lane East Transmission Line	2033	$ 5,512,150.00	$ 7,407,868.67	67% grant, 33% debt
23	Goodrich Connector Pipeline	2033	$ 272,625.00	$ 366,385.20	cash
24	Distribution System Improvements Budgeting II	2034	$ 1,000,000.00	$ 1,384,233.87	debt
25	Sewer Lagoon Bulk Fill Station	2034	$ 550,000.00	$ 761,328.63	cash
26	Buena Vista Drive Transmission Line	2035	$ 2,854,700.00	$ 4,070,119.60	67% grant, 33% debt
27	Mortimore Lane West Transmission Line	2035	$ 2,234,400.00	$ 3,185,720.13	67% grant, 33% cash
28	Industrial Park Improvements/Annexation	2036	$ 1,995,525.00	$ 2,930,495.74	67% grant, 33% special improvements district fees
29	Grandview/Valleyview Pipeline	2036	$ 2,313,675.00	$ 3,397,709.74	debt
30	N. 1st Street Transmission Line	2037	$ 4,586,400.00	$ 6,937,341.51	67% grant, 33% cash
31	S. 1st Street Pipeline	2037	$ 859,950.00	$ 1,300,751.53	debt
32	Mortimore Lane to Squaw Creek Transmission Line	2038	$ 3,777,650.00	$ 5,885,455.61	67% grant, 33% cash
33	Cascade Street Pipeline	2038	$ 3,076,027.50	$ 4,792,350.62	debt
34	Loop Drive to Spriggs Connector Transmission Line	2039	$ 1,749,900.00	$ 2,808,075.80	67% grant, 33% cash
35	Mager 2 Transmission Line	2039	$ 3,214,575.00	$ 5,158,449.20	67% grant, 33% cash

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
36	Distribution System Improvements Budgeting III	2040	$ 1,000,000.00	$ 1,652,847.63	cash
37	County Shop Bulk Fill Station	2040	$ 554,872.50	$ 917,119.70	cash
38	WTP Improvements Phase II	2040	$ 259,350.00	$ 428,666.03	cash
39	Infiltration Gallery Rehabilitation	2041	$ 2,000,000.00	$ 3,404,866.12	67% grant, 33% cash
40	Exchange Petition Update for Infiltration Gallery	2041	$ 35,000.00	$ 59,585.16	cash
41	North 2nd Street Transmission Line - Phase I	2041	$ 3,537,575.00	$ 6,022,484.64	67% grant, 33% cash
42	Redd Fox Improvements/Annexation	2042	$ 1,247,610.00	$ 2,187,691.69	67% grant, 33% special improvements district fees
43	North 2nd Street Transmission Line - Phase II	2042	$ 4,902,575.00	$ 8,596,694.94	67% grant, 33% cash
44	Deer Valley Expansion	2043	$ 100,000.00	$ 180,611.12	67% grant, 33% cash
45	WLRC Improvements/Annexation	2043	$ 1,030,575.00	$ 1,861,333.09	67% grant, 33% special improvements district fees
46	Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study	2043	$ 400,000.00	$ 722,444.49	75% Grant, 25% cash or loan
47	Lyons Valley Transmission Line	2044	$ 28,182,610.00	$ 52,427,956.40	67% grant, 33% special improvements district fees
48	Distribution System Improvements Budgeting IV	2044	$ 1,000,000.00	$1,860,294.57	cash

1.4 Review of Existing Information

1.4.1 Previous Studies

Since 1977 a total of sixteen studies have been completed for the City of Lander and three additional studies completed within the Popo Agie River watershed. Following is a list of known studies, fifteen of which are available through the University of Wyoming's Water Resources Data System Library (WRDS):

1. 1977 Water System Improvements Project (November 1977 - GENGE/CALL Engineering)
2. Lander Rehabilitation Project Level II Feasibility Study, Phase I, Flood Routing and Incremental Damage Analysis (November 1987 – ARIX Corporation)
3. Lander Rehabilitation Project Level II Feasibility Study, Phase II, Geotechnical Investigation and Rehabilitation Plan for Worthen Meadows Dam and Reservoir (December 1988 – ARIX Corporation)
4. Lander Water Supply Master Plan Level I Report (October 1996 – JFC Engineers)
5. Lander Water Supply Project Level II Study, Phase II Report (July 1998 – Nelson Engineering)
6. City of Lander Taylor Ditch Rehabilitation Project Level II Feasibility Study, Phase II Report (November 1998 – GEI Consultants)
7. Lander Water Supply Project Level II, Phase III, Final Report (December 1999 – Nelson Engineering)
8. Lander Level II Paleozoic Aquifer Well Siting Study, Final Report (November 2002 – Weston Engineering)
9. Popo Agie River Watershed Level I 2003 Study (July 9, 2003, Anderson Consulting, Inc. Engineers)
10. Lander Level II Water Supply Project, Final Report (August 2004 – Weston Engineering)
11. Lander Level II Water Supply Project, Exploration Well Deepening, Final Report (October 2007 – Weston Engineering)
12. Enterprise Conservation Program Level II Study, Final Report (September 2008 – Aqua Engineering, Inc.).
13. Lander Master Plan Level I Study, Final Report (October 2011 – TriHydro Corporation)
14. City of Lander Comprehensive Master Plan (December 2012 – Orion Planning Group & Dowl HKM)
15. Lander High Pressure Water System Upgrades Design Report (October 2013 – Dowl HKM)
16. City of Lander Tank and Pump Station Feasibility Study (September 2019 – HDR Engineering)
17. Popo Agie River Watershed Level II, Phase II 2019 Study (November 15, 2019, Olsson).
18. Lander Test Well Level II Study, Groundwater Development Alternatives and Evaluation of the Alluvial Aquifer as a Municipal Water Supply, Final Report, Volumes I & II (October 2020 – October 2021 Wyoming Groundwater, Hinkley Consulting, and WWC Engineering)
19. Middle Popo Agie River, Lander, Wyoming – Section 205-Flood Risk Management, Final Integrated Feasibility Report and Environmental Assessment (March 2021 – U.S. Army Corps of Engineers)

Recommendations and their respective status' up to 2010 are covered in the previous Level I Master Plan and will not be discussed here as there have been no known changes since that time. A list of the studies completed since 2010, recommendations, and status of those recommendations is provided below:

1.4.1.1 2010 LANDER MASTER PLAN LEVEL I STUDY – TRIHYDRO CORPORATION (OCTOBER 2011)

Recommendations generated from this study can be broken into three basic categories:

- Water line installations/system upgrades
- System operations and maintenance
- Water usage and rates

Each of these categories is discussed below:

Water Line Installations/Upgrades

This category of recommendations stems from either the system's modelled inability to meet fire-flow performance criteria or the need to loop dead-end lines and open up areas to the north and west of the City limits to development. The primary finding from this study was that there were many areas in the system that were deficient in meeting fire-flow demands. Out of 109 modeled fire flow nodes, 44 failed to meet the minimum fire-flow requirements. Four of six system improvements recommendations were driven from this finding. The remaining two related to looping dead end lines. The recommendations and their status follow:

- Replace 8-inch pipe feeding the WLRC and Dillon subdivisions under Poor Farm Road with a 12-inch.
  Status: Completed. Loop installed.
- Replace 8-inch pipe under North 4th between Main and Lincoln with a 10-inch.
  Status: Disregarded. The modeled fire-flow issues that these projects were intended to address were largely resolved with looping completed during the Lander High Pressure Water System Upgrades Projects recommended in the 2013 DOWL design report.
- Replace 4- and 6-inch pipe under Washington between 1st and 2nd with 10-inch.
  Status: Disregarded. The modeled fire-flow issues that these projects were intended to address were largely resolved with looping completed during the Lander High Pressure Water System Upgrades Projects recommended in the 2013 DOWL design report.
- Replace the 10-inch transmission main from Sinks Canyon Road to the Rodeo tank and High Pressure Zone bypass with a 16-inch bypass
  Status: Completed 2017
- Replace 8-inch Rodeo Tank bypass with a 10-inch bypass.
  Status: Completed 2017. Line was upgraded to 16-inch.
- Replace 8-inch hospital bypass with a 10-inch bypass.
  Status: Completed 2017. Line was upgraded to a 16-inch.
- Upgrade 8-inch lines under East Main from PRV vault to Kingdom Hall with 10-inch.
  Status: Disregarded – Further analysis was also recommended. The intent of this upgrade was to meet fire-flow performance criteria in the system. The Lander High Pressure Water System Upgrades Projects recommended in the 2013 DOWL design report resolved the modeled inability to meet fire-flow through system looping installed during those Projects.
- Replace 8-inch pipes under Buena Vista Drive with 12-inch pipes.
  Status: in-progress. Project is currently under design. Construction planned to occur during 2022-2024.
- Replace all 6-inch pipes within the Popo Agie Heights and Chevy Chase subdivisions with 8-inch pipes.
  Status: Disregarded. With Phase II HPWL upgrades, flow requirements met.
- Replace 4-inch pipe under Sage Street with a 6-inch pipe.
  Status: Completed.
- West Annexation: This recommendation included the installation of 12-inch line westwards from Fremont Street down Squaw Creek Road and then northwards to an existing water line on Waterfowl Way. It also included the installation of an 8-inch line westward from Spriggs Avenue.
  Status: Updated. Looping will be accomplished by running water lines down planned transportation corridors as those areas are developed. Updates to this recommendation will be included in this report.

- North Annexation: This recommendation included the installation of 12-inch and 8-inch pipe directly north of the city limits to allow for growth and expansion, along with looping.
  Status: Updated. Looping will be accomplished by running water lines down planned transportation corridors as those areas are developed. Updates to this recommendation will be included in this report.

System Operations and Maintenance
Recommendations and their status for this category follow:

- Develop emergency action procedures and a chain of command to address natural disasters, civil disorders, vandalism/terrorism.
  Status: Completed 2019
- Track and compare water consumption and production data at the smallest time interval available with the current data acquisition.
  Status: Completed 2015. More accurate meters needed at Water Treatment Plant.
- Systematically inspect fire hydrants, including stem valves, drains, isolation valves, and flow.
  Status: Completed. Inspect annually.
- Develop a water conservation ordinance and include residential and commercial audits to verify compliance. Ordinances should also include fines for non-compliance to incentivize compliance and add an additional revenue stream.
  Status: Captured in tiered rate structure.
- Digitize records of breaks and disruptions in service into a searchable database or geospatial representation and track trends to assist in prioritizing projects in the capital replacement program.
  Status: Completed. Records contained and managed through ArcGIS, Stacker, and Doppler programs.
- Send customer feedback surveys and conservation education flyers along with the annual water report published by the water treatment plant.
  Status: Completed and ongoing.
- Develop a program for implementing and tracking regularly scheduled preventative maintenance work with defined procedures.
  Status: Completed and ongoing.
- Develop a program for prioritizing non-emergency failures.
  Status: Completed: Stacker, ArcGIS programs are used.
- Develop a protocol for assigning manpower and equipment for emergency response.
  Status: Completed and ongoing.
- Prioritize and schedule replacement of 4-inch pipes with 6-inch pipes or larger to comply with WDEQ rules and regulations.
  Status: In-progress. Planned completion in 2030-2040. Hydraulic analysis completed for this study recommends an increase in all distribution mains to 8-inch when replaced.
- Inventory fire hydrants connected to 4-inch lines or dead end 6-inch lines greater than 250 ft. in length and either loop the line or increase the line size to comply with WDEQ rules and regulations.
  Status: In-progress. A table detailing remaining hydrants fitting these classifications is provided in the body of this report.

- Develop a prioritized schedule to repair and replace broken fire hydrants and hydrants without drain valves.
  Status: Disregarded. CIP takes into account needed hydrant replacements in prioritizing, however, not cost-effective to replace individual hydrants outside of normal CIP projects.
- Implement a fire hydrant color-coding scheme and coordinate with the fire department to develop operating procedures so their pumper truck does not exceed the capacity of the distribution system under fire-flow demands.
  Status: Completed in 1980's. No longer concerns since fire-flow concerns have been resolved.
- Implement surge and sediment protection for the PRV's.
  Status: Completed.

Water Usage and Rates
Recommendations and their status for this category follow:

- Revise the rate structure with a system-specific service availability charge and a commodity charge that will support the capital program.
  Status: Completed in the past. Redoing this in the current master plan.
- Impose the rate structure to create consumer awareness and encourage conservation.
  HRT Status: Completed.
- Continue the current practice of annually adjusting water rates.
  Status: Completed and ongoing.
- Restructure the current rate method and follow a recognized "cost of service" methodology that prices the water commodity at its true value.
  Status: Completed.
- Combine a more restrictive conservation block rate with the suggested method after the rate change has developed a usage history (approximately 3 years).
  Status: Completed
- Separate the "enterprise fund" into a water enterprise fund and a sewer enterprise fund.
  Status: Completed.
- Develop tap fees that reflect actual costs.
  Status: In-progress.
- Revise charges for out-of-town water hauling services to be consistent with Wyoming statutes.
  Status: Completed.
- Implement System Development Fees to support expansion necessary to serve growth.
  Status: In-progress

1.4.1.2 CITY OF LANDER COMPREHENSIVE MASTER PLAN – DOWL HKM AND ORION PLANNING GROUP (DECEMBER 2012)

The 2012 Lander Master Plan includes a host of recommendations not specifically related to water usage. Review of this report was relevant to the current water master planning in terms of projected growth areas and densification of existing neighborhoods. Growth and densification projections from this 2012 Master Plan were vetted and updated with City staff and included in the hydraulic modeling and growth projections analysis conducted for this report.

1.4.1.3 LANDER HIGH PRESSURE WATER SYSTEMS UPGRADES DESIGN REPORT – DOWL HKM (OCTOBER 2013)

Following up on the 2010 Water Master Plan findings of poor fire-flow performance and pressure surging across the City's water system, this design report made design recommendations that aimed to mitigate these issues. Recommendations and their status follows:

- Upsize remaining Rodeo Transmission Line from Ellis Tank to Rodeo Tank
- Install transmission main past the airport to provide higher pressures and fire-flows to eastern portions of town such as the cemetery and gold clubhouse areas.
- Install pressure reducing valve (PRV) vault and create new service area for cemetery and clubhouse areas.
- Replace the transmission main extending southeasterly along Highway 287 to the Industrial Park.
- Install PRV vault and establish new Industrial Park service area.
- Install PRV vault and establish new pressure zone to service Dillon subdivision and Wyoming Life Resource Center (WLRC).
- Replace failed emergency feed to the downtown service area and PRV vault.
- Replace altitude valves for Ellis, Mager, and Rodeo tanks.
- Upgrade Ellis Transmission line to replace asbestos cement (AC) line serving majority of Lander.

Status: Completed 2020. All recommendations were designed and implemented in Lander High Pressure Water System Upgrades Phase I and II projects. Popo Agie River Watershed Level II, Phase II 2019 Study (November 15, 2019, Olsson)

1.4.1.4 CITY OF LANDER TANK AND PUMP STATION FEASIBILITY STUDY – HDR ENGINEERING – (SEPTEMBER 2019)

This study examined alternatives for dealing with three of four water storage tanks and a pump station reaching the end of their useful service lives. Recommendations from this project and their status follows:

- Demolish 2 MG Ellis Tank and abandon 0.5 MG Mager and Rodeo Tanks.
- Install PRV stations to replace Mager and Rodeo Tanks.
- Install 4 MG Ellis Tank.
- Upgrade Hospital Pump Station to meet current and future demands.

Status: In-progress – The project was bid in April 2022 but there were not enough funds to construct. City is procuring more funds. Estimated construction 2023-2024.

1.4.1.5 LANDER TEST WELL LEVEL II STUDY – VOLUMES I & II – WYOMING GROUNDWATER HINCKLEY CONSULTING AND WWC ENGINEERING (OCTOBER 2020 AND OCTOBER 2021

The Lander Test Well Level II Study – Volumes I & II, completed in 2020 with Supplemental in October 2021 by Wyoming Groundwater, Hinkley Consulting, and WWC Engineering, represents the last study completed by the WWDC and Lander. The study focused on supplementing Lander's water supply with alluvial wells located near the existing 1M gallon tank on Sinks Canyon Road. The proposed well field could produce up to 1,500 gallons per minute (for approximately 30 days) to supplement water supply during short term emergency situations; and/or supply 450 gallons per minute for longer periods if needed.

Status: In-progress – The project was bid in spring of 2022 but there were not enough funds to construct. City is procuring more funds. Estimated construction 2024-2025.

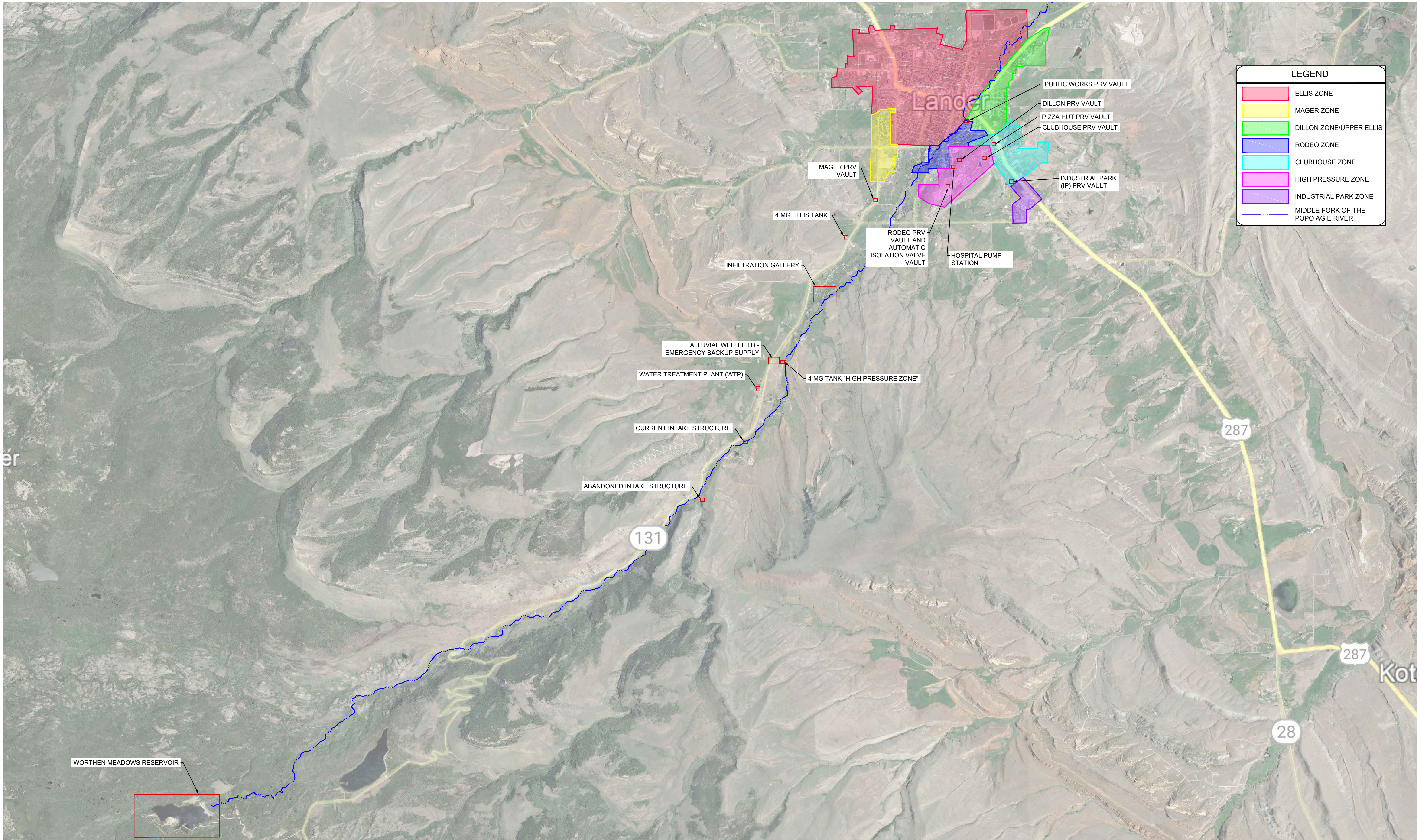
1.5 Existing Water System

1.5.1 Overview

The City of Lander relies on water diverted directly from the Middle Popo Agie River at the intake structure of the City of Lander Pipeline. The water is diverted under the City's direct flow water rights except during periods of shortage when the City releases storage water from Worthen Meadows Reservoir. The City will continue to have groundwater available for exchange from their retired infiltration gallery that no longer can provide direct water supplies since it was deemed to be under the influence of surface water by the USEPA in 2004. An additional groundwater source will be available for direct use or exchange during short-term emergency operations from four new planned production wells to be completed near the City's 8 MGD water treatment plant in 2024-2025.

The City's potable water system consists of six (6) pressure zones and is primarily gravity fed. Water flows from the water treatment plant to the City's 4 MG storage tank, which sets the uppermost hydraulic grade for the entire distribution system and is called the "High Pressure Zone". From the 4 MG tank, all pressure zones are fed through pressure reducing valve (PRV) stations or tanks. There is one pump station (the Hospital Pump Station) which can provide water from the lowest hydraulic grade zone to the highest in emergency scenarios. Aside from this, the water flows from the treatment plant by gravity to all users in the system.

Currently the system is amid a major upgrade which will replace two storage tanks (Mager and Rodeo) with PRV stations and upgrade the existing Ellis Tank from a 2 MG to 4 MG tank, along with upgrading the Hospital Pump Station. Figure 1-1 provides an overview of the City of Lander water system and major supply elements as it will be configured by the end of 2024.



LANDER MASTER PLAN - FIGURE 1-1 - LANDER WATER SYSTEM AND MAJOR SUPPLY ELEMENTS

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1.5.2 Water System Schematic

Hydraulic map of the proposed water system upgrades (estimated completion in 2024) is provided in Figure 1-2.

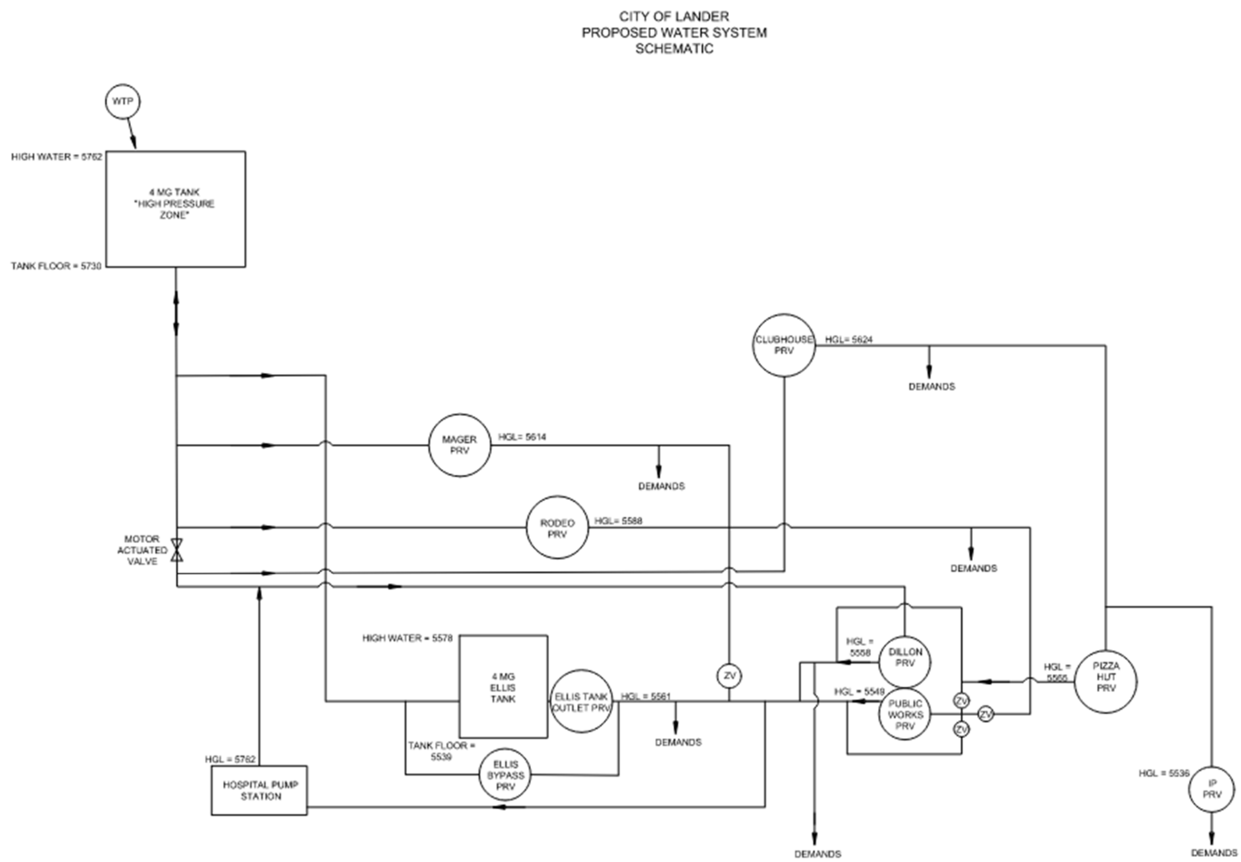
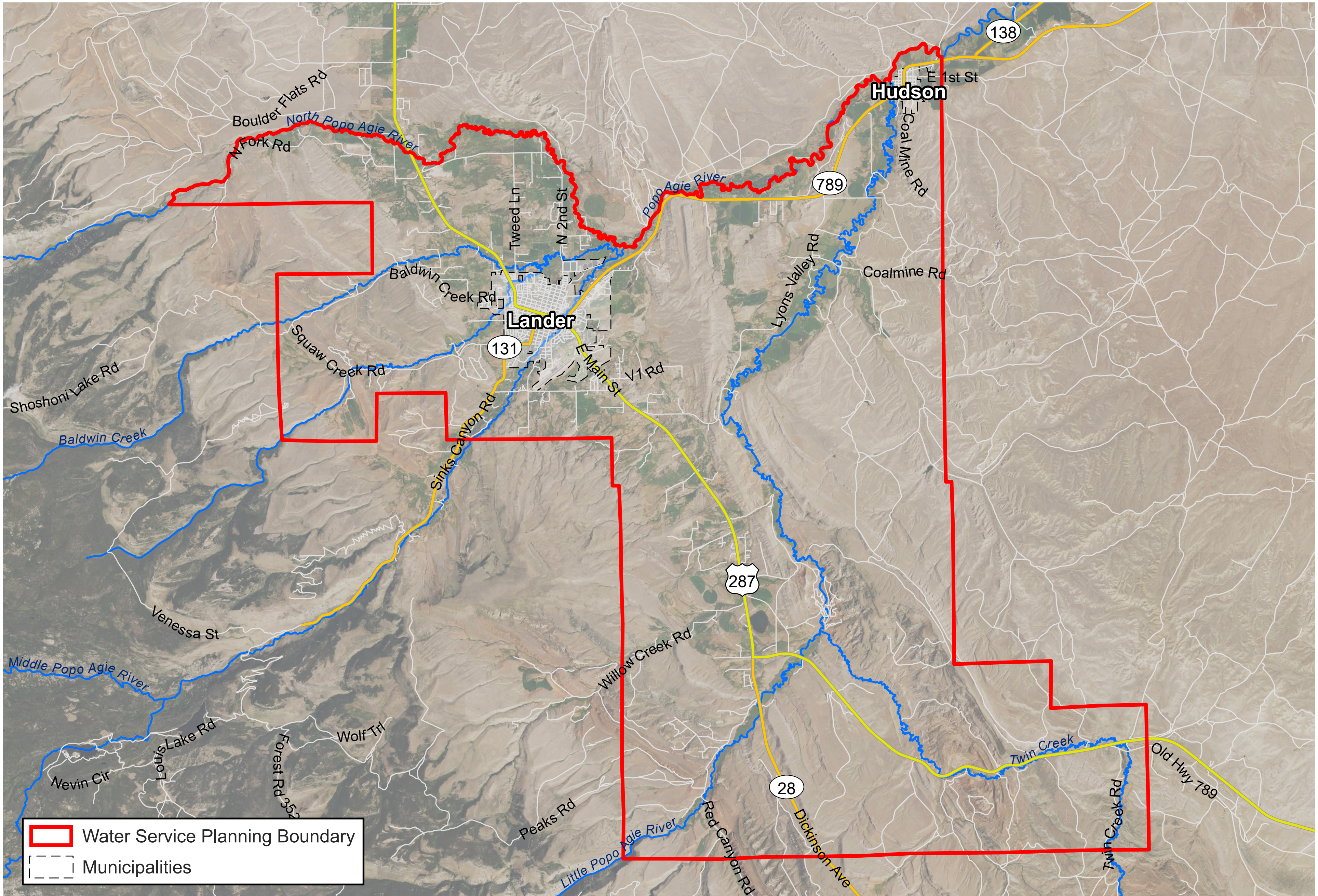


Figure 1-2 City of Lander 2024 Water Distribution System Upgrades System Schematic

1.5.3 Water Service Area

The City of Lander's existing planning water service area is depicted in Figure 1-3. The service area illustrates the existing water mains within the distribution system. In addition, the City water loading station provides City water throughout Fremont County. The service area boundary includes county households served by cisterns and storage tanks routinely filled with City water. The depicted service area is considered a planning area boundary because it includes county lands and households outside the City boundary that are expected to be served by expansions of the City's distribution system. The expansions during the twenty-year planning period are primarily expected to the north, northwest and to the west of the current municipal boundary.



SERVICE PLANNING BOUNDARY

Figure 1-3

LANDER, WYOMING MASTER PLAN

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1.5.4 Water Production

Based on production data from 2010-2021 provided by the City, the average daily water diversions were 1.74 MGD. For the purpose of analyzing the current system demands, the 2021 Water Treatment Plant (WTP) production yielded an average day and maximum day demand of 1.85 MGD and 4.65 MGD, respectively. The 2021 data analysis results in a peaking factor of 2.5, based on maximum day demand divided by average day. The peaking factor represents the entire water distribution system and is used to account for water demand. The treatment plant water uses are in addition to these quantities and will be addressed within the growth and demand projections.

1.5.5 Billed Consumption

City of Lander provided billed consumption to HDR to convert the consumption totals for individual customers. The analysis of billed data identified the top seven largest customers and located those demands. The same 2.5 maximum day factor was assumed to calculate the maximum day demands for the large customers. Table 1-2 lists the largest customers with average and maximum day demands based on consumption.

Table 1-2 Large Customers

Customer Name	Pressure Zone	Average Day Demand (GPM)	Average Day Demand (MGD)	Maximum Day Demand (GPM)	Maximum Day Demand (MGD)
Lander Valley HS	Ellis	150	0.22	374	0.54
Lander City Park	Ellis	45	0.06	111	0.16
Water Fill Station	Rodeo	37	0.05	93	0.13
FCSD #1 & Swimming Pool	Ellis	20	0.03	51	0.07
Northside Park	Ellis	17	0.02	43	0.06
Pathfinder HS/Lander MS	Ellis	16	0.02	39	0.06
Hospital	4 MG	13	0.02	31	0.04
Total		**298**	**0.43**	**742**	**1.07**

The 2021 average day demand for each customer is 576 gpd (0.40 GPM). Since this figure includes the large customers, the large customer demand was subtracted to estimate a revised average customer demand of approximately 446 gpd (0.31 GPM). County parcel information was used to approximate locations of customer meters within the system.

1.5.6 Non-Revenue Water

Non-revenue water is the difference between system production volume and billed consumption volume. The non-revenue water is based on water losses, real or apparent and any authorized consumption that is not billed. Real losses include system leaks/overflows and apparent losses result from metering inaccuracies or unauthorized consumption. Using water production and billed consumption data from the city, non-revenue water was calculated as a percentage of the monthly water treatment plant production versus billed monthly consumption. Between August 2020 to July 2021 the unaccounted water averaged about 20 percent of the treatment plant production based on difference between monthly WTP production and monthly meter usage. Within Figure 1-4 there does not appear to be any consistent monthly trend other than metered consumption being consistently less than plant production in winter months. Other months are variable differences with no consistent trends between production and metered usage. Some of the differences can be attributed to the water treatment plant production being tracked on a strict calendar month basis while metered billing periods end about one week before the actual end of the month. In addition, changes in water storage within the distribution system will cause monthly differences.

City Staff reported that extensive leak detection surveys have been conducted and all significant leaks were repaired. It is likely, then, that the non-revenue water is a result of poor measurement and non-synchronized measurement periods. The City plans to replace both meters within the plant and customer meters within the next five to ten years. Combined with synchronization of billing and plant monitoring records should reveal whether the non-revenue, is, indeed, a phantom caused by metering errors. If it is determined that a significant amount of non-revenue water remains, further actions should be taken to determine the source of non-revenue water.

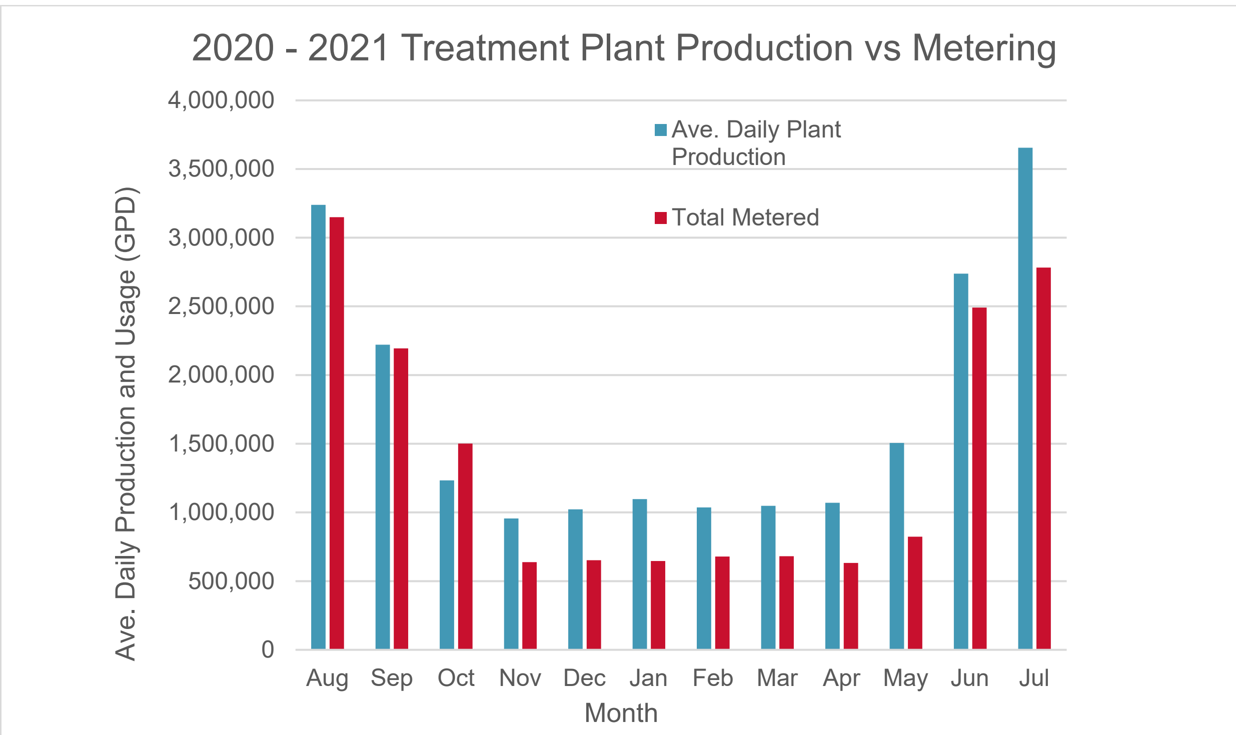


Figure 1-4 2020 - 2021 Treatment Plant Production vs Meter Usage

1.5.7 Water System Components

1.5.7.1 RESERVOIRS

Worthen Meadows Reservoir (WMR) is approximately 10 miles upstream located west of the Lander water treatment plant in the Shoshone National Forest. The reservoir has a permitted capacity of 1,503.6 acre-feet. The Reservoir is in the channel of the Roaring Fork River which is tributary to the Middle Popo Agie River. The City of Lander constructed the reservoir in 1960. A Level II study completed in 1988 addressed necessary dam safety and structural upgrades. The recommended rehabilitation of the reservoir was completed in 1995.

Under historic operations the released reservoir storage has been able to meet the municipal needs of Lander in the summer months when shortages occur in the Middle Popo Agie drainage. In the spring the reservoir must bypass flows to fill Frye Lake which is an irrigation reservoir with a capacity of 1,600 acre-feet that provides storage to the Enterprise Watershed Improvement District (Enterprise). Approximately 1,500 acre-feet of Frye's storage is senior in priority to Worthen Meadows Reservoir.

Watershed Shortages

The 2003 Watershed Study of the Popo Agie River watershed concluded that surface water supplies are not adequate to serve the existing irrigation demands in the drainage basin. In addition to an enlargement of Worthen, the previous watershed studies (2003 and 2019) have identified different reservoir storage sites within the Popo Agie Watershed. A total of 33 potential reservoirs sites were identified in the studies. Based on a screening process eighteen reservoir sites were recommended for further consideration. The alternative sites included two sites in the North Popo Agie drainage, eleven sites in the Middle Popo Agie, and five in the Little Popo Agie. The storage capacity ranges from a 450-acre foot enlargement to Worthen Meadows Reservoir in Roaring Fork drainage to a new 29,640-acre foot reservoir in Middle Popo Agie drainage named Middle Popo Agie-Mid Valley (Anderson Consulting Inc., 2003).

The Middle Popo Agie irrigation demands exceed available supplies, so it is considered to be over appropriated. The Middle Popo Agie drainage serves irrigation water rights in excess of 250 CFS (17,500 acres) with water shortages occurring every year in the mid to late summer months. Most of the return flow from the larger irrigation districts diverting from the Middle Popo Agie benefits the Little Popo Agie River drainage. Due to this irrigation return flow export the mainstem of the Middle Popo Agie receives very little benefit of return flows from irrigation.

Enterprise Ditch

Enterprise, one of the largest irrigation districts in the drainage, has taken steps to reduce irrigation shortages. In 2006, Enterprise was formed by landowners within the Enterprise Irrigation and Power Company. Enterprise has completed a Level II study and the recommended water conservation, efficiency improvements, and needed rehabilitation projects are ongoing. Enterprise is entitled to a total 53.93 CFS of direct flow diversions from Sawmill Creek, Crooked Creek, and Roaring Fork with 21.2 CFS of water rights available from the Roaring Fork drainage.

Based on the crop consumptive use demands and the average supply delivered to farms under the Enterprise Ditch, the Level II Study identified annual average water shortages amounts of 1,000 to 2,500 acre feet based on an estimated system-wide conveyance and application efficiency of approximately twenty percent.

Heathy Rivers Initiative (HRI)

HRI is a stakeholder driven initiative with the goal of improving water quality, water quantity and the biological health of the Watershed to support domestic, agricultural, recreation, fish, and wildlife uses in the future. In addition to the City, HRI has partnered with PACD. Other stakeholders include many federal and state agencies, environmental organizations, the agricultural community, local irrigation companies, and tribal entities.

Within this study HDR relied upon a model developed during the Lander Test Well Level II study to analyze the fill likelihood of Worthen Meadows Reservoir (WMR) over a range of reservoir expansions. The Healthy Rivers Initiative stakeholder group is reviewing the feasibility of increased storage capacity in the Popo Agie watershed and addressing conveyance efficiency and water conservation of agricultural irrigation systems with the goal of improving the region's drought resistance and decreasing late season water supply shortages.

In March 2022, the City with support from HRI and PACD, applied for NRCS PL 566 funding to complete a Preliminary Investigation Feasibility Report (PIFR) with a letter of support signed by eight irrigation companies accompanying the PL 566 application.

1.5.7.2 INTAKE STRUCTURES

Currently the entirety of Lander's potable water supply comes from surface water diverted from the Middle Fork of the Popo Agie River roughly 4,000 lineal feet from the water treatment plant. Constructed in 2002 of concrete, the intake structure is roughly 28'-0" x 20'-0" x 14'-0". Two sides are open to the river with ten 2'-6" x 12'-0" bays with three (3) screens per bay. Operationally, all screens are open to the river at all times. Eight of the bays feed the 24-inch pipeline that runs to the treatment plant. The remaining two bays feed the Hornecker Ditch pipeline.

There is an abandoned intake structure located at the mouth of Sinks Canyon southwest of Lander. Located adjacent to the structure is an abandoned building which previously housed chlorination and SCADA equipment. An asbestos concrete line, approximately 24 inches in diameter, runs from this building/structure towards Lander. Little could be determined about the age or condition of this structure.

1.5.7.3 WELLS

In 1929 two infiltration galleries were constructed in the alluvium of the Middle Popo Agie River. In addition, Lander Well No. 1 was drilled in 1942 developing water from the deep Tensleep Aquifer formation. The gallery and wells were fully permitted in 1947. In 1966 the State Engineer's Office (SEO) permit for the Tensleep was cancelled. The well is still flowing under artesian pressure and continues to discharge into a drainage near the river.

The older infiltration gallery was replaced in 1956 and was permitted by SEO (Permit no. P440G). In 1996 the gallery production was measured at a rate up to 1,400 GPM (2.0 MGD). On July 7, 1997, however, the City was ordered by the United States Environmental Protection Agency (U.S EPA) to remove the gallery as a treated water source when it was deemed to be "Groundwater under the Direct Influence of Surface Water". The gallery was disconnected from the system in 2004. The SEO granted the City an exchange petition in 2004 for water that is released to the Middle Popo Agie River from the City's Infiltration gallery of up to 750 gpm during periods of administration to offset out-of-priority diversions at the City of Lander Pipeline (COLP) intake, which feeds the water treatment plant. While the exchange petition allows for up to 750 gpm, since 2018 the City has only received a credit of 380 gpm based on measurements taken by SEO in August 2018.

1.5.7.4 TREATMENT

The existing water treatment plant, constructed in 2003-04, has a process operational capacity of 8 million gallons per day (MGD) and a hydraulic capacity of 10 MGD. The treatment process incorporates rapid mix, three-stage flocculation, sedimentation, dual media filtration, chlorine contact/disinfection, and on-site storage. Chemical feed systems consist of caustic soda/sodium hydroxide, primary coagulant, coagulant aid/polymer, and liquid sodium hypochlorite. Generally speaking, staff prefers to operate the Water Treatment Plant (WTP) continuously (24 hours per day) throughout the year, which is feasible during the high-use periods, but can be a challenge during the low-use winter periods.

<u>Rapid Mix:</u> The source water from Middle Popo Agie River flows through a magnetic flow meter and sleeve valve upstream of the rapid mix basin. The rapid mix basin is 5'-0" square with a 7'-0" water depth, tank volume of 1,310 gallons, and a detention time of fourteen (14) seconds at the 8 MGD design rate. The rapid mix incorporates a vertical coagulant induction system, with an average mixing intensity/"G" value of 500 – 600 Sec-1. The design includes the ability to feed caustic soda and the primary coagulant in the raw water upstream of the sleeve valve, as well as the ability to inject the primary coagulant in the

coagulant induction system in the rapid mix basin. Initially the primary coagulant was being fed to the induction system in the rapid mix basin. The motor on the induction system failed in 2015, so City staff started feeding the primary coagulant in the raw water upstream of the sleeve valve. Since that switch, staff indicated the operation of the flocculation/sedimentation process has been more consistent/reliable, so they have maintained the addition of the primary coagulant at this location. Caustic soda is added to the raw water, as needed, based on the raw water quality and quantity of the primary coagulant being added to the raw water. The need to add caustic soda varies from year to year, and from season to season. Staff indicated they typically feed the caustic soda three to four months out of the year (late spring to late summer), but there have been years in which caustic soda has not been added the entire year.

Flocculation: Downstream of the rapid mix basin are two (2) trains of three-stage flocculation, each rated at 4 MGD operating capacity. The flocculation step encourages the formation of large floc particles to aid in settling solids from the source water. Each train has horizontal paddlewheel flocculators with variable energy input in each stage. Maximum energy input at each stage is 60 Cycles / Sec for Stage 1, 45 Cycles / Sec for Stage 2, and 30 Cycles / Sec for Stage 3. Staff utilize the tapered speed philosophy through the three stages and adjust the energy input of each stage based on the water temperature. The energy input is increased during the cold water temperature periods and reduced during the warm water temperature periods. The flocculation basins are rectangular in shape with a detention time within each flocculation basin of 49 minutes at peak operating capacity of 4 MGD. The coagulant aid/polymer can be fed to the 1^{st}, 2^{nd}, or 3^{rd} stages of each flocculation basin. Since the WTP went on-line, the coagulant aid has been fed to the 1^{st} stage resulting in consistent/reliable results in the settled water. The City has not utilized the feed points in the 2^{nd} or 3^{rd} stages.

Sedimentation/Clarification: The flocculated water from each flocculation train flows to the respective sedimentation/clarification basin, each designed for 4 MGD processing rate. The sedimentation basins incorporate inclined plate settlers as manufactured by MRI. Each basin is 44'-3" L x 20'-0" W x 17'-0" D with a detention time of 40 minutes at the peak capacity of 4 MGD. The surface overflow rates in each basin are 3.2 GPM/square foot of total basin area, and 0.28 GPM/square foot of effective plate area with a plate efficiency of 90%. The basin flow-through velocity is 0.018 Feet Per Second (FPS) at the peak operating capacity of 4 MGD.

Sedimentation Basin Solids Handling: Each clarification basin incorporates a solids removal system, which consists of a cable driven vacuum system that removes the settled sludge from the bottom of the basin. The system operates in conjunction with an automated pneumatically operated sludge blowdown valve to direct the solids to the lagoon diversion structure. The sludge removal systems generally operate three (3) times per day for each train. Overall solids handling within the lagoon system is discussed later in this section.

Dual Media Filtration: The clarified water from the sedimentation basins flows to the dual media filters for additional particle removal. The design incorporates four (4) 20'-0" x 20'-0" square dual media filters, consisting of 18 inches of anthracite, 12 inches of sand, and a block-style underdrain with porous cap. The filter loading rate with all four filters operational at the peak operating capacity of 8 MGD is 3.47 Gallons per Minute per Square Foot (GPM/SF). With one filter off-line, the loading rate at the peak operating capacity of 8 MGD is 4.63 GPM/SF.

As the filters operate, particles are captured on the media which requires the filters to be periodically backwashed. The backwash sequence consists of utilizing air and water at various stages of the backwash. During the combination air/water backwash, the backwash rate is up to 2.5 Standard Cubic Feet Per Minute Per Square Foot (SCFM/SF). for the air and up to 15 GPM/SF. for the water. For the water only sequence, the backwash rate is up to 20 GPM/SF. The duration of each step of the backwash sequence and rates are adjusted seasonally. During the warm water periods, the filters are backwashed based on the differential pressure on the respective filters which typically results in filters being backwashed every 35 to 40 hours of operation. During the cold water periods and the reduced solids in the raw water, the filters are backwashed every 200 hours of operation.

Water used for the backwash comes from the rising well, which is downstream of the filters and filled by the other filters that are still in production. A pneumatically operated valve between the rising well and the filter being backwashed controls the backwash water flow to the filter. In the situation that the rising well cannot maintain a sufficient water elevation to complete the backwash sequence, a backwash supply pump will transfer water from storage to the rising well. Operations staff indicated the backwash supply pump operates very infrequently, thus indicating the operational filters are capable of maintaining the necessary water elevation in the rising well. The wastewater generated during a backwash is directed to the lagoon diversion structure. When a filter comes back on-line after a backwash, the filtered water is wasted, referred to as filter-to-waste, for a period until the filter turbidity reaches an acceptable level.

<u>Chlorine Contact/Disinfection</u>: The facility design included an ultraviolet light (UV) reactor to achieve the required disinfection of the water, particularly as it relates to *Cryptosporidium*. Source water testing approximately three years ago did not test positive for *Cryptosporidium*; thus, the City took the UV reactor off-line and achieve the required disinfection with chlorine addition and contact time. To achieve the required disinfection prior to distribution, sodium hypochlorite is added to the process flow downstream of the filtration step and the necessary disinfection is achieved prior to the water leaving the clearwell.

<u>On-Site Storage and To Distribution System</u>: On-site storage consists of the original 150,000-gallon clearwell and new 4.0 MG storage tank constructed in 2003-04. Due to the elevation of the water treatment plant site, high service pumps are not required to distribute water to the City’s distribution system.

<u>Liquid Chemical Feed Systems</u>:
Caustic Soda System consists of one 6,900-gallon bulk storage tank, three chemical feed pumps, and ancillary components such as calibration column, pulsation dampener, pressure relief valves, backpressure valves, manual isolation valves, etc. Caustic soda pump number 1 (CSSP-1) is specifically designed to pump caustic soda to the bulks tanks of the sodium hypochlorite feed system. Caustic soda pump number 2 (CSSP-2) is designed to pump caustic soda to the filter effluent. Caustic soda pump number 3 (CSSP-3) is designed to pump caustic soda to the raw water line downstream of the sleeve valve or the filter influent.

Primary Coagulant System consist of two 4,648-gallon bulk tanks, two chemical feed pumps, and ancillary components such as calibration column, pulsation dampener, pressure relief valves, backpressure valves, manual isolation valves, etc. Both feed pumps (PCP-1 and PCP-2) are designed to pump coagulant to either the raw water line upstream of the sleeve valve or the induction system in the rapid mix basin.

Coagulant Aid System consists of a skid mounted polymer preparation system for dry polymer bag use, three chemical feed pumps, and ancillary components such as calibration column, pulsation dampener, pressure relief valves, backpressure valves, manual isolation valves, etc. The system also includes a dilution water panel and static mixer upstream of each flocculator. Coagulant aid pump number 1 (CASP-1) is designed to pump to the flocculation stages of train no. 1. Coagulant aid pump number 2 (CASP-2) is capable of pumping to the flocculation stages of trains no. 1 and no. 2. Coagulant aid pump number 3 (CASP-3) is designed to pump to the flocculation stages of train no. 2.

Sodium Hypochlorite System consists of two 3,368-gallon bulk tanks, two sodium hypochlorite feed pumps, and ancillary components such as calibration column, pulsation dampener, pressure relief valves, backpressure valves, manual isolation valves, etc. Sodium hypochlorite pump number 1 (SHSP-1) is designed to pump to the raw water piping downstream of the sleeve valve or the filter influent. Sodium hypochlorite pump number 2 (SHSP-2) is designed to pump to the filter effluent.

Solids Handling/Lagoons: The solids from the water treatment processes are directed by gravity to the lagoon diversion structure, which directs the solids to one of three on-site concrete-lined lagoons. Each lagoon has an approximate useable volume of 400,000 gallons at a maximum depth of 5.5 feet. Decant/clear water from the top of the lagoons is recycled to the head of the water treatment plant. Staff indicate the decant is recycled typically over a four hour period each day. Current operation is to utilize all three lagoons during the year and clean each lagoon every year. Since the solids do not dry out well during this period, the City utilizes a sludge vac truck to clean the liquid mix from each lagoon.

Process Analyzers: The water treatment plant has the following process analyzers at the various stages of the process to aid in operation, and to provide compliance testing:

1) Turbidimeters: Raw Water, Clarified Water, Filter Effluent of Each Filter, Combined Filter Effluent, and Finished Water at UV Building Effluent

2) pH: Raw Water, Flash Mix Effluent, and Finished Water at UV Building Effluent

3) Chlorine: Clearwell Effluent, and Finished Water at UV Building Effluent

1.5.7.5 TRANSMISSION AND DISTRIBUTION PIPELINES

Based on current available information, the City of Lander's water system has roughly 71.5 miles of transmission and distribution pipelines ranging in size from 4-inch diameter to 24-inch diameter. The largest amount of pipe by diameter in the City's system are 6-inch and 8-inch, comprising roughly 64% of total pipe in the system. By material, 43.5% of are constructed of ductile iron pipe (DIP), and 37% of (Polyvinyl Chloride) PVC, with the remainder being Unknown (UNK) or High Density Polyethylene (HDPE). By age, roughly 58% of the pipelines in the City are at least 33 years old. Tables 1-3, 1-4, and 1-5 summarize the water pipelines in the City's system by diameter, material, and age, respectively.

Table 1-3 City Pipelines by Diameter

Diameter (Inches)	Length (Feet)	Length (Miles)	Percentage of Total Pipe
4	30,972	6	8.2%
6	139,412	26	36.9%
8	103,695	20	27.5%
10	22,681	4	6.0%
12	40,636	8	10.8%
16	5,719	1	1.5%
18	3,210	1	0.9%
20	11,299	2	3.0%
24	3,838	1	1.0%
UNK	16,065	3	4.3%

Table 1-4 City Pipelines by Pipe Material

Material	Length (Feet)	Length (Miles)	Percentage of Total Pipe (%)
DIP	164,065	31	43.5%
HDPE	1,532	0	0.4%
PVC	138,857	26	36.8%
UNK	73,072	14	19.4%

Table 1-5 City Pipelines by Pipe Age

Period Installed	Maximum Age	Minimum Age	Length (Feet)	Length (Miles)	Percentage of Total Pipe (%)
UNK	UNK	UNK	31,867	6	8.4%
1977-Older	UNK	45	129,137	24	34.2%
1978-1989	44	33	90,167	17	23.9%
1990-2009	32	13	61,796	12	16.4%
2010-Newer	12	3	63,872	12	16.9%

1.5.7.6 STORAGE TANKS

The City of Lander currently has 7 MG of total storage divided up between four storage tanks. Three of the four storage tanks have passed their useful service lives and are planned to be replaced in 2023-2024 as part of the *Lander High Pressure Water System Upgrades – Phase III Project*. The three storage tanks to be taken offline constitute 3 MG of storage. They will be replaced by one 4 MG storage tank. The planned upgrades are depicted in Figure 1-1. The existing and planned storage facilities are summarized in Tables 1-6 and 1-7, respectively.

Table 1-6 Existing Water Storage Facilities Summary

Tank Name	Storage Volume (MG)	Material	Year Installed	2023 Replacement planned?	Pressure Zones Served
4 MG	4.0	Welded Steel	2003	No	All
Ellis	2.0	Concrete	1977	Yes	Ellis
Rodeo	0.5	Concrete	1977	Yes	Rodeo
Mager	0.5	Concrete	1977	Yes	Mager

Table 1-7 Planned Water Storage Facilities Summary

Tank Name	Storage Volume (MG)	Material	Year Installed (Actual or planned)	Pressure Zones Served
4 MG	4.0	Welded Steel	2003	All
4 MG Ellis	2.0	Concrete	2023	Ellis, backup for all

1.5.7.7 PUMP STATIONS

The City currently has one pump station, referred to as the "Hospital Pump Station." This pump station currently serves the purpose of providing water service to the Lander Hospital from the Ellis Pressure Zone. The existing pump station is in poor condition and is planned to be replaced as part of the *Lander High Pressure Water System Upgrades – Phase III Projects* in 2023-2024. The pump station will be upgraded such that it can serve all of the high-pressure zones from the (lowest) Ellis pressure zone under emergency conditions. The new pump station will contain four parallel pumps that can each put out roughly 400 GPM each against roughly 210 feet of head. Reference Figure 1-1 for location of the old and new pump station locations.

1.5.7.8 INSTRUMENTATION AND CONTROLS

The City of Lander recently upgraded its water control systems (a.k.a. SCADA) with Dorsett Controls InfoScan. Lander utilizes a broadband wireless radio network for city wide SCADA communication. Local SCADA panels are located at various locations such as Ellis Tank, Mager PRV, Rodeo PRV, and Hospital Pump Station. Programmable logic controllers in these panels monitor water systems in real time with field input devices like analyzers, switches, and transmitters which measure conditions such as water level, pressure, flow, and chlorine level. These measurements are then used by control algorithms to determine appropriate control actions to maintain city water systems at desired settings. These actions may include sending an alarm to city personnel or actuating a field device like opening a valve, starting a pump motor, or adjusting pump speed.

2 Evaluation of Existing Water System

A cursory evaluation of capacity and condition for major components of the City water system were evaluated. A twenty-year planning horizon is used for purposes of making recommendations relevant to this report. However, for the purposes of long-term water supply forecasting, a fifty-year planning horizon is used. The findings are discussed in this section.

2.1 System Capacity

The water treatment plant has a capacity of 8 MGD. At the time of this writing, it is estimated that the City's maximum day demand will exceed this volume by 2067. See Table 6-6. Though in the short-term planning horizon of twenty years, treatment plant and water supply capacity are not an issue (maximum day demand in 2042 is estimated at 6.08 MGD – Table 8-1), the City should begin preparing for this apparent inevitability through financial planning and regular assessments of population growth and demand.

After the installation of the 4 MG Ellis tank, the total system storage will be 8 MG. Wyoming Department of Environmental Quality (WDEQ) requirements for systems of Lander's size is 25% of maximum day demand plus fire storage. Using a maximum fire flow requirement of 1500 GPM for 4 hours for larger structures having fire sprinklers renders a minimum system storage requirement of roughly 2.6 MG, well below existing storage. Though the storage capacity well exceeds the *minimum* requirement, it gives the City much needed reserve in case of an outage. Extra storage capacity is justified by the Town's remote rural location, which may require additional time for material and labor during service disruptions. The extra storage buys City staff additional precious time needed to deal with emergency outages.

2.2 Water Supply Sources

2.2.1 Worthen Meadows Reservoir

Worthen Meadows stores around 1,500 acre-ft of water. The discharge gate needs to be replaced. Aside from this factor, the dam's structure is in serviceable condition and can be operated for the foreseeable future. Improvements and reinforcement activities have been done in a routine capacity to promote the continued stability of the dam. The reservoir is operated to maintain a minimum conservation pool volume of 500 acre-feet during periods of release. Flows into and out of the reservoir are monitored by the State Engineers Office.

The reservoir functions as an area for recreation and periodic raw water supply for the City. The areas around the reservoir's periphery are typically wooded with native vegetation and some recreation access points.

The findings of this evaluation indicate that the expansion of Worthen Meadows storage capacity is theoretically feasible based on expected filling scenarios and should be further analyzed. The results from the Memorandum on this subject are included in Appendix C.

HDR developed an extension of the stage-storage curve from GIS analysis of USGS 10-Meter DEMs of existing ground elevations. An estimated raise of 20 feet provides for a total storage capacity of 3,826-acre feet and a 2,322-acre feet enlargement in accordance with Table 2.1. Due to steep topography a dam raise above 8,840 feet Mean Sea Level (MSL) would be of limited value as illustrated by the steep slope in Figure 2-1.

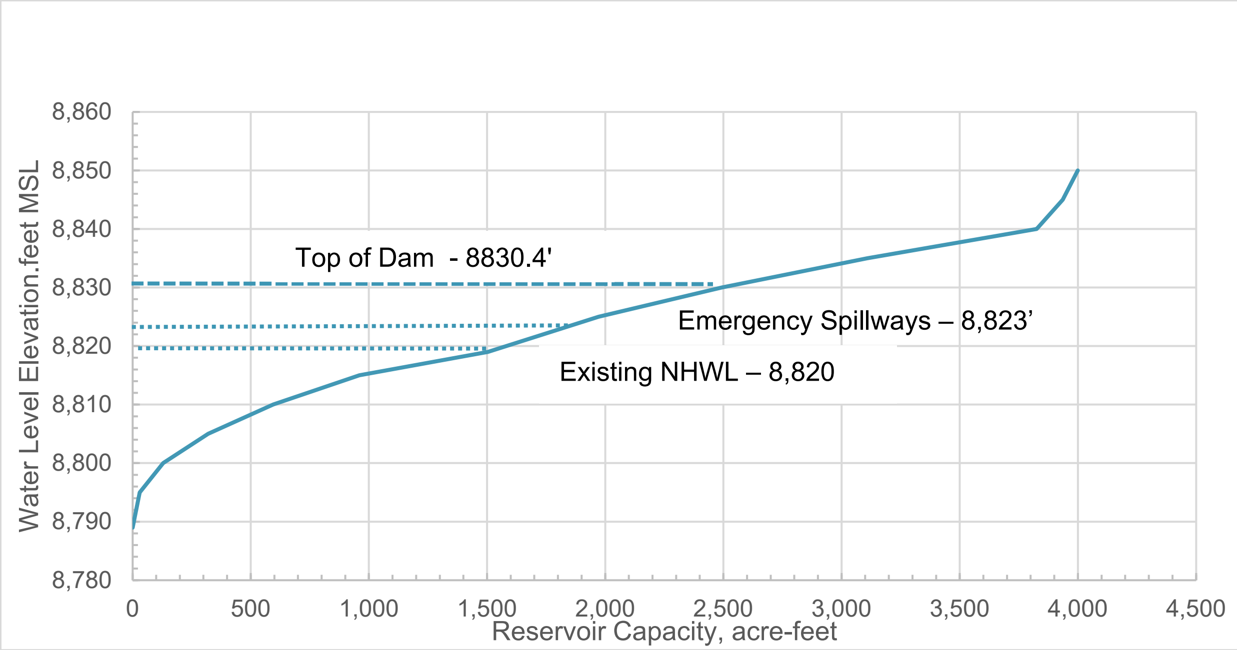


Figure 22-1 Worthen Meadows Reservoir – Stage to Storage Curve

Table 2-1 Worthen Meadows Reservoir – Estimated Potential Enlargement Capacities

Reservoir NHWL (ft MSL)	Worthen Meadows Capacity (acre-feet)	Enlargement Capacity (acre Feet)
8820.0	1,504	
8825.0	1,972	468
8832.0	2,750	1,246
8836.0	3,250	1,746
8839.5	3,750	2,246
8840.0	3,826	2,322

2.2.2 Alluvial Wellfield

The City's alluvial wellfield has not yet been completed. It should be assumed that the wellfield will be constructed and turned over to the City in good condition and will not need any upgrades or rehabilitation during the twenty-year planning horizon.

2.3 Intake Structure(s)

The City has two intake structures. One is currently in use while the other has been abandoned for at least twenty years. The condition of the older structure appears to be fair, however, the condition of the pipeline is largely unknown.

The current intake structure is situated on the river in a section that has quite a steep gradient. The structure's placement is not ideal, leading to large volumes and highly variable levels of entrained sediment during periods of heavy runoff and undercutting of the structure itself. The structure must be cleaned of sediment by City staff at least annually and the undercutting is a concern.

The placement of the old intake structure is on a less steep gradient section of the river and upstream of a drainage which is thought to dump large volumes of sediment during periods of high runoff. Utilizing this structure in tandem with the existing structure or in-lieu of it may be something the City should investigate further.

2.4 Infiltration Gallery

The City uses their old infiltration gallery, consisting of two manholes and an unknown amount of pipe as a water rights exchange for their diversion to the treatment plant. The City has to complete ongoing maintenance on the gallery, jetting the pipes and removing roots. The upstream-most manhole was observed to be surcharged. This is thought to be the result of root clogging or pipe collapse of the infiltration gallery pipes. The discharge to the river has no metering, so the amount of water available for exchange is manually measured by the State Engineer's Office using rudimentary flow measurement means. An investigation of the causes of surcharging of the system should be scheduled. Additionally, more accurate flow measurement tools should be explored for the outlet to the river.

2.5 Water Treatment Plant Evaluation

Since going on-line in 2004, the water treatment plant has produced high quality drinking water as evidenced by compliance with the drinking water standards. The water treatment plant operates at approximately 1.2 million gallons per day (MGD) during the winter/cold weather months and typically peaks around 5 MGD during the summer/warm weather months. With a design operating capacity of 8 MGD, the facility has the capacity to provide safe, reliable drinking water to account for future growth in and around the City.

By and large the water treatment plant is in good condition, however several issues were identified with regards to the treatment plant that should be addressed. Better flow measurement equipment and water use record keeping is needed. Variable Frequency Drives (VFD's) need to be replaced. The sludge collection system needs rehabilitation. Safety handrails need modifications in the process area. A redundant sleeve valve is needed at the plant influent line. Improvements are needed for the sludge lagoons/drying beds. A strainer is needed on the plant influent line. Piping modifications are needed such that substandard water can be discharged not into the distribution system but away from the plant. The filter media condition needs to be evaluated.

2.6 Water Storage Tanks

By the end of 2024, the Lander system's storage facilities will be comprised of the water treatment plant clearwell (150K gallons), the High Pressure Zone Tank (4 MG), and the Ellis Tank (4 MG).

Since the Ellis Tank will be constructed by the end of 2024, it is assumed for the purposes of this study that this tank will be constructed and turned over to the City in good working order and need little or no replacement or rehabilitation for the twenty-year planning horizon.

A diving inspection was conducted of the High Pressure Zone Tank in November 2021 (See Appendix B). Heavy staining and blistering of the tank coating system was observed over most of the interior floor, walls, roof, and other structural elements. The report recommended that the City start planning for a blast and recoat of the interior coating system in the next three to five years. The report also noted that there appeared to be an out-of-commission cathodic protection system interior to the tank.

2.7 Pump Station

The City of Lander's only current pump station, the Hospital Pump Station, will be replaced in the next two years. It is assumed that the new pump station will be turned over to the City in good working order and need little or no replacement or rehabilitation for the twenty-year planning horizon.

2.8 Bulk Fill Station

The City's bulk fill station, located next to the Public Works building, is currently thought to be in good condition. Issues surrounding the fill station revolve around traffic, it being collocated with an RV wastewater dump station, and water hammer in the transmission line serving it.

Because of the large number of rural users surrounding Lander, the bulk fill station operations are often highly impacted by excessive use which cause traffic jams and negatively impact not only traffic on Buena Vista Drive, but operations at the Public Works building as well. Further compounding this is a sewer dump station collocated with the fill station.

Severe water hammer in the Buena Vista Transmission Line feeding the bulk fill station has been observed. This water hammer has caused numerous pipe breaks given the age of the transmission line. A larger diameter pipeline should be used for the Buena Vista pipeline. Valve operations were changed such that the valve closure time at the bulk fill station was lengthened, however, water hammer is still occurring in this line.

2.9 Pipelines

There are numerous pipeline legs throughout Lander that are aging and will require replacement. These include both transmission and distribution systems throughout Lander City limits. Generally speaking, pipelines further out from the city center are more recently installed. Figure 2-1 shows the estimated age range of pipes installed in the City's system.

Water pipeline life span depends upon many factors, such as pipe bedding methods and materials used, pipe wall thickness, bends, valves, and appurtenance product quality, operational pressures and pressure fluctuations, installation quality, pipe material, and soil chemical characteristics. Upon inventory of the City's pipelines (see Tables 1-3 and 1-4), it was determined that over 60% of the pipelines, or 41 miles worth, are at least 33 years or older or have an unknown age. Of further concern is that roughly 19.5 miles (~27%) of pipelines are known to both be constructed of ductile iron pipe (DIP) and at least 45 years old. Buried DIP, like other ferrous materials, is susceptible to corrosion. The susceptibility to corrosion is highly dependent upon soil conditions. Figure 2-2 shows known pipeline materials in the City of Lander's system.

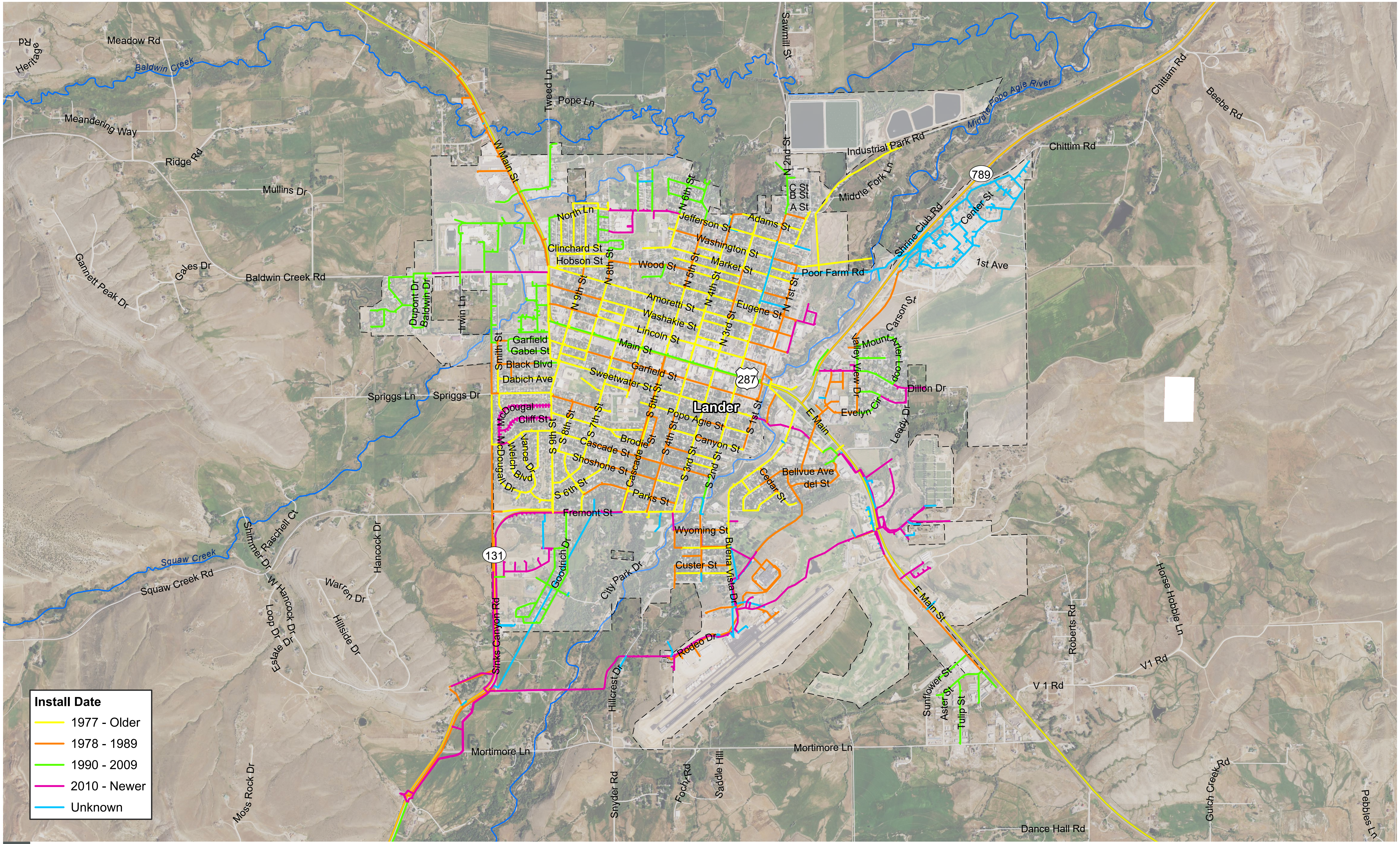
According to City staff, there is a seemingly strong correlation between the condition of DIP they have dug up and soil type they encounter. Generally speaking, DIP installed in alluvium is in fairly good condition, while DIP installed in clayey materials has aged poorly and is where they experience the most failures. A map of pipe material and NRCS-USDA designated soil type is provided in Figure 2-3. As can be seen in this figure, the majority of the DIP and Unknown pipe is installed in soil type designated as "Urban," which does not offer much information in the way of the nature of the soils there. As this is the case, aside from anecdotal information as to where breaks are occurring, the overall condition of the 27% of the City's water mains that are both older than 45 years and DIP is unknown.

Replacements are needed of the stretches of this pipe that are critical in nature and have known issues. Table 2-2 lists the top priority areas needing pipeline replacement that should be included in the twenty-year capital improvements plan (CIP).

In addition to the known critical pipes to be replaced as part of the twenty-year CIP, the City should conduct a desktop pipeline condition assessment of all pipelines that overlays soil type with age, material, repairs of breaks, and criticality to come up with a prioritized plan for pipeline renewal/replacement within the existing City. The City should also budget for distribution system renewal projects during the twenty-year CIP. The amount budgeted for should be dynamic based upon the findings of the desktop condition assessment.

Table 2-2 Priority Pipeline Renewal Projects. Includes Both Transmission and Distribution Line Projects

Project Description	Issue(s)
Lincoln Street Transmission Line	age, failures, freezing
5th Street Transmission Line	age, failures, improperly sized
North 5th Street Pipeline	age, failures, improperly sized
McFarland Drive Pipeline	age, failures, undersized
Baldwin Creek Transmission Line	age, failures
Goodrich Connector Pipeline	age, failures, undersized
Buena Vista Drive Transmission Line	age, failures, undersized, water hammer
Grandview Valleyview Pipeline	age, failures
North 1st Street Transmission Line	age, failures
South 1st Street Pipeline	age, failures, freezing
Cascade Street Pipeline	age, failures
Mager 2 Transmission Line	age, failures

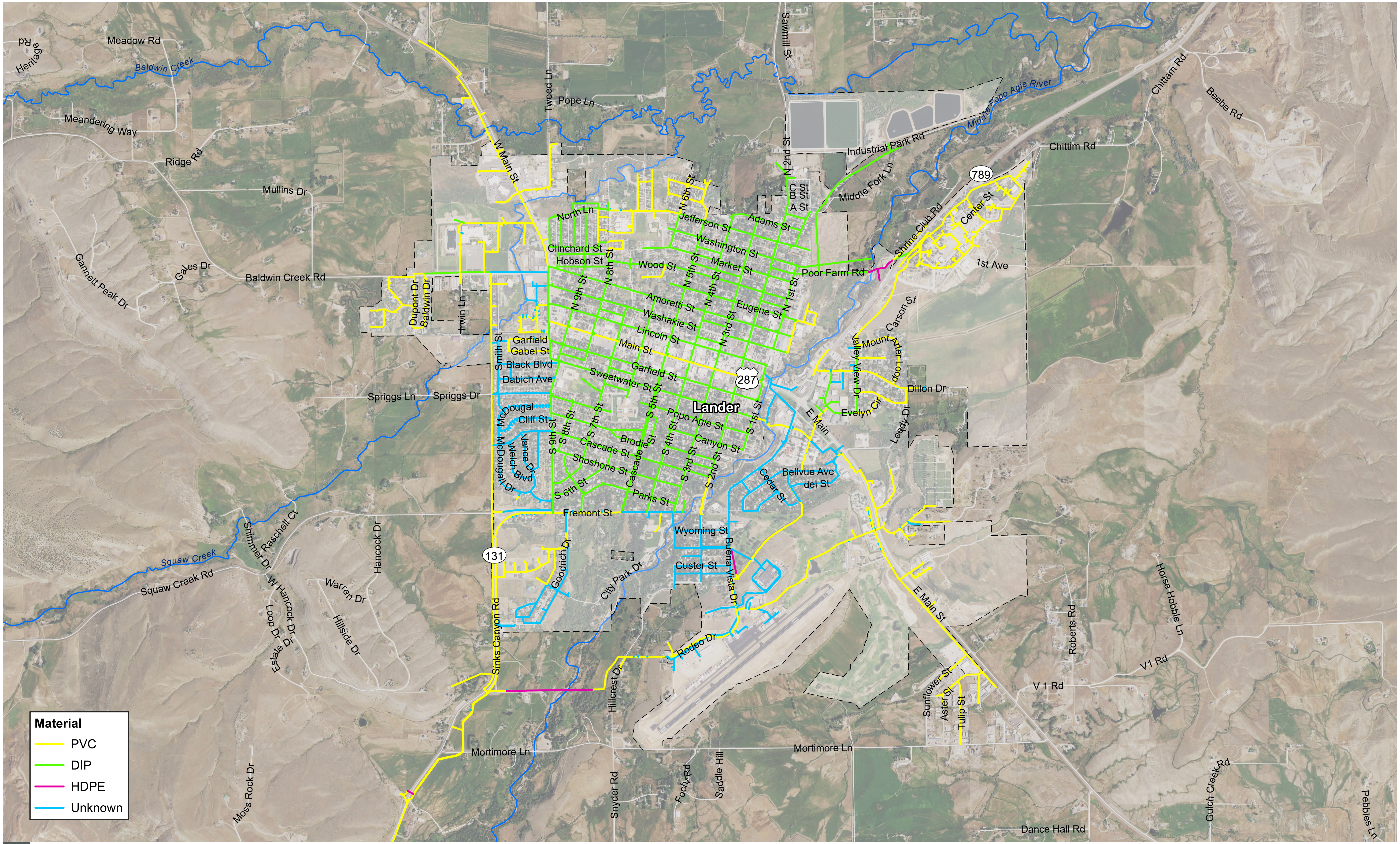


HDR

WATER MAINS INSTALL YEAR

Figure 2-1

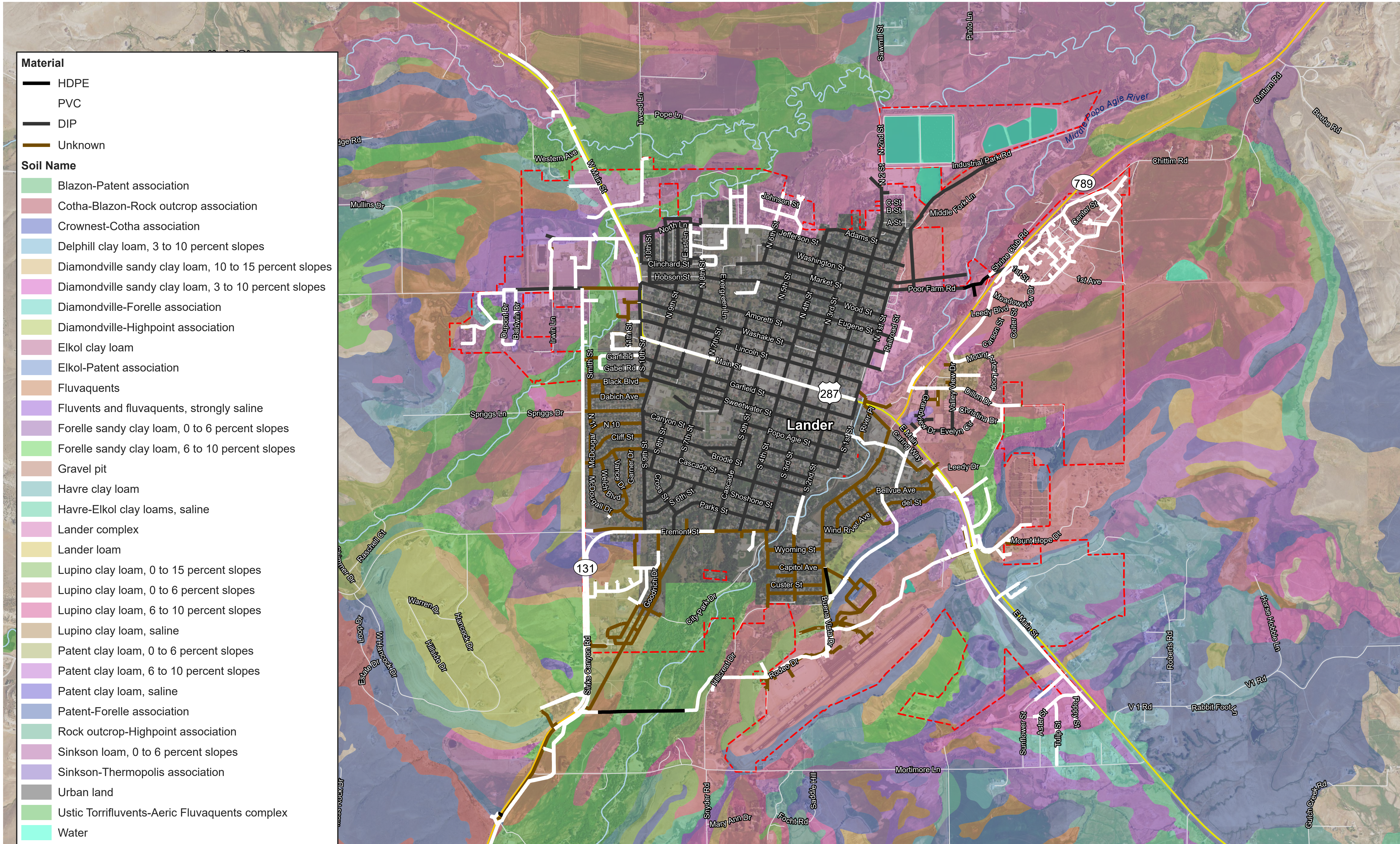
LANDER, WYOMING MASTER PLAN



WATER MAINS MATERIAL

Figure 2-2

LANDER, WYOMING MASTER PLAN



0 0.5 mi

SOIL TYPES PIPE MATERIAL

Figure 2-3

LANDER, WYOMING MASTER PLAN

2.10 Hydrants

The 2010 Master Plan identified one deficiency the City had as the need to upsize hydrant leads that were 4-inch in diameter or smaller, or 6-inch in diameter, greater than 250 feet in lead length, and not looped. While conducting the system inventory in GIS, it was determined that several such hydrants remained in service. The City has a policy to replace older hydrants as they renew existing water lines. As this is the case, no major action is needed for the City's hydrants aside from regular flushing and maintenance actions and replacement during other scheduled pipeline renewal projects.

2.11 Pressure Control Elements

As noted earlier, the City has six (6) pressure zones, which are controlled by tanks (and altitude valves) or pressure reducing valve (PRV) stations. With the exception of the High Pressure Zone Tank altitude valve, all of the PRV's and altitude valves, have or will have been, replaced between 2016 and 2024. Pressure control valves require regular maintenance and periodic replacement of parts. The City currently has a maintenance program for these pressure control valves, and all valves seem to be in good condition. No major actions are foreseen for these valves for the 20-year planning horizon aside from regular inspection, maintenance, and minor replacements.

2.12 Metering Infrastructure

The City has current plans to replace its existing customer meter infrastructure in the next several years as the existing meters are nearing the end of their useful service lives. As this project is in progress no immediate concerns are identified for the metering infrastructure for the twenty-year planning horizon that are not already being addressed. However, complete customer meter replacement will be budgeted for in the 20-year CIP.

The City has reported spotty results with the insertion meters installed in their PRV stations. Meters with more precise measurements should be considered at these locations for a better understanding of flow between pressure zones. Replacement of the current insertion meters in use with a higher quality insertion meter should be budgeted for in the 20-year CIP.

2.13 Instrumentation and Control

The City's current instrumentation and controls system was just installed. No major actions are foreseen for this item for the 20-year planning horizon.

2.14 Administrative Controls

As part of this study a recommendation for the refurbishment of the current water balance accounting system was developed. This would see the current billing schedules realigned to occur in line with data collection from water treatments production. In discussions with the City of Lander it was noted that there may be discrepancies between the usage billed by the city and actual usage. This consideration agrees with noted differences in production versus metered water. By evaluating current citywide water uses on an interval that more closely aligns with the production monitoring period it will be easier for City personnel to better quantify their systems loss characteristics.

An additional possible reason for the discrepancy between metered production and metered consumption is poor meter reading capability. The City is currently tackling this issue as well. They plan to replace their customer meters in the next five years as well as make improvements to the metering at the water treatment plant. Currently at the water treatment plant they have a magnetic flow meter on the plant influent, but poor effluent monitoring. They installed insertion-type meters on the filter effluent lines in 2021, but have found them to be incapable of registering small flows as well as having questionable accuracy. The City currently plans to install 24-inch diameter magnetic flow meters on the redundant effluent lines for the treatment plant during the summer of 2023.

3 Water System Operations

3.1 Water Loss and Treatment Plant Metering

To determine the net water loss within the distribution system the City needs to compare total metered billing against treated water flows leaving treatment plant. The analysis is typically conducted on an annual basis. It is recommended the utility inspect and calibrate water treatment plant inflow and outflow meters annually.

Target annual water loss is typically 10% of treated water volume. If water loss is significantly higher than the target volume, the utility should develop a program to evaluate and reduce water loss. Some potential items for the utility to consider are listed as follows.

- Accuracy of water treatment plant inflow and outflow meters
- Water loss from significant main breaks
- Leakage from ground storage tanks
- Unmetered water loss from construction and flushing
- Unmetered uses
- Accuracy of monthly and billing data

Additional considerations include a detailed examination of the water balance between winter and summer months. If the issue is an accounting issue the utility may consider revising recording periodicity for their entire system so that measurements can be taken at a uniform point in time. Such an approach would simplify water balancing and provide a clearer picture as to the losses experienced by the system.

3.2 Valve Exercising and Maintenance

The City has developed a valve exercising and maintenance system using a program called Stacker. It is recommended that the City continue utilizing their current system. The following recommendations are given for consideration only. The City may already be implementing some of these measures.

A valve exercising and maintenance program should have written procedures and goals. The program should include an annual target for number of valves to be exercised as well as number of broken valves to be replaced. Critical valves on transmission mains and near storage facilities should be identified and exercised on a regular basis. In addition to line valve, pressure reducing valves should be inspected, tested and maintained on a regular basis. Pressure reducing valve maintenance should be based on manufacturer recommendations. The valve program should include the following:

- Identify critical valves.
- Develop number of critical and non-critical valves to be exercised annually.
- Develop number of inoperable critical and non-critical valves to be replaced annually.
- Outline maximum time for broken critical and non-critical valves to be repaired or replaced.
- Develop annual inspection and testing of pressure reducing valves.
- Develop maintenance program for pressure reducing valves. Including cleaning and replacement of operating parts.
- Coordination of valve exercising with any flushing programs.

3.3 Hydrant Maintenance and Fire Flow Testing

The City has developed a hydrant maintenance and fire flow testing program. It is recommended that the City continue utilizing their current program. The following recommendations are given for consideration only. The City may already be implementing some of these measures.

The AWWA manual M17 should be used as a guideline for testing and maintenance. The testing and maintenance program should include the following.

- Procedures for opening and closing hydrants to ensure safety of staff and public and minimize potential of damage to distribution system.
- Develop number of hydrants to be inspected and exercised annually.
- Develop number of inoperable hydrants to be replaced annually.
- Coordination of hydrant testing program with any flushing programs.

3.4 Tank Inspection and Cleaning

The City has developed a tank inspection and maintenance program. It is recommended that the City continue utilizing their current program. The following recommendations are given for consideration only. The City may already be implementing some of these measures.

AWWA standards and manuals should be used as a guideline for the program, including AWWA D100 through D130 and manual M42 (steel tanks). Storage tanks are typically inspected inside and out every three years. Elevated storage tanks are typically cleaned at the same time as the inspection. Ground storage cleaning should be based on inspection of sediment depth within the tank. Utility should be mindful of specific coating requirements and parts prone to corrosion or failure. The tank inspection and maintenance program should include the following.

- Determine which AWWA standards apply to each tank and familiarize staff with those standards.
- Develop a schedule for comprehensive inspection and cleaning. Recommended inspection and cleaning is every three years. Inspection should be conducted by entity experienced with the tank type and material.
- Develop an annual or quarterly annual visual inspection program and check list. Check list should include items prone to corrosion or failure, safety concerns, sanitary concerns, sedimentation levels and observation of any leakage.

4 Geographic Information System

4.1 Development of GIS

The Lander GIS water system datasets were compiled using CAD files, historical water system maps, and QA/QC from the city staff.

The initial GIS schema was created for the city in a geodatabase format. Datasets were created for point features classes, Water_Devices, and line feature classes, Water_Mains, using the NAD 1983 StatePlane Wyoming W Central 4903 (US FT) coordinate system. Attribute fields and domain choices were configured for each feature class to meet the cities system needs.

To begin compiling the existing water system data the first import of data to the geodatabase was from converting a CAD file of the entire system, provided by the City of Lander, to GIS datasets. CAD files were exported to GIS, and the data was appended to the GIS feature classes in the configured geodatabase. Attribute information that was present in the CAD file for diameters, status, main type, material, etc., were appended to the GIS data.

After the initial data was collected, CAD files for recently installed projects were converted to GIS and appended to the water system datasets.

To complete a more comprehensive dataset for the city's water system, previous generations of maps were used to verify and locate additional information about the system, including PRV locations, general valve locations, and other system features. Any additional features and information were included in the GIS feature classes.

HDR collaborated with city staff to review the GIS dataset and ensure accuracy. The updated GIS features and information were provided to the city of Lander staff. City staff verified information about the water system shown on the maps and provided HDR with feedback. Revisions were completed from the review.

The completed GIS geodatabase now provides a comprehensive view of the city's water system. GIS was also used to create a Planning Water Service Boundary.

The GIS data deliverables were developed in accordance with the WWDC GIS Standards Technical Memorandum utilizing the provided Geodatabase templates. The GIS data deliverables were provided to the WWDO and City of Lander staff in digital format.

5 Hydraulic Model

The existing hydraulic model of the Lander water distribution system was updated and calibrated as part of the master plan. Steady state model calibration was conducted to verify model pipe network connectivity, pipe diameters and pipe friction factors. An extended period simulation calibration was also conducted to verify tank level settings and pressure reducer settings for the various pressure zones. A report summarizing the model update and calibration can be found in the appendix.

5.1 Model Overview

The initial WaterGEMS model was developed by HDR for analysis of projects within the water distribution system. HDR worked with City staff to verify and update pipe diameter, material, and approximate location of existing water mains. The model was also checked for pipe network connectivity, tank setup and pump station setup. Boundary conditions for the seven pressure zones were also verified with City staff.

Model analysis of the existing and future system improvements was conducted to determine adequacy of pressure and supply based on the following criteria.

- Maintain minimum pressure of 35 pounds per square inch (psi) at peak hour demand.
- Maximum pipe velocity of 5 fps at peak hour demand.
- Target fire flow of 1000 GPM under maximum day demand.

5.2 Analysis of Existing System

5.2.1 2022 Distribution System Analysis

Pressure and pipe velocities within the existing distribution system were analyzed under the estimated 2022 peak hour demand of 8.6 MGD. All pressures were above the target 35 psi except at locations near storage tanks and the Dillion zone supply Pressure Reducing Valve (PRV), which was 20-35 psi. It is normal for pressures to be lower in these areas due to their high elevations and no improvements are recommended at these locations. All pipe velocities were below the five (5) fps target. Pressure and pipe velocities for 2022 peak hour are shown in Figure 5-1.

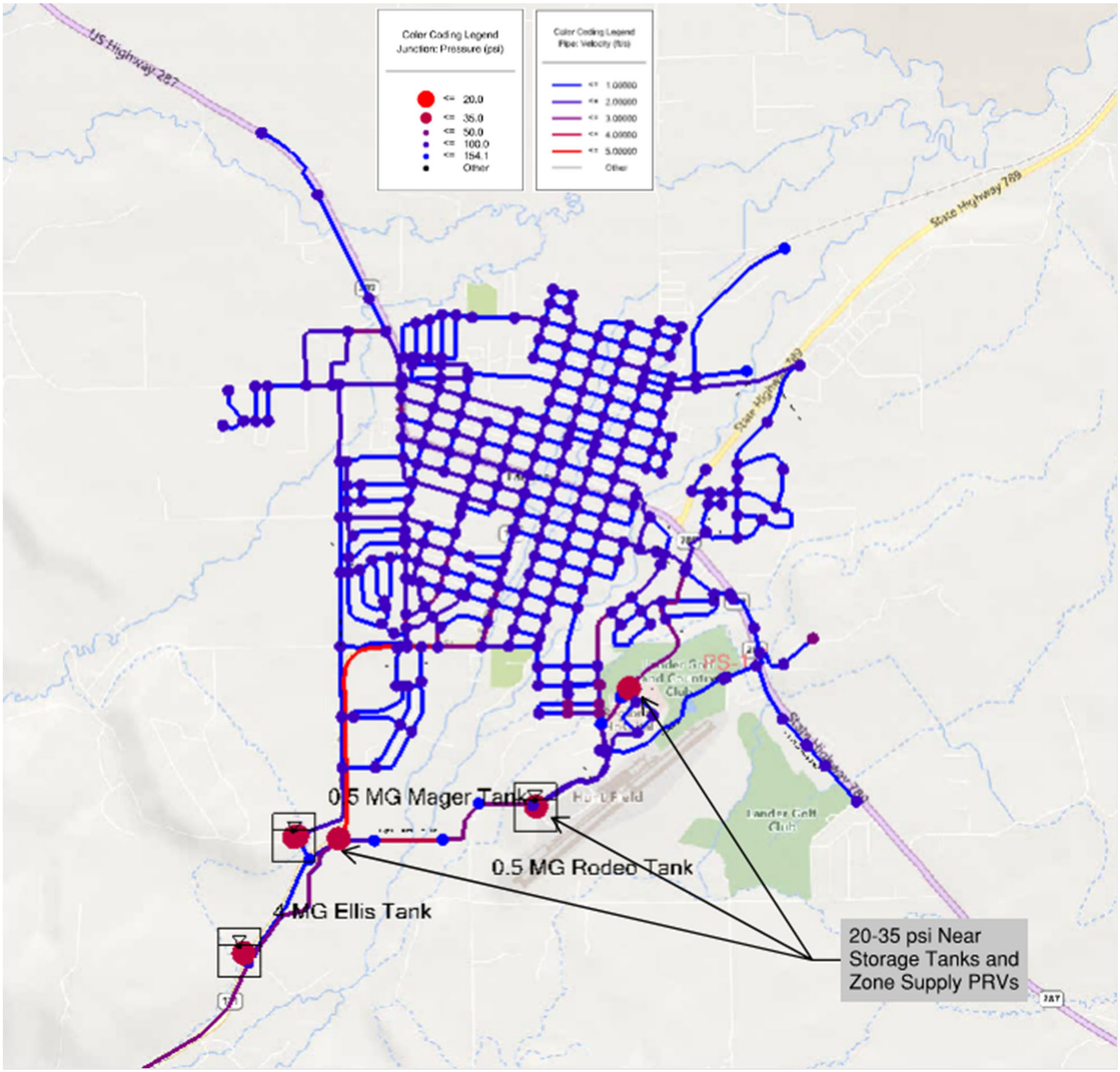


Figure 5-1 2022 Peak Hour Pressures and Pipe Velocities

5.2.2 2022 Fire Flow Analysis

A fire flow model analysis was conducted to estimate available fire flow available during 2022 estimated maximum day demands of 4.6 MGD. Most locations have over 1,500 GPM available except for some areas in the Mager and Rodeo zone which had flows between 1,000 and 1,500 GPM.

The only location with available fire flow below 1,000 GPM target fire flow is on a dead-end 4-inch line in the northeast area of the Ellis zone. It is recommended to up-size the existing main to 8-inch if higher available fire flow is desired at that location. Modeled available fire flow is shown in Figure 5-2

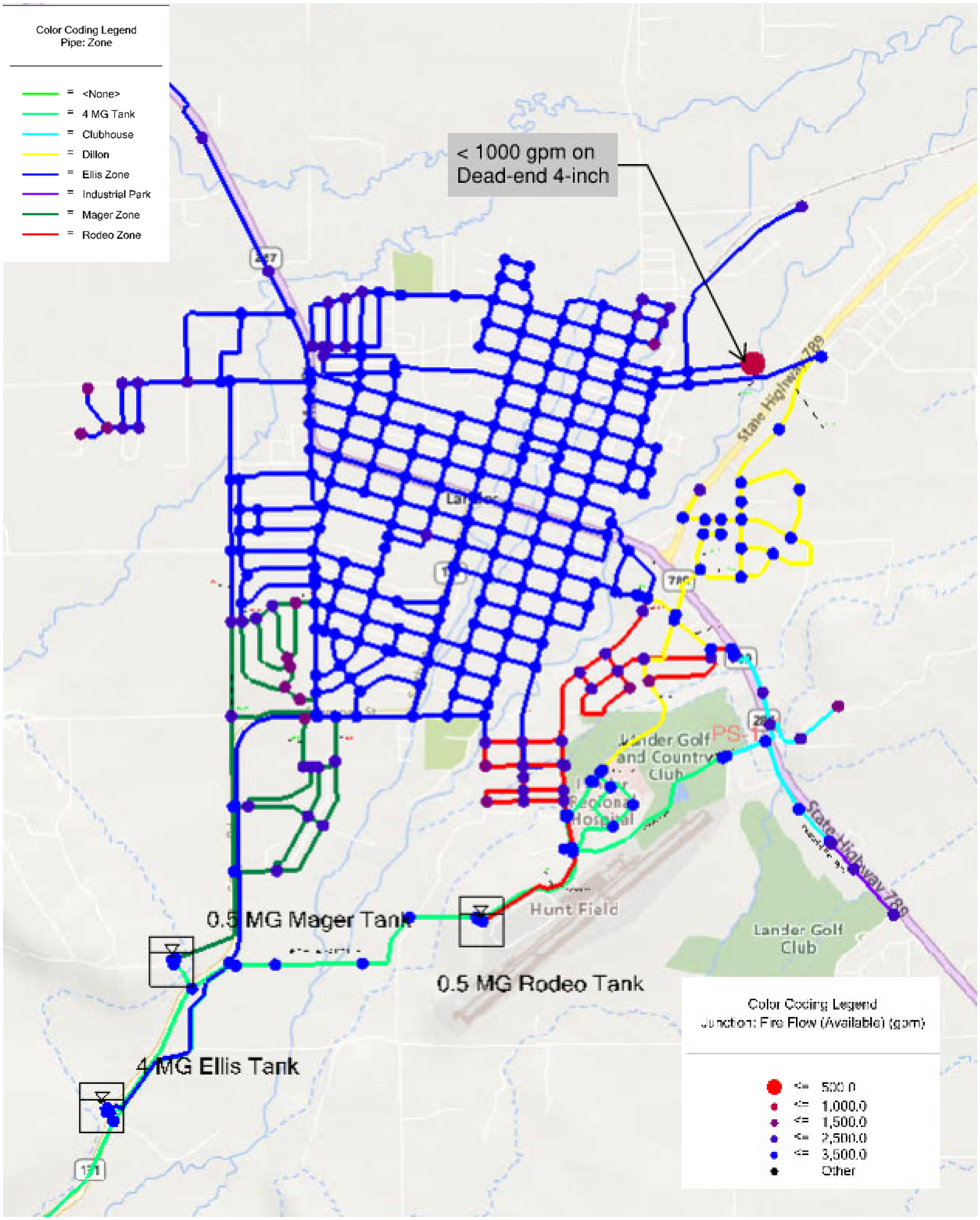


Figure 5-2 2022 Modeled Available Fire Flow with Maximum Day Demand

5.3 Analysis of Future System and Demand

Analysis of the distribution system was modeled using future demands from Section 2.6. Additionally, potential areas of expansion of the existing pressures zones were also evaluated based on contour elevation information. The future demand locations and pressure zone expansion areas are shown in Figure 5-3.

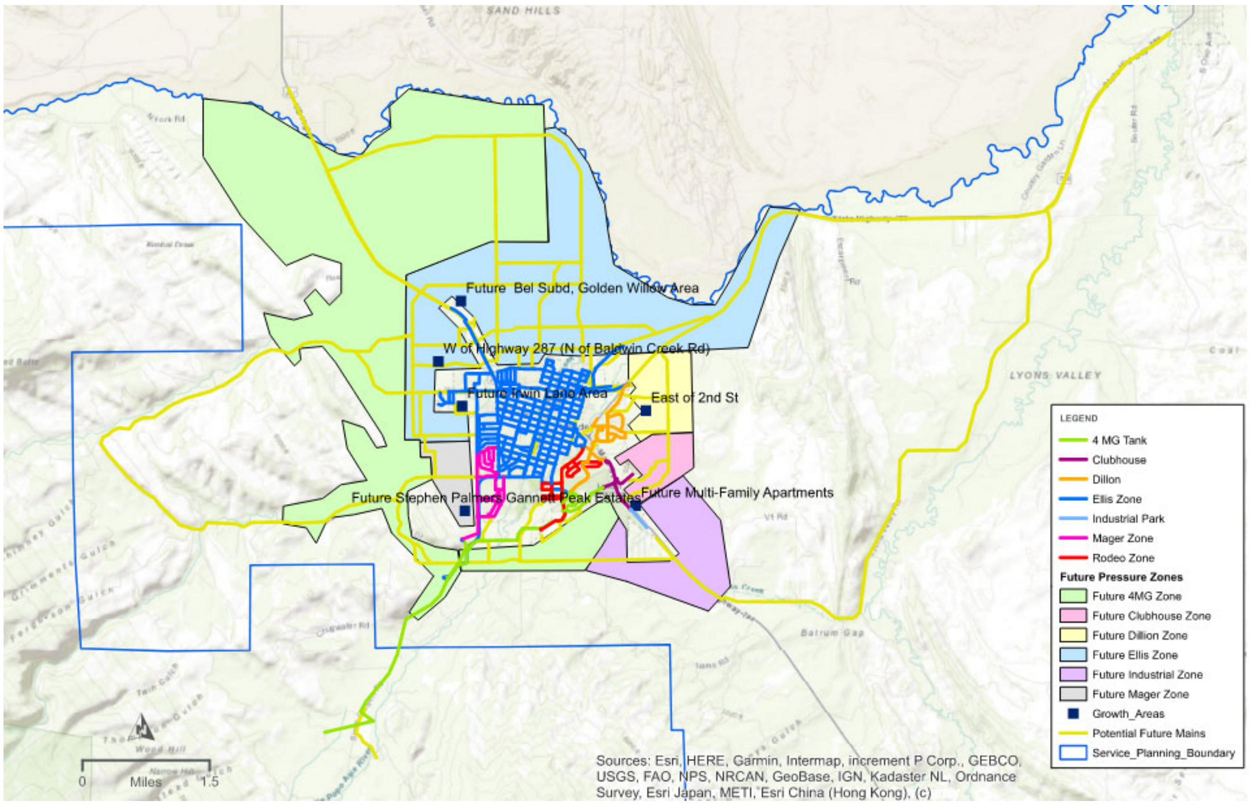


Figure 5-3 Pressure Zone Expansion Areas and Future Demand Locations Within Pressure Zone Expansion

5.3.1 2042 Distribution System Analysis

Pressure and pipe velocities were analyzed under the estimated 2042 peak hour demand of 11.6 MGD. As with the 2022 analysis, all pressures were above the target 35 psi except at locations near storage tanks and the Dillion zone supply PRV, which was 20-35 psi. All pipe velocities were below the five (5) fps target. Pressure and pipe velocities for 2042 peak hour are shown in Figure 5-4

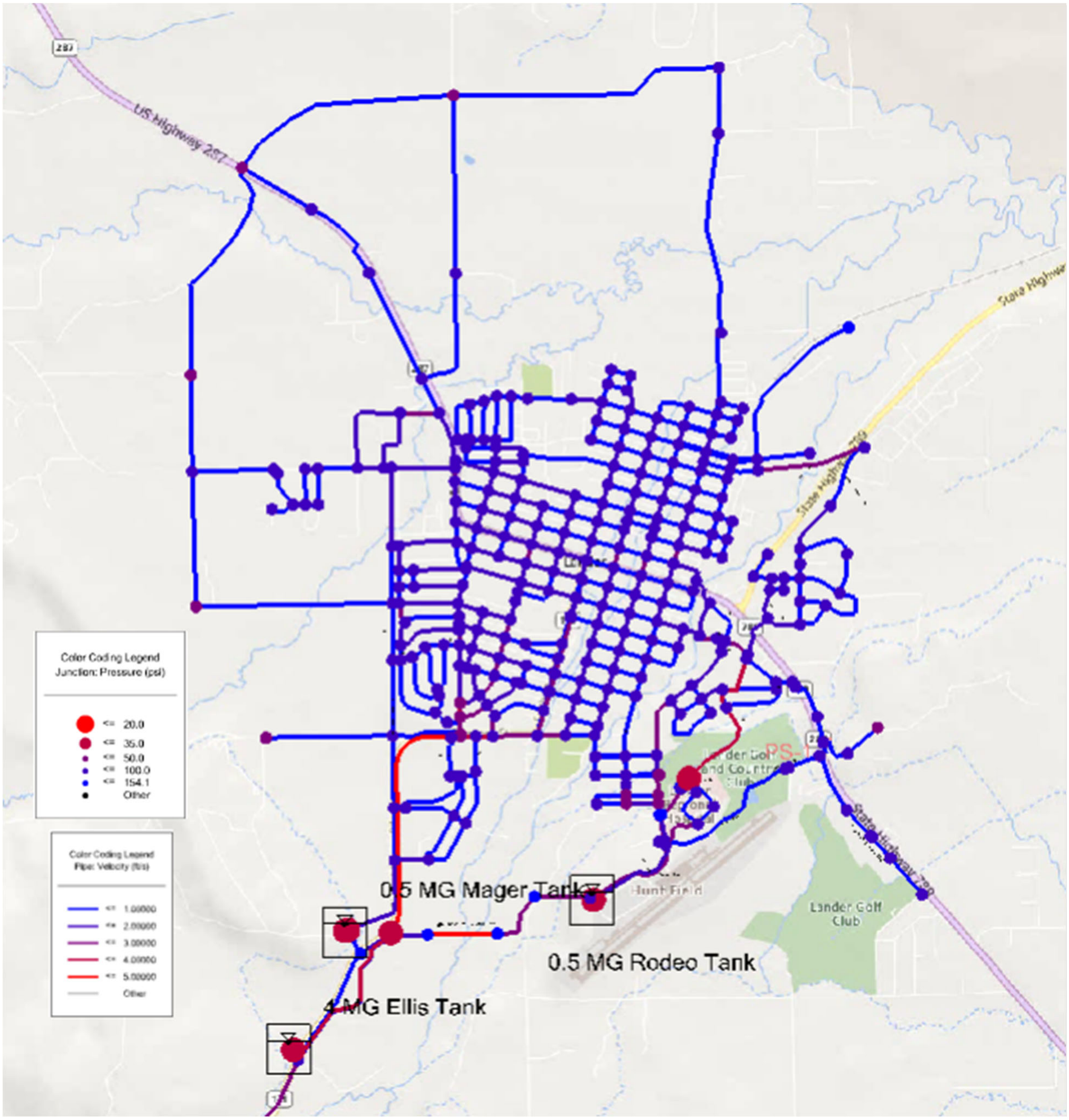


Figure 5-4 2042 Peak Hour Pressures and Pipe Velocities

5.3.2 2042 Fire Flow Analysis

A fire flow model analysis was conducted to estimate available fire flow available during 2042 estimated maximum day demands of 6.08 MGD. The model indicates the expansion areas have over 1,500 GPM available fire flow. Similar to the 2022 analysis, some areas in the Mager and Rodeo zones have available flows between 1,000 to 1,500 GPM. Also, the same dead-end 4-inch line in the northeast area of the Ellis zone has available fire flow below the target 1,000 GPM unless the main is upsized as a future improvement. Modeled available fire flow is show in Figure 5-5.

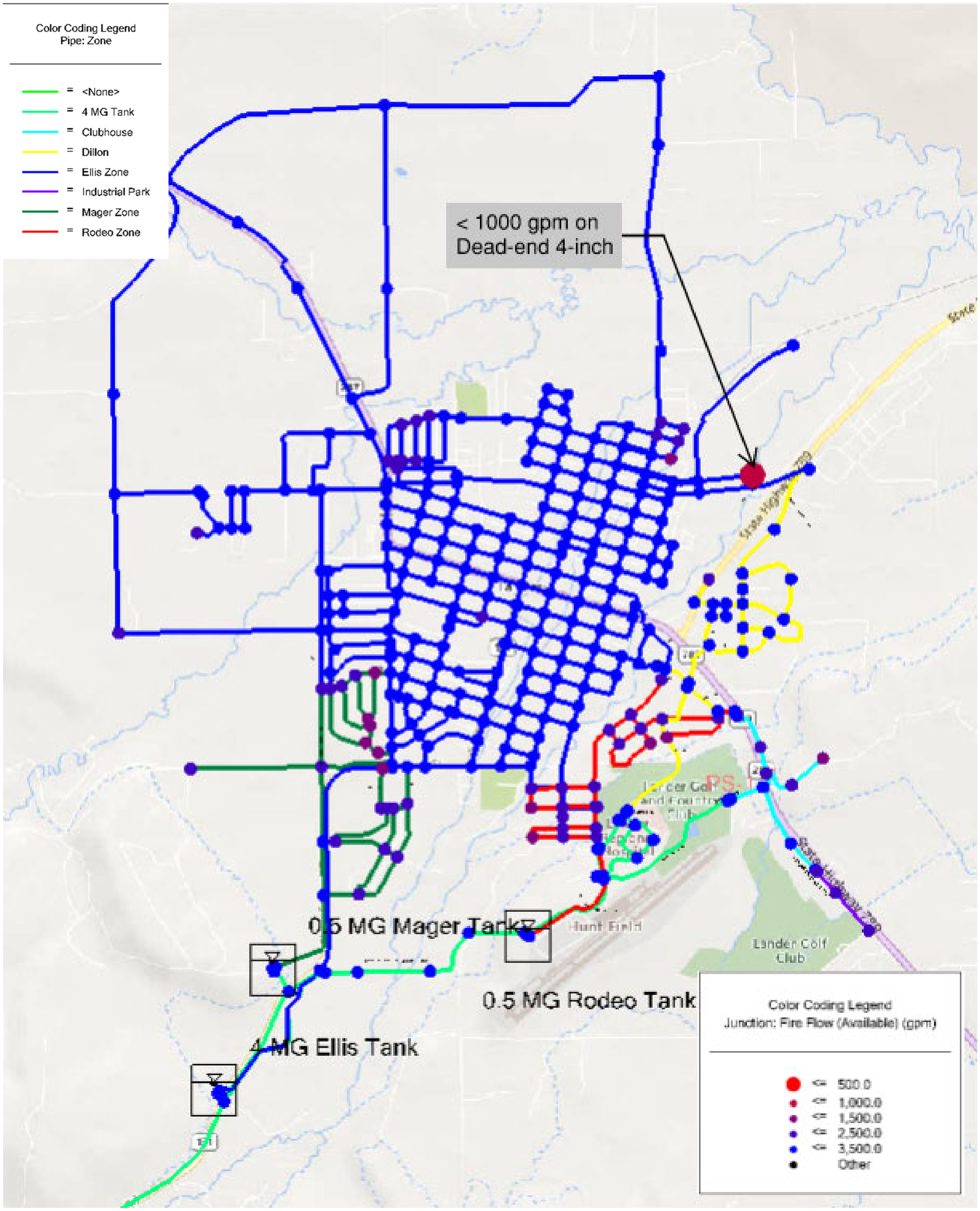


Figure 5-5 2042 Modeled Available Fire Flow with Maximum Day Demand

5.4 Transmission Main Evaluation and Prioritization

The City of Lander currently has several water main replacement projects under various stages of planning and design. An evaluation of the existing distribution system was made to develop a potential transmission main network plan as well as evaluate if certain replacement projects should be upsized or downsized from their current diameter.

For purposes of the analysis, a transmission main is defined as a pipe 12-inch in diameter or larger or a line that conveys water to or from a water storage facility or through a pressure zone or a line whose primary purpose is not to deliver water directly to customers.

5.4.1 Potential Main Replacements and Extensions

The distribution system evaluation was based on requirements for zone demands and pipe diameter. An overall map of the existing Lander distribution system based on pressure zone and pipe diameter is shown in Figure 5-6.

The City has several planned water main replacement projects in various stages of planning and design. Development of the potential transmission main corridors will consider locations of the upcoming main replacement projects for areas of overlap. Upcoming replacement projects are shown in Figure 10-1.

The City maintains a map of potential future main extension corridors to assist with planning for future development. Similar to the main replacement projects, these corridors will also be considered when evaluating the City’s future transmission main layout. See Figure 5-7 for map of potential main extensions and pressure zone service expansion areas.

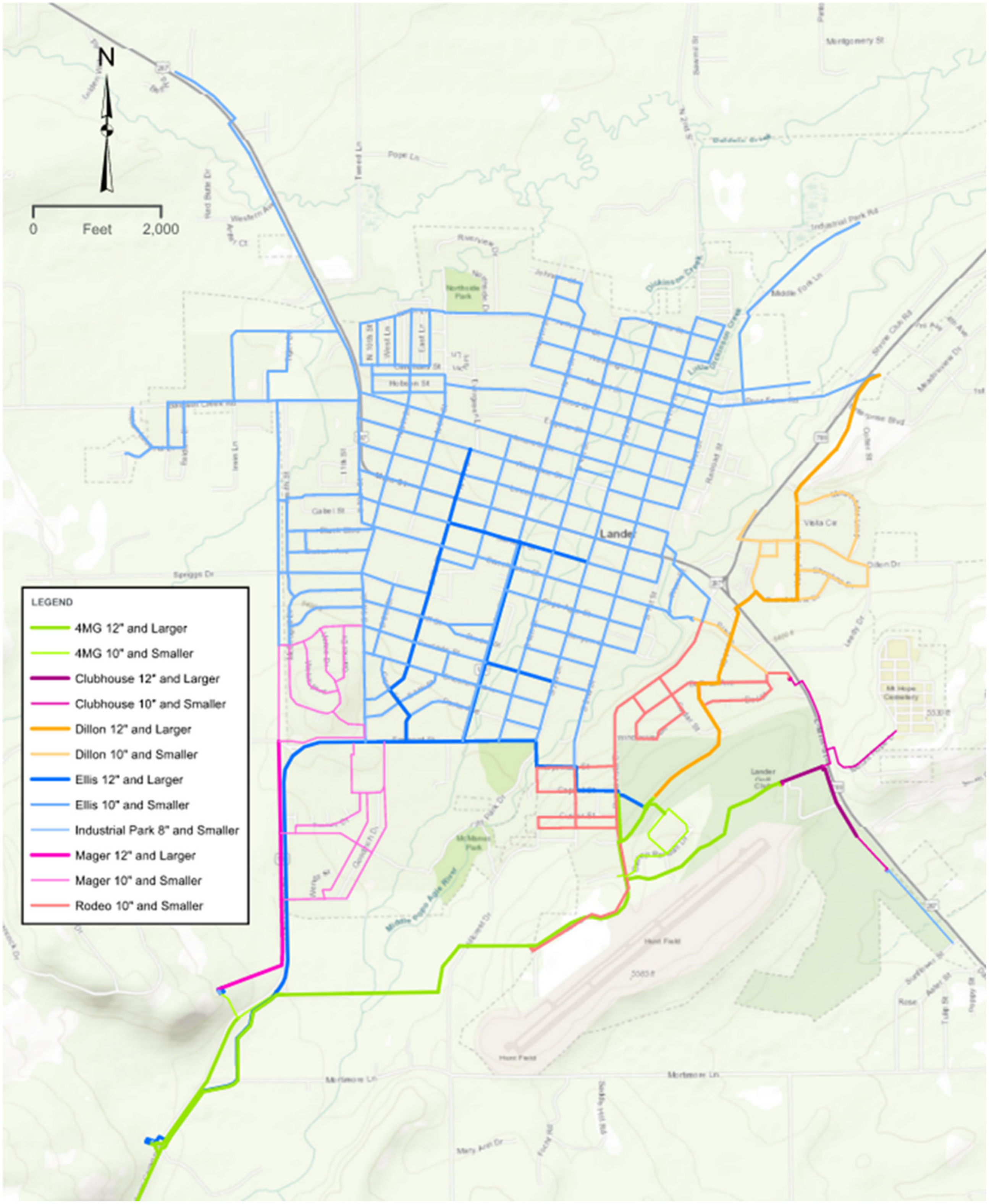


Figure 5-6 Existing Lander Distribution System Map

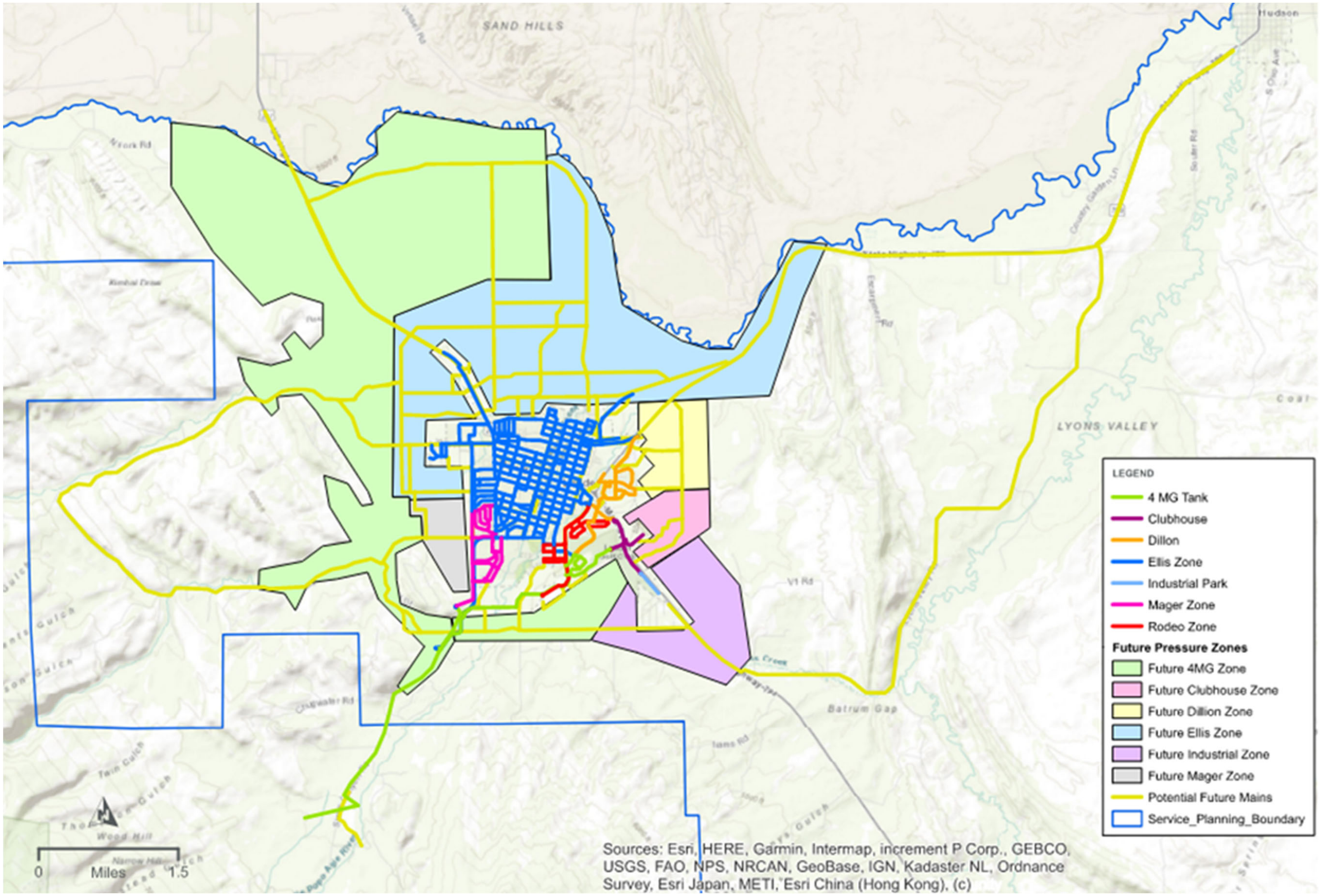


Figure 5-7 Potential Main Extensions and Pressure Zone Service Area Expansion

5.4.2 Transmission Main Hydraulic Analysis

To evaluate required transmission capacity for future demands, a basic network of transmission lines was assumed from the WTP to storage facilities and through the various pressure zones. The existing transmission system was utilized as much as possible. New transmission mains utilized corridors proposed for main extension or replacement projects where possible. For existing transmission mains that were redundant or stranded it was assumed those mains would be downsized to 8-inch.

The analysis assumed 2042 maximum day demand of 6.08 MGD plus an additional 3.0 MGD wholesale supply to customers northeast and northwest of Lander (1.5 MGD each). To limit the pressure drop across the distribution system headloss was limited to not exceed 3 feet per 1000 foot of main. The proposed transmission main network is shown in Figures 5-8 and 5-9.

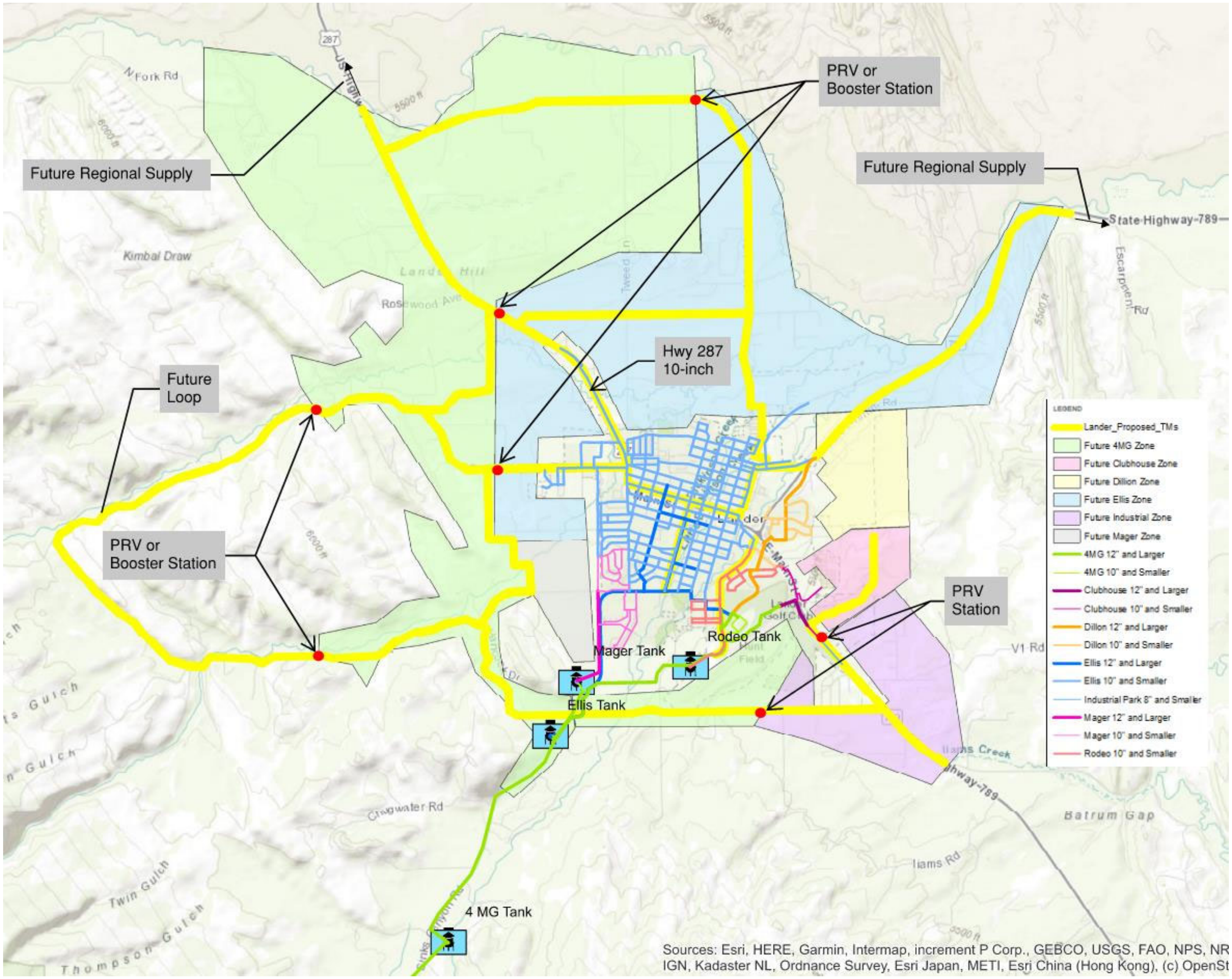


Figure 5-8 Transmission Main Corridor Map

5.5 Hydraulic Analysis Summary and Capacity Improvements

It is recommended that the expansion of existing pressure zones be limited to the topography limits they currently serve as shown in Figure 5-3. For areas of expansion beyond allowable zone service areas additional improvements will likely be required including booster stations and storage facilities. For main extensions, the recommended minimum main size should be 12-inch for trunk lines and 8-inch for general service lines.

If fire flows on the dead-end 6-inch on west side of Rodeo zone and the dead-end 4-inch line in the northeast area of the Ellis zone are desired, it is recommended to up-size those lines to 8-inch mains at those locations.

In general, a transmission main should be maintained to and from water storage facilities. There should also be at least one transmission main through each pressure zone. To minimize headloss across the distribution system, transmission mains should be sized to limit headloss to less than 3 feet per 1000 feet of main. Single-feed transmission main capacities with a C factor of 120 are shown in Table 5-1.

Table 5-1 Transmission Main Capacities with C factor of 120 and headloss of 3ft/1000ft

Diameter	Capacity (MGD)
12	1.5
16	3.0
20	5.5
24	9.0
30	16.0
36	25.0

Specific proposed transmission mains are described for each pressure zone as follows.

Ellis Zone

- 5th Street 12-inch on 5th Street from existing 20-inch on Fremont Street to Lincoln Street. This would replace the existing 18-inch main and distribution main along 5th Street.
- Lincoln Street 12-inch main from Hwy 287 to 1st Street
- Northeast corridor transmission main from Lincoln Street along 1st Street, Poor Farm Road, and Highway 789. Sizing based on ultimate demand needs including future wholesale demand.
- North corridor 12-inch main along N. 2nd Street from Poor Farm Road up to Industrial Park Road and to the North.
- Northwest corridor transmission main along Highway 287. Sizing based on ultimate demand needs including future wholesale demand. If this main is looped with the north corridor transmission main there may be a possibility to utilize the existing 10-inch along Highway 287 for a portion of the transmission main.
- The existing 12-inch main east of 5th Street on Cascade Street and Garfield Street can be downsized to 8-inch in the future.
- Existing Baldwin Creek Road 8-inch should be upsized to a 12-inch. Future expansion of the Baldwin Creek Transmission Line should be sized at 12-inch.

- All other existing transmission mains can remain.

4MG Tank Zone

- Northeast corridor transmission main along east side of Lander. This main would connect to potential interconnects with future Squaw Valley main and Ellis zone mains. The interconnects may have pressure relief valves (PRV) or booster pump stations depending on the water supply direction.
- East corridor transmission main will require a PRV at the interconnection point with the Industrial zone.

Rodeo Zone

- Buena Vista 12-inch main from supply tank or PRV through zone.

Clubhouse Zone

- 12-inch main from existing 12-inch main on Highway 287 that extends through the future zone expansion area.

Industrial Zone

- 12-inch main along Hwy 287 that connects to the Clubhouse zone and 4MG Tank zone transmission mains with a PRV.

Mager and Dillon Zones

- No changes to existing transmission mains are proposed.

For existing distribution mains 10-inch and smaller, it is recommended that those lines be replaced with a standard distribution main size of 8-inch for any future main replacement or extension projects, unless an unforeseen high demand warrants a transmission main.

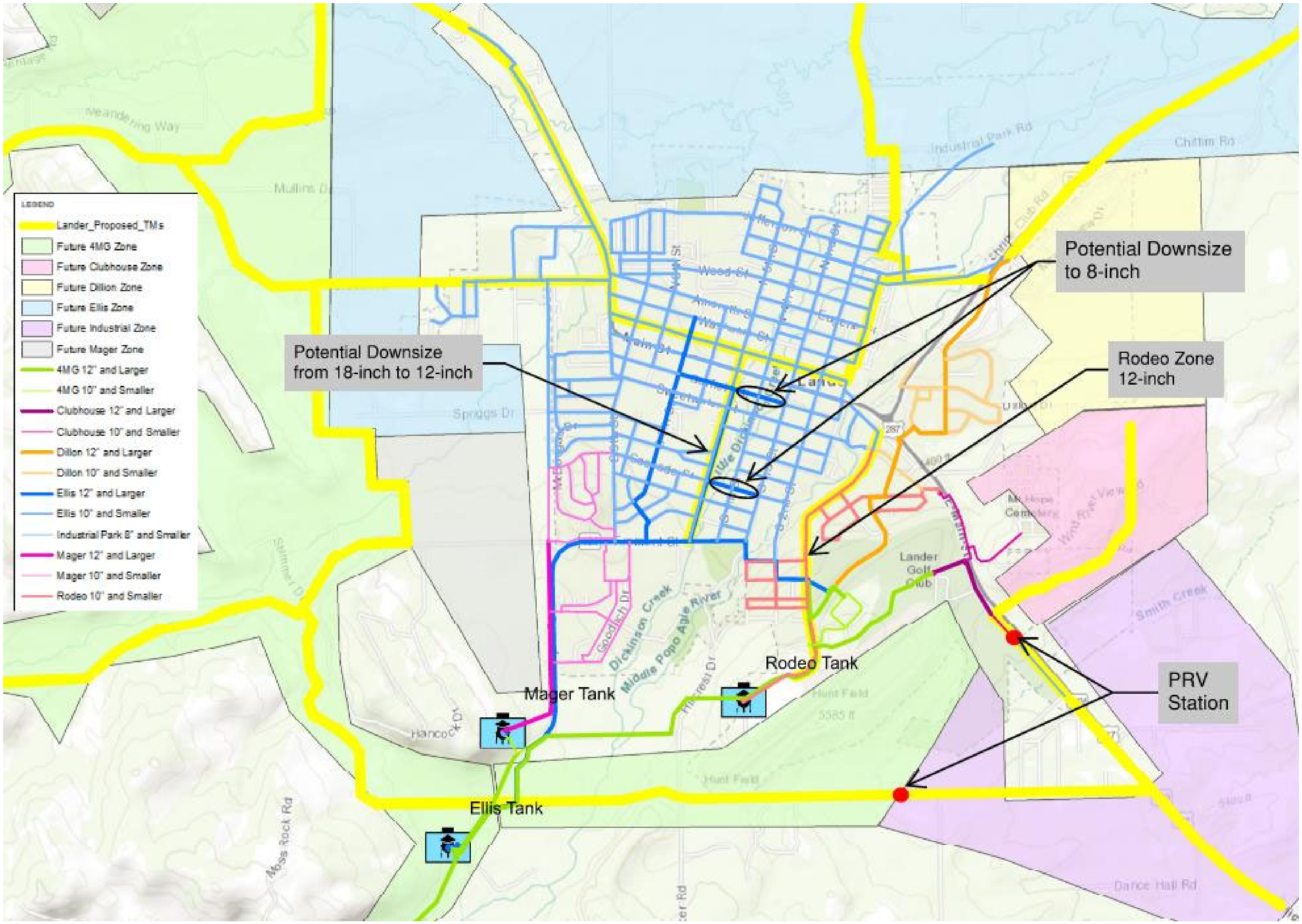


Figure 5-9 Transmission Main Corridor Enlarged Map

6 Water Source

6.1 Water Rights - General

The City of Lander relies on multiple water supply sources for meeting municipal water needs. The primary sources of supply are surface water diverted from the Middle Popo Agie River and storage water held and releases from Worthen Meadows Reservoir which is owned and operated by the City.

In addition, during periods of water shortages in the Middle Popo Agie drainage the City relies on a 2004 exchange petition approved by the Wyoming State Engineer's Office (SEO) for water that is released to the Middle Popo Agie River from the City's infiltration gallery. The exchange allows for up to 750 GPM (1.08 MGD) of water to be discharged to the river during periods of administration to offset out-of-priority diversions at the City of Lander Pipeline (COLP) intake. While the exchange petition allows for up to 750 gpm, the City is currently credited with 380 gpm (0.85 CFS). The reason for this is that the infiltration gallery discharge has been recently measured by the SEO to determine the credit available to the City for the exchange process. As recently as August 2018, the SEO measured the gallery discharge at 380 GPM (0.85 CFS). Subsequent to this measurement, SEO has consistently credited the City with 0.85 CFS or 0.55 MGD during periods of water rights administration.

During water shortages, the City has a second exchange approved by the SEO that allows for the City's storage releases from Worthen Meadows reservoir to address make-up water for in-priority senior irrigation rights under the Cemetery Ditch in exchange for out-of-priority diversions at the water treatment plant intake. The exchange and release of storage water allows for the City's diversions to have no adverse effect on the natural flow of the Popo Agie River below the City's intake.

In 2021 with WWDC funding, the City completed four shallow alluvial wells in the vicinity of the City's water treatment plant. The purpose of the wells was to serve as a back-up water supply to the City's primary water sources. The well water is available to provide up to a thirty-day water supply providing flexibility and resilience to the City's water system.

In addition to meeting the City's emergency water needs, during periods of water shortage in the drainage, the four wells can possibly be relied upon to release water directly to the Middle Popo Agie in exchange for out-of-priority diversions at the water treatment plant intake if an exchange petition is obtained from SEO similar to that for the infiltration gallery.

Because the Middle Popo Agie drainage frequently experiences shortages and the appropriators are subject to voluntary or actual water rights administration during the middle to late summer months, the City's senior direct flow water rights, storage rights, and groundwater rights are critical to meeting existing and future water needs.

6.2 Water Right Appropriations

The City holds various water right appropriations of varying priority dates allowing for the City diversion of surface water from the Middle Popo Agie River. The most senior appropriations are Territorial water rights that have been transferred from historically irrigated lands lying within the City's municipal boundary. Table 6-1 is a summary of the City's direct flow surface water rights ordered by priority date. The City has a total of 11.4742 cubic feet per second (CFS) or 7.41 MGD of surface water rights available at the COLP.

Table 6-1 City of Lander Pipeline Direct Flow Water Rights

Ditch	Priority Dates	CFS	MGD	COLP Cumulative MGD
City of Lander Pipeline (COLP)	1874 to 1878	0.9500	0.61	0.61
COLP	1880 to Summer 1881	0.5552	0.36	0.97
COLP	Spring 1884 to 4-01-1885	0.4057	0.26	1.23
COLP	5-04-1885	4.7500	3.07	4.30
COLP	5-15-1885 to 1903	2.4133	1.56	5.86
COLP	10/16/1920	2.4000	1.55	7.41
	COLP Total	11.4742		7.41

It should be noted that there is an additional 6/20/1879 priority water right on the Cemetery ditch for 1.01 CFS (0.65 MGD) used to irrigate the City of Lander Golf Course and a 5/4/1885 priority water right on the Dutch Flat-Taylor Ditch for 1.15 CFS (0.74 MGD) used to irrigate the City of Lander Cemetery.

The City's storage water rights in Worthen Meadows Reservoir are listed in Table 6-2.

Table 6-2 City of Lander Worthen Meadows Reservoir Water Rights

Permit	Priority Date	Capacity (acre feet)	Water Uses
Permit No. 6186 Res.	October 7, 1954	1,395.0	Municipal
Permit No. 6365 Res.	May 1, 1956	108.6	Municipal
Permit No. 6365 Res.	May 1, 1956, Proof no. 39038	0.0	Irrigation under Exchange
Permit No. 13619 Res. (Enl. of Use, P6186R)	July 16, 2010	0.0	Irrigation under Exchange
	Total	1,503.6	

Historically, during Middle Popo Agie shortages, the City released water from Worthen Meadow as a make-up or replacement water supply in exchange for the City's out-of-priority water rights diverting into the City of Lander Pipeline (C.O.L.P.) at the water treatment plant intake. Based on an approved SEO Exchange Petition, Worthen Meadow Reservoir storage releases passing the City's intake meet the irrigation needs of in-priority senior water rights under the Cemetery Ditch.

In 2019 the City, in cooperation with the SEO, installed equipment that measures the inflow, outflow, and reservoir elevations at Worthen Meadow Reservoir. The data is available via real-time on the SEO website and provides an extensive hydrologic dataset when combined with historical records.

The City's groundwater rights which include the infiltration gallery, the new shallow alluvial wells, an existing well near the treatment plant, as well as existing wells that irrigate parks, are listed in Table 6-3, and illustrated in Figure 6-1.

Table 6-3 City of Lander Groundwater Rights

Well Permit and Well Name	Priority Date	Yield Actual (GPM)	Well Depth (feet)	Active	Water Uses
Permit No. U.W. 215396 Lander Well PW 1	March 22, 2021	500	84	Yes	Municipal
Permit No. U.W. 215397 Lander Well PW 2	March 22, 2021	500	81	Yes	Municipal
Permit No. U.W. 215398 Lander Well PW 3	March 22, 2021	500	83	Yes	Municipal
Permit No. U.W. 215399 Lander Well PW 4	March 22, 2021	500	59	Yes	Municipal
Permit No. U.W. 134639 Lander Well Treatment Plant 3 A	May 2, 2001	250	85	Yes	Municipal
Permit No. W.R. U.W. 440G Lander Municipal Infiltration Gallery	May 1, 1956	760	18	Yes	Municipal
Permit No. U.W. 52717 City of Lander #1	April 13, 1979	130	2,320	No	Municipal
Permit No. U.W. 62640 Park 1	September 17, 1981	40	50	Yes	Municipal
Permit No. U.W. 71838 Park II	July 20, 1983	40	56	Yes	Municipal

6.3 Water Quality

Based on water quality reports from the City of Lander, the current water treatment plant is functioning adequately. The current water treatment plant can manage seasonal fluctuations in influent water quality. Conversations with plant operators indicate that the seasonal fluctuation varies substantially with weather year to year.

The currently installed capacity of the water treatment plant is anticipated to be capable of sustained operations in the coming years. As additional volumes are required through expansion of service areas and possible system interconnections, the water treatment plant should be considered for additional capacity upgrades. As additional load requirements are placed on the system treatment, capacity will need to be scaled up accordingly.

From the 2021 Drinking Water Summary Report, the following table provides the most recent report on water quality for the City of Lander. This report is provided to all residents served by the existing water system.

Table 6-4 2021 Water Quality Report (2021 Annual Water Quality Report, City of Lander)

Contaminants	MCLG or MRDLG	MCL, TT, or MRDL	Detect In Your Water	Range		Sample Date		Typical Source
				Low	High			
Disinfectants & Disinfection By-Products								
(There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
Chlorine (as Cl2) (ppm)	4	4	1	1	1	2021	No	Water additive used to control microbes
Haloacetic Acids (HAA5) (ppb)	NA	60	29	26	31	2021	No	By-product of drinking water chlorination
TTHMs [Total Trihalomethanes] (ppb)	NA	80	20	18	21	2021	No	By-product of drinking water disinfection
Total Organic Carbon (% Removal)	NA	TT	42.14	NA	NA	2021	No	Naturally present in the environment
Inorganic Contaminants								
Nitrate [measured as Nitrogen] (ppm)	10	10	0.02	NA	NA	2021	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Sodium (optional) (ppm)	NA		3.5	NA	NA	2021	No	Erosion of natural deposits; Leaching
Microbiological Contaminants								
Turbidity (NTU)	NA	0.3	99.4	NA	NA	2021	No	Soil runoff
99.4% of the samples were below the TT value of 0.3. A value less than 95% constitutes a TT violation. The highest single measurement was 0.855. Any measurement in excess of 1 is a violation unless otherwise approved by the state.								

The water quality report summarized in Table 6-4 is provided to the public annually. The full report is included in the appendix for this study.

6.3.1 Water Source Blending Review

The previous Level II Study (Wyoming Ground Water et al, 2020) performed an assessment of potential water quality related impacts to Lander's distribution system based on the emergency operations where the four new alluvial wells are used as a temporary supply source. The assessment concluded the groundwater is less corrosive than treated surface water because it is a hard water source. The analysis also concluded any additional treatment other than disinfection would not be effective as a temporary three or four-day emergency source. Finally, it is recommended that Lander perform additional sampling and analysis for various parameters to evaluate early warning signs of potential water quality problems.

6.4 Meeting Future Water Demands

The City's WTP and distribution system were evaluated based on their current conditions. The proposed prioritized capital improvements are projected over a planning period for the next twenty years. Section 7 of this report describes the anticipated projected maximum day demands based on the expected water system expansion to serve new customers and to meet the projected population growth within and outside the current municipal boundary. In addition, the City serves county customers with drinking water from the water haul station. The water service from the water haul station is expected to grow in the future. Section 9 of this report reviews the increase in water demands for a potential structural regionalization, such as an intertie serving municipal entities within the Wind River Indian Reservation in addition to serving the Town of Hudson.

For the purpose of water supply planning, it is prudent to review a longer planning period of up to fifty years or more. The development of new water supplies or acquiring water supplies and water rights can require the need for increased long-term planning.

The capacity, water supply and water rights of Lander's existing water system is not adequate to provide service to the potential intertie water demands in addition to serving an expanded City's service area. The City will need to look to acquiring new water supplies and developing new sources of water to meet the combined long-term needs of City and service to the potential intertie entities. A high priority of the City is to actively pursue the acquisition of additional water sources and associated water rights to address anticipated service area growth and structural regionalization demands from new intertie customers.

The City is routinely subject to water rights administration later in the summer and must rely on exchange water supplies in addition to the release of their Worthen Meadows storage water. The projected water demands for the anticipated population growth within and outside the current municipal boundary in the next twenty years are provided in Table 8-1.

Table 6-5 and Figure 6-1 summarize maximum day demands, raw water irrigation rights, and available and projected municipal storage over the longer fifty-year planning period. The projected water sources include an increase in the additional active storage water available to meet water supply demands beginning in the late summer when water administration is effective in the Middle Popo Agie drainage. The analysis assumes that 500-acre feet is maintained in Worthen Meadows Reservoir as a minimum inactive pool for recreation and fishery benefits.

To meet the existing and the projected maximum day demands in the next fifty years, the City will need to take some or all of the following actions:

- Continue to utilize direct flow surface water diversions from Middle Popo Agie River at the City of Lander Pipeline intake,
- Continue to utilize storage water released from Worthen Meadows Reservoir in exchange for out-of-priority COLP diversions and the potential expansion of municipal storage within the Reservoir,
- Pursue rehabilitation and maintenance to improve and maintain yields of the existing infiltration gallery that discharges to the Middle Popo Agie River in exchange for out-of-priority COLP diversions; and,
- Implement water conservation incentives in the high demand periods in summer,
- Pursue irrigating large City-owned green areas with a raw water irrigation system to reduce peak demands for treated water in the summer, and,
- Pursue acquisition and transfer of existing senior water rights and/or new or existing groundwater wells potentially targeting the Tensleep aquifer at locations west of Lander.

Future water supply feasibility studies are necessary to evaluate the potential water storage sites and to analyze and quantify the purpose and need for additional storage. One feasible water storage site is an enlargement to Worthen Meadows Reservoir. The preliminary analysis within this report indicates the likelihood of filling and the availability of physical water supply meeting the need for additional storage in the Roaring Fork drainage.

Table 6-5 Future Demands and Active Municipal Use Storage

Year	Water Supply Max Day Demand (MGD)	WTP Hydraulic Capacity[1] (MGD)	Infiltration Gallery Exchange (MGD)	Middle Popo Agie Watershed - Municipal Use - Active Storage Needs[2] (acre-feet)
2022	4.64	10	0.55	825
2027	5.01	10	1.08	621
2032	5.34	10	1.08	697
2037	5.70	10	1.08	780
2042	6.08	10	1.08	867
2047	6.49	10	1.08	962
2052	6.92	10	1.08	1,061
2057	7.38	10	1.08	1,166
2062	7.87	10	1.08	1,279
2067	8.40	10	1.08	1,401
2072	8.96	10	1.08	1,530

NOTES:
1. Although the City Water Treatment Plant has a hydraulic capacity of 10 MGD the approximate treatment capacity is 8 MGD. Treated surface water demands in excess of 8 MGD will exceed the capacity of existing treatment units.
2. The demand analysis assumes an additional 750-acre feet of active storage is available in the Middle Popo Agie drainage for municipal water needs beginning in 2047 since Worthen Reservoir would be drawn down to approximately 500-acre feet at end of Water Year following storage releases.

When the river flows drop to less than approximately 50 CFS at the streamflow gage measurement below the Rise in Sinks Canyon, the Cemetery Ditch can, and will, place administration calls for the regulation of junior water rights. Under typical circumstances during low streamflows, the Cemetery Ditch calling priority date can typically vary from 1887 to a May 4, 1885, priority based on the water supply conditions.

During water rights administration, any irrigation appropriations upstream of the Cemetery Ditch headgate that are junior to the calling senior right are shut off. Any appropriators senior to the administration priority must reduce diversions to a single original appropriation. Under Wyoming water law, the original single appropriation is equivalent to the water duty of 1 CFS per 70 acres of water rights.

Table 6-6 and Figure 6-1 contain the future water demands and source capacity to meet demands of the City of Lander. The analysis assumes the infiltration gallery is rehabilitated to increase the exchange water supply to its water right capacity of 1.08 MGD beginning in 2027.

The estimated reservoir storage release rate and volume in Table 6-6 is based upon an estimated conveyance loss of 25% over a sixty-day release period beginning late in the summer. An increase in 750- acre feet of active municipal storage within the watershed beginning in planning year 2047 would provide for increased reservoir releases to meet municipal needs through 2072.

Table 6-6 estimates the total water right shortage based on a sixty-day water administration period during peak summer demands. Over a fifty-year planning period, the total estimated total shortages grow from 2.83 MGD to 6.65 MGD or from 660-acre feet to 1,224-acre feet. Without an increase in municipal storage in the Middle Popo Agie drainage, the other water supply alternatives include 1) water conservation in the high demand periods in summer, 2) irrigating green areas with a raw water irrigation system to reduce peak demands for treated water in the summer, 3) acquisition and transfer of existing senior agricultural water rights and/or new or existing groundwater wells targeting the Tensleep aquifer at locations west of Lander, and; 4) addition of any new customers be for municipal use only and permitted as such.

The potential green areas irrigated with raw water within the City's municipal boundary are illustrated Figure 6-2. In addition, Figure 6-1 illustrates potential new and existing groundwater wells developing water supplies from the Tensleep aquifer along Squaw Creek Road serving as a potential long-term water supply alternative for the City.

A cost-benefit analysis of the water supply alternatives can help prioritize which alternative is the most cost effective for reducing future water shortages. With HDR's assistance the City performed a ranking analysis to identify the priority of water supply alternatives. Table 6-8 contains the results of the priority ranking and the conceptual estimated total cost of each alternative. The waters supply priority ranking was relied upon to decide the timing and implementation of water supply projects within the City's 20-year CIP. The ranking criteria included: 1) water source, 2) beneficial use, 3) estimated annual supply from implementing the project in acre feet, 4) cost per acre feet, 5) estimated number of new taps served by project, and 6) overall estimated project cost. The City assigned a 3 times weighting factor to the estimated total cost.

Table 6-6 Lander Water Service Area Future Demands and Estimated Total Shortages

YEAR	Service Area MDD	Pre 05-04-1885 Water Rights	Infiltration Gallery Exchange	Total Estimated Shortage	
	MGD	MGD	MGD	MGD	AC-FT
2022	4.65	1.23	0.55	2.87	660
2027	5.01	1.23	1.08	2.70	497
2032	5.34	1.23	1.08	3.03	558
2037	5.70	1.23	1.08	3.39	624
2042	6.08	1.23	1.08	3.77	694
2047	6.49	1.23	1.08	4.18	769
2052	6.92	1.23	1.08	4.61	849
2057	7.38	1.23	1.08	5.07	933
2062	7.87	1.23	1.08	5.56	1,023
2067	8.40	1.23	1.08	6.09	1,121
2072	8.96	1.23	1.08	6.65	1,224

NOTES:

1. Analysis assumes the Lander treatment capacity is enlarged prior to 2067 because treated surface water demands in excess of 8 MGD exceed the existing capacity treatment units.
2. Assumes estimated water supply shortages are due to senior water administration call (May 4, 1885 priority) for 60-days period in the late summer months.
3. Any future maximum day water demands in excess of the COLP intake capacity and exceeding the 7.41 MGD direct flow water right will require enlarging the physical capacity and an enlargement application of direct flow water rights.

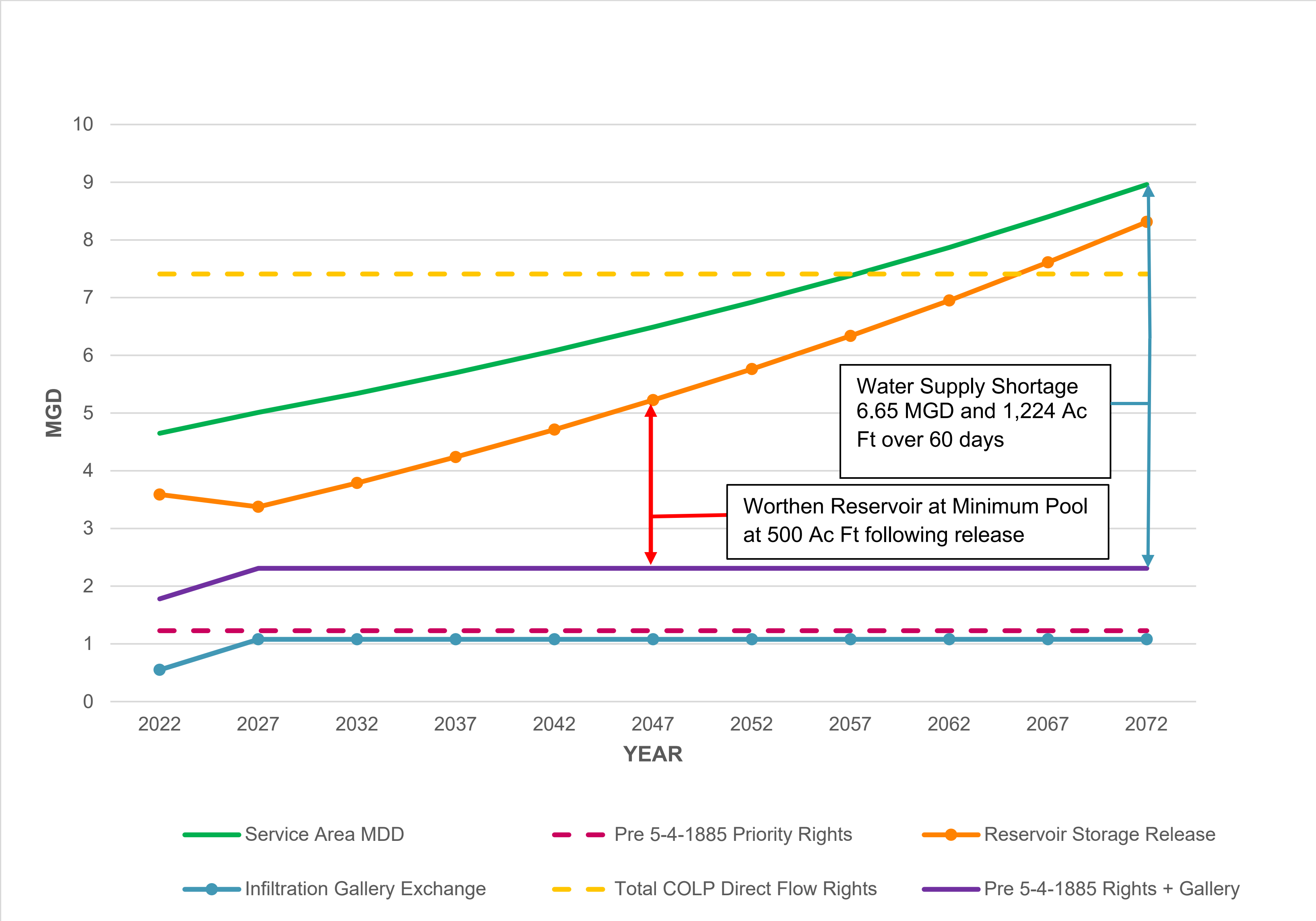
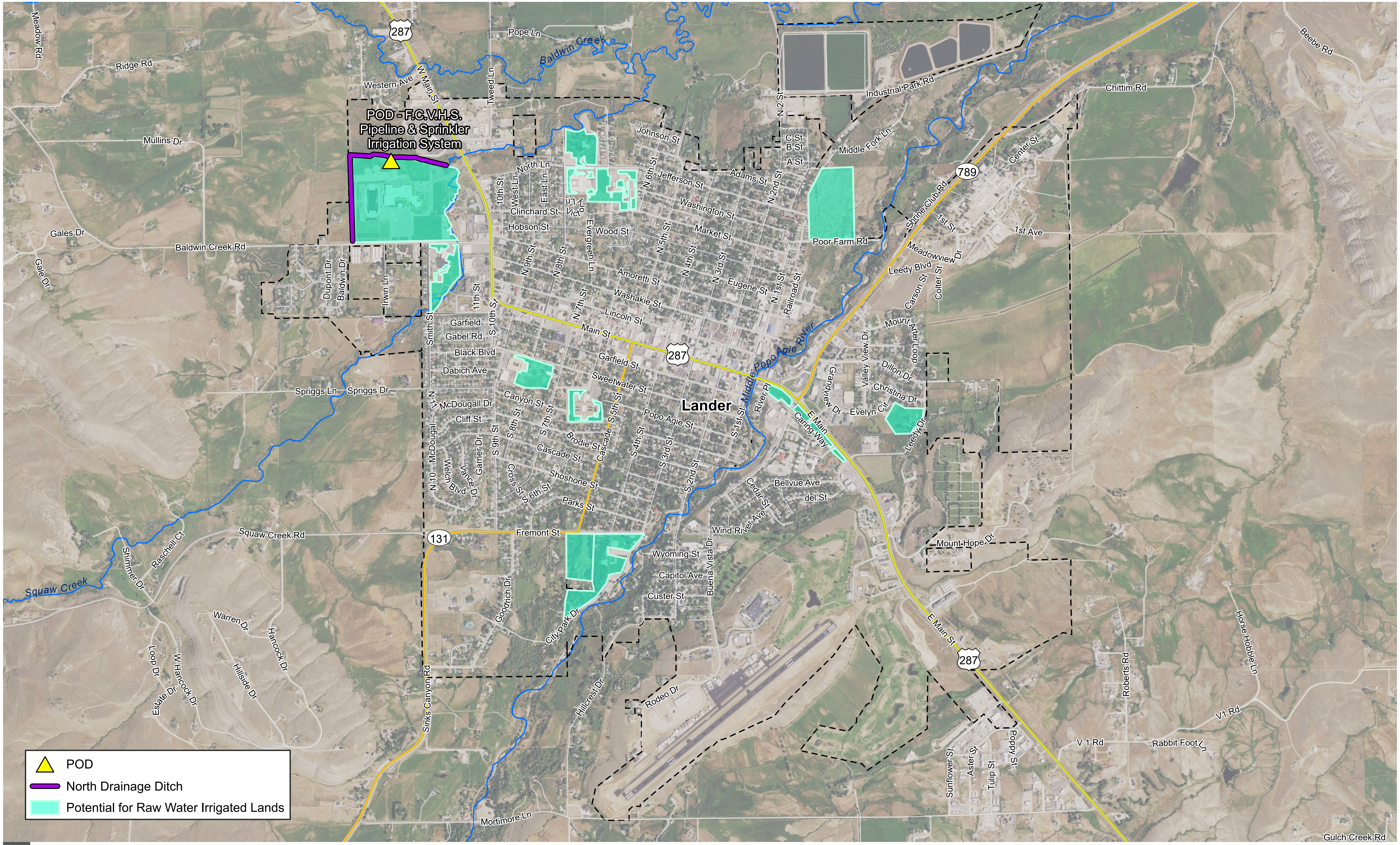


Figure 6-1 Lander Water Service Area Future Water Demands and Source Yields

Table 6-8 Prioritized Ranking of Water Supply Alternative Projects

Water Supply Alternative Projects	Conceptual - Estimated Total Cost	Water Source	Beneficial Use	Estim. Annual Supply (ac ft)		Conceptual - Estimated Cost per Ac. Ft.		Estim. New Service Taps	Overall Project Cost	Total Score
Weighting Factors		**1**	**1**		**1**		**1**	**1**	**3**	
Lander Valley High School Raw Water Conversion	$ 734,700	4	5	242	2	$ 3,000	5	1	4	**29**
Lander City Park	$ 432,250	1	5	73	1	$ 6,000	5	1	5	**28**
Infiltration Gallery - Full Rehabilitation	$ 2,400,000	2	5	270	3	$ 8,900	4	1	3	**24**
Northside Park & Lander MS/Pathfinder HS Raw Water Conversion	$ 644,750	1	5	53	1	$ 12,300	3	1	4	**23**
Squaw Creek Rd Wellfield + Well Transmission Line + 1MG Tank	$ 22,815,000	5	1	1,300	5	$ 17,600	3	3	1	**20**
Squaw - Baldwin Full Loop, Wellfield and Booster Pump	$ 36,655,500	5	1	1,300	5	$ 28,200	1	5	1	**20**
Worthen Meadows Res. Enl.	$8,346,000.00	4	1	450	4	$ 18,500	2	1	2	**18**



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POTENTIAL LANDER RAW WATER SYSTEM

Figure 6-2

LANDER, WYOMING MASTER PLAN

LANDER RAW WATER WELLS AND POTENTIAL TENSLEEP SOURCES

Figure 6-3

LANDER, WYOMING MASTER PLAN

7 Population Growth and Water Demand Projection

7.1 Historic Population Data

The 2020 Census results placed the population of Lander at 7,546. With the exception of significant increases in population during the city's infancy and again through the 1960's (due to natural resource(s) extraction industries); Lander's population has increased at a relatively constant rate – roughly seventy people per year since 1930.

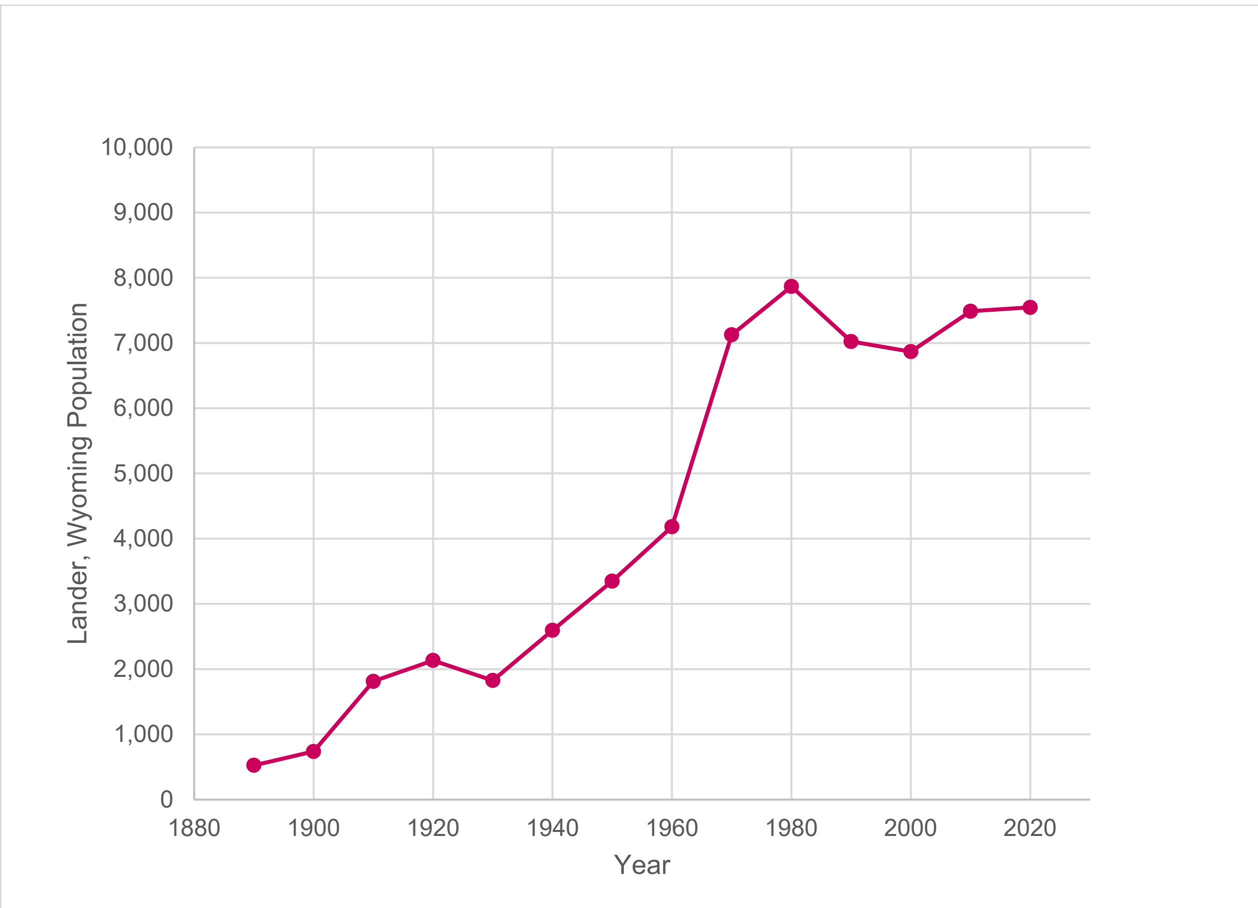


Figure 7-1 Historic Lander Population Growth

According to the Wyoming Office of Administration & Information – Economic Analysis Division (A&I-EAD) Lander's population is estimated to contract through 2026. Then, experience expansion through 2040 at a very slow pace – 0.1% to 0.25% per year. It is unclear how this growth profile was produced; however, the same growth profile is applied to all cities in Fremont County.

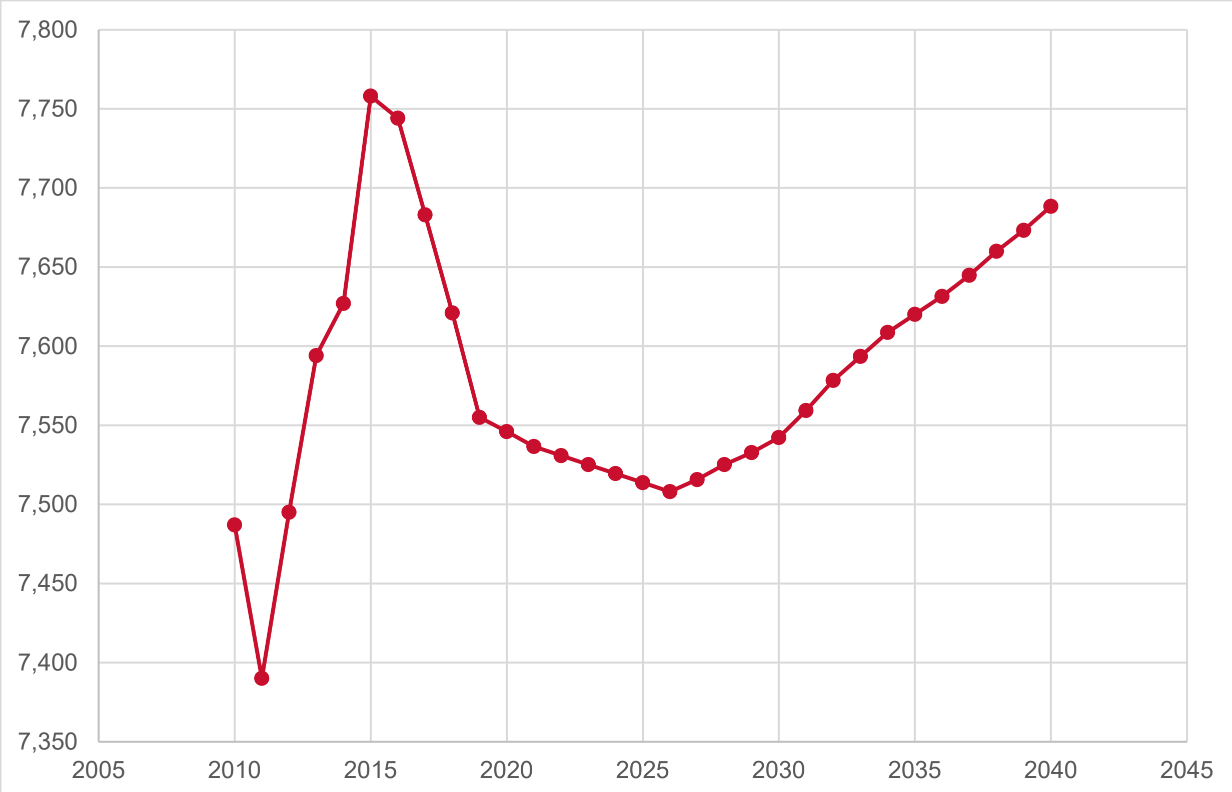


Figure 7-2 Lander A&I-EAD Population Projection

Based on the estimates from A&I-EAD, Lander would not return to its present population until the year 2031; essentially stagnating growth planning for the next nine years. This could have negative impacts on potential capital improvement projects planning, as it is not as conservative approach.

7.2 Growth Projection of City Service Area

The 2012 Lander Comprehensive Master plan estimated 92% of available land within the city had been developed. Given development trends in the last ten years and the City's lack of annexations, this number is likely higher today. In 2022, HDR completed the Lander Acquisition and Relocation Study for Properties Located in the FEMA Floodplain (reference, 2022). The study indicated a distinct lack of available homes on the market. This is reinforced by Lander's current housing density. Lander's population density is approximately 1,643 people per square mile – making it the eighth most dense city in Wyoming. Given these indices, it is unlikely Lander's population will increase substantially, without development outside the existing municipal boundary.

In an effort to provide the Sponsor with relatively conservative growth estimate(s), a growth profile with constant growth for the next twenty years was selected, rather than a variable and changing growth estimate from the State of Wyoming A&I-EAD.

As mentioned previously, Lander has historically experienced growth of approximately 70 people per year since 1930; save very high growth periods through the 1960's and 1970's. As is common in Wyoming towns, these high population growth periods typically mirror increased activities in the mineral extraction industry – and are exceptionally difficult to predict. Given the current state of these industries in Fremont County, Lander is unlikely to experience this sort of growth. Anecdotally, Lander is becoming a destination site for both retirees and young families seeking a lifestyle provided by a smaller mountain community.

In estimating Lander's future growth, the selected planning method for capital infrastructure is reasonably low and high annual growth rates that bracket the projected future population growth. Based on historical growth, an annual growth rate of 0.5 percent per year is a reasonable low projection estimate. An annual maximum annual growth rate of 1.3 percent closely matches peak historic rates experienced in Lander and other Wyoming cities and towns since 2000. For these reasons and to be conservative for capital planning, an annual maximum growth rate of 1.3 percent is projected within Table 7-1.

Table 7-1 Lander Service Area Growth

Year	Population	Annual Growth, %
1960	4,182	
1970	7,125	5.5%
1980	7,867	1.0%
1990	7,023	-1.1%
2000	6,867	-0.2%
2010	7,487	0.9%
2020	7,546	0.1%
2022	7,743	1.3%
2027	8,260	1.3%
2032	8,811	1.3%
2037	9,399	1.3%
2042	10,026	1.3%
2047	10,695	1.3%
2052	11,408	1.3%
2057	12,169	1.3%
2062	12,981	1.3%
2067	13,847	1.3%
2072	14,771	1.3%

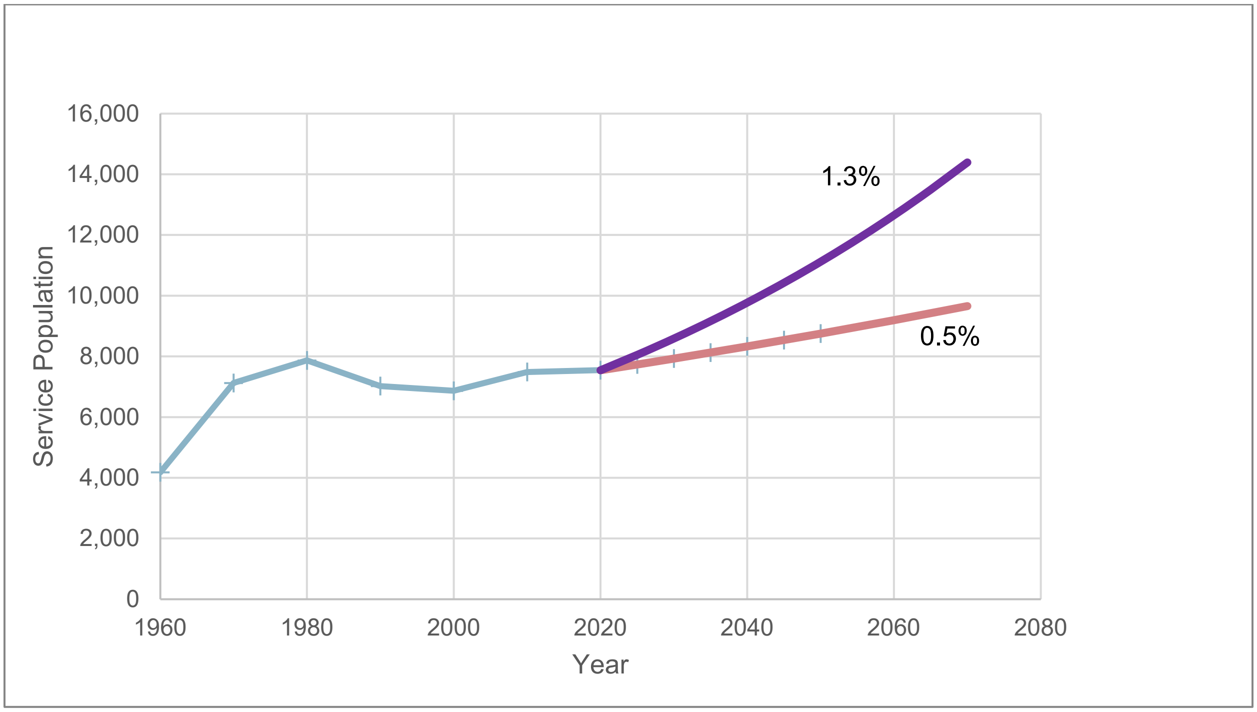


Figure 7-3 High and Low Projected Growth Rates for Service Area Population

Figures 7-3 provides the bracketed high and low growth scenarios through 2070 for the City of Lander – ranging from 0.5 percent to 1.3 percent per year.

The 2012 Lander Comprehensive Master Plan indicated 92% of the available land area within the corporate boundary of the City had been developed. The comprehensive master plan outlined three potential growth scenarios for the City. In discussions with both the City and county planning departments, a variation of the Growth Scenario 2 represents the most likely path forward.

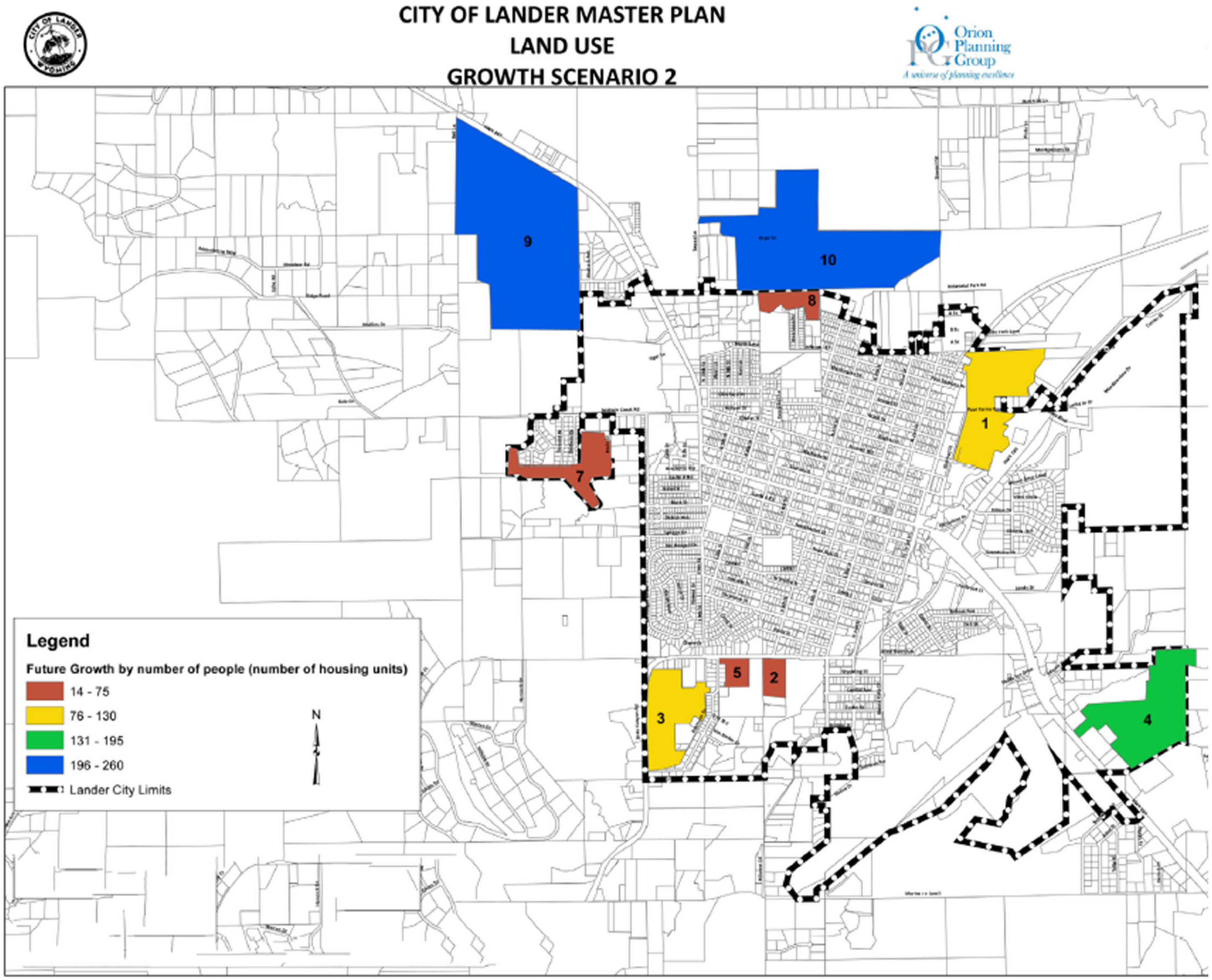


Figure 7-4 Potential Growth Areas from 2012 Study
Source: 2012 Lander Comprehensive Master Plan

In this scenario, nine separate locations were called out as potential areas for development. Some of the locations have had new development since 2012 and other areas will not accommodate residential development under the City's future plans. In the near term, the City is expected to expand its water service adding new taps to the north, northwest, west and south of the existing City boundary. The potential western and southern residential development is not illustrated in Figure 7-4.

8 System Expansion

Lander's water system serves both municipal and rural customers. As the City looks to the future, they need to plan to serve increased demands on their system, whether it be through expansion of the system through new transmission mains or new customers served through the existing and proposed water haul stations. This section lays out estimated demand increases to the Lander Service Area, which includes both rural and municipal customers. Also examined is the potential use of a non-potable system for existing large volume customers to offset demand in order to serve new customers. Additionally, pressure zone potential expansion areas are identified, as well as transmission main corridors and the sizing to be used.

8.1 Water Haul Station and Potential System Expansion Water Demand Projections

The projected population growth for the City's service population is derived from the estimated maximum growth rate of 1.3 percent annually. Lander services municipal customers with water taps and serves rural customers with a water haul station. The municipal population served is expected to grow from 7,743 in 2022 to 10,026 in 2042 as indicated within Table 8-1.

The average per capita water use within the existing City municipal service area is 243 gallons per day per person (GPCD) based on dividing the City's average municipal day demand of 1.8 MGD by the estimated 2021 municipal population of 7,644 people. A peaking factor of 2.5, as established in Section 5, was used to estimate maximum day demand. The maximum day demand is expected to grow from 4.64 MGD to 6.08 MGD. It is assumed that virtually all of the peak demand comes from irrigation.

It is unknown the exact population served by the rural water house, however, using the total estimate served of 2,000 and an average day demand of 55,000 gallons per day (GPD), the average per capita day demand for rural users is 27.5 GPCD. Given the uncertainty as to how many persons total are served by the rural water house, this figure should be used for total population estimated by the Census for rural areas, rather than actual users.

It is also highly probable that the average day demand is skewed heavily by the irrigation demand during summer. The City has reported that for 6 months out of the year, the amount of water produced through the water treatment plant is roughly 1.2 MGD. Were it not for suggested low flow through customer taps to prevent the mains from freezing during winter, this number would be even lower. As indicated in Table 8.1, the assumed portion of irrigation demand on the City's municipal system is significant.

Table 8-1 Lander Water Service Projected Demands

	Projected Population and Water Demand				
	Base Year (2022)	2027	2032	2037	2042
Lander Service Area Municipal Population Served	7,743	8,260	8,811	9,399	10,026
Lander Service Area Rural Population Served	2,000	2,135	2,277	2,429	2,591
Lander Service Area Minimum Day Demand (MGD)	1.20	1.28	1.37	1.46	1.55
Lander Service Area Average Day Demand (MGD)	1.85	2.00	2.14	2.28	2.43
Lander Service Area Maximum Day Peaking Factor	2.5	2.5	2.5	2.5	2.5
Lander Service Area Maximum Day Demand (MGD)	4.64	5.01	5.34	5.70	6.08
Assumed Irrigation Portion of Maximum Day Demand (MGD)	3.44	3.73	3.97	4.24	4.53
Assumed Potable Use Portion of Maximum Day Demand (MGD)	1.85	2.00	2.14	2.28	2.43

In addition, Lander serves rural residents in Fremont County within the proposed planning water service boundary illustrated in Figure 1-3. This county population is not included within the municipal service population in Table 8-1. Due to poor shallow groundwater quality that is unfit for domestic water needs, rural resident households have cisterns served by the City water haul station. Based on the 2020 Census and water hauling production quantities, the estimated 2022 population served by water hauls is estimated to be approximately 2,000 people. The water haul customer base is estimated to grow to 2,591 by the year 2042 under 1.3% annual growth as indicated in Table 8-2.

The average water use for water haul customers is approximately 30 gallons per day per person. The water haul average daily demand within the service area boundary is expected to grow from 55,000 gallons to 72,000 gallons by the Year 2042.

Table 8-2 Lander Water Service Projected Demands of Rural Customers

	Projected Population and Water Demand				
	Base Year (2022)	2027	2032	2037	2042
Estimated Water Haul Population Served	2,000	2,135	2,277	2,429	2,591
Water Haul Average Day Demand (MGD)	0.055	0.059	0.063	0.067	0.072

8.1.1 Estimated Development Plans

The land area available for single-family residential homes and multifamily complexes is very small within the current City municipal boundary. The expected development includes about 100 households leading to an increase of 250 people with an estimated increase in average water demand of 60,000 gallons per day.

The service planning boundary used for the study is shown in Figure 1-3, which was gathered from anecdotal information from several water haulers who indicated their range of operations for which they deliver from the Lander bulk fill station. The City of Lander indicated areas where the most growth is expected immediately outside of the City's limits based on current real estate sales and proposed subdivisions. These areas are shown in Figure 8-1 with expected future (20 year) population estimates based on 2020 Census data and projected growth.

It is projected that about 1,126 residential households with roughly 2,590 people will be serviced by expansions of the water distribution system by 2042. The anticipated average increase in water demand is over 500,000 gallons per day from this growth.

The City's capital improvements plan should include provisions for expansion of the water system to serve these areas. Tap fees and rates should be assessed differently in these areas of expansion and the use of the water should be for strictly municipal use only. Water load out station rates should also be used to help pay for these system expansions.

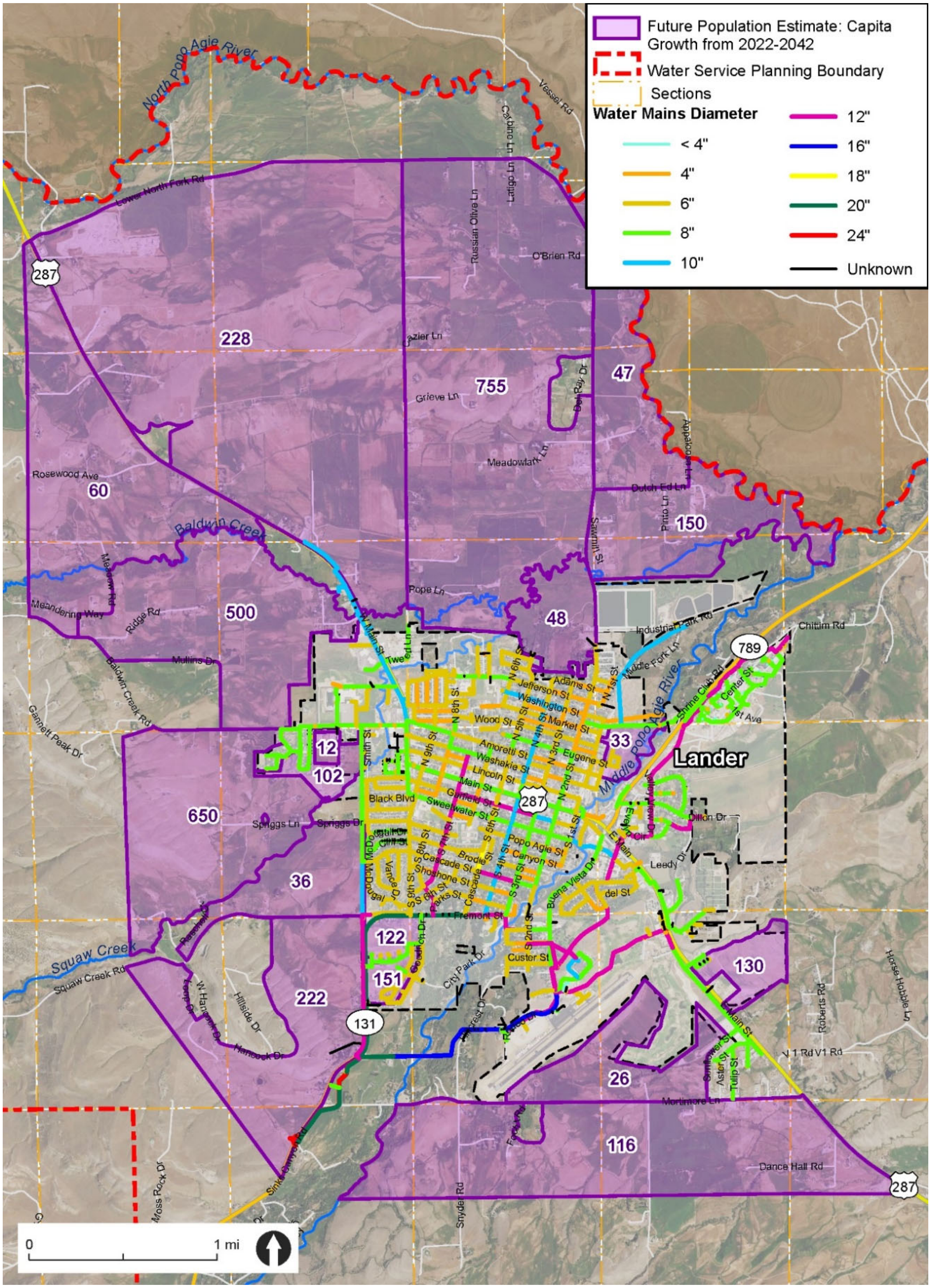


Figure 8-1 Municipal Service Area Expansion with Population Estimates

An opportunity to not only expand service to rural customers but procure additional potable water supply exists as well. To the west of the City along the "Squaw/Baldwin Loop", a number of water wells have been completed with acceptable yields and quality to be candidates for acquisition and water rights transfer to the City of Lander for municipal needs. Table 8-2 contains water well permits that may be eligible targets for acquisition. Another potential eligible candidate for acquisition is an artesian irrigation well located less than two miles from the Baldwin Creek Road and within two and half miles of the Squaw Creek Road Wellfield – Tank and Well Transmission Line Project.

Table 8-2 Candidate Water Wells Along the Squaw / Baldwin Creek Road Projects

Entity	SEO Permit No.	Well Yield, GPM	Well Depth, feet	Well Uses
Red Rock Water Users Association	U.W. 80249 Maxwell #2 U.W. 91986 Enl. Maxwell #2	25 200	1,800	Miscellaneous
Juniper Park Water Users Association	U.W. 91732 Hallett #4	200	1,560	Miscellaneous
Squaw Creek Vista Water Users Association	U.W. 95181 Moody Well #1	220	1,455	Miscellaneous

8.1.2 Non-Potable Water System

A non-potable system will provide for raw water supplies; thereby, allowing the City to meet new water demands of an expanded service area. The top five largest customers of treated water represent the most likely candidates to be served by a non-potable water system. Table 8-3 totals indicate that the maximum day demand of water service to the City's largest irrigation customers is approximately 1.0 MGD or 447-acre feet annually.

The total estimated number of acres presently irrigated is approximately 90 acres based on delineating areal imagery of existing green space. Assuming most of the customer water demands are for the purpose of irrigating green space, the estimated application rate from the recent meter records is approximately 4.35-acre feet for each acre of green space. If all the green areas are served by a new City non-potable water system, the City's existing maximum day demand for treated water is expected to be reduced by approximately 1.0 MG. This reduction could provide for a reduced municipal treated water maximum day demand for the Lander Service area of 3.6 MGD under existing conditions or a reduction to 5.1 MGD in 2042 for the twenty-year planning period.

Table 8-3 Candidate Customers of Non-Potable Irrigation System

Candidate Customers – Estimated Non-Potable Irrigation Demands		ADD		MDD	Estimated Annual Water Demands		
	acres	GPM	MGD	MGD	MG/YR	AF	AF/acre
Lander Valley HS	54	150	0.216	0.54	78.9	242.1	4.52
Lander City Park	16	45	0.065	0.16	23.7	72.6	4.54
FCSD #1 & Swimming Pool	7	20	0.029	0.07	10.5	32.3	4.35
Northside Park	7	17	0.024	0.06	8.9	27.4	3.98
Pathfinder HS/Lander MS	6	16	0.023	0.06	8.4	25.8	4.35
WDOT Main Street ROW	5	12	0.018	0.04	6.5	19.9	4.35
Dillon Park	6	17	0.024	0.06	8.7	26.7	4.35
TOTALS	**103**	**277**	**0.400**	**1.00**	**145.6**	**446.9**	

In addition to the areas listed above, the City may expand the non-potable system based on the purchases of new property within the existing municipal boundary that are ideal developments for new City-owned parks. The estimated number of acres to be served by near-term (five to ten-year period) land purchases by the City is approximately thirty acres. The estimated maximum day water diversions for new City parks is 0.30 MGD.

8.2 Pressure Zone Potential Expansion Areas, Transmission Main Corridors, and Sizing

To serve future growth areas, an evaluation of potential pressure zone expansion was conducted to estimate maximum limits of the zones using ground elevations of area served. Figure 8-2 shows limits of potential pressure zone expansion. Areas served beyond these limits will need pressure boosting or pressure reducing valve (PRV) stations (see Figure 5-9) to provide service.

As depicted in Figure 8-2, transmission mains installed to accommodate new growth should follow existing or proposed transportation corridors identified in the most recent Lander Transportation Plan and transmission main loops identified as “Potential Future Mains” in Figure 8-2. All new transmission mains should be a minimum of 12” in diameter, as determined in Section 5. More detail is provided on specific transmission main corridors in Appendix G, which also gives cost estimates for all transmission main corridors.

Figure 8-2 illustrates where transmission mains are needed for any developments that occur outside of the City’s capital improvements plan presented in this report.

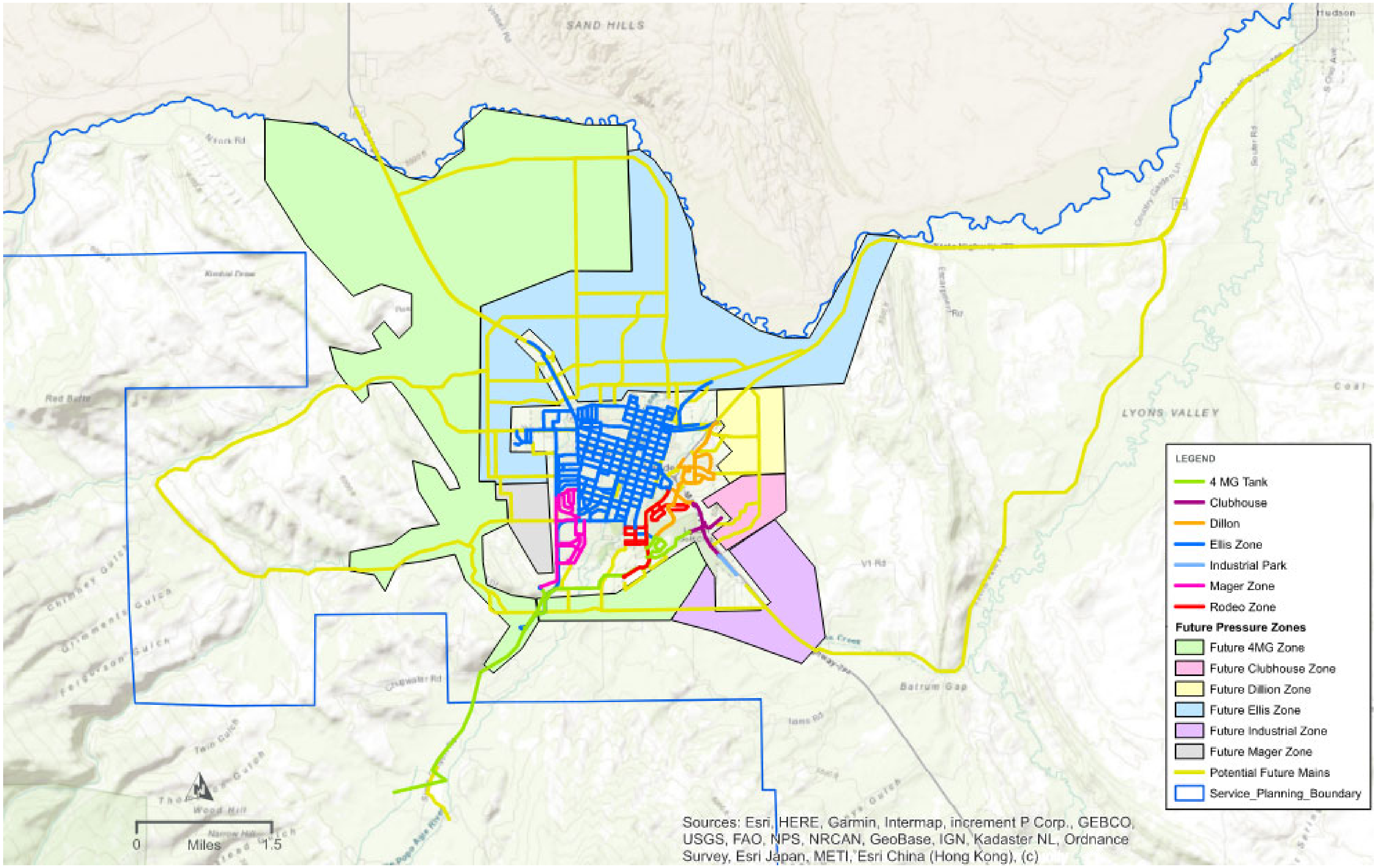


Figure 8-2 Potential Pressure Zone Expansion Areas

While Figure 8-2 provides all potential future transmission line corridors, several strategically placed transmission mains should be planned for the City's current capital improvements plan. These mains should have multiple purposes driven by the City's goals for the next 20 years:

1. Expand service to rural customers,
2. Provide opportunities for regional interties,
3. Provide opportunities for accessing new sources of supply, and
4. Match transportation planning corridors.

Another critical consideration of this targeted system expansion is maximizing use of existing pressure zones and minimizing installation of pump and PRV stations. Minimizing the use of additional PRV and pump stations lessens the complexity and cost associated with system operations and maintenance.

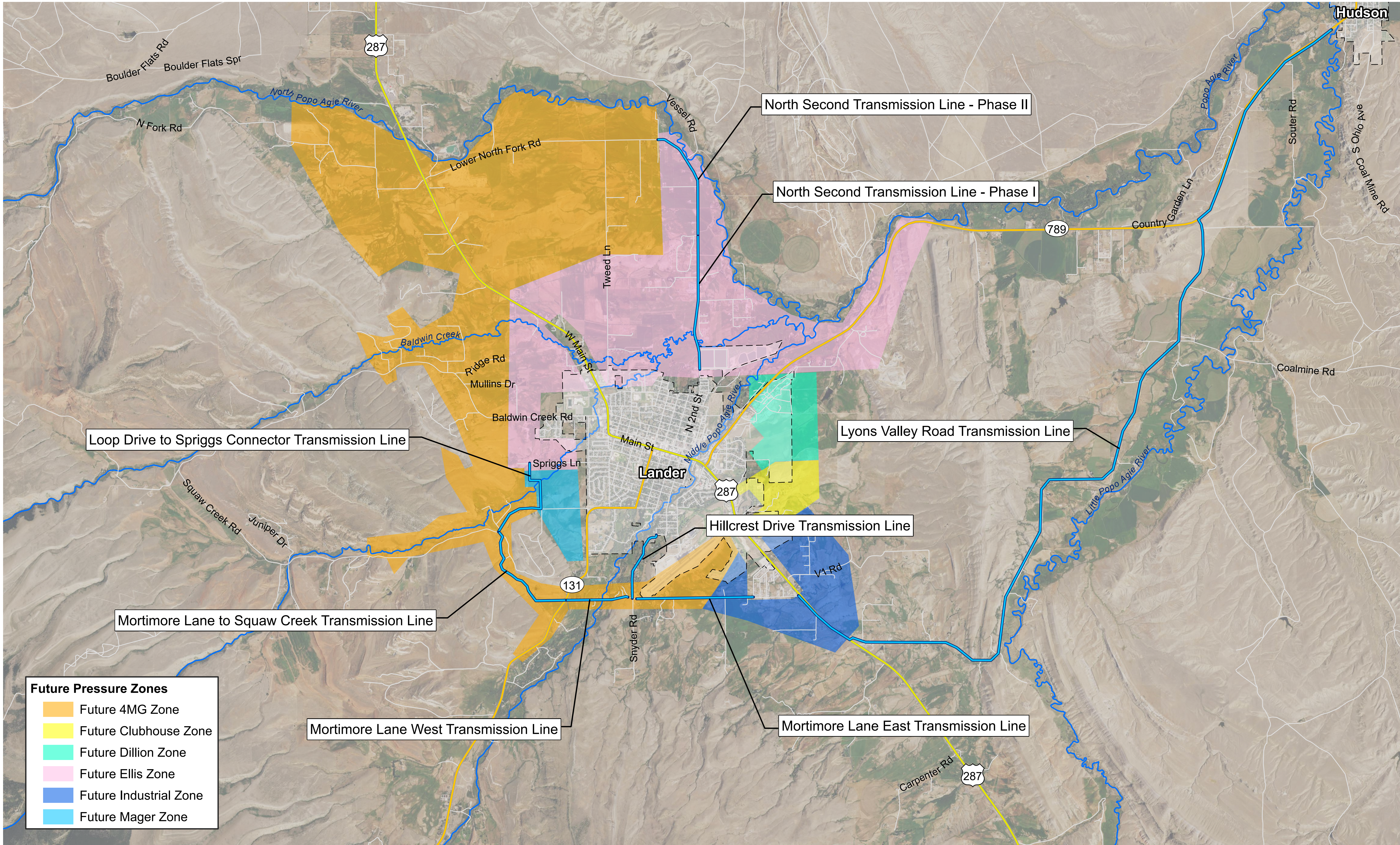
Accordingly, several transmission main projects were identified throughout the 20-year capital improvements plan, as shown in Figure 8-3, and described briefly below.

The high-pressure line from the 4 MG tank could be intercepted at Hillcrest drive and a new main installed heading north-south to Mortimore Lane and the edge of the existing system. After this, the (highest pressure) 4 MG water can be expanded both east and west along Mortimore Lane. The westward expanding line could then be utilized to both tie into a "Squaw/Baldwin Transmission Loop" and for connection to new groundwater water supply opportunities (See Table 8-2). After tying into the Squaw/Baldwin Loop, the line would continue northward in the "Future 4 MG Zone", providing water service to the North Fork Road area and providing a possible regional intertie with the Shoshone Utility Organization. The planning for the twenty-year CIP only extends to Spriggs Ln, given the large amount of needed projects to revamp the existing system, however, if the City wishes to prioritize this westward and northern service expansion over the twenty-year planning period, they could shift funding from other projects.

Expanding eastward from Hillcrest Drive and Mortimore Lane, the 4 MG pressure zone water could then be run to Hudson along Lyon's Valley Road (see analysis in Section 9). Not only can the 4 MG zone pressure be provided to customers along Lyon's Valley Road but extend further south along Highway 287/28 as needed/desired into the future.

The final system expansion transmission lines identified would accommodate system expansion to the north and east of town in areas that could utilize Ellis Zone pressure to the North up North 2nd Street.

All told, 8 system expansion transmission lines, as shown on Figure 8-3, are recommended over the 20-year planning horizon. It should be noted that to fund these projects under this CIP, it was planned that projects would be 67% grant funded, and the remainder would be funded by a special improvements district for these specific areas, such that existing users are not paying for the new customer's benefit. Furthermore, the City should restrict new users to municipal uses only from the potable system when they connect and file for junior Municipal only rights on behalf of these new customers such that they can make more efficient use of their potable system and allow for more customers.



HDR

PROPOSED SYSTEM EXPANSION TRANSMISSION LINES

Figure 8-3

LANDER, WYOMING MASTER PLAN

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9 Regional Service

Regionalization can take several different forms but is most readily described as either the administrative or physical combination of two or more utility providers. Typically, this is done with the end goal of improving operation and management of the combined systems. The advantages regionalization provides can be seen in the distribution of operational costs and operators across the combined system. Regionalization has been used successfully in other systems across Wyoming to develop and maintain large water service systems. The option of regionalization across Fremont County, Wyoming could present a large-scale solution to some issues faced by independent systems.

9.1 Lander Area Regional System Survey Results

As part of the study performed, a survey was provided to representatives of ten community water systems within 80 miles of Lander. The community water systems surveyed are as follows:

- Town of Hudson
- Town of Dubois
- Redd Fox Park HOA
- Sinks Canyon Center - Alpine Institute
- City of Riverton
- Fort Washakie PWS
- Shoshoni Municipal Water System (Regional System – Joint Powers Board)
- Town Of Pavilion
- City of Lander
- Ethete Water System/Arapaho Water System/Arapaho Industrial Park System

The results of the survey reflect serious concerns about many of these system's long-term viability and indicate a strong desire to explore a regional system, as depicted in Table 9-1.

Table 9-1 Overview of Results of Regionalization Stakeholder Survey

Percentage of Survey Respondents	Answered in the affirmative to the following:
100%	Have issues hiring certified operators
60%	Have issues retaining certified operators
70%	Don't believe their system is financially viable
50%	Are concerned about providing adequate water supply to customers in the future
40%	Have ongoing water quality issues
80%	Have interest in some form of regional system
70%	Are interested in learning more about regionalized system
80%	Think there are opportunities for regional partnerships in Fremont County
90%	Are supportive of WWDO conducting a regionalization feasibility study for Fremont County

9.2 Review of Potential Near-term Regional Partners

The nearest neighboring public water systems to Lander that would be immediate candidates for a regional partnership are summarized in Table 9-2 and depicted in Figure 9-1. Note that there is a mixture in types of systems presented as candidates for immediate connection to Lander's system: some of the system's given have existing ties to Lander's system, some are not officially recognized water systems, some are already metered and billed by the City of Lander. The potential near-term regional partners are shown in Table 9-2.

Table 9-2 Potential Near-Term Regional Partner Overview

System Name	Approximate Population Served	'Community Water System' Recognized by EPA?	Existing Tie to Lander System?	Existing Master Meter?	Existing Backflow Prevention?	Interest in regional Partnership?
Redd Fox Park HOA	50	yes	yes	yes	yes	yes
Lander Industrial Park	20	no	yes	no	unk	yes
Wyoming Life Resource Center	unk	no	yes	yes	unk	unk
Deer Valley	unk	no	no	n/a	n/a	unk
Sinks Canyon Center - Alpine Institute	25	yes	no	n/a	n/a	yes
Town of Hudson	445	yes	no	n/a	n/a	yes
Shoshone Utility Organization - Fort Washakie/Boulder Flats	2000	yes	no	n/a	n/a	yes

A qualitative description and evaluation of what partnering with each of these system's entails is provided below.

9.2.1 Redd Fox Park HOA

The Redd Fox Park HOA is currently fed by the City of Lander's potable water system through a master meter, however, there are likely major issues with the system in terms of installation, materials used, pipeline age, and water quality that should be addressed prior to the City taking over the management of such a system or entering into an official agreement. The Lander system is currently protected with a backflow prevention device; however, the deficiencies with this water system should be addressed. Rates charged to this system should reflect the level of risk taken on by the City in supplying a deficient water system. Costs for bringing this system to an acceptable state that meets WDEQ standards were estimated as part of this study. These costs are included in the twenty-year Capital Improvements Plan (CIP) for the City of Lander but are assumed to paid entirely through grant funding and the formation of a special improvements district, not through the existing municipal users' rates.

9.2.2 Lander Industrial Park

The Lander Industrial Park is a service area which is not part of the City of Lander municipality, but customers are served by the City of Lander and metered individually. The system is considered incomplete and requires roughly 2,900 LF of additional water main to serve all customers. There was a water users association which has since dissolved. Prior to the dissolution, there were discussions between the Industrial Park Users' Association and City of Lander regarding annexation, however, that did not take place. While the City does not own the system, it is likely that they would need to make any emergency requires repaired or be faced with isolating the entire system until the users found a way to make the repairs. This is problematic, as there needs to be a legally responsible entity for any repairs, maintenance, operations, and completion of the system. Costs for finalizing the system were included in the CIP considering that the City should plan to annex this system to provide a legally responsible entity for it. As with the Redd Fox HOA system, these costs were assumed to be covered with a grant and formation of a special improvements district.

9.2.3 Wyoming Life Resource Center

Another entity which is currently not a part of the City of Lander municipal system is the Wyoming Life Resource Center (WLRC). It is currently served through one 8” and one 4” meter from the City of Lander’s water system. Both water and wastewater systems are believed to have serious issues with operations, maintenance, and installation. The WLRC is reported to have been threatened with being fined by the Wyoming Department of Environmental Quality several times due to deficiencies identified. It is unknown if there is an existing backflow prevention device for this system. As with the other systems tied to Lander that are not owned by Lander, steps should be taken to protect the City from potential cross-contamination from a sub-standard water system. As with Redd Fox Park HOA and the Industrial Park, needed repairs to this system should be planned. If the WLRC is unable to make needed adjustments to their system, the City should reevaluate their rate structure for this customer and plan for revenues generated to cover the costs of bringing the system up to current standards.

9.2.4 Deer Valley

Deer Valley is a small residential community located to the south of Lander between Sinks Canyon Highway and the Middle Fork Popo Agie in the vicinity of Pheasant Run and Deer Valley Drives. It is unknown if there is a community well in this area or multiple private wells. Given its vicinity to the 4 MG pressure zone main and infiltration gallery, it may be beneficial to connect to this small system in order to provide finished drinking water and additional revenues to the City.

9.2.5 Sinks Canyon Center – Alpine Institute

The Sinks Canyon Center Alpine Institute (Institute) is a satellite campus for Central Wyoming College (CWC). It is served by a groundwater well and considered a community water system by the EPA. The system manager suggests that the water supply is adequate, and the system is well managed. They were curious as to the benefits of tying into the Lander system. Working against this system is that it is up-gradient from the highest pressure point in the Lander system, so a pump station would be required to provide service. Additionally, the Institute is on the opposite side of the Middle Popo Agie River from the water system, which would require a costly river crossing. Nevertheless, this system was evaluated as a potential regional partner.

9.2.6 Town of Hudson

The Town of Hudson lies about ten miles to the northeast of Lander along Highway 789. The water quality of Hudson’s raw water makes it challenging to treat and requires a high-skill operator for the water treatment plant. For a town with a population of 445 as of the 2020 census, and as indicated in the survey, it is extremely difficult to find qualified operators to run this treatment plant. As this is the case, Hudson would benefit immensely from being supplied water from Lander. The survey results from the Town of Hudson indicate this, as have informal discussions in 2023 with the Mayor of Hudson.

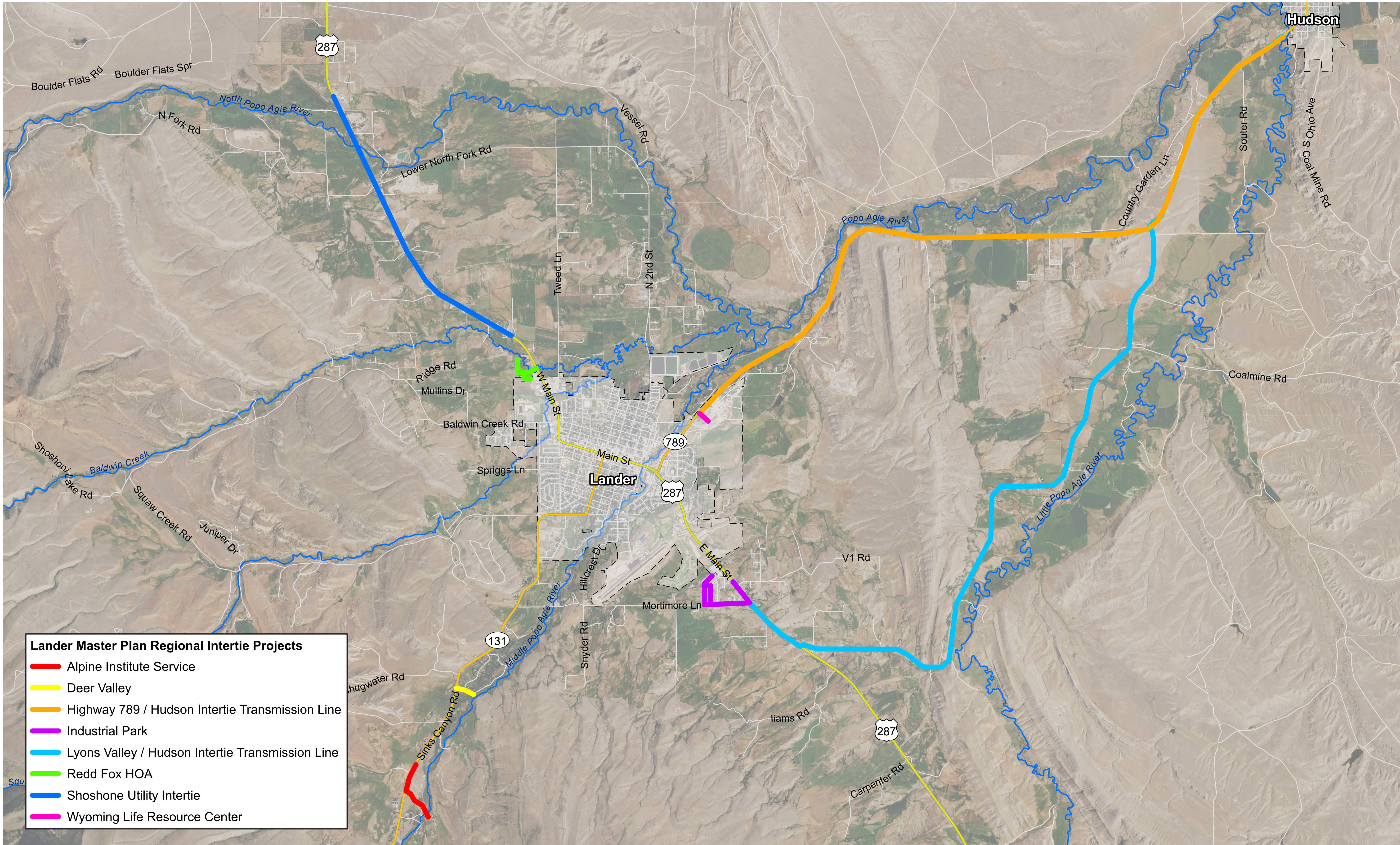
Not only would the Town of Hudson benefit from an intertie with Lander’s system, but rural users along the pipeline corridor could tie into the Lander system as well. Two pipeline alignments were examined as possible routes to connect to the Town of Hudson as part of this study (See Figure 9-2). While slightly more costly initially, it was determined that running water to Hudson with a pipeline down Lyon’s Valley Road would have the dual benefit of serving far more rural customers and providing the City with more long-term revenue, making their system more sustainable. As mentioned in Section 8, an additional benefit of this pipeline alignment is possible further future expansion to the south of Lander along highway 287/28, if desired.

9.2.7 Shoshone Utility Organization

To the north of Lander lies the Wind River Indian Reservation, home to the Northern Arapaho and Eastern Shoshone Tribes. The tribal water system closest to Lander is the Shoshone Utility Organization, although the N. Arapaho Ethete water system could be connected to from the Shoshone Utility system. In the survey provided to all utilities, the Utility manager for SUO indicated an interest in an emergency intertie arrangement with Lander. The Northern Arapaho Utility manager also indicated an interest in some sort of formalized system intertie arrangement. An advantage of planning for this intertie lies in it coinciding with tying to the Squaw/Baldwin Loop customers and future supply and providing service to the high growth areas north of town.

9.3 Estimation of Near-Term Partner Regionalization Growth and Demands

Potential demands from the larger system inter-ties were estimated for this study. A regional connection to Tribal utilities on the Wind River Indian Reservation (WRIR) north of Lander could serve an estimated county intertie population of over 4,000 new customers by 2042. An estimated population of 462 people within the municipal boundary of the Town of Hudson could also be served. These population estimates are identified in Table 9-3 and were obtained by projecting the historical county growth rate since 1990 for these areas. The average day demand for municipal customers established in Section 8.1 of 243 GPCD for Lander was used to determine total future demand for these entities.



REGIONAL PARTNER CONNECTIONS EVALUATED

Figure 9-1

Table 9-3 Potential Structural Regionalization Water Demands

Potential Structural Regionalization – WRIR and Hudson Interties					
	Projected Population and Water Demands				
	Base Year (2022)	2027	2032	2037	2042
Potential WRIR Intertie Population	3,456	3,592	3,734	3,881	4,034
Potential WRIR Intertie Average Day Demand (MGD)	0.69	0.73	0.75	0.78	0.81
Hudson Intertie Population	434	441	448	455	462
Hudson Average Day Demand (MGD)	0.10	0.097	0.099	0.100	0.102

Table 9-4 combines the projected water demands for the future Lander service area (Table 8-1) and potential interties serving utilities on the Wind River Indian Reservation and Hudson at a projected average day demand equal to 3.35 MGD in 2042.

Table 9-4 Lander Water Service Area and Intertie Demand Totals

	Projected Population and Water Demands				
	Base Year (2022)	2027	2032	2037	2042
Lander Service Area Average Day Demand (MGD)	1.85	2.00	2.14	2.28	2.43
Potential Intertie Average Day Demand (MGD)	0.69	0.73	0.75	0.78	0.81
Hudson Average Day Demand (MGD)	0.10	0.097	0.099	0.100	0.102
Total Average Day Demand (MGD)	2.64	2.83	2.99	3.16	3.35

The entire population of Fremont County grew at 0.51% annual rate between 1990 to 2020, so the projected population from a base of 39,659 in 2022 is 43,900 people in 2042. In consideration of potential county-wide structural regionalization, the estimated average day demand is 10.7 MGD based on a per capita demand of 243 gallons per day.

9.4 Comparison of Possible Near-Term Regional Partner Connections

The potential new system partners (Hudson, Shoshone Utility/WRIR, Alpine Institute, and Deer Valley) were compared for this study. The minimum annual charge per customer was first determined using the city's existing rural customer rate structure. The total revenue from customers served by the intertie was then estimated based on number of customers and a minimum monthly charge per customer. In the case of the Town of Hudson, in addition to the customer revenue from minimum monthly charges, it was assumed that the dollar amount used by Hudson currently to operate and maintain their water treatment plant would be paid to the City of Lander as revenue. Calculations for the estimated amount of revenue gathered from the connections are given in Table 9-5.

Table 9-5 Estimated Revenue Calculations

Entity	Estimated ADD (gallons)	Approximate Number of Housing Units Served	Assumed Meter Size	Meter Monthly Minimum	Charge per 1000 gallons over 4000 gallons	Daily ADD Charge	Annual Minimum Revenue Gained from New Customers	FY22/23, FY 23/24 Budget for WTP and Wells
Town of Hudson	25,000	200	8-inch	$1,467.57	$ 4.66	$ 16.50	$60,133.34	$155,000.00
Alpine Institute	1,200	UNK	4-inch	$ 402.60	$ 4.66	$ 4.66	$ 6,532.10	
WRIR/SUO	Emergency Use Only	NA	NA	NA	NA	NA	$ -	
Deer Valley	4625	37	4-inch	$ 402.60	$ 4.66	$ 23.30	$13,335.70	

In addition to revenue gathered from regional wholesale customers (excluding wholesale customers currently connected like WLRC, Industrial Park, and Redd Fox HOA), revenue will be gained from users who could have access to drinking water served by the pipeline used for the regional customers/connection. This was an important consideration when comparing regional partner connections.

The 2020 US Census data was used to determine the number of customers potentially served by the pipelines used for regional connections. It was assumed that all potential customers in the census blocks touching pipeline alignments would be customers within 20 years of the pipeline installation. It was then assumed that each customer would pay at least the minimum monthly charge for rural customers under the City’s current rate structure, a somewhat conservative assumption. These revenue numbers were then combined with the revenue numbers estimated in Table 9-5 to provide an estimated revenue for the City from each connection.

The total capital cost for the connection projects were then estimated, including pump stations and other needs, assuming 10 years of inflation at 3% per year. It was further assumed that 67% of the cost would be covered by grants to cover the project capital costs and that the remaining 33% would be funded by a Drinking Water State Revolving Fund (DWSRF) loan with a 30-year term and the current interest rate of 2.5%. An annual loan repayment obligation was estimated. This dollar amount was then compared to the total estimated revenue generated from the wholesale customer and customers along each route. A minimum rate needed to break even on the loan alone was then determined. This analysis is presented in Table 9-6.

Table 9-6 Potential Regional Partner Rate Analysis

Potential Regional Partner Connection	Approximate Number of Housing Units Along Pipeline 2020 US Census	Monthly Minimum Charge (assume 1" meters)	Annual Minimum Charge per Customer	Annual Potential Minimum Revenue	Capital Cost (assume construction within 10 years)	Grant Coverage (Assume 67%)	DWSRF Loan (Assume 33%)	Loan Term (year)	Interest Rate	Annual Payment Obligation	Shortfall with Current Rates	Needed Monthly Minimum Rate to Break Even on Loan Only
Lyons Valley Hudson Intertie	280	$ 69.81	$837.72	$234,561.60	$37,875,000.00	$25,376,250.00	$12,498,750.00	30	2.5%	($597,160.79)	($207,599.19)	$ 131.50
HWY 789 Hudson Intertie	101	$ 69.81	$837.72	$84,609.72	$29,814,000.00	$19,975,380.00	$9,838,620.00	30	2.5%	($470,066.05)	($230,456.33)	$ 260.00
Alpine Institute Service	5	$ 69.81	$837.72	$4,188.60	$ 2,446,000.00	$1,638,820.00	$ 807,180.00	30	2.5%	($38,565.16)	($34,376.56)	$ 650.00
WRIR/SUO Emergency Intertie	245	$ 69.81	$837.72	$205,241.40	$11,723,000.00	$7,854,410.00	$3,868,590.00	30	2.5%	($184,832.10)	$20,409.30	$ 63.00
Deer Valley	37	$ 69.81	$837.72	$30,995.64	$ 670,000.00	$448,900.00	$ 221,100.00	30	2.5%	($10,563.64)	$20,432.00	$ 24.00

Based solely on required minimum customer charges alone, it was determined that the following interties should be pursued, as they seem to be beneficial both for potential rural customers and for the City from a financial feasibility standpoint:

1. Deer Valley Intertie
2. WRIR/SUO Intertie
3. Lyons Valley Road Pipeline Hudson Intertie

Furthermore, the analysis revealed that these pipelines will be beneficial for rural customers, regardless of if the regional connections are made. With the benefits in mind, the three intertie projects above were added to the City's 20-year CIP. The WRIR/SUO intertie pipeline is phased into several different projects (see Section 8), and the connection as planned in the current CIP, will not occur during the current planning period. The phasing of these projects is highly flexible, however, and will depend upon many factors that are currently unforeseen.

Note that in the estimated project costs and their effects on current rates, it was assumed that these projects would be covered by a special improvement tax for customers that would benefit, and that the rate burden does not fall on current City of Lander customers in the rate analysis as planned.

9.5 Regional Partner Evaluation Results and Next Steps

Based on the results of the survey conducted as part of this study, there is a level of interest in Fremont County for exploring regional partnerships. The first step needed is for an entity, such as the City of Lander, to sponsor a Level II WWDC funded regionalization study. According WWDO staff, letters of support from other entities in the area will strengthen this application. At this point, at a minimum, letters of support from the Town of Hudson, and perhaps the Tribal Business Councils could be obtained. Applications for Level II studies are due annually by March 1st.

Even if no regional partners are connected, the transmission lines recommended for construction along Lyon's Valley Road, to Deer Valley, and to the north of Lander with the high-pressure line should be planned as they have potential to benefit both those customers and the City, with or without the regional connectivity.

Regarding the wholesale customers already connected to the City of Lander with allegedly substandard systems, each should be assessed individually as to whether they meet the City's standards. Backflow prevention should be installed at all cross connections and the wholesale meter rates should be reassessed. Another option that should be examined is annexation, especially with systems that have no qualified operators, and the City would likely end up needing to assist with the repairs of in the event of a serious emergency/outage.

A sensible approach to regionalization over the 20-year planning period is applying for a level II study, beginning to build out the trunk lines that will feed maximum rural customers around Lander, allow for regional connections with minimal installation of pump stations or PRV stations, and to bring wholesale customers connected to the Lander system up to acceptable standard of quality systems. These action items are reflected in the Capital Improvements Plan furnished with this study.

10 Recommendations

An overview of recommended projects and actions is provided in Figure 10-1 and summarized below. Project costs and schedule are provided in Section 11.

1. City of Lander Pipeline Condition Assessment

At a minimum, the City should conduct a desktop study utilizing GIS to overlay break data with pipe age and material, and soil type (if information is available). At direction of the City, this will be the initial effort planned for determining a prioritized list of pipeline replacements. The success of this type of desktop study is highly dependent upon the availability of data, however, so if it is not successful, a more in-depth investigation option is provided here as a reference.

If the desktop study is not successful, it is recommended that the 19.5 miles of pipe that is 45+ years old and DI be assessed via an Electromagnetic Conductivity (Emag) Survey first. Even more beneficial would be a condition assessment of the 41 miles of pipeline that are older than thirty years.

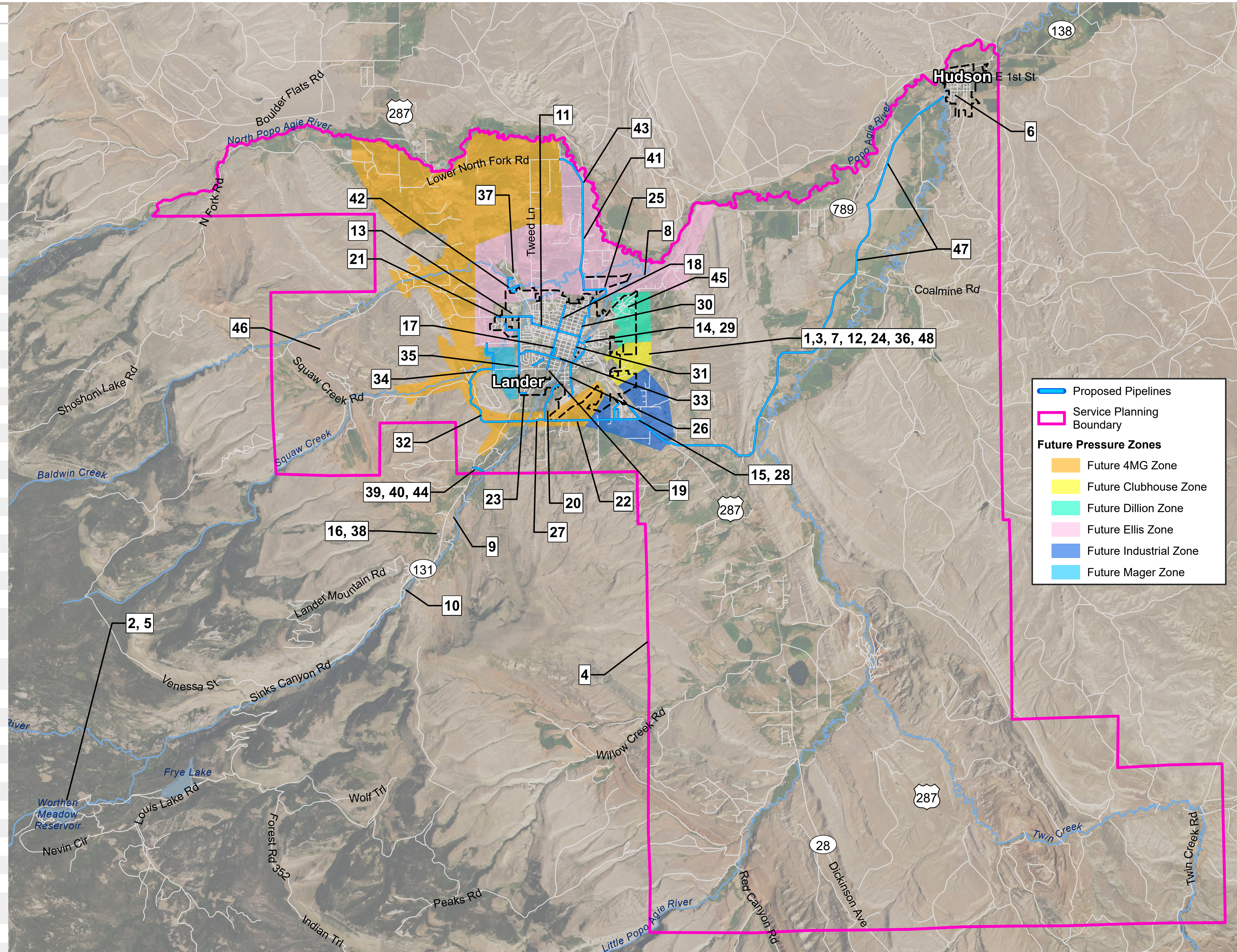
An Emag Survey is a fairly efficient methodology for mapping the corrosion landscape and is accomplished with a handheld unit that does not require soil contact. One two-person team can accomplish one mile per day in urban areas and ten miles per day in rural areas. The Emag survey should be combined with use of a Wenner 4-pin survey in accordance with ASTM G-57 after the Emag survey is complete to confirm findings from the Emag survey and determine the resistivity in different soil strata. Finally, soil sampling must be accomplished to determine the presence of moisture, acidity, and soluble salts and tested in accordance with ASTM G187 and thus further confirm electrical resistivity of various strata.

Once the soil corrosivity and content landscape is determined, it can be overlayed with water main break data and pipe age and material to prioritize areas requiring renewal of existing lines. This condition assessment should provide estimated remaining service lives of all pipelines older than thirty years and generate a renewal plan. Recommended renewal plans should include a financial planning component that will allow the City to adjust their rates for this long-term effort.

Conducting this study is a high priority as it will further refine priority pipeline renewal plans provided in this study and may impact overall CIP.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

Project Number	Project Name
1	City of Lander Pipeline Condition Assessment
2	Worthen Meadows Outlet Gate Rehabilitation
3	PRV Station Metering
4	Planning Water Service Map
5	Worthen Meadows Enlargement Level II Study
6	Regionalization Level II Study
7	Distribution Metering and LCR Compliance Project
8	Non-Potable Water System Level II Study
9	High Pressure Zone Tank Rehabilitation
10	Intake Structure Rehabilitation
11	Lincoln Street Transmission Line
12	Distribution System Improvements Budgeting I
13	Lander Valley HS Raw Water Conversion
14	McFarland Drive Pipeline
15	Industrial Park Bulk Fill Station
16	WTP Improvements Phase I
17	5th Street Transmission Line
18	N. 5th Street Pipeline
19	Lander City Park Raw Water Conversion
20	Hillcrest Drive Transmission Line
21	Baldwin Creek Transmission Line
22	Mortimore Lane East Transmission Line
23	Goodrich Connector Pipeline
24	Distribution System Improvements Budgeting II
25	Sewer Lagoon Bulk Fill Station
26	Buena Vista Drive Transmission Line
27	Mortimore Lane West Transmission Line
28	Industrial Park Improvements/Annexation
29	Grandview/Valleyview Pipeline
30	N. 1st Street Transmission Line
31	S. 1st Street Pipeline
32	Mortimore Lane to Squaw Creek Transmission Line
33	Cascade Street Pipeline
34	Loop Drive to Spriggs Connector Transmission Line
35	Mager 2 Transmission Line
36	Distribution System Improvements Budgeting III
37	County Shop Bulk Fill Station
38	WTP Improvements Phase II
39	Infiltration Gallery Rehabilitation
40	Exchange Petition Update for Infiltration Gallery
41	North 2nd Street Transmission Line - Phase I
42	Redd Fox Improvements/Annexation
43	North 2nd Street Transmission Line - Phase II
44	Deer Valley Expansion
45	WLRC Improvements/Annexation
46	Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study
47	Lyons Valley Transmission Line
48	Distribution System Improvements Budgeting IV



RECOMMENDED PROJECTS

Figure 10-1

LANDER, WYOMING MASTER PLAN

2. Worthen Meadows Outlet Gate Rehabilitation

The City has reported that the outlet gate at Worthen Meadows Reservoir is not functioning properly. Construction drawings for the outlet show a 36-inch diameter butterfly valve installed on a reinforced concrete pipe (RCP) and accessible through a roughly 40-foot deep, 48-inch diameter corrugated metal pipe (CMP) manhole. Figure 10-2 shows a cross-section of the dam.

While the drawings show a 36-inch butterfly valve, the City staff believe the valve to be a slide gate. Staff reported that it is difficult to operate and seems to be loose. Following OSHA protocols, the existing conditions must be determined through a physical investigation of the valve. This may be possible to establish with a pipeline camera. After the actual valve type is established, the City should plan replacement efforts.

The assumed material cost of the valve only was included for this item as it is believed that this is something the City could undertake this operation without specialized support. If that is not the case, the City should reevaluate the budget for this item.

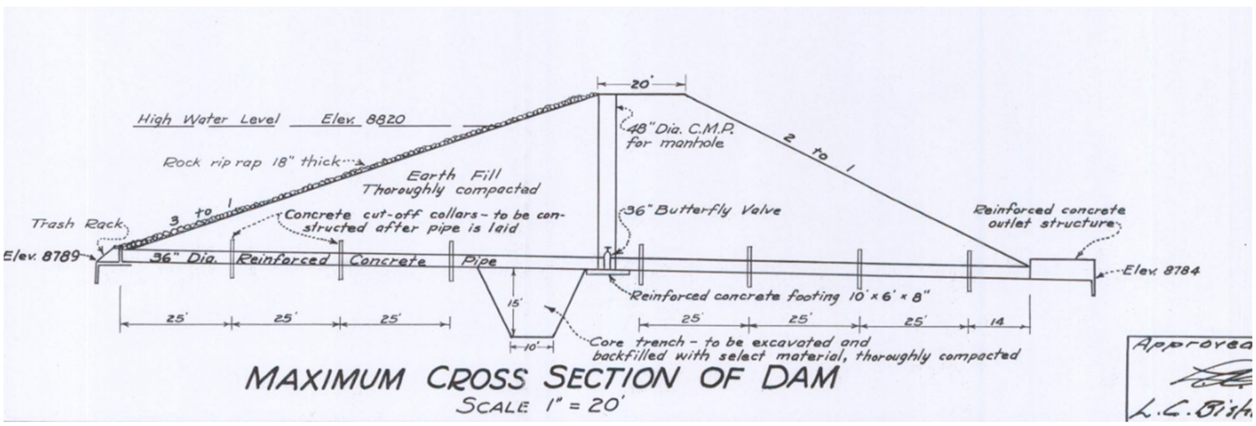


Figure 10-2 Worthen Meadows Dam Cross Section showing Outlet Pipe.

This is considered a high priority item as failure of this valve directly effects the City's water supply and could also result in major structural issues for the dam if all flow during high runoff times cannot be diverted through the emergency spillway.

Project may be eligible for WWDC grant funding; however, project is planned to be 100% cash funded in the CIP.

3. PRV Station Metering

The insertion meters installed in the existing PRV stations have not provided the measurement accuracy desired by City staff. The existing meters are installed with a service saddle into the process piping and do not measure low flows. Insertion meters that can be installed directly into the existing PRV's will provide a higher level of precision in measurements and pick up lower flows.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

4. Planning Water Service Map

City to complete a planning water service map illustrating all lands served by municipal water rights as shown in Figure 1-3. The map includes county households served by the City's water hauling station. The City anticipates water system expansions in the next 20 years providing tap service to county households north, northwest, west and south of the City boundary and a possible intertie to Hudson to the northeast. The City needs to proceed with updating the water service area within the Wyoming State Engineer's Office records so the place of use of existing municipal water rights is accurate.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

5. Worthen Meadows Enlargement Feasibility Study

Based on the preliminary analysis of a potential enlargement to Worthen Meadows, the runoff from the catchment feeding the reservoir provides adequate flow to fill an expanded reservoir. HDR estimated the effects of various dam raises to develop the amount of enlarged storage capacity available at Worthen.

The GIS analysis relied upon DEM data gathered with U.S.G.S. LIDAR for existing ground elevations above the Normal High Water Line (NHWL). An estimated dam raise of twenty feet provides an estimated total storage capacity of 3,826-acre feet or an enlargement of approximately 2,322-acre feet. A much smaller more modest dam raise of five feet of dam height provides for an enlargement of approximately 468-acre feet that is expected to meet the future municipal water demands of the City of Lander. The preliminary analysis indicates a twenty-foot dam raise allows for increased release amounts and longer release periods. The shorter release periods are anticipated in wetter years with the driest years needing release periods of up to sixty-days to address shortages in the watershed. Based on an extension of the Reservoir's area capacity curve, reservoir enlargements above twenty feet were significantly less effective at increasing storage due to steep topographic conditions.

An examination of the impacts of a Worthen Meadows Reservoir volumetric capacity increase was performed based on an existing model developed by WWC Engineering. The evaluation of minimum reservoir volume for fishery and recreation benefits was 500 acre-feet. Currently Worthen has a maximum storage volume of 1,503.6 acre-feet and a target minimum volume of 750-acre feet.

This allowed the model to be evaluated based on a range of values to inspect storage volumes that could theoretically satisfy an 80-95% likelihood of filling each year. The range chosen was based on common reservoir operating practices for serving agricultural and municipal water needs.

The findings of this evaluation indicate that the expansion of Worthen Meadows storage capacity is theoretically feasible based on expected filling scenarios and should be further analyzed. The results from the Memorandum on this subject are included in Appendix C.

HDR developed an extension of the stage-storage curve from GIS analysis of USGS 10-Meter DEMs of existing ground elevations. An estimated raise of 20 feet provides for a total storage capacity of 3,826-acre feet and a 2,322-acre feet enlargement. Due to steep topography a dam raise above 8,840 feet Mean Sea Level (MSL) would be of limited value.

A Level II water supply feasibility study is needed to evaluate potential enlargements of Worthen Meadows Reservoir and to review other feasible storage sites in the watersheds of the Popo Agie basin. The City of Lander with support from local irrigation stakeholders have applied for funding from NRCS through PL-566. If funded, a PIFR feasibility study would help to address preliminary planning steps and to define potential project sponsors as listed below.

- Applicable Agency Authority and Authorized Purposes
- Agricultural (Rural) Benefits
- Resource Information, concerns, and opportunities
- Proposed Project Purpose and Need Statement
- Tribal, Federal Stakeholder Engagement
- Potential Alternatives
- Facilitating Factors and Obstructing Factors
- Environmental Document
- Potential Sponsors, Cooperating Agencies, and Stakeholders

Three potential sponsors are the City of Lander and Enterprise and Cemetery Ditch companies. The Dutch-Taylor and Baldwin ditch entities are also potential irrigation sponsors.

The WWDO Level II feasibility study would evaluate shortages and provide more reliable data for the firm yield analysis of potential reservoir sites. A more sophisticated model; such as, StateMOD will provide for an improved watershed demand and shortage analysis for Worthen Meadows and the other reservoir sites in the Popo Agie watersheds; particularly for evaluating the downstream water demands to fill Fry Lake and to meet the storage demands of the Enterprise Ditch and as well as serving irrigation ditches with shortages within the Popo Agie watershed.

A potential long-term water supply alternative for serving future water needs within the Popo Agie watershed is an enlargement of Worthen Meadows or construction of new storage reservoir within the watershed. An enlargement or new storage reservoir could consist of separate allocations to meet irrigation, environmental/fishery and municipal uses serving long-term water supplies and future water needs within the Popo Agie watershed for the next fifty years. The City of Lander's anticipated water shortages are expected to grow over the next 50 years as described within this Level 1 study.

Project is eligible for 100% WWDC grant funding and is planned in the CIP to be funded 100% by grant.

6. Regionalization Level II Study

There is a clear opportunity for the regionalization of utilities within the Lander area. Immediate interties to target would be the Town of Hudson, Shoshone Utility Organization, and bring wholesale customers into compliance with regulations. As laid out in Section 9, the City of Lander should take the following actions with regards to moving towards a regionalized system:

1. **Apply for Level II Regionalization Study through WWDC of Regionalization in Fremont County**
   a. City of Lander can act as the sponsor for this study.
   b. Obtaining letters of support from other local entities interested in exploring regional options will help the application immensely.
   c. Applications are due March 1st annually.
2. **Address Existing Wholesale Customers Deficiencies (Industrial Park, Redd Fox, WLRC):**
   a. Ensure adequate backflow prevention and metering at wholesale customer connections.
   b. Assess condition of water systems run by wholesale customers to determine deficiencies.
   c. Reassess rates for existing wholesale customers connected to system such that those customer's systems can be brought up to City standards.
   d. Explore options for annexing these systems, including the creation of a special improvements district to pay for correcting deficiencies.
3. **Pursue Expansion of the System Along Corridors That Maximize Use of Existing Pressure Zones and Can be Used As Regional Interties**

All of the above actions are incorporated into the City's CIP.

Project is eligible for 100% WWDC grant funding and is planned in the CIP to be funded 100% by grant.

7. Distribution Metering and Lead and Copper Rule Compliance Project

The City's metering infrastructure has reached the end of its useful service life and needs to be replaced. Additionally, the Lead and Copper Rule requires that utilities conduct a service line inventory, which can be conducted concurrently with this project. It was assumed in the estimation of cost, that materials would be verified in the crawl space only, and no exploratory excavations would be required. Further assumed in the estimate was that all meters would be installed in-home. If meter pits are planned, the project cost will be affected.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

8. Non-Potable Water System Feasibility Study

The City is reviewing water supply alternatives that will allow for a portion of the estimated future demands to be met by a non-potable water system that will allow for the City's municipal water rights to be dedicated to the existing and future needs of households and businesses. The expected service of the non-potable water system would be irrigation needs of green areas within and surrounding the City of Lander.

The non-potable system will reduce the need for treated water enabling the City's treated water system to serve future expansion into property within the City, county property surrounding the City boundary, and for serving structural regionalization.

The potential water sources to be developed for serving the non-potable water systems include shallow wells which develop groundwater in the vicinity of the City's green areas. Another potential water supply source is a direct flow water diversion from Popo Agie River drainages serving the needs of the City's proposed raw water system. The potential intake structure would be an infiltration gallery system constructed in the vicinity of the Middle Popo Agie River. One potential use of an expanded Worthen would be releases specifically used to serve non-potable system diversions.

Project is eligible for 100% WWDC grant funding and is planned in the CIP to be funded 100% by grant.

9. High Pressure Zone Tank Rehabilitation

As identified in the 2021 dive inspection of the 4 MG High Pressure Zone Tank, the interior of the tank needs to be rehabilitated. Due to the extent of the corrosion observed, this project will likely include a near white blast of all interior surfaces for surface preparation. Details of surface preparation and coating system will be determined during detailed design efforts. In addition to recoating of the interior, it should be assessed if the cathodic protection system needs to be renewed.

According to WWDO draft review comments, this project is not eligible for funding through the Wyoming Water Development Commission.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

10. Intake Structures Rehabilitation

The existing intake structure has known issues with sedimentation and undercutting. It is installed at a very steep gradient portion of the river, and essentially acts as an energy dissipation and sedimentation structure while diverting water for the City of Lander Pipeline.

Given the issues with the existing intake structure, it is recommended that several alternatives be identified and compared in a design basis memorandum so that an appropriate course of action can be taken to address these issues. At a minimum, the alternatives should include:

1. Addressing sediment issues with existing structure
2. Mitigating undercutting of existing structure
3. Changing operation of existing structure
4. Rehabilitating old structure and pipeline
5. Using both intake structures in tandem
6. Using old structure exclusively

These alternatives should be compared, contrasted, and a recommendation made for the best course of action to address issues the City faces at their intake structure with sedimentation and undercutting.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by debt.

11. Lincoln Street Transmission Line

As discussed in Section 2, this 6-inch DIP transmission line suffers from breaks and freezing due to its age, material, and installation. Due to the frequency of breaks and freezing, this line is the highest priority for replacement.

Total transmission line length is roughly 1 mile. Line size shall be 12-inch according to Section 5 of this report. Basic alignment is along Lincoln Street from 1st Street to West Main Street and connection to existing 8-inc DIP on the west side of west Main Street as shown in Figure 10-3. Project will include a roughly 100 LF bore with steel casing as Main Street is a state highway. Note that this transmission line will continue as 12-inch northwards along West Main Street to connect to the Baldwin Creek transmission line and replace the existing 8-inch DIP.

Approximate pipeline alignment is shown in Figure 10-3 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

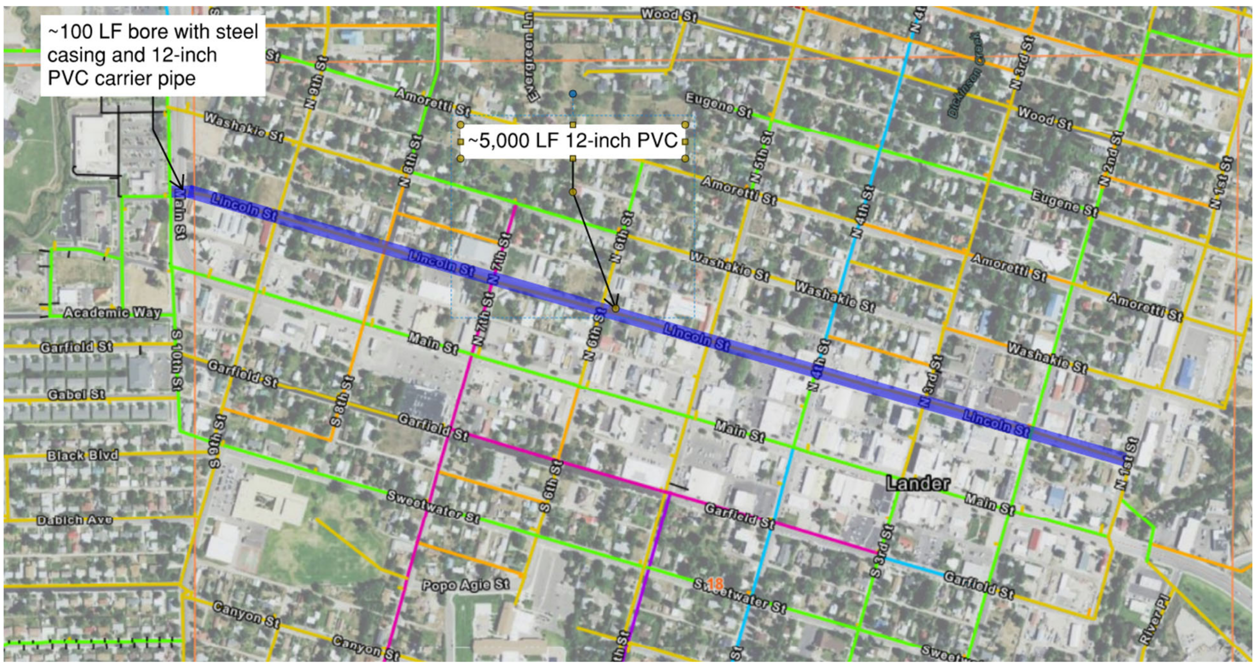


Figure 10-3 Lincoln Street Transmission Line

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by debt.

12. Distribution System Improvements Budgeting I

The City should start budgeting for investment in ductile iron distribution piping renewal in the next twenty years given the age, frequency of current failures, and pipe material. For the current Capital Improvements Plan, roughly $4M in present value costs is budgeted for distribution system renewal. These numbers should be adjusted after the Pipeline Condition Assessment is conducted.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

13. Lander Valley High School Raw Water Conversion

As discussed in Section 8, the High School is currently the largest user on the system, maxing out at 0.54 MGD (roughly 10% of use during peak demand times). A conversion of the high school to a raw water system would be highly beneficial. It appears that there is an existing water right for diversion off of a return ditch that could feed the high school fields. It is recommended that a small reservoir is developed near the fields that is filled by the return ditch such that constant head can be maintained for the irrigation system.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

14. McFarland Drive Pipeline

This pipeline is undersized at 4-inch and installation practices combined with pipeline age and material cause it to fail frequently. Additionally, line should be looped with Dillon pipeline. Pipeline should be replaced with an approximately 1,200 LF 8-inch PVC line as shown in Figure 10-4. Project will include two bores under state highways with steel casing as shown.

Approximate pipeline alignment is shown in Figure 10-4 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

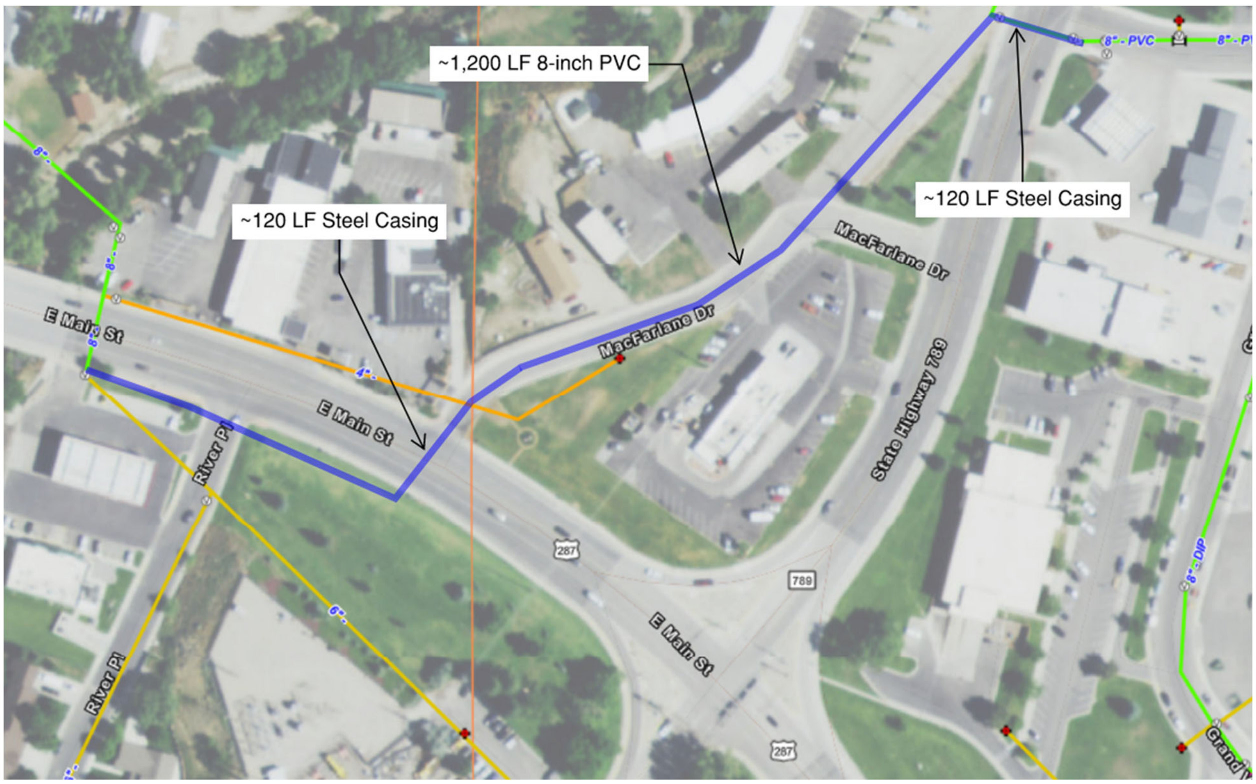


Figure 10-4 McFarland Drive Pipeline

15. Industrial Park Bulk Fill Station

To mitigate traffic impacts for the Public Works Department and Buena Vista Drive, distribute loading on pavement, help with water quality on dead-end lines, combat water hammer in the Buena Vista Transmission Line, and accommodate future growth, bulk fill stations should be constructed for the Lander system. After a cursory review of several locations, it is recommended that the bulk fill stations be located at the sewer lagoons at the end of the dead-end 10" line there and at the Fremont County Shop at the terminal end of the 10-inch transmission line serving West Main Street.

Location given for this bulk fill station is highly generalized, as shown in Figure 10-5. Land acquisition requirements have not been examined, nor have required build-out of the Industrial Park Water System, both of which will impact location of this Bulk Fill Station.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

Figure 10-5 Proposed Location for Industrial Park Bulk Fill Station

16. Water Treatment Plant Improvements I

The following items have been identified as the highest priority improvements to the Water Treatment Plant, and are included in the first project phase:

1) Construct Sludge Drying Bed: The current process for cleaning the existing sludge lagoons, as identified previously, requires City staff to haul approximately 50 loads of slurry/sludge per cell or a total of 150 loads for all three cells to an area near the sewer lagoons for drying. This requires a significant amount of City resources and staff time to complete this on an annual basis. The recommendation is to construct a drying bed on-site to allow WTP staff to transfer the slurry from the cells to the drying bed. Once constructed, City staff can determine the most effective timing for cycling through the three cells. Based on the available area on-site, it is anticipated a drying bed approximately half the size of one of the existing lagoons/cells could be constructed. Once the solids have dried on-site, City staff can dispose similar to how they currently dispose of the solids from near the sewer lagoons. While this may not completely alleviate the need to haul slurry, it will significantly reduce the resources and time required by City staff in handling the solids within the sludge lagoons.
2) Review Design of Safety Handrails in the Process Area and Incorporate Improvements, As Needed: City staff have concerns with the handrails in the process area as it pertains to conducting water treatment plant tours. A review of the safety handrails will be completed to determine if replacement is recommended. There are approximately 615 lineal of feet of handrails associated with the medial filters, sedimentation basins, and flocculation basins.
3) East Lagoon New Valve and Discharge Pipe: Install a new buried valve and discharge pipe from East lagoon to the borrow ditch.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

17. 5th Street Transmission Line

This project consists of installing roughly 4,100 LF of 12-inch transmission line along 5th Street from Fremont Street to Lincoln Street. Project includes installation of roughly 1,000 LF of 8-inch line along Brodie Street and a roughly 120 LF bore with steel casing across Main Street. Project planned to be constructed simultaneously with N. 5th Street Pipeline.

Approximate pipeline alignment is shown in Figure 10-6 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

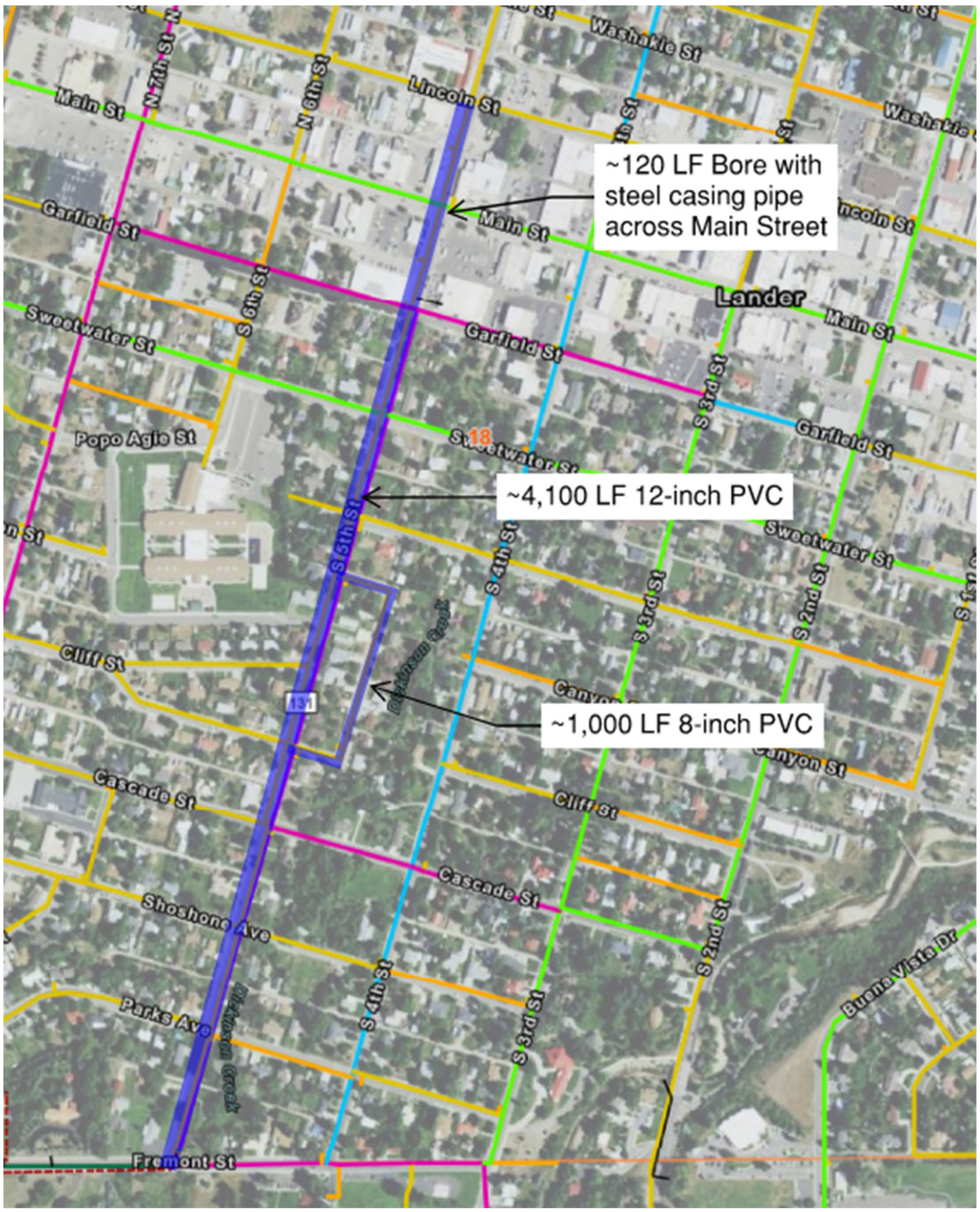


Figure 10-6 5th Street Transmission Line Rough Alignment and Scope of Work

18. North 5th Street Pipeline

This project consists of installing roughly 2,700 LF of 8-inch pipeline along 5th Street from Lincoln Street to Jefferson Street. Project planned to be constructed simultaneously with 5th Street Transmission Line.

Approximate pipeline alignment is shown in Figure 10-7 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

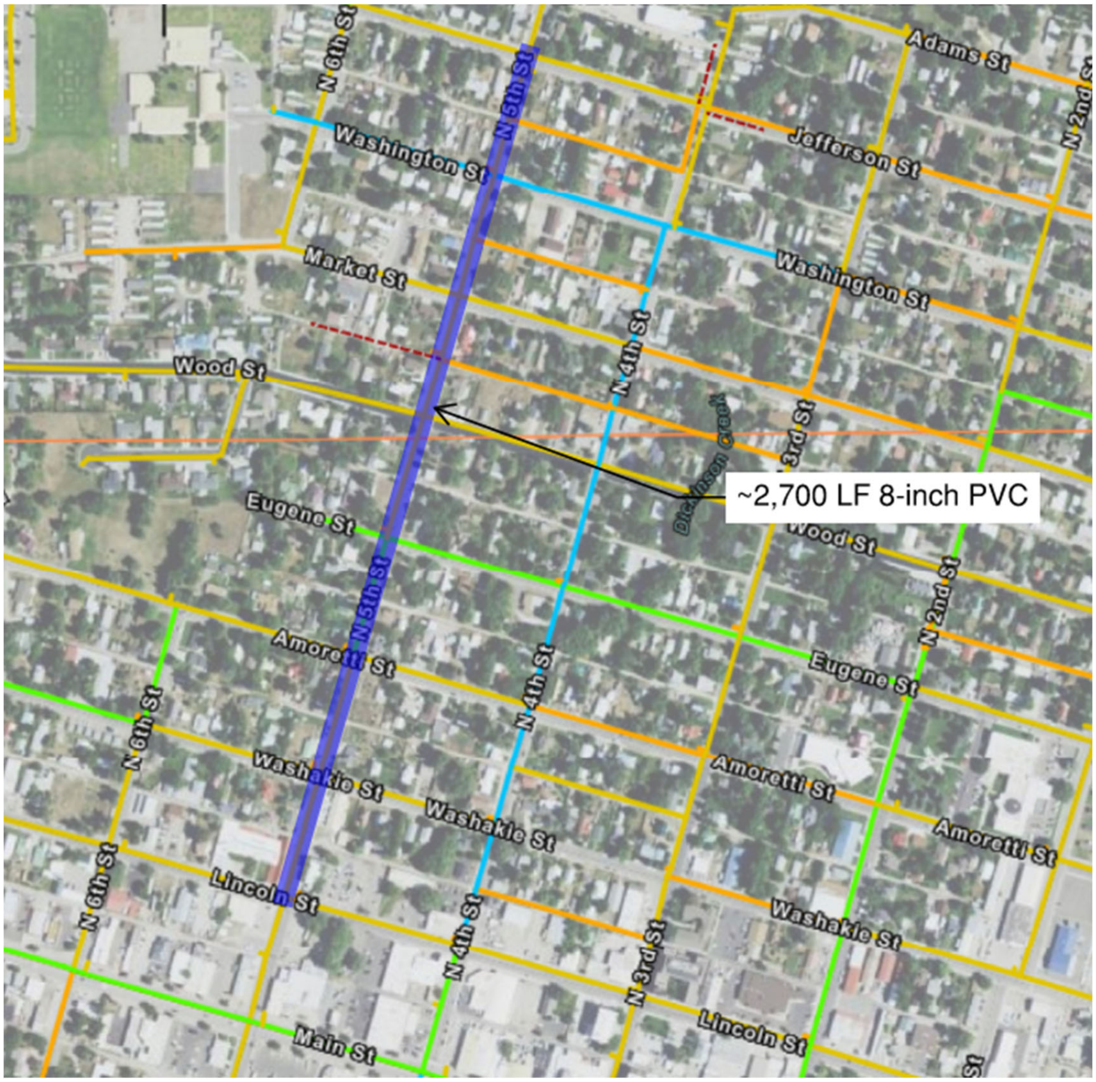


Figure 10-7 North 5th Street Pipeline Rough Alignment and Scope of Work

19. Lander City Park Raw Water Conversion

Similar to irrigation of the High School sports fields, several of the green spaces at City Park are irrigated using municipal supply. City Park is one of the top ten customers for peak demand on the Lander Municipal System. The system would benefit from a conversion to a raw water system for City Park. As with the High School irrigation system, constant head would need to be maintained with some sort of small reservoir or intake structure on the Popo Agie at City Park.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

20. Hillcrest Drive Transmission Line

This project is the first step in system expansion to the south, east, west, and eventually north of Lander with the highest pressure zone pressure available. These pipelines will serve multiple purposes discussed previously: allowing for optimal customer connections in high-development areas, maximizing use of existing pressure zones in system expansion, allowing for the possibility of regional system connections, and installation of new water transmission lines that is concurrent with transmission corridors.

Project consists of installation of approximately 2,100 LF of 16-inch transmission line. Approximate pipeline alignment is shown in Figure 10-8 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

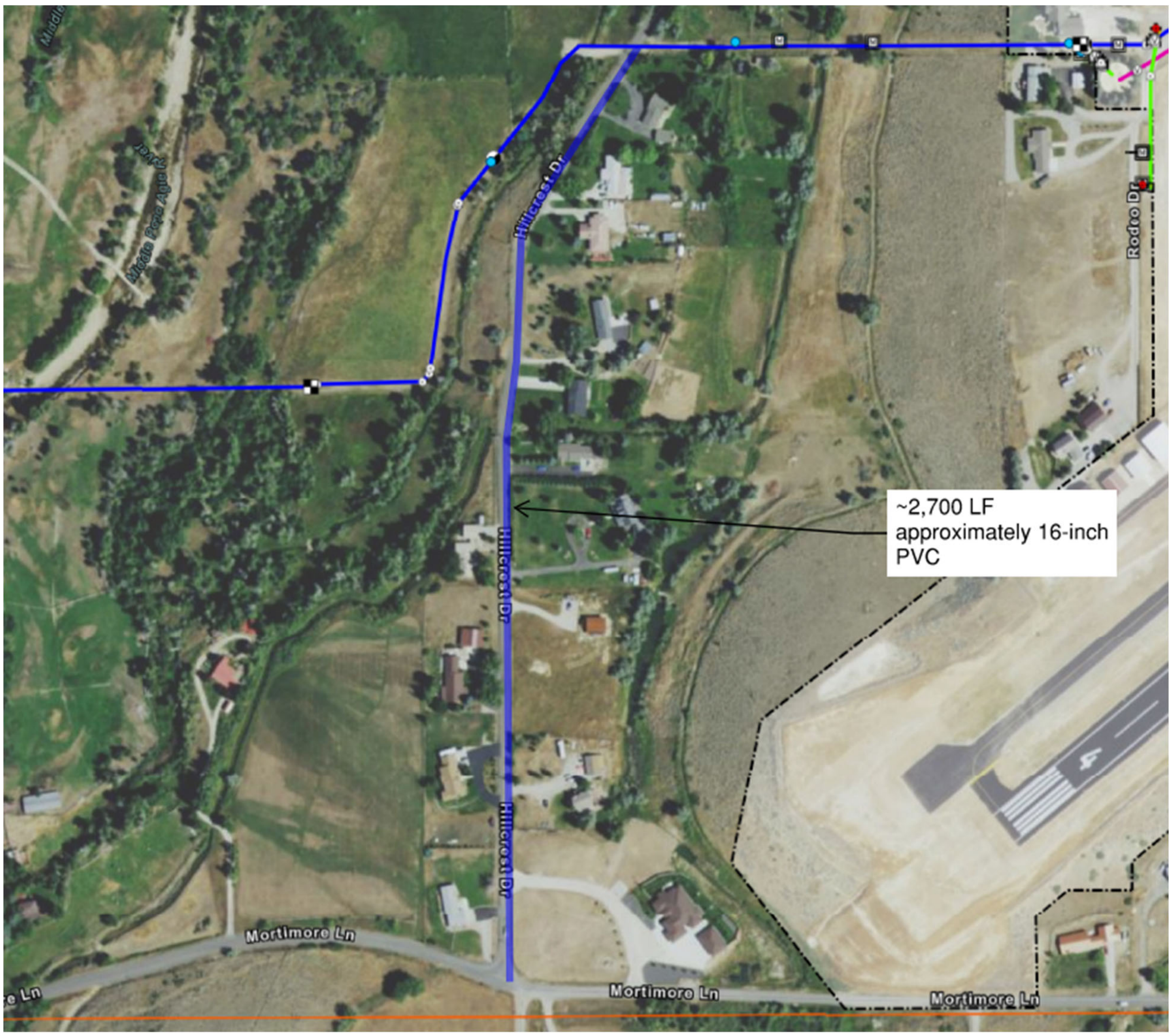


Figure 10-8 Hillcrest Drive Transmission Line Approximate Alignment and Scope of Work

21. Baldwin Creek Transmission Line

Project consists of installation of approximately 4,500 LF of 12-inch transmission line along E. Main Street from Lincoln Street to Baldwin Creek Road. Project may include approximately 100 LF bore across Baldwin Creek

Road. Approximate pipeline alignment is shown in Figure 10-9 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by debt.

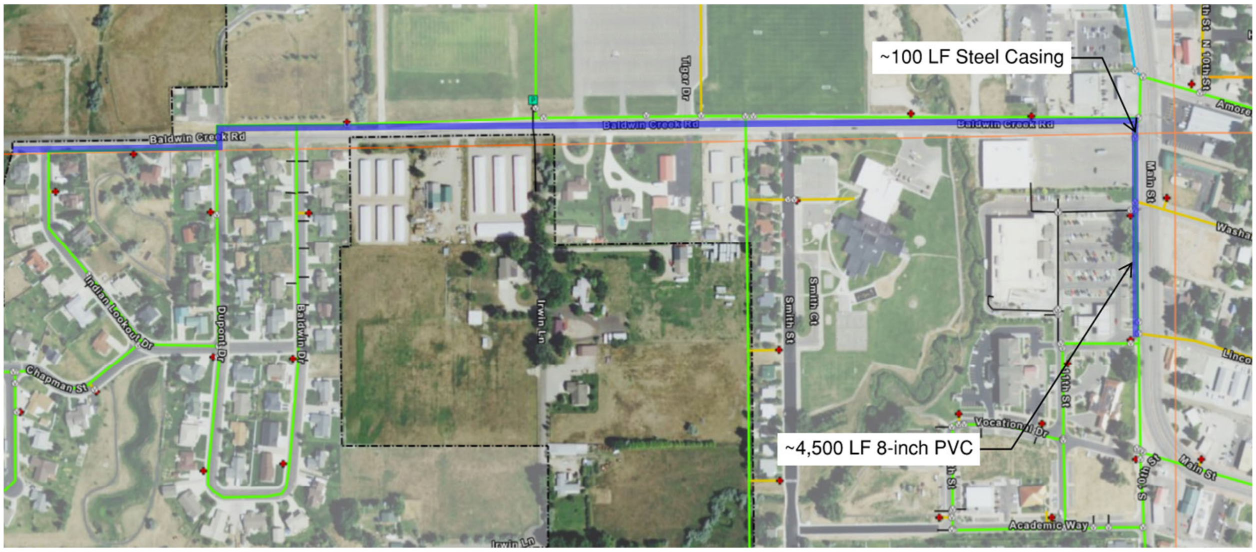


Figure 10-9 Baldwin Creek Transmission Line Approximate Alignment and Scope of Work

22. Mortimore Lane East Transmission Line

Purpose of project is to provide water service to customers along Mortimore Lane, provide redundancy to Industrial Park Water Users Association, and allow for system expansion to the south and east of Lander along Highway 287 and down Lyon's Valley Road as well as set the stage for regional connection to the Town of Hudson.

Project consists of installation of approximately 10,100 LF of 12-inch transmission line along Mortimore Lane from Hillcrest Drive to Highway 789. Approximate pipeline alignment is shown in Figure 10-10 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by debt.

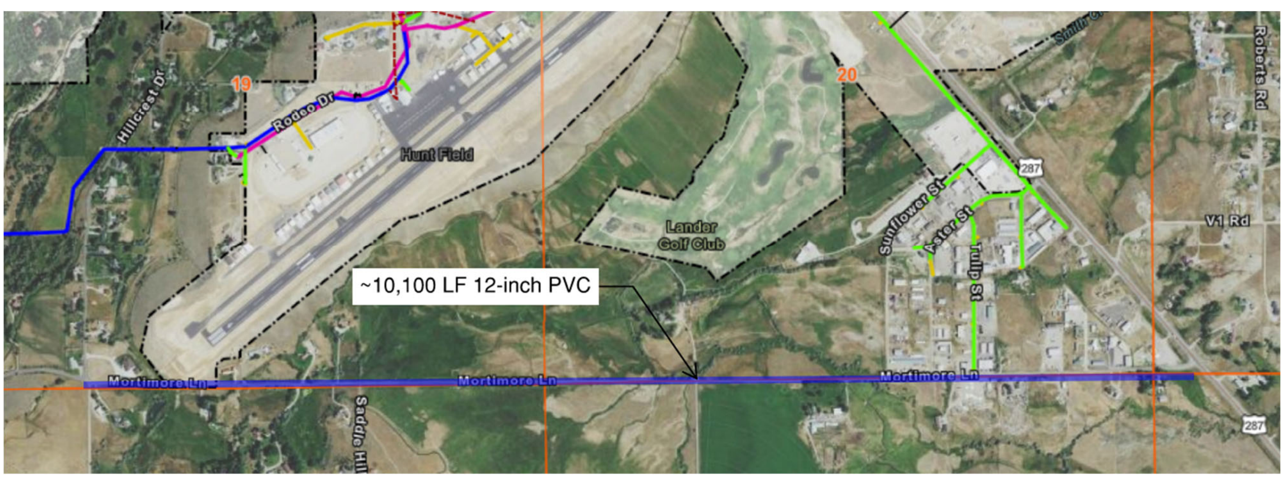


Figure 10-10 Mortimore Lane East Transmission Line Approximate Alignment and Scope of Work

23. Goodrich Connector Pipeline

Purpose of this project is to provide a loop between the 20-inch Ellis Transmission line on Sinks Canyon Highway and Fremont Street by connecting a dead-end 6-inch line on Goodrich Drive to the 20-inch on the Highway.

Project consists of installation of approximately 600 LF of 8-inch pipeline. Approximate pipeline alignment is shown in Figure 10-11 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

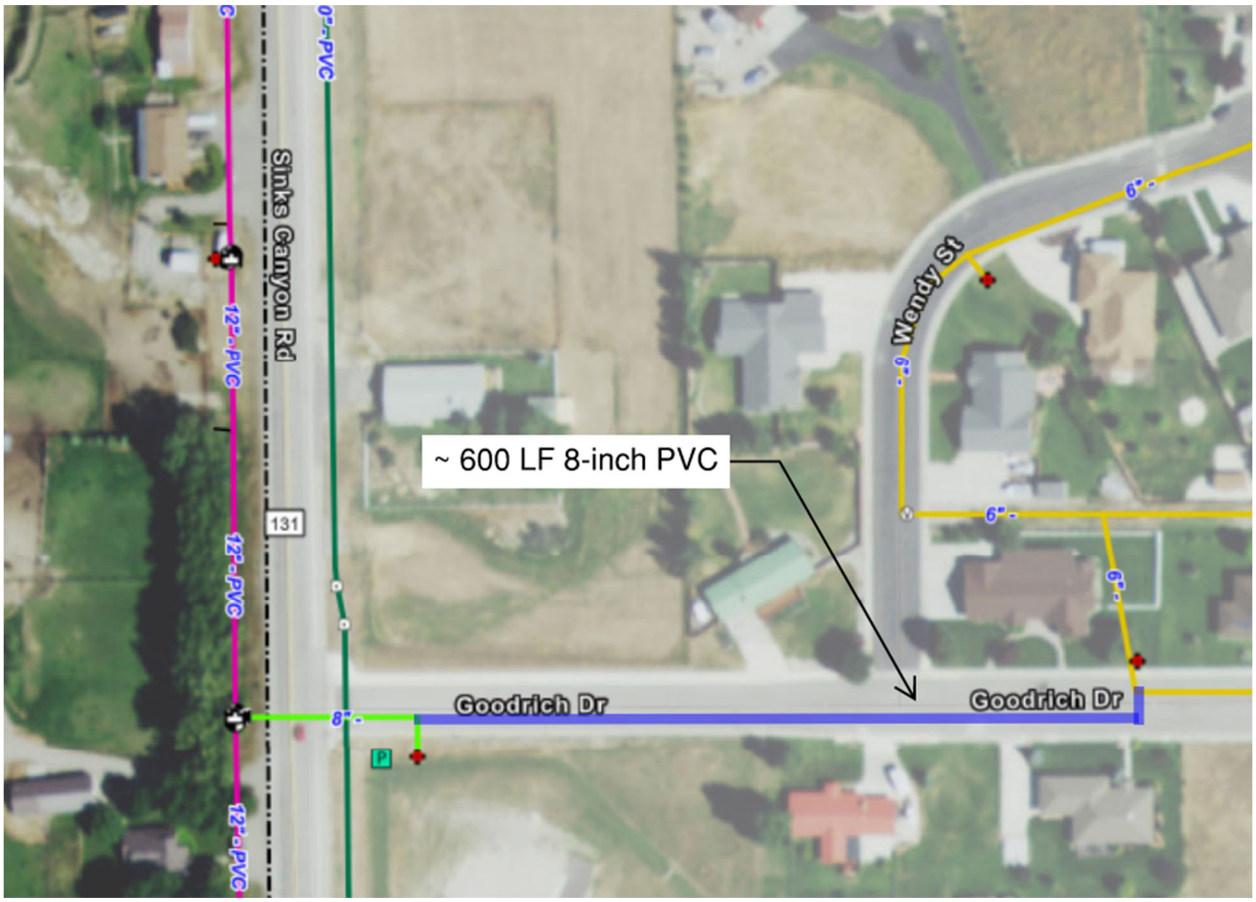


Figure 10-11 Goodrich Connector Pipeline Approximate Alignment and Scope of Work

24. Distribution System Improvements Budgeting II

The City should start budgeting for investment in ductile iron distribution piping renewal in the next twenty years given the age, frequency of current failures, and pipe material. For the current Capital Improvements Plan, roughly $4M in present value costs is budgeted for distribution system renewal. These numbers should be adjusted after the Pipeline Condition Assessment is conducted.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

25. Sewer Lagoon Bulk Fill Station

To mitigate traffic impacts for the Public Works Department and Buena Vista Drive, distribute loading on pavement, help with water quality on dead-end lines, combat water hammer in the Buena Vista Transmission Line, and accommodate future growth, bulk fill stations should be constructed for the Lander system. After a cursory review of several locations, it is recommended that the bulk fill stations be located at the sewer lagoons at the end of the dead-end 10” line there and at the Fremont County Shop at the terminal end of the 10-inch transmission line serving West Main Street.

Approximate location of for the bulk fill station is shown in Figure 10-12.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

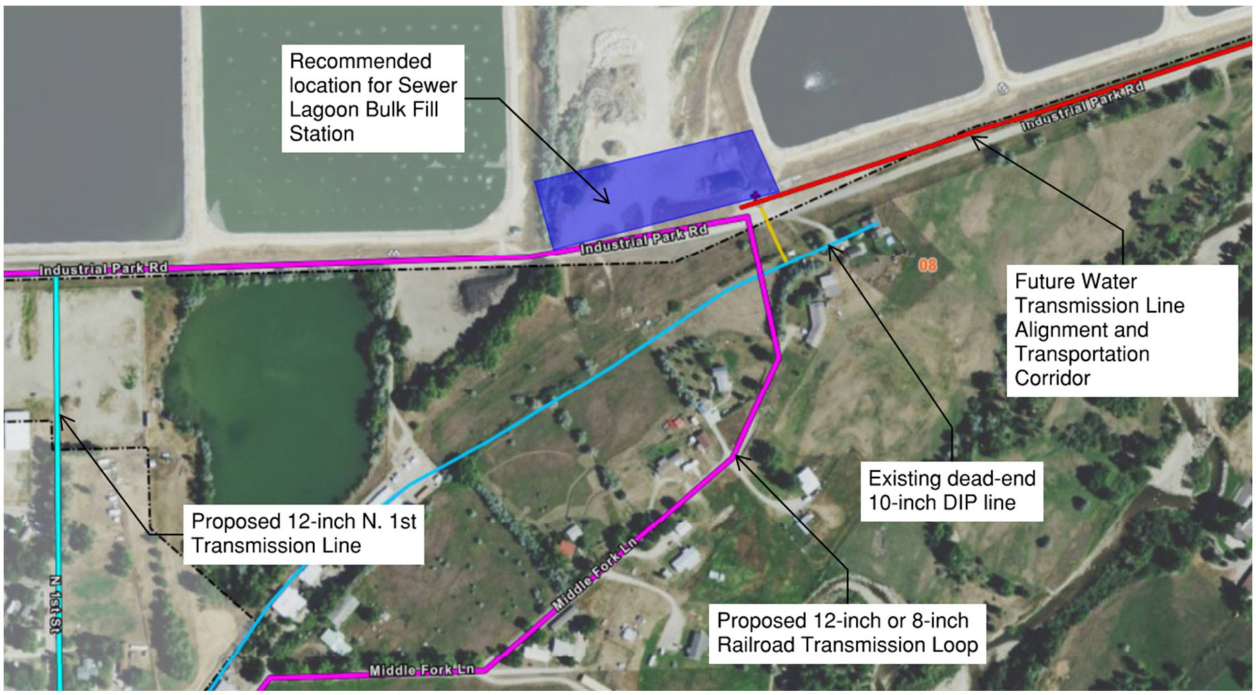


Figure 10-12 Sewer Lagoon Bulk Fill Station Proposed Location

26. Buena Vista Transmission Line

Purpose of project is to replace failing 8-inch DIP Rodeo Transmission Line and mitigate water hammer affects at Public Works Bulk Fill Station by increasing diameter.

Project consists of installation of approximately 5,800 LF of 12-inch pipeline from Rodeo PRV Station to Public Works PRV Station feed line. Approximate pipeline alignment is shown in Figure 10-13 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by debt.

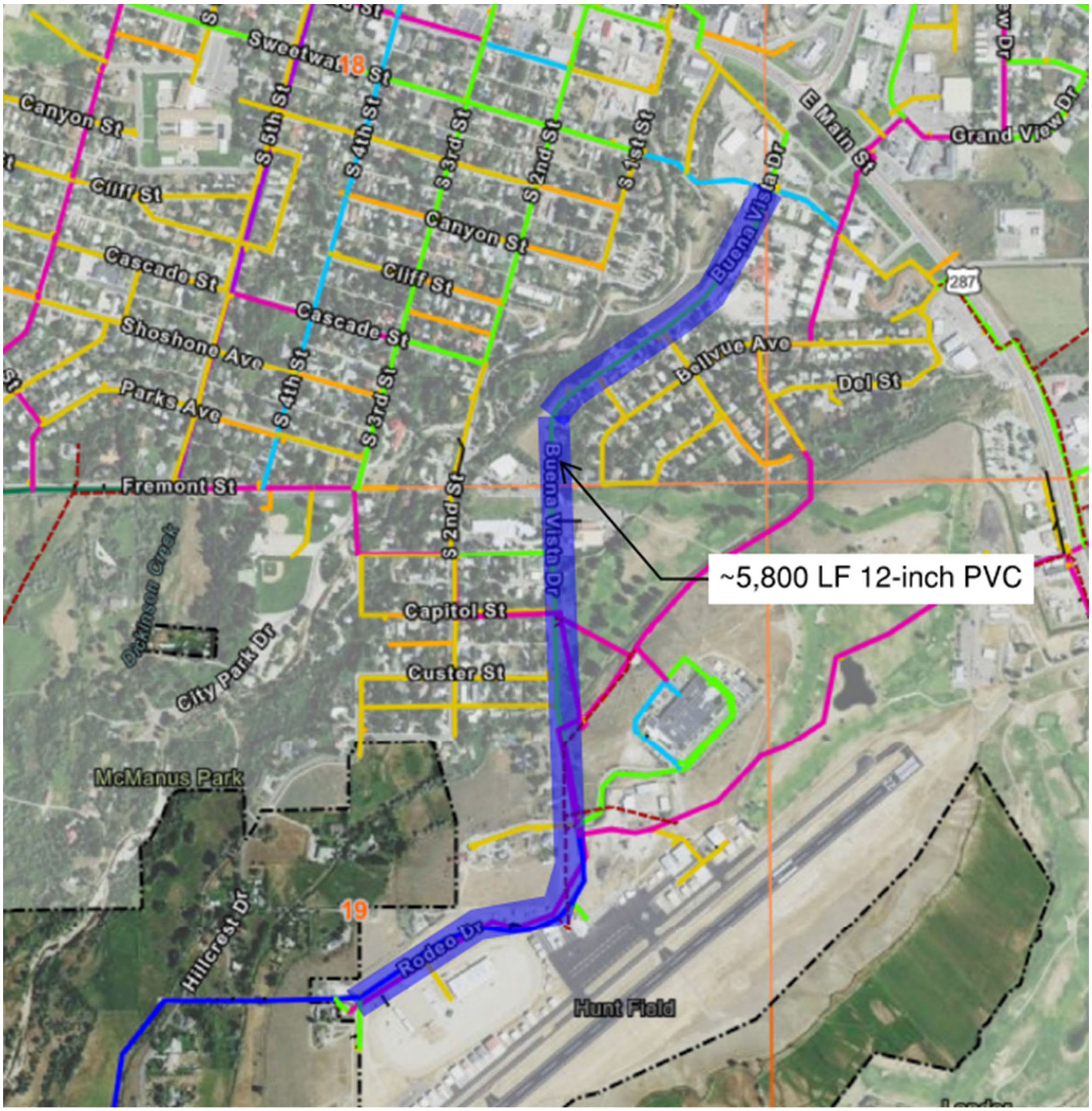


Figure 10-13 Buena Vista Drive Transmission Line Approximate Alignment and Scope of Work

27. Mortimore Lane West Transmission Line

Purpose of project is to provide water service to customers along Mortimore Lane and allow for system expansion to the west and north of Lander as well as set the stage for regional connection to the Shoshone Utility Organization.

Project consists of installation of approximately 4,000 LF of 12-inch transmission line along Mortimore Lane from Hillcrest Drive to Sinks Canyon Road. Approximate pipeline alignment is shown in Figure 10-14 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

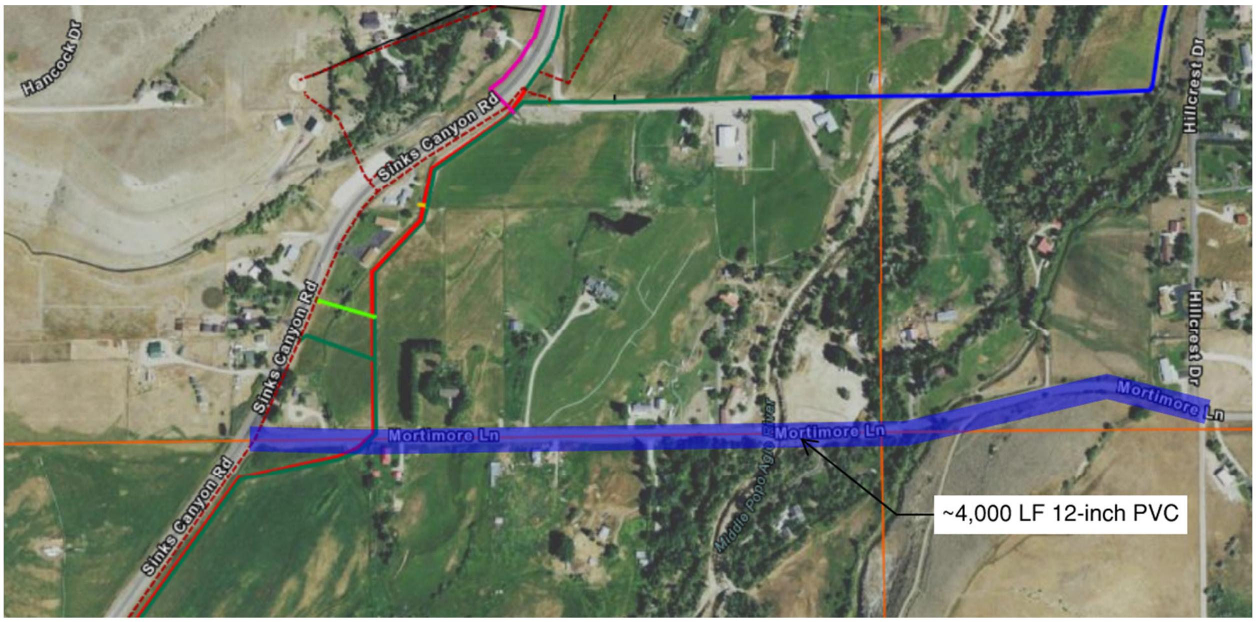


Figure 10-14 Mortimore Lane West Transmission Line Approximate Alignment and Scope of Work

28. Industrial Park Improvements/Annexation

The purpose of this project is to complete the Industrial Park Water Users Association System and bring it up to an acceptable standard before being either annexed by the City of Lander or adopting City standards as a wholesale customer. It was assumed that roughly $2M in 8-inch line installations and replacements would be required. Backflow prevention should be ensured. Wholesale rates needed to be reassessed. Layout of the existing system is provided in Figure 10-15.

Project is not eligible for WWDC funding and is planned in the CIP to be funded 100% by special improvements district tax for users of this system.

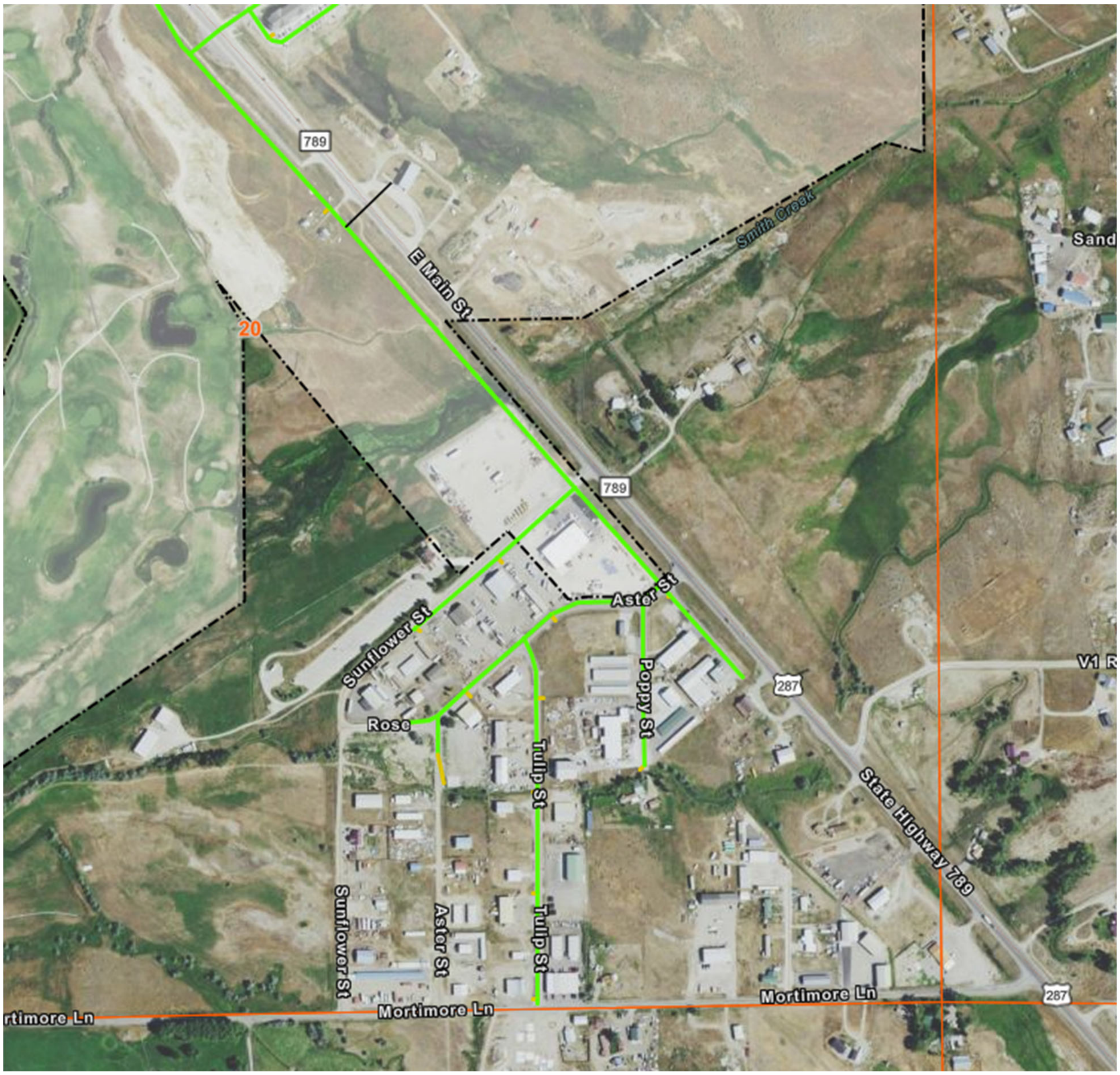


Figure 10-15 Industrial Park Users Association Existing Water System

29. Grandview/Valleyview Pipeline

Sections of pipeline along Grandview and Valleyview are both made of Ductile Iron and installed in corrosive soils, resulting in multiple breaks. Roughly 4,780 LF of this pipe have been identified for replacement with 8-inch PVC. Approximate pipeline alignment is shown in Figure 10-16 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

Figure 10-16 Grandview Valleyview Pipeline Approximate Alignment and Scope of Work

30. North 1st Street Transmission Line

The purpose of this project is two-fold: replacement of aging ductile iron pipe with known deficiencies and failures, and installation of new transmission main that can be used to expand the Ellis pressure zone to the north and east of Lander. Roughly 1.6 miles of 12-inch PVC pipe is planned for installation. Also included is a bore across the Middle Fork Popo Agie and across Highway 789 in order loop into the Dillon subdivision. Approximate pipeline alignment is shown in Figure 10-17 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

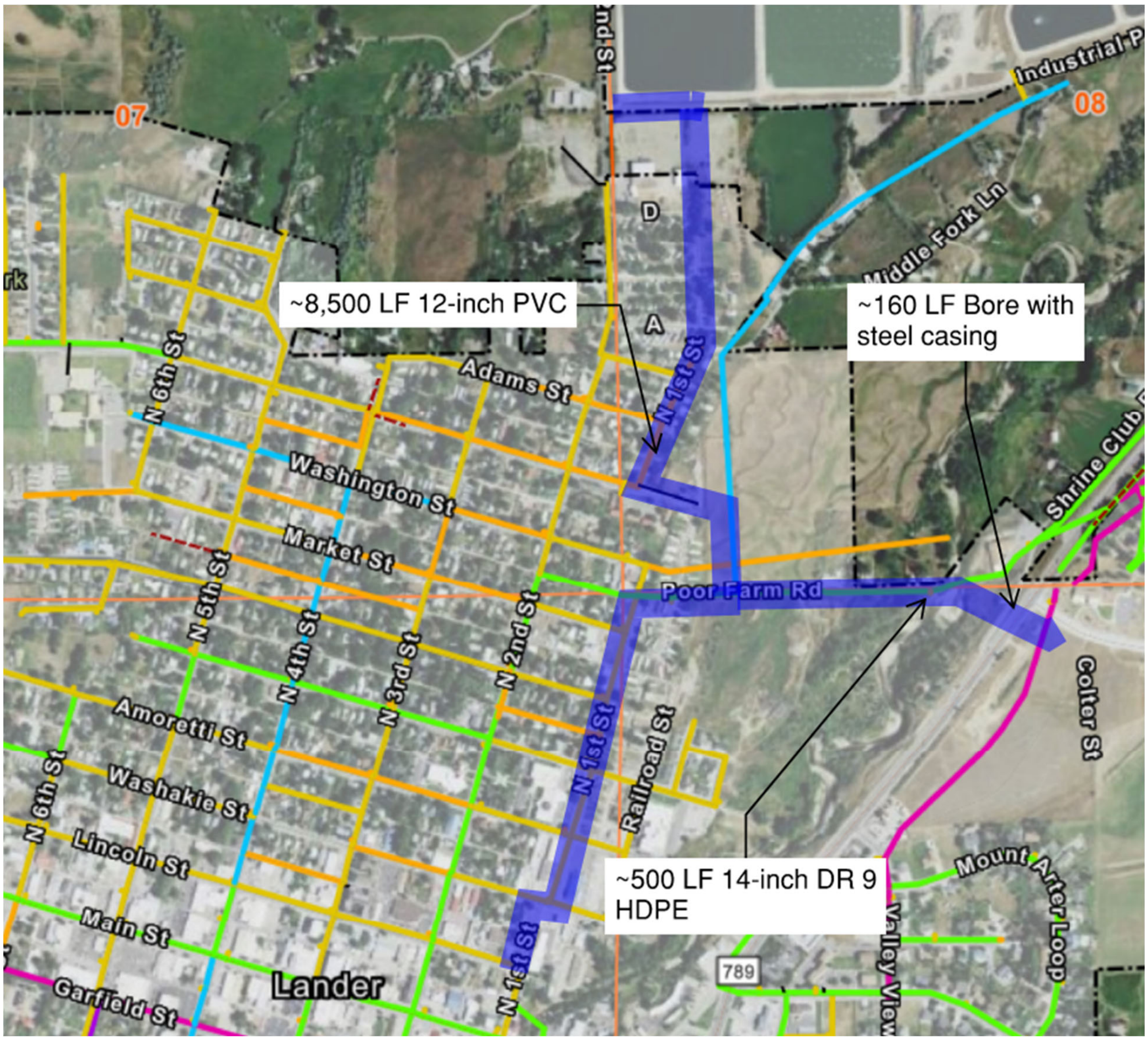


Figure 10-17 North 1st Street Transmission Line Approximate Pipeline Alignment and Scope of Work

31. South 1st Street Pipeline

The pipeline along First Street from Lincoln to Canyon Street, has known issues due to its age, material, and installation. Additionally, between Sweetwater and Garfield, there is currently no pipeline along 1st Street. Installation of a pipeline will help with water quality and fire flow capability.

Project scope includes roughly 2,000 LF of 8-inch PVC. Approximate pipeline alignment is shown in Figure 10-18 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

Figure 10-18 South 1st Street Pipeline Approximate Alignment and Scope of Work

32. Mortimore Lane to Squaw Creek Transmission Line

This project extends the highest pressure zone to more customers to the west and north of Lander and lays the groundwork for both a regional connection to the SUO and for a connection to the Squaw/Baldwin Loop and potential future water supply wells located there.

Estimated scope of the project includes approximately 7,400 LF of 12-inch PVC and will include a bore with steel casing across Sinks Canyon Road. Approximate pipeline alignment is shown in Figure 10-19 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

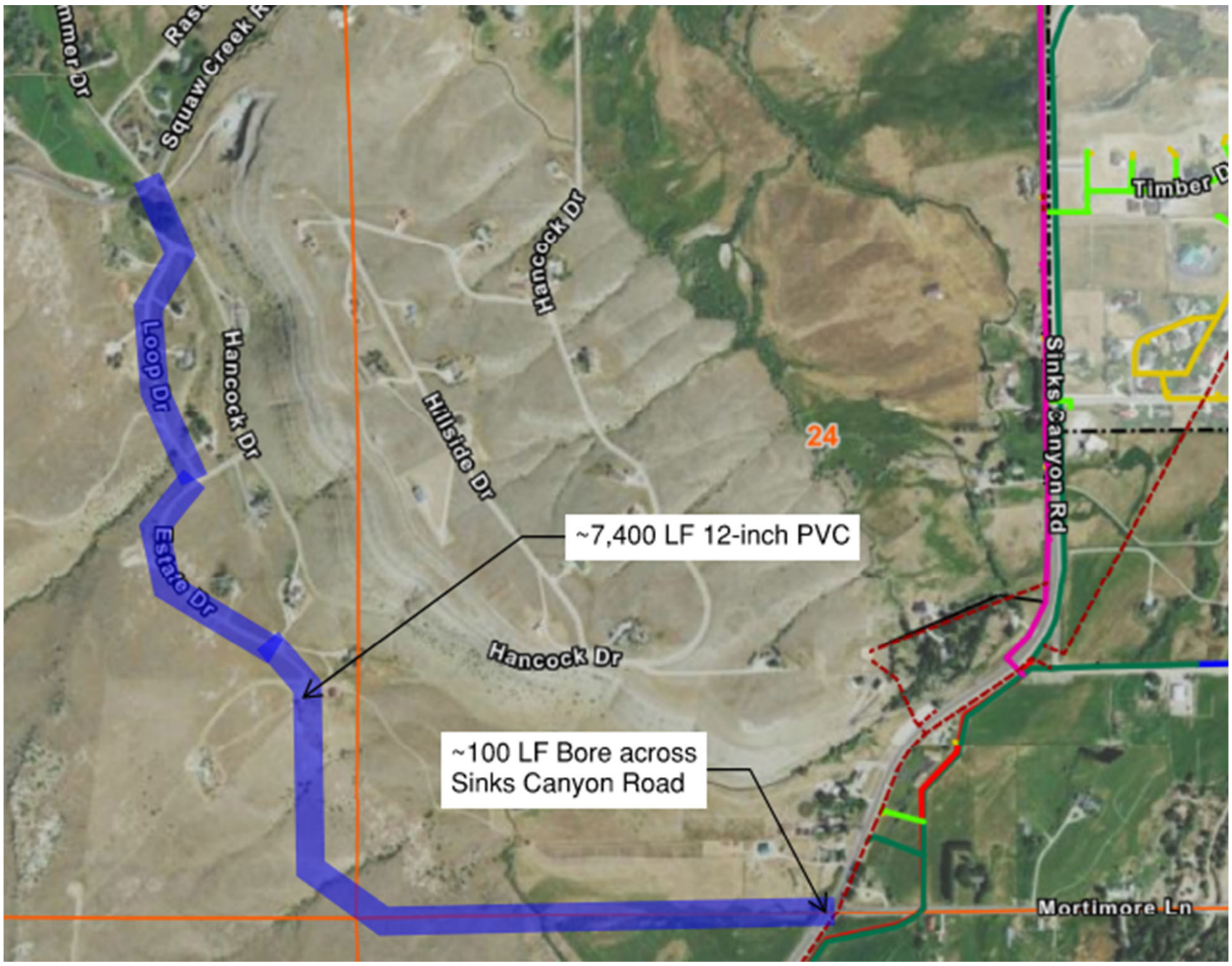


Figure 10-19 Mortimore to Squaw Creek Transmission Line Approximate Alignment and Scope of Work

33. Cascade Street Pipeline

The purpose of this project is to replace failing water line along Cascade Street between 2nd Street and McDougall Drive and along South 6th between Shoshone Avenue and South 9th Street with 8-inch PVC. Project requires roughly 6,400 LF of water line.

Approximate pipeline alignment is shown in Figure 10-20 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by debt.

Figure 10-20 Cascade Steet Pipeline Approximate Alignment and Scope of Work

34. Loop Drive to Spriggs Connector Transmission Line

This project further extends the highest pressure zone to more customers to the west and north of Lander and lays the groundwork for both a regional connection to the SUO and for a connection to the Squaw/Baldwin Loop and potential future water supply wells located there.

Estimated scope of the project includes approximately 6,600 LF of 12-inch PVC. Approximate pipeline alignment is shown in Figure 10-21 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

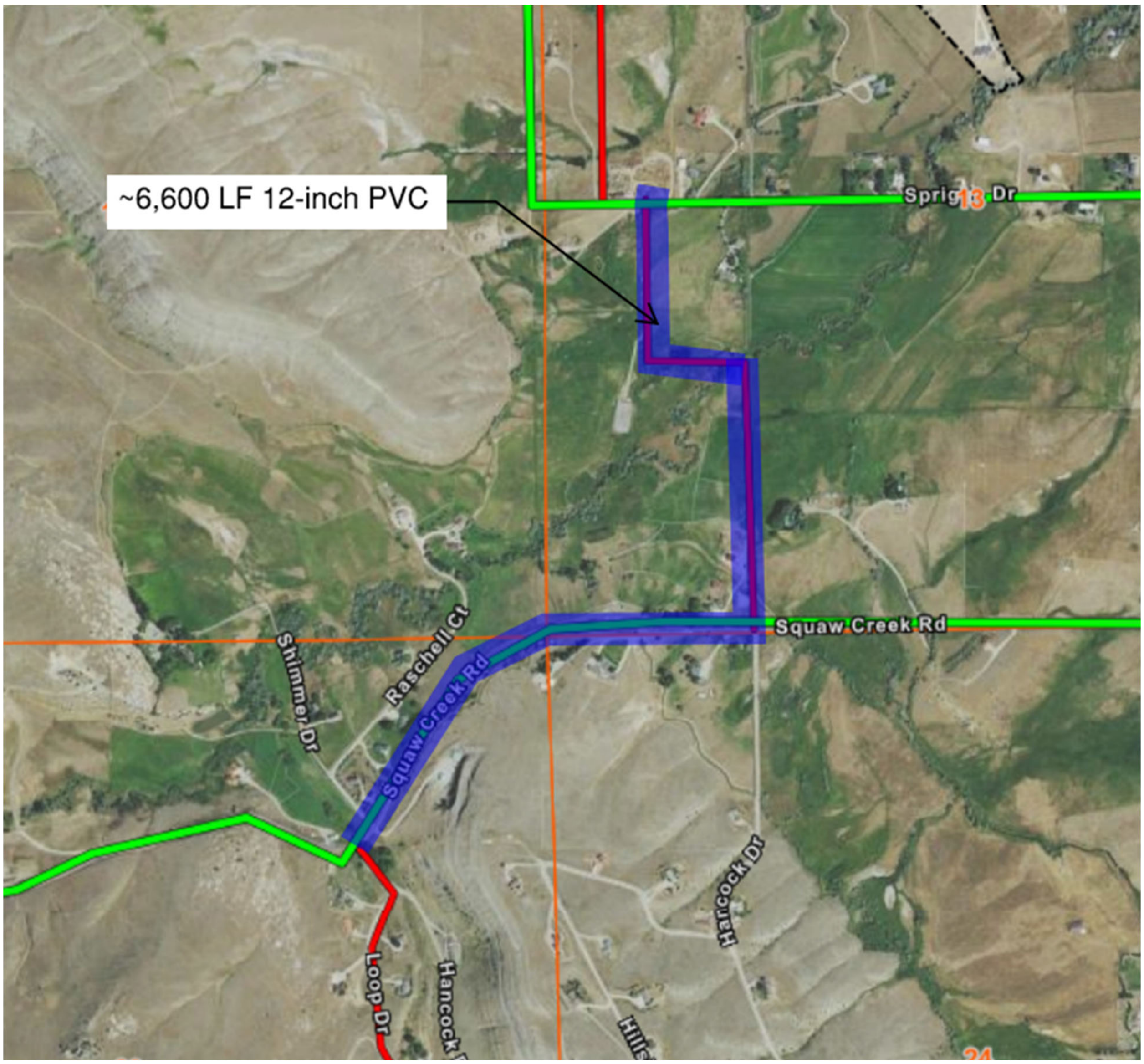


Figure 10-21 Loop Drive to Spriggs Connector Transmission Approximate Alignment and Scope of Work

35. Mager 2 Transmission Line

This project replaces the aging Mager Transmission Line and extends it further to loop into the water line on Baldwin Drive.

Estimated scope of the project includes approximately 6,600 LF of 12-inch PVC. Approximate pipeline alignment is shown in Figure 10-22 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

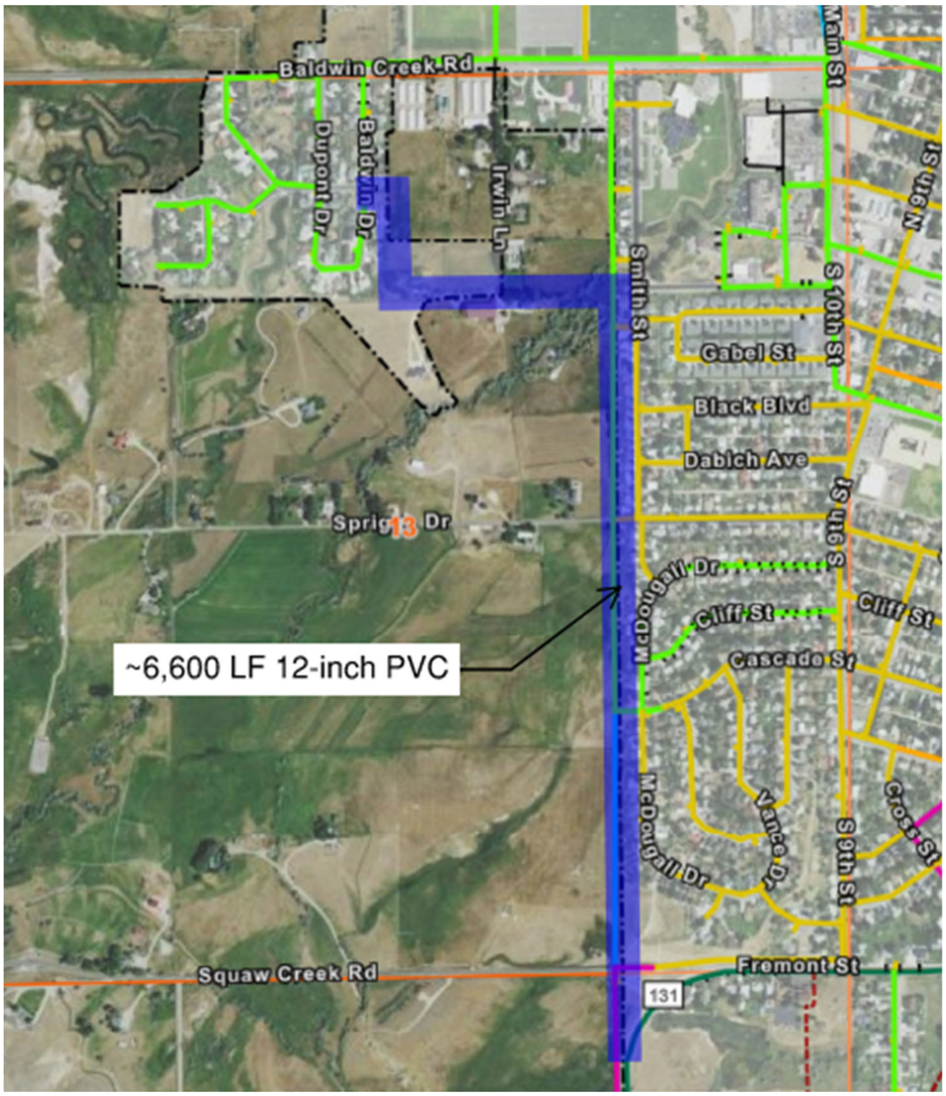


Figure 10-22 Mager 2 Transmission Approximate Alignment and Scope of Work

36. Distribution System Improvements Budgeting III

The City should start budgeting for investment in ductile iron distribution piping renewal in the next twenty years given the age, frequency of current failures, and pipe material. For the current Capital Improvements Plan, roughly $4M in present value costs is budgeted for distribution system renewal. These numbers should be adjusted after the Pipeline Condition Assessment is conducted.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

37. County Shop Bulk Fill Station

To mitigate traffic impacts for the Public Works Department and Buena Vista Drive, distribute loading on pavement, help with water quality on dead-end lines, combat water hammer in the Buena Vista Transmission Line, and accommodate future growth, bulk fill stations should be constructed for the Lander system. After a cursory review of several locations, it is recommended that the bulk fill stations be located at the sewer lagoons at the end of the dead-end 10" line there and at the Fremont County Shop at the terminal end of the 10-inch transmission line serving West Main Street.

Approximate location of for the bulk fill station is shown in Figure 10-23.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

Figure 10-23 Approximate Location for County Bulk Fill Station

38. WTP Improvements Phase II

Incorporate Strainer in Raw Water Upstream of Sleeve Valve: While the City has made improvements to the intake to screen out larger debris, there is still debris in the source water that can impact the operation of the sleeve valve. It is recommended that a strainer be incorporated into the raw water piping upstream of the sleeve valve.

Evaluate the Condition of the Filter Media, Replace As Needed: As the filter media is backwashed over the years the media size can be impacted and the media can become polished, which can impact the effectiveness of the filter. It is recommended that the media be tested to determine if media replacement may be required.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

39. Infiltration Gallery Rehabilitation

The infiltration gallery is impacted by what is thought to be root infiltration or collapsed section of pipe, resulting in lower flows and lower water rights exchange available for the treatment plant diversion. It is recommended that a more in-depth analysis be conducted of the Infiltration gallery and alternatives for mitigating the poor performance and possibility of installing additional infiltration piping be examined. In addition, it is recommended that different flow measurement alternatives, including use of instrumentation, be examined. After different alternatives for both rehabilitation and flow measurement have been carefully examined in a design basis memorandum and approved by the City, design and construction phases should occur.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

40. Exchange Petition Update for Infiltration Gallery

Flow was measured at the infiltration gallery in 1996 at 1,400 gpm. The infiltration gallery is permitted for up to 750 gpm. The City has been credited with 380 gpm exchange water rights for the City of Lander Pipeline since 2018 (see Section 1.5.7.3.). Based on initial measurements of this gallery, its rehabilitation and installation of an accurate, consistent flow measurement apparatus, should result in an opportunity for the exchange petition for the infiltration gallery to be updated with a higher exchange credit.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

41. North 2nd Transmission Line – Phase I

As discussed in previous sections, the area to the north of the City has been identified as having high current growth and future growth potential. Because of the topography, both the Ellis and 4 MG/High Pressure pressure zones can feed this area (see Figure 8-2). This project is the first phase of a transmission line that will deliver Ellis zone pressure to customers along N. 2nd Street.

Estimated scope of the project includes approximately 6,800 LF of 12-inch PVC. Approximate pipeline alignment is shown in Figure 10-22 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

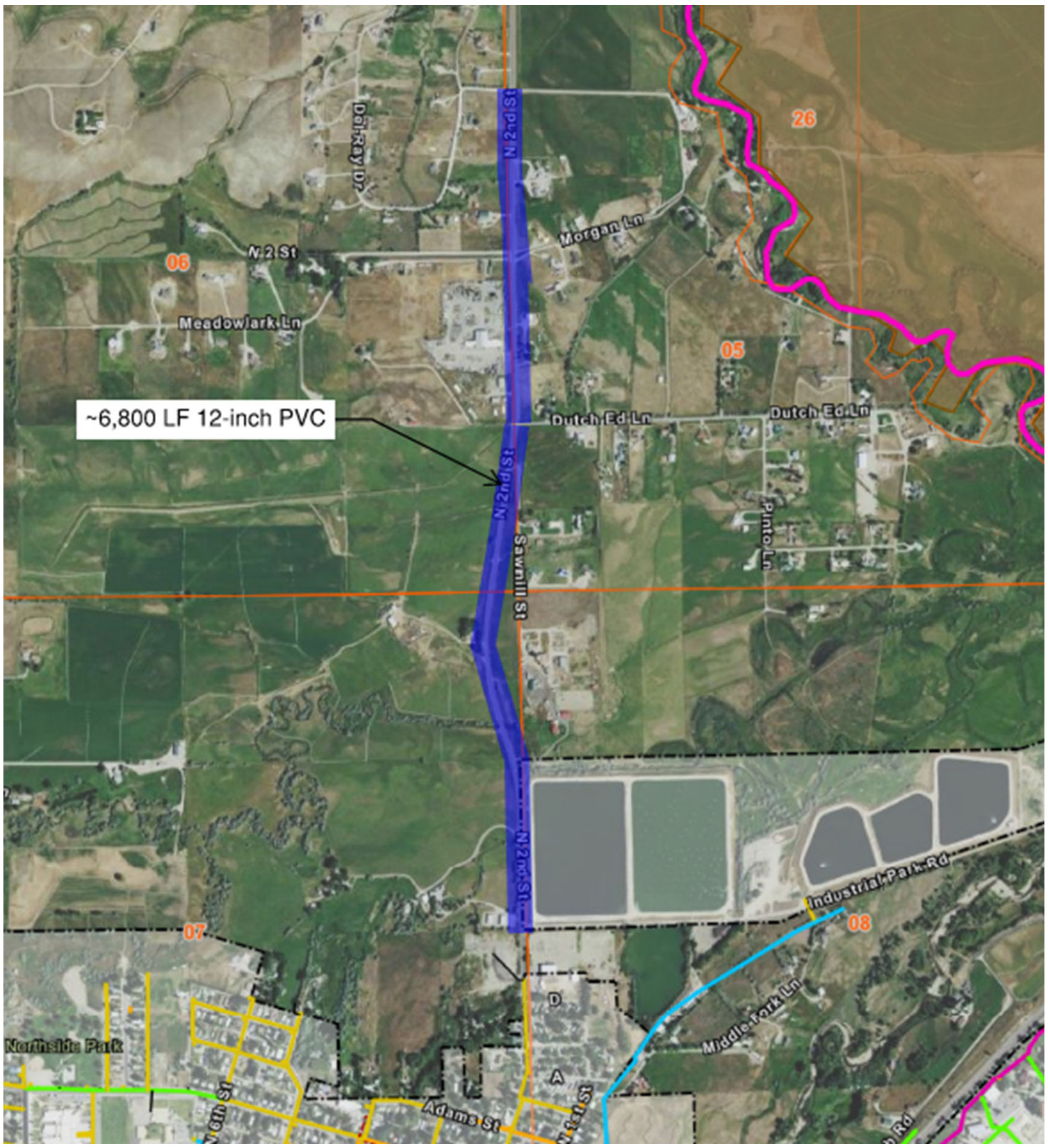


Figure 10-24 North Second - Phase II Approximate Alignment and Scope of Work

42. Redd Fox Improvements/Annexation

The purpose of this project is to bring the Redd Fox HOA System up to an acceptable standard before being either annexed by the City of Lander or adopting City standards as a wholesale customer. It was assumed that roughly 2,900 LF of 8-inch line installation would be required. Backflow prevention should be ensured. Wholesale rates needed to be reassessed. Based on existing system condition, it was assumed that the entire system would need to be replaced. Layout of the existing system is provided in Figure 10-25.

Project is not eligible for WWDC funding and is planned in the CIP to be funded 100% by special improvements district tax for users of this system.

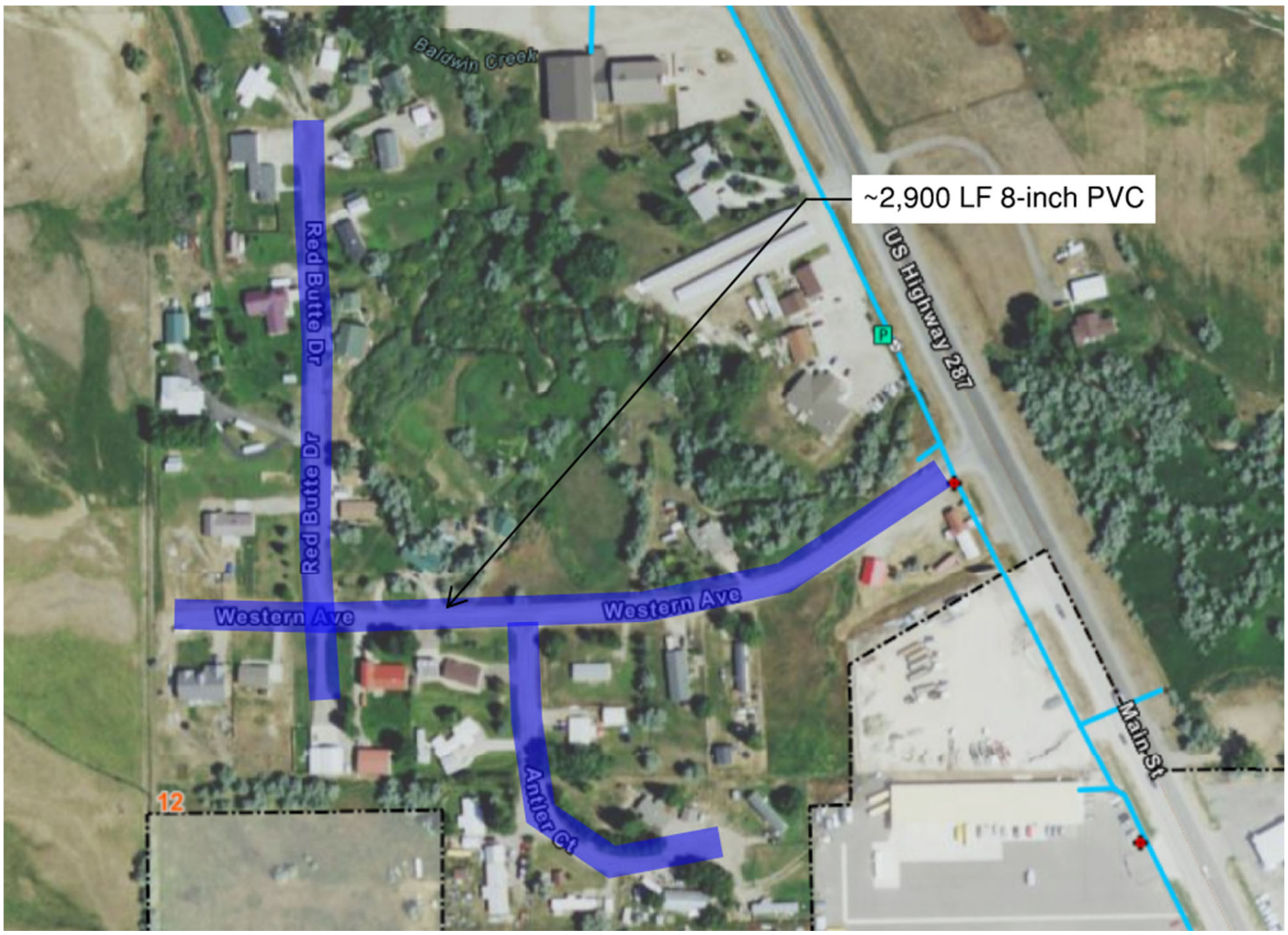


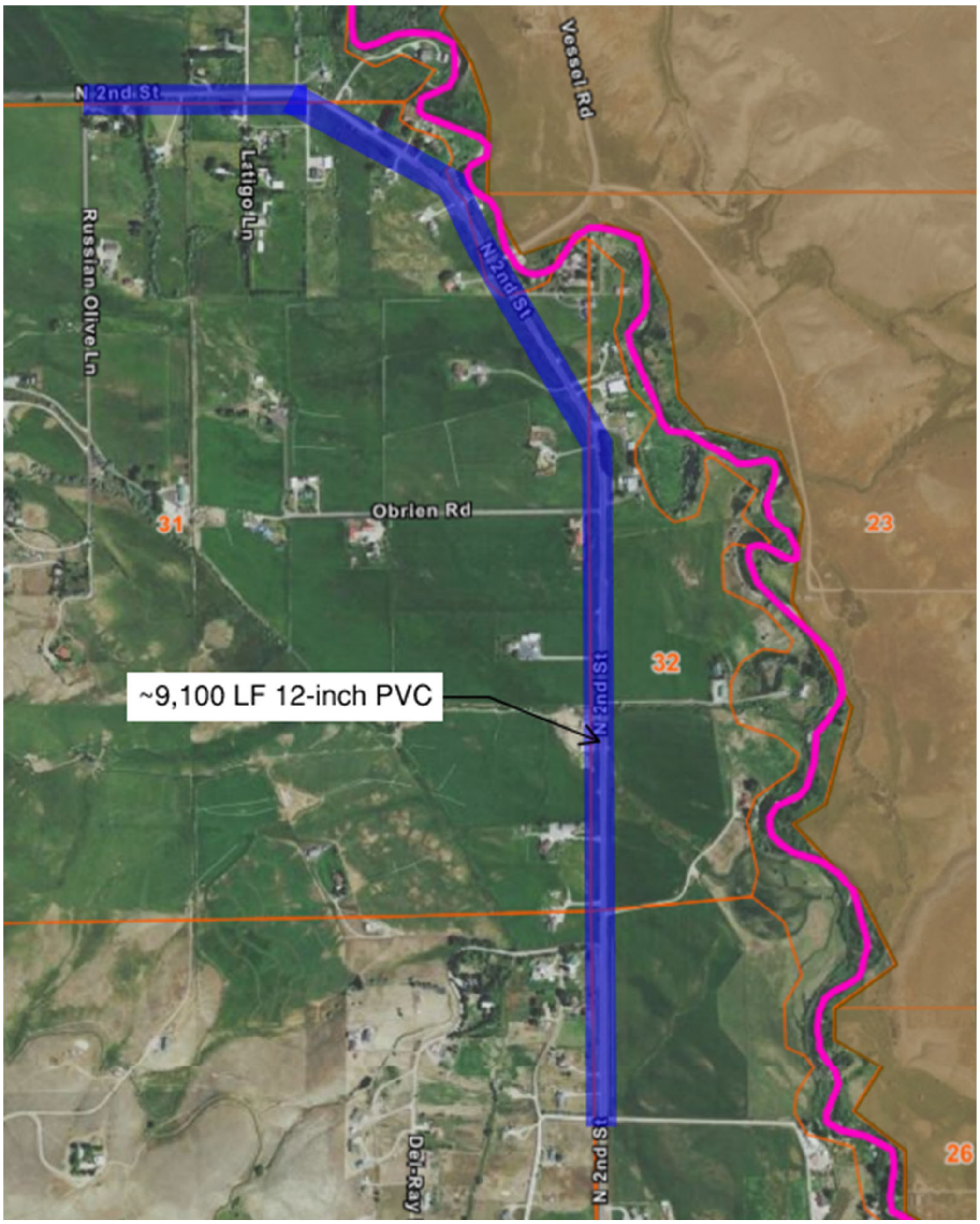
Figure 10-25 Redd Fox HOA Improvements General Alignment and Scope of Work

43. North 2nd Transmission Line – Phase II

As discussed in previous sections, the area to the north of the City has been identified as having high current growth and future growth potential. Because of the topography, both the Ellis and 4 MG/High Pressure pressure zones can feed this area (see Figure 8-2). This project is the second phase of a transmission line that will deliver Ellis zone pressure to customers along N. 2nd Street.

Estimated scope of the project includes approximately 9,100 LF of 12-inch PVC. Approximate pipeline alignment is shown in Figure 10-22 used for high level planning cost estimate. Final design could differ significantly based on detailed design decisions.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.



44. Deer Valley Expansion

Approximately 37 housing units are in the general vicinity of the Deer Valley and Pheasant Run Drives that are currently not connected to the City system. There is a great opportunity to connect these customers to the City's system, however, given their close proximity to the high pressure zone water line running along Sinks Canyon Highway in this vicinity. It is estimated that static pressures from this line for these customers would range from roughly 75 – 105 psi. Connecting to this system is a great opportunity for both these potential users and the City of Lander. This area could be metered through one wholesale meter or multiple meters.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by cash.

Figure 10-26 General Area of the Deer Valley Area of System Expansion

45. Wyoming Life Resource Center Improvements/Annexation

The purpose of this project is to bring the WLRC System up to an acceptable standard before being either annexed by the City of Lander or adopting City standards as a wholesale customer. Layout of the existing system is provided in Figure 10-27. Roughly $1M (present day dollars) in improvements are planned for this system, although very little is known about the deficiencies associated with this system. Anecdotally, the WDEQ has issued multiple warnings to this system, and it is difficult to find and retain qualified, experienced operators, and the City needs to provide occasional assistance with management and operation of the system. Wholesale rates need to be reassessed. Backflow prevention needs to be reassured.

Project is not eligible for WWDC funding and is planned in the CIP to be funded 100% by special improvements district tax for users of this system.

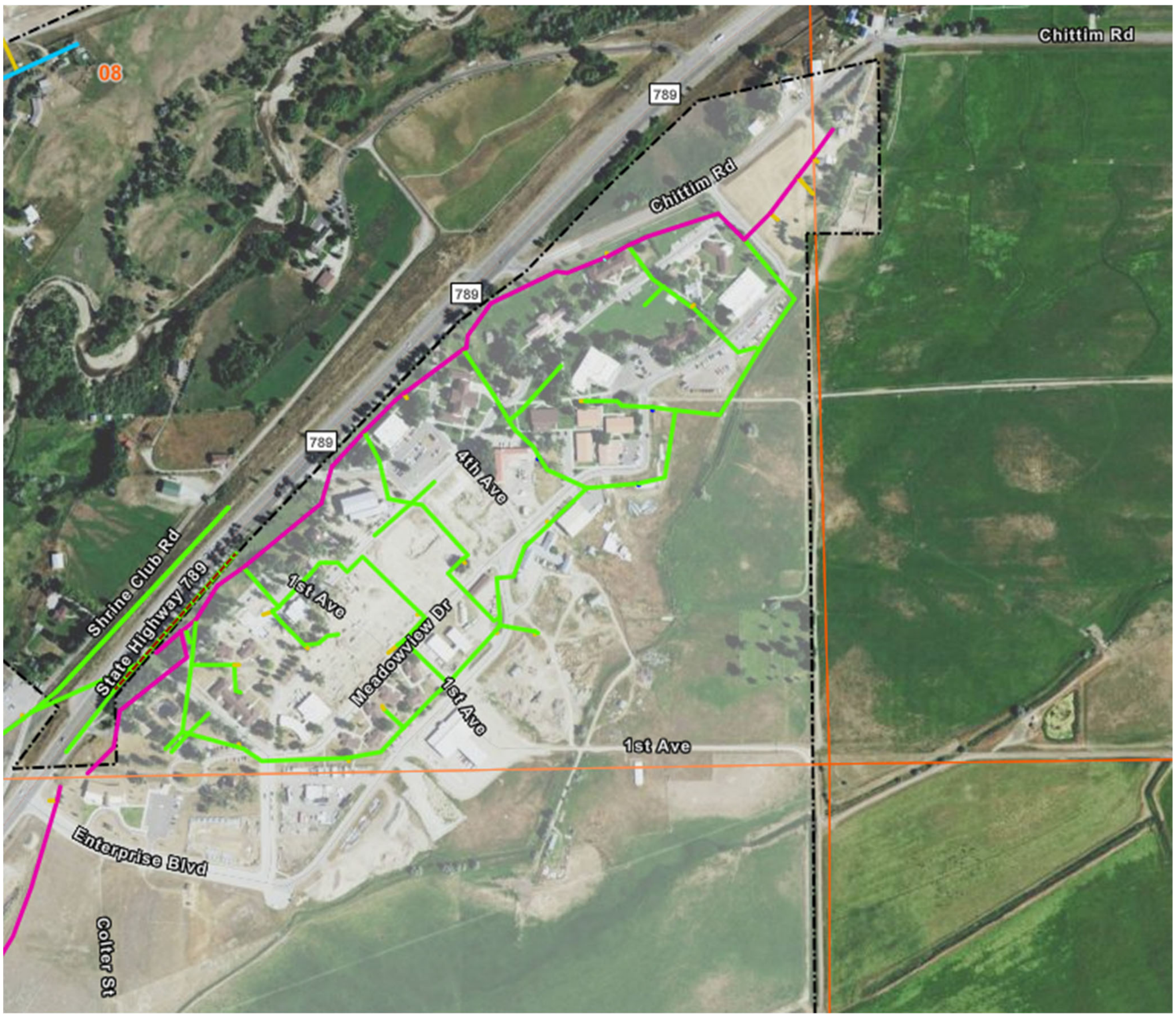


Figure 10-27 Basic Layout of the Wyoming Life Resource Center System

46. Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study

There are several wells along the Squaw/Baldwin Loop (see Figure 6-3) that should be investigated for connection to the Lander system as a new source of water supply. It is recommended that a study of possible sources be conducted, whether that be drilling new wells or procuring and connecting to existing wells. The WWDO has three possible options for groundwater exploration:

1. Groundwater Grant – Applications accepted year-round with periodic reviews. Grants up to $400K. Sponsor owns success or failure of groundwater exploration.
2. Level II Study – 100% grant funded. Applications accepted annually. Grants cover easements, permitting, materials. WWDC owns well(s) afterwards. Commission sells well to sponsor afterwards. All risk is on commission.
3. Level III Construction Project – 67% grant covered. Sponsor owns well afterwards. Not preferred by WWDC due to production and easement uncertainty.

Given the three options, the Level II study is recommended and was included in the CIP. Although the study is 100% grant funded, a portion of the cost is planned to be covered by cash from the City given that the City will need to purchase the well from the WWDC if the exploration is successful.

47. Lyons Valley Transmission Line

Based on 2020 Census data, there are roughly 280 potential customers along the proposed alignment for a Lyon's valley transmission line. This line is also the preferred connection between Hudson and Lander, as well as extending service to the east and south of Lander along Highway 287. Figure 10-28 shows the general alignment and scope of work of the project.

Project eligible for WWDC grant funding and is planned in the CIP to be funded 67% by grant and 33% by special improvements district. Project funding may shift based on results of the planned Level II Regionalization Study.

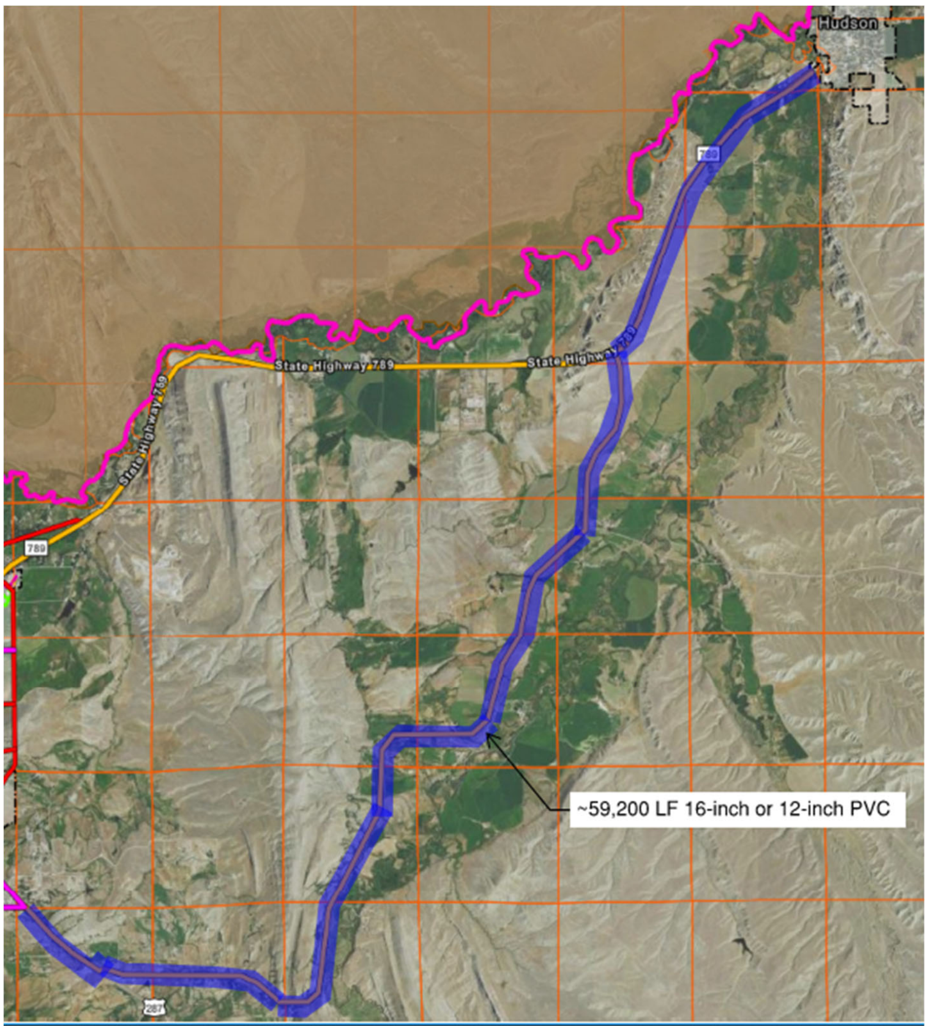


Figure 10-28 Lyons Valley Transmission Approximate Alignment and Scope of Work

48. Distribution System Improvements Budgeting IV

The City should start budgeting for investment in ductile iron distribution piping renewal in the next twenty years given the age, frequency of current failures, and pipe material. For the current Capital Improvements Plan, roughly $4M in present value costs is budgeted for distribution system renewal. These numbers should be adjusted after the Pipeline Condition Assessment is conducted.

Project not eligible for WWDC grant funding and is planned in the CIP to be funded 100% by cash.

11 Project Costs, Prioritization, and Schedule

Details of the cost estimates are provided in Appendix F. From direct prioritization of projects by the City and in concert with the financial plan development, a capital improvements plan was formulated for the next 20 years. The city's preferred funding scenario and schedule, as determined in the *Financial Plan Development* section (12), rendered the estimated schedule and costs provided in Table 11-1. Project physical locations are provided in *Figure 10-1 – Recommended Projects*.

Table 11-1 Project Costs, Start Date, Funding Source

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
1	City of Lander Pipeline Condition Assessment	2024	$ 35,000.00	$ 36,050.00	cash
2	Worthen Meadows Outlet Gate Rehabilitation	2024	$ 100,000.00	$ 103,000.00	cash
3	PRV Station Metering	2024	$ 85,000.00	$ 87,550.00	cash
4	Planning Water Service Map	2025	$ 20,000.00	$ 21,218.00	cash
5	Worthen Meadows Enlargement Level II Study	2025	$ 450,000.00	$ 477,405.00	100% grant
6	Regionalization Level II Study	2025	$ 650,000.00	$ 689,585.00	100% grant
7	Distribution Metering and LCR Compliance Project	2026	$ 5,102,001.45	$ 5,575,094.74	debt
8	Non-Potable Water System Level II Study	2026	$ 150,000.00	$ 163,909.05	100% grant
9	High Pressure Zone Tank Rehabilitation	2026	$ 1,392,300.00	$ 1,521,403.80	debt
10	Intake Structure Rehabilitation	2027	$ 1,000,000.00	$ 1,125,508.81	67% grant, 33% debt
11	Lincoln Street Transmission Line	2027	$ 2,443,225.00	$ 2,749,871.26	67% grant, 33% debt
12	Distribution System Improvements Budgeting I	2028	$ 1,000,000.00	$ 1,159,274.07	debt
13	Lander Valley HS Raw Water Conversion	2028	$ 734,700.00	$ 851,718.66	67% grant, 33% cash
14	McFarland Drive Pipeline	2029	$ 682,500.00	$ 814,940.69	debt
15	Industrial Park Bulk Fill Station	2029	$ 554,872.50	$ 662,546.78	debt
16	WTP Improvements Phase I	2030	$ 1,379,762.50	$ 1,696,933.84	debt
17	5th Street Transmission Line	2030	$ 2,443,350.00	$ 3,005,012.31	67% grant, 33% debt
18	N. 5th Street Pipeline	2031	$ 1,442,805.00	$ 1,827,702.21	debt
19	Lander City Park Raw Water Conversion	2031	$ 432,250.00	$ 547,561.37	67% grant, 33% cash
20	Hillcrest Drive Transmission Line	2032	$ 1,162,400.00	$ 1,516,668.35	67% grant, 33% cash

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
21	Baldwin Creek Transmission Line	2032	$ 1,771,090.00	$ 2,310,870.74	67% grant, 33% debt
22	Mortimore Lane East Transmission Line	2033	$ 5,512,150.00	$ 7,407,868.67	67% grant, 33% debt
23	Goodrich Connector Pipeline	2033	$ 272,625.00	$ 366,385.20	cash
24	Distribution System Improvements Budgeting II	2034	$ 1,000,000.00	$ 1,384,233.87	debt
25	Sewer Lagoon Bulk Fill Station	2034	$ 550,000.00	$ 761,328.63	cash
26	Buena Vista Drive Transmission Line	2035	$ 2,854,700.00	$ 4,070,119.60	67% grant, 33% debt
27	Mortimore Lane West Transmission Line	2035	$ 2,234,400.00	$ 3,185,720.13	67% grant, 33% cash
28	Industrial Park Improvements/ Annexation	2036	$ 1,995,525.00	$ 2,930,495.74	67% grant, 33% special improvements district fees
29	Grandview/Valleyview Pipeline	2036	$ 2,313,675.00	$ 3,397,709.74	debt
30	N. 1st Street Transmission Line	2037	$ 4,586,400.00	$ 6,937,341.51	67% grant, 33% cash
31	S. 1st Street Pipeline	2037	$ 859,950.00	$ 1,300,751.53	debt
32	Mortimore Lane to Squaw Creek Transmission Line	2038	$ 3,777,650.00	$ 5,885,455.61	67% grant, 33% cash
33	Cascade Street Pipeline	2038	$ 3,076,027.50	$ 4,792,350.62	debt
34	Loop Drive to Spriggs Connector Transmission Line	2039	$ 1,749,900.00	$ 2,808,075.80	67% grant, 33% cash
35	Mager 2 Transmission Line	2039	$ 3,214,575.00	$ 5,158,449.20	67% grant, 33% cash
36	Distribution System Improvements Budgeting III	2040	$ 1,000,000.00	$ 1,652,847.63	cash
37	County Shop Bulk Fill Station	2040	$ 554,872.50	$ 917,119.70	cash
38	WTP Improvements Phase II	2040	$ 259,350.00	$ 428,666.03	cash
39	Infiltration Gallery Rehabilitation	2041	$ 2,000,000.00	$ 3,404,866.12	67% grant, 33% cash
40	Exchange Petition Update for Infiltration Gallery	2041	$ 35,000.00	$ 59,585.16	cash
41	North 2nd Street Transmission Line - Phase I	2041	$ 3,537,575.00	$ 6,022,484.64	67% grant, 33% cash
42	Redd Fox Improvements/Annexation	2042	$ 1,247,610.00	$ 2,187,691.69	67% grant, 33% special improvements district fees
43	North 2nd Street Transmission Line - Phase II	2042	$ 4,902,575.00	$ 8,596,694.94	67% grant, 33% cash
44	Deer Valley Expansion	2043	$ 100,000.00	$ 180,611.12	67% grant, 33% cash

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
45	WLRC Improvements/Annexation	2043	$ 1,030,575.00	$ 1,861,333.09	67% grant, 33% special improvements district fees
46	Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study	2043	$ 400,000.00	$ 722,444.49	75% Grant, 25% cash or loan
47	Lyons Valley Transmission Line	2044	$ 28,182,610.00	$ 52,427,956.40	67% grant, 33% special improvements district fees
48	Distribution System Improvements Budgeting IV	2044	$ 1,000,000.00	$ 1,860,294.57	cash
	Total		**$ 101,279,001.45**	**$ 157,652,706.12**	

12 Financial Plan Development

12.1 Background of the Financial Plan

As part of the water master plan development, a financial plan was also developed. Five different capital planning/funding scenarios were considered. These are described in more detail in Appendix G. The discussion contained in this Chapter summarizes the financial plan for the preferred capital scenario.

This plan is intended to show future cash flows (both revenue and expenses) and to provide guidance on needed rate increases to fund the capital improvement plan developed. The City provided historical revenue and expense data for Fiscal Years (FY) 2021 and 2022 and prospective revenue and expense data for FY 2023. The expense data provided included a detailed budget for all departments associated with water and wastewater services. For departments that cover both utilities, it was generally assumed that 50% of the expenses are associated with the water utility. The City also provided the number of water customers by customer class, meter sizes for each customer, and the volume billed for each customer class over a full twelve-month period. This information, and the developed CIP, was used to build a financial planning model for the water utility. This model forecasts future revenue and expenditures of the utility under varying assumptions including customer growth rates and varying levels and timing of capital improvement spending. The model provides projections for a 20-year period, or until 2042.

To develop a projection of revenues, the current FY23 water utility rates were entered, and the number of customers and volume billed in each customer class were used to calculate the revenue generated for each year of the twenty-year period. In addition to rate revenues, the Water Utility also receives revenue from other miscellaneous sources including interest earnings, late charges, and water transfer fees. No transfers in from the General Fund or other sources of revenue outside of the rate revenue were included. The financial model allows the water utility rates to be adjusted each year as a percentage increase. The total customer count can also be adjusted each year to reflect population growth and the collection rates can also be adjusted. It should be noted that the customer growth rate was set at 2.0% annually for all customers and the revenue generation was based on an assumed collection rate of 97%.

On the expenditures side, a 3% rate of inflation was assumed on all expenditures, including personnel, maintenance, and supply costs. For the sequential CIP costs, a 3% rate of inflation was also assumed for all project costs. In general, some projects were assumed to be partially grant funded through WWDC grants, with the remaining portion of those projects being cash funded. Projects that were not eligible for grant funding are funded with only cash (no future debt issues are assumed in the scenario described below). It is important to understand that HDR is not acting as the City’s municipal financial advisor, and all assumptions described above were for scenario comparison purposes and estimated rate impacts only.

12.2 Current Utility Assessment

As summarized above, data contained within the rate model to determine revenues and expenses was derived from data provided by the City. This section will provide a more detailed discussion and summary of that data.

Currently, the City charges the water demand charge (or the fixed portion of the monthly water bill) based on water meter size. This is the current best practice for charging water rates within the industry. For the volume portion of the bill, all customers are considered one customer class and charged the same rate per 1,000 gallons of usage over 4,000 gallons per month. All usage under 4,000 gallons per month is included in the demand charge. Many utilities will have separate customer classes for residential and non-residential customers as it is sometimes appropriate to have a different volume rate structure for each customer class depending on their use characteristics. Likewise, many utilities will employ more tiers (normally around four) to help better capture the cost of providing water service to high water users.

The water utility currently appears to have a health fund balance with about six months of cash on hand. It was assumed the utility entered FY23 with a fund balance of about $1.2 million. Total estimated expenses for FY23 are $2,507,671 ($2,052,029 in Operations and Maintenance Expense, $301,143 in existing debt service expense, and $154,500 for cash funded Capital Projects. No transfers to the General Fund are included in the water utility expenses. Total estimated revenue in FY23 is $2,806,716 for a positive net revenue of $299,045.

There is currently limited debt associated with the water utility, so the utility will have capacity to issue debt if needed in the future to fund capital programs, although no future debt issues have been included in this scenario. In the past, there has been limited spending on capital projects have mostly been paid for with cash with limited debt issues to fund larger projects. Over the past several years, the utility has been generally neutral with net revenues, meaning increased revenue (i.e., rate increases) will be needed if expenses increase, such as with an increased capital program.

12.3 Proposed Plan (Capital Cost, Distribution and Assignment; Use of Funding Mechanisms, Assumptions, Term/Rate Projections/Fund Summary, Tool Guidance)

As part of the master plan development, $101.3 million of needed capital projects were identified. When inflated to their year of construction, this total becomes $157.7 million (Table 12-1). Of this total, about $52.7 million is modeled as being a mixture of cash or debt funded with the remaining portion being grant funded or funded through the formation of special improvements districts.

Table 12-1 Proposed Funding Plan for Capital Projects

Project Name	Cost Center	Fund Project? (Y/N)	Source of Funding	Estimated Project Cost by Year 2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	CIP Total
					$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
City of Lander Pipeline Condition Assessment	Distribution	Yes	Cash	$ 36,050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 36,050
Worthen Meadows Outlet Gate Rehabilitation	SW Supply	Yes	Cash	$ 103,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 103,000
PRV Station Metering	PS&T	Yes	Cash	$ 87,550	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 87,550
Planning Water Service Map	PS&T	Yes	Cash	$ -	$ 21,218	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 21,218
Worthen Meadows Enlargement Level II Study	SW Supply	Yes	Other	$ -	$ 477,405	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 477,405
Regionalization Level II Study	SW Supply	Yes	Other	$ -	$ 689,585	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 689,585
Distribution Metering and LCR Compliance Project	Distribution	Yes	Debt	$ -	$ -	$ 5,575,095	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,575,095
Non-Potable Water System Level II Study	Distribution	Yes	Other	$ -	$ -	$ 163,909	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 163,909
High Pressure Zone Tank Rehabilitation	PS&T	Yes	Debt	$ -	$ -	$ 1,521,404	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,521,404
Intake Structure Rehabilitation	SW Supply	Yes	Debt	$ -	$ -	$ -	$ 371,418	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 371,418
Intake Structure Rehabilitation	SW Supply	Yes	Other	$ -	$ -	$ -	$ 754,091	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 754,091
Lincoln Street Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ 907,458	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 907,458
Lincoln Street Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ 1,842,414	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,842,414
Distribution System Improvements Budgeting I	Distribution	Yes	Debt	$ -	$ -	$ -	$ -	$ 1,159,274	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,159,274
Lander Valley HS Raw Water Conversion	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ 281,067	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 281,067
Lander Valley HS Raw Water Conversion	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ 570,652	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 570,652
McFarland Drive Pipeline	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ 814,941	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 814,941
Industrial Park Bulk Fill Station	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ 662,547	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 662,547
WTP Improvements Phase I	Water Treatment	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,696,934	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,696,934
5th Street Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ 991,654	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 991,654
5th Street Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,013,358	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,013,358
N. 5th Street Pipeline	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,827,702	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,827,702
Lander City Park Raw Water Conversion	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 180,695	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 180,695
Lander City Park Raw Water Conversion	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 366,866	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 366,866
Hillcrest Drive Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 500,501	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 500,501
Hillcrest Drive Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,016,168	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,016,168
Baldwin Creek Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 762,587	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 762,587
Baldwin Creek Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,548,283	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,548,283
Mortimore Lane East Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,444,597	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,444,597
Mortimore Lane East Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,963,272	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,963,272
Goodrich Connector Pipeline	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 366,385	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 366,385
Distribution System Improvements Budgeting II	Distribution	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,384,234	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,384,234
Sewer Lagoon Bulk Fill Station	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 761,329	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 761,329
Buena Vista Drive Transmission Line	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343,139	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,343,139
Buena Vista Drive Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,726,980	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,726,980
Mortimore Lane West Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,051,288	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,051,288
Mortimore Lane West Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,134,432	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,134,432
Industrial Park Improvements/Annexation	Distribution	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,930,496	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,930,496
Grandview/Valleyview Pipeline	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,397,710	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,397,710
N. 1st Street Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,289,323	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,289,323
N. 1st Street Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,648,019	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,648,019
S. 1st Street Pipeline	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,300,752	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,300,752
Mortimore Lane to Squaw Creek Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,942,200	$ -	$ -	$ -	$ -	$ -	$ 1,942,200
Mortimore Lane to Squaw Creek Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,943,255	$ -	$ -	$ -	$ -	$ -	$ 3,943,255
Cascade Street Pipeline	PS&T	Yes	Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,792,351	$ -	$ -	$ -	$ -	$ -	$ 4,792,351
Loop Drive to Springs Connector Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 926,665	$ -	$ -	$ -	$ -	$ 926,665
Loop Drive to Springs Connector Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,881,411	$ -	$ -	$ -	$ -	$ 1,881,411
Mager 2 Transmission Line	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,702,288	$ -	$ -	$ -	$ -	$ 1,702,288
Mager 2 Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,456,161	$ -	$ -	$ -	$ -	$ 3,456,161
Distributioin System Improvements Budgeting III	Distribution	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,652,848	$ -	$ -	$ -	$ 1,652,848
County Shop Bulk Fill Station	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 917,120	$ -	$ -	$ -	$ 917,120
WTP Improvements Phase II	Water Treatment	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 428,666	$ -	$ -	$ -	$ 428,666
Infiltration Gallery Rehabilitation	Water Treatment	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,123,606	$ -	$ -	$ 1,123,606
Infiltration Gallery Rehabilitation	Water Treatment	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,281,260	$ -	$ -	$ 2,281,260
Exchange Petition Update for Infiltration Gallery	Water Treatment	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 59,585	$ -	$ -	$ 59,585
North 2nd Street Transmission Line - Phase I	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,987,420	$ -	$ -	$ 1,987,420
North 2nd Street Transmission Line - Phase I	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,035,065	$ -	$ -	$ 4,035,065
Redd Fox Improvements/Annexation	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,187,692	$ -	$ 2,187,692
North 2nd Street Transmission Line - Phase II	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,836,909	$ -	$ 2,836,909
North 2nd Street Transmission Line - Phase II	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,759,786	$ -	$ 5,759,786
Deer Valley Expansion	PS&T	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 59,602	$ 59,602
Deer Valley Expansion	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 121,009	$ 121,009
WLRC Improvements/Annexation	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,861,333	$ 1,861,333
Squaw Baldwin Tensleep and Madison Well Level II Groundwater Study	GW Supply	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 180,611	$ 180,611
Squaw Baldwin Tensleep and Madison Well Level II Groundwater Study	GW Supply	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 541,833	$ 541,833
Lyons Valley Transmission Line	PS&T	Yes	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 52,427,956	$ 52,427,956
Distribution System Improvements Budgeting IV	Distribution	Yes	Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,860,295	$ 1,860,295
				$ 226,600	$ 1,188,208	$ 7,260,408	$ 3,875,380	$ 2,010,993	$ 1,477,487	$ 4,701,946	$ 2,375,264	$ 3,827,539	$ 7,774,254	$ 2,145,563	$ 7,255,840	$ 6,328,205	$ 8,238,093	$ 10,677,806	$ 7,966,525	$ 2,998,633	$ 9,486,936	$ 10,784,387	$ 57,052,640	$ 157,652,706

In response to this, cash funded projects are expected to increase over time from $154,500 in 2023 to $5.0 million per year by 2042. With this increase in cash funded capital projects and inflation on other costs associated with providing water services, costs for the utility are expected to increase from $2.5 million in 2023 to $8.6 million in 2042, or a 243% increase (Table 12-2 and Figure 12-1).

Table 12-2 Income Statement Summary

Item	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BEGINNING FUND BALANCE			$ 750,000	$ 4,545,227	$ 8,885,009	$ 13,394,650	$ 18,253,087	$ 23,485,181	$ 29,117,177	$ 35,176,783	$ 41,697,077
REVENUES											
Operating Revenues	$ 4,595,550	$ 4,642,974	$ 5,154,302	$ 5,732,367	$ 5,936,742	$ 6,321,088	$ 6,731,363	$ 7,168,981	$ 7,635,438	$ 8,136,140	$ 8,669,060
Operating Transfers In	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenues	$ 4,595,550	$ 4,642,974	$ 5,154,302	$ 5,732,367	$ 5,936,742	$ 6,321,088	$ 6,731,363	$ 7,168,981	$ 7,635,438	$ 8,136,140	$ 8,669,060
EXPENDITURES											
O&M Expenses (less capital & transfers))	$ 978,301	$ 1,084,472	$ 1,117,006	$ 1,150,516	$ 1,185,031	$ 1,220,582	$ 1,257,200	$ 1,294,916	$ 1,333,763	$ 1,373,776	$ 1,414,989
Operating Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service Requirements											
Debt Service - Existing Debt	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069
Debt Service - Proposed New Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Debt Service	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069	$ 242,069
Transfers											
Operating Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash CIP/ Other Capital Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenditures	$ 1,220,370	$ 1,326,541	$ 1,359,075	$ 1,392,585	$ 1,427,101	$ 1,462,651	$ 1,499,269	$ 1,536,985	$ 1,575,832	$ 1,615,845	$ 1,657,059
NET REVENUE	3,375,179	3,316,434	3,795,227	4,339,782	4,509,641	4,858,436	5,232,094	5,631,996	6,059,605	6,520,295	7,012,001
ENDING FUND BALANCE		$ 750,000	$ 4,545,227	$ 8,885,009	$ 13,394,650	$ 18,253,087	$ 23,485,181	$ 29,117,177	$ 35,176,783	$ 41,697,077	$ 48,709,078

Item	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
BEGINNING FUND BALANCE	$ 48,709,078	$ 56,249,494	$ 64,357,069	$ 73,204,498	$ 82,747,636	$ 92,987,583	$ 103,976,759	$ 115,775,909	$ 128,493,969	$ 142,132,072	$ 156,759,755
REVENUES											
Operating Revenues	$ 9,239,924	$ 9,850,806	$ 10,503,896	$ 11,201,511	$ 11,946,098	$ 12,744,538	$ 13,599,786	$ 14,510,525	$ 15,484,343	$ 16,529,311	$ 17,644,677
Operating Transfers In	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Revenues	$ 9,239,924	$ 9,850,806	$ 10,503,896	$ 11,201,511	$ 11,946,098	$ 12,744,538	$ 13,599,786	$ 14,510,525	$ 15,484,343	$ 16,529,311	$ 17,644,677
EXPENDITURES											
O&M Expenses (less capital & transfers))	$ 1,457,439	$ 1,501,162	$ 1,546,197	$ 1,592,583	$ 1,640,360	$ 1,689,571	$ 1,740,258	$ 1,792,466	$ 1,846,240	$ 1,901,627	$ 1,958,676
Operating Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Debt Service Requirements											
Debt Service - Existing Debt	$ 242,069	$ 242,069	$ 110,270	$ 65,790	$ 65,790	$ 65,790	$ 60,377	$ -	$ -	$ -	$ -
Debt Service - Proposed New Debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Debt Service	$ 242,069	$ 242,069	$ 110,270	$ 65,790	$ 65,790	$ 65,790	$ 60,377	$ -	$ -	$ -	$ -
Transfers											
Operating Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash CIP/ Other Capital Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Transfers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Expenditures	$ 1,699,508	$ 1,743,231	$ 1,656,467	$ 1,658,373	$ 1,706,151	$ 1,755,362	$ 1,800,636	$ 1,792,466	$ 1,846,240	$ 1,901,627	$ 1,958,676
NET REVENUE	7,540,416	8,107,575	8,847,429	9,543,138	10,239,947	10,989,176	11,799,150	12,718,059	13,638,103	14,627,683	15,686,001
ENDING FUND BALANCE	$ 56,249,494	$ 64,357,069	$ 73,204,498	$ 82,747,636	$ 92,987,583	$ 103,976,759	$ 115,775,909	$ 128,493,969	$ 142,132,072	$ 156,759,755	$ 172,445,756

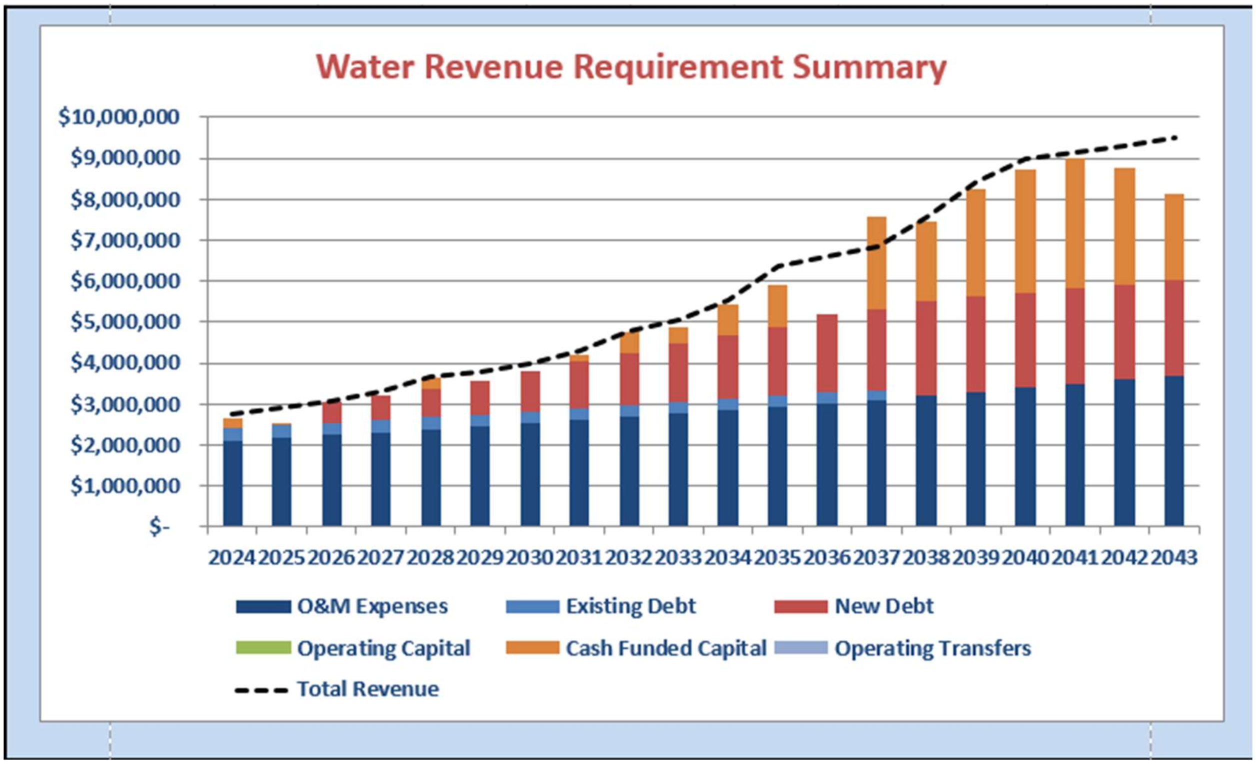


Figure 12-1 Water Revenue Requirement Summary

Due to the limited growth rate of the utility, most of the increased revenue needed will likely come from rate increases. As modeled, a 7% rate increase is assumed starting in 2023 and continuing through 2032. After this time period, a 3% rate increase has been modeled for the remaining years in the planning period (Figure 12-2).

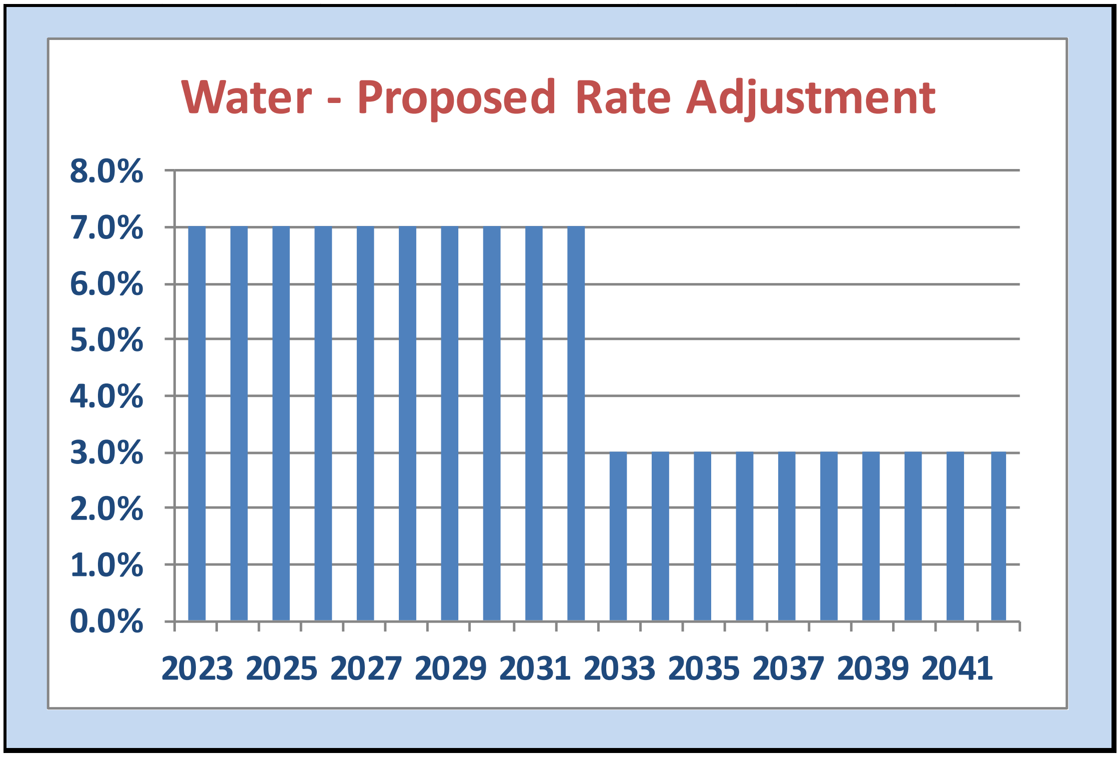


Figure 12-2 Proposed Rate Adjustments for Water Utility

The cumulative rate increase needed over the planning period to fund all projects and other expenses associated with the utility is 100% (Figure 12-3).

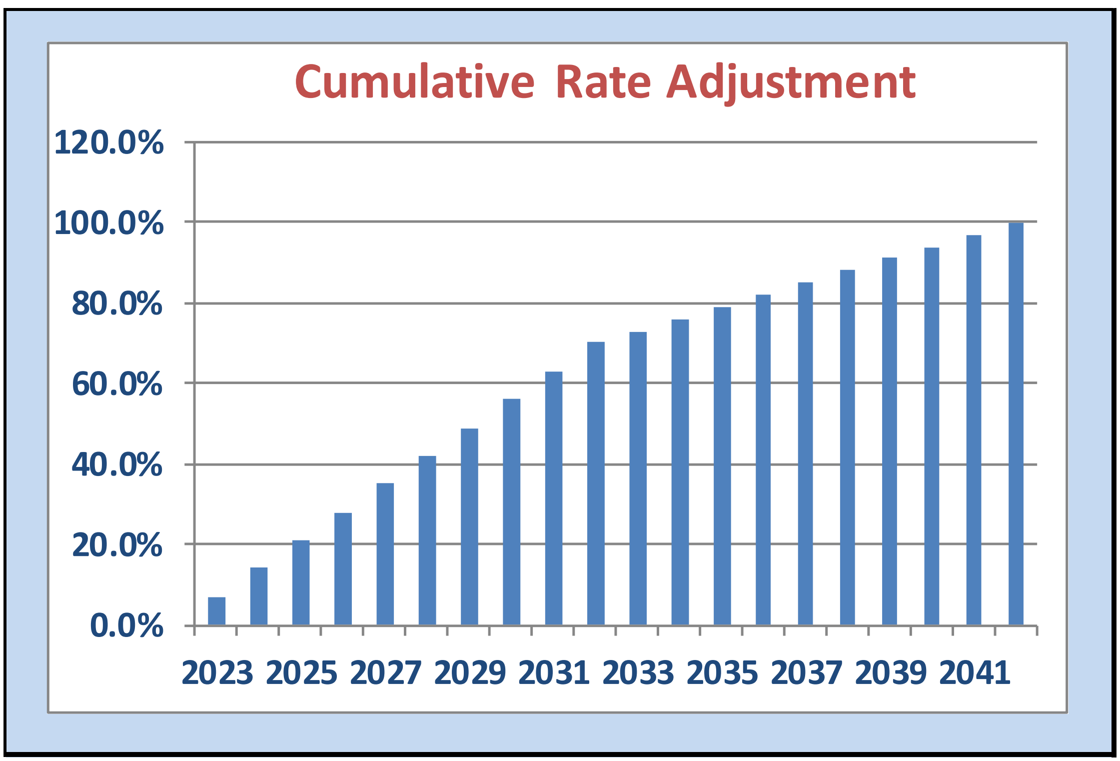


Figure 12-3 Cumulative Water Rate Increase

APPENDICES

Appendix A

Water Distribution System Hydraulic Model Update Memo

Water Distribution Hydraulic Model Update

Lander, WY

July 22, 2022

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1.0 Background

The City of Lander has selected HDR to update their water master plan. One of the tasks of the master plan work is to update and calibrate the existing Water GEMS hydraulic model of the Lander distribution system. This report summarizes the model update, calibration methodology and calibration results.

2.0 Verifying Model Inputs

2.1 Pipeline Network and Pressure Zones

The initial WaterGEMS model was developed by HDR for analysis of projects within the water distribution system. HDR worked with City staff to verify and update pipe diameter, material and approximate location of existing water mains. The model was also checked for pipe network connectivity, tank setup and pump station setup. Boundary conditions for the seven pressure zones were also verified with City staff. An overall map of the Lander distribution system is shown in Figure 2-1.

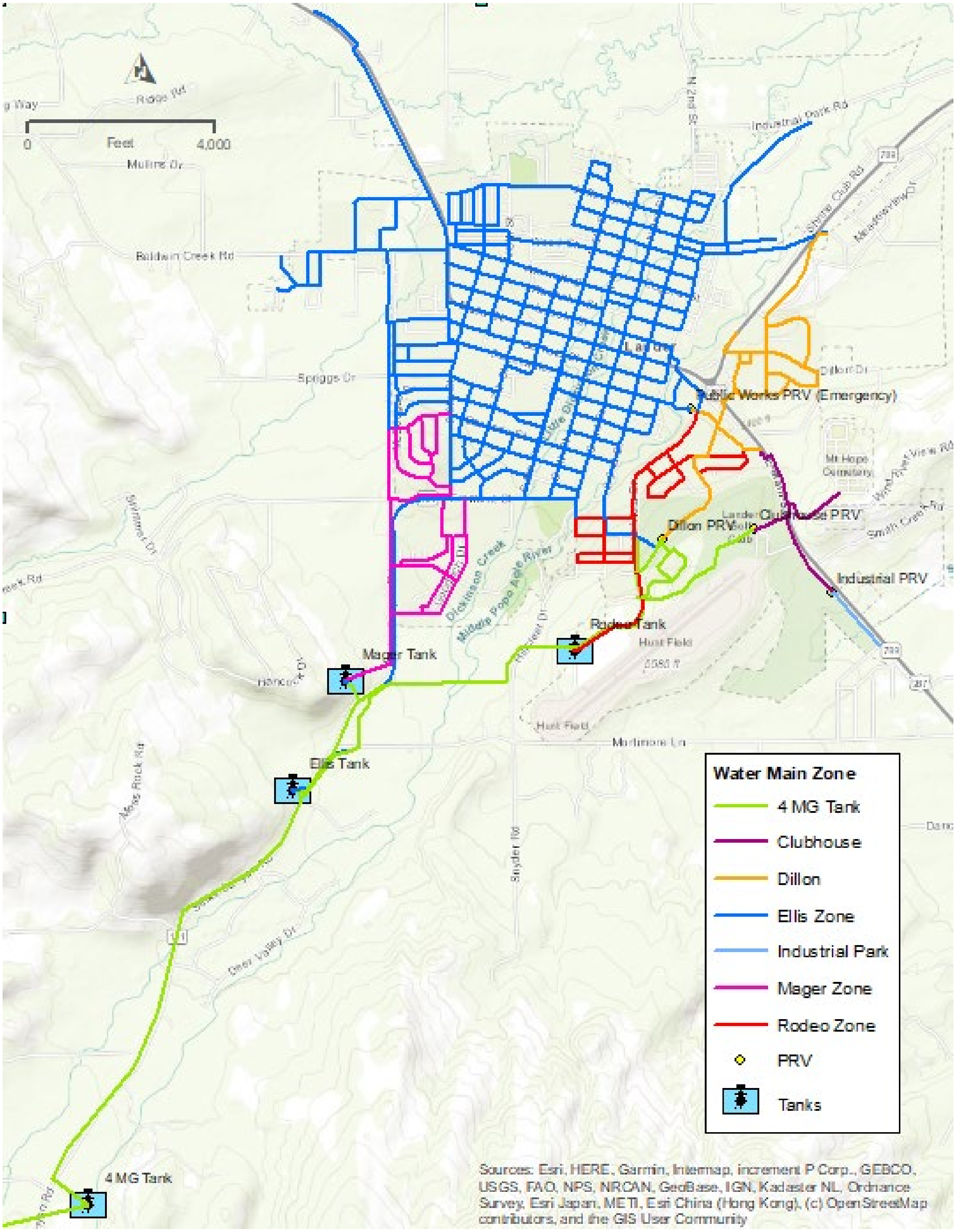

Figure 2-1: Lander Distribution System Map

2.2 Storage Tanks and Pressure Reducing Valves

The Lander distribution system has seven pressures zones. Each pressure zone is served by either a ground storage tank or pressure reducing valve (PRV) as a supply. The High (4MG), Mager, Rodeo and Ellis zones are currently served by storage tanks. The Dillon, Clubhouse and Industrial zones are served by PRVs connected to the higher zones. Tank and PRV information is shown in Table 2-1 and Figure 2-2. The City has plans to replace the Rodeo and Mager tanks with PRVs. Additionally the Ellis tank is being rebuilt with a higher overflow elevation and will have a discharge PRV to limit the Ellis tank discharge pressure. It is assumed the future zone supply PRVs will have the same operating range as the existing tanks.

Table 2-1: Storage Tank and PRV Information

Tank/PRV Name	Tank Diameter (ft)	Nominal Size (gallons)	Tank Base or PRV Elevation (ft)	Tank Range (ft)	Tank Overflow or PRV Setting (HGL)
4 MG Tank	150	4,000,000	5,730	32	5762
Clubhouse PRV	NA	NA	5,514	NA	5664
Mager Tank	71	500,000	5,596	18	5614
Rodeo Tank	71	500,000	5,570	18	5588
Ellis Tank	136	4,000,000	5,540	37	5577
Ellis Discharge PRV	NA	NA	5,540	NA	5560
Dillon PRV	NA	NA	5,483	NA	5557
Industrial PRV	NA	NA	5,402	NA	5541

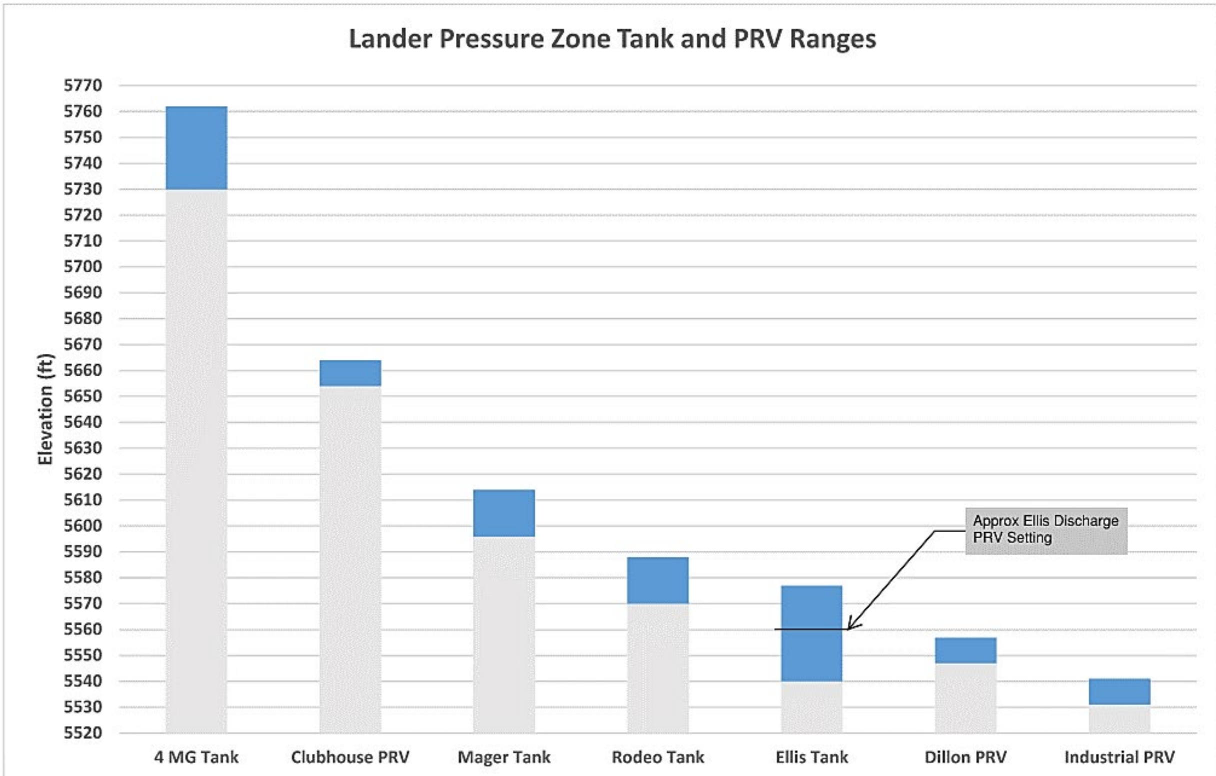

Figure 2-2: Pressure Zone Hydraulic Schematic

2.3 Booster Pump Station

The Lander distribution system typically operates as a gravity system with the water treatment plant as the highest point in the system. The Golf Course Pump Station located near the intersection of Capital Street and Buena Vista Drive serves as an emergency supply from the Ellis pressure zone into the 4 MG pressure zone in case the supply line across Popo Agie River is out of service.

3.0 System Demands and Diurnal Curves

2021 WTP discharge flows and billing data was used to estimate customer and system demands within the model. The average day and maximum day system demand was 1.85 MGD and 4.62 respectively, which results in a 2.5 factor from average day to maximum day. Table 3-1 shows monthly WTP flows and customer count.

Table 3-1: WTP 2021 Monthly Discharge Flow and System Customer Count

Month	Customer Count	Total Monthly Production (gallons)	Average Monthly Production (gpd)	Average Monthly Production (MGD)	Average Monthly Production (gpm)	Customer Average Usage (gpm)
January	3,220	30,647,349	988,624	0.99	686.5	0.21
February	3,219	27,591,178	985,399	0.98	684.3	0.21
March	3,222	30,872,873	995,899	1.00	691.6	0.21
April	3,222	30,510,662	1,017,022	1.02	706.3	0.22
May	3,216	49,400,803	1,593,574	1.59	1,106.6	0.34
June	3,235	105,266,887	3,508,896	3.51	2,436.7	0.75
July	3,230	124,623,860	4,020,125	4.02	2,791.8	0.86
August	3,245	99,236,840	3,201,188	3.20	2,223.0	0.69
September	3,227	78,016,826	2,600,561	2.60	1,805.9	0.56
October	3,223	39,464,550	1,273,050	1.27	884.1	0.27
November	3,208	29,686,610	989,554	0.99	687.2	0.21
December	3,224	30,498,858	983,834	0.98	683.2	0.21
Average	**3,224**	**56,318,108**	**1,846,477**	**1.85**	**1,282.3**	**0.40**

The billing data was analyzed to identify the top seven largest customers and locate those demands within the model. The same 2.5 maximum day factor was assumed to calculate the maximum day demands for the large customers. See Table 3-2 for list of largest customers with average and maximum day demands.

Table 3-2: Large Customers

Customer Name	Pressure Zone	Average Day Demand (gpm)	Maximum Day Demand
Lander Valley HS	Ellis	150	374
Lander City Park	Ellis	45	111
Water Fill Station	Rodeo	37	93
FCSD #1 & Swimming Pool	Ellis	20	51
Northside Park	Ellis	17	43
Pathfinder HS/Lander MS	Ellis	16	39
Hospital	4 MG	13	31
Total		**297**	**742**

The 2021 average day demand for each customers is 576 gpd (0.40 gpm). Since this figure includes the large customers, the large customer demand was subtracted to estimate a revised average customer demand of approximately 446 gpd (0.31 gpm). County parcel information was used to approximate locations of customer meters within the system. Those locations were then used to place the demands to the nearest node within the model. Figure 3-1 shows the estimated location of customer meters based on parcel information. Tables 3-3 and 3-4 show the average and maximum day demand for each pressure zone based on the average and large customer locations.

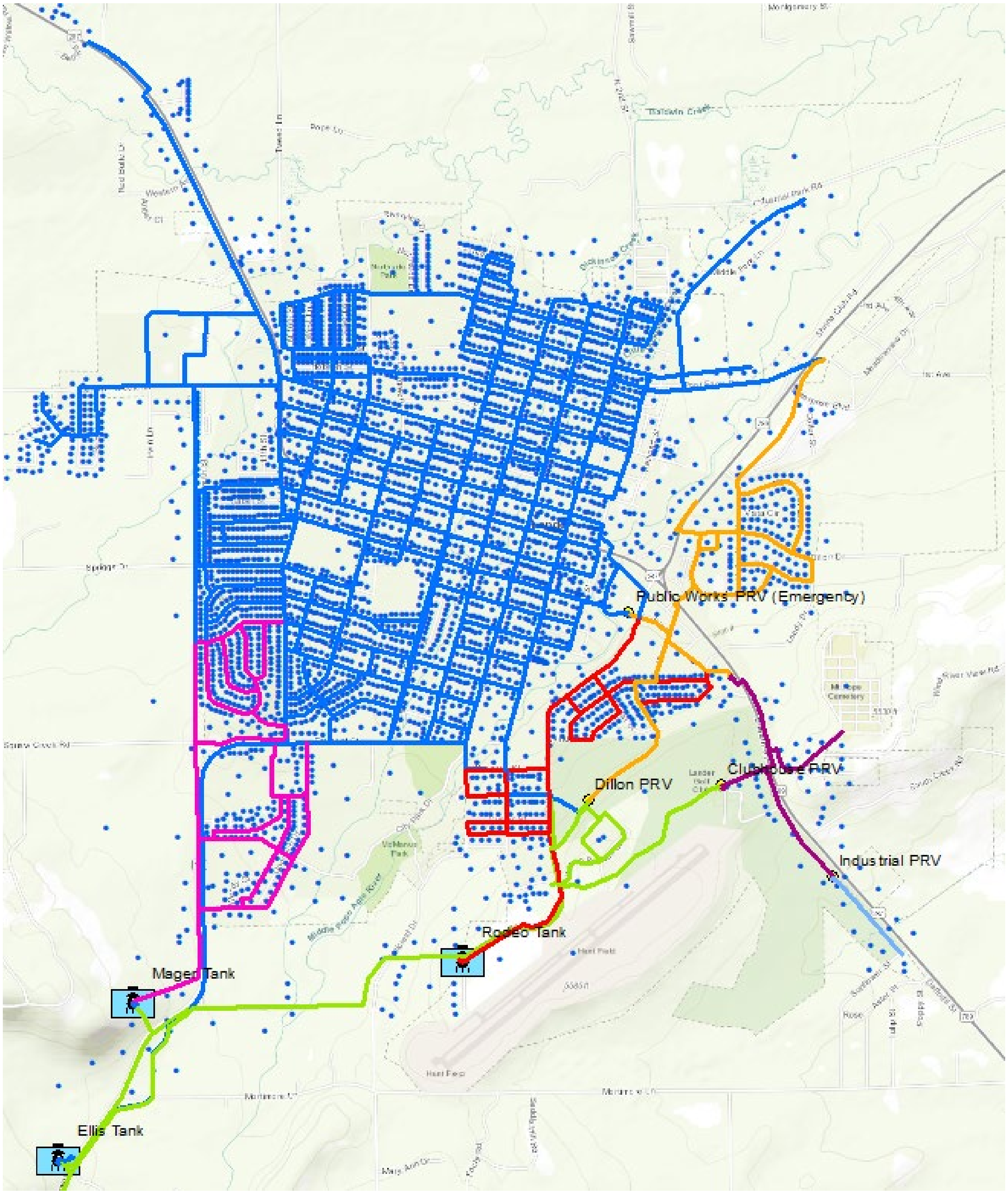

Figure 3-1: Estimated Customer Locations

Table 3-3: 2021 Average Day Demand for Pressure Zones and System

Zone Name	Customer Demand (MGD)	Large Customers (MGD)	Total Demand (MGD)
4 MG Tank	0.01	0.02	0.03
Mager	0.12	0.00	0.12
Ellis	1.09	0.36	1.44
Clubhouse	0.02	0.00	0.02
Rodeo	0.10	0.05	0.15
Dillon	0.07	0.00	0.07
Industrial	0.00	0.00	0.00
Total	**1.42**	**0.43**	**1.85**

Table 3-4: 2021 Maximum Day Demand for Pressure Zones and System

Zone Name	Customer Demand (MGD)	Large Customers (MGD)	Total Demand (MGD)
4 MG Tank	0.04	0.05	0.08
Mager	0.31	0.00	0.31
Ellis	2.72	0.89	3.61
Clubhouse	0.06	0.00	0.06
Rodeo	0.25	0.13	0.38
Dillon	0.17	0.00	0.17
Industrial	0.01	0.00	0.01
Total	3.55	1.07	4.62

SCADA information was not granular enough to develop estimated system diurnal curves for the distribution system. Consequently estimated diurnal curves for average day and maximum day scenarios for used in the model for extended period simulations (EPS). The model diurnal curves are shown in Figure 3-2.

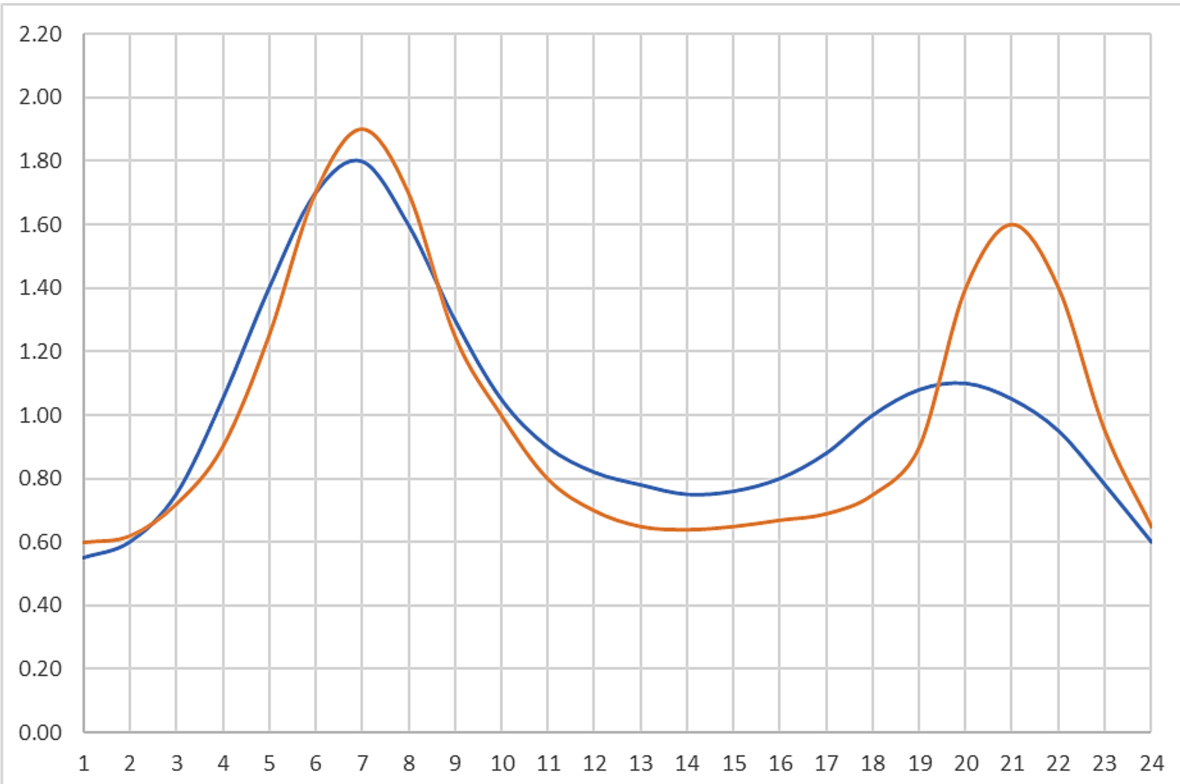

Figure 3-2: Average Day and Maximum Day Diurnal Curves

4.0 Extended Period Simulation Model Calibration

EPS calibration utilizes SCADA information provided by the City for tank levels to compare with model outputs. Model controls for fill valve flow rates and tank level on/off elevations were then adjusted until model results generally matched SCADA information. The calibration comparison time was a two day period from July 4th and July 5th 2021 since it was a high use period with tank level changes. The model maximum day 48-hour EPS scenario was utilized to simulate the same time period. Figures 4-1 through 4-5 show SCADA and model tank levels for the 4MG, Ellis and Rodeo tanks for the calibration period. SCADA information was not available for model comparison for the Mager tank.

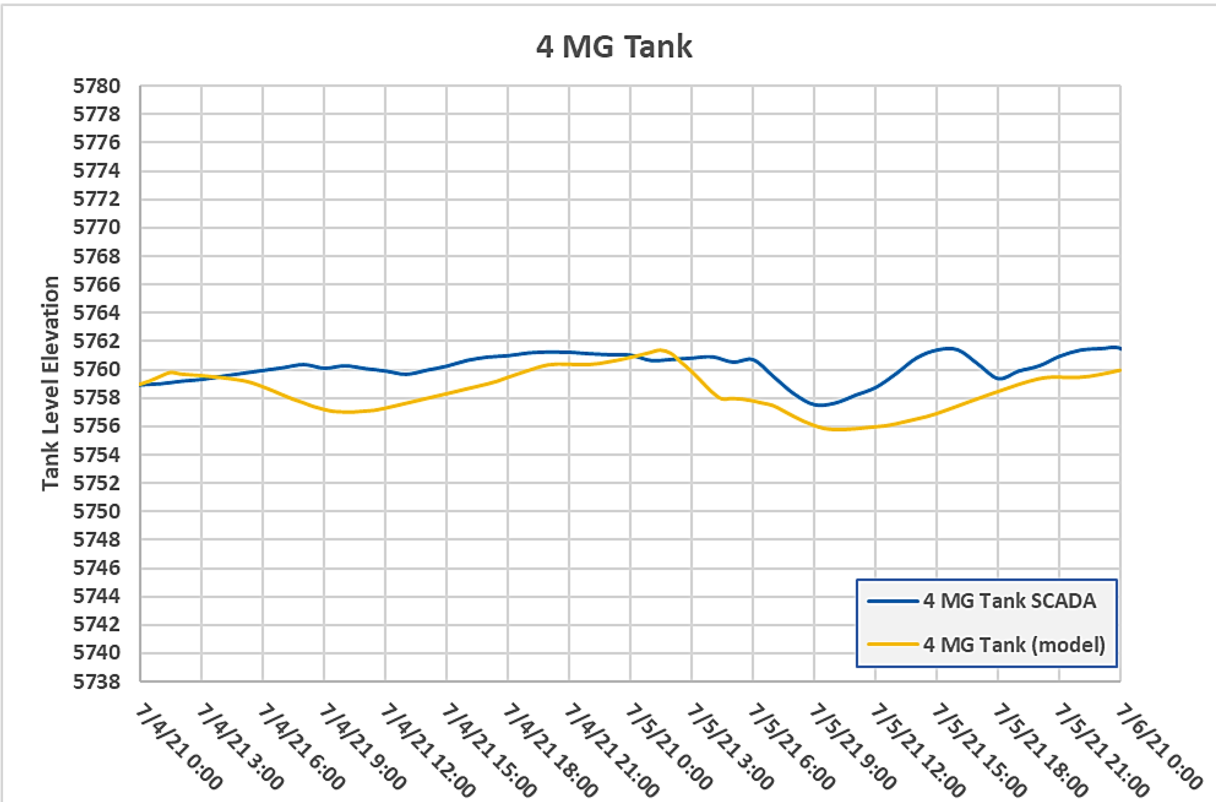

Figure 4-1: 4 MG Tank Levels (SCADA vs. Model)

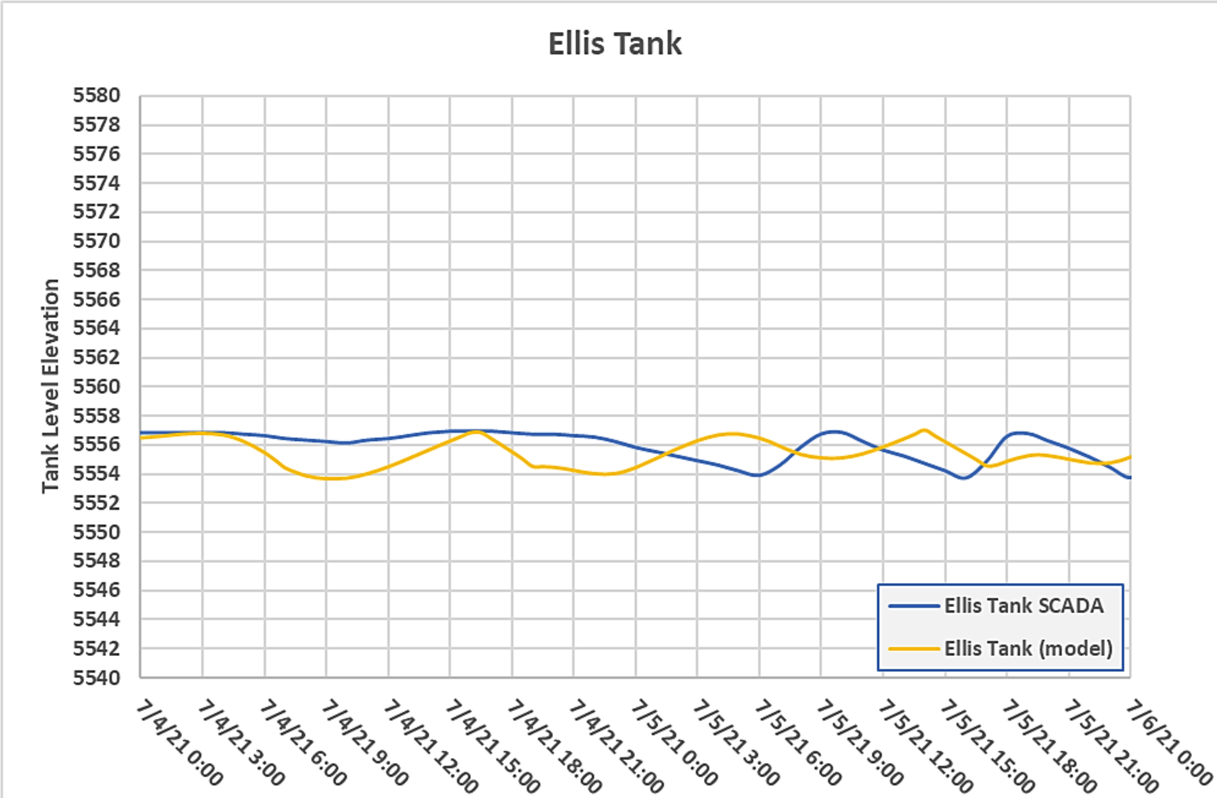

Figure 4-2: Ellis Tank Level (SCADA vs. Model)

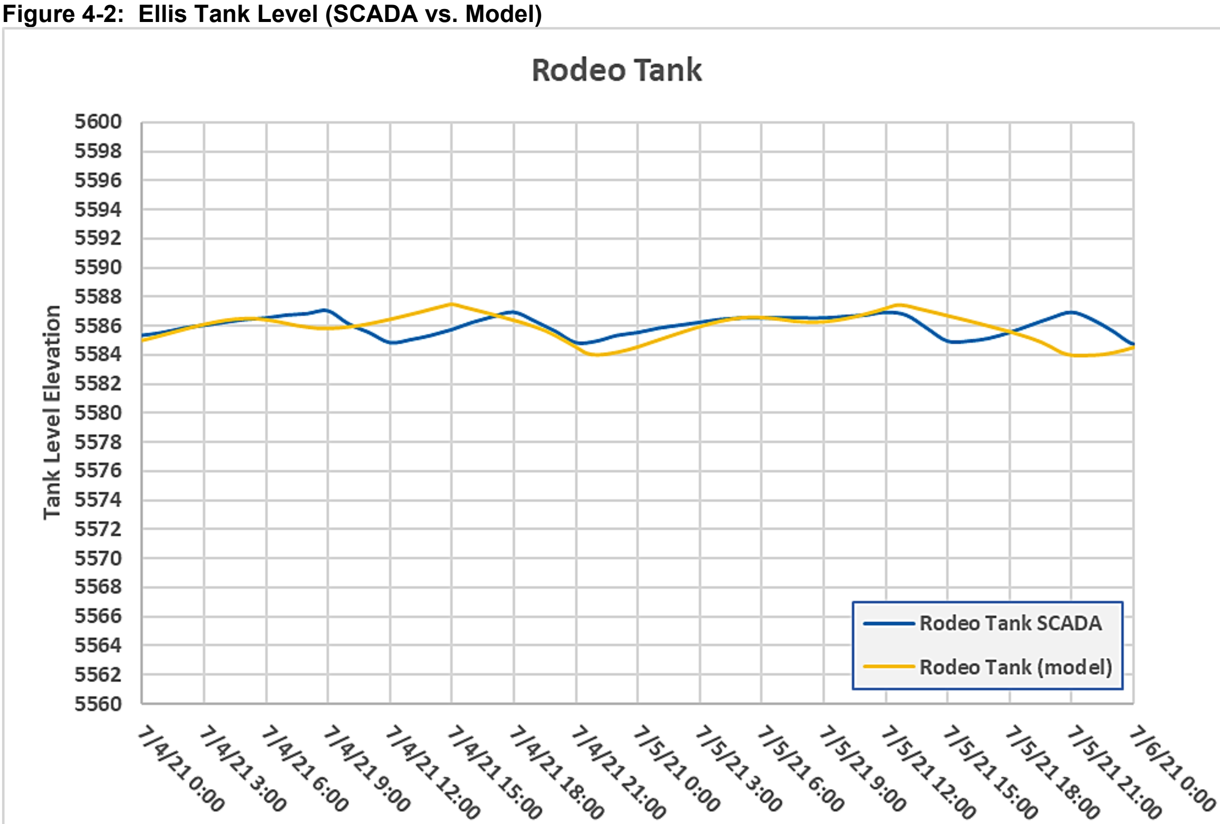

Figure 4-3: Rodeo Tank Levels (SCADA vs. Model)

5.0 Steady State Model Calibration

Steady state calibration utilizes fire hydrant flow test data to compare with modeled hydrant flow simulations, and is typically used to ensure that the model pipe network (diameter and C factor) is correct and model tank elevation ranges are appropriate The target accuracy for modeled static and residual pressures is outlined by American Water Works Association (AWWA) Manual of Water Supply Practices M32. The guideline indicate the HGL predictions by the model should be within 5 to 10 feet (2-4 psi) of recorded field measurements. If the pressures do not match within guidelines then adjustments were made to the model accordingly.

Model predictions were within the target accuracy range for all test locations. Pressure reducing stations (PRVs) were set such that the smaller PRV matched measured static pressures and larger PRVs matched residual pressures. All pipe diameters are set equal to nominal diameters except for the 16-inch HDPE river crossing. The C-factors that were assigned to the various pipe materials based on the calibration adjustments are listed as follows:

Ductile Iron	115
PVC	120
HDPE	120
Other or Unknown	115

See Figure 5-1 for location map of hydrant test locations. See Table 5-1 for comparison of model results vs. field hydrant testing.

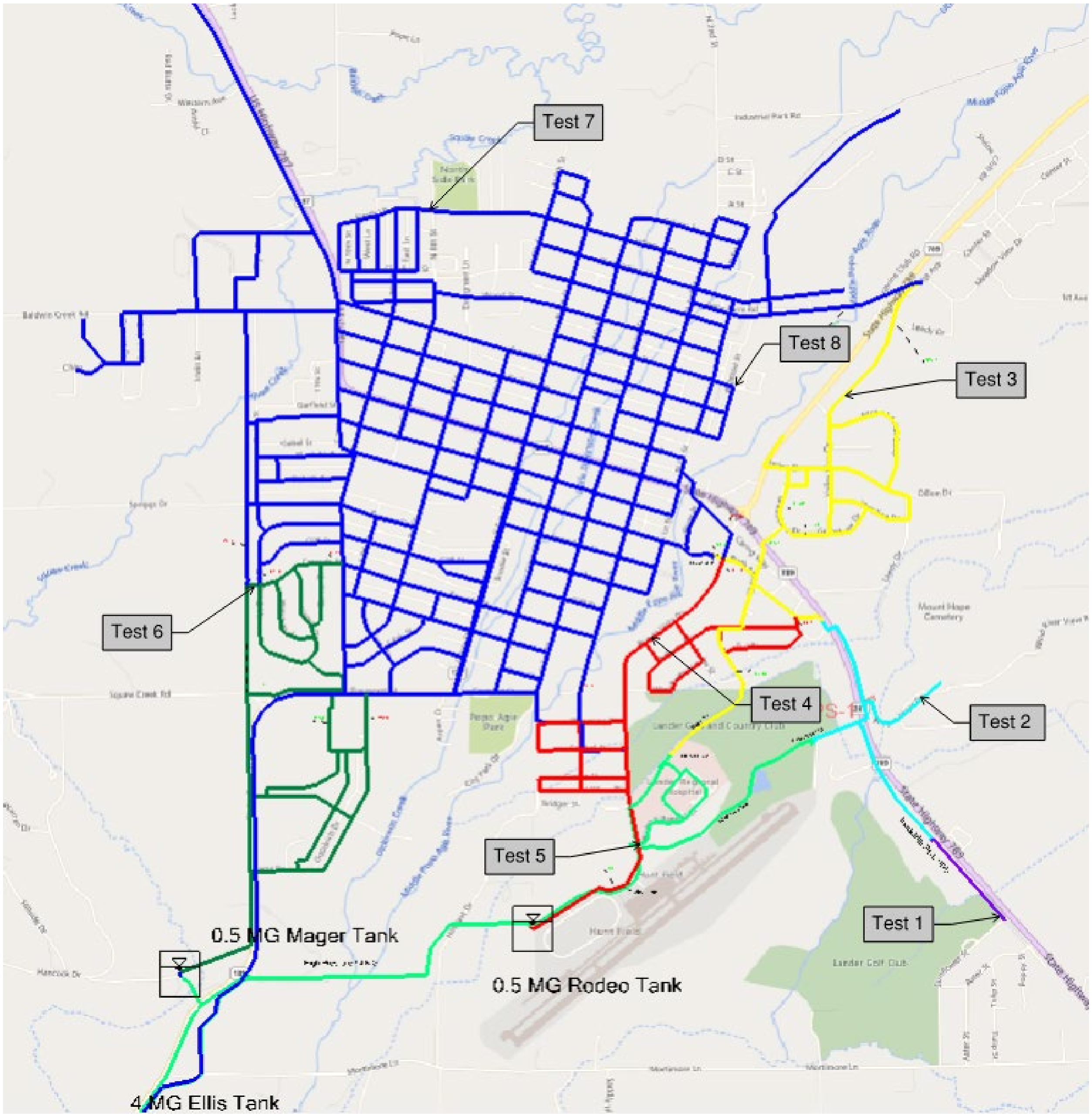

Figure 5-1: Hydrant Test Locations

Table 5-1: Hydrant Test Results

				Flow Hydrant			Residual Hydrant							Field/Model Comparison	
Test #	Zone	Date & Time	Location	Hydrant Location	Pitot Pressure (psi)	Flow (gpm)	Hydrant Location	Measured Static Pressure (psi)	Measured Residual Pressure (psi)	Measured Pressure Drop (psi)	Model Static Pressure (psi)	Model Residual Pressure (psi)	Model Pressure Drop (psi)	Difference in Static Pressure (psi)	Difference in Pressure Drop (psi)
1	Industial Zone	5/6/2022	Hwy 789 (N of Sunflower St)	South	30	920	North	65	43	22	66	44	22	1	0
2	Clubhouse Zone	5/6/2022	Mt Hope Drive (Near Cemetary)	North	25	840	South	51	41	10	53	44	9	2	-1
3	Dillon Zone	5/6/2022	Hwy 789 & Leedy Dr	North	40	1,060	South	82	70	12	84	74	10	2	-2
4	Rodeo Zone	5/6/2022	Buena Vista Dr	Cedar St	32.5	960	Sage St	66	52	14	67	51	16	1	2
5	4MG Zone	5/6/2022	Buena Vista & Bishop Randall Dr	South	50	1,190	North	91	75	16	91	77	14	0	-2
6	Mager Zone	5/6/2022	McDougall Dr & Cascade St	East	40	1,060	West	80	67	13	81	68	13	1	0
7	Main Zone	5/6/2022	Jefferson & 8th St	West	60	1,300	East	85	76	9	86	80	6	1	-3
8	Main Zone	5/6/2022	Eugene St & Railroad St	West	50	1,190	East	91	77	14	92	80	12	1	-2

6.0 Summary

After adjustments to the model as described in this report were made the hydraulic model is considered calibrated for both steady state and EPS scenarios. The model currently has scenarios for 2022 average day and maximum day demands. Future demand or development scenarios can be developed within the model as information becomes available for analysis of those scenarios.

Appendix B

Water Quality Reports

ANALYTICAL SUMMARY REPORT

May 28, 2021

City of Lander
240 Lincoln St
Lander, WY 82520-2848

Work Order: C21050786

Project Name: WY5600176C

Energy Laboratories, Inc. Casper WY received the following 3 samples for City of Lander on 5/19/2021 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C21050786-001	Bus Barn	05/19/21 7:55	05/19/21	Drinking Water	Haloacetic Acid Liquid-Liquid Ext. (VOA) 552-Haloacetic Acids-(HAAs) 524-Purgeable Organics, Trihalomethanes
C21050786-002	WLRC	05/19/21 8:15	05/19/21	Drinking Water	Same As Above
C21050786-003	Trip Blank - mas2103290936	05/19/21 7:55	05/19/21	Trip Blank	524-Purgeable Organics, Trihalomethanes

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Alyson Degnan
Project Manager

Digitally signed by
Alyson T. Degnan
Date: 2021.05.28 13:48:58 -06:00

CLIENT: City of Lander
Project: WY5600176C
Work Order: C21050786

Report Date: 05/28/21

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.
Tests associated with analyst identified as ELI-H were subcontracted to Energy Laboratories, 3161 E.Lyndale Ave., Helena, MT, EPA Number MT00945.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C21050786-001
Client Sample ID: Bus Barn
Report Date: 05/28/21
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/19/21 07:55
Facility ID: DIST
Date Received: 05/19/21
SamplingPoint/Location: S2-BUS BARN / Bus Barn
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
TRIHALOMETHANES							
2943 Bromodichloromethane	1.3	ug/L		0.50		E524.2	05/25/21 22:36 / eli-h
2942 Bromoform	ND	ug/L		0.50		E524.2	05/25/21 22:36 / eli-h
2944 Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/25/21 22:36 / eli-h
2941 Chloroform	19	ug/L		0.50		E524.2	05/25/21 22:36 / eli-h
2950 Trihalomethanes, Total	21	ug/L		0.50	80	E524.2	05/25/21 22:36 / eli-h
Surr: 1,2-Dichloroethane-d4	101	%REC			70-130	E524.2	05/25/21 22:36 / eli-h
Surr: p-Bromofluorobenzene	108	%REC			70-130	E524.2	05/25/21 22:36 / eli-h
Surr: Toluene-d8	111	%REC			70-130	E524.2	05/25/21 22:36 / eli-h
HALOACETIC ACIDS							
2454 Dibromoacetic acid	ND	ug/L		0.25		E552.2	05/22/21 06:25 / eli-b
2451 Dichloroacetic acid	13	ug/L		0.75		E552.2	05/22/21 06:25 / eli-b
2453 Monobromoacetic acid	ND	ug/L		0.50		E552.2	05/22/21 06:25 / eli-b
2450 Monochloroacetic acid	0.86	ug/L		0.75		E552.2	05/22/21 06:25 / eli-b
2452 Trichloroacetic acid	17	ug/L		0.50		E552.2	05/22/21 06:25 / eli-b
2456 Total Regulated Haloacetic Acids	31	ug/L		0.50	60	E552.2	05/22/21 06:25 / eli-b
2455 Bromochloroacetic acid	0.50	ug/L		0.50		E552.2	05/22/21 06:25 / eli-b
Surr: 2,3-Dibromopropionic acid	109	%REC			70-130	E552.2	05/22/21 06:25 / eli-b

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C21050786-002
Client Sample ID: WLRC
Report Date: 05/28/21
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/19/21 08:15
Facility ID: DIST
Date Received: 05/19/21
SamplingPoint/Location: S2-WLRC / WLRC
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS	Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
	TRIHALOMETHANES							
2943	Bromodichloromethane	1.2	ug/L		0.50		E524.2	05/25/21 23:07 / eli-h
2942	Bromoform	ND	ug/L		0.50		E524.2	05/25/21 23:07 / eli-h
2944	Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/25/21 23:07 / eli-h
2941	Chloroform	17	ug/L		0.50		E524.2	05/25/21 23:07 / eli-h
2950	Trihalomethanes, Total	18	ug/L		0.50	80	E524.2	05/25/21 23:07 / eli-h
	Surr: 1,2-Dichloroethane-d4	103	%REC			70-130	E524.2	05/25/21 23:07 / eli-h
	Surr: p-Bromofluorobenzene	106	%REC			70-130	E524.2	05/25/21 23:07 / eli-h
	Surr: Toluene-d8	108	%REC			70-130	E524.2	05/25/21 23:07 / eli-h
	HALOACETIC ACIDS							
2454	Dibromoacetic acid	ND	ug/L		0.25		E552.2	05/22/21 06:54 / eli-b
2451	Dichloroacetic acid	11	ug/L		0.75		E552.2	05/22/21 06:54 / eli-b
2453	Monobromoacetic acid	ND	ug/L		0.50		E552.2	05/22/21 06:54 / eli-b
2450	Monochloroacetic acid	ND	ug/L		0.75		E552.2	05/22/21 06:54 / eli-b
2452	Trichloroacetic acid	14	ug/L		0.50		E552.2	05/22/21 06:54 / eli-b
2456	Total Regulated Haloacetic Acids	26	ug/L		0.50	60	E552.2	05/22/21 06:54 / eli-b
2455	Bromochloroacetic acid	ND	ug/L		0.50		E552.2	05/22/21 06:54 / eli-b
	Surr: 2,3-Dibromopropionic acid	111	%REC			70-130	E552.2	05/22/21 06:54 / eli-b

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	City of Lander	**Report Date:**	05/28/21
Project:	WY5600176C	**Collection Date:**	05/19/21 07:55
Lab ID:	C21050786-003	**DateReceived:**	05/19/21
Client Sample ID:	Trip Blank - mas2103290936	**Matrix:**	Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
TRIHALOMETHANES							
Bromodichloromethane	ND	ug/L		0.50		E524.2	05/26/21 12:37 / eli-h
Bromoform	ND	ug/L		0.50		E524.2	05/26/21 12:37 / eli-h
Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/26/21 12:37 / eli-h
Chloroform	ND	ug/L		0.50		E524.2	05/26/21 12:37 / eli-h
Trihalomethanes, Total	ND	ug/L		0.50	80	E524.2	05/26/21 12:37 / eli-h
Surr: 1,2-Dichloroethane-d4	100	%REC		70-130		E524.2	05/26/21 12:37 / eli-h
Surr: p-Bromofluorobenzene	108	%REC		70-130		E524.2	05/26/21 12:37 / eli-h
Surr: Toluene-d8	107	%REC		70-130		E524.2	05/26/21 12:37 / eli-h

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C21050786 **Report Date:** 05/27/21

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E552.2									Analytical Run: 155653
Lab ID: CK3-155653	Continuing Calibration Verification Standard								05/22/21 01:31
Dibromoacetic acid	1.04	ug/L	0.25	104	70	130			
Dichloroacetic acid	3.17	ug/L	0.75	106	70	130			
Monobromoacetic acid	2.30	ug/L	0.50	115	70	130			
Monochloroacetic acid	3.34	ug/L	0.75	111	70	130			
Trichloroacetic acid	0.933	ug/L	0.50	93	70	130			
Bromochloroacetic acid	1.99	ug/L	0.50	100	70	130			
Total Regulated Haloacetic Acids	10.8	ug/L	0.25	108	70	130			
Surr: 2,3-Dibromopropionic acid			1.3	113	70	130			
Lab ID: CK5-155653	Continuing Calibration Verification Standard								05/22/21 07:23
Dibromoacetic acid	4.23	ug/L	0.25	106	70	130			
Dichloroacetic acid	13.0	ug/L	0.75	108	70	130			
Monobromoacetic acid	9.01	ug/L	0.50	113	70	130			
Monochloroacetic acid	14.3	ug/L	0.75	119	70	130			
Trichloroacetic acid	4.03	ug/L	0.50	101	70	130			
Bromochloroacetic acid	8.35	ug/L	0.50	104	70	130			
Total Regulated Haloacetic Acids	44.5	ug/L	0.25	111	70	130			
Surr: 2,3-Dibromopropionic acid			1.3	109	70	130			
Method: E552.2									Batch: 155653
Lab ID: MB-155653	Method Blank				Run: JECD.I_210521A				05/21/21 18:40
Dibromoacetic acid	ND	ug/L	0.25						
Dichloroacetic acid	ND	ug/L	0.75						
Monobromoacetic acid	ND	ug/L	0.50						
Monochloroacetic acid	ND	ug/L	0.75						
Trichloroacetic acid	ND	ug/L	0.50						
Bromochloroacetic acid	ND	ug/L	0.50						
Total Regulated Haloacetic Acids	ND	ug/L	0.25						
Surr: 2,3-Dibromopropionic acid			1.3	109	70	130			
Lab ID: LCS-155653	Laboratory Control Sample				Run: JECD.I_210521A				05/21/21 19:10
Dibromoacetic acid	4.64	ug/L	0.25	116	70	130			
Dichloroacetic acid	13.0	ug/L	0.75	109	70	130			
Monobromoacetic acid	9.00	ug/L	0.50	113	70	130			
Monochloroacetic acid	13.9	ug/L	0.75	116	70	130			
Trichloroacetic acid	4.19	ug/L	0.50	105	70	130			
Bromochloroacetic acid	8.83	ug/L	0.50	110	70	130			
Total Regulated Haloacetic Acids	44.8	ug/L	0.25	112	70	130			
Surr: 2,3-Dibromopropionic acid			1.3	112	70	130			
Lab ID: B21051497-001BMS	Sample Matrix Spike				Run: JECD.I_210521A				05/21/21 20:09
Dibromoacetic acid	5.37	ug/L	0.25	104	70	130			
Dichloroacetic acid	21.3	ug/L	0.75	115	70	130			
Monobromoacetic acid	9.63	ug/L	0.50	120	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C21050786 **Report Date:** 05/27/21

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E552.2									Batch: 155653
Lab ID: B21051497-001BMS	Sample Matrix Spike				Run: JECD.I_210521A				05/21/21 20:09
Monochloroacetic acid	14.1	ug/L	0.75	111	70	130			
Trichloroacetic acid	8.59	ug/L	0.50	116	70	130			
Bromochloroacetic acid	11.8	ug/L	0.50	113	70	130			
Total Regulated Haloacetic Acids	59.0	ug/L	0.25	114	70	130			
Surr: 2,3-Dibromopropionic acid			1.3	118	70	130			
Lab ID: B21051497-002BDUP	Sample Duplicate				Run: JECD.I_210521A				05/21/21 21:07
Dibromoacetic acid	1.10	ug/L	0.25				9.8	40	
Dichloroacetic acid	6.92	ug/L	0.75				3.4	40	
Monobromoacetic acid	ND	ug/L	0.50					40	
Monochloroacetic acid	ND	ug/L	0.75					40	
Trichloroacetic acid	4.56	ug/L	0.50				1.3	40	
Bromochloroacetic acid	2.75	ug/L	0.50				2.2	40	
Total Regulated Haloacetic Acids	12.6	ug/L	0.25				1.4	40	
Surr: 2,3-Dibromopropionic acid			1.3	114	70	130			
Lab ID: B21051689-001BMS	Sample Matrix Spike				Run: JECD.I_210521A				05/22/21 02:30
Dibromoacetic acid	5.17	ug/L	0.25	115	70	130			
Dichloroacetic acid	29.1	ug/L	0.75	114	70	130			
Monobromoacetic acid	9.70	ug/L	0.50	121	70	130			
Monochloroacetic acid	15.5	ug/L	0.75	120	70	130			
Trichloroacetic acid	18.7	ug/L	0.50	115	70	130			
Bromochloroacetic acid	13.4	ug/L	0.50	115	70	130			
Total Regulated Haloacetic Acids	78.2	ug/L	0.25	118	70	130			
Surr: 2,3-Dibromopropionic acid			1.3	110	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050786 **Report Date:** 05/27/21

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2									Analytical Run: R165246
Lab ID: 25-May-21_CCV_4	Continuing Calibration Verification Standard								05/25/21 12:13
Bromodichloromethane	4.74	ug/L	0.50	95	70	130			
Bromoform	4.79	ug/L	0.50	96	70	130			
Chlorodibromomethane	4.83	ug/L	0.50	97	70	130			
Chloroform	5.12	ug/L	0.50	102	70	130			
Trihalomethanes, Total	19.5	ug/L	0.50	97	70	130			
Surr: p-Bromofluorobenzene			0.50	104	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	95	70	130			
Surr: Toluene-d8			0.50	112	70	130			
Lab ID: 25-May-21_CCV1_7	Continuing Calibration Verification Standard								05/25/21 14:21
Bromodichloromethane	0.547	ug/L	0.50	109	50	150			
Bromoform	0.501	ug/L	0.50	100	50	150			
Chlorodibromomethane	0.539	ug/L	0.50	108	50	150			
Chloroform	0.592	ug/L	0.50	118	50	150			
Trihalomethanes, Total	2.18	ug/L	0.50	109	50	150			
Surr: 1,2-Dichloroethane-d4			0.50	98	70	130			
Surr: p-Bromofluorobenzene			0.50	104	70	130			
Surr: Toluene-d8			0.50	110	70	130			
Method: E524.2									Batch: R165246
Lab ID: 25-May-21_MBLK_8	Method Blank				Run: 5973MSD2_210525B				05/25/21 14:53
Bromodichloromethane	ND	ug/L	0.50						
Bromoform	ND	ug/L	0.50						
Chlorodibromomethane	ND	ug/L	0.50						
Chloroform	ND	ug/L	0.50						
Trihalomethanes, Total	ND	ug/L	0.50						
Surr: p-Bromofluorobenzene			0.50	107	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	101	70	130			
Surr: Toluene-d8			0.50	108	70	130			
Lab ID: H21050500-001ADUP	Sample Duplicate				Run: 5973MSD2_210525B				05/26/21 13:09
Bromodichloromethane	ND	ug/L	0.50					20	
Bromoform	ND	ug/L	0.50					20	
Chlorodibromomethane	ND	ug/L	0.50					20	
Chloroform	ND	ug/L	0.50					20	
Trihalomethanes, Total	ND	ug/L	0.50					20	
Surr: p-Bromofluorobenzene			0.50	107	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	99	70	130			
Surr: Toluene-d8			0.50	107	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050786 **Report Date:** 05/27/21

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2									Analytical Run: R165270
Lab ID: 26-May-21_CCV_2	Continuing Calibration Verification Standard								05/26/21 10:01
Bromodichloromethane	4.69	ug/L	0.50	94	70	130			
Bromoform	4.75	ug/L	0.50	95	70	130			
Chlorodibromomethane	4.95	ug/L	0.50	99	70	130			
Chloroform	5.06	ug/L	0.50	101	70	130			
Trihalomethanes, Total	19.5	ug/L	0.50	97	70	130			
Surr: p-Bromofluorobenzene			0.50	102	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	100	70	130			
Surr: Toluene-d8			0.50	108	70	130			
Lab ID: 26-May-21_CCV1_4	Continuing Calibration Verification Standard								05/26/21 11:27
Bromodichloromethane	0.422	ug/L	0.50	84	50	150			
Bromoform	0.413	ug/L	0.50	83	50	150			
Chlorodibromomethane	0.437	ug/L	0.50	87	50	150			
Chloroform	0.457	ug/L	0.50	91	50	150			
Trihalomethanes, Total	1.73	ug/L	0.50	86	50	150			
Surr: 1,2-Dichloroethane-d4			0.50	95	70	130			
Surr: p-Bromofluorobenzene			0.50	104	70	130			
Surr: Toluene-d8			0.50	110	70	130			
Method: E524.2									Batch: R165270
Lab ID: 26-May-21_LCS_3	Laboratory Control Sample				Run: 5973MSD2_210526B				05/26/21 10:44
Bromodichloromethane	4.56	ug/L	0.50	91	70	130			
Bromoform	4.58	ug/L	0.50	92	70	130			
Chlorodibromomethane	4.66	ug/L	0.50	93	70	130			
Chloroform	4.98	ug/L	0.50	100	70	130			
Trihalomethanes, Total	18.8	ug/L	0.50	94	70	130			
Surr: p-Bromofluorobenzene			0.50	105	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	94	70	130			
Surr: Toluene-d8			0.50	110	70	130			
Lab ID: 26-May-21_MBLK_5	Method Blank				Run: 5973MSD2_210526B				05/26/21 11:58
Bromodichloromethane	ND	ug/L	0.50						
Bromoform	ND	ug/L	0.50						
Chlorodibromomethane	ND	ug/L	0.50						
Chloroform	ND	ug/L	0.50						
Trihalomethanes, Total	ND	ug/L	0.50						
Surr: p-Bromofluorobenzene			0.50	106	70	130			
Surr: 1,2-Dichloroethane-d4			0.50	100	70	130			
Surr: Toluene-d8			0.50	108	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

City of Lander C21050786

Login completed by:	Kylie A. Hurdle	Date Received:	5/19/2021
Reviewed by:	Misty Stephens	Received by:	kls
Reviewed Date:	5/19/2021	Carrier name:	Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	22.0°C From Field		
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

ENERGY LABORATORIES

www.energylab.com

Chain of Custody (COC) & Analytical Request Record

Lab Workorder #: C21050786

Project Information | **Laboratory Use**

Client: City of Lander	Quote: N/A	Critical Hold Time: 14 Days
Project: WY5600176C	BO#: 64697-S	# of Samples: 3
Purchase Order:	EE#: 3388	Matrix: Various
Contact/Phone: Shane White (307)332-4291	Turn-Around Time: Standard	

Comments: Annual DBPs

Collect in May

Contact ELI prior to RUSH sample submittal for charges, availability & scheduling. Samples submitted may be subcontracted to other laboratories to complete the test(s) requested; this will be clearly noted on the analytical report.

Analysis Requested | Public Water Supply (PWS) Required System Information

	Sample Identification	Collection Date/Time	# of Containers	Matrix	RUSH TAT	EPA/State Compliance	524-Purgeable Organics, Trihalomethanes (E524.2)	552-Haloacetic Acids-(HAAs) (E552.2)					PWS System ID	PWS Facility ID	PWS Sample Pt ID
	Hold Time (Days)						14	14							
1	Bus Barn	5/19/21 7:55 AM	6	DW		X	X	X					WY5600176	DIST	S2-BUS BARN
2	WLRC	5/19/21 8:15 AM	6	DW		X	X	X					WY5600176	DIST	S2-WLRC
3	DBP Trip Blank		1	W			X								
4															
5															
6															
7															
8															
9															
10															
11															

Custody Record MUST be signed						
Lab provided preservatives were used ☐Yes ☐No		Sampler Name (if different than Relinquished by):			Sampler Phone:	
Relinquished by (print): Shane White	Date/Time: 5/19/21 8:30 A	Signature:	Received by (print):	Date/Time:	Signature:
Relinquished by (print): Treyden Martinson	Date/Time: 5/19/21 11:42a	Signature: [signature]	Received by Laboratory (print): Kristin Smith	Date/Time: 5/19/2021 11:43	Signature: [signature]

Date Printed: 03/29/2021 EE: CA - 3388 Temp 22.0 NO ICE w/Blank COC: Page 1 of 1

ENERGY

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BOTTLE ORDER 64697 EEx 3388

***** This is a recurring bottle order. If you have received this in error please contact your laboratory *****

SHIPPED TO: **City of Lander**

Contact: Shane White
240 Lincoln St.
Lander WY 82520-
Phone: (307) 332-4291
Project: Annual DBP

Order Created by: Alyson T. Degnan
Shipped From: Casper, WY
Ship Date: 3/29/2021
VIA: Ground

Bottle Size/Type	Bottles Per Samp	Method	Tests	Critical Hold Time	Preservative	Notes	Num of Samp
DBP (2 Sets)							
40 mL Amber Glass VOA-NH4CL	3	E552.2	552-Haloacetic Acids-(HAAs)		NH4CL	Do Not Rinse - Contains Additive. . Zero Headspace	1
40 mL Clear Glass VOA	3	E524.2	524-Purgeable Organics, Trihalomethanes		AA ■ HCL	Do Not Rinse - Contains Additive. . Zero Headspace.	1
DBP Trip Blank							
40 mL Clear Glass VOA	1	E524.2	524-Purgeable Organics, Trihalomethanes		■ HCL		1

Comments

Ship in April for May sampling

■ HNO3 - Nitric Acid ☐ H2SO4 - Sulfuric Acid ■ NaOH - Sodium Hydroxide
■ ZnAc - Zinc Acetate ■ HCl - Hydrochloric Acid ☐ H3PO4 - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

1 of 1

ANALYTICAL SUMMARY REPORT

June 01, 2021

City of Lander
240 Lincoln St
Lander, WY 82520-2848

Work Order: C21050765

Project Name: WY5600176C

Energy Laboratories, Inc. Casper WY received the following 2 samples for City of Lander on 5/19/2021 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C21050765-001	SP01 Post Filtration	05/19/21 7:05	05/19/21	Drinking Water	Metals by ICP/ICPMS, Drinking Water Cyanide, SDWA Mercury, Drinking Water Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA 524-Purgeable Organics, SDWA
C21050765-002	Trip Blank - 79121	05/19/21 7:05	05/19/21	Trip Blank	524-Purgeable Organics, SDWA

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Alyson Degnan
Project Manager

Digitally signed by
Alyson T. Degnan
Date: 2021.06.01 15:35:15 -06:00

CLIENT: City of Lander
Project: WY5600176C
Work Order: C21050765

Report Date: 06/01/21

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

Tests associated with analyst identified as ELI-H were subcontracted to Energy Laboratories, 3161 E.Lyndale Ave., Helena, MT, EPA Number MT00945.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Client Sample ID: SP01 Post Filtration
PWS #: WY5600176 **Name:** LANDER, CITY OF
Facility ID: TP01
SamplingPoint/Location: SP01 / SP01
Project ID: WY5600176C
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

Lab ID: C21050765-001
Report Date: 06/01/21
Collection Date: 05/19/21 07:05
Date Received: 05/19/21
Matrix: Drinking Water
Federal ID#: WY00002

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
1052 Sodium	3.5	mg/L		0.5		E200.7	05/20/21 14:00 / meh
NUTRIENTS							
1038 Nitrogen, Nitrate+Nitrite as N	0.02	mg/L		0.01	10	E353.2	05/21/21 16:19 / dmb
INORGANIC COMPOUNDS							
1025 Fluoride	ND	mg/L		0.1	4	E300.0	05/20/21 21:22 / dmb
1074 Antimony	ND	mg/L		0.001	0.006	E200.8	05/27/21 20:43 / jcg
1005 Arsenic	ND	mg/L	L	0.002	0.01	E200.8	05/27/21 20:43 / jcg
1010 Barium	ND	mg/L		0.1	2	E200.7	05/20/21 14:00 / meh
1075 Beryllium	ND	mg/L		0.001	0.004	E200.8	05/27/21 20:43 / jcg
1015 Cadmium	ND	mg/L		0.001	0.005	E200.8	05/27/21 20:43 / jcg
1020 Chromium	ND	mg/L		0.05	0.1	E200.7	05/20/21 14:00 / meh
1035 Mercury	ND	mg/L		0.0001	0.002	E245.1	05/24/21 12:48 / eli-b
1036 Nickel	ND	mg/L		0.05	0.1	E200.7	05/20/21 14:00 / meh
1045 Selenium	ND	mg/L		0.001	0.05	E200.8	05/27/21 20:43 / jcg
1085 Thallium	ND	mg/L		0.0004	0.002	E200.8	05/27/21 20:43 / jcg
1024 Cyanide, Total	ND	mg/L		0.005	0.2	Kelada-01	05/21/21 12:00 / eli-b
VOLATILE ORGANIC COMPOUNDS							
2990 Benzene	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2993 Bromobenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2430 Bromochloromethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2943 Bromodichloromethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2942 Bromoform	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2214 Bromomethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2422 n-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2428 sec-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2426 tert-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2982 Carbon tetrachloride	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2980 1,2-Dichloroethane	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2989 Chlorobenzene	ND	ug/L		0.50	100	E524.2	05/24/21 20:18 / eli-h
2944 Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2216 Chloroethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2941 Chloroform	0.67	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2210 Chloromethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
L - Lowest available reporting limit for the analytical method used
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander **Lab ID:** C21050765-001
Client Sample ID: SP01 Post Filtration **Report Date:** 06/01/21
PWS #: WY5600176 **Name:** LANDER, CITY OF **Collection Date:** 05/19/21 07:05
Facility ID: TP01 **Date Received:** 05/19/21
SamplingPoint/Location: SP01 / SP01 **Matrix:** Drinking Water
Project ID: WY5600176C **Federal ID#:** WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
2965 2-Chlorotoluene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2966 4-Chlorotoluene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2931 1,2-Dibromo-3-chloropropane	ND	ug/L		1.0	0.2	E524.2	05/24/21 20:18 / eli-h
2408 Dibromomethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2968 1,2-Dichlorobenzene	ND	ug/L		0.50	600	E524.2	05/24/21 20:18 / eli-h
2967 1,3-Dichlorobenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2969 1,4-Dichlorobenzene	ND	ug/L		0.50	75	E524.2	05/24/21 20:18 / eli-h
2212 Dichlorodifluoromethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2978 1,1-Dichloroethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2946 1,2-Dibromoethane	ND	ug/L		0.50	0.05	E524.2	05/24/21 20:18 / eli-h
2977 1,1-Dichloroethene	ND	ug/L		0.50	7	E524.2	05/24/21 20:18 / eli-h
2380 cis-1,2-Dichloroethene	ND	ug/L		0.50	70	E524.2	05/24/21 20:18 / eli-h
2979 trans-1,2-Dichloroethene	ND	ug/L		0.50	100	E524.2	05/24/21 20:18 / eli-h
2983 1,2-Dichloropropane	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2412 1,3-Dichloropropane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2416 2,2-Dichloropropane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2410 1,1-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2413 cis-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2224 trans-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2992 Ethylbenzene	ND	ug/L		0.50	700	E524.2	05/24/21 20:18 / eli-h
2246 Hexachlorobutadiene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2994 Isopropylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2030 p-Isopropyltoluene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2251 Methyl tert-butyl ether (MTBE)	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2964 Methylene chloride	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2248 Naphthalene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2998 n-Propylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2996 Styrene	ND	ug/L		0.50	100	E524.2	05/24/21 20:18 / eli-h
2986 1,1,1,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2988 1,1,2,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2987 Tetrachloroethene	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2991 Toluene	ND	ug/L		0.50	1000	E524.2	05/24/21 20:18 / eli-h
2420 1,2,3-Trichlorobenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2378 1,2,4-Trichlorobenzene	ND	ug/L		0.50	70	E524.2	05/24/21 20:18 / eli-h
2981 1,1,1-Trichloroethane	ND	ug/L		0.50	200	E524.2	05/24/21 20:18 / eli-h
2985 1,1,2-Trichloroethane	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C21050765-001
Client Sample ID: SP01 Post Filtration
Report Date: 06/01/21
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/19/21 07:05
Facility ID: TP01
Date Received: 05/19/21
SamplingPoint/Location: SP01 / SP01
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
2984 Trichloroethene	ND	ug/L		0.50	5	E524.2	05/24/21 20:18 / eli-h
2218 Trichlorofluoromethane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2414 1,2,3-Trichloropropane	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2418 1,2,4-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2424 1,3,5-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2976 Vinyl chloride	ND	ug/L		0.50	2	E524.2	05/24/21 20:18 / eli-h
2963 m+p-Xylenes	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2997 o-Xylene	ND	ug/L		0.50		E524.2	05/24/21 20:18 / eli-h
2950 Trihalomethanes, Total	0.67	ug/L		0.50	80	E524.2	05/24/21 20:18 / eli-h
2955 Xylenes, Total	ND	ug/L		0.50	10000	E524.2	05/24/21 20:18 / eli-h
Surr: p-Bromofluorobenzene	109	%REC			70-130	E524.2	05/24/21 20:18 / eli-h
Surr: 1,2-Dichloroethane-d4	103	%REC			70-130	E524.2	05/24/21 20:18 / eli-h
Surr: Toluene-d8	109	%REC			70-130	E524.2	05/24/21 20:18 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	City of Lander	**Report Date:**	06/01/21
Project:	WY5600176C	**Collection Date:**	05/19/21 07:05
Lab ID:	C21050765-002	**DateReceived:**	05/19/21
Client Sample ID:	Trip Blank - 79121	**Matrix:**	Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
Benzene	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Bromobenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Bromochloromethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Bromodichloromethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Bromoform	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Bromomethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
n-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
sec-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
tert-Butylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Carbon tetrachloride	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
1,2-Dichloroethane	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Chlorobenzene	ND	ug/L		0.50	100	E524.2	05/24/21 14:58 / eli-h
Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Chloroethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Chloroform	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Chloromethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
2-Chlorotoluene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
4-Chlorotoluene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2-Dibromo-3-chloropropane	ND	ug/L		1.0	0.2	E524.2	05/24/21 14:58 / eli-h
Dibromomethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2-Dichlorobenzene	ND	ug/L		0.50	600	E524.2	05/24/21 14:58 / eli-h
1,3-Dichlorobenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,4-Dichlorobenzene	ND	ug/L		0.50	75	E524.2	05/24/21 14:58 / eli-h
Dichlorodifluoromethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,1-Dichloroethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2-Dibromoethane	ND	ug/L		0.50	0.05	E524.2	05/24/21 14:58 / eli-h
1,1-Dichloroethene	ND	ug/L		0.50	7	E524.2	05/24/21 14:58 / eli-h
cis-1,2-Dichloroethene	ND	ug/L		0.50	70	E524.2	05/24/21 14:58 / eli-h
trans-1,2-Dichloroethene	ND	ug/L		0.50	100	E524.2	05/24/21 14:58 / eli-h
1,2-Dichloropropane	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
1,3-Dichloropropane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
2,2-Dichloropropane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,1-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
cis-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
trans-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Ethylbenzene	ND	ug/L		0.50	700	E524.2	05/24/21 14:58 / eli-h
Hexachlorobutadiene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Isopropylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
p-Isopropyltoluene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Methyl tert-butyl ether (MTBE)	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Methylene chloride	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Naphthalene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
n-Propylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	City of Lander	**Report Date:**	06/01/21
Project:	WY5600176C	**Collection Date:**	05/19/21 07:05
Lab ID:	C21050765-002	**DateReceived:**	05/19/21
Client Sample ID:	Trip Blank - 79121	**Matrix:**	Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
Styrene	ND	ug/L		0.50	100	E524.2	05/24/21 14:58 / eli-h
1,1,1,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,1,2,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Tetrachloroethene	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Toluene	ND	ug/L		0.50	1000	E524.2	05/24/21 14:58 / eli-h
1,2,3-Trichlorobenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2,4-Trichlorobenzene	ND	ug/L		0.50	70	E524.2	05/24/21 14:58 / eli-h
1,1,1-Trichloroethane	ND	ug/L		0.50	200	E524.2	05/24/21 14:58 / eli-h
1,1,2-Trichloroethane	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Trichloroethene	ND	ug/L		0.50	5	E524.2	05/24/21 14:58 / eli-h
Trichlorofluoromethane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2,3-Trichloropropane	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,2,4-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
1,3,5-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Vinyl chloride	ND	ug/L		0.50	2	E524.2	05/24/21 14:58 / eli-h
m+p-Xylenes	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
o-Xylene	ND	ug/L		0.50		E524.2	05/24/21 14:58 / eli-h
Trihalomethanes, Total	ND	ug/L		0.50	80	E524.2	05/24/21 14:58 / eli-h
Xylenes, Total	ND	ug/L		0.50	10000	E524.2	05/24/21 14:58 / eli-h
Surr: p-Bromofluorobenzene	106	%REC		70-130		E524.2	05/24/21 14:58 / eli-h
Surr: 1,2-Dichloroethane-d4	103	%REC		70-130		E524.2	05/24/21 14:58 / eli-h
Surr: Toluene-d8	109	%REC		70-130		E524.2	05/24/21 14:58 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0										Analytical Run: IC3-C_210520A
Lab ID: ICV		Initial Calibration Verification Standard								05/20/21 16:54
Fluoride		4.82	mg/L	0.10	96	90	110			
Method: E300.0										Batch: R270696
Lab ID: ICB		Method Blank				Run: IC3-C_210520A				05/20/21 17:13
Fluoride		ND	mg/L	0.02						
Lab ID: LFB		Laboratory Fortified Blank				Run: IC3-C_210520A				05/20/21 17:32
Fluoride		4.94	mg/L	0.10	99	90	110			
Lab ID: C21050602-003AMS		Sample Matrix Spike				Run: IC3-C_210520A				05/20/21 18:30
Fluoride		25.9	mg/L	0.26	98	80	120			
Lab ID: C21050602-003AMSD		Sample Matrix Spike Duplicate				Run: IC3-C_210520A				05/20/21 18:49
Fluoride		25.8	mg/L	0.26	97	80	120	0.2	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2									Analytical Run: FIA201-C_210521C	
Lab ID: ICV		Initial Calibration Verification Standard							05/21/21 16:01	
Nitrogen, Nitrate+Nitrite as N		1.01	mg/L	0.010	101	90	110			
Method: E353.2									Batch: R270693	
Lab ID: MBLK		Method Blank				Run: FIA201-C_210521C			05/21/21 16:02	
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.009						
Lab ID: LFB		Laboratory Fortified Blank				Run: FIA201-C_210521C			05/21/21 16:03	
Nitrogen, Nitrate+Nitrite as N		1.05	mg/L	0.010	106	90	110			
Lab ID: C21050602-001DMS		Sample Matrix Spike				Run: FIA201-C_210521C			05/21/21 16:07	
Nitrogen, Nitrate+Nitrite as N		9.14	mg/L	0.050	103	90	110			
Lab ID: C21050602-001DMSD		Sample Matrix Spike Duplicate				Run: FIA201-C_210521C			05/21/21 16:08	
Nitrogen, Nitrate+Nitrite as N		9.14	mg/L	0.050	103	90	110	0.0	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/28/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7										Analytical Run: ICP4-C_210520A
Lab ID: QCS	4	Initial Calibration Verification Standard								05/20/21 11:58
Barium		0.796	mg/L	0.10	100	90	110			
Chromium		0.783	mg/L	0.050	98	90	110			
Nickel		0.738	mg/L	0.050	92	90	110			
Sodium		37.1	mg/L	0.53	93	90	110			
Method: E200.7										Batch: R270626
Lab ID: LRB	4	Method Blank				Run: ICP4-C_210520A				05/20/21 11:37
Barium		ND	mg/L	0.0007						
Chromium		ND	mg/L	0.004						
Nickel		ND	mg/L	0.01						
Sodium		ND	mg/L	1.0						
Lab ID: LFB	4	Laboratory Fortified Blank				Run: ICP4-C_210520A				05/20/21 11:54
Barium		1.01	mg/L	0.10	101	85	115			
Chromium		0.975	mg/L	0.050	97	85	115			
Nickel		0.936	mg/L	0.050	94	85	115			
Sodium		46.6	mg/L	0.54	93	85	115			
Lab ID: C21050750-001BMS2	4	Sample Matrix Spike				Run: ICP4-C_210520A				05/20/21 13:40
Barium		1.07	mg/L	0.050	107	70	130			
Chromium		1.07	mg/L	0.0050	107	70	130			
Nickel		1.04	mg/L	0.010	104	70	130			
Sodium		53.3	mg/L	1.0	103	70	130			
Lab ID: C21050750-001BMSD	4	Sample Matrix Spike Duplicate				Run: ICP4-C_210520A				05/20/21 13:44
Barium		1.06	mg/L	0.050	106	70	130	0.5	20	
Chromium		1.08	mg/L	0.0050	107	70	130	0.5	20	
Nickel		1.06	mg/L	0.010	106	70	130	1.5	20	
Sodium		53.0	mg/L	1.0	103	70	130	0.6	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/28/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Analytical Run: ICPMS5-C_210527A
Lab ID: QCS	6	Initial Calibration Verification Standard								05/27/21 19:31
Antimony		0.0487	mg/L	0.0010	97	90	110			
Arsenic		0.0501	mg/L	0.0010	100	90	110			
Beryllium		0.0252	mg/L	0.0010	101	90	110			
Cadmium		0.0251	mg/L	0.0010	101	90	110			
Selenium		0.0513	mg/L	0.0010	103	90	110			
Thallium		0.0532	mg/L	0.00050	106	90	110			
Method: E200.8										Batch: R270921
Lab ID: LRB	6	Method Blank				Run: ICPMS5-C_210527A				05/27/21 16:35
Antimony		ND	mg/L	0.0001						
Arsenic		ND	mg/L	6E-05						
Beryllium		ND	mg/L	5E-05						
Cadmium		ND	mg/L	2E-05						
Selenium		ND	mg/L	0.0001						
Thallium		ND	mg/L	0.0003						
Lab ID: LFB	6	Laboratory Fortified Blank				Run: ICPMS5-C_210527A				05/27/21 16:40
Antimony		0.0537	mg/L	0.0010	107	85	115			
Arsenic		0.0541	mg/L	0.0010	108	85	115			
Beryllium		0.0546	mg/L	0.0010	109	85	115			
Cadmium		0.0547	mg/L	0.0010	109	85	115			
Selenium		0.0547	mg/L	0.0010	109	85	115			
Thallium		0.0562	mg/L	0.00050	112	85	115			
Lab ID: C21050705-001BMS	6	Sample Matrix Spike				Run: ICPMS5-C_210527A				05/27/21 20:12
Antimony		0.113	mg/L	0.0010	113	70	130			
Arsenic		0.114	mg/L	0.0010	113	70	130			
Beryllium		0.111	mg/L	0.0010	111	70	130			
Cadmium		0.111	mg/L	0.0010	111	70	130			
Selenium		0.108	mg/L	0.0010	108	70	130			
Thallium		0.112	mg/L	0.00050	112	70	130			
Lab ID: C21050705-001BMSD	6	Sample Matrix Spike Duplicate				Run: ICPMS5-C_210527A				05/27/21 20:16
Antimony		0.111	mg/L	0.0010	111	70	130	1.7	20	
Arsenic		0.114	mg/L	0.0010	112	70	130	0.6	20	
Beryllium		0.111	mg/L	0.0010	111	70	130	0.2	20	
Cadmium		0.111	mg/L	0.0010	111	70	130	0.4	20	
Selenium		0.108	mg/L	0.0010	108	70	130	0.3	20	
Thallium		0.112	mg/L	0.00050	112	70	130	0.1	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/24/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E245.1										Analytical Run: HGCV202-B_210524A
Lab ID: ICV		Initial Calibration Verification Standard								05/24/21 12:05
Mercury		0.00212	mg/L	0.00010	106	90	110			
Method: E245.1										Batch: 155674
Lab ID: MB-155674		Method Blank				Run: HGCV202-B_210524A				05/24/21 12:10
Mercury		ND	mg/L	0.00001						
Lab ID: LCS-155674		Laboratory Control Sample				Run: HGCV202-B_210524A				05/24/21 12:11
Mercury		0.00215	mg/L	0.00010	108	85	115			
Lab ID: C21050765-001CMS		Sample Matrix Spike				Run: HGCV202-B_210524A				05/24/21 12:49
Mercury		0.00224	mg/L	0.00010	112	70	130			
Lab ID: C21050765-001CMSD		Sample Matrix Spike Duplicate				Run: HGCV202-B_210524A				05/24/21 12:50
Mercury		0.00217	mg/L	0.00010	108	70	130	3.0	30	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/24/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Kelada-01							Analytical Run: SFA-201-B_210521A			
Lab ID: ICV		Initial Calibration Verification Standard							05/21/21 10:50	
Cyanide, Total		0.106	mg/L	0.0050	106	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							05/21/21 11:46	
Cyanide, Total		0.107	mg/L	0.0050	107	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							05/21/21 12:21	
Cyanide, Total		0.107	mg/L	0.0050	107	90	110			
Method: Kelada-01									Batch: R361124	
Lab ID: ICB		Method Blank				Run: SFA-201-B_210521A			05/21/21 10:52	
Cyanide, Total		ND	mg/L	0.002						
Lab ID: LFB		Laboratory Fortified Blank				Run: SFA-201-B_210521A			05/21/21 10:54	
Cyanide, Total		0.107	mg/L	0.0050	107	90	110			
Lab ID: LCS1-K4Fe(CN)6		Laboratory Control Sample				Run: SFA-201-B_210521A			05/21/21 10:56	
Cyanide, Total		0.189	mg/L	0.0050	95	90	110			
Lab ID: B21051712-001EMS		Sample Matrix Spike				Run: SFA-201-B_210521A			05/21/21 11:32	
Cyanide, Total		0.109	mg/L	0.0050	109	90	110			
Lab ID: B21051712-001EMSD		Sample Matrix Spike Duplicate				Run: SFA-201-B_210521A			05/21/21 11:34	
Cyanide, Total		0.109	mg/L	0.0050	109	90	110	0.4	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Method: E524.2 Analytical Run: R165196

Lab ID: 24-May-21_CCV_2 65 Continuing Calibration Verification Standard 05/24/21 09:56

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Benzene		5.22	ug/L	0.50	104	70	130			
Bromobenzene		5.22	ug/L	0.50	104	70	130			
Bromochloromethane		5.36	ug/L	0.50	107	70	130			
Bromodichloromethane		4.93	ug/L	0.50	99	70	130			
Bromoform		5.11	ug/L	0.50	102	70	130			
Bromomethane		4.81	ug/L	0.50	96	70	130			
n-Butylbenzene		5.20	ug/L	0.50	104	70	130			
sec-Butylbenzene		5.25	ug/L	0.50	105	70	130			
tert-Butylbenzene		5.43	ug/L	0.50	109	70	130			
Carbon tetrachloride		5.11	ug/L	0.50	102	70	130			
1,2-Dichloroethane		4.73	ug/L	0.50	95	70	130			
Chlorobenzene		5.16	ug/L	0.50	103	70	130			
Chlorodibromomethane		5.21	ug/L	0.50	104	70	130			
Chloroethane		5.19	ug/L	0.50	104	70	130			
Chloroform		5.16	ug/L	0.50	103	70	130			
Chloromethane		5.68	ug/L	0.50	114	70	130			
2-Chlorotoluene		5.21	ug/L	0.50	104	70	130			
4-Chlorotoluene		5.13	ug/L	0.50	103	70	130			
1,2-Dibromo-3-chloropropane		5.10	ug/L	1.0	102	70	130			
Dibromomethane		4.91	ug/L	0.50	98	70	130			
1,2-Dichlorobenzene		5.08	ug/L	0.50	102	70	130			
1,3-Dichlorobenzene		5.00	ug/L	0.50	100	70	130			
1,4-Dichlorobenzene		4.87	ug/L	0.50	97	70	130			
Dichlorodifluoromethane		5.25	ug/L	0.50	105	70	130			
1,1-Dichloroethane		5.42	ug/L	0.50	108	70	130			
1,2-Dibromoethane		5.11	ug/L	0.50	102	70	130			
1,1-Dichloroethene		5.26	ug/L	0.50	105	70	130			
cis-1,2-Dichloroethene		5.32	ug/L	0.50	106	70	130			
trans-1,2-Dichloroethene		5.32	ug/L	0.50	106	70	130			
1,2-Dichloropropane		5.27	ug/L	0.50	105	70	130			
1,3-Dichloropropane		5.21	ug/L	0.50	104	70	130			
2,2-Dichloropropane		5.54	ug/L	0.50	111	70	130			
1,1-Dichloropropene		5.15	ug/L	0.50	103	70	130			
cis-1,3-Dichloropropene		5.37	ug/L	0.50	107	70	130			
trans-1,3-Dichloropropene		5.41	ug/L	0.50	108	70	130			
Ethylbenzene		5.33	ug/L	0.50	107	70	130			
Hexachlorobutadiene		5.51	ug/L	0.50	110	70	130			
Isopropylbenzene		5.39	ug/L	0.50	108	70	130			
p-Isopropyltoluene		5.41	ug/L	0.50	108	70	130			
Methyl tert-butyl ether (MTBE)		5.50	ug/L	0.50	110	70	130			
Methylene chloride		5.20	ug/L	0.50	104	70	130			
Naphthalene		5.34	ug/L	0.50	107	70	130			
n-Propylbenzene		5.49	ug/L	0.50	110	70	130			
Styrene		5.59	ug/L	0.50	112	70	130			
1,1,1,2-Tetrachloroethane		5.16	ug/L	0.50	103	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Method: E524.2 — Analytical Run: R165196

Lab ID: 24-May-21_CCV_2 — 65 Continuing Calibration Verification Standard — 05/24/21 09:56

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
1,1,2,2-Tetrachloroethane		4.80	ug/L	0.50	96	70	130			
Tetrachloroethene		5.41	ug/L	0.50	108	70	130			
Toluene		5.48	ug/L	0.50	110	70	130			
1,2,3-Trichlorobenzene		5.38	ug/L	0.50	108	70	130			
1,2,4-Trichlorobenzene		5.41	ug/L	0.50	108	70	130			
1,1,1-Trichloroethane		5.21	ug/L	0.50	104	70	130			
1,1,2-Trichloroethane		5.15	ug/L	0.50	103	70	130			
Trichloroethene		5.10	ug/L	0.50	102	70	130			
Trichlorofluoromethane		4.98	ug/L	0.50	100	70	130			
1,2,3-Trichloropropane		5.06	ug/L	0.50	101	70	130			
1,2,4-Trimethylbenzene		5.36	ug/L	0.50	107	70	130			
1,3,5-Trimethylbenzene		5.39	ug/L	0.50	108	70	130			
Vinyl chloride		5.30	ug/L	0.50	106	70	130			
m+p-Xylenes		11.1	ug/L	0.50	111	70	130			
o-Xylene		5.57	ug/L	0.50	111	70	130			
Trihalomethanes, Total		20.4	ug/L	0.50	102	70	130			
Xylenes, Total		16.7	ug/L	0.50	111	70	130			
Surr: p-Bromofluorobenzene				0.50	106	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	100	70	130			
Surr: Toluene-d8				0.50	110	70	130			

Method: E524.2 — Batch: R165196

Lab ID: 24-May-21_LCS_3 — 65 Laboratory Control Sample — Run: 5973MSD2_210524A — 05/24/21 10:33

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Benzene		4.71	ug/L	0.50	94	70	130			
Bromobenzene		4.70	ug/L	0.50	94	70	130			
Bromochloromethane		4.98	ug/L	0.50	100	70	130			
Bromodichloromethane		4.36	ug/L	0.50	87	70	130			
Bromoform		4.53	ug/L	0.50	91	70	130			
Bromomethane		5.61	ug/L	0.50	112	70	130			
n-Butylbenzene		4.79	ug/L	0.50	96	70	130			
sec-Butylbenzene		4.59	ug/L	0.50	92	70	130			
tert-Butylbenzene		4.85	ug/L	0.50	97	70	130			
Carbon tetrachloride		4.74	ug/L	0.50	95	70	130			
1,2-Dichloroethane		4.23	ug/L	0.50	85	70	130			
Chlorobenzene		4.63	ug/L	0.50	93	70	130			
Chlorodibromomethane		4.72	ug/L	0.50	94	70	130			
Chloroethane		5.93	ug/L	0.50	119	70	130			
Chloroform		4.81	ug/L	0.50	96	70	130			
Chloromethane		6.34	ug/L	0.50	127	70	130			
2-Chlorotoluene		4.72	ug/L	0.50	94	70	130			
4-Chlorotoluene		4.66	ug/L	0.50	93	70	130			
1,2-Dibromo-3-chloropropane		4.06	ug/L	1.0	81	70	130			
Dibromomethane		4.56	ug/L	0.50	91	70	130			
1,2-Dichlorobenzene		4.49	ug/L	0.50	90	70	130			
1,3-Dichlorobenzene		4.46	ug/L	0.50	89	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R165196
Lab ID: 24-May-21_LCS_3	65	Laboratory Control Sample				Run: 5973MSD2_210524A				05/24/21 10:33
1,4-Dichlorobenzene		4.41	ug/L	0.50	88	70	130			
Dichlorodifluoromethane		6.42	ug/L	0.50	128	70	130			
1,1-Dichloroethane		4.80	ug/L	0.50	96	70	130			
1,2-Dibromoethane		4.53	ug/L	0.50	91	70	130			
1,1-Dichloroethene		4.70	ug/L	0.50	94	70	130			
cis-1,2-Dichloroethene		4.80	ug/L	0.50	96	70	130			
trans-1,2-Dichloroethene		4.78	ug/L	0.50	96	70	130			
1,2-Dichloropropane		4.72	ug/L	0.50	94	70	130			
1,3-Dichloropropane		4.70	ug/L	0.50	94	70	130			
2,2-Dichloropropane		4.96	ug/L	0.50	99	70	130			
1,1-Dichloropropene		4.81	ug/L	0.50	96	70	130			
cis-1,3-Dichloropropene		4.73	ug/L	0.50	95	70	130			
trans-1,3-Dichloropropene		4.72	ug/L	0.50	94	70	130			
Ethylbenzene		4.82	ug/L	0.50	96	70	130			
Hexachlorobutadiene		4.81	ug/L	0.50	96	70	130			
Isopropylbenzene		4.79	ug/L	0.50	96	70	130			
p-Isopropyltoluene		4.77	ug/L	0.50	95	70	130			
Methyl tert-butyl ether (MTBE)		5.16	ug/L	0.50	103	70	130			
Methylene chloride		4.71	ug/L	0.50	94	70	130			
Naphthalene		4.75	ug/L	0.50	95	70	130			
n-Propylbenzene		4.93	ug/L	0.50	99	70	130			
Styrene		4.97	ug/L	0.50	99	70	130			
1,1,1,2-Tetrachloroethane		4.57	ug/L	0.50	91	70	130			
1,1,2,2-Tetrachloroethane		4.20	ug/L	0.50	84	70	130			
Tetrachloroethene		4.86	ug/L	0.50	97	70	130			
Toluene		4.99	ug/L	0.50	100	70	130			
1,2,3-Trichlorobenzene		4.90	ug/L	0.50	98	70	130			
1,2,4-Trichlorobenzene		4.75	ug/L	0.50	95	70	130			
1,1,1-Trichloroethane		4.71	ug/L	0.50	94	70	130			
1,1,2-Trichloroethane		4.51	ug/L	0.50	90	70	130			
Trichloroethene		4.62	ug/L	0.50	92	70	130			
Trichlorofluoromethane		5.38	ug/L	0.50	108	70	130			
1,2,3-Trichloropropane		4.66	ug/L	0.50	93	70	130			
1,2,4-Trimethylbenzene		4.97	ug/L	0.50	99	70	130			
1,3,5-Trimethylbenzene		4.85	ug/L	0.50	97	70	130			
Vinyl chloride		6.00	ug/L	0.50	120	70	130			
m+p-Xylenes		9.93	ug/L	0.50	99	70	130			
o-Xylene		4.92	ug/L	0.50	98	70	130			
Trihalomethanes, Total		18.4	ug/L	0.50	92	70	130			
Xylenes, Total		14.9	ug/L	0.50	99	70	130			
Surr: p-Bromofluorobenzene				0.50	105	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	97	70	130			
Surr: Toluene-d8				0.50	110	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R165196
Lab ID: 24-May-21_MBLK_5	65	Method Blank				Run: 5973MSD2_210524A				05/24/21 11:41
Benzene		ND	ug/L	0.50						
Bromobenzene		ND	ug/L	0.50						
Bromochloromethane		ND	ug/L	0.50						
Bromodichloromethane		ND	ug/L	0.50						
Bromoform		ND	ug/L	0.50						
Bromomethane		ND	ug/L	0.50						
n-Butylbenzene		ND	ug/L	0.50						
sec-Butylbenzene		ND	ug/L	0.50						
tert-Butylbenzene		ND	ug/L	0.50						
Carbon tetrachloride		ND	ug/L	0.50						
1,2-Dichloroethane		ND	ug/L	0.50						
Chlorobenzene		ND	ug/L	0.50						
Chlorodibromomethane		ND	ug/L	0.50						
Chloroethane		ND	ug/L	0.50						
Chloroform		ND	ug/L	0.50						
Chloromethane		ND	ug/L	0.50						
2-Chlorotoluene		ND	ug/L	0.50						
4-Chlorotoluene		ND	ug/L	0.50						
1,2-Dibromo-3-chloropropane		ND	ug/L	1.0						
Dibromomethane		ND	ug/L	0.50						
1,2-Dichlorobenzene		ND	ug/L	0.50						
1,3-Dichlorobenzene		ND	ug/L	0.50						
1,4-Dichlorobenzene		ND	ug/L	0.50						
Dichlorodifluoromethane		ND	ug/L	0.50						
1,1-Dichloroethane		ND	ug/L	0.50						
1,2-Dibromoethane		ND	ug/L	0.50						
1,1-Dichloroethene		ND	ug/L	0.50						
cis-1,2-Dichloroethene		ND	ug/L	0.50						
trans-1,2-Dichloroethene		ND	ug/L	0.50						
1,2-Dichloropropane		ND	ug/L	0.50						
1,3-Dichloropropane		ND	ug/L	0.50						
2,2-Dichloropropane		ND	ug/L	0.50						
1,1-Dichloropropene		ND	ug/L	0.50						
cis-1,3-Dichloropropene		ND	ug/L	0.50						
trans-1,3-Dichloropropene		ND	ug/L	0.50						
Ethylbenzene		ND	ug/L	0.50						
Hexachlorobutadiene		ND	ug/L	0.50						
Isopropylbenzene		ND	ug/L	0.50						
p-Isopropyltoluene		ND	ug/L	0.50						
Methyl tert-butyl ether (MTBE)		ND	ug/L	0.50						
Methylene chloride		ND	ug/L	0.50						
Naphthalene		ND	ug/L	0.50						
n-Propylbenzene		ND	ug/L	0.50						
Styrene		ND	ug/L	0.50						
1,1,1,2-Tetrachloroethane		ND	ug/L	0.50						

Qualifiers:

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ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C21050765 **Report Date:** 05/25/21

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R165196
Lab ID: 24-May-21_MBLK_5	65	Method Blank				Run: 5973MSD2_210524A				05/24/21 11:41
1,1,2,2-Tetrachloroethane		ND	ug/L	0.50						
Tetrachloroethene		ND	ug/L	0.50						
Toluene		ND	ug/L	0.50						
1,2,3-Trichlorobenzene		ND	ug/L	0.50						
1,2,4-Trichlorobenzene		ND	ug/L	0.50						
1,1,1-Trichloroethane		ND	ug/L	0.50						
1,1,2-Trichloroethane		ND	ug/L	0.50						
Trichloroethene		ND	ug/L	0.50						
Trichlorofluoromethane		ND	ug/L	0.50						
1,2,3-Trichloropropane		ND	ug/L	0.50						
1,2,4-Trimethylbenzene		ND	ug/L	0.50						
1,3,5-Trimethylbenzene		ND	ug/L	0.50						
Vinyl chloride		ND	ug/L	0.50						
m+p-Xylenes		ND	ug/L	0.50						
o-Xylene		ND	ug/L	0.50						
Trihalomethanes, Total		ND	ug/L	0.50						
Xylenes, Total		ND	ug/L	0.50						
Surr: p-Bromofluorobenzene				0.50	105	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	102	70	130			
Surr: Toluene-d8				0.50	108	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

City of Lander C21050765

Login completed by:	Kylie A. Hurdle	Date Received:	5/19/2021
Reviewed by:	Misty Stephens	Received by:	kls
Reviewed Date:	5/19/2021	Carrier name:	Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	7.6°C On Ice - From Field		
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

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Chain of Custody & Analytical Request Record

www.energylab.com

Page _____ of _____

Account Information (Billing information)

Company/Name	City of Lander
Contact	Shane White
Phone	307-332-4291
Mailing Address	240 Lincoln St.
City, State, Zip	Lander, WY 82520
Email	swhite@landerwyoming.org
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☐Email
Purchase Order / Quote / Bottle Order	

Report Information (if different than Account Information)

Company/Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Report ☐Hard Copy ☐Email	
Special Report/Formats: ☐ LEVEL IV ☐NELAC ☐ EDD/EDT (contact laboratory) ☐ Other______	

Comments

Project Information

Project Name, PWSID, Permit, etc. WY5600176c

Sampler Name Shane White | Sampler Phone 307-332-4291

Sample Origin State WY | EPA/State Compliance ☐ Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type
☐ Unprocessed Ore
☐ Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11(e)2 Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Oil
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	IOC	VOC	N+N	See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	SPO1 Post Filtration	5/19/21	7:05am	3	DW	✓					C21050765
2	SPO1 Post Filtration	5/19/21	7:10am	1	DW		✓				
3	SPO1 Post Filtration	5/19/21	7:15am	1	DW			✓			
4											
5											
6											
7											
8											
9											

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were **NOT** used, please attach your preservative information with this COC.

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Shane White	5/19/21 7:30A	Shane White			
	Treyton Martinsen	5/19/21 11:46a	[signature]	Received by Laboratory (print): [illegible] Smith	5/19/21 11:46	[signature]

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
		Y N C B	Y N	4.0 °C	Y N	Y N	CC Cash Check______	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

EU-COC-01/21 v.4

ENERGY

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Billings, MT 800.735.4489 • Casper, WY 888.235.0515 • Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

BOTTLE ORDER 65337

SHIPPED TO: City of Lander

Contact: Shane White
240 Lincoln St.
Lander WY 82520-
Phone: (307) 332-4291
Project: IOC/VOC/N+N

Order Created by: Misty Stephens
Shipped From: Casper, WY
Ship Date: 4/28/2021
VIA: Ground

Bottle Size/Type	Bottles Per Samp	Method	Tests	Critical Hold Time	Preservative	Notes	Num of Samp
IOC/VOC/N+N							
250 mL Plastic	1	E200.7_8	Metals by ICP/ICPMS, Drinking Water		■ HNO3		1
		E245.1	Mercury, Drinking Water				
500 mL Amber Plastic	1	Kelada-01	Cyanide, SDWA		■ NaOH		1
250 mL Plastic	1	E300.0	Anions by Ion Chromatography				1
40 mL Clear Glass VOA	3	E524.2	524-Purgeable Organics, SDWA		AA ■ HCL	Do Not Rinse - Contains Additive. . Zero Headspace.	1
250 mL Plastic	1	E353.2	Nitrogen, Nitrate + Nitrite		☐ H2SO4		1
VOC 524 Trip Blank							
40 mL Clear Glass VOA	1	E524.2	524-Purgeable Organics, SDWA		■ HCL		1

■ HNO3 - Nitric Acid ☐ H2SO4 - Sulfuric Acid ■ NaOH - Sodium Hydroxide
■ ZnAc - Zinc Acetate ■ HCl - Hydrochloric Acid ☐ H3PO4 - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

1 of 2

ANALYTICAL SUMMARY REPORT

June 10, 2022

City of Lander
240 Lincoln St
Lander, WY 82520-2848

Work Order: C22051078

Project Name: WY5600176C

Energy Laboratories, Inc. Casper WY received the following 3 samples for City of Lander on 5/24/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C22051078-001	Bus Barn	05/23/22 8:58	05/24/22	Drinking Water	Haloacetic Acid Liquid-Liquid Ext. (VOA) 552-Haloacetic Acids-(HAAs) 524-Purgeable Organics, Trihalomethanes
C22051078-002	WLRC	05/23/22 9:20	05/24/22	Drinking Water	Same As Above
C22051078-003	DBP Trip Blank	05/23/22 8:58	05/24/22	Trip Blank	524-Purgeable Organics, Trihalomethanes

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Alyson Degnan
Project Manager

Digitally signed by
Alyson T. Degnan
Date: 2022.06.10 11:13:11 -06:00

CLIENT: City of Lander
Project: WY5600176C
Work Order: C22051078

Report Date: 06/10/22

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.
Tests associated with analyst identified as ELI-H were subcontracted to Energy Laboratories, 3161 E.Lyndale Ave., Helena, MT, EPA Number MT00945.

This work order is associated with a trip blank from lot #81363. This lot has been found to have detections for THM analytes. The data has been qualified to identify those analytes detected in the trip blank.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C22051078-001
Client Sample ID: Bus Barn
Report Date: 06/10/22
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/23/22 08:58
Facility ID: DIST
Date Received: 05/24/22
SamplingPoint/Location: S2-BUS BARN / Bus Barn
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
TRIHALOMETHANES							
2943 Bromodichloromethane	1.4	ug/L	T	0.50		E524.2	05/26/22 16:59 / eli-h
2942 Bromoform	ND	ug/L		0.50		E524.2	05/26/22 16:59 / eli-h
2944 Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/26/22 16:59 / eli-h
2941 Chloroform	25	ug/L		0.50		E524.2	05/26/22 16:59 / eli-h
2950 Trihalomethanes, Total	26	ug/L		0.50	80	E524.2	05/26/22 16:59 / eli-h
Surr: 1,2-Dichloroethane-d4	99.0	%REC			70-130	E524.2	05/26/22 16:59 / eli-h
Surr: p-Bromofluorobenzene	104	%REC			70-130	E524.2	05/26/22 16:59 / eli-h
Surr: Toluene-d8	107	%REC			70-130	E524.2	05/26/22 16:59 / eli-h
HALOACETIC ACIDS							
2454 Dibromoacetic acid	ND	ug/L		0.25		E552.2	05/31/22 00:39 / eli-b
2451 Dichloroacetic acid	14	ug/L		0.75		E552.2	05/31/22 00:39 / eli-b
2453 Monobromoacetic acid	ND	ug/L		0.50		E552.2	05/31/22 00:39 / eli-b
2450 Monochloroacetic acid	0.76	ug/L		0.75		E552.2	05/31/22 00:39 / eli-b
2452 Trichloroacetic acid	19	ug/L		0.50		E552.2	05/31/22 00:39 / eli-b
2456 Total Regulated Haloacetic Acids	34	ug/L		0.50	60	E552.2	05/31/22 00:39 / eli-b
2455 Bromochloroacetic acid	ND	ug/L		0.50		E552.2	05/31/22 00:39 / eli-b
Surr: 2,3-Dibromopropionic acid	75.0	%REC			70-130	E552.2	05/31/22 00:39 / eli-b

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
T - Analyte detected in the associated trip blank
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Client Sample ID: WLRC
PWS #: WY5600176 **Name:** LANDER, CITY OF
Facility ID: DIST
SamplingPoint/Location: S2-WLRC / WLRC
Project ID: WY5600176C
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

Lab ID: C22051078-002
Report Date: 06/10/22
Collection Date: 05/23/22 09:20
Date Received: 05/24/22
Matrix: Drinking Water
Federal ID#: WY00002

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
TRIHALOMETHANES							
2943 Bromodichloromethane	1.3	ug/L	T	0.50		E524.2	05/26/22 17:31 / eli-h
2942 Bromoform	ND	ug/L		0.50		E524.2	05/26/22 17:31 / eli-h
2944 Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/26/22 17:31 / eli-h
2941 Chloroform	22	ug/L		0.50		E524.2	05/26/22 17:31 / eli-h
2950 Trihalomethanes, Total	23	ug/L		0.50	80	E524.2	05/26/22 17:31 / eli-h
Surr: 1,2-Dichloroethane-d4	99.0	%REC			70-130	E524.2	05/26/22 17:31 / eli-h
Surr: p-Bromofluorobenzene	105	%REC			70-130	E524.2	05/26/22 17:31 / eli-h
Surr: Toluene-d8	106	%REC			70-130	E524.2	05/26/22 17:31 / eli-h
HALOACETIC ACIDS							
2454 Dibromoacetic acid	ND	ug/L		0.25		E552.2	05/31/22 01:08 / eli-b
2451 Dichloroacetic acid	15	ug/L		0.75		E552.2	05/31/22 01:08 / eli-b
2453 Monobromoacetic acid	ND	ug/L		0.50		E552.2	05/31/22 01:08 / eli-b
2450 Monochloroacetic acid	ND	ug/L	D	1.0		E552.2	05/31/22 01:08 / eli-b
2452 Trichloroacetic acid	19	ug/L		0.50		E552.2	05/31/22 01:08 / eli-b
2456 Total Regulated Haloacetic Acids	34	ug/L		0.50	60	E552.2	05/31/22 01:08 / eli-b
2455 Bromochloroacetic acid	ND	ug/L		0.50		E552.2	05/31/22 01:08 / eli-b
Surr: 2,3-Dibromopropionic acid	74.0	%REC			70-130	E552.2	05/31/22 01:08 / eli-b

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
T - Analyte detected in the associated trip blank
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)
D - Reporting Limit (RL) increased due to sample matrix

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	City of Lander	**Report Date:**	06/10/22
Project:	WY5600176C	**Collection Date:**	05/23/22 08:58
Lab ID:	C22051078-003	**DateReceived:**	05/24/22
Client Sample ID:	DBP Trip Blank	**Matrix:**	Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
TRIHALOMETHANES							
Bromodichloromethane	2.8	ug/L		0.50		E524.2	05/26/22 18:03 / eli-h
Bromoform	1.4	ug/L		0.50		E524.2	05/26/22 18:03 / eli-h
Chlorodibromomethane	4.4	ug/L		0.50		E524.2	05/26/22 18:03 / eli-h
Chloroform	1.5	ug/L		0.50		E524.2	05/26/22 18:03 / eli-h
Trihalomethanes, Total	10	ug/L		0.50	80	E524.2	05/26/22 18:03 / eli-h
Surr: 1,2-Dichloroethane-d4	97.0	%REC		70-130		E524.2	05/26/22 18:03 / eli-h
Surr: p-Bromofluorobenzene	106	%REC		70-130		E524.2	05/26/22 18:03 / eli-h
Surr: Toluene-d8	107	%REC		70-130		E524.2	05/26/22 18:03 / eli-h

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22051078 **Report Date:** 06/02/22

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E552.2									Analytical Run: 166871
Lab ID: CK3-166871	Continuing Calibration Verification Standard								05/30/22 21:14
Dibromoacetic acid	0.703	ug/L	0.25	70	70	130			
Dichloroacetic acid	3.15	ug/L	0.75	105	70	130			
Monobromoacetic acid	2.16	ug/L	0.50	108	70	130			
Monochloroacetic acid	3.26	ug/L	0.75	109	70	130			
Trichloroacetic acid	1.01	ug/L	0.50	101	70	130			
Bromochloroacetic acid	1.62	ug/L	0.50	81	70	130			
Total Regulated Haloacetic Acids	10.3	ug/L	0.25	103	70	130			
Surr: 2,3-Dibromopropionic acid			1.2	78	70	130			
Lab ID: CK5-166871	Continuing Calibration Verification Standard								05/31/22 04:33
Dibromoacetic acid	3.46	ug/L	0.25	87	70	130			
Dichloroacetic acid	12.7	ug/L	0.75	106	70	130			
Monobromoacetic acid	8.41	ug/L	0.50	105	70	130			
Monochloroacetic acid	13.4	ug/L	0.75	111	70	130			
Trichloroacetic acid	4.11	ug/L	0.50	103	70	130			
Bromochloroacetic acid	7.48	ug/L	0.50	93	70	130			
Total Regulated Haloacetic Acids	42.1	ug/L	0.25	105	70	130			
Surr: 2,3-Dibromopropionic acid			1.2	79	70	130			
Method: E552.2									Batch: 166871
Lab ID: MB-166871	Method Blank				Run: JECD.I_220530A				05/30/22 21:43
Dibromoacetic acid	ND	ug/L	0.25						
Dichloroacetic acid	ND	ug/L	0.75						
Monobromoacetic acid	ND	ug/L	0.50						
Monochloroacetic acid	ND	ug/L	0.75						
Trichloroacetic acid	ND	ug/L	0.50						
Bromochloroacetic acid	ND	ug/L	0.50						
Total Regulated Haloacetic Acids	ND	ug/L	0.25						
Surr: 2,3-Dibromopropionic acid			1.2	87	70	130			
Lab ID: LCS-166871	Laboratory Control Sample				Run: JECD.I_220530A				05/30/22 22:42
Dibromoacetic acid	3.23	ug/L	0.25	81	70	130			
Dichloroacetic acid	11.6	ug/L	0.75	97	70	130			
Monobromoacetic acid	7.38	ug/L	0.50	92	70	130			
Monochloroacetic acid	12.6	ug/L	0.75	105	70	130			
Trichloroacetic acid	3.81	ug/L	0.50	95	70	130			
Bromochloroacetic acid	6.90	ug/L	0.50	86	70	130			
Total Regulated Haloacetic Acids	38.6	ug/L	0.25	96	70	130			
Surr: 2,3-Dibromopropionic acid			1.2	78	70	130			
Lab ID: B22052257-001BMS	Sample Matrix Spike				Run: JECD.I_220530A				05/31/22 00:10
Dibromoacetic acid	3.35	ug/L	0.25	77	70	130			
Dichloroacetic acid	27.6	ug/L	0.75	95	70	130			
Monobromoacetic acid	8.63	ug/L	0.50	108	70	130			
Monochloroacetic acid	13.1	ug/L	0.75	96	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22051078 **Report Date:** 06/02/22

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E552.2									Batch: 166871
Lab ID: B22052257-001BMS	Sample Matrix Spike				Run: JECD.I_220530A				05/31/22 00:10
Trichloroacetic acid	25.1	ug/L	0.50	97	70	130			
Bromochloroacetic acid	9.21	ug/L	0.50	82	70	130			
Total Regulated Haloacetic Acids	77.8	ug/L	0.25	96	70	130			
Surr: 2,3-Dibromopropionic acid			1.2	80	70	130			
Lab ID: B22052506-002BDUP	Sample Duplicate				Run: JECD.I_220530A				05/31/22 04:04
Dibromoacetic acid	ND	ug/L	0.25					40	
Dichloroacetic acid	18.0	ug/L	0.75				0.9	40	
Monobromoacetic acid	ND	ug/L	0.50					40	
Monochloroacetic acid	ND	ug/L	0.75					40	
Trichloroacetic acid	27.2	ug/L	0.50				0.5	40	
Bromochloroacetic acid	ND	ug/L	0.50					40	
Total Regulated Haloacetic Acids	45.2	ug/L	0.50				0.6	40	
Surr: 2,3-Dibromopropionic acid			1.2	81	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22051078 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Analytical Run: R175116
Lab ID: 26-May-22_CCV_2	8	Continuing Calibration Verification Standard								05/26/22 07:34
Bromodichloromethane		4.66	ug/L	0.50	93	70	130			
Bromoform		4.85	ug/L	0.50	97	70	130			
Chlorodibromomethane		4.74	ug/L	0.50	95	70	130			
Chloroform		4.57	ug/L	0.50	91	70	130			
Trihalomethanes, Total		18.8	ug/L	0.50	94	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	94	70	130			
Surr: p-Bromofluorobenzene				0.50	100	70	130			
Surr: Toluene-d8				0.50	108	70	130			
Lab ID: 26-May-22_CCV1_4	8	Continuing Calibration Verification Standard								05/26/22 09:48
Bromodichloromethane		0.486	ug/L	0.50	97	50	150			
Bromoform		0.454	ug/L	0.50	91	50	150			
Chlorodibromomethane		0.429	ug/L	0.50	86	50	150			
Chloroform		0.485	ug/L	0.50	97	50	150			
Trihalomethanes, Total		1.85	ug/L	0.50	93	50	150			
Surr: 1,2-Dichloroethane-d4				0.50	87	70	130			
Surr: p-Bromofluorobenzene				0.50	105	70	130			
Surr: Toluene-d8				0.50	109	70	130			
Method: E524.2										Batch: R175116
Lab ID: 26-May-22_LCS_3	8	Laboratory Control Sample				Run: 5973MSD_220526A				05/26/22 08:17
Bromodichloromethane		4.43	ug/L	0.50	89	70	130			
Bromoform		4.61	ug/L	0.50	92	70	130			
Chlorodibromomethane		4.64	ug/L	0.50	93	70	130			
Chloroform		4.47	ug/L	0.50	89	70	130			
Trihalomethanes, Total		18.1	ug/L	0.50	91	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	94	70	130			
Surr: p-Bromofluorobenzene				0.50	101	70	130			
Surr: Toluene-d8				0.50	108	70	130			
Lab ID: 26-May-22_MBLK_5	8	Method Blank				Run: 5973MSD_220526A				05/26/22 10:20
Bromodichloromethane		ND	ug/L	0.50						
Bromoform		ND	ug/L	0.50						
Chlorodibromomethane		ND	ug/L	0.50						
Chloroform		ND	ug/L	0.50						
Trihalomethanes, Total		ND	ug/L	0.50						
Surr: 1,2-Dichloroethane-d4				0.50	99	70	130			
Surr: p-Bromofluorobenzene				0.50	104	70	130			
Surr: Toluene-d8				0.50	105	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

City of Lander   C22051078

Login completed by:	Ciara M. Leis	Date Received:	5/24/2022
Reviewed by:	Chantel S. Johnson	Received by:	cmj
Reviewed Date:	5/24/2022	Carrier name:	FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☑	No ☐	Not Present ☐
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	4.3°C On Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

The trip blank sample was assigned the earliest collection time for the requested analysis in order to evaluate the holding time. 5/24/2022 CL

C22051076

ENERGY

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Chain of Custody & Analytical Request Record

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Page _____ of _____

Account Information (Billing information)

Company/Name	City of Lander
Contact	Shane White
Phone	(307) 332-4291
Mailing Address	240 Lincoln St.
City, State, Zip	Lander, WY 82520
Email	Swhite@landerwyoming.org
Receive Invoice ☐Hard Copy ☐Email	Receive Report ☐Hard Copy ☒Email
Purchase Order	Quote / Bottle Order

Report Information (if different than Account Information)

Company/Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Report ☐Hard Copy ☐Email	
Special Report/Formats: ☐ LEVEL IV ☐ NELAC ☐ EDD/EDT (contact laboratory) ☐ Other_____	

Comments

Project Information

Project Name, PWSID, Permit, etc.	WY5600176c
Sampler Name: Shane White	Sampler Phone: (307) 332-4291
Sample Origin State: WY	EPA/State Compliance ☒Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type.
- ☐ NOT Source or Byproduct Material
- ☐ Source/Processed Ore (Ground or Refined) **CALL BEFORE SENDING
- ☐ 11e.(2) Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Analysis Requested

#	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	TTHM	HAA5								See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	Bus Barn	5/23/22	8:58 AM	3	DW	X											
2	Bus Barn	5/23/22	9:00 AM	3	DW		X										
3	WLRC	5/23/22	9:20 AM	3	DW	X											
4	WLRC	5/23/22	9:25 AM	3	DW		X										
5																	
6																	
7																	
8																	
9																	
10																	

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Shane White	5/23/22 [illegible]:30	Shane White			
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print): Caroline Johnson	Date/Time: 5/24/22 10:53	Signature: [illegible]

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check_____	Amount $	Receipt Number (cash/check only)

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

EL-COC-10/18 v.3

ENERGY LABORATORIES

www.energylab.com

Chain of Custody (COC) & Analytical Request Record

Lab Workorder #: C22051076

Project Information | **Laboratory Use**

Client: City of Lander	*Quote:* N/A	*Critical Hold Time:* 14 Days	
Project: WY5600176C	*BO#:* 70118-S	*# of Samples:* 3	
Purchase Order:	*EE#:* 8371	*Matrix:* Various	
Contact/Phone: Shane White (307)332-4291	*Turn-Around Time:* Standard		

Comments: Annual DBPs

Collect in May

No Charge Per Alyson

Contact ELI prior to RUSH sample submittal for charges, availability & scheduling. Samples submitted may be subcontracted to other laboratories to complete the test(s) requested; this will be clearly noted on the analytical report.

Analysis Requested — Hold Time (Days): 524-Purgeable Organics 14; 552-Haloacetic Acids 14

Public Water Supply (PWS) Required System Information

	Sample Identification	Collection Date/Time	# of Containers	Matrix	RUSH TAT	EPA/State Compliance	524-Purgeable Organics, Trihalomethanes (E524.2)	552-Haloacetic Acids-(HAAs) (E552.2)					PWS System ID	PWS Facility ID	PWS Sample Pt ID
1	Bus Barn		6	DW		X	X	X					WY5600176	DIST	S2-BUS BARN
2	WLRC		6	DW		X	X	X					WY5600176	DIST	S2-WLRC
3	DBP Trip Blank		1	W			X								
4															
5															
6															
7															
8															
9															
10															
11															

Custody Record MUST be signed	Lab provided preservatives were used ☐Yes ☐No		Sampler Name (if different than Relinquished by):		Sampler Phone:	
	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature

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BOTTLE ORDER 70118 EEx 8371

******* This is a recurring bottle order. If you have received this in error please contact your laboratory *******

SHIPPED TO: **City of Lander**

Contact: Shane White
240 Lincoln St.
Lander WY 82520-
Phone: (307) 332-4291
Project: Annual DBP

Order Created by: Alyson T. Degnan
Shipped From: Casper, WY
Ship Date: 5/18/2022
VIA: Ground

Bottle Size/Type	Bottles Per Samp	Method	Tests	Critical Hold Time	Preservative	Notes	Num of Samp
DBP (2 Sets)							
40 mL Amber Glass VOA-NH4CL	3	E552.2	552-Haloacetic Acids-(HAAs)		NH4CL	Do Not Rinse - Container is pre-preserved. . Zero Headspace	1
40 mL Clear Glass VOA	3	E524.2	524-Purgeable Organics, Trihalomethanes		HCL AA	Do Not Rinse - Container is pre-preserved. . Zero Headspace.	1
DBP Trip Blank							
40 mL Clear Glass VOA	1	E524.2	524-Purgeable Organics, Trihalomethanes		HCL		1

Comments

Ship in April for May sampling

■ HNO3 - Nitric Acid ☐ H2SO4 - Sulfuric Acid ■ NaOH - Sodium Hydroxide
■ ZnAc - Zinc Acetate ■ HCl - Hydrochloric Acid ☐ H3PO4 - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

BO#: 70118

ANALYTICAL SUMMARY REPORT

June 02, 2022

City of Lander
240 Lincoln St
Lander, WY 82520-2848

Work Order: C22050638

Project Name: WY5600176C

Energy Laboratories, Inc. Casper WY received the following 2 samples for City of Lander on 5/16/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C22050638-001	SP01 Clearwell	05/16/22 7:35	05/16/22	Drinking Water	Metals by ICP/ICPMS, Drinking Water Cyanide, SDWA Mercury, Drinking Water Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Metals Preparation by EPA 200.2 Digestion, Mercury by CVAA 524-Purgeable Organics, SDWA
C22050638-002	Trip Blank-79732	05/16/22 7:35	05/16/22	Trip Blank	524-Purgeable Organics, SDWA

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Alyson Degnan
Project Manager

Digitally signed by
Alyson T. Degnan
Date: 2022.06.02 11:05:02 -06:00

CLIENT: City of Lander
Project: WY5600176C
Work Order: C22050638

Report Date: 06/02/22

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

Tests associated with analyst identified as ELI-H were subcontracted to Energy Laboratories, 3161 E.Lyndale Ave., Helena, MT, EPA Number MT00945.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C22050638-001
Client Sample ID: SP01 Clearwell
Report Date: 06/02/22
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/16/22 07:35
Facility ID: TP01
Date Received: 05/16/22
SamplingPoint/Location: SP01 / SP01 Clearwell
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
MAJOR IONS							
1052 Sodium	9.2	mg/L		0.5		E200.7	05/23/22 13:47 / eli-b
NUTRIENTS							
1038 Nitrogen, Nitrate+Nitrite as N	ND	mg/L		0.05	10	E353.2	05/18/22 14:58 / nts
INORGANIC COMPOUNDS							
1025 Fluoride	ND	mg/L		0.1	4	E300.0	05/18/22 18:31 / nts
1074 Antimony	ND	mg/L		0.001	0.006	E200.8	05/21/22 11:37 / eli-b
1005 Arsenic	ND	mg/L		0.005	0.01	E200.8	05/21/22 11:37 / eli-b
1010 Barium	ND	mg/L		0.1	2	E200.8	05/21/22 11:37 / eli-b
1075 Beryllium	ND	mg/L		0.001	0.004	E200.8	05/22/22 04:12 / eli-b
1015 Cadmium	ND	mg/L		0.001	0.005	E200.8	05/21/22 11:37 / eli-b
1020 Chromium	ND	mg/L		0.05	0.1	E200.8	05/21/22 11:37 / eli-b
1035 Mercury	ND	mg/L		0.0001	0.002	E245.1	05/25/22 14:56 / eli-h
1036 Nickel	ND	mg/L		0.05	0.1	E200.8	05/21/22 11:37 / eli-b
1045 Selenium	ND	mg/L		0.001	0.05	E200.8	05/21/22 11:37 / eli-b
1085 Thallium	ND	mg/L		0.0005	0.002	E200.8	05/21/22 11:37 / eli-b
1024 Cyanide, Total	ND	mg/L		0.005	0.2	Kelada-01	05/19/22 10:11 / eli-b
VOLATILE ORGANIC COMPOUNDS							
2990 Benzene	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2993 Bromobenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2430 Bromochloromethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2943 Bromodichloromethane	0.27	ug/L	J	0.50		E524.2	05/20/22 18:36 / eli-h
2942 Bromoform	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2214 Bromomethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2422 n-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2428 sec-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2426 tert-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2982 Carbon tetrachloride	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2980 1,2-Dichloroethane	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2989 Chlorobenzene	ND	ug/L		0.50	100	E524.2	05/20/22 18:36 / eli-h
2944 Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2216 Chloroethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2941 Chloroform	1.8	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2210 Chloromethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
J - Estimated value - analyte was present but less than the Reporting Limit (RL)
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C22050638-001
Client Sample ID: SP01 Clearwell
Report Date: 06/02/22
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/16/22 07:35
Facility ID: TP01
Date Received: 05/16/22
SamplingPoint/Location: SP01 / SP01 Clearwell
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS	Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
	VOLATILE ORGANIC COMPOUNDS							
2965	2-Chlorotoluene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2966	4-Chlorotoluene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2931	1,2-Dibromo-3-chloropropane	ND	ug/L		1.0	0.2	E524.2	05/20/22 18:36 / eli-h
2408	Dibromomethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2968	1,2-Dichlorobenzene	ND	ug/L		0.50	600	E524.2	05/20/22 18:36 / eli-h
2967	1,3-Dichlorobenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2969	1,4-Dichlorobenzene	ND	ug/L		0.50	75	E524.2	05/20/22 18:36 / eli-h
2212	Dichlorodifluoromethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2978	1,1-Dichloroethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2946	1,2-Dibromoethane	ND	ug/L		0.50	0.05	E524.2	05/20/22 18:36 / eli-h
2977	1,1-Dichloroethene	ND	ug/L		0.50	7	E524.2	05/20/22 18:36 / eli-h
2380	cis-1,2-Dichloroethene	ND	ug/L		0.50	70	E524.2	05/20/22 18:36 / eli-h
2979	trans-1,2-Dichloroethene	ND	ug/L		0.50	100	E524.2	05/20/22 18:36 / eli-h
2983	1,2-Dichloropropane	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2412	1,3-Dichloropropane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2416	2,2-Dichloropropane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2410	1,1-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2413	cis-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2224	trans-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2992	Ethylbenzene	ND	ug/L		0.50	700	E524.2	05/20/22 18:36 / eli-h
2246	Hexachlorobutadiene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2994	Isopropylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2030	p-Isopropyltoluene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2251	Methyl tert-butyl ether (MTBE)	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2964	Methylene chloride	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2248	Naphthalene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2998	n-Propylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2996	Styrene	ND	ug/L		0.50	100	E524.2	05/20/22 18:36 / eli-h
2986	1,1,1,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2988	1,1,2,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2987	Tetrachloroethene	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2991	Toluene	ND	ug/L		0.50	1000	E524.2	05/20/22 18:36 / eli-h
2420	1,2,3-Trichlorobenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2378	1,2,4-Trichlorobenzene	ND	ug/L		0.50	70	E524.2	05/20/22 18:36 / eli-h
2981	1,1,1-Trichloroethane	ND	ug/L		0.50	200	E524.2	05/20/22 18:36 / eli-h
2985	1,1,2-Trichloroethane	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Lab ID: C22050638-001
Client Sample ID: SP01 Clearwell
Report Date: 06/02/22
PWS #: WY5600176 **Name:** LANDER, CITY OF
Collection Date: 05/16/22 07:35
Facility ID: TP01
Date Received: 05/16/22
SamplingPoint/Location: SP01 / SP01 Clearwell
Matrix: Drinking Water
Project ID: WY5600176C
Federal ID#: WY00002
Collector's Name: Shane White **Contact Phone #:** (307) 332-3956
Compliance Sample: YES **Sample Type:** RT

FRDS	Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
	VOLATILE ORGANIC COMPOUNDS							
2984	Trichloroethene	ND	ug/L		0.50	5	E524.2	05/20/22 18:36 / eli-h
2218	Trichlorofluoromethane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2414	1,2,3-Trichloropropane	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2418	1,2,4-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2424	1,3,5-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2976	Vinyl chloride	ND	ug/L		0.50	2	E524.2	05/20/22 18:36 / eli-h
2963	m+p-Xylenes	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2997	o-Xylene	ND	ug/L		0.50		E524.2	05/20/22 18:36 / eli-h
2950	Trihalomethanes, Total	2.1	ug/L		0.50	80	E524.2	05/20/22 18:36 / eli-h
2955	Xylenes, Total	ND	ug/L		0.50	10000	E524.2	05/20/22 18:36 / eli-h
	Surr: p-Bromofluorobenzene	103	%REC			70-130	E524.2	05/20/22 18:36 / eli-h
	Surr: 1,2-Dichloroethane-d4	102	%REC			70-130	E524.2	05/20/22 18:36 / eli-h
	Surr: Toluene-d8	105	%REC			70-130	E524.2	05/20/22 18:36 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: City of Lander
Project: WY5600176C
Lab ID: C22050638-002
Client Sample ID: Trip Blank-79732

Report Date: 06/02/22
Collection Date: 05/16/22 07:35
DateReceived: 05/16/22
Matrix: Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
Benzene	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Bromobenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Bromochloromethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Bromodichloromethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Bromoform	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Bromomethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
n-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
sec-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
tert-Butylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Carbon tetrachloride	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
1,2-Dichloroethane	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Chlorobenzene	ND	ug/L		0.50	100	E524.2	05/20/22 17:00 / eli-h
Chlorodibromomethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Chloroethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Chloroform	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Chloromethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
2-Chlorotoluene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
4-Chlorotoluene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2-Dibromo-3-chloropropane	ND	ug/L		1.0	0.2	E524.2	05/20/22 17:00 / eli-h
Dibromomethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2-Dichlorobenzene	ND	ug/L		0.50	600	E524.2	05/20/22 17:00 / eli-h
1,3-Dichlorobenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,4-Dichlorobenzene	ND	ug/L		0.50	75	E524.2	05/20/22 17:00 / eli-h
Dichlorodifluoromethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,1-Dichloroethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2-Dibromoethane	ND	ug/L		0.50	0.05	E524.2	05/20/22 17:00 / eli-h
1,1-Dichloroethene	ND	ug/L		0.50	7	E524.2	05/20/22 17:00 / eli-h
cis-1,2-Dichloroethene	ND	ug/L		0.50	70	E524.2	05/20/22 17:00 / eli-h
trans-1,2-Dichloroethene	ND	ug/L		0.50	100	E524.2	05/20/22 17:00 / eli-h
1,2-Dichloropropane	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
1,3-Dichloropropane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
2,2-Dichloropropane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,1-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
cis-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
trans-1,3-Dichloropropene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Ethylbenzene	ND	ug/L		0.50	700	E524.2	05/20/22 17:00 / eli-h
Hexachlorobutadiene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Isopropylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
p-Isopropyltoluene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Methyl tert-butyl ether (MTBE)	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Methylene chloride	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Naphthalene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
n-Propylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client:	City of Lander	**Report Date:**	06/02/22
Project:	WY5600176C	**Collection Date:**	05/16/22 07:35
Lab ID:	C22050638-002	**DateReceived:**	05/16/22
Client Sample ID:	Trip Blank-79732	**Matrix:**	Trip Blank

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC COMPOUNDS							
Styrene	ND	ug/L		0.50	100	E524.2	05/20/22 17:00 / eli-h
1,1,1,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,1,2,2-Tetrachloroethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Tetrachloroethene	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Toluene	ND	ug/L		0.50	1000	E524.2	05/20/22 17:00 / eli-h
1,2,3-Trichlorobenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2,4-Trichlorobenzene	ND	ug/L		0.50	70	E524.2	05/20/22 17:00 / eli-h
1,1,1-Trichloroethane	ND	ug/L		0.50	200	E524.2	05/20/22 17:00 / eli-h
1,1,2-Trichloroethane	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Trichloroethene	ND	ug/L		0.50	5	E524.2	05/20/22 17:00 / eli-h
Trichlorofluoromethane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2,3-Trichloropropane	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,2,4-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
1,3,5-Trimethylbenzene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Vinyl chloride	ND	ug/L		0.50	2	E524.2	05/20/22 17:00 / eli-h
m+p-Xylenes	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
o-Xylene	ND	ug/L		0.50		E524.2	05/20/22 17:00 / eli-h
Trihalomethanes, Total	ND	ug/L		0.50	80	E524.2	05/20/22 17:00 / eli-h
Xylenes, Total	ND	ug/L		0.50	10000	E524.2	05/20/22 17:00 / eli-h
Surr: p-Bromofluorobenzene	104	%REC		70-130		E524.2	05/20/22 17:00 / eli-h
Surr: 1,2-Dichloroethane-d4	96.0	%REC		70-130		E524.2	05/20/22 17:00 / eli-h
Surr: Toluene-d8	107	%REC		70-130		E524.2	05/20/22 17:00 / eli-h

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/23/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0										Analytical Run: IC3-C_220518A
Lab ID: ICV		Initial Calibration Verification Standard								05/18/22 16:13
Fluoride		4.89	mg/L	0.10	98	90	110			
Method: E300.0										Batch: R282790
Lab ID: ICB		Method Blank				Run: IC3-C_220518A				05/18/22 16:51
Fluoride		ND	mg/L	0.01						
Lab ID: LFB		Laboratory Fortified Blank				Run: IC3-C_220518A				05/18/22 17:10
Fluoride		5.08	mg/L	0.10	106	90	110			
Lab ID: C22050638-001AMS		Sample Matrix Spike				Run: IC3-C_220518A				05/18/22 18:50
Fluoride		4.88	mg/L	0.10	97	80	120			
Lab ID: C22050638-001AMSD		Sample Matrix Spike Duplicate				Run: IC3-C_220518A				05/18/22 19:09
Fluoride		5.03	mg/L	0.10	100	80	120	3.1	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/23/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2										Analytical Run: FIA201-C_220518A
Lab ID: ICV		Initial Calibration Verification Standard								05/18/22 13:57
Nitrogen, Nitrate+Nitrite as N		1.04	mg/L	0.050	104	90	110			
Method: E353.2										Batch: R282708
Lab ID: MBLK		Method Blank				Run: FIA201-C_220518A				05/18/22 13:58
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.01						
Lab ID: LFB		Laboratory Fortified Blank				Run: FIA201-C_220518A				05/18/22 13:59
Nitrogen, Nitrate+Nitrite as N		1.04	mg/L	0.050	105	90	110			
Lab ID: C22050628-002CMS		Sample Matrix Spike				Run: FIA201-C_220518A				05/18/22 14:53
Nitrogen, Nitrate+Nitrite as N		1.43	mg/L	0.050	115	90	110			S
Lab ID: C22050628-002CMSD		Sample Matrix Spike Duplicate				Run: FIA201-C_220518A				05/18/22 14:54
Nitrogen, Nitrate+Nitrite as N		1.44	mg/L	0.050	116	90	110	0.7	10	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/25/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.7							Analytical Run: ICP203-B_220523A			
Lab ID: ICV		Continuing Calibration Verification Standard							05/23/22 11:36	
Sodium		25.0	mg/L	1.0	100	95	105			
Lab ID: CCV		Continuing Calibration Verification Standard							05/23/22 13:21	
Sodium		25.0	mg/L	1.0	100	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							05/23/22 14:13	
Sodium		25.0	mg/L	1.0	100	90	110			
Method: E200.7									Batch: R381796	
Lab ID: MB-6500DIS220523A		Method Blank				Run: ICP203-B_220523A			05/23/22 11:45	
Sodium		ND	mg/L	0.2						
Lab ID: LFB-6500DIS220523A		Laboratory Fortified Blank				Run: ICP203-B_220523A			05/23/22 11:53	
Sodium		51.2	mg/L	1.0	102	85	115			
Lab ID: B22051254-006AMS2		Sample Matrix Spike				Run: ICP203-B_220523A			05/23/22 13:30	
Sodium		160	mg/L	1.0	102	70	130			
Lab ID: B22051254-006AMSD		Sample Matrix Spike Duplicate				Run: ICP203-B_220523A			05/23/22 13:34	
Sodium		161	mg/L	1.0	102	70	130	0.6	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/25/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Analytical Run: ICPMS207-B_220520A
Lab ID: QCS	8	Initial Calibration Verification Standard								05/21/22 05:20
Antimony		0.0493	mg/L	0.050	99	90	110			
Arsenic		0.0542	mg/L	0.0050	108	90	110			
Barium		0.0521	mg/L	0.10	104	90	110			
Cadmium		0.0257	mg/L	0.0010	103	90	110			
Chromium		0.0545	mg/L	0.010	109	90	110			
Nickel		0.0549	mg/L	0.010	110	90	110			
Selenium		0.0529	mg/L	0.0050	106	90	110			
Thallium		0.0533	mg/L	0.10	107	90	110			
Lab ID: CCV	8	Continuing Calibration Verification Standard								05/21/22 11:46
Antimony		0.0483	mg/L	0.050	97	90	110			
Arsenic		0.0486	mg/L	0.0050	97	90	110			
Barium		0.0487	mg/L	0.10	97	90	110			
Cadmium		0.0485	mg/L	0.0010	97	90	110			
Chromium		0.0485	mg/L	0.010	97	90	110			
Nickel		0.0489	mg/L	0.010	98	90	110			
Selenium		0.0494	mg/L	0.0050	99	90	110			
Thallium		0.0482	mg/L	0.10	96	90	110			
Lab ID: QCS		Initial Calibration Verification Standard								05/21/22 23:21
Beryllium		0.0257	mg/L	0.0010	103	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								05/22/22 03:45
Beryllium		0.0496	mg/L	0.0010	99	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								05/22/22 04:25
Beryllium		0.0461	mg/L	0.0010	92	90	110			
Method: E200.8										Batch: R381733
Lab ID: LRB	9	Method Blank				Run: ICPMS207-B_220520A				05/20/22 20:07
Antimony		ND	mg/L	0.00007						
Arsenic		ND	mg/L	0.001						
Barium		0.0006	mg/L	0.00007						
Beryllium		ND	mg/L	0.00009						
Cadmium		ND	mg/L	0.00002						
Chromium		ND	mg/L	0.0009						
Nickel		0.0003	mg/L	0.0002						
Selenium		ND	mg/L	0.001						
Thallium		0.00007	mg/L	0.00005						
Lab ID: LFB	9	Laboratory Fortified Blank				Run: ICPMS207-B_220520A				05/20/22 20:11
Antimony		0.0501	mg/L	0.050	100	85	115			
Arsenic		0.0526	mg/L	0.0050	105	85	115			
Barium		0.0509	mg/L	0.10	102	85	115			
Beryllium		0.0469	mg/L	0.0010	94	85	115			
Cadmium		0.0497	mg/L	0.0010	99	85	115			
Chromium		0.0508	mg/L	0.010	102	85	115			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/25/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Batch: R381733
Lab ID: LFB	9	Laboratory Fortified Blank				Run: ICPMS207-B_220520A				05/20/22 20:11
Nickel		0.0491	mg/L	0.010	98	85	115			
Selenium		0.0521	mg/L	0.0050	104	85	115			
Thallium		0.0501	mg/L	0.10	100	85	115			
Lab ID: B22051525-001BMS	9	Sample Matrix Spike				Run: ICPMS207-B_220520A				05/21/22 11:19
Antimony		0.0501	mg/L	0.0010	100	70	130			
Arsenic		0.0572	mg/L	0.0010	102	70	130			
Barium		0.116	mg/L	0.050	104	70	130			
Beryllium		0.0403	mg/L	0.0010	81	70	130			
Cadmium		0.0483	mg/L	0.0010	97	70	130			
Chromium		0.0492	mg/L	0.0050	96	70	130			
Nickel		0.0469	mg/L	0.010	94	70	130			
Selenium		0.0522	mg/L	0.0010	100	70	130			
Thallium		0.0486	mg/L	0.00050	97	70	130			
Lab ID: B22051525-001BMSD	9	Sample Matrix Spike Duplicate				Run: ICPMS207-B_220520A				05/21/22 11:23
Antimony		0.0527	mg/L	0.0010	105	70	130	5.1	20	
Arsenic		0.0624	mg/L	0.0010	113	70	130	8.8	20	
Barium		0.118	mg/L	0.050	107	70	130	1.5	20	
Beryllium		0.0416	mg/L	0.0010	83	70	130	3.2	20	
Cadmium		0.0511	mg/L	0.0010	102	70	130	5.7	20	
Chromium		0.0539	mg/L	0.0050	105	70	130	9.1	20	
Nickel		0.0520	mg/L	0.010	104	70	130	10	20	
Selenium		0.0573	mg/L	0.0010	110	70	130	9.3	20	
Thallium		0.0522	mg/L	0.00050	104	70	130	7.0	20	
Lab ID: B22051459-001AMS	9	Sample Matrix Spike				Run: ICPMS207-B_220520A				05/22/22 03:27
Antimony		0.0513	mg/L	0.0010	103	70	130			
Arsenic		0.0575	mg/L	0.0010	108	70	130			
Barium		0.0509	mg/L	0.050	101	70	130			
Beryllium		0.0475	mg/L	0.0010	95	70	130			
Cadmium		0.0498	mg/L	0.0010	100	70	130			
Chromium		0.0545	mg/L	0.0050	99	70	130			
Nickel		0.0532	mg/L	0.0050	99	70	130			
Selenium		0.0518	mg/L	0.0021	104	70	130			
Thallium		0.0510	mg/L	0.00050	102	70	130			
Lab ID: B22051459-001AMSD	9	Sample Matrix Spike Duplicate				Run: ICPMS207-B_220520A				05/22/22 03:31
Antimony		0.0514	mg/L	0.0010	103	70	130	0.2	20	
Arsenic		0.0567	mg/L	0.0010	107	70	130	1.5	20	
Barium		0.0512	mg/L	0.050	102	70	130	0.6	20	
Beryllium		0.0475	mg/L	0.0010	95	70	130	0	20	
Cadmium		0.0496	mg/L	0.0010	99	70	130	0.3	20	
Chromium		0.0554	mg/L	0.0050	100	70	130	1.6	20	
Nickel		0.0548	mg/L	0.0050	102	70	130	3.0	20	
Selenium		0.0529	mg/L	0.0021	106	70	130	2.1	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/25/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E200.8										Batch: R381733
Lab ID: B22051459-001AMSD	9	Sample Matrix Spike Duplicate				Run: ICPMS207-B_220520A				05/22/22 03:31
Thallium		0.0511	mg/L	0.00050	102	70	130	0.2	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/25/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Kelada-01										Analytical Run: SFA-201-B_220519A
Lab ID: ICV		Initial Calibration Verification Standard								05/19/22 09:46
Cyanide, Total		0.0982	mg/L	0.0050	98	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								05/19/22 10:33
Cyanide, Total		0.0982	mg/L	0.0050	98	90	110			
Method: Kelada-01										Batch: R381645
Lab ID: ICB		Method Blank				Run: SFA-201-B_220519A				05/19/22 09:47
Cyanide, Total		ND	mg/L	0.002						
Lab ID: LFB		Laboratory Fortified Blank				Run: SFA-201-B_220519A				05/19/22 09:49
Cyanide, Total		0.0989	mg/L	0.0050	99	90	110			
Lab ID: LCS1-K4Fe(CN)6		Laboratory Control Sample				Run: SFA-201-B_220519A				05/19/22 09:51
Cyanide, Total		0.206	mg/L	0.0050	103	90	110			
Lab ID: B22051478-001AMS		Sample Matrix Spike				Run: SFA-201-B_220519A				05/19/22 10:03
Cyanide, Total		0.103	mg/L	0.0050	103	90	110			
Lab ID: B22051478-001AMSD		Sample Matrix Spike Duplicate				Run: SFA-201-B_220519A				05/19/22 10:05
Cyanide, Total		0.102	mg/L	0.0050	102	90	110	0.9	20	
Lab ID: B22051553-006AMS		Sample Matrix Spike				Run: SFA-201-B_220519A				05/19/22 10:19
Cyanide, Total		0.0887	mg/L	0.0050	89	90	110			S
Lab ID: B22051553-006AMSD		Sample Matrix Spike Duplicate				Run: SFA-201-B_220519A				05/19/22 10:21
Cyanide, Total		0.0889	mg/L	0.0050	89	90	110	0.2	10	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E245.1							Analytical Run: HGCV203-H_220525A			
Lab ID: ICV		Initial Calibration Verification Standard							05/25/22 14:34	
Mercury		0.000942	mg/L	0.00010	94	90	110			
Lab ID: CCV1		Continuing Calibration Verification Standard							05/25/22 14:36	
Mercury		0.00253	mg/L	0.00010	101	95	105			
Method: E245.1									Batch: 61524	
Lab ID: MB-61524		Method Blank				Run: HGCV203-H_220525A			05/25/22 14:43	
Mercury		ND	mg/L	0.00005						
Lab ID: LCS-61524		Laboratory Control Sample				Run: HGCV203-H_220525A			05/25/22 14:45	
Mercury		0.000502	mg/L	0.00010	100	85	115			
Lab ID: H22050633-003CMS		Sample Matrix Spike				Run: HGCV203-H_220525A			05/25/22 14:52	
Mercury		0.00100	mg/L	0.00010	100	70	130			
Lab ID: H22050633-003CMSD		Sample Matrix Spike Duplicate				Run: HGCV203-H_220525A			05/25/22 14:54	
Mercury		0.00101	mg/L	0.00010	101	70	130	0.2	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Analytical Run: R174957
Lab ID: 20-May-22_CCV_1	65	Continuing Calibration Verification Standard								05/20/22 10:40
Benzene		5.59	ug/L	0.50	112	70	130			
Bromobenzene		5.50	ug/L	0.50	110	70	130			
Bromochloromethane		5.60	ug/L	0.50	112	70	130			
Bromodichloromethane		5.60	ug/L	0.50	112	70	130			
Bromoform		5.76	ug/L	0.50	115	70	130			
Bromomethane		5.33	ug/L	0.50	107	70	130			
n-Butylbenzene		5.24	ug/L	0.50	105	70	130			
sec-Butylbenzene		5.48	ug/L	0.50	110	70	130			
tert-Butylbenzene		5.81	ug/L	0.50	116	70	130			
Carbon tetrachloride		5.59	ug/L	0.50	112	70	130			
1,2-Dichloroethane		4.48	ug/L	0.50	90	70	130			
Chlorobenzene		5.97	ug/L	0.50	119	70	130			
Chlorodibromomethane		5.66	ug/L	0.50	113	70	130			
Chloroethane		5.03	ug/L	0.50	101	70	130			
Chloroform		5.27	ug/L	0.50	105	70	130			
Chloromethane		4.66	ug/L	0.50	93	70	130			
2-Chlorotoluene		5.77	ug/L	0.50	115	70	130			
4-Chlorotoluene		5.38	ug/L	0.50	108	70	130			
1,2-Dibromo-3-chloropropane		3.78	ug/L	1.0	76	70	130			
Dibromomethane		5.80	ug/L	0.50	116	70	130			
1,2-Dichlorobenzene		5.47	ug/L	0.50	109	70	130			
1,3-Dichlorobenzene		5.71	ug/L	0.50	114	70	130			
1,4-Dichlorobenzene		5.44	ug/L	0.50	109	70	130			
Dichlorodifluoromethane		4.26	ug/L	0.50	85	70	130			
1,1-Dichloroethane		5.15	ug/L	0.50	103	70	130			
1,2-Dibromoethane		5.65	ug/L	0.50	113	70	130			
1,1-Dichloroethene		5.82	ug/L	0.50	116	70	130			
cis-1,2-Dichloroethene		5.42	ug/L	0.50	108	70	130			
trans-1,2-Dichloroethene		5.79	ug/L	0.50	116	70	130			
1,2-Dichloropropane		5.65	ug/L	0.50	113	70	130			
1,3-Dichloropropane		5.31	ug/L	0.50	106	70	130			
2,2-Dichloropropane		5.45	ug/L	0.50	109	70	130			
1,1-Dichloropropene		5.68	ug/L	0.50	114	70	130			
cis-1,3-Dichloropropene		5.41	ug/L	0.50	108	70	130			
trans-1,3-Dichloropropene		5.26	ug/L	0.50	105	70	130			
Ethylbenzene		6.05	ug/L	0.50	121	70	130			
Hexachlorobutadiene		5.58	ug/L	0.50	112	70	130			
Isopropylbenzene		5.61	ug/L	0.50	112	70	130			
p-Isopropyltoluene		5.73	ug/L	0.50	115	70	130			
Methyl tert-butyl ether (MTBE)		4.39	ug/L	0.50	88	70	130			
Methylene chloride		4.72	ug/L	0.50	94	70	130			
Naphthalene		3.92	ug/L	0.50	78	70	130			
n-Propylbenzene		5.73	ug/L	0.50	115	70	130			
Styrene		6.00	ug/L	0.50	120	70	130			
1,1,1,2-Tetrachloroethane		5.86	ug/L	0.50	117	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Analytical Run: R174957
Lab ID: 20-May-22_CCV_1	65	Continuing Calibration Verification Standard								05/20/22 10:40
1,1,2,2-Tetrachloroethane		4.97	ug/L	0.50	99	70	130			
Tetrachloroethene		6.69	ug/L	0.50	134	70	130			S
Toluene		6.27	ug/L	0.50	125	70	130			
1,2,3-Trichlorobenzene		4.31	ug/L	0.50	86	70	130			
1,2,4-Trichlorobenzene		4.51	ug/L	0.50	90	70	130			
1,1,1-Trichloroethane		5.41	ug/L	0.50	108	70	130			
1,1,2-Trichloroethane		5.57	ug/L	0.50	111	70	130			
Trichloroethene		6.09	ug/L	0.50	122	70	130			
Trichlorofluoromethane		4.69	ug/L	0.50	94	70	130			
1,2,3-Trichloropropane		4.66	ug/L	0.50	93	70	130			
1,2,4-Trimethylbenzene		5.50	ug/L	0.50	110	70	130			
1,3,5-Trimethylbenzene		5.47	ug/L	0.50	109	70	130			
Vinyl chloride		4.95	ug/L	0.50	99	70	130			
m+p-Xylenes		12.5	ug/L	0.50	125	70	130			
o-Xylene		6.11	ug/L	0.50	122	70	130			
Trihalomethanes, Total		22.3	ug/L	0.50	112	70	130			
Xylenes, Total		18.6	ug/L	0.50	124	70	130			
Surr: p-Bromofluorobenzene				0.50	100	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	88	70	130			
Surr: Toluene-d8				0.50	113	70	130			
Method: E524.2										Batch: R174957
Lab ID: 20-May-22_LCS_2	65	Laboratory Control Sample				Run: 5973MSD_220520A				05/20/22 11:26
Benzene		5.41	ug/L	0.50	108	70	130			
Bromobenzene		5.37	ug/L	0.50	107	70	130			
Bromochloromethane		5.36	ug/L	0.50	107	70	130			
Bromodichloromethane		5.44	ug/L	0.50	109	70	130			
Bromoform		5.43	ug/L	0.50	109	70	130			
Bromomethane		5.81	ug/L	0.50	116	70	130			
n-Butylbenzene		4.99	ug/L	0.50	100	70	130			
sec-Butylbenzene		5.23	ug/L	0.50	105	70	130			
tert-Butylbenzene		5.44	ug/L	0.50	109	70	130			
Carbon tetrachloride		5.20	ug/L	0.50	104	70	130			
1,2-Dichloroethane		4.52	ug/L	0.50	90	70	130			
Chlorobenzene		5.76	ug/L	0.50	115	70	130			
Chlorodibromomethane		5.61	ug/L	0.50	112	70	130			
Chloroethane		5.07	ug/L	0.50	101	70	130			
Chloroform		5.15	ug/L	0.50	103	70	130			
Chloromethane		4.63	ug/L	0.50	93	70	130			
2-Chlorotoluene		5.59	ug/L	0.50	112	70	130			
4-Chlorotoluene		5.13	ug/L	0.50	103	70	130			
1,2-Dibromo-3-chloropropane		3.57	ug/L	1.0	71	70	130			
Dibromomethane		5.41	ug/L	0.50	108	70	130			
1,2-Dichlorobenzene		5.26	ug/L	0.50	105	70	130			
1,3-Dichlorobenzene		5.35	ug/L	0.50	107	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R174957
Lab ID: 20-May-22_LCS_2	65	Laboratory Control Sample				Run: 5973MSD_220520A				05/20/22 11:26
1,4-Dichlorobenzene		5.19	ug/L	0.50	104	70	130			
Dichlorodifluoromethane		4.24	ug/L	0.50	85	70	130			
1,1-Dichloroethane		4.97	ug/L	0.50	99	70	130			
1,2-Dibromoethane		5.40	ug/L	0.50	108	70	130			
1,1-Dichloroethene		5.61	ug/L	0.50	112	70	130			
cis-1,2-Dichloroethene		5.16	ug/L	0.50	103	70	130			
trans-1,2-Dichloroethene		5.52	ug/L	0.50	110	70	130			
1,2-Dichloropropane		5.44	ug/L	0.50	109	70	130			
1,3-Dichloropropane		5.27	ug/L	0.50	105	70	130			
2,2-Dichloropropane		5.18	ug/L	0.50	104	70	130			
1,1-Dichloropropene		5.48	ug/L	0.50	110	70	130			
cis-1,3-Dichloropropene		5.17	ug/L	0.50	103	70	130			
trans-1,3-Dichloropropene		5.03	ug/L	0.50	101	70	130			
Ethylbenzene		5.75	ug/L	0.50	115	70	130			
Hexachlorobutadiene		5.31	ug/L	0.50	106	70	130			
Isopropylbenzene		5.35	ug/L	0.50	107	70	130			
p-Isopropyltoluene		5.35	ug/L	0.50	107	70	130			
Methyl tert-butyl ether (MTBE)		4.37	ug/L	0.50	87	70	130			
Methylene chloride		4.59	ug/L	0.50	92	70	130			
Naphthalene		3.64	ug/L	0.50	73	70	130			
n-Propylbenzene		5.56	ug/L	0.50	111	70	130			
Styrene		5.64	ug/L	0.50	113	70	130			
1,1,1,2-Tetrachloroethane		5.44	ug/L	0.50	109	70	130			
1,1,2,2-Tetrachloroethane		4.92	ug/L	0.50	98	70	130			
Tetrachloroethene		6.40	ug/L	0.50	128	70	130			
Toluene		5.87	ug/L	0.50	117	70	130			
1,2,3-Trichlorobenzene		4.06	ug/L	0.50	81	70	130			
1,2,4-Trichlorobenzene		4.01	ug/L	0.50	80	70	130			
1,1,1-Trichloroethane		5.10	ug/L	0.50	102	70	130			
1,1,2-Trichloroethane		5.40	ug/L	0.50	108	70	130			
Trichloroethene		5.84	ug/L	0.50	117	70	130			
Trichlorofluoromethane		4.64	ug/L	0.50	93	70	130			
1,2,3-Trichloropropane		4.79	ug/L	0.50	96	70	130			
1,2,4-Trimethylbenzene		5.19	ug/L	0.50	104	70	130			
1,3,5-Trimethylbenzene		5.24	ug/L	0.50	105	70	130			
Vinyl chloride		4.91	ug/L	0.50	98	70	130			
m+p-Xylenes		11.9	ug/L	0.50	119	70	130			
o-Xylene		5.75	ug/L	0.50	115	70	130			
Trihalomethanes, Total		21.6	ug/L	0.50	108	70	130			
Xylenes, Total		17.7	ug/L	0.50	118	70	130			
Surr: p-Bromofluorobenzene				0.50	101	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	86	70	130			
Surr: Toluene-d8				0.50	111	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R174957
Lab ID: 20-May-22_MBLK_4	65	Method Blank				Run: 5973MSD_220520A				05/20/22 12:39
Benzene		ND	ug/L	0.50						
Bromobenzene		ND	ug/L	0.50						
Bromochloromethane		ND	ug/L	0.50						
Bromodichloromethane		ND	ug/L	0.50						
Bromoform		ND	ug/L	0.50						
Bromomethane		ND	ug/L	0.50						
n-Butylbenzene		ND	ug/L	0.50						
sec-Butylbenzene		ND	ug/L	0.50						
tert-Butylbenzene		ND	ug/L	0.50						
Carbon tetrachloride		ND	ug/L	0.50						
1,2-Dichloroethane		ND	ug/L	0.50						
Chlorobenzene		ND	ug/L	0.50						
Chlorodibromomethane		ND	ug/L	0.50						
Chloroethane		ND	ug/L	0.50						
Chloroform		ND	ug/L	0.50						
Chloromethane		ND	ug/L	0.50						
2-Chlorotoluene		ND	ug/L	0.50						
4-Chlorotoluene		ND	ug/L	0.50						
1,2-Dibromo-3-chloropropane		ND	ug/L	1.0						
Dibromomethane		ND	ug/L	0.50						
1,2-Dichlorobenzene		ND	ug/L	0.50						
1,3-Dichlorobenzene		ND	ug/L	0.50						
1,4-Dichlorobenzene		ND	ug/L	0.50						
Dichlorodifluoromethane		ND	ug/L	0.50						
1,1-Dichloroethane		ND	ug/L	0.50						
1,2-Dibromoethane		ND	ug/L	0.50						
1,1-Dichloroethene		ND	ug/L	0.50						
cis-1,2-Dichloroethene		ND	ug/L	0.50						
trans-1,2-Dichloroethene		ND	ug/L	0.50						
1,2-Dichloropropane		ND	ug/L	0.50						
1,3-Dichloropropane		ND	ug/L	0.50						
2,2-Dichloropropane		ND	ug/L	0.50						
1,1-Dichloropropene		ND	ug/L	0.50						
cis-1,3-Dichloropropene		ND	ug/L	0.50						
trans-1,3-Dichloropropene		ND	ug/L	0.50						
Ethylbenzene		ND	ug/L	0.50						
Hexachlorobutadiene		ND	ug/L	0.50						
Isopropylbenzene		ND	ug/L	0.50						
p-Isopropyltoluene		ND	ug/L	0.50						
Methyl tert-butyl ether (MTBE)		ND	ug/L	0.50						
Methylene chloride		ND	ug/L	0.50						
Naphthalene		ND	ug/L	0.50						
n-Propylbenzene		ND	ug/L	0.50						
Styrene		ND	ug/L	0.50						
1,1,1,2-Tetrachloroethane		ND	ug/L	0.50						

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: City of Lander **Work Order:** C22050638 **Report Date:** 05/28/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E524.2										Batch: R174957
Lab ID: 20-May-22_MBLK_4	65	Method Blank				Run: 5973MSD_220520A				05/20/22 12:39
1,1,2,2-Tetrachloroethane		ND	ug/L	0.50						
Tetrachloroethene		ND	ug/L	0.50						
Toluene		ND	ug/L	0.50						
1,2,3-Trichlorobenzene		ND	ug/L	0.50						
1,2,4-Trichlorobenzene		ND	ug/L	0.50						
1,1,1-Trichloroethane		ND	ug/L	0.50						
1,1,2-Trichloroethane		ND	ug/L	0.50						
Trichloroethene		ND	ug/L	0.50						
Trichlorofluoromethane		ND	ug/L	0.50						
1,2,3-Trichloropropane		ND	ug/L	0.50						
1,2,4-Trimethylbenzene		ND	ug/L	0.50						
1,3,5-Trimethylbenzene		ND	ug/L	0.50						
Vinyl chloride		ND	ug/L	0.50						
m+p-Xylenes		ND	ug/L	0.50						
o-Xylene		ND	ug/L	0.50						
Trihalomethanes, Total		ND	ug/L	0.50						
Xylenes, Total		ND	ug/L	0.50						
Surr: p-Bromofluorobenzene				0.50	105	70	130			
Surr: 1,2-Dichloroethane-d4				0.50	97	70	130			
Surr: Toluene-d8				0.50	105	70	130			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

City of Lander C22050638

Login completed by:	Kirsten L. Smith	Date Received:	5/16/2022
Reviewed by:	Misty Stephens	Received by:	lmc
Reviewed Date:	5/18/2022	Carrier name:	Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	12.3°C On Ice - From Field		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

Samples were assigned the earliest collection time for the requested analysis in order to evaluate the holding time.

The trip blank sample was assigned the earliest collection time for the requested analysis in order to evaluate the holding time. 5/17/2022-KS

ENERGY LABORATORIES
Trust our People. Trust our Data.

Chain of Custody & Analytical Request Record

www.energylab.com

Page 1 of 2

Account Information (Billing Information)

Company/Name	City of Lander
Contact	Shane White
Phone	(307) 332-4291
Mailing Address	240 Lincoln St
City, State, Zip	Lander, WY 82520
Email	swhite@landerwyoming.org
Receive Invoice ☐Hard Copy ☒Email	Receive Report ☐Hard Copy ☒Email
Purchase Order	Quote / Bottle Order

Report Information (If different than Account Information)

Company/Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Report ☐Hard Copy ☐Email	
Special Report/Formats: ☐ LEVEL IV ☐ NELAC ☐ EDD/EDT (contact laboratory) ☐ Other ______	

Comments

Project Information

Project Name, PWSID, Permit, etc.	WY5600176c
Sampler Name Shane White	Sampler Phone (307) 332-4291
Sample Origin State WY	EPA/State Compliance ☒ Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type.
☐ NOT Source or Byproduct Material
☐ Source/Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11e.(2) Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Analysis Requested

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Metals by ICP/ICPMS Mercury	Cyanide	Anions by Ion Chromatography	Nitrogen, Nitrate + Nitrite	Purgable Organics						See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	SPO1 CLearwell	5/16/22	7:35	1	DW	X												C22051038
2	SPO1 Clearwell	5/16/22	7:41	1	DW		X											
3	Spo1 Clearwell	5/16/22	8:01	1	DW			X										
4	SPO1 Clearwell	5/16/22	7:45	1	DW				X									
5	SPO1 Clearwell	5/16/22	7:52	3	DW					X								
6																		
7																		
8																		
9																		
10																		

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Shane White	5/16/22 8:15	[signature]			
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print) [illegible]	Date/Time 5/16/22 432	Signature [signature]

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
		Y N C B	Y N	12.3 °C	Y N	Y N	CC Cash Check ____	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-10/18 v.3

BOTTLE ORDER 69005

SHIPPED TO: **City of Lander**

Contact: Shane White
240 Lincoln St.
Lander WY 82520-
Phone: (307) 332-4291
Project: IOC/VOC/N+N/Rads

Order Created by: Misty Stephens
Shipped From: Casper, WY
Ship Date: 2/25/2022
VIA: Ground

Bottle Size/Type	Bottles Per Samp	Method	Tests	Critical Hold Time	Preservative	Notes	Num of Samp
IOC/VOC/N+N							
250 mL Plastic	1	E200.7_8 E245.1	Metals by ICP/ICPMS, Drinking Water Mercury, Drinking Water		HNO3		1
500 mL Amber Plastic	1	Kelada-01	Cyanide, SDWA		NaOH		1
250 mL Plastic	1	E300.0	Anions by Ion Chromatography				1
40 mL Clear Glass VOA	3	E524.2	524-Purgeable Organics, SDWA		HCL AA	Do Not Rinse - Container is pre-preserved. . Zero Headspace.	1
250 mL Plastic	1	E353.2	Nitrogen, Nitrate + Nitrite		H2SO4		1
VOC 524 Trip Blank							
40 mL Clear Glass VOA	1	E524.2	524-Purgeable Organics, SDWA		HCL		1

DW Rads							
1 Gallon Plastic	1	RA-05 E903.0 A7500-RA	Radium 228, Total Radium 226, Total Radium 226 + Radium 228		☐ HNO3		1
500 mL Plastic	1	E900.0	Gross Alpha, Gross Beta, Total		☐ HNO3		1
250 mL Plastic	1	E200.7_8	Metals by ICP/ICPMS, Drinking Water		■ HNO3		1

☐ HNO3 - Nitric Acid ☐ H2SO4 - Sulfuric Acid ■ NaOH - Sodium Hydroxide

■ ZnAc - Zinc Acetate ■ HCl - Hydrochloric Acid ☐ H3PO4 - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

BO#: 69005

Appendix C

Worthen Meadows Reservoir Memo – Evaluation of Fill Likelihood of Reservoir Expansion

Worthen Meadows Reservoir

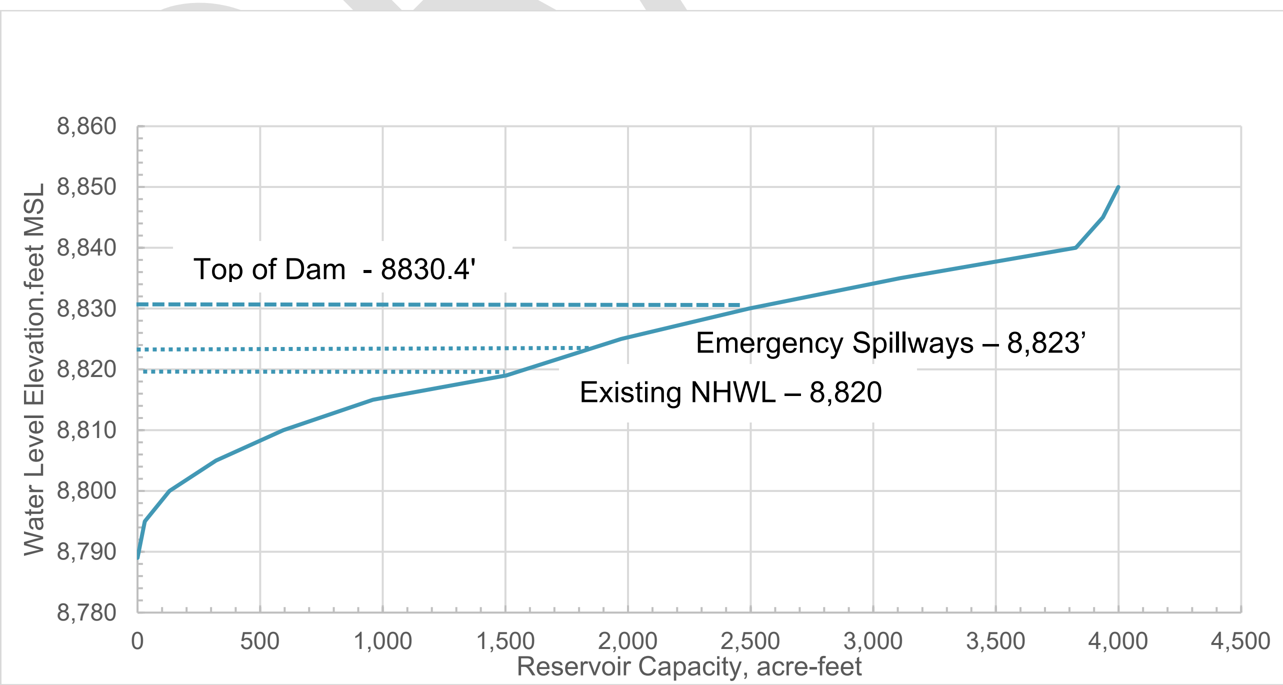
- Evaluation of Fill Likelihood of Reservoir Expansion

Purpose

Using the model developed by WWC Engineering (Model) for water accounting and the information presented in the Technical Memorandum titled *Worthen Meadows Reservoir Reliability* (WWDC, October 2020), HDR evaluated modelled behavior of the Worthen Meadows Reservoir (Worthen) for the period of record and inferred data from 1955 to current. The model was presented as a monthly time step water balance for the system of drainages that feed into Worthen, Frye Reservoir (Frye) and associated downstream drainage of the Middle Popo Agie. The primary goal of the HDR investigation was to determine the fill likelihood of a range of reservoir expansions.

For the purposes of this evaluation the targeted minimum reservoir pool volume for recreation and environmental purposes is 750 acre-feet. Currently Worthen has a maximum storage volume of 1,503.6 acre-feet as illustrated in the stage-to-storage curve in Figure 1.0. The existing normal high-water line is 8,820', two emergency spillway crests at 8,823' and existing top of dam is 8,830.4'.

Figure 1.0**: Worthen Meadow Reservoir - Stage to Storage Curve**



Summary

Based on these ranges for initial operation, the target filling years percentage was evaluated by testing the Model using different reservoir enlargements for the period of record of the model and its data. A filling year being defined by a year having at least one month where Worthen fills to maximum active storage.

Evaluation of the model was done by making modifications to the inputs of the model such that the reservoir volume could be set as a variable quantity. This allowed the model to be evaluated. at a range of enlargement sizes with a 78-97% likelihood of filling each year.

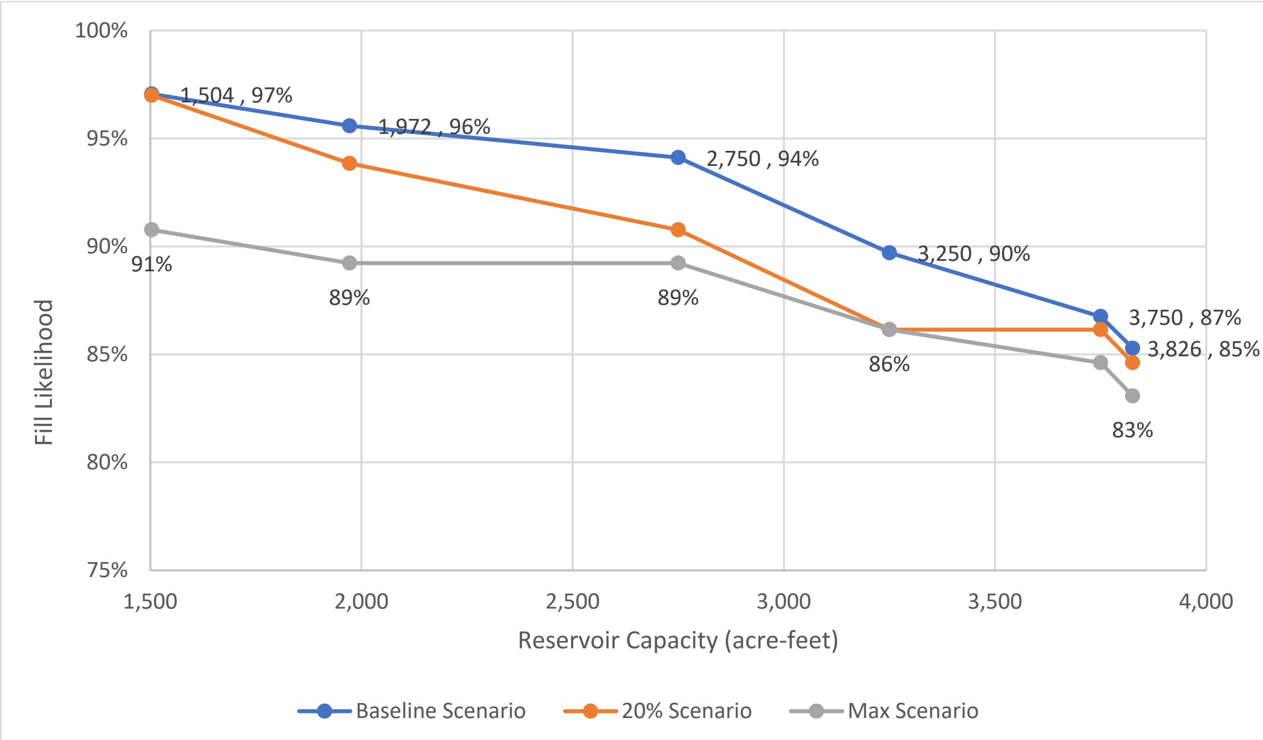
For potential reservoir enlargement sizes the necessary dam raise was estimated. The stage-storage data for the existing dam was obtained from the Wyoming State Engineer's Office (Table A.1). HDR developed an extension of the stage-storage curve above the Worthen's existing normal high water line (NHWL) of 8820'. The GIS analysis relied upon the USGS 10 Meter Digital Elevation Model (DEM) for existing ground elevations. An estimated maximum dam raise to 8840' or approximately 20 feet above the existing dam height provides for a total storage capacity of approximately 3,826 acre feet. Any dam raises above this elevation was found to be less effective at increasing reservoir storage capacity due to much steeper topography.

Evaluation of each storage volume was performed using an iterative process to calculate the percentage of years across the Model's database. This considered the volume of the reservoir with outputs being registered for the number of years in which the reservoir was filled to the enlargement volume. The results of this process produced figures and tables. Evaluation was performed on three scenarios; baseline with estimated historical releases to meet Lander's municipal water needs, 20% increase of releases to serve growing downstream uses, and 60% increase in releases to meet an estimated maximum growth in downstream demands. For each of these release and demand scenarios the likelihood of filling during release years was determined based on the period of record for the model.

For each of the evaluated scenarios the likelihood of filling the reservoir to the enlarged reservoir capacity was evaluated based on the years of reservoir releases to meet downstream demands. These years were counted as filling years. The percentage of these years compared against the total number of years produced a percentage for filling years. This value is taken as the likelihood percentage for filling Worthen to the given target volume across the years of the model.

$$Fill\ Likelihood\ Percentage = \frac{\Sigma(years\ filled)}{\Sigma(model\ years)} * 100$$

Figure 2.0: **Fill Likelihood for Worthen Meadows Enlargements**



The following table indicates the range of volumes for which fill conditions can be met under varying demand scenarios.

Table 1.0: **Capacity and Estimated Fill Likelihood of Worthen Meadows Enlargements**

Reservoir NHWL (ft MSL)	**Worthen Meadows Capacity** (acre-feet)	**Enlargement Capacity (acre Feet)**	**Baseline Scenario**	**20% Demand Increase Scenario**	**60% Max Demand Increase Scenario**
8820.0	1,504		97%	97%	91%
8825.0	1,972	468	96%	94%	89%
8832.0	2,750	1,246	94%	91%	89%
8836.0	3,250	1,746	90%	86%	86%
8839.5	3,750	2,246	87%	86%	85%
8840.0	3,826	2,322	85%	85%	83%

For each of these enlargement sizes the minimum reservoir volume was estimated during the modeled period of record. If the estimated release reduced the storage volume to less than the dead storage of 30 acre-feet, the predicted release volume was reduced to maintain a minimum of 30 acre feet in Worthen.

The scenario reservoir level operations for the existing reservoir are illustrated under baseline, 20 percent increase and maximum 60 percent increase scenarios are within Figures 3.0, 3.1, and 3.2, respectively. The five foot and 20-foot enlargement scenarios are illustrated in Figures 4.0, 4.1, 4.2, and 5.0, 5.1, and 5.2, respectively.

For the baseline scenario the reservoir capacity dipped below 750 acre-feet in 1956, 1959, and 1960 with a minimum capacity of 585 acre in 1956. Increasing the demands by 20 percent and 60 percent caused low water levels in nine (9) and eleven (11) years; respectively. The 20 percent demand scenario exhibited five (5) consecutive low water level years beginning in 1955 with dead pool elevations in 1959. The other four (4) low years were 1989, 2002, 2003, and 2013. For the 60 percent increase the same five (5) consecutive years in the 1960's experienced low water with dead pool elevations in 1955, 1956, and 1959. For the five and 20-foot enlargement scenarios the occurrence of low water elevations are significantly reduced under both the 20 and 60 percent demand scenarios with only two occurrences of dead pool elevations remaining in the 1950's under the 60 percent demands.

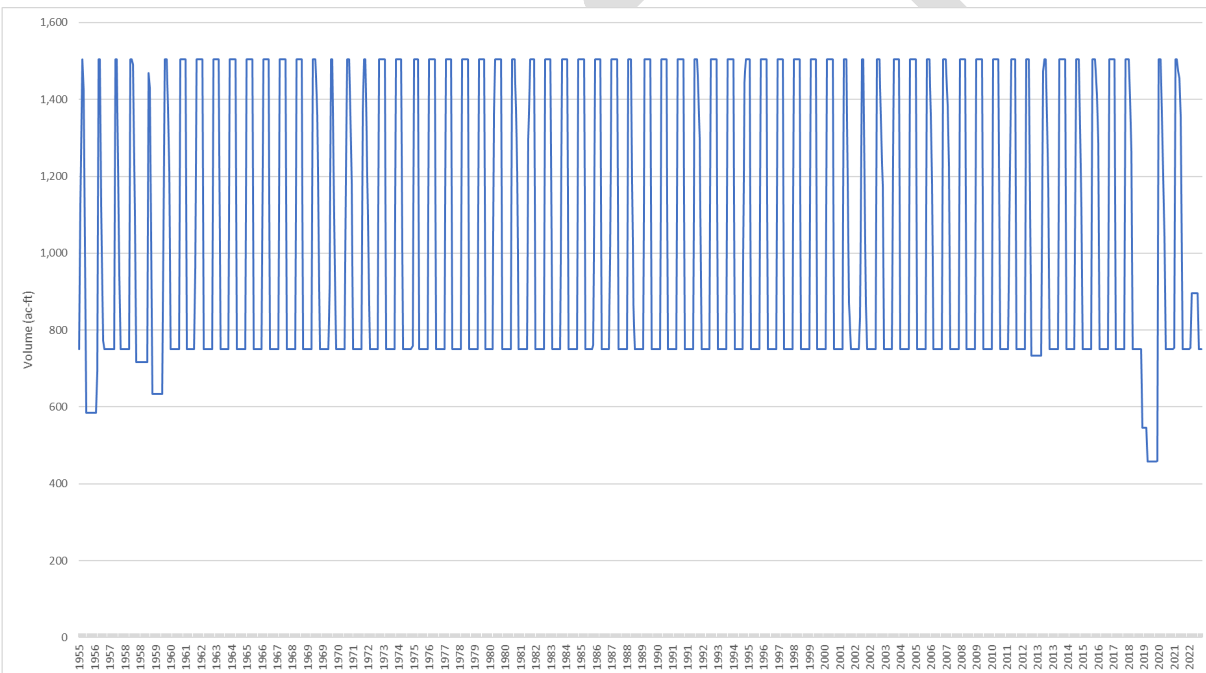


Figure 3.0, Worthen Storage under Baseline Scenario

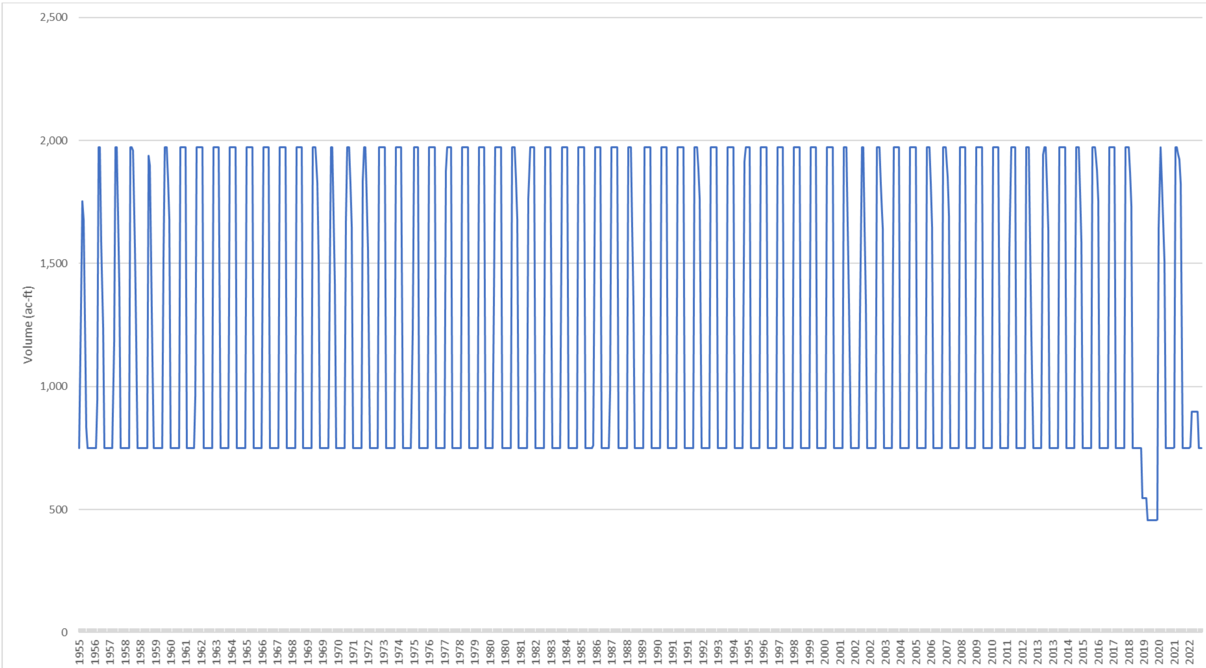


Figure 3.1, Worthen Storage under Baseline Scenario (+5 feet dam expansion)

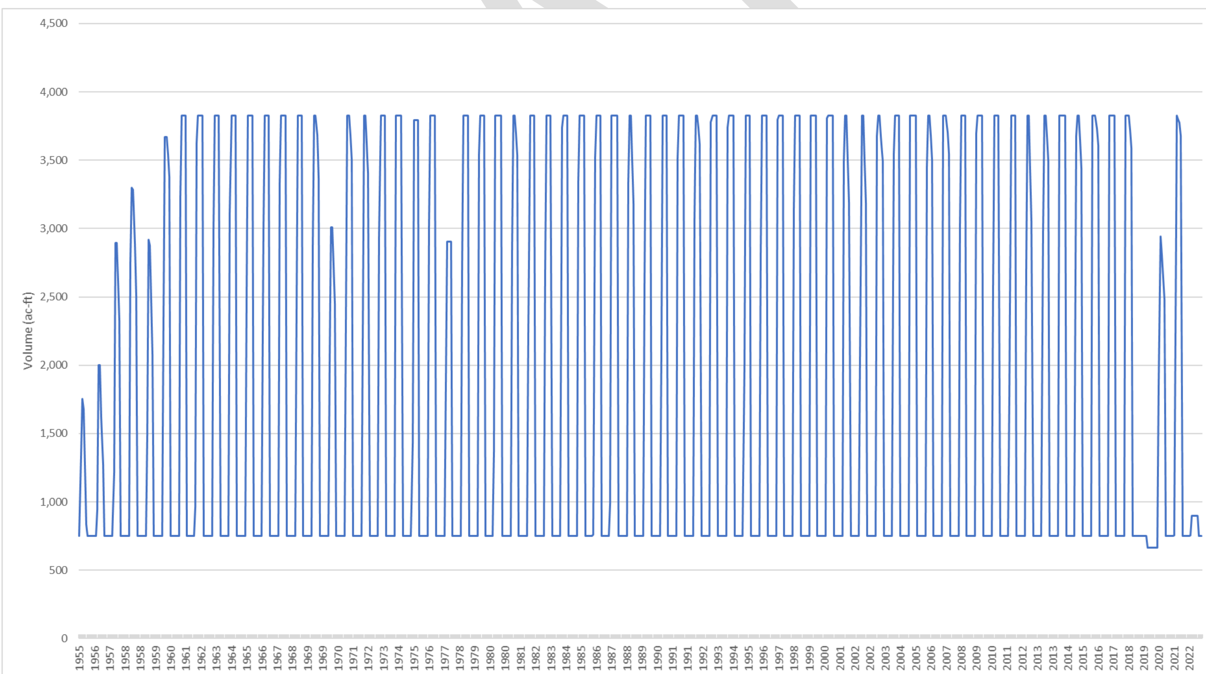


Figure 3.2, Worthen Storage under Baseline Scenario (+20 feet dam expansion)

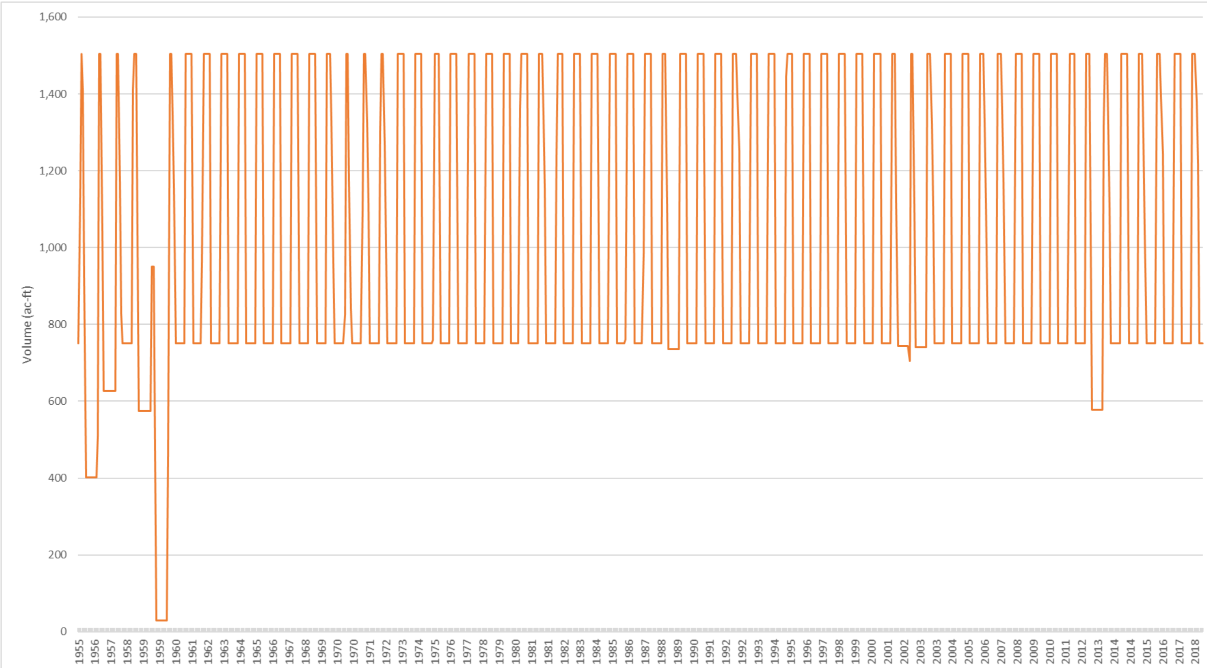


Figure 4.0 Worthen Storage under 20 percent demand increase Scenario

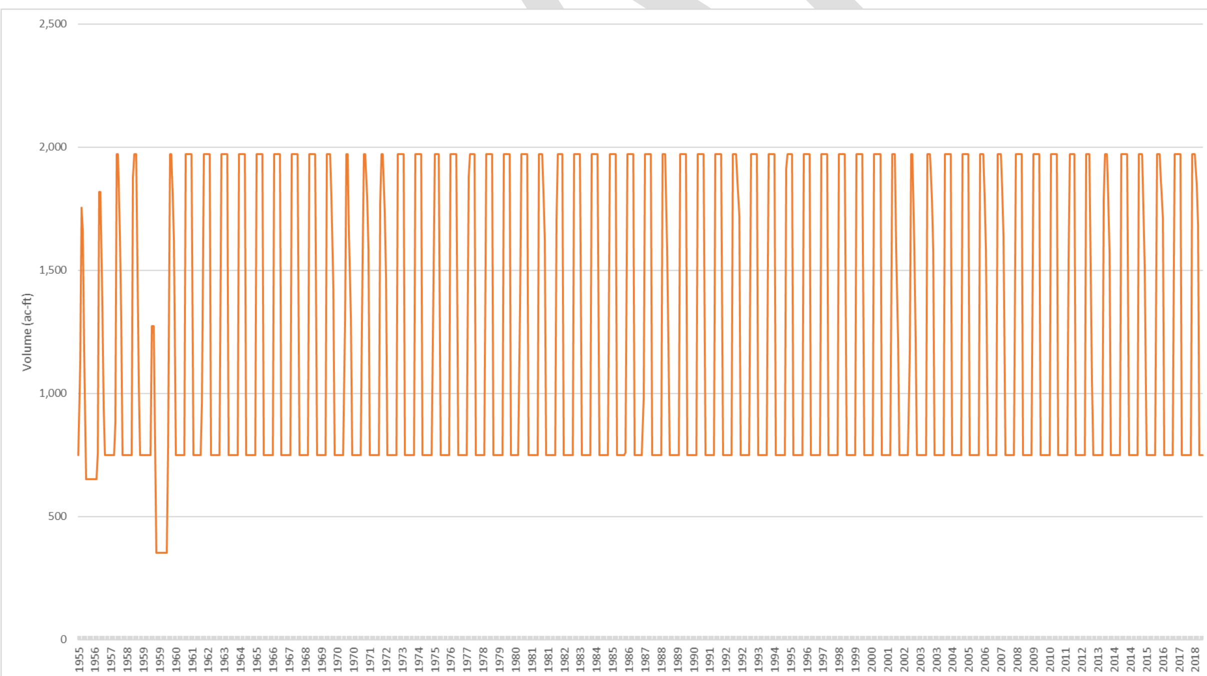


Figure 4.1 Worthen Storage under 20 percent demand increase Scenario (+5 feet dam expansion)

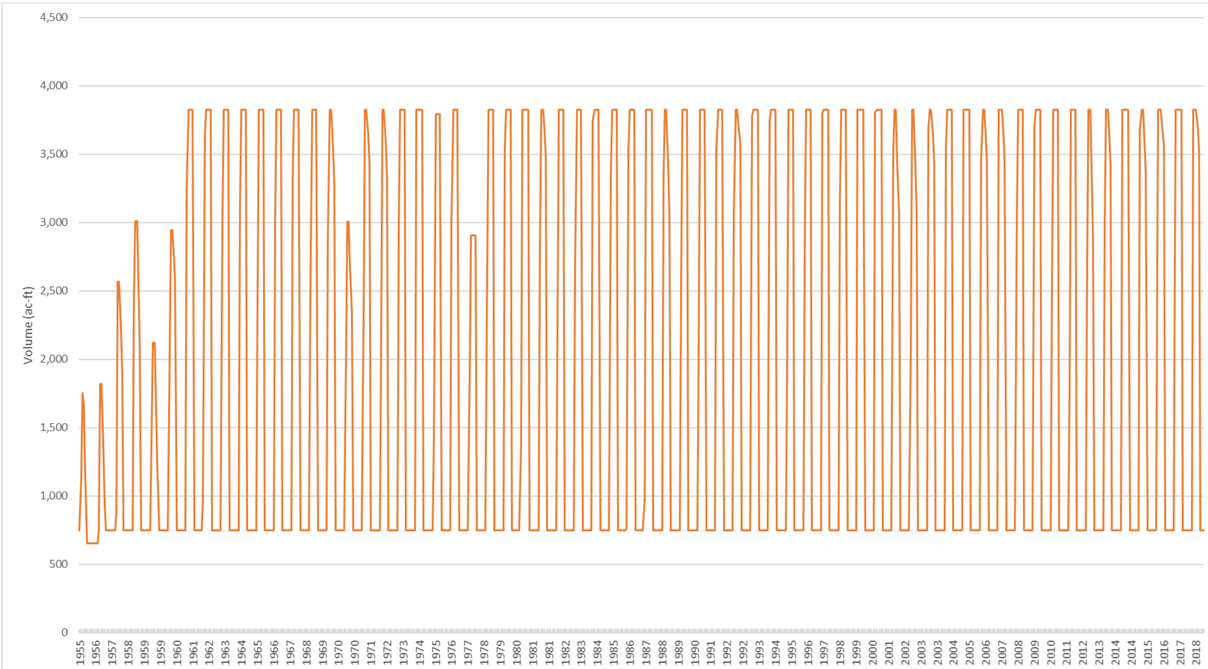


Figure 4.2 Worthen Storage under 20 percent demand increase Scenario (+20 feet dam expansion)

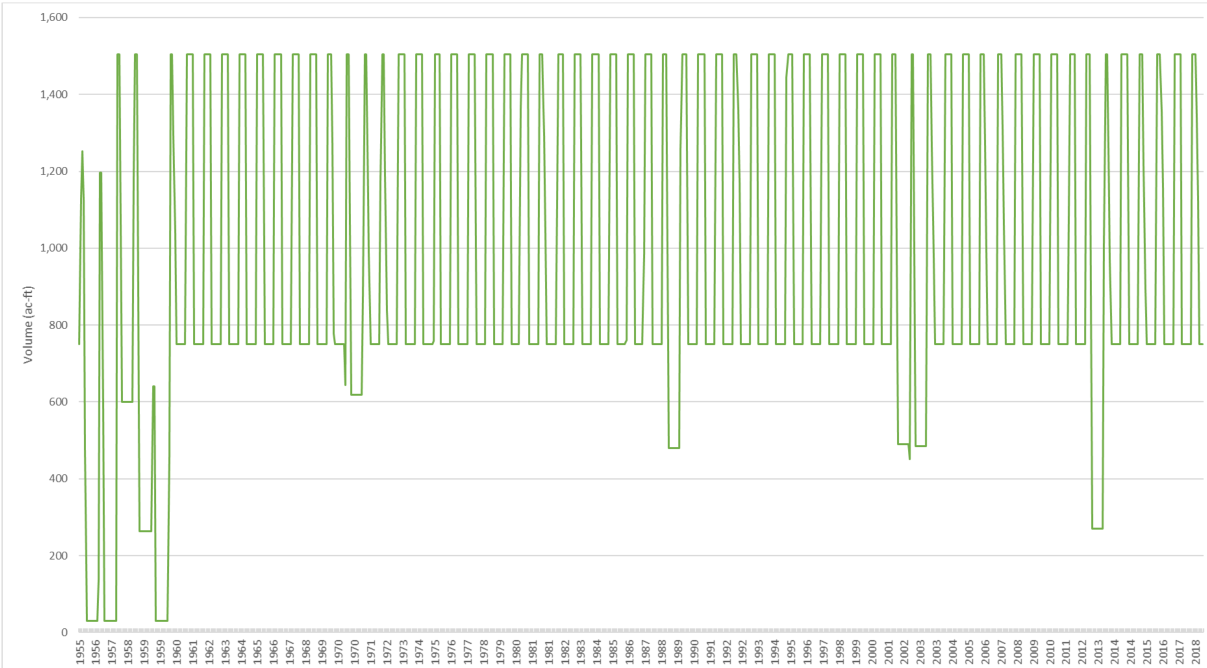


Figure 5.0 Worthen Storage under 60 percent demand increase Scenario

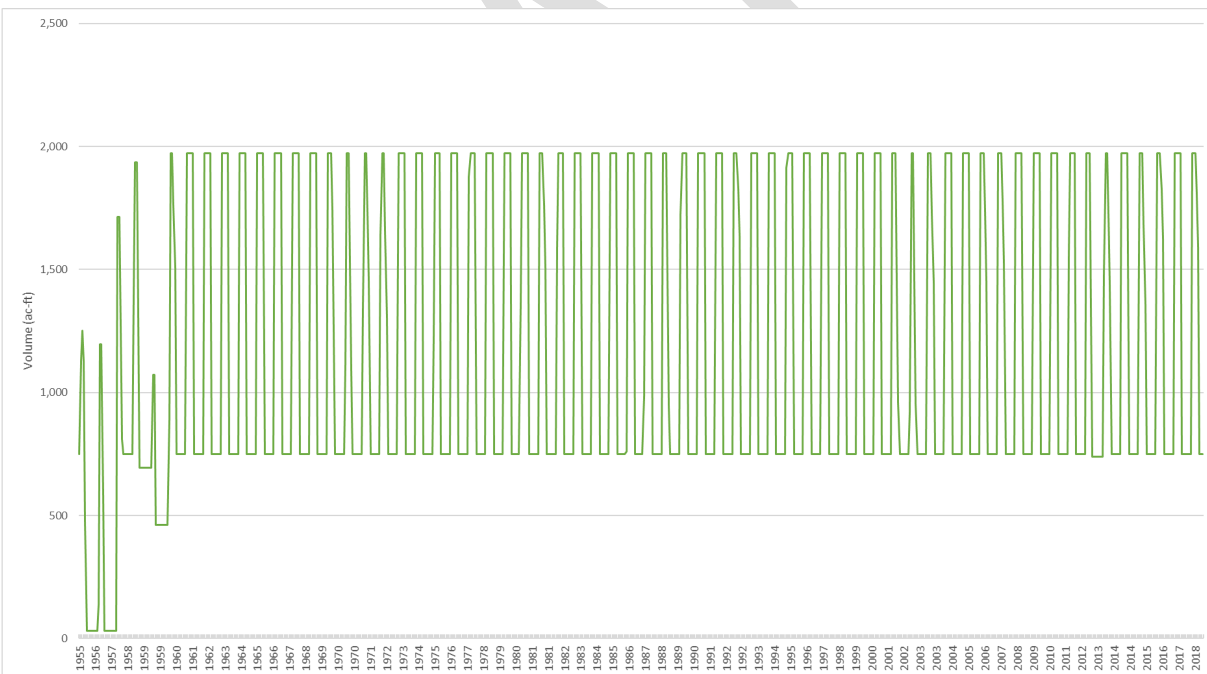


Figure 5.1 Worthen Storage under 60 percent demand increase Scenario (+5 feet dam expansion)

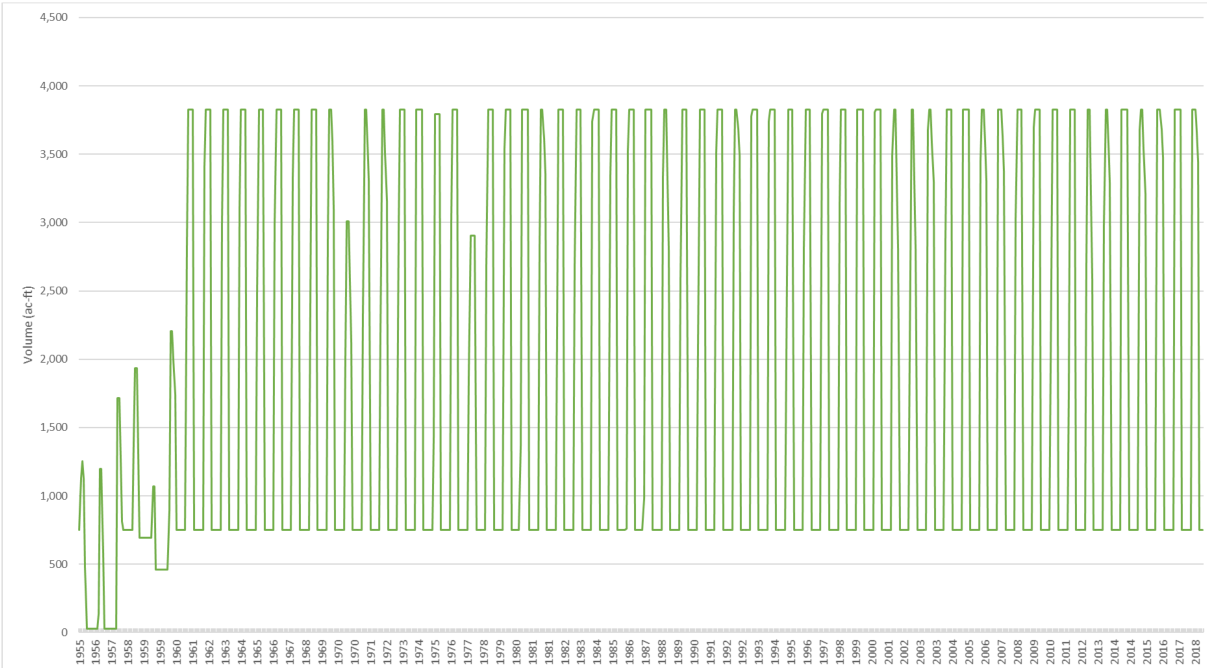


Figure 5.2 Worthen Storage under 60 percent demand increase Scenario (+20 feet dam expansion)

The modeled reservoir releases which were reduced during the dead storage years in the late 1950's. A review of the statistics of the release amounts helps to estimate water supplies available during future periods of Middle Popo Agie administration.

The statistics of the simulated reservoir releases under baseline, 120 percent baseline, and 160 percent are an average of 473 acre feet, 581 acre feet, and 736 acre feet respectively. The estimated release rate amounts for release periods range from 5.3 cfs and 5.9 cfs for 40 and 50-day releases periods to 6.2 cfs for the maximum release amount over a 60-day period. The 80th percentile exceedance values for the actual release years range from 278 to 465 acre feet and maximum release amounts range from 919 to 1,261 acre feet.

Table 2.0**: Statistics of Worthen Reservoir Flow Releases**

Model Releases	**Baseline**	**120% Release**	**160% Release**
Average (acre-feet)	473	581	736
CFS	5.3	5.9	6.2
Days of Release	45	50	60
80th Percentile Exceedance (acre-feet)	278	349	465
Max (acre-feet)	919	1,103	1,261

Recommendations:

A conclusion from this preliminary enlargement analysis is that the natural runoff of the watershed of Worthen Meadows Reservoir is adequate to meet water needs of a reservoir enlargement based on the likelihood of filling over the 63-year period of record. This preliminary analysis indicates a twenty-foot dam raise allows for releases up to 736 acre feet on average and 465 acre feet in 8 out of 10 years over a 60-day release period in the late summer and early fall. A more modest dam raise of only five feet is expected to increase average releases from 473 to 581 acre feet based on a 45-day and 50-day release period, respectively, in the late summer months.

An enlargement of Worthen Meadows with separate storage allocations to meet irrigation, environmental/fishery and municipal uses is a long-term water supply alternative for serving future water needs of the City of Lander and the Middle Popo Agie watershed. Any water storage dedicated specifically to meet instream uses within the watershed would need to be owned by the State of Wyoming under Wyoming's current Instream Flow Laws. To obtain instream flow rights, the Wyoming Game and Fish Department completes the filing process for the State of Wyoming and helps to administer this storage that is protected and conveyed to the critical reach of the river identified as the place of use.

A stakeholder group focused on water conservation and water quality is very active in the community. The Healthy Rivers Initiative (HRI) is led by Popo Agie Conservation District. The organization has regular monthly meetings that is well attended by government agency individuals as well as local irrigators. The working group formed in 2016 helps to strategize and build upon past efforts while working towards the long-term solution of improving water quality and quantity (Popo Agie Conseration District, 2021).

- Based on this review, the recommended next step to advance the analysis of a reservoir enlargement, with a Wyoming Water Development Commission (WWDC) application request to conduct a Level II study for the feasibility review of an enlargement and an alternatives analysis of increased storage in the Popo Agie watershed.

- Another recommendation is for the City to request a formal conveyance loss determination from the Wyoming State Engineer's Office for releases from Worthen Meadows Reservoir. In the past the WSEO has not defined the percentage of loss for the water released from the Reservoir and diverted at the City's Pipeline. An analysis of measured releases and water flow measured at the City pipeline diversion from 2003 to 2018 estimated an average conveyance loss of 24% based on gage data (WWDC, 2020). Once a formal determination is obtained, the City and watershed entities can plan and evaluate the effects of a reservoir enlargement in meeting future long-term water supplies.

Limitation of Analysis

This analysis should be considered as a preliminary review of the likelihood of reservoir filling under the various enlargement scenarios. The time step of the spreadsheet model is one of the limitations that affects the analysis being performed. A more sophisticated model; such as, Statemod and StateCU, will provide for an improved watershed demand and shortage analysis; particularly for evaluating the downstream water demands to fill Fry Lake and to meet the storage and natural flows demands of the Enterprise Ditch and other irrigation ditch systems within the Middle Popo Agie watershed.

References

Anderson Consulting Engineers (ACE), Inc. July 9, 2003. Popo Agie River Watershed Study, Level 1. Prepared for Wyoming Water Development Commission.

Olsson, Nov. 15, 2019. Popo Agie Level I Phase II Watershed Study. Prepared for Wyoming Water Development Commission.

Popo Agie Conservation District. Healthy Rivers Initiative (HRI). Available on-line at: www.sites.google.com/view/popoagieconservationdistrict/home. Accessed September 2021.

Wyoming Groundwater, Hinckley Consulting and WWC Engineering, October 2020, October 2021. Lander Test Well Level II Study, Volumes 1 and 2 and Supplement.

Appendix A

Table A.1

			Worthen Meadows Reservoir								
						Rating for Total Storage (Acre-ft)					
RATING I	EXPANSION:Logrithmic STATUS: Provisional										
		Created by myron.smalley on 05/29/2013 @ 17:41:47 UTC									
	REMARKS: Spillway elevation is 8820 ft.										
Reservoir	Elevation (	Total Storage (Acre-		DIFF IN Q PER							
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
8795	30.00*	30.98	32	33.04	34.12	35.24	36.39	37.58	38.81	40.08	11.39
8796	41.39	42.75	44.15	45.59	47.08	48.62	50.22	51.86	53.55	55.31	15.73
8797	57.12	58.98	60.91	62.91	64.96	67.09	69.28	71.55	73.89	76.31	21.68
8798	78.8	81.38	84.04	86.79	89.63	92.56	95.59	98.72	101.9	105.3	29.9
8799	108.7	112.3	116	119.7	123.7	127.7	131.9	136.2	140.7	145.2	41.3
8800	150.0*	152.9	155.8	158.7	161.8	164.8	168	171.2	174.4	177.7	31.1
8801	181.1	184.6	188.1	191.7	195.3	199	202.8	206.7	210.6	214.6	37.6
8802	218.7	222.9	227.1	231.4	235.8	240.3	244.9	249.6	254.3	259.2	45.4
8803	264.1	269.1	274.2	279.4	284.8	290.2	295.7	301.3	307.1	312.9	54.8
8804	318.9	324.9	331.1	337.4	343.8	350.4	357	363.8	370.8	377.8	66.1
8805	385.0*	389.6	394.2	398.9	403.6	408.4	413.3	418.2	423.2	428.2	48.3
8806	433.3	438.4	443.6	448.9	454.3	459.7	465.1	470.6	476.2	481.9	54.3
8807	487.6	493.4	499.3	505.2	511.2	517.3	523.4	529.7	536	542.3	61.2
8808	548.8	555.3	561.9	568.6	575.3	582.2	589.1	596.1	603.2	610.3	68.8
8809	617.6	624.9	632.3	639.9	647.5	655.1	662.9	670.8	678.8	686.8	77.4
8810	695.0*	701	707.1	713.2	719.4	725.7	731.9	738.3	744.7	751.1	62.7
8811	757.7	764.2	770.9	777.5	784.3	791.1	797.9	804.8	811.8	818.9	68.3
8812	826	833.1	840.3	847.6	855	862.4	869.9	877.4	885	892.7	74.4
8813	900.4	908.2	916.1	924	932	940.1	948.2	956.5	964.8	973.1	81.2
8814	981.6	990.1	998.6	1007	1016	1025	1034	1043	1052	1061	88.4
8815	1070*	1077	1085	1093	1100	1108	1116	1124	1131	1139	77
8816	1147	1155	1163	1172	1180	1188	1196	1205	1213	1222	83
8817	1230	1239	1248	1256	1265	1274	1283	1292	1301	1310	89
8818	1319	1328	1338	1347	1357	1366	1376	1385	1395*	1404	94
8819	1413	1421	1430	1439	1448	1457	1466	1476	1485	1494	91
8820	1504*										
* indicates a rating descriptor point											
ID	Startin										
----	------------------------										
1	11/27/1957 00:00:00 UTC-06:00										

Appendix D

Worthen Meadows Water Rights

THE STATE OF WYOMING

Proof of Construction of Reservoir

(In accordance with the Laws of Wyoming, and Regulations of the State Board of Control.)

OK

116

109

PERMIT NO. 6365 E9 RES. DATE OF PRIORITY May 1, 1956

NAME OF RESERVOIR First Enlargement of Worthen Meadow (Permit No. 6186 Res.)

Source of Water Supply Roaring Fork Creek

Tributary of Big or Middle Fork of Popo Agie River, tributary of Little Wind River, tributary of Big Horn River

1. Name of Owner City of Lander, Wyoming
2. Address of Owner City Hall, 183 South 4th Street
3. Is Owner the Original Applicant for Permit No. Yes Res.? City of Lander

   If not, what evidence shows your interest in the works constructed under such permit?

4. When did construction of the reservoir begin? 29 July 1957
5. When was it completed? 1 Dec 1958
6. Was reservoir constructed to capacity set forth in permit? Yes
7. State area submerged when reservoir is filled to constructed capacity 92 Acres
8. State available storage capacity of reservoir as constructed (Enlargement: 108.6 Acre-Feet) 1503.6 Acre-Feet Capacity covered by this Enl. = 108.6 Acre Feet

   Use this E.

9. Was reservoir constructed according to terms of permit and plans on file in the State Engineer's Office? Yes

   If not, state exceptions

10. Has water been stored in reservoir each year since its completion? Yes

    If not, state exceptions

11. Give location of reservoir, Subdivision ~~N. 82° W. a distance of 1026 feet from E¼ Corner,~~ In SE¼ NE¼

    Sec. 32 T. 32 N. R. 101 W.

12. Are there any dependent secondary permits? No. If so, give permit numbers
13. State beneficial use for which water is stored Municipal
14. If reservoir is not located on stream, give name of stream and supply ditch

    Permit No.

15. Give name of County in which reservoir is located Fremont

THE STATE OF WYOMING,
County of Fremont } ss.

I, Clinton Dunning, being first duly sworn, do depose and say that I have read the above and foregoing proof of construction of reservoir; that I know the contents thereof; and that the facts stated therein are true.

In Witness Whereof, I have hereunto set my hand this 18 day of January, 1968.

We hereby state that the above statements are correct to the best of our knowledge and belief.

Orren J. Bower
Orren J. Bower
City Engineer

Clinton Dunning
Mayor, City of Lander

Subscribed and sworn to before me this 18 day of January, 1968.

Dunnell Barnes
Superintendent, Water Division No. 3

(Party submitting proof must show his authority to represent entire ownership in reservoir by documentary evidence or power-of-attorney.)

REPORT OF SUPERINTENDENT

THE STATE OF WYOMING, } ss.
County of ______

I, ______, Superintendent of Water Division No. ______, hereby certify:

That on the ______ day of ______, 19____, I made an inspection of the ______ Reservoir, constructed under authority of Permit No. ______ Res., and found the dimensions as follows:

Length of dam 1137 feet,

Width of dam on top 20 feet,

Maximum height of dam 46 feet,

Slope of face 3 to one,

Slope of back 2 to one.

Method of protection from waves Rock Rip-Rap 18" Thick covering the entire upstream face

Difference in elevation between bottom of spillway and top of dam (freeboard) 7.0 feet.

Effective width of spillway 30.0 feet.

REMARKS: ______

Kenneth Bauer
Superintendent Water Division No. 3

28636

JUN 30 '72

MICROFILMED

RESERVOIR

Proof of Construction

Permit No. 6365 Res.

Division No. 3 District No. 1

First Enl. Worthen Medow
Reservoir

May 1, 1956
Date of Priority

Roaring Fork Creek, Trib. Big Popo Agie River
Name of Stream

Little Wind River, Trib. Big Horn River
Tributary of

City of Lander
Name of Owner

City Hall, 183 S. 4th Street
Lander, Wyo. P. O.

Filed with me this 18 day of Jan 1968
Kenneth Bauer
Superintendent.

Fees Paid $ 5.00

Filed in the office of the State Board of Control this 24 day of Jan 1968
[signature]
Ex-officio Secretary State Board of Control.

Fees Paid $ 2.00 Rec 5307

THE MILLS COMPANY, SHERIDAN

SEO-2646

Form S.W. 3
Rev. 5/4/2010

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.

STATE OF WYOMING

07-16-10 RCVD 0130

SCANNED JUL 30 2010

OFFICE OF THE STATE ENGINEER

APPLICATION FOR PERMIT TO APPROPRIATE SURFACE WATER

cwright

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

Filing/Priority Date

THE STATE OF WYOMING } SS.
STATE ENGINEER'S OFFICE

This instrument was received and filed for record on the 16 day of July, 20 10, at 1:30 o'clock P M.

John R. Barnes for
State Engineer

Recorded in Book 71 of Reservoir Permits, on Page 69

Fee Paid $ 50.00 Map Filed E-9

WATER DIVISION NO. 3 DISTRICT NO. 1 TEMPORARY FILING NO. 35 5/84

S. O. D. PERMIT NO. 13619 RESERVOIR
E-~~29~~9

NAME OF FACILITY

THE Enl. Worthen Meadow (Permit # 6186R) RESERVOIR

1. Name(s), mailing address and phone no. of applicant(s) is/are City of Lander
240 Lincoln Street, Lander, WY 82520
(307) 332-2870
E-mail address:
(if more than one applicant, designate one to act as Agent for the others)

2. Name & address of agent to receive correspondence and notices Robin Griffin - City of Lander
240 Lincoln Street, Lander, WY 82520
E-mail address: landercity@wyoming.com

3. The use to which the water is to be applied is Irrigation (Enl. for use only no physical enlargement)
(a) If more than one beneficial use of water is applied for, the reservoir capacity must be allocated in acre-feet to the various uses:

Active Capacity	Inactive Capacity
1395 ac-ft	

(b) The area of the high water line of the reservoir is 92 (Record) acres.
(c) The total available capacity of the reservoir is 1395 (Record) acre-feet.
(d) If enlargement, the capacity of this enlargement is 0 acre-feet.

4. The source of the proposed appropriation is Roaring Fork ~~Creek~~, trib. Big or Middle Fk. Popo Agie Rv., trib. Little Wind Rv., trib. Big Horn Rv., trib. Yellowstone Rv. cw

5. The outlet of the proposed reservoir is located N 82° W 1026 feet distant from the E¼ corner of Section 32 T. 32 N., R. 101 W., and is in the SE¼NE¼ of Section 32 ori sur T. 32 N., R. 101 W. Lot Block Subdivision Name
Latitude (Decimal Degrees) 42.70139 N 42°42' 3.47" Longitude (Decimal Degrees) 108.91934 W 108°55' 5.76

6. Are any of the lands covered by the proposed reservoir owned by the State or Federal government? If so, describe lands and designate whether State or Federally owned. Lands are Federally owned - Forest Service

7. Fill out for either (a) or (b):
(a) The reservoir is located in the channel of Roaring Fork ~~Creek~~ cw
(b) The reservoir is to be filled through the -
Canal which has a carrying capacity of - cubic feet per second (c.f.s.)

8. (a) The dam is to be constructed as follows: Previously Constructed
contents = cubic yards.
(b) The water face of the dam is to be protected from wave action in the following manner:
(c) The dam height, as measured by the dam crest elevation minus the lowest downstream toe elevation is 46 feet.

Permit No. 13619 Res.   Page No. 69 (Leave Blank)

9. The estimated time required for completion of construction is Existing.

10. The accompanying map is prepared in accordance with the State Engineer's Rules and Regulations for filing applications and is hereby declared a part of this application. The State Engineer may require the filing of detailed construction plans.

REMARKS

The intent of this application is the addition of irrigation as a use for Permit # 6186R to aid in the approval of an exchange petition. No physical change or enlargement is proposed for the reservoir or dam.

We request that the current permit map be used for this Enlargement application.

Height of Dam based on P6365R

NOTICE

A copy of the Rules and Regulations manual for filing applications will be furnished by the State Engineer's Office upon request.

This application (on 24 lb., 25% cotton bond paper, top-bound) must be accompanied by the required map, prepared in accordance with the instructions contained in the manual and by the required filing fee. All applications and maps are reviewed by the State Engineer's Office to assure compliance with both the Rules and Regulations by the applicant, the professional engineer or land surveyor.

This application is not your authority to begin construction work. You can commence work only after a permit is approved by the State Engineer.

CONSENT TO ENLARGE (if applicable)

Consent to Enlarge must be requested from all owners of reservoirs described in existing water rights, permits or applications for permits for the facility to be enlarged before the State Engineer will consider approval of the application. Where the reservoir operator is an incorporated company or irrigation district, consent may be made on behalf of the individual owners by that entity where the consent is an excerpt of meeting minutes showing approval and authority for the individual signing for the company or district to act in such capacity. Consent to Enlarge Reservoir forms are available on the State Engineer's website or may be obtained from the State Engineer's Office.

I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

Karen Bright — 7-16-2010

Printed Name and Signature of Applicant or Agent — Date

THE STATE OF WYOMING } ss.
STATE ENGINEER'S OFFICE

TEMPORARY FILING NO. 35 5/84

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This permit grants only the right to use the water available in the stream after all prior rights are satisfied.

This permit is granted to add the use of irrigation to 1395 acre-feet of water stored under Permit No. 6186R, no additional storage of water is granted under this permit.

This permit is conditioned on the holder of this permit securing and/or providing free and unencumbered access to this reservoir site to allow State Engineer personnel to perform their duties as prescribed by Law. These duties include, but are not limited to, construction inspections and water administration.

~~This permit is granted subject to the terms of the Yellowstone River Compact.~~ JoE 6/12/11

This permit is issued to make an existing facility a matter of record. The notice of completion of construction is hereby waived.

~~The time for completing the construction of the reservoir shall terminate on December 31, 20~~______.

Witness my hand this 30TH day of June, A.D. 2010.

FOR [signature]
PATRICK T. TYRRELL, State Engineer

Permit No. 13619 Res.

Page No. 69
(Leave Blank)

PERMIT NO. 13619 RES.

~~E-29~~
E-9

PERMIT STATUS

Priority Date July 16, 2010

Approval Date July 30, 2010

PROOF PREPARED
ADJUDICATION IN PROCESS

July 19, 2011: EXCHANGE PETITION, State Engineer Docket 2009-47-03, GRANTED by Order of the State Engineer to allow direct flow water from the Cemetery Ditch, Territorial Proof Nos. 1287, 1288, 1289, 1290, 1291, 1292, 1317, 1318, 1332, 1333, 1334, 1343, and 1355, to be utilized by the City of Lander Pipeline when the City of Lander Pipeline is out of priority during the historic irrigation season. In exchange for the direct flow water, water stored in the Worthen Meadow Reservoir, Permit No.6186R, 6365R, and 13619R, will be released for the lands entitled to water under the referenced Cemetery Ditch rights. Water released from the Worthen Meadow Reservoir must be applied to the lands specified under the above-referenced Territorial Cemetery Ditch rights when the exchange is in effect.

The operation of this exchange is set forth in more detail under the Petition and Order which are recorded in Miscellaneous Record Book 16, Pages 224-235.

Map filed in Back of G-9, under Permit No. 6186R.

CERT. REC. R21, P. 12 PROOF NO. 40888

IRR. ✓ STK. ____ DOM. ____ MISC. ____

AC. ____ ~~C.F.S.~~ AF 0.0

Patrick T. Tyrrell, State Engineer

NOTICE

This permit, does not constitute a complete water right. It is your authority to begin construction work, which must be commenced within the time allowed in the permit.

Notice of completion of the work described in the permit, must be filed in the State Engineer's Office before the expiration of the time allowed in the permit.

If extensions of time beyond the time limits set forth in the permit are required, requests for same must be in writing, stating why the additional time is required, and must be received in the State Engineer's Office before the expiration of the time allowed in the permit.

Once the Notice of Completion has been filed, Proof of Appropriation will be prepared and sent to your Water Division Superintendent. The Superintendent will arrange with you for an inspection of the facility. Should you desire adjudication, the Proof will be considered by the Board of Control, and, if found to be satisfactory, the Board will issue to you a Certificate of Construction which will constitute a completed water right.

The granting of a permit does not constitute the granting of right-of-way. If any right-of-way is necessary in connection with the application it should be understood that this responsibility is the applicant's.

CRCC 16 / 378

MICRO FILMED DEC 02 2005

PROOF NO. - 39038

THE STATE OF WYOMING

NOTE: Use Typewriter or Ball Point Pen

Proof of Construction of Reservoir

PERMIT NO. 6365R RESERVOIR
NAME OF RESERVOIR First Enl. Worthen Meadow
SOURCE OF WATER SUPPLY Roaring Fork ~~Creek~~
DATE OF PRIORITY May 1, 1956
STORAGE CAPACITY ________ ACRE FEET
TRIBUTARY OF Big or Middle Fork Popo Agie River, trib. Little Wind River, trib. Big Horn River, trib. Yellowstone River

1. Name of claimant City of Lander
2. Postoffice 240 Lincoln St., Lander State Wyoming Zip 82520
3. Are you original applicant for this Permit? Yes If not, what evidence shows your interest in this reservoir?
4. Was reservoir located and constructed according to terms of the permit and maps on file in the State Engineers Office? Yes If not, state exceptions.
5. Has water been stored in reservoir each year since its completion? Yes If not, state exceptions and reasons therefor.
6. Have all notices required in connection with this permit been filed in the State Engineers Office? Yes
7. Are there any dependent secondary permits? No If so, give numbers
8. State beneficial use for which water is stored Irrigation
9. Reservoir is on ~~xxxx~~ channel and (also) receives water from ________ Permit No. ________

Give location of reservoir, County Fremont, Subdivision SE¼NE¼ Sec. 32 T. 32 N., R. 101 W.

10. THE STATE OF WYOMING
County of Fremont } ss.
District No. 1
Division No. III

I, DAN C. Shatto, being first duly sworn, do depose and say that I have read the above proof of construction of reservoir; that I understand the contents thereof; and that the facts stated herein are true.

Subscribed and sworn to before me this 1st day of September, 2004

ROBIN A. GRIFFIN - NOTARY PUBLIC
COUNTY OF FREMONT STATE OF WYOMING
My Commission Expires 11/01/2007

Robin A Griffin
~~Superintendent~~ Water Division No. III
Field Adjudication Inspector

Dan C Shatto

11. Report of Division ~~Superintendent~~ Field Adjudication Inspector Field Inspection on 30th day of July, ~~19xx~~2004

Length of dam	680' + 220' feet	Slope of face	3 to one	Pit Measurements:	
Width of dam on top	24' feet	Slope of back	2 to one	Length	____ feet
Maximum height of dam	46' feet	Width of spillway	24 feet	Width	____ feet
		Freeboard	10 feet		

Method of protection from waves rock rip-rap

Were all conditions of permit fulfilled? No If not, describe deficiencies No domestic use is being made and should be eliminated

Do you recommend this proof be allowed? Yes

Other Comments 108.6 af storage capacity previously adjudicated under Permit No. 6365R for municipal use by CR R-4, Pg 458. This proof taken to adjudicate irrigation use in conjunction with municipal use.

Note: Also check for attached, detailed inspection report.

Filed in the office of the State Board of Control

________ day of ________, 19____

Ex-officio Secretary, State Board of Control

Fees Paid $________ Rec. No.________

Fees Paid $ -0-

2 day of September, ~~19~~ 2004

Randall Maxwell
~~Superintendent~~ Water Division No. III
Field Adjudication Inspector

White - Board of Control Pink - Superintendent - File Canary - Water Commission

594 words

161

Cert. Record R-4 P. 457 No. 1395.0 ac. ft mun. PERMIT NO. 6186 RESERVOIR
on December 1, 1958 E9

Notice of Completion/Received October 6, 1960 Proof Submitted

THE MILLS COMPANY, SHERIDAN 83549

APPLICATION FOR A PERMIT TO CONSTRUCT

THE WORTHEN MEADOW RESERVOIR

Water Division No. 3 District No.

I, Floyd A. Bishop of Lander, County of Fremont, State of Wyoming, being duly sworn according to law, upon my oath say:

1. The name of the applicant is Town of Lander, Wyoming.

2. The postoffice address of the applicant c/o Town Clerk, Lander, Wyoming.

3. The name of the stream from which the reservoir is to be filled is Roaring Fork Creek, which is a tributary of Big Popo Agie River, trib. Little Wind River, trib. Big Horn River.

4. The use to which the water is to be applied is Municipal.

5. The outlet of the proposed reservoir is located N. 82° W. 1026 feet distant from the E ¼ corner of Section 32, T. 32 N., R. 101 W., and is in the SE¼NE¼ of Section 32, T. 32 N., R. 101 W.

The formation at the outlet consists of earth and granite boulders.

6. Fill out either (a) or (b).

(a) The reservoir is located in the channel of Roaring Fork Creek.

(b) The reservoir is to be filled through the ______ Canal, which has a carrying capacity of ______ cubic feet per second.

7. The area of the high-water line of the reservoir is 92 acres.

The available capacity of the reservoir is 1395 acre-feet.

8. The dam is to be constructed as follows: earth fill, moistened to optimum and compacted thoroughly with sheepsfoot rollers. Contents = 45,000 Cubic Yards.

The water face of the dam is to be protected from wave action in the following manner: Rock rip-rap at least 18" thick on entire upstream face.

9. The estimated cost of said reservoir is 35,000.00 Dollars.

10. Construction of the proposed reservoir will begin within one year from the date of approval of this application.

11. The time required for the construction of the reservoir is 5 years from December 31, 1954.

12. The accompanying map is prepared in accordance with the Manual of Regulations and Instructions for Filing Applications in the State Engineer's Office and is hereby declared a part of this application.

(Signed) Floyd A. Bishop

THE STATE OF WYOMING,)
) SS.
County of Fremont)

I hereby certify that the foregoing application was signed in my presence and sworn to before me by Floyd A. Bishop this 5th day of October, 1954.

(SEAL)

Wilma June Bishop
Notary Public

My commission expires March 19, 1958

THE STATE OF WYOMING,)
) SS.
STATE ENGINEER'S OFFICE)

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This permit grants only the right to use the surplus water of the stream when all prior rights are satisfied.

Construction of the proposed reservoir shall begin within one year from date of approval

The time for completing the construction of the reservoir shall terminate on December 31, 1960.

Witness my hand this 26th. day of January, A. D. 1955.

L. C. Bishop, State Engineer.

THE STATE OF WYOMING,)
) SS.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 7th day of October, A. D. 1954, at 9:00 o'clock A. M.

L. C. Bishop, State Engineer.

Recorded in Book 22 of Reservoirs, on Page 161.

September 30, 1955 - Notice of expiration of time for commencement mailed.

October 13, 1955 - Notice of commencement on September 12, 1955, received.

September 23, 1960 - Notice of expiration of time for completion mailed.

October 6, 1960 - Notice of completion on December 1, 1958, received.

SCANNED MAY 20 2009

July 19, 2011: EXCHANGE PETITION, State Engineer Docket 2009-47-03, GRANTED by Order of the State Engineer to allow direct flow water from the Cemetery Ditch, Territorial Proof Nos. 1287, 1288, 1289, 1290, 1291, 1292, 1317, 1318, 1332, 1333, 1334, 1343, and 1355, to be utilized by the City of Lander Pipeline when the City of Lander Pipeline is out of priority during the historic irrigation season. In exchange for the direct flow water, water stored in the Worthen Meadow Reservoir, Permit No.6186R, 6365R, and 13619R, will be released for the lands entitled to water under the referenced Cemetery Ditch rights. Water released from the Worthen Meadow Reservoir must be applied to the lands specified under the above-referenced Territorial Cemetery Ditch rights when the exchange is in effect.

The operation of this exchange is set forth in more detail under the Petition and Order which are recorded in Miscellaneous Record Book 16, Pages 224-235.

Map filed in Back of G-9, under Permit No. 6186R.

Patrick T. Tyrrell, State Engineer

Proof No. 28635

THE STATE OF WYOMING

Certificate of Constuction of Reservoir

Certificate Record No. R-4 Page 457

WHEREAS, City of Lander, Wyoming has presented to the State Board of Control of the State of Wyoming, proof of construction of the Worthen Meadow Reservoir, Permit No. 6186 Res., located in $S\frac{1}{2}N\frac{1}{2}$, $N\frac{1}{2}SW\frac{1}{4}$, $N\frac{1}{2}SE\frac{1}{4}$, $SW\frac{1}{4}SE\frac{1}{4}$ Section 32, T. 32 N., R 101 W., Fremont County, Wyoming; and

Whereas, the proof of construction sets forth that said reservior has been completed in accordance with the terms of said permit to a capacity sufficient to impound ---1395--- acre-feet of water; and that the source of the quantity of water authorized to be stored in the Worthen Meadow Reservoir is obtained from Roaring Fork Creek, Tributary Big or Middle Fork Popo Agie River, Tributary Little Wind River, Tributary Big Horn River on which the reservoir is located, ~~and~~ ~~through the~~ ~~Ditch, Permit No.~~

NOW KNOW YE, That the State Board of Control, under the provisions of the Statutes of Wyoming, has by an order duly made and entered on the 26th day of July, A.D. 19 68, in Order Record No. 17, Page ~~365~~ 354, determined the priority and capacity of said reservoir as follows:

Name of Owner City of Lander, Wyoming; Address City Hall, 183 South 4th Street, Lander, Wyoming

Date of Priority October 7, 1954; Total available storage capacity in the Worthen Meadow Reservoir, as constructed under provisions of Permit No. 6186 Res., is -----------1395----------acre-feet.

The right to store water is limited to such an amount as shall be beneficially used, not to exceed one filling annually of said reservoir, for municipal -- use.

IN TESTIMONY WHEREOF, I, FLOYD A. BISHOP, President of the State Board of Control, have hereunto set my hand this 26th day of July, A. D. 19 68, and caused the seal of said Board to be hereunto affixed.

ATTEST:

George L. Christopulos
Ex-officio Secretary.

Floyd A. Bishop
President.

THE MILLS COMPANY, SHERIDAN 119099

Proof No. 28636

THE STATE OF WYOMING

Certificate of Constuction of Reservoir

Certificate Record No. R-4 Page 458

WHEREAS, City of Lander, Wyoming has presented to the State Board of Control of the State of Wyoming, proof of construction of the First Enl. Worthen Meadow Reservoir, Permit No. 6365 Res., located in SE¼NE¼ Section 32 N, T. 32 N., R 101 W., Fremont County, Wyoming; and

Whereas, the proof of construction sets forth that said reservior has been completed in accordance with the terms of said permit to a capacity sufficient to impound ---108.6--- acre-feet of water; and that the source of the quantity of water authorized to be stored in the First Enl. Worthen Meadow Reservoir is obtained from Roaring Fork ~~Creek,~~ Tributary Big or Middle Fork Popo Agie River, Tributary Little Wind River, Tributary Big Horn River on which the reservoir is located, ~~and~~ ~~through the~~ ~~Ditch, Permit No.~~

NOW KNOW YE, That the State Board of Control, under the provisions of the Statutes of Wyoming, has by an order duly made and entered on the 26th day of July, A.D. 1968, in Order Record No. 17, Page ~~365~~ 354, determined the priority and capacity of said reservoir as follows:

Name of Owner City of Lander, Wyoming; Address City Hall, 183 South 4th Street, Lander, Wyoming

Date of Priority May 1, 1956; Total available storage capacity in the First Enl. Worthen Meadow Reservoir, as constructed under provisions of Permit No. 6365 Res., is ----------108.6--------- acre-feet. under this enlargement.

The right to store water is limited to such an amount as shall be beneficially used, not to exceed one filling annually of said reservoir, for municipal--- use.

IN TESTIMONY WHEREOF, I, FLOYD A. BISHOP, President of the State Board of Control, have hereunto set my hand this 26th day of July, A. D. 1968, and caused the seal of said Board to be hereunto affixed.

ATTEST:

George L. Christopulos
Ex-officio Secretary.

Floyd A. Bishop
President.

THE MILLS COMPANY, SHERIDAN 119099

COPY

THE STATE OF WYOMING

Certificate of Construction of Reservoir

Proof No. 39038
Certificate Record No. R-16 Page 378
Water Division No. 3, District No. 1

WHEREAS, City of Lander has presented to the Board of Control of the State of Wyoming, proof of construction of the Enl. Worthen Meadow Reservoir, Permit No. 6365R, located in S½N½, N½SW¼, SE¼SW¼, N½SE¼, and SW¼SE¼ Section 32, T. 32 N., R. 101 W., Fremont County, Wyoming;
Outlet: SE¼NE¼, Section 32-32-101

Whereas, the proof of construction sets forth that said reservoir has been completed in accordance with the terms of said permit to a capacity sufficient to impound ------- acre-feet of water; and that the source of the quantity of water authorized to be stored in the Enl. Worthen Meadow Reservoir is obtained from Roaring Fork, tributary Big or Middle Fork Popo Agie River, tributary Little Wind River, tributary Big Horn River, tributary Yellowstone River

NOW KNOW YE, That the State of Board of Control, under the provisions of the Statutes of Wyoming, has, by an order of the District Court Fifth Judicial District entered on March 8, 2005, determined and established the priority and amount of such appropriation as follows:

Name of Owner City of Lander; Address 240 Lincoln Street, Lander, WY 82520;

Date of Priority May 1, 1956; Total available storage capacity in the Enl. Worthen Meadow Reservoir, as constructed under provisions of Permit No. 6365R, is ------- acre-feet. This adjudication of irrigation is in conjunction with a previous adjudication of municipal use under CR R-4, Page 458, Proof 28636.

The right to store water is limited to such an amount as shall be beneficially used, not to exceed one filling annually of said reservoir, for irrigation of lands -----------------

IN TESTIMONY WHEREOF, I, Patrick T. Tyrrell President of the State Board of Control, have hereunto set my hand this 22 day of July, A.D. 2005, and caused the seal of said Board to be hereunto affixed.

ATTEST:

Allan Cunningham
Ex-officio Secretary

This Certificate issued in accordance with an Order of the Fifth Judicial District Court, entered March 8, 2005, in Civil No. 86-0012-3871, entitled, "In Re: The General Adjudication Of All Rights To Use Water In The Big Horn River System And All Other Sources, State Of Wyoming." For supporting documents, see Division No. 3 Proof File, Proof No. 39038

Patrick T. Tyrrell
President

THE STATE OF WYOMING

Certificate of Construction of Reservoir

Proof No. 40888
Certificate Record No. R-21 Page 12
Water Division No. 3 , District No. 1

WHEREAS, City of Lander has presented to the Board of Control of the State of Wyoming, proof of construction of the Enl. Worthen Meadow Reservoir, Permit No. 13619 Res., located in S½NE¼; S½NW¼; N½SW¼; N½SE¼; SW¼SE¼ Section 32 , T. 32 N., R. 101 W., Fremont County, Wyoming;
Outlet: SE¼NE¼, Section 32, T32N, R101W

Whereas, the proof of construction sets forth that said reservoir has been completed in accordance with the terms of said permit to a capacity sufficient to impound 0.00*-- acre-feet of water; and that the source of the quantity of water authorized to be stored in the Enl. Worthen Meadow Reservoir is obtained from Roaring Fork, tributary Big or Middle Fork Popo Agie River, tributary Little Wind River, tributary Big Horn River, tributary Yellowstone River

NOW KNOW YE, That the State of Board of Control, under the provisions of the Statutes of Wyoming, has, by an order duly made on Feb. 9, 2012 and entered on August 15, 2012 , in Order Record 82 Page 246 , determined and established the priority and amount of such appropriation as follows:

Name of Owner City of Lander ; Address 240 Lincoln Street, Lander, WY 82520 ;

Date of Priority July 16, 2010 ; Total available storage capacity in the Enl. Worthen Meadow Reservoir, as constructed under provisions of Permit No. 13619 Res. , is 0.00*-- acre-feet. *This facility is an enlargement of Permit No. 6186 Res., for use only. No appropriation is granted herein.

The right to store water is limited to such an amount as shall be beneficially used, not to exceed one filling annually of said reservoir, for irrigation purposes

IN TESTIMONY WHEREOF, I, Patrick T. Tyrrell President of the State Board of Control, have hereunto set my hand this 15th day of August , A.D. 2012 , and caused the seal of said Board to be hereunto affixed.

ATTEST:

Allan Cunningham
Ex-officio Secretary

Patrick T. Tyrrell
President

Appendix E

Capital Financing Plan Scenario Development and Analysis Background Memo

Capital Financing Plan Scenario Development and Analysis Background Memo

Five different capital planning/capital financing plans were developed as part of the master planning effort. These plans had different levels of capital spending and different means of financing the projects contained in the plan.

- Scenario 1 – Full capital plan with cash and grant funding
- Scenario 2 – Full capital plan with cash, debt, and grant funding
- Scenario 3 – Full capital plan, debt and grant funding for large projects, cash funding for small projects
- Scenario 4 – Deferred capital plan, cash and grant funding
- Preferred Scenario – 7% rate increase for 10 years, limited project deferment, cash and grant funding

The levels of capital spending and financing mechanisms are summarized in Table E-1. Revenue reequipments and predicted monthly bills are shown in Table E-2.

Table E-1. Capital Spending Summary

Scenario	Total Capital Cost in Year of Construction	Debt Funded	Cash Funded	Grant Funded
1	$ 84,474,010	$ -	$ 65,352,618	$ 19,121,392
2	$ 84,474,010	$ 33,515,283	$ 31,837,335	$ 19,121,392
3	$ 84,474,010	$ 55,444,483	$ 9,908,135	$ 19,121,392
4	$ 50,749,021	$ -	$ 27,160,969	$ 23,588,052
Preferred	$ 66,158,796	$ -	$ 44,815,176	$ 21,343,620

Table E-2. Revenue Requirement Projections and Monthly Bill Projections

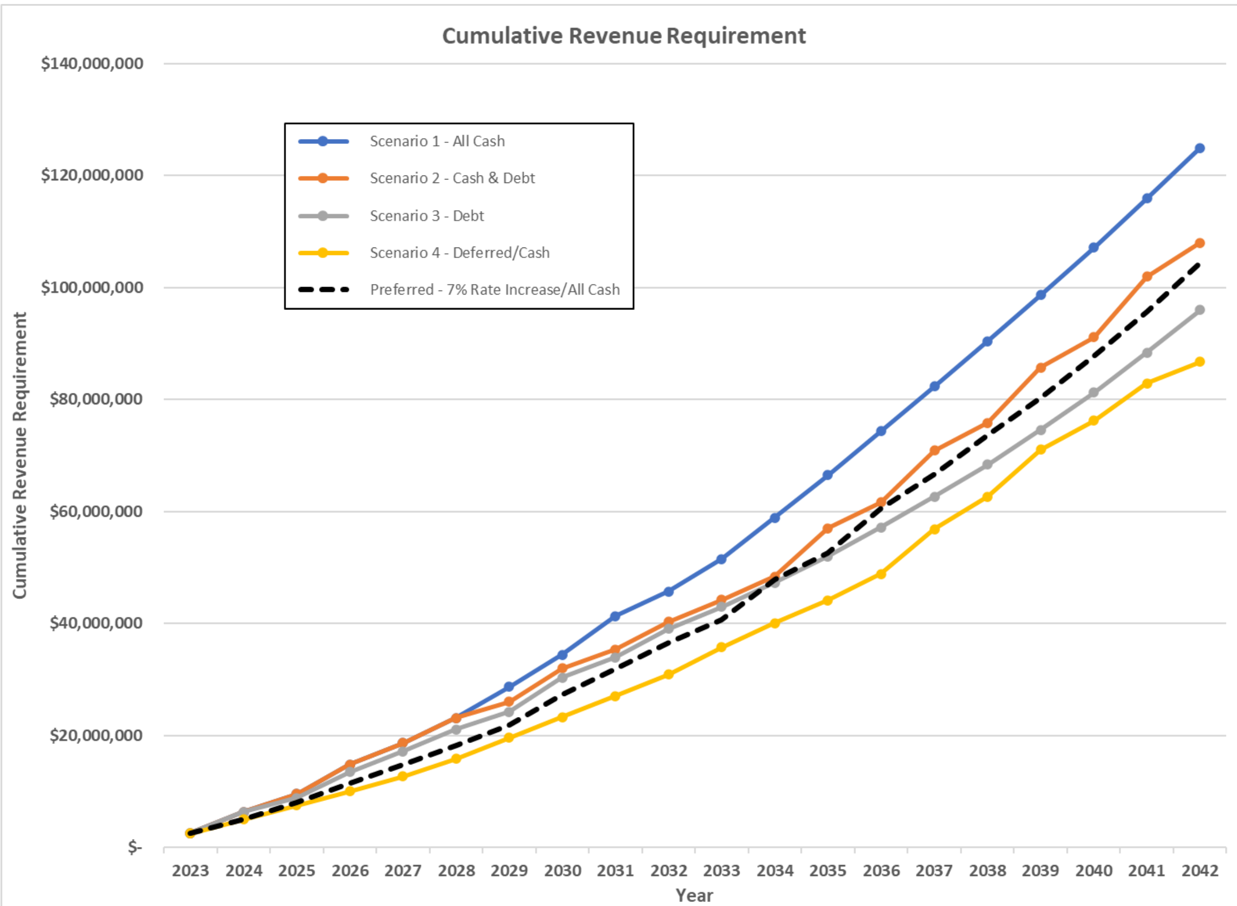
Item	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Annual Revenue Requirement										
Scenario 1 - All Cash	$ 2,595,221	$ 3,725,225	$ 3,224,472	$ 5,242,642	$ 3,852,399	$ 4,461,593	$ 5,597,109	$ 5,736,611	$ 6,914,184	$ 4,404,329
Scenario 2 - Cash & Debt	$ 2,595,221	$ 3,725,225	$ 3,224,472	$ 5,242,642	$ 3,852,399	$ 4,461,593	$ 2,958,609	$ 5,943,848	$ 3,400,113	$ 4,903,851
Scenario 3 - Debt	$ 2,595,221	$ 3,725,225	$ 2,532,490	$ 4,618,690	$ 3,666,994	$ 3,983,333	$ 3,137,077	$ 6,122,316	$ 3,578,581	$ 5,082,319
Scenario 4 - Deferred/Cash	$ 2,507,671	$ 2,504,909	$ 2,478,140	$ 2,543,449	$ 2,648,975	$ 3,152,851	$ 3,742,976	$ 3,690,082	$ 3,748,693	$ 3,865,559
Preferred - 7% Rate Increase/All Cash	$ 2,507,671	$ 2,539,918	$ 2,910,860	$ 3,450,907	$ 3,402,503	$ 3,456,140	$ 3,563,089	$ 5,427,836	$ 4,660,024	$ 4,610,997
Cumulative Revenue Requirement										
Scenario 1 - All Cash	$ 2,595,221	$ 6,320,446	$ 9,544,918	$ 14,787,560	$ 18,639,959	$ 23,101,552	$ 28,698,661	$ 34,435,271	$ 41,349,455	$ 45,753,784
Scenario 2 - Cash & Debt	$ 2,595,221	$ 6,320,446	$ 9,544,918	$ 14,787,560	$ 18,639,959	$ 23,101,552	$ 26,060,161	$ 32,004,009	$ 35,404,121	$ 40,307,973
Scenario 3 - Debt	$ 2,595,221	$ 6,320,446	$ 8,852,936	$ 13,471,626	$ 17,138,620	$ 21,121,953	$ 24,259,030	$ 30,381,346	$ 33,959,927	$ 39,042,247
Scenario 4 - Deferred/Cash	$ 2,507,671	$ 5,012,580	$ 7,490,720	$ 10,034,169	$ 12,683,144	$ 15,835,995	$ 19,578,971	$ 23,269,052	$ 27,017,745	$ 30,883,304
Preferred - 7% Rate Increase/All Cash	$ 2,507,671	$ 5,047,589	$ 7,958,449	$ 11,409,356	$ 14,811,859	$ 18,267,999	$ 21,831,088	$ 27,258,924	$ 31,918,948	$ 36,529,946
Annual % Change in Revnue Requirement										
Scenario 1 - All Cash		43.5%	-13.4%	62.6%	-26.5%	15.8%	25.5%	2.5%	20.5%	-36.3%
Scenario 2 - Cash & Debt		43.5%	-13.4%	62.6%	-26.5%	15.8%	-33.7%	100.9%	-42.8%	44.2%
Scenario 3 - Debt		43.5%	-32.0%	82.4%	-20.6%	8.6%	-21.2%	95.2%	-41.5%	42.0%
Scenario 4 - Deferred/Cash		-0.1%	-1.1%	2.6%	4.1%	19.0%	18.7%	-1.4%	1.6%	3.1%
Preferred - 7% Rate Increase/All Cash		1.3%	14.6%	18.6%	-1.4%	1.6%	3.1%	52.3%	-14.1%	-1.1%
Cumulative % Change in Revenue Requirement										
Scenario 1 - All Cash	0.0%	43.5%	30.1%	92.7%	66.2%	82.0%	107.4%	109.9%	130.5%	94.2%
Scenario 2 - Cash & Debt	0.0%	43.5%	30.1%	92.7%	66.2%	82.0%	48.3%	149.2%	106.4%	150.6%
Scenario 3 - Debt	0.0%	43.5%	11.5%	93.9%	73.3%	81.9%	60.7%	155.8%	114.3%	156.3%
Scenario 4 - Deferred/Cash	0.0%	-0.1%	-1.2%	1.5%	5.6%	24.6%	43.3%	41.9%	43.5%	46.6%
Preferred - 7% Rate Increase/All Cash	0.0%	1.3%	15.9%	34.4%	33.0%	34.6%	37.7%	90.0%	75.9%	74.8%
Monthly Water Bill (7,500 gallons)										
Scenario 1 - All Cash	$ 48.92	$ 86.60	$ 54.98	$ 126.45	$ 56.89	$ 90.46	$ 117.61	$ 108.19	$ 140.65	$ 50.64
Scenario 2 - Cash & Debt	$ 48.92	$ 86.60	$ 54.98	$ 126.45	$ 56.89	$ 90.46	$ 34.37	$ 142.29	$ 31.29	$ 100.45
Scenario 3 - Debt	$ 48.92	$ 86.60	$ 31.18	$ 113.83	$ 57.49	$ 76.45	$ 45.88	$ 144.96	$ 35.51	$ 104.78
Scenario 4 - Deferred/Cash	$ 46.00	$ 45.08	$ 43.26	$ 44.99	$ 46.81	$ 60.84	$ 73.00	$ 64.25	$ 64.88	$ 66.17
Preferred - 7% Rate Increase/All Cash	$ 51.84	$ 55.45	$ 59.33	$ 63.50	$ 67.95	$ 72.72	$ 77.82	$ 83.26	$ 89.10	$ 95.33

Item	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Annual Revenue Requirement										
Scenario 1 - All Cash	$ 5,739,998	$ 7,418,912	$ 7,632,446	$ 7,846,629	$ 7,996,700	$ 8,011,113	$ 8,251,445	$ 8,498,989	$ 8,753,959	$ 9,016,577
Scenario 2 - Cash & Debt	$ 3,920,512	$ 4,134,782	$ 8,625,598	$ 4,632,469	$ 9,320,310	$ 4,871,185	$ 9,925,637	$ 5,437,815	$ 10,800,083	$ 6,038,952
Scenario 3 - Debt	$ 3,932,135	$ 4,326,355	$ 4,732,402	$ 5,144,874	$ 5,499,184	$ 5,723,961	$ 6,180,970	$ 6,651,690	$ 7,136,531	$ 7,635,918
Scenario 4 - Deferred/Cash	$ 4,861,444	$ 4,363,628	$ 4,034,538	$ 4,733,797	$ 7,955,952	$ 5,826,382	$ 8,377,202	$ 5,197,794	$ 6,661,824	$ 3,833,038
Preferred - 7% Rate Increase/All Cash	$ 4,115,855	$ 7,171,042	$ 4,784,806	$ 7,961,714	$ 6,137,865	$ 6,905,606	$ 6,792,903	$ 7,391,690	$ 7,993,441	$ 8,598,244
Cumulative Revenue Requirement										
Scenario 1 - All Cash	$ 51,493,783	$ 58,912,695	$ 66,545,140	$ 74,391,769	$ 82,388,469	$ 90,399,581	$ 98,651,027	$ 107,150,016	$ 115,903,975	$ 124,920,553
Scenario 2 - Cash & Debt	$ 44,228,485	$ 48,363,267	$ 56,988,865	$ 61,621,335	$ 70,941,645	$ 75,812,830	$ 85,738,467	$ 91,176,282	$ 101,976,365	$ 108,015,317
Scenario 3 - Debt	$ 42,974,382	$ 47,300,737	$ 52,033,139	$ 57,178,013	$ 62,677,197	$ 68,401,158	$ 74,582,129	$ 81,233,819	$ 88,370,350	$ 96,006,268
Scenario 4 - Deferred/Cash	$ 35,744,749	$ 40,108,377	$ 44,142,914	$ 48,876,711	$ 56,832,663	$ 62,659,044	$ 71,036,247	$ 76,234,041	$ 82,895,865	$ 86,728,904
Preferred - 7% Rate Increase/All Cash	$ 40,645,800	$ 47,816,842	$ 52,601,647	$ 60,563,361	$ 66,701,226	$ 73,606,832	$ 80,399,735	$ 87,791,425	$ 95,784,867	$ 104,383,111
Annual % Change in Revnue Requirement										
Scenario 1 - All Cash	30.3%	29.2%	2.9%	2.8%	1.9%	0.2%	3.0%	3.0%	3.0%	3.0%
Scenario 2 - Cash & Debt	-20.1%	5.5%	108.6%	-46.3%	101.2%	-47.7%	103.8%	-45.2%	98.6%	-44.1%
Scenario 3 - Debt	-22.6%	10.0%	9.4%	8.7%	6.9%	4.1%	8.0%	7.6%	7.3%	7.0%
Scenario 4 - Deferred/Cash	25.8%	-10.2%	-7.5%	17.3%	68.1%	-26.8%	43.8%	-38.0%	28.2%	-42.5%
Preferred - 7% Rate Increase/All Cash	-10.7%	74.2%	-33.3%	66.4%	-22.9%	12.5%	-1.6%	8.8%	8.1%	7.6%
Cumulative % Change in Revenue Requirement										
Scenario 1 - All Cash	124.5%	153.7%	156.6%	159.4%	161.3%	161.5%	164.5%	167.5%	170.5%	173.5%
Scenario 2 - Cash & Debt	130.6%	136.0%	244.7%	198.4%	299.6%	251.8%	355.6%	310.4%	409.0%	364.9%
Scenario 3 - Debt	133.7%	143.7%	153.1%	161.8%	168.7%	172.8%	180.8%	188.4%	195.7%	202.7%
Scenario 4 - Deferred/Cash	72.4%	62.2%	54.6%	72.0%	140.0%	113.3%	157.0%	119.1%	147.2%	104.8%
Preferred - 7% Rate Increase/All Cash	64.1%	138.3%	105.1%	171.5%	148.6%	161.1%	159.4%	168.2%	176.4%	184.0%
Monthly Water Bill (7,500 gallons)										
Scenario 1 - All Cash	$ 113.96	$ 145.89	$ 134.23	$ 135.58	$ 134.21	$ 132.20	$ 134.84	$ 136.20	$ 137.57	$ 138.95
Scenario 2 - Cash & Debt	$ 56.24	$ 69.75	$ 192.50	$ 37.54	$ 198.94	$ 37.81	$ 204.17	$ 44.93	$ 213.88	$ 50.25
Scenario 3 - Debt	$ 53.96	$ 75.01	$ 81.78	$ 87.50	$ 91.87	$ 92.79	$ 101.14	$ 107.20	$ 112.58	$ 119.35
Scenario 4 - Deferred/Cash	$ 93.29	$ 68.09	$ 61.27	$ 82.74	$ 161.32	$ 74.20	$ 157.31	$ 51.13	$ 112.99	$ 30.52
Preferred - 7% Rate Increase/All Cash	$ 98.18	$ 101.12	$ 104.17	$ 107.29	$ 110.52	$ 113.82	$ 117.23	$ 120.76	$ 124.37	$ 128.10

It should be noted that for Scenario's 1 through 4, the capital financing model was configured to set rates so that the utility ended each fiscal year with exactly six months' worth of cash and hand. This produces large variations in rates each year with rates increasing in years with large capital expenditures and rate decreasing in years with smaller capital expenditures than the preceding year. This produces projected monthly bills that change rapidly from year to year. For the Preferred Scenario, the financing model was allowed to smooth rate changes over time to generate a more predictable monthly bill.

Scenario 1 (all cash) had the highest total cumulative revenue requirement over the planning period as all projects are fully paid for at the time of construction. Conversely, Scenario 3 had the lowest total cumulative revenue requirement of the three full capital scenarios as mostly debt service was used to fund capital projects, thus pushing some of the cost to other years outside of the planning period (Figure E-1). By deferring some capital (Scenario 4), the utility could pay all cash for projects while still keeping the cumulative revenue requirement lower than other scenarios; however, not all projects would be constructed in the planning period.

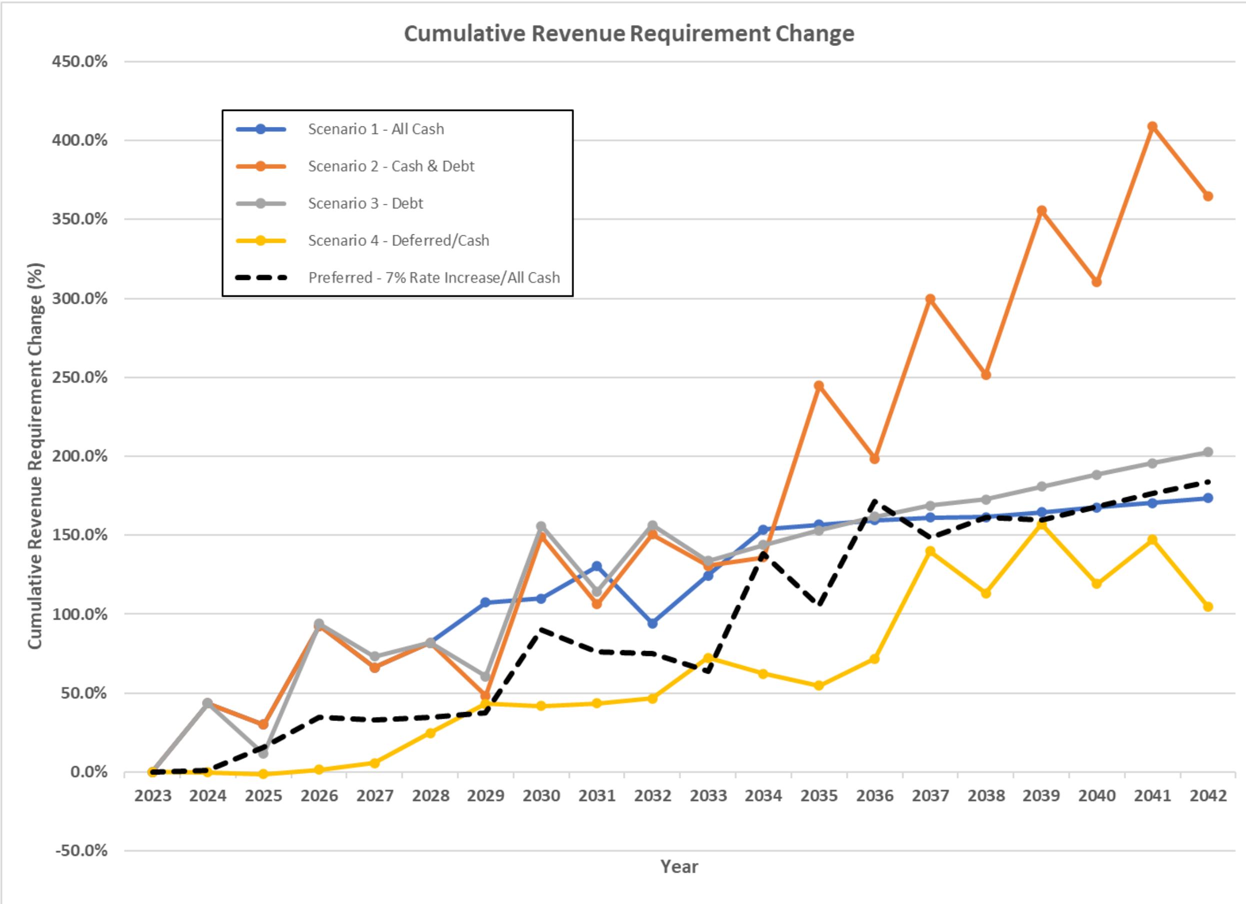
Figure E-1 – Cumulative Revenue Requirement for Each Scenario



When looking at the cumulative revenue requirement change expressed as a percentage, Scenario 2 has the highest annual revenue change over the planning period. This is largely due to debt funding capital in one year and then cash funding capital the following year. This produces large differences in the annual revenue requirement and results in a larger overall cumulative revenue requirement change. It is hard to plan rate increases with capital spending is not consistent from year to year. The all debt and all cash scenarios have much smaller revenue requirement changes due to the fact that spending is more consistent on an annual basis (Figure E-2).

The preferred scenario combines these scenarios into one. This scenario uses mostly debt funding early on to produce consistent annual spending, then uses more cash in later years. This does produce some larger changes in annual capital spending, but as modeled, the utility would "bank" revenues in some years to pay for the cash funding projects in later years, thus leading to stable rates.

Figure E-2. Cumulative Revenue Requirement Change



Appendix F

Cost Estimates

Appendix F – Cost Estimates

The project costs, start dates, inflation adjustment, and funding source from the financial development plan are summarized in Table 1.

Table 1 Project Costs, Start Date, Inflation Adjustment, Funding Source

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
1	City of Lander Pipeline Condition Assessment	2024	$ 35,000.00	$ 36,050.00	cash
2	Worthen Meadows Outlet Gate Rehabilitation	2024	$ 100,000.00	$ 103,000.00	cash
3	PRV Station Metering	2024	$ 85,000.00	$ 87,550.00	cash
4	Planning Water Service Map	2025	$ 20,000.00	$ 21,218.00	cash
5	Worthen Meadows Enlargement Level II Study	2025	$ 450,000.00	$ 477,405.00	100% grant
6	Regionalization Level II Study	2025	$ 650,000.00	$ 689,585.00	100% grant
7	Distribution Metering and LCR Compliance Project	2026	$ 5,102,001.45	$ 5,575,094.74	debt
8	Non-Potable Water System Level II Study	2026	$ 150,000.00	$ 163,909.05	100% grant
9	High Pressure Zone Tank Rehabilitation	2026	$ 1,392,300.00	$ 1,521,403.80	debt
10	Intake Structure Rehabilitation	2027	$ 1,000,000.00	$ 1,125,508.81	67% grant, 33% debt
11	Lincoln Street Transmission Line	2027	$ 2,443,225.00	$ 2,749,871.26	67% grant, 33% debt
12	Distribution System Improvements Budgeting I	2028	$ 1,000,000.00	$ 1,159,274.07	debt
13	Lander Valley HS Raw Water Conversion	2028	$ 734,700.00	$ 851,718.66	67% grant, 33% cash
14	McFarland Drive Pipeline	2029	$ 682,500.00	$ 814,940.69	debt
15	Industrial Park Bulk Fill Station	2029	$ 554,872.50	$ 662,546.78	debt
16	WTP Improvements Phase I	2030	$ 1,379,762.50	$ 1,696,933.84	debt
17	5th Street Transmission Line	2030	$ 2,443,350.00	$ 3,005,012.31	67% grant, 33% debt
18	N. 5th Street Pipeline	2031	$ 1,442,805.00	$ 1,827,702.21	debt
19	Lander City Park Raw Water Conversion	2031	$ 432,250.00	$ 547,561.37	67% grant, 33% cash
20	Hillcrest Drive Transmission Line	2032	$ 1,162,400.00	$ 1,516,668.35	67% grant, 33% cash
21	Baldwin Creek Transmission Line	2032	$ 1,771,090.00	$ 2,310,870.74	67% grant, 33% debt
22	Mortimore Lane East Transmission Line	2033	$ 5,512,150.00	$ 7,407,868.67	67% grant, 33% debt
23	Goodrich Connector Pipeline	2033	$ 272,625.00	$ 366,385.20	cash
24	Distribution System Improvements Budgeting II	2034	$ 1,000,000.00	$ 1,384,233.87	Debt
25	Sewer Lagoon Bulk Fill Station	2034	$ 550,000.00	$ 761,328.63	Cash

Project Number	Project Name	Start Year	Baseline Cost	Inflated Cost (assume 3% annually)	Funding Source
26	Buena Vista Drive Transmission Line	2035	$ 2,854,700.00	$ 4,070,119.60	67% grant, 33% debt
27	Mortimore Lane West Transmission Line	2035	$ 2,234,400.00	$ 3,185,720.13	67% grant, 33% cash
28	Industrial Park Improvements/Annexation	2036	$ 1,995,525.00	$ 2,930,495.74	67% grant, 33% special improvements district fees
29	Grandview/Valleyview Pipeline	2036	$ 2,313,675.00	$ 3,397,709.74	debt
30	N. 1st Street Transmission Line	2037	$ 4,586,400.00	$ 6,937,341.51	67% grant, 33% cash
31	S. 1st Street Pipeline	2037	$ 859,950.00	$ 1,300,751.53	debt
32	Mortimore Lane to Squaw Creek Transmission Line	2038	$ 3,777,650.00	$ 5,885,455.61	67% grant, 33% cash
33	Cascade Street Pipeline	2038	$ 3,076,027.50	$ 4,792,350.62	debt
34	Loop Drive to Spriggs Connector Transmission Line	2039	$ 1,749,900.00	$ 2,808,075.80	67% grant, 33% cash
35	Mager 2 Transmission Line	2039	$ 3,214,575.00	$ 5,158,449.20	67% grant, 33% cash
36	Distribution System Improvements Budgeting III	2040	$ 1,000,000.00	$ 1,652,847.63	cash
37	County Shop Bulk Fill Station	2040	$ 554,872.50	$ 917,119.70	cash
38	WTP Improvements Phase II	2040	$ 259,350.00	$ 428,666.03	cash
39	Infiltration Gallery Rehabilitation	2041	$ 2,000,000.00	$ 3,404,866.12	67% grant, 33% cash
40	Exchange Petition Update for Infiltration Gallery	2041	$ 35,000.00	$ 59,585.16	cash
41	North 2nd Street Transmission Line - Phase I	2041	$ 3,537,575.00	$ 6,022,484.64	67% grant, 33% cash
42	Redd Fox Improvements/Annexation	2042	$ 1,247,610.00	$ 2,187,691.69	67% grant, 33% special improvements district fees
43	North 2nd Street Transmission Line - Phase II	2042	$ 4,902,575.00	$ 8,596,694.94	67% grant, 33% cash
44	Deer Valley Expansion	2043	$ 100,000.00	$180,611.12	67% grant, 33% cash
45	WLRC Improvements/Annexation	2043	$ 1,030,575.00	$1,861,333.09	67% grant, 33% special improvements district fees
46	Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study	2043	$ 400,000.00	$722,444.49	75% Grant, 25% cash or loan
47	Lyons Valley Transmission Line	2044	$ 28,182,610.00	$52,427,956.40	67% grant, 33% special improvements district fees
48	Distribution System Improvements Budgeting IV	2044	$ 1,000,000.00	$1,860,294.57	cash

Detailed cost estimates are given below. The estimates are broken down into estimates for items in Table 1 in Section F.1. Section F.2 gives a summary of additional transmission line estimates requested by the City. Details of the additional transmission line cost estimates are given in the Project Notebook.

F.1 – Recommended Projects Estimates

Item No. 1 City of Lander Pipeline Condition Assessment – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Meetings, project management	$ 5,000.00	
Data acquisition, entry, quality control	$ 15,000.00	
Report	$ 15,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 35,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 35,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 2 Worthen Meadows Outlet Gate Rehabilitation – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
36" Valve or Slide Gate	$ 80,000.00	
Valve install	$ 20,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 100,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 100,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 3 PRV Station Metering – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Insertion Meters	$ 75,000.00	
Meter Install	$ 10,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 85,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 85,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 4 Planning Water Service Map – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Preparation of Water Service Map	$ 20,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 20,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 20,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 5 Worthen Meadows Enlargement Level II Study

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Engineering Studies	$ 450,000.00	
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 450,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 450,000.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 450,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 6 Regionalization Level II Study

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance		
Base Station, Automated Meter Reading Infrustructure		
Meters and Radios Material Cost		
In-home installations		
Service Line Inventory		
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Engineering Studies	$ 650,000.00	
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 650,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 650,000.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 650,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 7 Distribution Metering and LCR Compliance Project

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 340,000	assume 10% of total project cost
Base Station, Automated Meter Reading Infrustructure	$ 131,250	quote from 2022 inflated 5%
Meters and Radios Material Cost	$ 2,310,000	quote from 2022 inflated 5%
In-home installations	$ 940,800	assumed $300/(meter+radio) * 3136
Service Line Inventory	$ 15,680	Assume only verified in crawl space, not through exporatory excavation @ $5/service
Cost of Project Components TOTAL (Subtotal #1)	$ 3,737,730.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 373,773.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 4,111,503.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 616,725.45	
Construction Costs Total (Subtotal #2 + Contingency)	$ 4,728,228.45	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 373,773.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 373,773.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 5,102,001.45	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 5,102,001.45	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 4,111,503.00	

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Item No. 8 Non-Potable Water System Level II Study

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance		
Base Station, Automated Meter Reading Infrustructure		
Meters and Radios Material Cost		
In-home installations		
Service Line Inventory		
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Engineering Studies	$ 150,000.00	
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 150,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 150,000.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 150,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 9 High Pressure Zone Tank Rehabilitation – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 100,000	
Environmenal Controls	$ 100,000	
Surface Preparation	$ 250,000	
Coating System	$ 500,000	
Cathodic Protection	$ 70,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,020,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 102,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,122,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 168,300.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,290,300.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 102,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 102,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,392,300.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,392,300.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,122,000.00	

Item No. 10 Intake Structure Rehabilitation

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 80,000	
Undercutting Repair	$ 300,000	
Log boom	$ 100,000	
Sedimentation Passing Modifications	$ 255,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 735,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 73,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 808,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 121,275.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 929,775.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 73,500.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 73,500.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,003,275.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,003,275.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 808,500.00	

Item No. 11 Lincoln Street Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 99,908	
Materials Testing	$ 25,000	
Traffic Control	$ 40,000	
Demolition/Site Work	$ 50,000	
Pipe	$ 1,000,000	
Bends, Fittings, Valves, Appurtenances	$ 225,000	
Surface Repair	$ 350,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,789,908.43	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 178,990.84	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,968,899.27	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 295,334.89	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,264,234.16	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 178,990.84	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 178,990.84	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 2,443,225.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 2,443,225.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,968,899.27	

Item No. 12 **Distribution System Improvements Budgeting I – Non-WWDC Eligible**

Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Distribution System Piping Replacement Budgeting	$ 1,000,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 1,000,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,000,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 13 Lander Valley HS Raw Water Conversion

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization	$50,000	
Reregulation Reservoir	$ 350,000	
Pumps	$ 100,000	
Piping	$ 38,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 538,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 53,800.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 591,800.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 88,770.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 680,570.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 53,800.00	(Subtotal #3)
Permitting and Mitigation	$ 330.00	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 54,130.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 734,700.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
High School Irrigation Raw Water Conversion		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 734,700.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 591,800.00	

Item No. 14 McFarland Drive Pipeline – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 50,000	
Materials Testing	$ 10,000	
Traffic Control	$ 30,000	
Demolition/Site Work	$ 20,000	
Pipe	$ 225,000	
Bends, Fittings, Valves, Appurtenances	$ 90,000	
Surface Repair	$ 75,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 500,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 50,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 550,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 82,500.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 632,500.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 50,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 50,000.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 682,500.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 682,500.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 550,000.00	

Item No. 15 Industrial Park Bulk Fill Station

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 10,000	
Materials Testing	$ 1,500	
Traffic Control	$ 7,000	
Demolition/Site Work	$ 15,000	
Pipe	$ 40,000	
Bends, Fittings, Valves, Appurtenances	$ 20,000	
Structure	$ 285,000	
Surface Repair / Paving	$ 28,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 406,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 40,650.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 447,150.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 67,072.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 514,222.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 40,650.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 40,650.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 554,872.50	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 554,872.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 447,150.00	

Item No. 16 WTP Improvements Phase I – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Drying Bed		
Excavation	$ 50,000	
Constructing Drying Bed w/ Native Material	$ 350,000	
Gravel Surfacing	$ 25,000	
Seeding	$ 10,000	
Redundant Sleeve Valve		
DIP Fittings	$ 50,000	
DIP Butterfly Valves	$ 50,000	
DIP Sleeve Valve	$ 250,000	
DIP	$ 15,000	
Process Area - Handrail		
Remove Existing Handrail - Approx 615 LF	$ 20,000	
Install New Handrail - Approx 615 LF	$ 140,000	
East Lagoon Discharge		
Buried Valve	$ 10,000	
Buried PVC Pipe	$ 15,000	
DIP Fittings	$ 7,500	
Cost of Project Components TOTAL (Subtotal #1)	$ 992,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 99,250.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,091,750.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 163,762.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,255,512.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 99,250.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)		
Geotechnical Investigation	$ 15,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 124,250.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,379,762.50	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,379,762.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,091,750.00	

Item No. 17 5th Street Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 125,000	
Materials Testing	$ 25,000	
Traffic Control	$ 40,000	
Demolition/Site Work	$ 50,000	
Pipe	$ 1,100,000	
Bends, Fittings, Valves, Appurtenances	$ 200,000	
Surface Repair	$ 250,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,790,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 179,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,969,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 295,350.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,264,350.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 179,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 179,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 2,443,350.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 2,443,350.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,969,000.00	

Item No. 18 N. 5th Street Pipeline – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 75,000	
Materials Testing	$ 15,000	
Traffic Control	$ 30,000	
Demolition/Site Work	$ 40,000	
Pipe	$ 570,000	
Bends, Fittings, Valves, Appurtenances	$ 127,000	
Surface Repair	$ 200,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,057,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 105,700.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,162,700.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 174,405.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,337,105.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 105,700.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 105,700.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,442,805.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,442,805.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,162,700.00	

Item No. 19 Lander City Park Raw Water Conversion

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 30,000	
Intake Structure	$ 250,000	
Pumps	$ 30,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 310,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 31,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 341,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 51,150.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 392,150.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 31,000.00	(Subtotal #3)
Permitting and Mitigation	$ 5,000.00	
Legal Fees (Title of Opinion Only)	$ 4,000.00	
Acquisition of Access and Rights of Way	$ 100.00	
Pre-construction Costs Total (Subtotal #4)	$ 40,100.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 432,250.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 432,250.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 341,000.00	

Item No. 20 Hillcrest Drive Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 75,000	
Materials Testing	$ 15,000	
Traffic Control	$ 30,000	
Demolition/Site Work	$ 40,000	
Pipe	$ 400,000	
Bends, Fittings, Valves, Appurtenances	$ 50,000	
Surface Repair	$ 150,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 760,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 76,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 836,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 125,400.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 961,400.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 76,000.00	(Subtotal #3)
Permitting and Mitigation	$ 5,000.00	
Legal Fees (Title of Opinion Only)	$ 25,000.00	
Acquisition of Access and Rights of Way	$ 95,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 201,000.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,162,400.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,162,400.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 836,000.00	

Item No. 21 Baldwin Creek Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 98,000	
Materials Testing	$ 24,500	
Traffic Control	$ 40,000	
Demolition/Site Work	$ 50,000	
Pipe	$ 810,000	
Bends, Fittings, Valves, Appurtenances	$ 100,000	
Surface Repair	$ 175,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,297,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 129,750.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,427,250.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 214,087.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,641,337.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 129,750.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 129,750.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,771,087.50	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,771,087.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,427,250.00	

Item No. 22 Mortimore Lane East Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 35,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 75,000	
Pipe	$ 2,000,000	
Bends, Fittings, Valves, Appurtenances	$ 700,000	
Surface Repair	$ 800,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 3,910,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 391,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 4,301,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 645,150.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 4,946,150.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 391,000.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)	$ 50,000.00	
Acquisition of Access and Rights of Way	$ 115,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 566,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 5,512,150.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 5,512,150.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 4,301,000.00	

Item No. 23 Goodrich Connector Pipelines – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 10,000	
Materials Testing	$ 2,000	
Traffic Control	$ 7,000	
Demolition/Site Work	$ 15,000	
Pipe	$ 88,000	
Bends, Fittings, Valves, Appurtenances	$ 50,000	
Surface Repair	$ 28,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 200,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 20,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 220,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 33,000.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 253,000.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 20,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 20,000.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 273,000.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 273,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 220,000.00	

Item No. 24 Distribution System Improvements Budgeting II – Non-WWDC Eligible

Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Distribution System Piping Replacement Budgeting	$ 1,000,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 1,000,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,000,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 25 Sewer Lagoon Bulk Fill Station – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 10,000	
Materials Testing	$ 1,500	
Traffic Control	$ 7,000	
Demolition/Site Work	$ 15,000	
Pipe	$ 40,000	
Bends, Fittings, Valves, Appurtenances	$ 20,000	
Structure	$ 285,000	
Surface Repair / Paving	$ 28,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 406,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 40,650.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 447,150.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 67,072.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 514,222.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 40,650.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 40,650.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 554,872.50	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 554,872.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 447,150.00	

Item No. 26 Buena Vista Drive Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 191,000	
Materials Testing	$ 50,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 1,100,000	
Bends, Fittings, Valves, Appurtenances	$ 250,000	
Surface Repair	$ 350,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 2,091,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 209,100.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 2,300,100.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 345,015.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,645,115.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 209,100.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 209,100.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 2,854,215.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 2,854,215.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 2,300,100.00	

Item No. 27 Mortimore Lane West Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 150,000	
Materials Testing	$ 35,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 75,000	
Pipe	$ 800,000	
Bends, Fittings, Valves, Appurtenances	$ 150,000	
Surface Repair	$ 300,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,560,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 156,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,716,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 257,400.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,973,400.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 156,000.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)	$ 25,000.00	
Acquisition of Access and Rights of Way	$ 70,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 261,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 2,234,400.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 2,234,400.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,716,000.00	

Item No. 28 Industrial Park Improvements/Annexation

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 100,000	
Materials Testing	$ 35,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 75,000	
Pipe	$ 700,000	
Bends, Fittings, Valves, Appurtenances	$ 125,000	
Surface Repair	$ 300,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,385,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 138,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,523,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 228,525.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,752,025.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 138,500.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)	$ 25,000.00	
Acquisition of Access and Rights of Way	$ 70,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 243,500.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,995,525.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,995,525.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,523,500.00	

Item No. 29 Grandview/Valleyview to Table Mountain Pipeline – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 150,000	
Materials Testing	$ 32,000	
Traffic Control	$ 40,000	
Demolition/Site Work	$ 50,000	
Pipe	$ 1,000,000	
Bends, Fittings, Valves, Appurtenances	$ 223,000	
Surface Repair	$ 200,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,695,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 169,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,864,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 279,675.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,144,175.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 169,500.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 169,500.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 2,313,675.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 2,313,675.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,864,500.00	

Item No. 30 North 1st Street Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 60,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 2,000,000	
Bends, Fittings, Valves, Appurtenances	$ 500,000	
Surface Repair	$ 400,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 3,360,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 336,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 3,696,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 554,400.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 4,250,400.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 336,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 336,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 4,586,400.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 4,586,400.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 3,696,000.00	

Item No. 31 S. 1st Street Pipeline – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 60,000	
Materials Testing	$ 15,000	
Traffic Control	$ 20,000	
Demolition/Site Work	$ 15,000	
Pipe	$ 375,000	
Bends, Fittings, Valves, Appurtenances	$ 70,000	
Surface Repair	$ 75,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 630,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 63,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 693,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 103,950.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 796,950.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 63,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 63,000.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 859,950.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 859,950.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 693,000.00	

Item No. 32 Mortimore Lane to Squaw Creek Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 60,000	
Traffic Control	$ 50,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 1,750,000	
Bends, Fittings, Valves, Appurtenances	$ 350,000	
Surface Repair	$ 50,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 2,610,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 261,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 2,871,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 430,650.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 3,301,650.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 261,000.00	(Subtotal #3)
Permitting and Mitigation	$ 80,000.00	
Legal Fees (Title of Opinion Only)	$ 75,000.00	
Acquisition of Access and Rights of Way	$ 60,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 476,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 3,777,650.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 3,777,650.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 2,871,000.00	

Item No. 33 Cascade Street Pipelines – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 150,000	
Materials Testing	$ 45,000	
Traffic Control	$ 58,500	
Demolition/Site Work	$ 50,000	
Pipe	$ 1,400,000	
Bends, Fittings, Valves, Appurtenances	$ 250,000	
Surface Repair	$ 300,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 2,253,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 225,350.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 2,478,850.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 371,827.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,850,677.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 225,350.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 225,350.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 3,076,027.50	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 3,076,027.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 2,478,850.00	

Item No. 34 Loop Drive to Spriggs Connector Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 100,000	
Materials Testing	$ 25,000	
Traffic Control	$ 15,000	
Demolition/Site Work	$ 20,000	
Pipe	$ 800,000	
Bends, Fittings, Valves, Appurtenances	$ 150,000	
Surface Repair	$ 150,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 1,260,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 126,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,386,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 207,900.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,593,900.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 126,000.00	(Subtotal #3)
Permitting and Mitigation	$ 5,000.00	
Legal Fees (Title of Opinion Only)	$ 15,000.00	
Acquisition of Access and Rights of Way	$ 10,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 156,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,749,900.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,749,900.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,386,000.00	

Item No. 35 Mager 2 Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 60,000	
Traffic Control	$ 45,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 1,500,000	
Bends, Fittings, Valves, Appurtenances	$ 300,000	
Surface Repair	$ 100,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 2,355,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 235,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 2,590,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 388,575.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 2,979,075.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 235,500.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 235,500.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 3,214,575.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 3,214,575.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 2,590,500.00	

Item No. 36 Distribution System Improvements Budgeting III – Non-WWDC Eligible

Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Distribution System Piping Replacement Budgeting	$ 1,000,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 1,000,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,000,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 37 County Shop Bulk Fill Station – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 10,000	
Materials Testing	$ 1,500	
Traffic Control	$ 7,000	
Demolition/Site Work	$ 15,000	
Pipe	$ 40,000	
Bends, Fittings, Valves, Appurtenances	$ 20,000	
Structure	$ 285,000	
Surface Repair / Paving	$ 28,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 406,500.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 40,650.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 447,150.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 67,072.50	
Construction Costs Total (Subtotal #2 + Contingency)	$ 514,222.50	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 40,650.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 40,650.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 554,872.50	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 554,872.50	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 447,150.00	

Item No. 38 WTP Improvements Phase II – Non-WWDC Eligible

CONSTRUCTION COSTS		
Component	Cost	Comments
Raw Water Wye Strainer		
DIP Fittings	$ 40,000	
DIP Butterfly Valves	$ 40,000	
DIP Wye Strainer	$ 20,000	
DIP	$ 15,000	
UV Building Piping Improvements		
DIP Fittings	$ 30,000	
DIP Butterfly Valves	$ 30,000	
DIP	$ 15,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 190,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 19,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 209,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 31,350.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 240,350.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 19,000.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 19,000.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 259,350.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 259,350.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 209,000.00	

Item No. 39 Infiltration Gallery Rehabilitation Budgeting

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 80,000	
Flow Measurement	$ 172,000	
Jetting/Camera Investigation	$ 10,000	
Pipe Replacement	$ 420,000	
SCADA	$ 50,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 732,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 73,200.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 805,200.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 120,780.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 925,980.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 73,200.00	(Subtotal #3)
Permitting and Mitigation	$ 820.00	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 74,020.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,000,000.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,000,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 805,200.00	

Item No. 40 Exchange Petition Update for Infiltration Gallery

CONSTRUCTION COSTS		
Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation		
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Exchange Petition Update	$ 35,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 35,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 35,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 41 North 2nd Street Transmission Line - Phase I

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 60,000	
Traffic Control	$ 45,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 1,500,000	
Bends, Fittings, Valves, Appurtenances	$ 300,000	
Surface Repair	$ 300,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 2,555,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 255,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 2,810,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 421,575.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 3,232,075.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 255,500.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)	$ 15,000.00	
Acquisition of Access and Rights of Way	$ 25,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 305,500.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 3,537,575.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 3,537,575.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 2,810,500.00	

Item No. 42 Redd Fox Improvements/Annexation

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 125,000	
Materials Testing	$ 45,000	
Traffic Control	$ 25,000	
Demolition/Site Work	$ 50,000	
Pipe	$ 290,000	~2900 LF 8"
Bends, Fittings, Valves, Appurtenances	$ 100,000	
Surface Repair	$ 279,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 914,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 91,400.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 1,005,400.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 150,810.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 1,156,210.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 91,400.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 91,400.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,247,610.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,247,610.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 1,005,400.00	

Item No. 43 North 2nd Street Transmission Line - Phase II

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 250,000	
Materials Testing	$ 60,000	
Traffic Control	$ 45,000	
Demolition/Site Work	$ 100,000	
Pipe	$ 2,200,000	
Bends, Fittings, Valves, Appurtenances	$ 400,000	
Surface Repair	$ 500,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 3,555,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 355,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 3,910,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 586,575.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 4,497,075.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 355,500.00	(Subtotal #3)
Permitting and Mitigation	$ 10,000.00	
Legal Fees (Title of Opinion Only)	$ 15,000.00	
Acquisition of Access and Rights of Way	$ 25,000.00	
Pre-construction Costs Total (Subtotal #4)	$ 405,500.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 4,902,575.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 4,902,575.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 3,910,500.00	

Item No. 44 Deer Valley Expansion

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 5,000	
Materials Testing	$ 5,000	
Traffic Control	$ 1,000	
Demolition/Site Work	$ 3,000	
Pipe	$ 40,000	
Bends, Fittings, Valves, Appurtenances	$ 10,000	
Surface Repair	$ 5,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 69,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 6,900.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 75,900.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 11,385.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 87,285.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 6,900.00	(Subtotal #3)
Permitting and Mitigation	$ 5,815.00	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 12,715.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 100,000.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 100,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 75,900.00	

Item No. 45 WLRC Improvements/Annexation

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 100,000	
Materials Testing	$ 15,000	
Traffic Control	$ 25,000	
Demolition/Site Work	$ 25,000	
Pipe	$ 290,000	
Bends, Fittings, Valves, Appurtenances	$ 100,000	
Surface Repair	$ 200,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 755,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 75,500.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 830,500.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 124,575.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 955,075.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 75,500.00	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 75,500.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 1,030,575.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,030,575.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 830,500.00	

Item No. 46 Squaw Baldwin Tensleep and Madison Wells Level II Groundwater Study

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance		
Base Station, Automated Meter Reading Infrustructure		
Meters and Radios Material Cost		
In-home installations		
Service Line Inventory		
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Engineering Studies	$ 400,000.00	
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 400,000.00	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ 400,000.00	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 400,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

Item No. 47 Lyons Valley Transmission Line

CONSTRUCTION COSTS		
Component	Cost	Comments
Mobilization, Bonds, Insurance	$ 600,000	
Materials Testing	$ 250,000	
Traffic Control	$ 150,000	
Demolition/Site Work	$ 500,000	
Pipe	$ 10,000,000	
Bends, Fittings, Valves, Appurtenances	$ 5,000,000	
Surface Repair	$ 4,000,000	
Cost of Project Components TOTAL (Subtotal #1)	$ 20,500,000.00	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ 2,050,000.00	
Components + Construction Engineering Costs (Subtotal #2)	$ 22,550,000.00	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ 3,382,500.00	
Construction Costs Total (Subtotal #2 + Contingency)	$ 25,932,500.00	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ 2,050,000.00	(Subtotal #3)
Permitting and Mitigation	$ 200,110.00	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ 2,250,110.00	(Subtotal #4)
TOTAL WWDC INELLIGIBLE PROJECT COST		
Total WWDC Inelligible Project Cost (Subtotal #3 + Subtotal #4)	$ 28,182,610.00	(Subtotal #5)
TOTAL WWDC ELLIGIBLE PROJECT COST		
itemized Costs of Elligible Project Components		
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Elligible Project Costs Total	$ -	(Subtotal #6)
TOTAL PROJECT COST - WWDC INELLIGIBLE		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 28,182,610.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ 22,550,000.00	

Item No. 48 Distribution System Improvements Budgeting IV – Non-WWDC Eligible

Component	Cost	Comments
Cost of Project Components TOTAL (Subtotal #1)	$ -	(Subtotal #1)
Construction Engineering (Subtotal #1 x 10%)	$ -	
Components + Construction Engineering Costs (Subtotal #2)	$ -	(Subtotal #2)
Contingency (Subtotal #2 x 15%)	$ -	
Construction Costs Total (Subtotal #2 + Contingency)	$ -	
PRE-CONSTRUCTION COSTS		
Preparation of Final Designs & Specifications (subtotal #1 x 10%) (Subtotal #3)	$ -	(Subtotal #3)
Permitting and Mitigation	$ -	
Legal Fees (Title of Opinion Only)	$ -	
Acquisition of Access and Rights of Way	$ -	
Pre-construction Costs Total (Subtotal #4)	$ -	(Subtotal #4)
TOTAL WWDC ELLIGIBLE PROJECT COST		
Total WWDC Elligible Project Cost (Subtotal #3 + Subtotal #4)	$ -	(Subtotal #5)
TOTAL WWDC INELLIGIBLE PROJECT COST		
itemized Costs of Inelligible Project Components		
Distribution System Piping Replacement Budgeting	$ 1,000,000.00	
Additional Cost for Construction Engineering	$ -	
Additional Cost for Preparation of Final Designs & Specifications	$ -	
Total WWDC Inelligible Project Costs Total	$ 1,000,000.00	(Subtotal #6)
TOTAL PROJECT COST		
Total Project Cost (Subtotal #5 + Subtotal #6)	$ 1,000,000.00	
MATERIALS ONLY TOTAL		
Materials Only Total (Subtotal #1 + (Subtotal #1 x 10%))	$ -	

F.2 – Miscellaneous Estimates

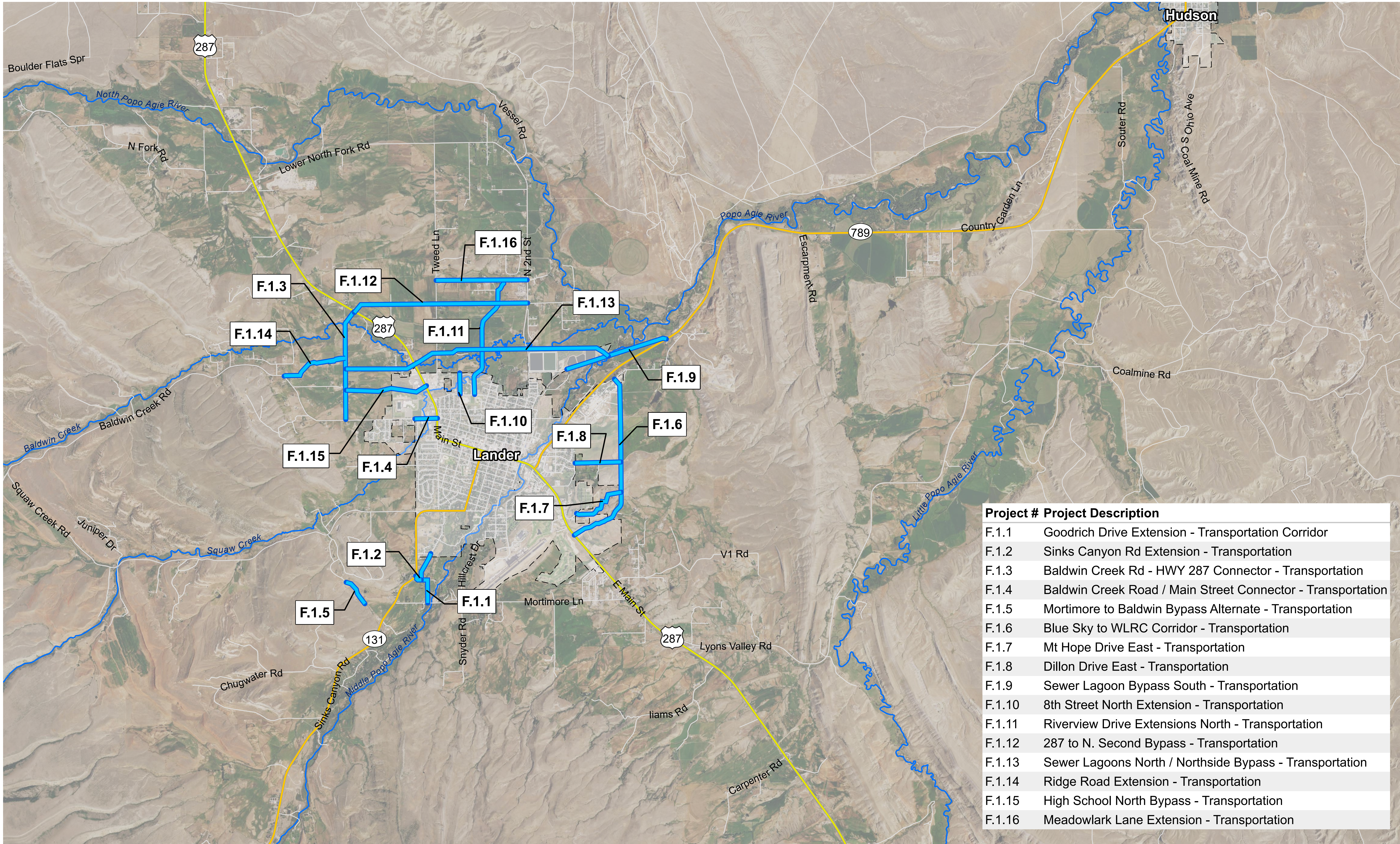
All Transmission Main Projects Cost Estimates

While putting together the planned infrastructure improvements projects, City Staff identified miscellaneous pipeline corridors where they saw the potential for future growth or a need of a new pipeline. While not all of these projects were included in the overall recommended projects given the scale of the number of transmission mains, cost estimates were prepared for all transmission main projects identified by the City. The projects are divided into several categories:

1. Transportation Plan Corridor Pipelines (Figure F-1)
2. Pipeline Looping Projects (Figure F-2)

A summary table of these estimates is provided below.

Project #	Project Description	Total Project Cost USD
F.1.1	Goodrich Drive Extension - Transportation Corridor	$ 1,639,020.00
F.1.2	Sinks Canyon Rd Extension - Transportation	$ 272,625.00
F.1.3	Baldwin Creek Rd - HWY 287 Connector - Transportation	$ 3,140,275.00
F.1.4	Baldwin Creek Road / Main Street Connector - Transportation	$ 661,270.00
F.1.5	Mortimore to Baldwin Bypass Alternate - Transportation	$ 868,000.00
F.1.6	Blue Sky to WLRC Corridor - Transportation	$ 5,181,890.00
F.1.7	Mt Hope Drive East - Transportation	$ 1,666,625.00
F.1.8	Dillon Drive East - Transportation	$ 1,307,785.00
F.1.9	Sewer Lagoon Bypass South - Transportation	$ 2,960,855.00
F.1.10	8th Street North Extension - Transportation	$ 606,945.00
F.1.11	Riverview Drive Extensions North - Transportation	$ 3,576,170.00
F.1.12	287 to N. Second Bypass - Transportation	$ 5,001,075.00
F.1.13	Sewer Lagoons North / Northside Bypass - Transportation	$ 7,663,585.00
F.1.14	Ridge Road Extension - Transportation	$ 2,414,815.00
F.1.15	High School North Bypass - Transportation	$ 2,337,070.00
F.1.16	Meadowlark Lane Extension - Transportation	$ 2,598,125.00
F.2.1	Squaw / Baldwin Loop	$ 24,769,315.00
F.2.2	LEDA Subdivision Transmission Loop	$ 2,211,975.00
F.2.3	Airport and Rodeo Loop	$ 1,096,870.00
F.2.4	Airport Transmission Loop No. 2	$ 710,015.00
F.2.5	Spriggs Loop	$ 5,181,890.00
F.2.6	N. Second / Tweed Lane Loop	$ 17,792,915.00
F.2.7	HWY 287 / N. Second Loop	$ 13,735,305.00
F.2.8	Western Avenue Loop	$ 1,307,785.00
F.2.9	Lucky Lane Loop	$ 683,000.00

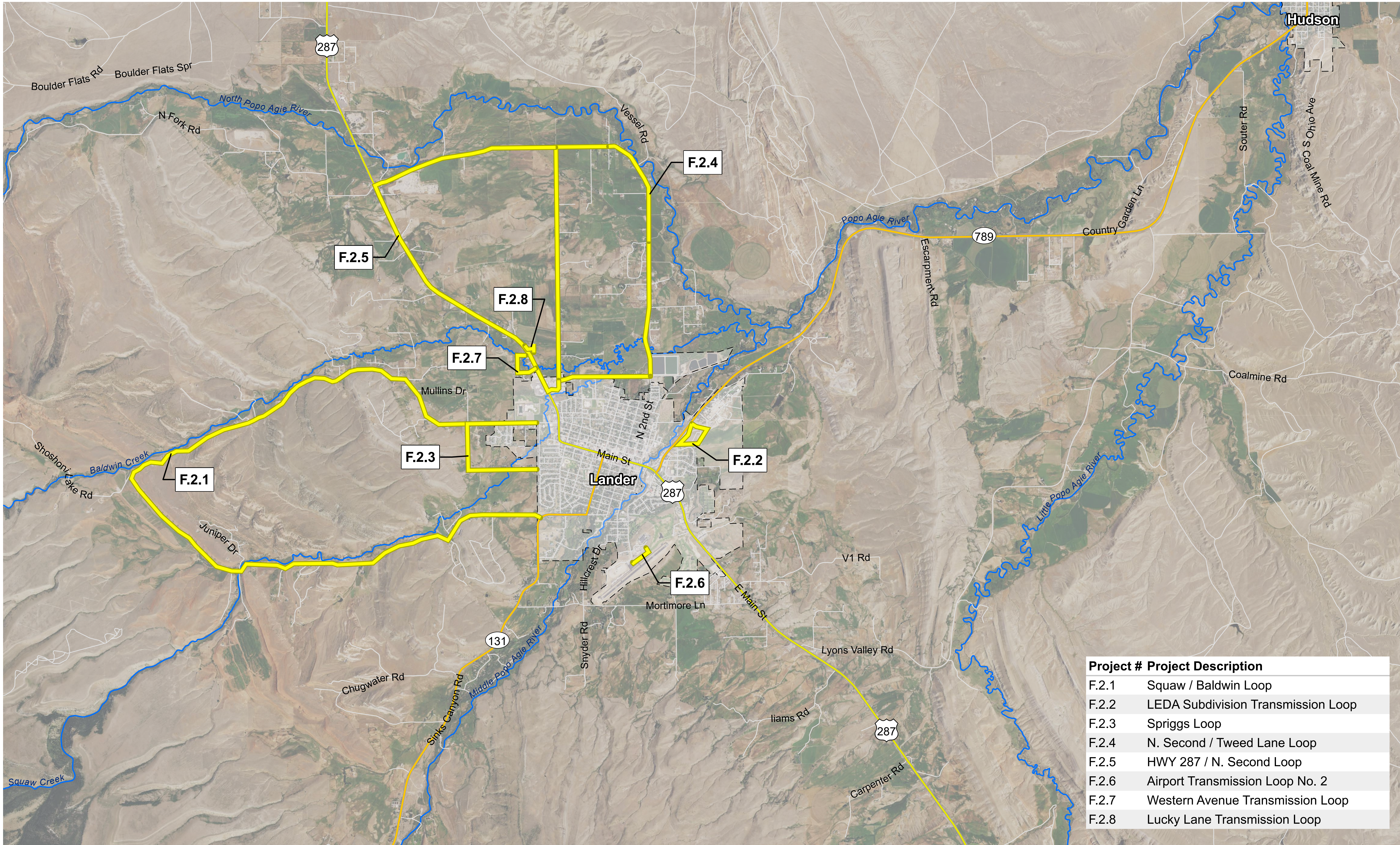


Project #	Project Description
F.1.1	Goodrich Drive Extension - Transportation Corridor
F.1.2	Sinks Canyon Rd Extension - Transportation
F.1.3	Baldwin Creek Rd - HWY 287 Connector - Transportation
F.1.4	Baldwin Creek Road / Main Street Connector - Transportation
F.1.5	Mortimore to Baldwin Bypass Alternate - Transportation
F.1.6	Blue Sky to WLRC Corridor - Transportation
F.1.7	Mt Hope Drive East - Transportation
F.1.8	Dillon Drive East - Transportation
F.1.9	Sewer Lagoon Bypass South - Transportation
F.1.10	8th Street North Extension - Transportation
F.1.11	Riverview Drive Extensions North - Transportation
F.1.12	287 to N. Second Bypass - Transportation
F.1.13	Sewer Lagoons North / Northside Bypass - Transportation
F.1.14	Ridge Road Extension - Transportation
F.1.15	High School North Bypass - Transportation
F.1.16	Meadowlark Lane Extension - Transportation

TRANSPORTATION PLAN CORRIDOR TRANSMISSION LINE PROJECTS

Figure F-1

LANDER, WYOMING MASTER PLAN



Project #	Project Description
F.2.1	Squaw / Baldwin Loop
F.2.2	LEDA Subdivision Transmission Loop
F.2.3	Spriggs Loop
F.2.4	N. Second / Tweed Lane Loop
F.2.5	HWY 287 / N. Second Loop
F.2.6	Airport Transmission Loop No. 2
F.2.7	Western Avenue Transmission Loop
F.2.8	Lucky Lane Transmission Loop

TRANSMISSION LOOPS

Figure F-2

LANDER, WYOMING MASTER PLAN

\\SXF-SRV01\ENG\GIS\PROJECTS\CITY_LANDER\LANDER_WATER_MASTER_PLAN_10299335\MAP_DOCS\LANDER_WATER_MASTER_PLAN.APRX DATE: 7/19/2023