2023 WATER SYSTEM COMPREHENSIVE PLAN UPDATE

City of Coeur d' Alene

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Prepared by:

J-U-B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

(208) 762-8787 | www.jub.com

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ABBREVIATIONS

AC	Asbestos-cement (pipe)
ADD	Average Daily Demand
AF	Acre-foot (43,560 cubic feet or 325,829 gallons)
AI	Aggressiveness index
Alk	Alkalinity
APD	Aquifer Protection District of Kootenai County
ASTM	American Society for Testing and Materials
C	Disinfectant concentration
CAMP	Comprehensive Aquifer Management Plan
cfs	Cubic feet per second
CT	Value time (disinfectant concentration times the contact time)
CU	Color units
CWA	Clean Water Act
DBP	Disinfection byproduct
DEQ/IDEQ	Idaho Department of Environmental Quality
DIC	Dissolved inorganic carbon
DWR/IDWR	Idaho Department of Water Resources
EPA/USEPA	United States Environmental Protection Agency
fps	Feet per second
GI	Gastrointestinal
GMA	Groundwater Management Area
gpcd	Gallons per capita per day
gpd	Gallons per day
gpm	Gallons per minute
GUDI	Groundwater Under the Direct Influence (of Surface Water)
HAA	Halo-acetic acid
IOC	Inorganic chemicals
LSI/LI	Langelier saturation index
MCL	Maximum containment level
MCLG	Maximum containment level goal
MDD	Maximum Daily Demand
MDL	Method detection limit
AC	Asbestos-cement (pipe)
meq	Milliequivalent, 10-3 equivalents
mg/l	Milligrams per liter = ppm
µg/l	Micrograms per liter = ppb
mgd	Million gallons per day
MPA	Microscopic Particle Analysis
NTU	Nephelometric turbidity unit
NPDES	National Pollutant Discharge Elimination System
PHD	Peak Hour Demand
ppb	Parts per billion
ppm	Parts per million
PQL	Practical Quantitation Limit
PVC	Polyvinyl Chloride (pipe)
RAFN	Reasonably Anticipated Future Needs Provisions of Idaho's Municipal Water Rights Act of 1996
SCADA	Supervising control and data acquisition
SDWA	Safe Drinking Water Act (P.L. 93-523 plus amendments)
SMCL	Secondary maximum containment level
SOC	Synthetic organic chemical
SVRPA/RPA	Spokane Valley-Rathdrum Prairie Aquifer
SWTR	Surface Water Treatment Rule
T	Contact time or temperature

LSL	Lead Service Lines
PFAS	Poly and Perfluoroalkyl Substance
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
TDS	Total dissolved solids
THM	Trihalomethane
TOC	Total organic carbon
UCMR	Unregulated Contaminant Monitoring Rule
USGS	U.S. Geological Survey
UV	Ultraviolet
VFD	Variable frequency drive
VOC	Volatile organic chemical

EXECUTIVE SUMMARY

ES-1 Introduction and Purpose

The City of Coeur d'Alene's previous Water System Comprehensive Plan was completed in 1999 and updated in 2012. Since that time, the City Water Department has implemented many of the recommended improvements. Remarkably, all the improvements were paid for from operating revenues without the need to add any debt. This plan update is conceived as the next step in continuing the successful management of the City's water system.

The City of Coeur d'Alene, Idaho (City) authorized J-U-B ENGINEERS, Inc. (J-U-B) to update the City's 2012 Water Comprehensive Plan Update. This plan update incorporates land use changes and establishes a new planning boundary. Using evaluation criteria approved by the City, the entire system was evaluated to determine the impact of future growth. The resulting recommendations presented in this report are for planning immediate and long-term improvements. This 2023 Comprehensive Plan Update focuses on improvements required within the next ten years as well as water demands, and the system infrastructure needs expected at system build-out. Reviewing the Comprehensive Plan annually and updating as conditions change from the expectations presented here will help maintain excellent water service throughout the planning period.

ES-2 Production and Consumption

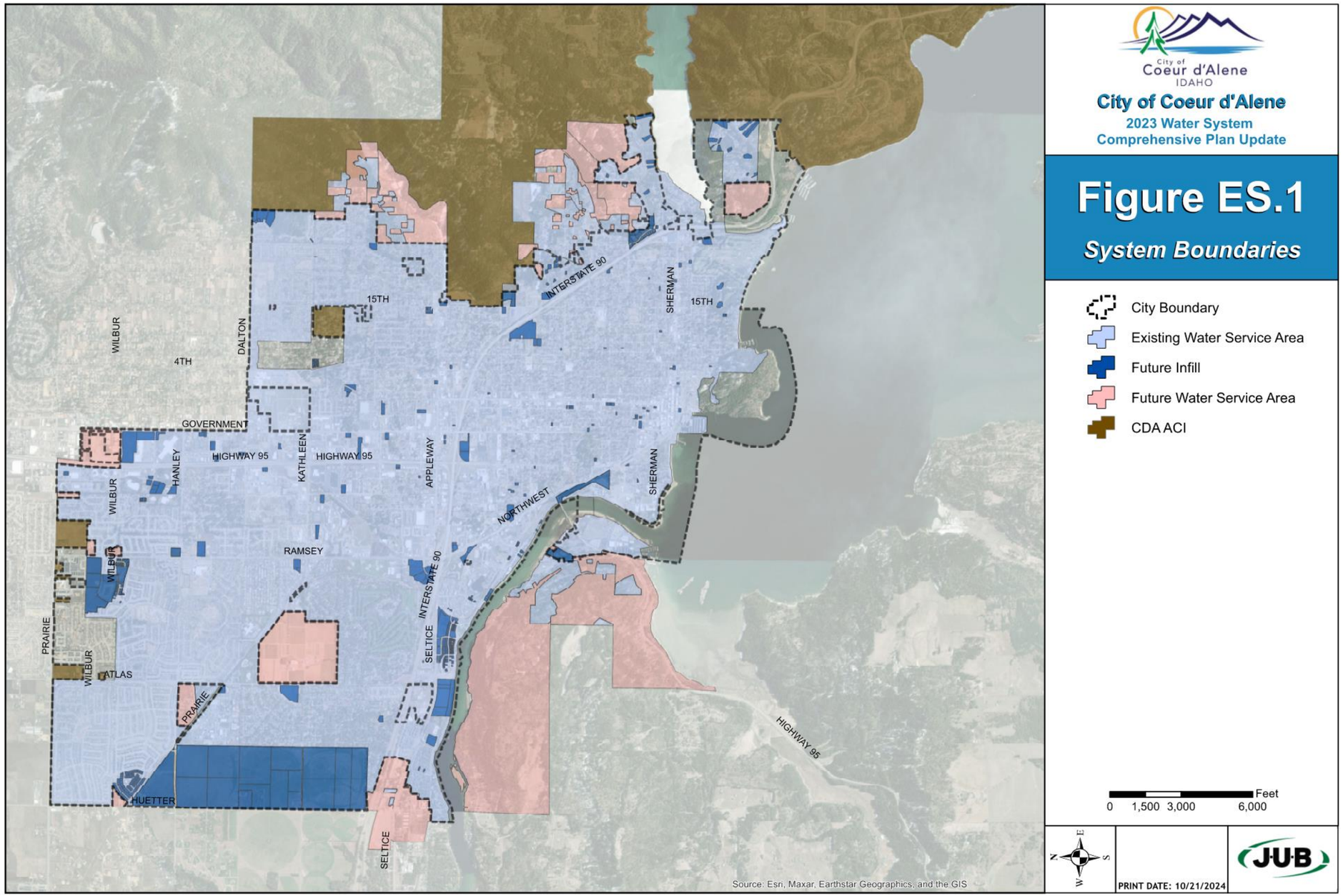
The City water system boundary serves approximately 10,300 acres and provides drinking water to over 20,000 metered connections. Over the 20-year planning period, 2043, the current population of 55,836 people is expected to continue growing at an average rate of 2.5 percent with an estimated buildout population in 2040 per current Comprehensive Plan. **Table ES - 1** includes the projected demands.

Table ES - 1 - City of Coeur d'Alene Current and Future Water Demand

	2023 (mgd)	2028 (mdg)	2033 (mgd)	Build Out 2040 (mgd)
Average Daily Demand	14.11	16.0	18.1	20.5
Maximum Daily Demand	42.8	48.5	54.9	62.2
Peak Hour Demand	77.0	87.2	98.8	112.0

Figure ES - 1 shows the existing and future planning boundaries for the water system. The planning boundary is consistent with the City's Area of City Impact (ACI) on the north, west, and southwest borders. The water planning boundary to the east and southeast have been reduced from the ACI to encompass areas that are thought to be reasonably serviceable by the current system. **Chapter 2** evaluates water production and consumption.

Figure ES - 1 – System Boundaries



ES-3 System Overview

The City of Coeur d'Alene water system is currently in very good condition, which continues to improve through an aggressive replacement program. Water is currently supplied by eleven groundwater wells, and storage is provided by six storage tanks. Six pressure zones are included within the boundary, two of which are served directly by wells and four of which are served by booster stations. The eleven wells within the system can provide over 36,000 gpm at the current pump capacities. A summary of these wells is included in **Table ES - 2**.

The City has total water rights of 81.0 cfs which meets the current maximum day demand. These water rights have been consolidated to a municipal water right and are looked at for the system as a whole, meaning the City can use up to its full water right regardless of which wells are operating.

The existing storage tanks are typically located at the periphery of the system. **Table ES - 3** includes the summary of the existing facilities.

Table ES - 2 - Well and Pump Data

Well No.	Original Well Test		Present Pump & Motor	Pump Rated Capacity		Peak Operating Points			Auxiliary Power
	Flow (gpm)	Drawdown (feet)		Flow (gpm)	Head (feet)	Flow (gpm)	System Pressure (psi)	Well Drawdown (feet)	
1. Atlas	6,000	23.2	600 hp Worthington Model 15HH410-7, 7-stage deep well turbine	4,000	420	4,150	53	14.5	750 KW Diesel Generator
2. 4th St.	3,500	20.1	400 hp Flowserve, 4 Stage Vertical Turbine	3,000	361	3,600	53	13.0	None
3. Hanley	6,000	5.75	500 hp Peerless deep well turbine pump	3,500	440	3,600	65	5.0	None
4. Honeysuckle	2,500	N/A	250 hp Goulds Model 14RJ-DWT, 5-stage deep well turbine	2,000	375	2,000	80	12	None
5. Linden	3,100	10.7	350 hp Flowserve 15EHM 4 Stage deep well turbine	3,000	360	3,200	65	13.5	600 KW diesel generator
6. Locust	3,700	5.9	350 hp Peerless Vertical Turbine 14HH 7 stage deep well turbine	3,200	337	2,800	55	4.0	None
7. Landings	3,500	14	500 hp Flowserve Model 15EHM/15HZ77, 5-stage deep well turbine	3,000	512	3,450	65	10	None
8. Prairie	4,000	1	500 hp Flowserve 16 ENL 6 stage deep well turbine	3,700	450	3,500	59	6.0	600 KW Diesel Generator
9. Annie	2,500	93	350 hp Peerless Model 16HXB, 5-stage deep well turbine	2,500	429	2,180	65	25.0	400 KW Diesel Generator
10. Ralph Capaul	4,000	-	600 hp Flowserve, 5 Stage Vertical Turbine	4,000	461	4,300	68	3.0	600 KW Diesel Generator
11. Huetter	4,000	-	600 hp Flowserve, Vertical Turbine	4,000	452	4,200	68	2.0	750 KW Diesel Generator
Total	**42,800**			**35,900**		**36,980**			

Table ES - 3 - Summary of Existing Storage

	Storage Tank	Capacity (MG)	Operating Characteristics			
			Overflow Elevation (MSL)	Height (feet)	Pressure Zone	Type of Tank
1	Best Hill	2.0	2,355.35	31.85	General	Ground Level (steel)
2	Tubbs Hill	2.0	2,355.35	24	General	Ground Level (concrete)
		1.0	2,355.35	24	General	Ground Level (steel)
3	Prairie Standpipe	2.0	2,430.5	156.5	High	Standpipe (steel)
4	Industrial Standpipe	2.0	2,430.50	160	Highr	Standpipe (steel)
5	Stanley Hill	0.2	2,540.22	31	Stanley	Ground Level (steel)
6	Blackwell Hill	0.012	2,400 (a)	10	Blackwell	Ground Level (concrete)
7	Armstrong Park	0.16	2,882 (a)	32	Armstrong Park	Ground Level (steel)
Total		**9.2(b)**				

(a) Approximate elevation
(b) Excludes Blackwell Hill and Armstrong Park

The City also has five major booster stations that supply the areas of higher elevation. These booster stations are summarized in **Table ES - 4**.

Table ES - 4 - Summary of Existing Booster Pump Stations

Booster Station		Operating Characteristics						Notes
		Suction Pressure Zone	Discharge Pressure Zone	Pump No.	HP	Capacity (gpm)	TDH [(a)] (ft)	
1	Elm Street	General	Stanley	1	20	200	230	
				2	50	500	230	
				3	20	200	230	
2	Blackwell Hill – Lower	General	Blackwell	1	20	90		
				2	20	120		
				3	20			
	Blackwell Hill - Upper			1 & 2	3	53.3		
3	Tubbs Hill	General	Tubbs Hill	1	1.5	30	158	
				2	1.5	30	158	
				3	1.5	30	158	
4	Armstrong Park	General	Armstrong Park	1	50	220	560	
				2	50	220	560	
5	Best Hill	General (Best Hill Tank)	General	1	50	2,000	60	

(a) Total dynamic head based on nameplate and original pump curve information.

The City's water distribution system includes a total of 318 miles of piping. This piping ranges in size and material throughout the system. **Table ES - 5** includes a summary of the existing piping by diameter and material. Chapter 3 summarizes the existing system.

Table ES - 5 - Pipe Summary [(a)]

Material	Pipe Length Diameter										
	< 6" (miles)	6" (miles)	8" (miles)	10" (miles)	12" (miles)	14" (miles)	16" (miles)	18" (miles)	20" (miles)	24" (miles)	Total (miles)
AC	5.1	49.9	24.6	2.2	19.5	0.6	1.1				**103.0**
Ductile	0.2	1.5	0.2		1.3	0.2	0.1	0.2	0.5	3.3	**7.5**
Galvanized	2.5										**2.5**
PVC	3.5	30.9	106.7	4.8	50.4		3.2	0.8			**200.2**
Steel	1.6	1.9	0.3		0.2						**4.0**
Other	0.6	0.2									**0.8**
Total	**13.54**	**84.4**	**112.3**	**7.0**	**71.3**	**0.8**	**4.4**	**1.0**	**0.5**	**3.3**	**318.0**

(a) Pipe material, length, and sizes were generated from the City's GIS water system database as of February 2023.

ES-4 Water Supply Evaluation

The City's existing supply is both high quality and productive. To help ensure reliable water service, water systems strive to meet maximum day demands through "firm" capacity. The "firm" supply required for the system is the supply required with the largest well out of service. **Table ES - 6** shows the current firm supply for each of the pressure zones as well as identifies the additional supply that will be required for each of the zones to meet the build-out demands.

Table ES - 6 - Supply Analysis

Zone	Current Firm Capacity MGD (gpm)	Build-Out Required Firm Capacity MGD (gpm)	Additional Capacity Required MGD (gpm)
High	30.10 (20,900)	47.38 (32,900)	17.28 (12,000)
General	16.96 (11,780)	22.72 (15,780)	5.76 (4,000)
Stanley Hill	0.58 (400)	1.15 (800)	0.58 (400)
Armstrong Park	0.63 (440)	0.95 (660)	0.32 (220)
Blackwell Hill	0.48 (330)	0.78 (540)	0.30 (210)
Fernan Hill	---	1.08 (750)	1.08 (750)

To meet the future supply requirements, five supply improvements have been scheduled. Three additional 4,000 gpm wells will be required in the High Zone. The General Zone will require two additional 2,000 gpm wells. These wells may be in either the High or General Zone.

In addition to the additional supply that will be added to the system, several other improvements have been recommended, including the replacement of one wellhouse and upgrades to the existing disinfection systems, along with regular maintenance items such as pump repairs and control system upgrades. A complete discussion of the recommended improvements can be found in **Chapter 4.**

ES-5 Water Storage Evaluation

The existing storage facilities are generally in good condition. The storage required for each zone is developed based on the City's criteria described in **Chapter 1**, which includes storage for equalization, fire, and emergency supplies. **Table ES - 7** includes the current storage, required capacity, and total deficit by zone.

Table ES - 7 - Storage Analysis

Zone	Current Usable Capacity (MG)	Build-Out Required Firm Capacity (MG)	Additional Capacity Required (MG)
High	2.00	4.00	2.00
General	5.00	3.72	---
Stanley Hill	0.20	065	0.50
Armstrong Park	0.16	0.60	0.50
Blackwell Hill	0.00	0.50	0.60
Fernan Hill	N/A	0.70	0.70

An additional 2 MG storage tank is recommended in the High Zone. Several tanks will also require re-coating within the upcoming years. Many of the boosted systems will require additional storage as these areas develop further. Since these are largely development driven, the improvements will be driven by development activity in these areas. A complete discussion of the recommended improvements can be found in **Chapter 5**.

ES-6 Distribution System Evaluation

The existing distribution system is generally in good condition. The Water Department schedules replacement of 1 to 2 miles of pipelines each year, focusing their program on the areas with old pipe and undersized pipe. This rate of replacement will allow the entire system to be fully replaced every 150 to 300 years.

As the system grows toward build-out of the planning area and the demands increase across the system, moving water from the large supply wells to the remainder of the system becomes more difficult. Several the recommended improvements involve upsizing pipes are driven by the need to

move more water throughout the system. **Chapter 6** of the Plan includes a detailed discussion of the recommended improvements.

ES-7 Capital Improvement Plan

The recommended improvements for the system are identified in **Chapters 4, 5, and 6** and are previously shown on **Figure ES - 1**. These recommended improvements have been scheduled through the planning period, to meet the system requirements and demands. **Table ES - 8** shows the phasing of system improvements.

Table ES - 8 - City of Coeur d' Alene Schedule of Improvements

Item	City-Funded Capital Cost Opinion by Year [(a)] [(b)]		
	2023-2027	2028-2032	2033-2043
Supply Improvements			
New Wells	$2,800,000	$2,800,000	$8,100,000
Other Supply Improvements	$1,835,000	$1,680,000	$4,605,000
Storage Improvements			
New Tanks	$6,800,000	$8,900,000	$12,000,000
Other Storage Improvements	$600,000	$600,000	$1,850,000
Distribution Improvements			
Distribution Improvements	$10,380,000	$13,260,000	$26,220,000
Annual Water Main Replacement	$9,000,000	$9,000,000	$14,400,000
Booster Stations			
Booster Station Improvements	$2,000,000	$2,190,000	$1,100,000
Additional Capital Improvements			
Additional Improvements	$1,894,000	$3,323,000	$5,105,000
Totals	**$36,179,000**	**$42,983,000**	**$73,380,000**

(a) All Opinions of Cost are planning level in 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

(b) Development-driven improvements are included at no cost to the City.

The cost of these improvements is paid for in different ways, depending on the driving factor for the improvement. Facilities located within the existing system that are driven by growth to supply future connections such as the recommended supply wells, new storage, and water transmission improvements are funded by capitalization fees. Projects that are related to regular maintenance or replacement of existing system components are funded by water rates. Projects that specifically serve a single major new development are expected to be fully funded by the development and donated to the City. **Table ES - 8** includes all the recommended City-funded improvements. The complete list of projects, can be found on **Table 7-1** to **Table 7-6**.

ES-8 Appendices

The appendices of this report include background and supplementary information:

- **Appendix A** presents the detailed analysis of the population projections for the Water Department and how the specific growth rate was selected.
- **Appendix B** incudes the Water Conservation Plan. This Plan fulfills the requirements of the Idaho Department of Water Resources for applying for future water rights.
- **Appendix C** contains specific information on each of the wells and well pumps.
- **Appendix D** and **Appendix E** include memorandums completed during the 2012 update describing the technical components for the future of the Fernan Hill Zone and the Blackwell Hill Zone.
- **Appendix F** details the technical components that went into the update of the hydraulic water model that was used to evaluate the distribution system.
- **Appendix G** outlines specific criteria for future developments.
- **Appendix H** includes the detailed Capital Improvement Plan.
- **Appendix I** includes DEQ Correspondence
- **Appendix J** includes City Council Meeting Minutes

ES-9 Financial Plan

A financial plan will be prepared by FCS group and will be included as a companion document. This document evaluates the cost of the recommended improvements and evaluates how the City can fund these from existing cash flow without adding debt. As a result of this analysis, it presents recommended rate and capitalization fee increases for the upcoming years.

ES-10 Acknowledgments

Many people were extremely helpful in providing documentation, information, and input. We wish, however, to especially thank the City of Coeur d'Alene Water Department staff who were instrumental in completing this report. Kyle Marine, Glen Poelstra, Ryan Webster, and Rob Stark were instrumental in collecting data; presenting improvement ideas; evaluating alternatives; expressing system concerns; and giving timely, pointed feedback. We would also like to thank Nick McCausland for his assistance with the City's GIS files. This assistance is gratefully acknowledged.

1 REVIEW CRITERIA

1.1 Introduction

This chapter includes an overview of some of the current and future regulatory requirements facing the Water Department as well as an overall view of the water quality for the City. This chapter also identifies the basic review criteria that will form the basis for this Master Plan Update.

1.2 Regulatory Issues

Rules, regulations, and requirements for groundwater systems have not changed significantly since the last two Comprehensive Plans completed in 1999 and 2012; however, there are some future regulatory requirements that may impact the City. An overview of future regulatory requirements that may affect the City are discussed in this section.

1.2.1 Existing Water Quality

The City operates a Public Water System (PWS #ID1280053) that is regulated by the State of Idaho Department of Environmental Quality (IDEQ). As a regulated Class 4 Water System, the City must submit water samples each year to verify the quality of water they serve the public.

All eleven of the City's wells draw water from the Spokane Valley-Rathdrum Prairie Aquifer (SVRPA). The aquifer was designated as a "Sole-Source Aquifer" by the Environmental Protection Agency in 1978. It has been further protected by Kootenai County and the Panhandle Health District, which limits septic tank wastewater service to one residential equivalent per five acres. Additionally, the Sensitive Resource Aquifer designation in 1997 by the State of Idaho further protects the SVRPA with Idaho's only "non-degradation" management standard.

Monthly coliform bacteria samples that are representative of water throughout the water system are submitted monthly to the IDEQ. In addition to coliform testing, the City is required to perform regular testing for contaminants, including lead and copper, volatile organic chemicals, synthetic organic chemicals, and inorganic chemicals.

Water quality throughout the system is generally very good and rarely elicits customer complaints. The City Water Department performs an excellent job in maintaining the system in good operating order. Water quality reports for the City's well sources show no detection of most chemical contaminates. Slight levels of nitrate exist within some of the City's wells. The highest level reported in 2022 was 2.63 mg/L, which is typical of Rathdrum Prairie wells and is well below the maximum contaminant level (MCL) of 10 mg/L. There is also naturally occurring arsenic in the City wells ranging from 1.50 to 28.10 µg/L (2022), almost all of which is well below the Maximum Containment Level (MCL) of 10 µg/L.

The two City wells that are near or exceed the MCL for arsenic set by the Environmental Protection Agency (EPA) include the Hanley and Annie wells. The Hanley Well exceeds the MCL, with arsenic

levels ranging from 1.7 to 28.10 µg/L. The Annie Well exceeds the MCL, with arsenic levels ranging from 1.5 to 10.8 µg/L. The City limits operation of both the Hanley and Annie wells per the agreement with IDEQ (from July 2006) to achieve an annual exposure of less than 10 µg/L to residents of these areas. Both the Annie & Hanley Wells are operated as a "last on"/"first off" well minimizing run time and blending with other sources per agreement with IDEQ (from July 2006). Strong protection measures in place for the Spokane Valley-Rathdrum Prairie Aquifer are expected to maintain water quality within water quality limits well beyond the planning period. The City will continue to monitor arsenic MCL requirements and will review alternatives.

1.2.2 Source Water Quantity

The Spokane Valley / Rathdrum Prairie aquifer is supplied by several large surface water sources, including Coeur d'Alene Lake, the Spokane River, Lake Pend Oreille, and Hayden Lake. Other small lake watersheds such as Hauser, Spirit, and Twin Lakes supply the balance of the surface water input to the aquifer. In an average year, precipitation also supplies the aquifer with one quarter of its recharge water. Of course, surface water flows and precipitation are subject to natural variations and will affect aquifer recharge rates. Detailed quantity, flow, and level analyses have been performed on both the Idaho and Washington side of the aquifer as part of the 2007 U.S. Geologic Surveys' "Bi-State" Study and are available on the IDEQ website.

The Spokane Valley/Rathdrum Prairie Aquifer is comprised of a thin layer of soil overlaying 200 to 400 feet of coarse sands and gravels. The alluvial material was deposited by Ice Age floods from Glacial Lake Missoula approximately 12,000 years ago. The 2007 "Bi-State" aquifer study completed by the U.S. Geologic Surveys shows that annual estimated aquifer withdrawals are approximately 22 percent of estimated annual recharge for the aquifer. While adequate aquifer supply appears to exist, pressure has been building from conservation groups to reduce per capita consumption to maintain Spokane River flows and water quality.

The Spokane Valley/Rathdrum Prairie Aquifer is the largest source of drinking water within the City's hydrologic area. Treating water from the nearby Spokane River or other surface sources would remove water that recharges the aquifer. It is significantly more costly than continued use of groundwater and could also introduce minimum river flow constraints directly into water supply planning. As a result, it is assumed that the City will continue to use groundwater as its sole water supply. Conserving water is likely the best way the City can reduce its dependence upon the aquifer. The City has been implementing conservation measures over the last few years, including promoting moisture sensors for irrigation systems and xeriscapes, education, ratepayer incentive programs, and block rate structures to promote conservation. Long-term aquifer quantity issues cannot be resolved by the City alone, as it is something that affects all communities located within the hydrologic boundaries of the aquifer.

1.2.3 Future Regulatory Issues

For detailed description of existing water quality standards including the ***Total Coliform Rule*** and ***Radon in Drinking Water Regulation*** *and* its impacts to the City's water system, reference the 2012 Water System Comprehensive Plan Update.

Two new drinking water rules are being proposed by the EPA that could potentially impact the City– the revised Lead and Copper Rule and the proposed Regulation to Target PFAs in Drinking Water.

The ***Lead and Copper Rule (LCR)*** was first effective in 1991, setting health goals and MCLs for total lead and copper in public drinking water systems. On August 4, 2022, EPA announced intentions to strengthen the Lead and Copper Rule by requiring communities to Develop and Maintain a Service Line Inventory. Inventory of service line materials, including public-side and private-side of the meter, is to be completed in October 16, 2024. The revisions to this rule are intended to provide a comprehensive inventory of all potable service line materials, both upstream and downstream of the meter. Additionally, new sampling requirements will be initiated downstream of all Lead Service Lines (LSLs), as defined by EPA. Those samples exceeding the trigger levels for lead will be required to work with EPA on a plan to "find and fix" LSLs on both the private and public side of the service lines.

City staff has begun inventory of service lines on the Owner side of the meter. As of March 2023, City staff has completed 12,000 of the 20,000 service tap cards on the public side of the meter. City staff is currently reviewing electrical evaluation options for review and material identification on the customer side of the meter. City plans to work with EPA and DEQ to find an approved methodology for material identification on the private side or downstream of the meter. City is on track to have the service line inventory completed by October 16, 2024.

With the updated sampling procedure, there is the potential that City staff may have to make modifications to the Lead and Copper sampling locations and procedures to meet the new tiered sampling requirements. Additionally, depending on the outcome of the service line inventory, the City staff may need to develop a "find and fix" program with EPA to eliminate LSLs.

The second rule that could impact the City is the proposed **Regulation to Target PFAs in Drinking Water.** This rule is intended to target two PFAS compounds, PFOA and PFOS, which are chemicals associated with a variety of health problems. Monitoring for PFOA and PFOS as individual contaminates will be at an MCL of 4 parts per trillion (ppt). This rule will also regulate four other PFAS compounds, PFHxS, PFNA, PFBS and HFPO-DA as a mixture and assessed using the Hazard Index with the MCL set to 1.0 (unitless) Hazard Index. Sampling will be required, and monitoring requirements will be based on water system size. Current timeline for regulation requires UCMR's in 2025. City staff has a preliminary plan in place for sampling and testing.

1.3 Fire Protection Criteria

Historically, the City water system has been designed to provide adequate water for domestic use only. Although there is no legal requirement for the water system to provide fire protection, the City has made a policy decision to provide reasonable flows and pressures for fire protection.

The current fire protection goal for the City are based on providing reasonable minimum flows and pressures. Through policy decision, the City Water Department works closely with the City Fire Department to meet fire flow goals for commercial and residential areas, as listed in **Table 1-1** and

Appendix I. Water system improvements identified in the CIP and new developments are designed to meet the City fire flow goals. Future development will need to meet or provide additional mitigation (i.e. sprinklers) the minimum standards established by this Plan. The target minimum flows and pressures are presented in **Table 1-1** and **Appendix I.**

Table 1-1 - Summary of Fire Flow Targets

Land Use and Zoning	Median Home Size (square feet)	Operating Characteristics		
		Flow Rate (gpm)	Residual System Pressure (psig)	Duration (hours)
Residential (R-1, R-3, R-8, R-12)	3,600	1,000	20	2
		1,750 [(a)]	20	2
Commercial (C-17, C-34)	3,600-5,000	3,500	20	3
Industrial (LM, M)		3,500	20	3

(a) On a case-by-case basis for structures greater than 5,000 SF

In the case of exceptionally high fire flow demands or demands exceeding those in **Table 1-1**, the property owner will be required to provide onsite fire protection (i.e., storage, pumping, and sprinklers) as necessary to meet the required fire flow per IBC/IFC. For these cases, the additional requirements will need to be approved by the Water Department Director and Fire Department and will be at the property owner's expense.

Due to the distributed nature of the City's supply, there is a wide variation in system performance between summer and winter. Since all system wells are operating during the peak summer months, available fire flows tend to be much higher during that period than in the winter months when storage is used more heavily.

The Water Department and Fire Department jointly determined during the 2012 Comprehensive Water Plan Update that the standard system condition under which sprinkler systems shall be designed and fire flows evaluated will be under low-demand, winter conditions with the Honeysuckle Well and the 4th Street Well operating and tank levels just above the minimum pump start levels.

1.4 Minimum Water Service Criteria

The City developed service criteria for the 1999 and 2012 Comprehensive Water Plan Updates to meet regulatory requirements, specific system performance/operation conditions, and fire flow criteria. City staff have indicated the criteria from the 1999 and 2012 Plan have worked well. The criteria to be maintained by the City water system are as follows (minor changes were made for this update):

- A normal operating pressure range of 50 to 80 psi at the meter.

- Where possible, a maximum system pressure of 80 psi at the meter. If these pressures are to be exceeded, special arrangements will be made to provide an acceptable pressure range.
- Where possible, a minimum pressure of 40 psi.
- Water supply at least equal to the maximum day demand with the largest well out of service.
- Storage capable of meeting the maximum fire demand plus equalization demand with the largest well out of service during the maximum day while maintaining 10 percent storage in reserve.
- Where possible, meet a minimum fire flow of 3,500 gpm in commercial areas; a minimum fire flow of 1,750 gpm in the R-1 and R-3 (or as modified by PUD) zoning districts; and a minimum fire flow of 1,000 gpm in the R-5 through R-12 zoning districts during normal system operation.
- Minimum residual pressure of 20 psi during fires meeting the fire flow criterion.
- Fire flow demands based on the size of the structure and type of construction exceeding these ranges will require that property owners provide onsite fire protection, including, but not limited to, sprinklers.

2 WATER PRODUCTION AND CONSUMPTION

2.1 Introduction

Growth in the City of Coeur d'Alene has continued over the last few years, with the overall growth between 2000 and present day being substantial. During this time, the Water Department has been able to keep up with the growth, provide good service, and minimize rate increases.

2.2 Coeur d'Alene Demographics

Coeur d'Alene has been growing rapidly over the last two decades. U.S. Census data indicates that the City population was 44,137 in 2010 and grew to 54,628 in 2020, an increase of approximately 2.16 percent year-over-year.

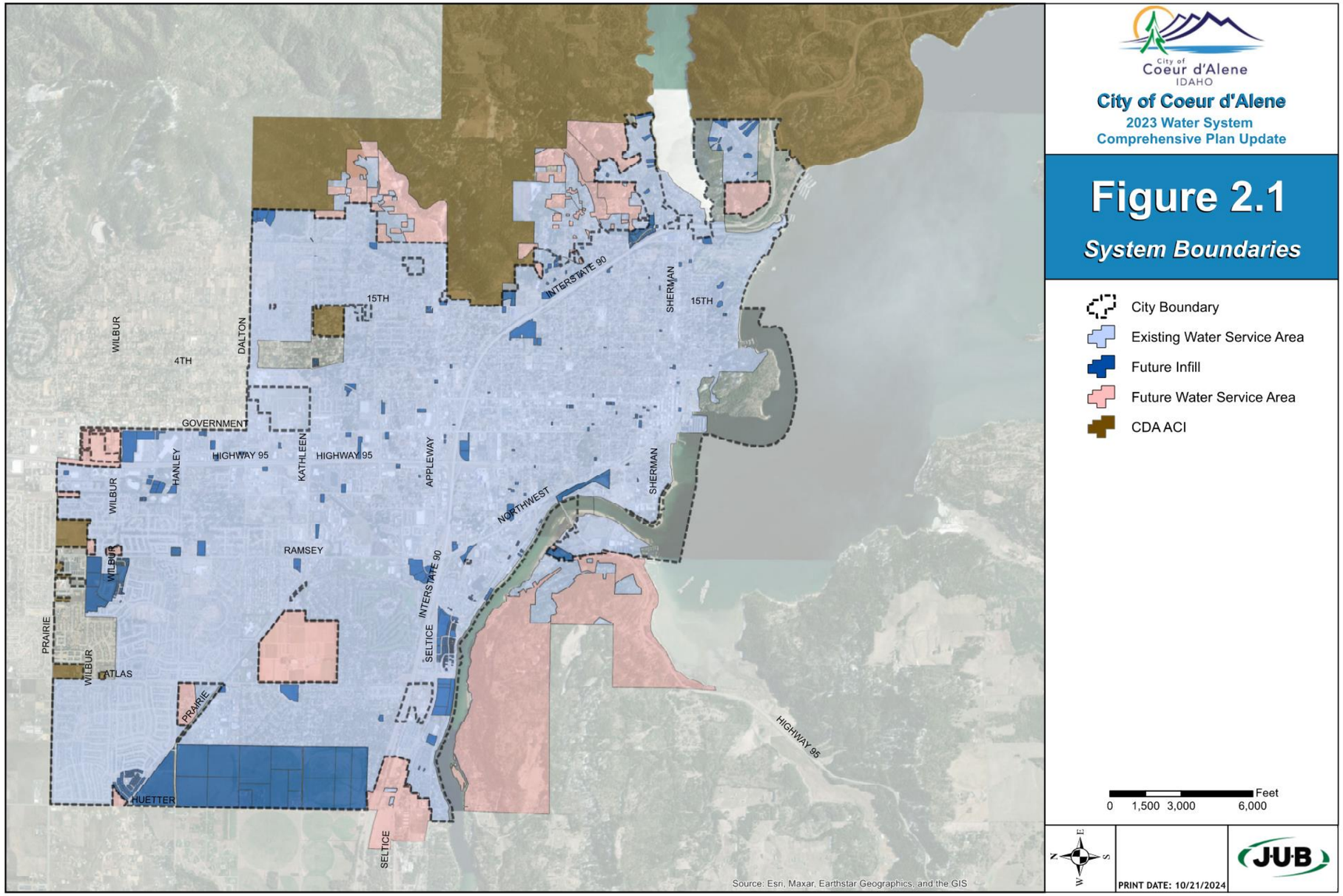
The Kootenai Metropolitan Planning Organization (KMPO) estimates Coeur d'Alene's projected average future annual growth rate at 2.5 percent. Coordination with the City's current 2022-2042 Comprehensive Plan, the Wastewater Department, and the Water Department resulted in a selected population growth rate of 2.5 percent for the planning period. A complete discussion of this evaluation is included in **Appendix A**.

2.3 Coeur d' Alene Water Service Boundary

The water service population differs slightly from the City population because the water service boundary and the City boundary are not the same. Several small areas within the limits are served by other water purveyors, including Hoffman Water, Dalton Water Association, Hayden Lake Irrigation District, and Huetter Water. The City also serves some legacy customers in unincorporated Kootenai County. The differences in the City and water service boundaries are shown on **Figure 2-1.** The existing water service boundary encompasses approximately 10,300 acres. This existing service boundary and future service area boundaries are also included on **Figure 2-1**.

The City Water Department currently has close to 20,148 total metered connections (2022 Max Month). Using the 2020 Census house hold of 2.40 persons per household, the population of the service area is approximately 55,836 people.

Figure 2-1- Existing and Future Service Area Boundaries



2.4 Water System Growth and Planning Period

Growth of the water system is restricted on several sides due to adjacent water systems. Adjacent water purveyors exist on the north and west sides of the City along with one small private system within the City. Ross Point Water serves a large portion of the area north of Seltice and west of Huetter, and the Hayden Lake Irrigation District (HLID) borders the City system to the north along Prairie Avenue. The south side of the system is bound by Coeur d'Alene Lake.

Most of the expected growth in the City of Coeur d'Alene is generally progressing toward the east and south with infill in the northwest, as shown on **Figure 2-1**. Specific areas of growth in the water system include:

- The northwestern portion of town as development fills in toward Prairie Avenue and Huetter
- The portion of town south of Seltice and north of the Spokane River, currently under development
- The area south of the Spokane River
- The area east of the existing City boundary in the foothills

There are also several relatively small areas within the future City water boundary serviced by independent water systems. These specific areas are Hoffman Water, the Kootenai County Fairgrounds, and the USFS Nursery. These water systems may become part of the City system in the future, increasing demands to the City water system. Build-out water demand projections include the incorporation of the USFS Nursery and fairgrounds into the City for planning purposes. Hoffman Water is assumed to remain independent.

The equivalent served acreage for the City was estimated by comparing build-out water demands with current water usage for land use areas within the system boundary. Based on this equivalent area, it is assumed that there will be a significant increase in water demands within the current system boundary. The total serviceable area for the build-out scenarios of the water system is approximately 12,800 acres.

The anticipated increase in system demand for the water service area is accounted for by applying the growth rate of 2.5 percent for Coeur d'Alene to current peak day flow. Build-out demand for the system was estimated in conjunction with the City Planning Department using current zoning and water demand factors developed for major usage categories and applying these demands to the full build-out acreage. The growth rates were used to estimate approximate timing for service area build-out by projecting flows forward from today's maximum day demand (MDD) at a 2.5 percent increase. Future projects described in this Plan include dates for planning purposes; however, observed system demand is the more accurate and critical component to scheduling upgrades. The City's 2022-2042 Comprehensive Plan references KMPO's estimated 2040 population for the City to be approximately 85,000 people.

2.5 Current and Future Water Consumption Demands

Water demands within the City are similar to nearby municipalities, with peak summer daily demands (MDD) nearing three times the average daily demand (ADD). The terms below are typically used to define water consumption demands:

Average Day Demand (ADD): The average number of gallons of water consumed per day as calculated over the course of one year.

Maximum Day Demand (MDD): The maximum number of gallons of water used in one day as determined from well production records.

Peak Hour Demand (PHD): The maximum amount of water used in a one-hour period. This number is extrapolated from well production and tank level records.

Daily and hourly pumping records are kept at each well site. The observed production has generally remained consistent, from 2018 to 2023. The maximum historical recorded maximum day demand on July 1, 2021 was 42.8 MG. The July 2021 MDD per capita water use was 768 gallons per capita per day and the 2021 ADD was 253 gallons per capita day. These values will be used in combination with the projected growth rate to develop future projected demands. Continual monitoring of actual system demands is recommended, if demands continue to remain consistent the CIP identified in **Chapter 7** can be extended. **Table 2-1** illustrates current and future water use within the City's water service area utilizing an annual growth rate of 2.5 percent.

Table 2-1-City of Coeur d' Alene Current and Future Water Demand

	2023 (mgd)	2028 (mgd)	2033 (mgd)	Build-Out 2040 (mgd)
Average Daily Demand	14.11	16.0	18.1	20.5
Maximum Daily Demand	42.8	48.5	54.9	62.2
Peak Hour Demand	77.0	87.2	98.8	112.0

The fluctuation in demands over a 24-hour period is demonstrated on **Figure 2-2** as a percentage of average over a 24-hour period. The demand fluctuation was developed during the 2012 Water System Comprehensive Plan Update using hourly SCADA information from the maximum day demand in 2011, considering pump run times, starts, and stops. The peak hour demand represents the highest rate of water use occurring in a one-hour period during the maximum day. Observed reservoir level fluctuations and pumping records indicate the PHD is approximately 1.8 times the MDD. This peak hour occurs at approximately 5:00 a.m., with a second lesser peak (1.2) at approximately 8:00 p.m. Demands above the base line show periods when equalization storage would be required if firm production capacity matched the peak day demand.

In addition to daily demand fluctuation, domestic water use varies yearly primarily due to irrigation use. **Figure 2-3** shows both the peak day and average day pumping values from 2018 through 2023. Comparing the average annual water demand of 14.1 mgd (9,801 gpm) to the maximum day

demand of 42.8 mgd (29,700 gpm) yields a peaking factor of 3.0. This peaking factor is assumed to remain consistent through the planning period.

In addition to the domestic water use and irrigation, typical system demands include fire flow. Fire flow criteria were established by the City and tabulated in **Chapter 1**.

2.6 Unaccounted Water

The City maintains daily water production records for each well in the system. Comparing water production to individual user meter readings indicates unaccounted water ranges from 2 percent to 18 percent annually. The losses for the City are very low and indicate a well-managed and maintained system. A detailed evaluation of Unaccounted for Water is included in **Appendix B** (City of Coeur d'Alene Water System Conservation Plan).

Figure 2-2 – Diurnal Demand

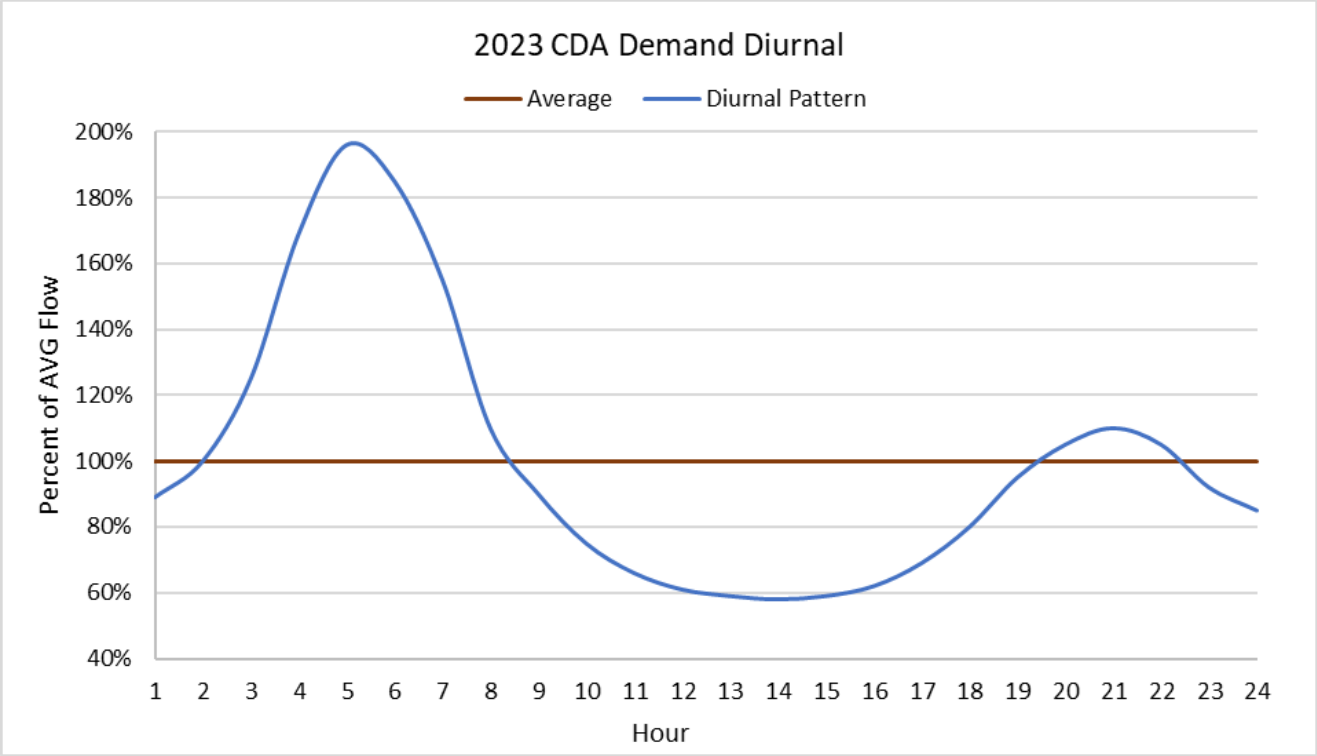
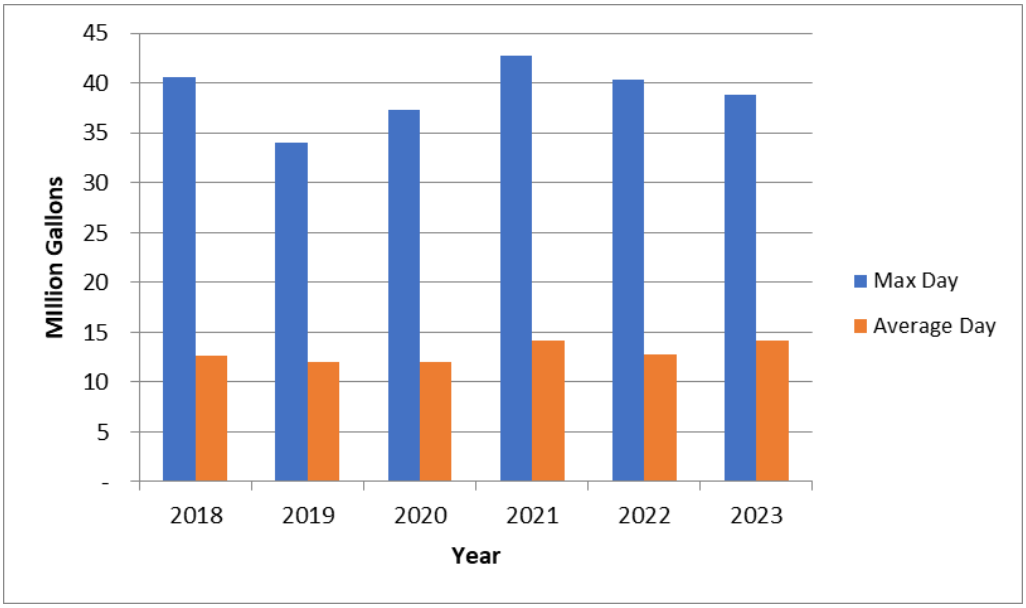


Figure 2-3 - Maximum and Average Day Pumping: 2018-2023



3 DESCRIPTION OF EXISTING SYSTEM

3.1 Introduction

The Coeur d'Alene water system currently uses groundwater as its primary supply with major storage tanks on Tubbs Hill, Best Hill, Mineral Drive at Wilbur Avenue, and at the Coeur d'Alene Industrial Park.

The existing Coeur d'Alene water system utilizes eleven groundwater wells for its supply located throughout the City. These wells deliver water directly to the distribution system and also fill six storage tanks. Use of boosters and pressure-reducing valves has created six distinct pressure zones within the system. Figure 3.1 shows a map of the water system wells, tanks, and distribution system. The system is in good condition due to excellent maintenance practices on the major system components.

3.2 Water Supply

The municipal water system supply for the City is provided by eleven groundwater wells having a combined operating capacity of approximately 53.25 million gallons per day (mgd). A twelfth well, the Clayton Well, is currently used for irrigation only at the Fairgrounds. Table 3-1 summarizes the well and pump operating conditions for all the existing wells.

The existing wells utilize line-shaft vertical turbine pumps, with soft starters or variable frequency drives (VFDs). Lightning suppression and motor savers are used on all pumps. Discharge piping includes check valves and pump control valves. The pump control valves discharge to troughs adjacent to the pump buildings. The condition of all the existing well pumps and housing is excellent due to an aggressive maintenance program by the City Water Department. Prior to the 2012 Comprehensive Plan Update, the wells historically all utilized downhole chlorination for disinfection, which is mixed in the pump bowls. This was done with a gas chlorination system. Since the 2012 Comprehensive Plan Update, the City has converted from gas chlorine to onsite generation of sodium hypochlorite as well as replacing the downhole chlorination with pipeline injection of the disinfectant.

The City is currently operating all of the well pumps based on tank level. The General Zone Wells (Annie, 4th Street, Linden, and Locust) are operated based on levels in the Tubbs Hill Tanks. One of the High Zone Wells (Atlas) is operated based on levels in the Industrial Park Standpipe, and the other five wells (Honeysuckle, Hanley, Landings, Ralph Capaul, and Prairie) operate based on the Prairie Standpipe levels. The Huetter well is operated based on both the Prairie and Industrial Tank water levels. The Honeysuckle Well is the first on, last off well and is nearly always on.

The City has two main operational scenarios–one for high flow, summer months and one for winter months. During winter months, the 4th Street and Honeysuckle wells are used as the primary supply sources with the Linden and Huetter wells as backups. During the summer months, all wells are

utilized as needed. The following paragraphs describe the City's supply wells. Well logs and corresponding pump curves are included in **Appendix C.**

Figure 3-1-Existing System

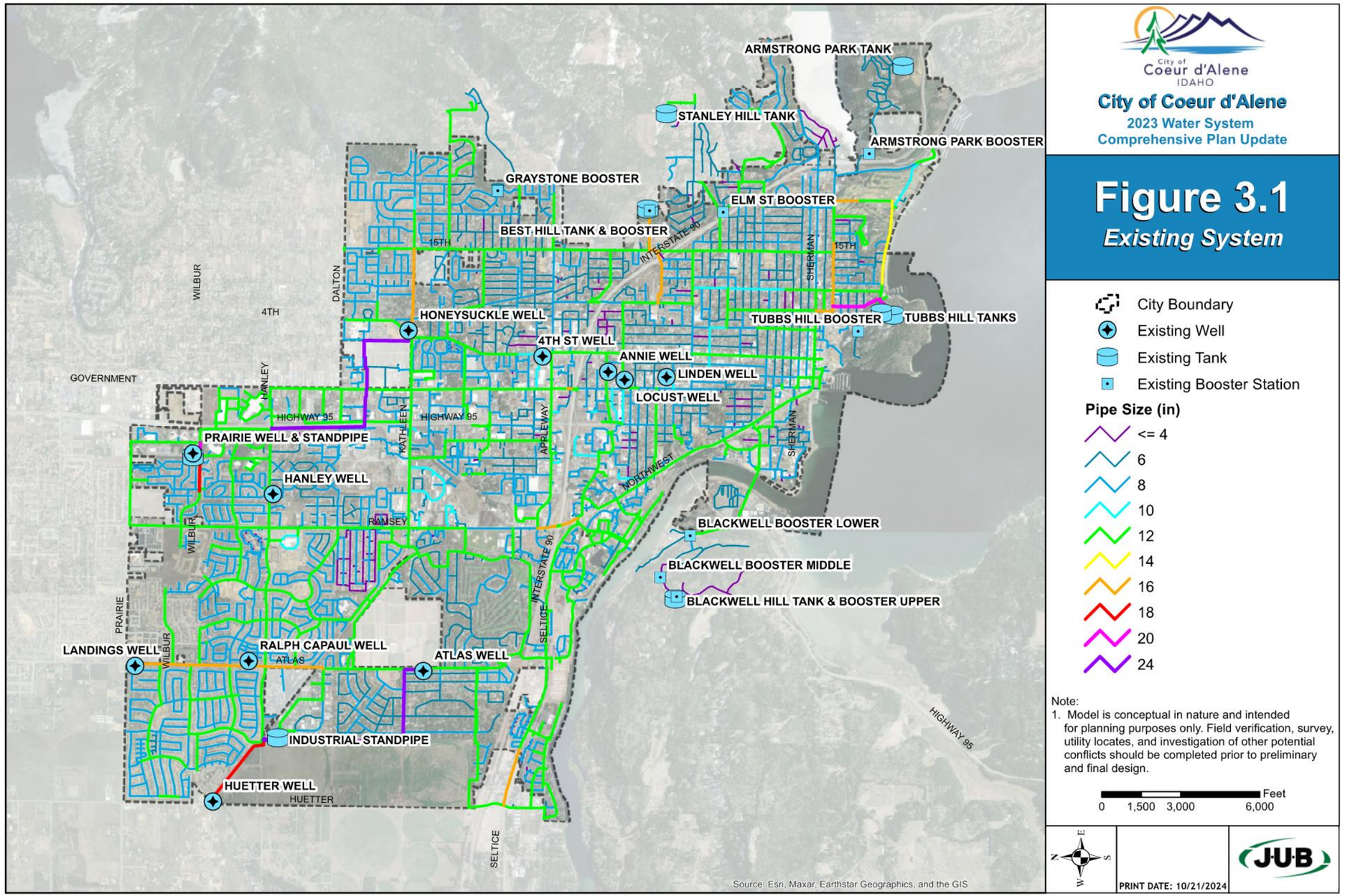


Table 3-1 – Well and Pump Data

Well No.	Original Well Test		Present Pump & Motor	Pump Rated Capacity		Peak Operating Points			Auxiliary Power
	Flow (gpm)	Drawdown (feet)		Flow (gpm)	Head (feet)	Flow (gpm)	System Pressure (psi)	Well Drawdown (feet)	
1. Atlas	6,000	23.2	600 hp Worthington Model 15HH410-7, 7-stage deep well turbine	4,000	420	4,150	53	14.5	750 KW Diesel Generator
2. 4th St.	3,500	20.1	400 hp Flowserve, 4 Stage Vertical Turbine	3,000	361	3,600	53	13.0	None
3. Hanley	6,000	5.75	500 hp Peerless deep well turbine pump	3,500	440	3,600	65	5.0	None
4. Honeysuckle	2,500	N/A	250 hp Goulds Model 14RJ-DWT, 5-stage deep well turbine	2,000	375	2,000	80	12	None
5. Linden	3,100	10.7	350 hp Flowserve 15EHM 4 Stage deep well turbine	3,000	360	3,200	65	13.5	600 KW diesel generator
6. Locust	3,700	5.9	350 hp Peerless Vertical Turbine 14HH 7 stage deep well turbine	3,200	337	2,800	55	4.0	None
7. Landings	3,500	14	500 hp Flowserve Model 15EHM/15HZ77, 5-stage deep well turbine	3,000	512	3,450	65	10	None
8. Prairie	4,000	1	500 hp Flowserve 16 ENL 6 stage deep well turbine	3,700	450	3,500	59	6.0	600 KW Diesel Generator
9. Annie	2,500	93	350 hp Peerless Model 16HXB, 5-stage deep well turbine	2,500	429	2,180	65	25.0	400 KW Diesel Generator
10. Ralph Capaul	4,000	-	600 hp Flowserve, 5 Stage Vertical Turbine	4,000	461	4,300	68	3.0	600 KW Diesel Generator
11. Huetter	4,000	-	600 hp Flowserve, Vertical Turbine	4,000	452	4,200	68	2.0	750 KW Diesel Generator
Total	**42,800**			35,900		**36,980**			

The City also has a surface water source located adjacent to Tubbs Hill. This supply is disconnected from the system. The City maintains Ownership, access and power to the site. This report does not examine their use any further.

3.2.1 High Zone Wells

The following wells are in the High Pressure Zone and are called to run based on the level in either the Prairie or Industrial standpipes. These wells also supply the General Zone indirectly through pressure-reducing valves separating the High and General Zones.

3.2.1.1 Atlas Well

The Atlas Well has a design flow of 4,000 gallons per minute (gpm); however, during peak periods, this well produces flows of close to 4,150 gpm. This 600 hp well is used during the summer months when demand is at a peak and the well is needed on a continuous basis. The Atlas Well is controlled by the water level in the Industrial Park Standpipe.

The Atlas well is currently configured to supply water to either the high or the General Zones manually. City staff is currently working on implementing programming to allow the switch between supplying the General or High Zone to happen via the City's SCADA. Programming anticipated to be completed in 2023.

3.2.1.2 Hanley Well

The Hanley Well was constructed in 1991 and at the time was the only well on the High Pressure Zone. This pump's rated capacity is 3,000 gpm, with peaks of up to 3,600 gpm during the maximum day demand conditions. The Hanley Well is controlled by the Prairie Standpipe.

In the 1990s, water quality sampling of this well detected low concentrations of a regulated compound-trichloroethylene (TCE). Although the exact source of TCE contamination is unknown, some potential sources have been identified and are in the process of being remediated. Samples are pulled every month for water quality to verify that the average TCE concentration over four successive quarters is below the maximum contaminant level of 5 µg/l. Although individual samples have exceeded 5 µg/l, the average TCE level over four successive quarters has not. The Water Department continues to use this well since TCE levels appear to be declining and do not exceed the MCL over four successive quarters.

The Hanley Well has also exhibited arsenic levels above the MCL of 10 µg/l. Water quality sampling has found arsenic levels of 1.7 µg/l to 28.10 µg/l. To meet requirements of the Safe Drinking Water Act per a written agreement between the City and IDEQ from July 2008, the City currently blends the Hanley Well water with lower arsenic water and limits operation (last on first off) to the summer months, significantly reducing annual exposure to arsenic.

3.2.1.3 Honeysuckle Well

The Honeysuckle Well was constructed in 1996 and has a current capacity of 2,000 gpm. The well capacity is limited due to its proximity to the aquifer boundary. This well is currently utilized by the Department as the first pump on and the last pump off. It is called to run based on the water level in the Prairie Standpipe.

3.2.1.4 Landings Well

The Landings Well was drilled in 2004 and was test pumped at a flow rate of 3,500 gpm with negligible drawdown. The well currently operates at 3,450 gpm and 512 feet TDH, with approximately 10 feet of measurable drawdown. The well is controlled based on the water level in the Industrial and Prairie Standpipe.

3.2.1.5 Prairie Well

The Prairie Well was completed in 1999. The operational conditions for the Prairie Well are 3,500 gpm and 450 feet TDH. This well has a 500 hp motor and is controlled based on the level in the Prairie Standpipe.

3.2.1.6 Clayton Well

The City owns an additional well in the High Zone, the Clayton Well. The Clayton Well has historically had elevated arsenic levels that were originally detected at the well test pump after drilling. This well site was not completed based on the arsenic levels and does not have a wellhouse or standard, large horsepower pump. The Kootenai Fairgrounds currently uses this well for irrigation using a low capacity submersible pump. It is recommended that the City continue to regularly monitor the arsenic level, as it appears to be decreasing over time.

3.2.1.7 Ralph Capaul Well

The Ralph Capaul Well was drilled in 2014 and is one of the City's largest producing wells. The pump rated capacity is 4,000 gpm at 461 feet of TDH. Under peak demands, the well is known to produce 4,300 gpm. The well is controlled based on the water level in the Prairie Standpipe.

3.2.1.8 Huetter Well

The Huetter Well is the City's newest and one of the largest producing wells, drilled in 2021. The well is rated for 4,000 gpm at 452 feet of TDH. The well currently operates under peak conditions at 4,200 gpm. The well is controlled based on the water level in the Prairie and Industrial Park Standpipe. Due to the wells close proximity to the Industrial Park Tank, an altitude valve was installed at the base of the Industrial Park tank to help balance pressures. Current operations of the altitude valve allow the Industrial tank to fill first. Once full the valve closes diverting water to the Prairie Standpipe.

3.2.2 General Zone Wells

The following four supply wells are in the General Zone:

1. Annie Well
2. 4th Street Well
3. Linden Well
4. Locust Well

All four wells are controlled based on the level of the Tubbs Hill Reservoir.

3.2.2.1 Annie Well

The Annie Well was drilled in 2004 and originally test pumped at 2,500 gpm, with 93 feet of drawdown. Additional well development improved production to 2,500 gpm at 12 feet of drawdown. Since its original construction, the well has been re-developed using hydropulsing to improve production. The Annie Well's production zone includes relatively fine material that has produced

elevated arsenic levels, ranging from 1.5 to 10.8 µg/l. The average arsenic level for the well is less than the MCL of 10 ppb. Operation of this well is based on a 2008 written agreement with IDEQ and is operated as first on last off, similar to the Hanley Well.

3.2.2.2 4th Street Well

The 4th Street Well was originally hand dug and wood-lined. This well is currently designed to provide 3,000 gpm of flow at 360 feet of head. Under peak demand conditions, the well produces 3,600 gpm.

Because this well historically has produced some sand, a series of pressure tanks are installed on the discharge that serve as sand traps. This well was also re-developed using Johnson well screens to help eliminate the sand problem.

The original design for this well utilized a 2,200 gpm well pump. The total capacity was increased to 3,000 gpm when the pump was replaced in 2007. This well has historically had problems at high flows rates when the well began to pull air into the well, creating taste and odor problems. This air entrainment was partially caused by cascading upper aquifer. A packer was installed to block out the upper aquifer in 1993 to help with the entrainment and taste and odor problems. The packer is no longer in use, and air entrainment, taste, and odor do not appear to be problems.

3.2.2.3 Linden Well

The current Linden Well pump was installed since the previous Comprehensive plan update and has a design capacity of 3,000 gpm. The current pump in the Linden Well provides 3,200 gallons per minute at 310 feet of head. There are no reported issues with this well.

3.2.2.4 Locust Well

The Locust Well currently has a capacity of 2,800 gpm at 337 feet of discharge head. Originally hand-dug in 1955, the well was expanded in 1968 and most recently in 1990. This well has been one of the system's most reliable producers.

3.2.3 Existing Water Rights

The City currently has a total of 81.0 cfs in adujicated groundwater rights and 16.78 cfs in claimed surface water rights. A summary of the rights and their priority dates is included in **Table 3-2**.

Table 3-2 – Summary of Water Rights

Right Number	Priority	Amount (cfs)	Source	Nature of Use	Period of Use
95-2111	04/20/1955	3.00	Ground Water	Municipal	1/1 to 12/31
95-2133	07/21/1960	2.27	Ground Water	Municipal	1/1 to 12/31
95-2164	10/03/1964	3.61	Ground Water	Municipal	3/15 to 11/15
95-2198	12/13/1966	5.12	Ground Water	Municipal	1/1 to 12/31
95-4322	*10/31/1921*	*13.04*	*Surface Water*	*Municipal*	*1/1 to 12/31*
95-7142	05/03/1971	2.45	Ground Water	Municipal	1/1 to 12/31
95-7181	03/14/1972	5.73	Ground Water	Municipal	1/1 to 12/31
95-8565	12/07/1987	7.55	Ground Water	Municipal	1/1 to 12/31
95-8647	03/19/1990	7.30	Ground Water	Municipal	1/1 to 12/31
95-8672	08/27/1990	3.00	Ground Water	Municipal	1/1 to 12/31
95-8938	02/08/1996	4.57	Ground Water	Municipal	1/1 to 12/31
95-9007	01/25/1999	7.80	Ground Water	Municipal	1/1 to 12/31
95-16580	5/14/2013	9.00	Ground Water	Municipal	1/1 to 12/31
95-17815	5/5/2019	9.00	Ground Water	Municipal	1/1 to 12/31
Municipal Sub Total		**70.4**	**Ground Water Only**		
95-2131		8.0		Irrigation	
95-8262	*2/14/1983*	*3.31*	*Surface Water*	*Fire Protection/Industrial*	*1/1 to 12/31*
95-8716	*9/11/1991*	*.03*	*Surface Water*	*Irrigation*	*04 /01 to 11/01*
95-7216	*10/19/1972*	*0.4*	*Surface Water*	*Irrigation*	*3/15 to 11/15*
95-7096	3/10/1970	2.60	Ground Water	Irrigation	4/15 to 10/15
Other Sub Total		**10.6**	**Ground Water Only**		
TOTAL [(a)]		**81.0**	**Ground Water Only**		

(a) The City's rights have been consolidated as municipal water rights and apply to the system as a whole.

3.3 Existing Storage

The purpose of water storage in the City is to provide for flow equalization and stabilization of pressures throughout the course of the day as well as to store water for fire flow demands. Tanks also provide emergency storage to alleviate water shortages during water supply interruptions due to mechanical or electrical problems with the existing wells.

Six tanks provide storage for the City of Coeur d'Alene. The total storage capacity of these tanks is 9.2 million gallons. However, because the Prairie and Industrial Park standpipes each have approximately 1.0 mg of storage that is too low to provide adequate pressure, the actual usable storage is 7.1 MG. **Table 3-3** presents characteristics of each of the storage tanks.

Table 3-3- -Summary of Existing Storage

	Storage Tank	Capacity (MG)	Operating Characteristics			
			Overflow Elevation (MSL)	Height (feet)	Pressure Zone	Type of Tank
1	Best Hill	2.0	2,355.35	31.85	General	Ground Level (steel)
2	Tubbs Hill	2.0	2,355.35	24	General	Ground Level (concrete)
		1.0	2,355.35	24	General	Ground Level (steel)
3	Prairie Standpipe	2.0 (c)	2,430.5	156.5	High	Standpipe (steel)
4	Industrial Standpipe	2.0 (c)	2,430.50	160	High	Standpipe (steel)
5	Stanley Hill	0.2	2,540.22	31	Stanley	Ground Level (steel)
6	Blackwell Hill	0.012	2,400 (a)	10	Blackwell	Ground Level (concrete)
7	Armstrong Park	0.16	2,882 (a)	32	Armstrong Park	Ground Level (steel)
	Total	**9.2 (b)**				

(a) Approximate elevation
(b) Total does not include capacity of Blackwell Hill or Armstrong Park.
(c) 1.0 MG of Operating Storage and 1.0 MG of Dead Storage

Table 3-4a- -Summary of Storage Components (Existing Conditions)

	Zone	Finished Water Storage (MG)	Dead Storage (MG)	Components of Effective Storage (a)		
				Equalization Storage (MG)	Fire Flow Storage (MG)	Reserve/Operational Storage (MG) (d)
1	High Zone	4.0 (c)	2.0	2.61	0.63	0.32
2	General Zone	5.0	0.0	1.93	0.63	0.26
	City Total	**9.0 (b)**	**2.0**	**4.54**	**1.26**	**0.58**

(a) Standby storage not required. City meets criteria to provide eight hours of operation at average day demand with standby power.
(b) Total does not include storage in the boosted zones.
(c) Additional storage planned for High Zone in 2025/2026.
(d) 10% of EQ plus FF storage. Exceeds IDAPA 58.01.08.003.04.

3.3.1 Best Hill Tank

The Best Hill Tank is located in the General Zone on the eastern side of the City and is connected via a 16-inch pipe to the water main in Fifteenth Street. This tank was constructed in 1971 and has a nominal capacity of 2 million gallons.

The Best Hill Tank water levels historically did not track with the levels in the Tubbs Hill Tanks. Since the Best Hill and Tubbs Hill Tanks are on the same pressure zone, they should "float" at approximately the same level. However, the Best Hill Tank consistently has higher water surface elevation than that of the Tubbs Hill Tanks during peak demands. Prior to 2017/2018, the Best Hill Tank was only dropping 6 feet of water elevation when the Tubbs Hill Tank drops 10 feet. The primary concern with the slow tank draining is the potential for water stagnation leading to poor water quality.

In 2017/2018 the City Water Department constructed a Booster Pump Station at the base of the Best Hill Tank. The BPS is operated to pull water from the Best Hill Tank during peak demands. This increases supply into the General Zone and cycles the tank more regularly, eliminating water quality concerns.

3.3.2 Tubbs Hill Storage

The Tubbs Hill storage system is in the General Zone and consists of one 2.0 MG concrete tank and one 1.0 MG welded steel tank. The tanks are located on Tubbs Hill in the southern portion of town adjacent to the central business district. They supply most of the storage for the General Pressure Zone.

The concrete tank is a post-tensioned pre-cast concrete tank and was constructed in 2004. The tank levels in this tank are used as the basis for control in the General Zone.

The second Tubbs Hill Tank is a 1 MG steel tank on a concrete foundation constructed in 1948. This tank had a sizeable leak in the base, estimated at approximately 10 to 15 gpm, between the concrete base and tank walls where the existing caulking has failed. The City cut and patched the bottom portion of the tank to weld a steel base to the bottom of the tank in 2004, eliminating the leakage.

3.3.3 Prairie Standpipe

The Prairie Standpipe is a 2 MG, 160-foot-tall steel standpipe located in the High Zone. This standpipe was constructed in 1992 and primarily supplies water to the High Zone but can provide the General Pressure Zone through the system PRVs. The tank is located at the northern boundary of the City. The tank is in excellent condition and has had no reported problems since being placed online.

A pressure transducer located at the base of this tank controls pump starts in the High-Pressure Zone for the Honeysuckle, Hanley, Prairie Wells, Landings, Ralph Capaul and Huetter Wells.

Recent upgrades include recoating of the tank and the addition of emergency back-up power, with the ability to run both the controls and communications through the generator. Adjacent to the Prairie Standpipe is the Prairie well, which recently underwent power supply upgrades, including the installation of a soft start.

3.3.4 Industrial Standpipe

The Industrial Standpipe is 160 feet tall and holds 2 million gallons. It is a steel standpipe located on the High Pressure Zone. This standpipe was constructed in 1999 and supplies water to the High Zone, which can supply the General Pressure Zone via pressure-reducing valves. The tank is located at the northwest boundary of the City. The tank is in excellent condition and has had no reported problems since being placed online.

A pressure transducer located at the base of this tank controls pump starts in the High Pressure Zone. The level in this standpipe is the control variable that calls the Atlas Well and Huetter Well to run.

Due to the close proximity of the Huetter Well, an altitude valve was installed at the base of the tank. This valve allows the Industrial Tank to fill first. Once full, the valve closes and diverts water to the Prairie tank.

Recent improvements to the Industrial Tank site include the addition of backup power, including a generator and an automatic transfer switch.

3.3.5 Stanley Hill Tank

The Stanley Hill Tank is a 200,000-gallon steel tank that serves the Stanley Hill High Pressure Zone. This tank is located east of the Best Hill Tank. There have been no reported problems with operation of this tank.

Access to the tank is difficult. The current approach is through a local farm under agreement with the landowner. The City has no formal easement allowing access to the tank except for the pipeline easement that is impassible by vehicles.

The City has no immediate plans to improve access to the site or secure an easement with the property Owner. If the property were to sell, the City may look into formalizing an easement.

3.3.6 Blackwell Hill Tank

The Blackwell Hill Tank is a 12,000-gallon tank located at the top of Blackwell Hill. The tank is rectangular in shape and constructed of cast-in-place concrete. The tank is fed by the Blackwell Booster Station at the bottom of the hill and an intermediate in-line booster, which is currently

offline. The Blackwell Hill Tank contains a small booster station that feeds the residents at the top of the system.

Recent upgrades to the tank include the addition of a generator and telemetry, run off cellular communications. Filling of the tank is accomplished through use of a mechanical float valve that opens to allow water to fill the tank and closes when the tank is full. This tank is used as working volume for the residents at the top of the hill and is not available for use by any of the residents below the tank.

3.3.7 Nettleton Gulch Tank

The Nettleton Gulch Tank is an 18,000-gallon tank, which is currently disconnected from the system. It was removed from service when the Best Hill Tank was constructed and is not in a usable condition. The City is in the process of releasing the easement for the transmission main and tank site.

3.4 Booster Pump Stations

The City system currently has five booster pump stations. Table 3-5 summarizes these existing booster stations and their capacities.

Table 3-5- Summary of Existing Booster Pump Stations

Booster Station		Operating Characteristics						Notes
		Suction Pressure Zone	Discharge Pressure Zone	Pump No.	HP	Capacity (gpm)	TDH [(a)] (ft)	
1	Elm Street	General	Stanley	1	20	200	230	
				2	50	500	230	
				3	20	200	230	
2	Blackwell Hill – Lower	General	Blackwell	1	20	90		
				2	20	120		
	Blackwell Hill - Upper			3	20	120		
				1 & 2	3	53.3		
3	Tubbs Hill	General	Tubbs Hill	1	1.5	30	158	
				2	1.5	30	158	
				3	1.5	30	158	
4	Armstrong Park	General	Armstrong Park	1	50	220	560	
				2	50	220	560	
5	Best Hill	General (Best Hill Tank)	General	1	50	2,000	60	

(a) Total dynamic head based on nameplate and original pump curve information.

3.4.1 Elm Street Booster Station

The Elm Street Booster Pump Station consists of two 20 hp, 200 gpm centrifugal booster pump and one 50 hp, 500 gpm centrifugal booster pump manufactured by Byron Jackson. This booster pump station is controlled by levels in the Stanley Hill Tank and serves the Stanley Hill High Pressure Zone. During peak demands, the 20 hp and 50 hp pumps are called to run simultaneously. The design points on the 20 hp and 50 hp pumps have significantly different discharge heads. The 200 gpm pumps have a design head of 230 feet while the 500-gpm pump has a design head of 280 feet. Based on existing SCADA data, the 200 gpm boosters are operating near their shutoff head and discharging very low flows while the 500-gpm booster is operating. Running the 200-gpm booster close to its shutoff head creates premature pump wear and is inefficient. All pumps have been switched to VFD's from soft starts to help decrease pump wear. A generator has been added to the site for emergency standby power.

3.4.2 Blackwell Hill Booster System

The Blackwell Hill system was obtained from the Hayden Pines Water Company in 1993 and consists of three booster stations. The lower station has one 90 gpm booster pump and two 120 gpm booster pumps. The middle station has a single pump that pumps water to the storage tank at the top of Blackwell Hill, but is currently offline. The upper station has two pumps used to fill six pressure tanks to maintain pressure for the five users. Back-up power has been added to both the lower and upper booster stations.

To maintain pressures, the Water Department operates the smaller pump at the lower booster pump station continuously. During periods of low demand, the pump recirculates water to avoid over pressuring the system. Although not efficient, this has reduced the number of customer complaints.

This system has no usable storage, so the booster pumps are vital for providing water to this system; however, the power supply at the station is adequate to run both larger pumps at one time to provide the required demand. Currently, the boosters are operated solely on system pressure.

The City is currently working on the design for a new booster station.

3.4.3 Tubbs Hill Booster Station

The Tubbs Hill Booster Station was replaced in 2004 and includes three 1.5 hp, 30 gpm pumps. The TDH of the pumps at 30 gpm is 158 feet. This station provides service to seven connections located above the service elevations of the Tubbs Hill Tanks.

3.4.4 Armstrong Park Booster Station

In 2008, the City replaced the below-grade Armstrong Park Booster Station with a more accessible at-grade facility. The station currently has three 50 hp pumps that pump 220 gpm each. VFD's have been added to each pump to help prevent water hammer. The flow from the pumps is fed directly to a 160,000-gallon storage tank using dedicated transmission main. The pump suction pressure at the station is very low (<20 psi) due to elevation and suction pipe size (6 inches). Provisions for

boosting chlorine residual are included in the station but are not currently used. Back-up power and fail safes for temperature and pressure have been recently added to the station.

3.4.5 Best Hill Booster Station

In 2017/2018, the City installed a Pentair -Aurora, Vertical Slit Case Pump at the base of the Best Hill Tank to improve cycling of the Best Hill Tank during peak periods, providing additional capacity to the General Zone and increasing tank turnover. The station currently contains one 50 hp pump, that discharges to the General Zone 2,000 gpm at 60 feet of head. During times of low system demand, the reservoir will fill from the General Zone via a solenoid controlled hydraulic control valve.

3.5 Existing Distribution System

3.5.1 Pressure Zones

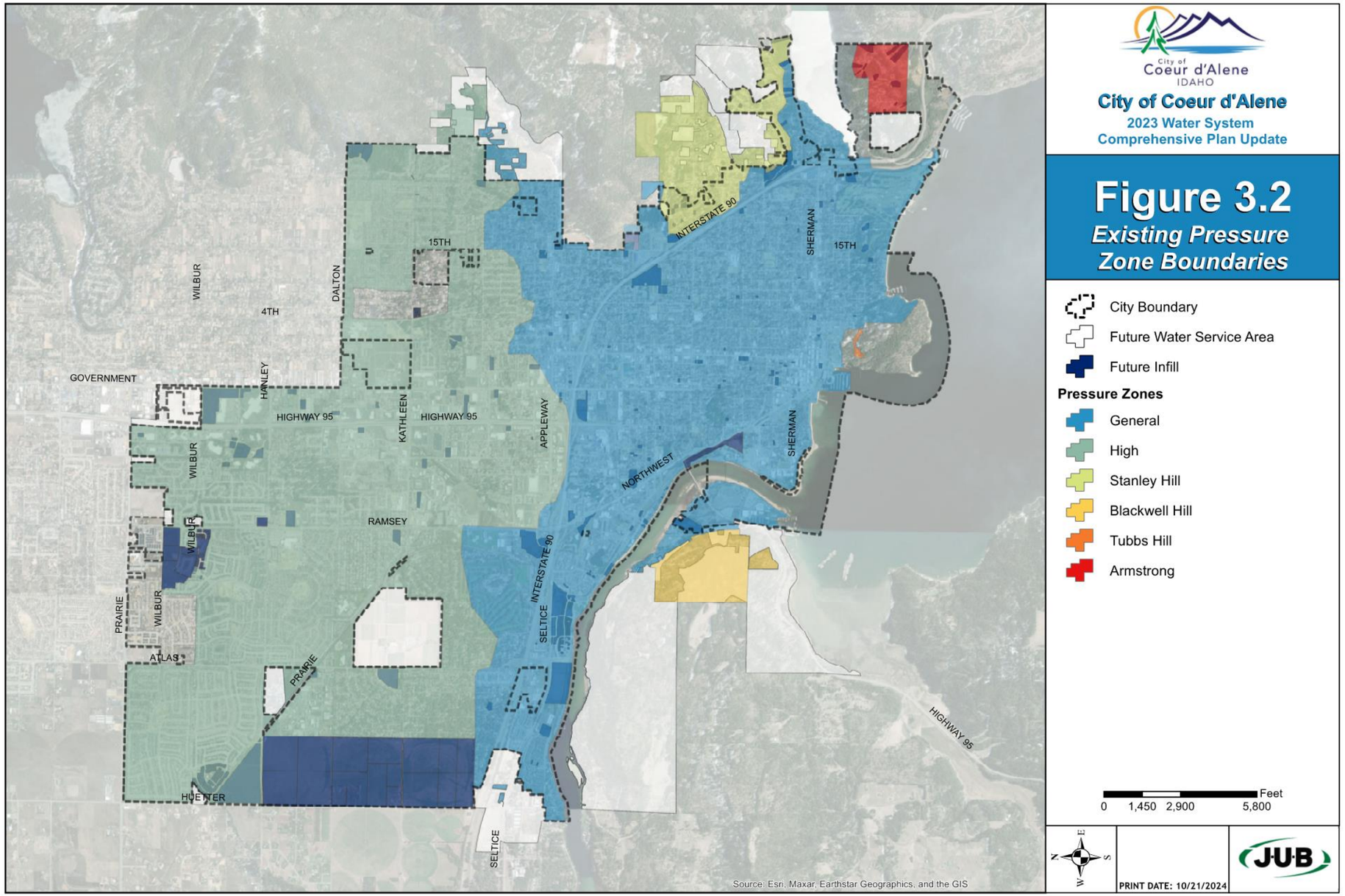
The distribution system, as shown in **Figure 3 1**, consists of six pressure zones. Because of the varied terrain, six zones are needed to maintain working pressures between 50 and 80 psi. The pressure zones are serviced by a combination of wells, water tanks, booster stations, and pressure reducing valves (PRVs). **Figure 3 2** shows the six existing zones. The two largest pressure zones (the High Zone and the General Zone) contain all of the City wells. Four of the existing booster zones (Stanley Hill, Armstrong Park, Blackwell Hill, and Tubbs Hill) are all supplied by booster pump stations fed from the General Zone. The fifth booster pump station, Best Hill, provides supplemental water to the General Zone during peak demands, by pulling from the Best Hill Tank.

The High Pressure Zone is able to provide water to the General Zone via PRV and PSVs to control downstream pressure. The identified connections between those zones are summarized in **Table 3 5:**

Table 3-6 – Pressure Reducing Valves

Type	Location	Size (Inch)
PRV/PSV	Blackwell Hill	2
PRV/PSV	12th and Crawford	8
PRV	Atlantic Drive	8
PRV	Atlas and Appaloosa	10
PRV	Huetter Road North of Seltice	8
PRV/PSV	15th and Lunceford	10
PRV/PSV	Lee Court and Appleway	8

Figure 3-2 – Existing Zone Boundaries



3.5.2 Pipe Network

The City owns and maintains approximately 321 miles of water distribution pipe and transmission mains. Pipe sizes and materials range greatly from 1-inch distribution pipe to 24-inch transmission mains. Transmission mains include 16-inch to 24-inch ductile iron and PVC pipes that route water from wells and storage reservoirs into the distribution system. The distribution system is generally comprised of 10-inch to 12-inch pipes installed in a ½ mile grid, with smaller 8-inch and 6-inch lines providing service to patrons. Pipes smaller than 6 inches remain in service within the system; however, City policy now requires replacement to a minimum of 8-inch PVC. Less than 4.5 percent of the total system piping is smaller than 6 inches, and 2.7 percent of the total is 4 inches. A summary of these sizes and materials within the system is provided in **Table 3 6**. Typically, different pipe materials can be dated back to specific periods depending on available material and the City's preferences at the time.

Table 3-7 – Pipe Summary [(a)]

Material	Pipe Length Diameter										Total
	< 6" (miles)	6" (miles)	8" (miles)	10" (miles)	12" (miles)	14" (miles)	16" (miles)	18" (miles)	20" (miles)	24" (miles)	(miles)
AC	5.1	49.9	24.6	2.2	19.5	0.6	1.1				**103.0**
Ductile	0.2	1.5	0.2		1.3	0.2	0.1	0.2	0.5	3.3	**7.5**
Galvanized	2.5										**2.5**
PVC	3.5	30.9	106.7	4.8	50.4		3.2	0.8			**200.2**
Steel	1.6	1.9	0.3		0.2						**4.0**
Other	0.6	0.2									**0.8**
Total	**13.54**	**84.4**	**112.3**	**7.0**	**71.3**	**0.8**	**4.4**	**1.0**	**0.5**	**3.3**	**321.0**

(a) Pipe material, length, and sizes were generated from the City's GIS water system database as of February 2023.

4 WATER SUPPLY EVALUATION

4.1 Introduction

This chapter addresses the system's ability to match demand requirements with supply. Generally, the system must be able to supply enough water to meet the maximum daily demand (MDD). The supply to each by zone must also meet the MDD with its maximum pumping capacity, or the largest source out of operation, for that zone. This Comprehensive Plan Update defines the worst case as the Huetter Well out of service because it is the largest single source of supply and it serves both the High and General Zones.

4.2 Existing Supply Requirements

The existing water system must be able to supply enough water to meet the current system-wide MDD of 42.8 mgd (29,700 gpm). The total pumping capacity with all wells on line is 53.25 mgd (36,980 gpm). Evaluating the system under the worst case (as defined above) with the Huetter Well out of operation results in a current firm pumping capacity of 47.06 mgd (32,680 gpm). Therefore, the existing City-wide water supply meets the current MDD.

The existing supply capacity is summarized in **Table 4 1** for comparison with the existing MDD for both the High and the General Zones.

Table 4-1- Existing Supply Requirements

	Maximum Day Demand	Current Supply Capacity	Reliable Capacity Largest Pump Off Line [b]
City Total	42.8 mgd (29,700 gpm) [a]	53.25 mgd (36,980 gpm)	47.06 mgd (32,680 gpm)
High Zone	25.67 mgd (17,820 gpm)	36.29 mgd (25,200 gpm)	30.1 mgd (20,900 gpm)
General Zone	15.76 mgd (10,950 gpm)	23.16 mgd (16,080 gpm)	16.96 mgd (11,780 gpm)

(a) Maximum Day Demand based on Summer 2021.
(b) Huetter Well is assumed off line for both the High and General Zones.

All of the City supply is located in the High and General Pressure Zones. The High Zone can be fed only from wells in the High Zone and has a current supply capacity of 36.29 mgd (25,200 gpm). The General Zone has an available supply of 23.16 mgd (16,080 gpm) and can be fed from wells located in either zone. This analysis assumes that the two zones are independent; however, the ability to feed from the High Zone to the General Zone does provide some system flexibility. The three existing boosted zones (Blackwell Hill, Stanley Hill, and Armstrong Park) as well as the future Fernan Hill Zone are all fed from the General Zone. The complete discussion on the future requirements for these zones is included in **Chapter 6**. The supply available in the High Zone and the General Zone is adequate to meet the current MDD requirements; however, as the service population increases, additional supply will be necessary.

4.3 Future Supply Requirements

Water system growth will require additional supply sources as development occurs. The year-over-year growth rate assumption approximates a build-out supply requirement of 62.2 mgd (43,200 gpm) MDD occurring at approximately 2040. **Table 4-2** summarizes projected supply requirements for 2023, 2028, 2033, and build-out of the system as detailed in previous chapters. Based on current projections and planning documents, build-out of the system is estimated to occur in 2040. However, actual system demands should be used to program future upgrades at the times they are required.

Table 4-2 - Future Supply Requirements for Planning Period

Year	Average Day Demand (mgd)	Average Day Demand (gpm)	Maximum Day Demand (mgd)	Maximum Day Demand (gpm)
2023	14.11	9,800	42.77	29,700
2028	16.0	11,110	48.5	33,680
2033	18.1	12,570	54.9	38,125
Build-Out 2040	20.5	14,240	62.2	43,200

As shown, the projected maximum day demand for the planning boundary is 62.2 mgd. As a minimum, this firm supply capacity must be met. In addition, supply can help meet peak demands, reducing the total amount of storage required. Balancing supply and storage to meet both minimum storage criteria and peak system demands results in a total recommended firm supply of 62.2 mgd.

Five additional sources of supply are required to meet the increased demand and reliability criteria. Supply from three additional wells are required in the High Zone as well as two new wells in the General Zone to meet this demand. Each future well source is assumed to have a capacity of 4,000 gallons per minute in the High Zone and 2,000 gallons per minute in the General Zone. **Figure 4 1** and **Figure 4 2** provide a visual comparison of water system demand and firm capacity for the High and General Zones respectively. These figures also demonstrate the relationship between supply and storage. The triggers for adding supply to the system occur when the firm capacity nears the MDD.

Table 4-3 shows the approximate years in which a new well source should be added to the City's supply system.

Figure 4-1- Storage and Capacity Requirements-High Zone

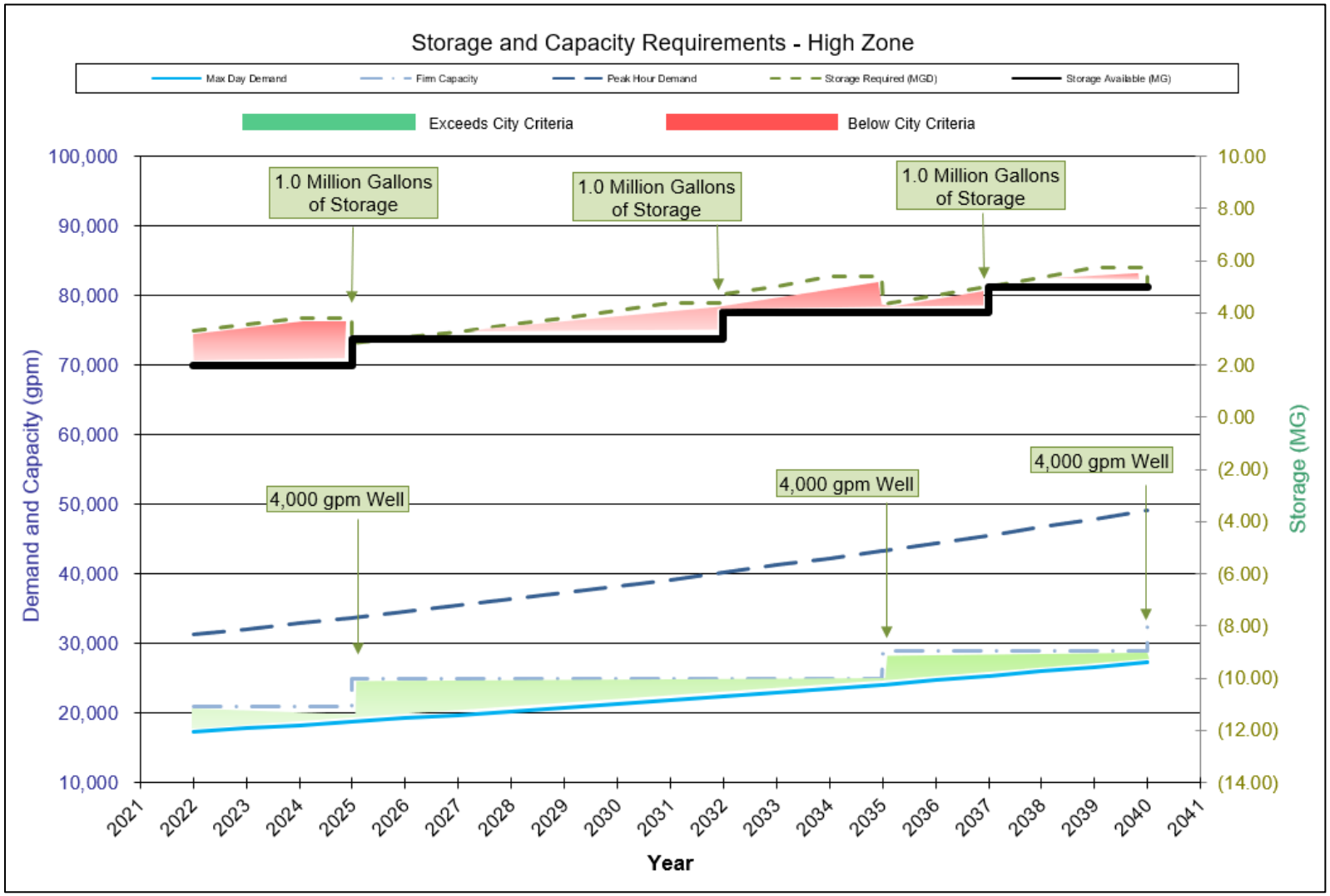


Figure 4-2- Storage and Capacity Requirements-General Zone

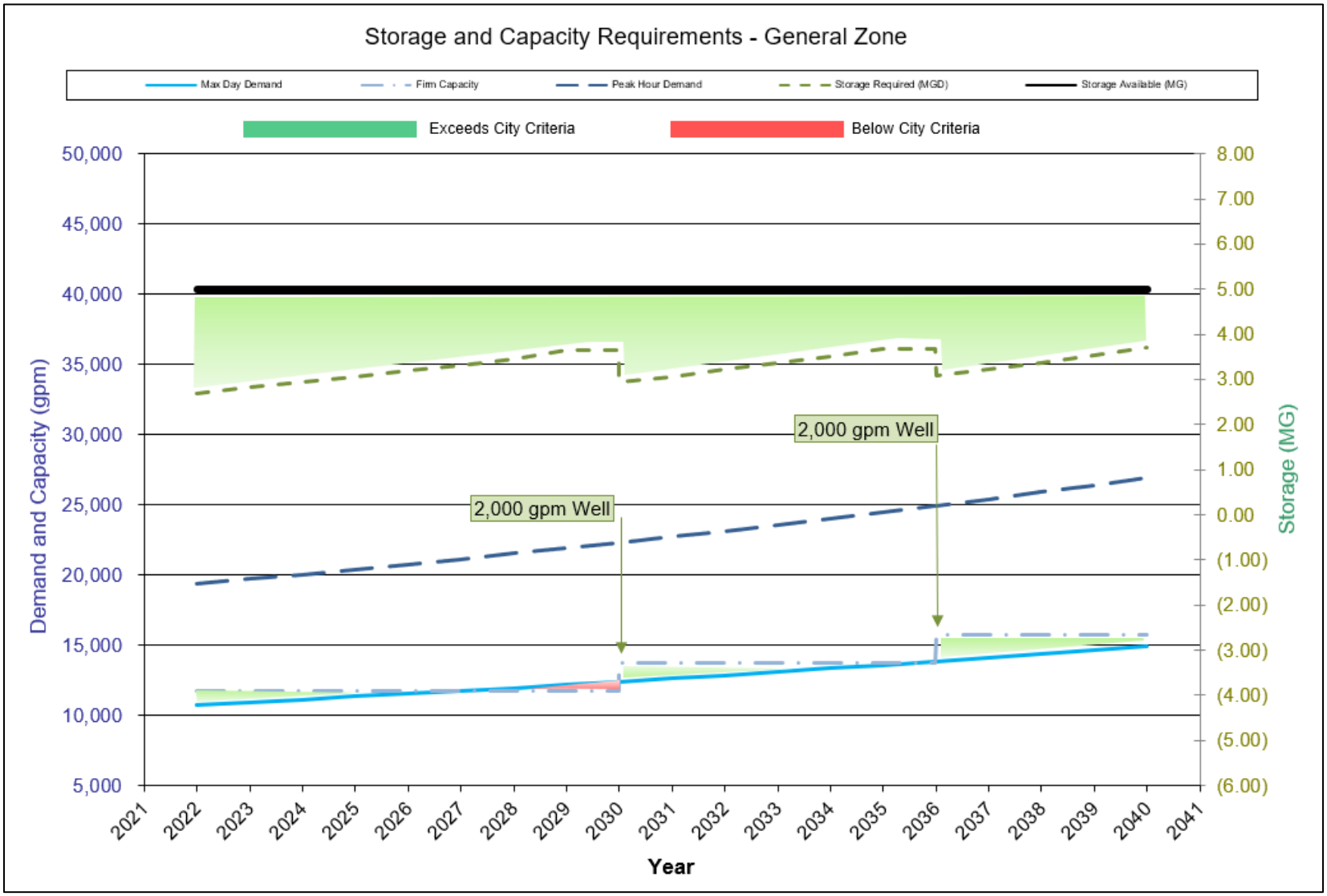


Table 4-3- Future Supply Trigger Flow Requirements

Need	Additional Supply (gpm)	Estimated Year [a]	Maximum Daily Demand Trigger
High Zone Supply	4,000	2025[b]	18,700 gpm in High Zone
General Zone Supply	2,000	2030	12,400 gpm in General Zone
High Zone Supply	4,000	2035	24,900 gpm in High Zone
General Zone Supply	2,000	2036	13,800 gpm in General Zone
High Zone Supply	4,000	2040	27,300 gpm in High Zone

(a) Year is approximate based on projected growth rate.
(b) City is actively working towards the procurement of a well site.

Although **Figure 4-3** gives estimated years for increasing water supply, new well sources should be added to the system before listed MDD conditions occur. The table provides trigger flows for each zone when additional supply is required. If the MDD increases at a rate that is greater than expected, an additional well should be on line when the demand reaches the limits listed in **Figure 4-3**, regardless of the year.

4.4 Boosted Pressure Zones Supply Requirements

4.4.1 Stanley Hill Zone

Elm Street Booster Station

The Stanley Hill Zone is supplied by the Elm Street Booster Station and includes the Stanley Hill area in addition to the Fernan area. The long-term plan for the City is to improve pressures in the higher elevations in Fernan Hill by dividing these areas into two separate pressure zones. A detailed analysis for the division of this zone was completed during the 2012 Comprehensive Plan update and is located in **Appendix D.** For the current comprehensive plan update, the demands for the zones were evaluated using current water meter data. **Appendix D** was not updated, as the premise of spitting the zones remained the same. The Stanley Hill Zone has a current MDD of 687 gpm and a build-out MDD of 700 gpm.

The firm capacity of the existing Elm Street Station (400 gpm) is less than the MDD, making the station vulnerable to supply problems. **Table 4-4** summarizes the anticipated demands for this zone.

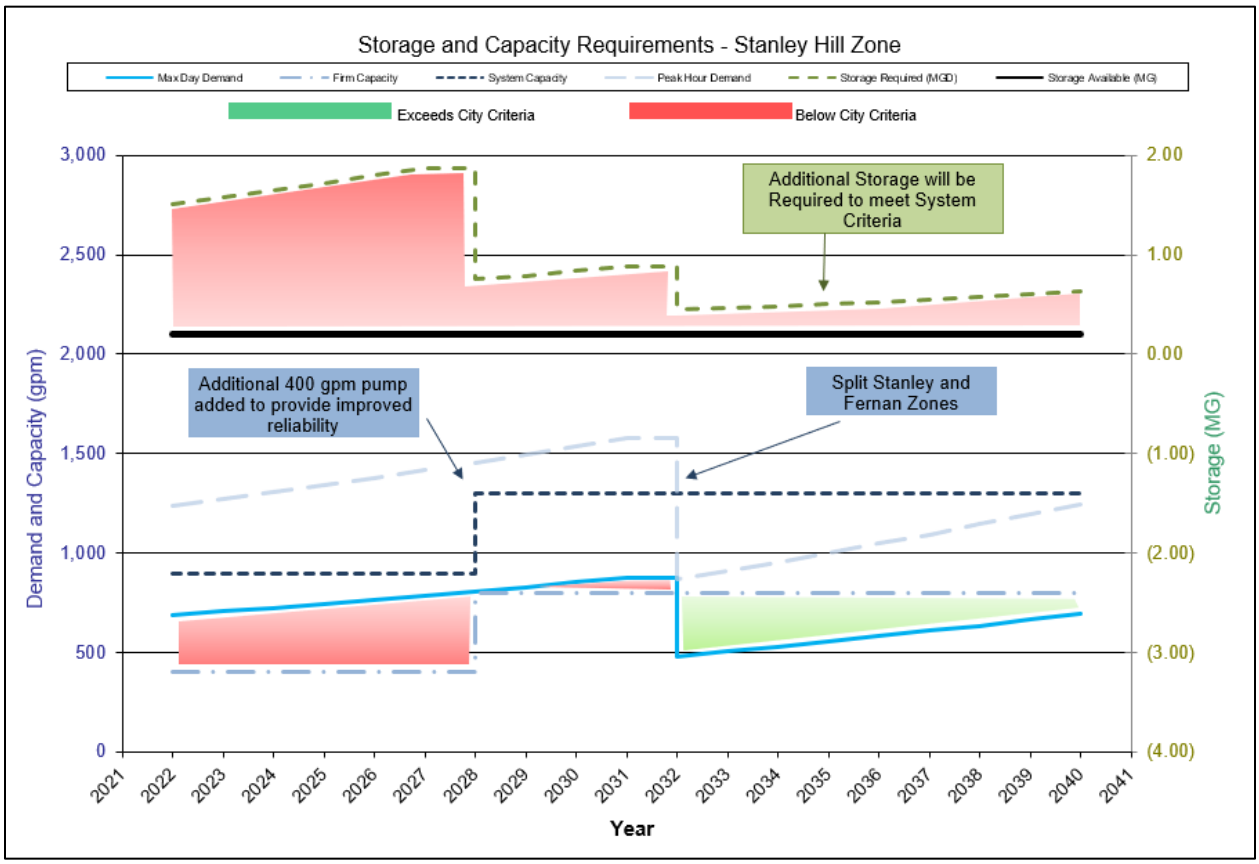
Table 4-4 - Elm Street Booster Station Demands

Year	ADD (MGD)	MDD (MGD)	Required Firm System Capacity (MGD)
2023	0.30	0.99	1.15
2028	0.35	1.15	1.15
2033[(a)]	0.22	0.72	1.15
Build-Out 2040[(a)]	0.30	1.00	1.15

(a) Assumes Fernan Hill Zone served by new Fernan Pump Station

The supply and storage analysis is presented on **Figure 4-3**.

Figure 4-3- Supply and Capacity Requirements-Stanley Hill Zone



4.4.2 Fernan Hill Zone

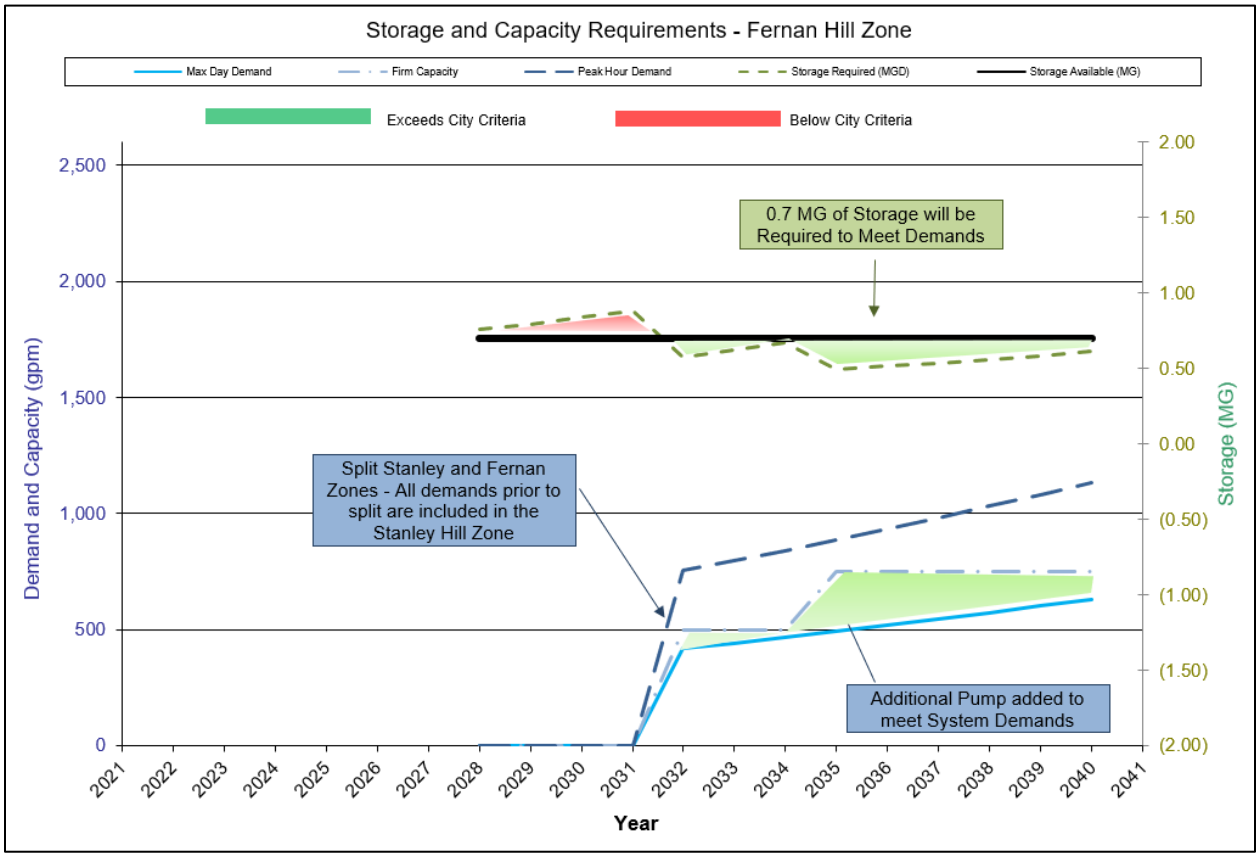
The Fernan Hill Zone is currently part of the Stanley Hill Zone and is supplied by the Elm Street Booster Station. The higher elevations in this area currently have very low system pressures. Splitting these two zones will allow the City to increase pressures in this zone. Low elevation areas will be supplied by the General Zone, and the elevated areas will be divided along French Gulch Road (see **Appendix D** for more detail). **Table 4-5** summarizes the anticipated demands for this zone.

Table 4-5- Fernan Hill Booster Station

Year	ADD (MGD)	MDD (MGD)	Required Firm System Capacity (MGD)
2023	---	---	---
2028	---	---	---
2033	0.20	0.64	0.72
Build-Out 2040	0.27	0.9	1.10

The balance of the supply and storage for the zone is demonstrated on **Figure 4-4**.

Figure 4-4 - Storage and Capacity Requirements-Fernan Hill Zone



4.4.3 Armstrong Park Zone

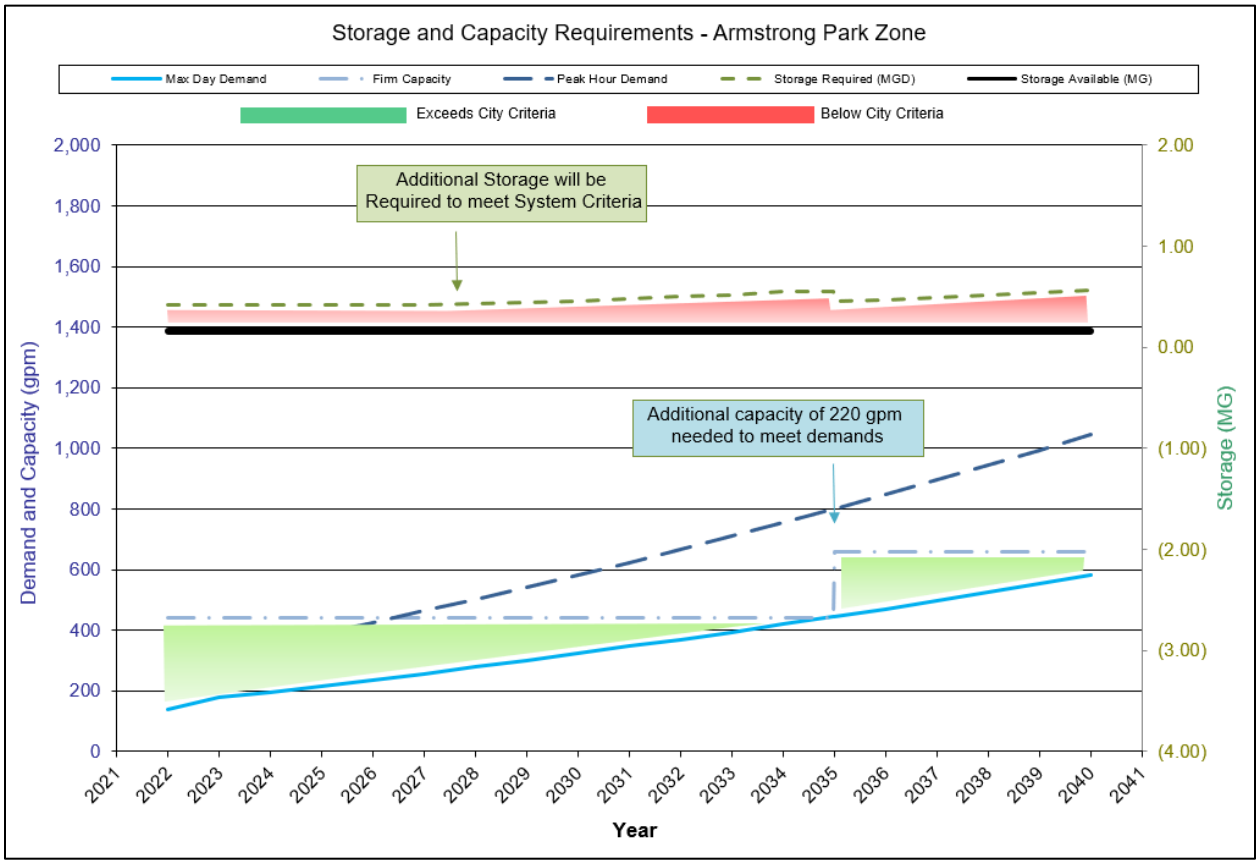
The existing Armstrong Park Station has three 220 gpm pumps. The existing maximum day demand for this zone is 180 gpm. When this demand exceeds 440 gpm, an additional 220 gpm of capacity will need to be added. A summary of the anticipated demands for this zone is included in **Table 4-6**.

Table 4-6- Armstrong Park Booster Station

Year	ADD (MGD)	MDD (MGD)	Required Firm System Capacity (MGD)
2023	0.08	0.26	0.63
2028	0.12	0.40	0.63
2033	0.17	0.57	0.63
Build-Out 2040	0.25	0.84	0.95

The supply and storage analysis is demonstrated on **Figure 4-5**. The storage requirements will be discussed further in **Chapter 5**.

Figure 4-5- Storage and Capacity Requirements-Armstrong Park Zone



4.4.4 Blackwell Hill Zone

The current maximum day demand for the Blackwell Hill service area is 70 gpm and the firm capacity of the lower station is 210 gpm. This zone lies outside of the City's area of impact and is not anticipated to be developed. Growth for this zone was estimated at 2.5%, to provide a factor of safety for the City and to account for the potential of changes in water use characteristics. The build-out maximum day demand for this zone is 475 gpm, which is anticipated to be met following planned booster station upgrades. A summary of the anticipated demands for this zone is included in **Table 4-7**.

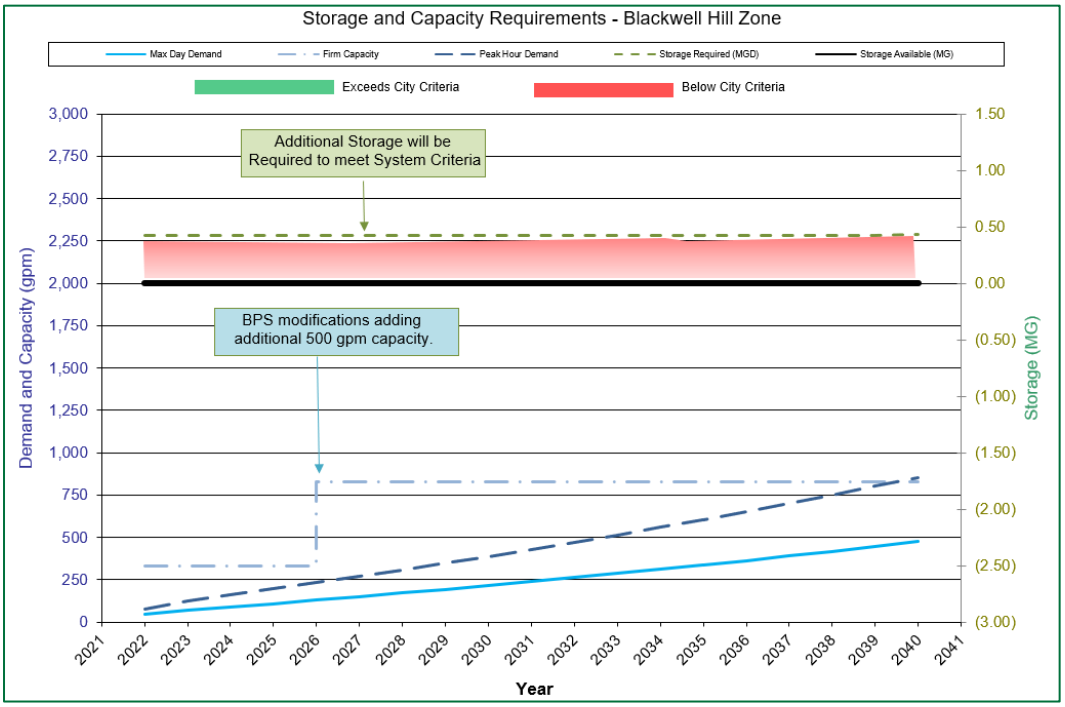
Table 4-7- Blackwell Hill Booster Station

Year	ADD (MGD)	MDD (MGD)	Firm System Capacity (MGD)
2023	0.03	0.10	0.48
2028[1]	0.08	0.25	1.19
2033	0.14	0.41	1.19
Build-Out 2040	0.22	0.68	1.19

[1] *Planned Booster Station upgrades anticipated to increase firm capacity.*

Balancing the storage and supply will be critical for providing adequate emergency supply and fire storage. This balance is shown on **Figure 4-6**.

Figure 4-6- Storage and Capacity Requirements-Blackwell Hill Zone



4.4.5 Best Hill

In 2017/2018 the City Water Department constructed a Booster Pump Station at the base of the Best Hill Tank. The BPS is operated to pull 2,000 gpm of water from the Best Hill Tank during peak demands. During times of low system demands, the reservoir will fill from the General Zone via a solenoid controlled hydraulic control valve. This increased supply into the General Zone and cycles the tank more regularly, eliminating water quality concerns.

4.5 Water Supply Recommendations by Pressure Zone

4.5.1 Existing Wells

The existing eleven wells have been constructed over the life of the water system and while they are in good condition for the most part, there are a number of improvement and maintenance projects that will be required. A summary for each zone is included below.

High Pressure Zone

Three additional wells, each at 4,000 gpm, are anticipated to meet growing demands in the high pressure zone. The City is actively working on siting one of these wells on the western boundary of the City. Construction for this well is anticipated to begin in 2025.

The City's existing high pressure zone wells are in good condition, needing no major upgrades in this planning period. Regular maintenance is recommended. It is recommended to continue monitoring the arsenic levels in the Hanley well with MCL regulations and continue coordinating with IDEQ on blending requirements.

General Pressure Zone

A number of the wells in the General Pressure Zone are on smaller lots in highly developed areas. Additionally, several wells discharge their pump-to-waste directly to the City's Stormwater system. The City would like to procure additional property at the 4th Street and Locust sites because of the small lot sizes and to increase well protection zone. The building at 4th Street will also need to be replaced within the next fifteen years, which would ideally be staged with obtaining additional property.

The boosted zones are all supplied from the General Zone. It has been assumed that the booster stations will be designed to supply the MDD and the peak hour demand will be supplied by the storage.

Stanley Hill Pressure Zone

It is recommended that the Stanley Hill and Fernan Zones are split into two zones to better serve these areas. A detailed analysis for the division of this zone was completed during the 2012 Comprehensive Plan update and is located in **Appendix D.** For the current comprehensive plan update, the demands for the zones were evaluated using current water meter data. **Appendix D** was

not updated, as the premise of spitting the zones remained the same. This improvement will require modifications to the Elm Street Booster Station to supply the two separate zones. A detailed discussion of this analysis is included in **Appendix D**. The demand for the Stanley Hill Zone is anticipated to go from a current day demand of 687 gpm to a future demand of 700 gpm after splitting the two zones. The firm capacity of the pump station will need to meet the 700 gpm demand. Additional boosters will be required to serve development that occurs in the higher elevations of this planned service area.

Fernan Hill Pressure Zone

The Fernan Booster Station will be located on the same property as the Elm Street Station. Build-out MDD for this zone is expected to be 650 gpm. A triplex station is the recommended layout. Specific options for the station configuration are included in **Appendix D**. This zone will require an additional booster pump station near the future fernan tank in order to provide higher elevation properties.

Armstrong Park Pressure Zone

The current demand for this zone is 180 gpm with a firm capacity of 440 gpm. When the demands near 400 gpm, it is recommended that an additional 220 gpm of capacity be added. These improvements would require significant building upgrades and improvements to the suction line. These improvements would provide a firm capacity of 660 gpm, which will supply the planned service area demand of 580 gpm and would be driven by growth.

Blackwell Hill Pressure Zone

Blackwell Hill has some significant areas within the planning boundary that can be developed over a range of elevations. However, this zone lies outside of the City's area of impact and is not anticipated to see growth. The current demands of 45 gpm are met by the pumps. A planned upgrade to the booster station will increase firm capacity for the existing service area.

If build-out were to occur, the zone would require several booster stations or PRVs to service this area. In September of 2012, J-U-B completed a technical memorandum providing detailed discussion on future expansion of this area which, is included in **Appendix E**. Replacement of the station will be required to meet future demands. Additional booster stations will be required to serve upper elevations of this zone.

Best Hill

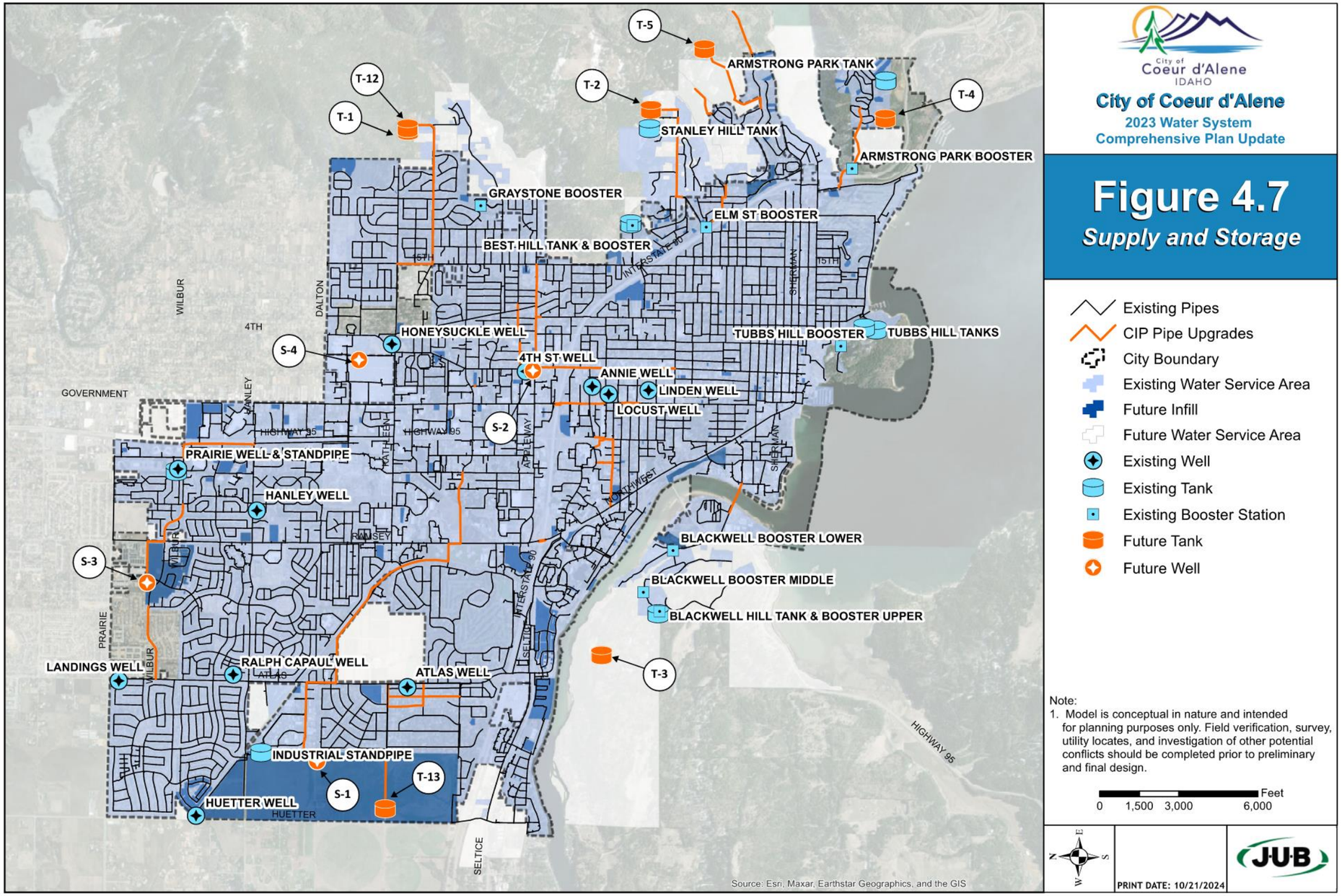
Construction of the Best Hill Booster station was completed in 2017/2018. No additional upgrades are anticipated during the planning period.

4.5.2 New Wells

Water supply recommendations include installing one new well in 2025 to meet demand and storage requirements. The well should be installed in the High Zone to meet the system demands.

Placement of future wells will need to take place on the western edge of the City where the aquifer is productive and water quality is best. Building and improving the pipe network to supply the water from the western side of town to the expected areas of growth in the areas east and south of the City will be critical in providing adequate pressures and flow. **Figure 4-7** shows proposed locations of the new wells. A total of five new wells will be required to serve the system's projected build-out (two within the next ten years). Verification of site requirements with IDEQ should be completed prior to final selection of future well sites.

Figure 4-7- Supply and Storage



City of Coeur d'Alene
IDAHO

City of Coeur d'Alene
2023 Water System Comprehensive Plan Update

Figure 4.7
Supply and Storage

- Existing Pipes
- CIP Pipe Upgrades
- City Boundary
- Existing Water Service Area
- Future Infill
- Future Water Service Area
- Existing Well
- Existing Tank
- Existing Booster Station
- Future Tank
- Future Well

Note:
1. Model is conceptual in nature and intended for planning purposes only. Field verification, survey, utility locates, and investigation of other potential conflicts should be completed prior to preliminary and final design.

0 1,500 3,000 6,000 Feet

PRINT DATE: 10/21/2024

JUB

4.6 Proposed Well Locations

There are five supply recommendations for the City, anticipated at 4,000 gpm each for the High Zone and 2,000 gpm each for the General Zone. The City is actively working on securing a well site along the western edge of the service are, south of the Industrial Tank, as shown on **Figure 4-7**. The well project (S-1) is scheduled to begin construction in 2025. This well will supply water to the High Zone.

The second supply upgrade recommendation is Project S-2 and is a 2,000 gpm well. The recommended location for this well is near the existing Fourth Street Well. This well will supply water to the General Zone.

The third supply upgrade recommendation is Project S-3 and is a 4,000 gpm well. The recommended location for this well is on the north end of the boundary, near the Coeur d'Alene Place Development. This well will supply water to the High Zone.

The fourth project, S-4, will supply water to the High Zone. The recommended location for this well is near the Kootenai County Fair Grounds. This location would help supply the north east quadrant of the system, and would be well connected to the General Zone through a PRVs immediately south.

The fifth supply upgrade recommendation is Project S-13 and is a 2,000 gpm well. The recommended location for this well is near the north edge of the General Zone, south of I90. This well will supply water to the General Zone.

4.7 Ultimate Demand and Water Rights

The projected MDD for the City at build-out is 62.2 mgd (43,200 gpm), as shown in **Figure 4-2**. The immediate demand requirement at that time must actually exceed 112.0 mgd (77,800 gpm) in order to meet peak hour demands. This capacity is achievable by adding three 4,000 gpm wells and two 2,000 gpm wells to the current firm supply. Criteria dictate that new sources are installed prior to the MDD reaching the City's firm supply (i.e., total supply with the largest source out of service). These criteria will also limit the equalization storage requirements and take advantage of more cost-effective aquifer storage.

Based on existing total water rights of 81.0 cfs (52.35 mgd), the City will need a minimum additional instantaneous water right of 92.2 cfs (59.66 mgd), for a total of 112 cfs (72.4 mgd).

Additional rights will be required to meet the projected reliable water supply requirement of 112 cfs (72.4 mgd). Those rights should be obtained through rights transfers when land with existing rights is annexed into the City and through new water rights applications. New rights should be sought under Idaho Department of Water Resources Reasonably Anticipated Future Needs (RAFN) procedures using this Comprehensive Plan as a basis for the filing. That application should be made in the near future.

Issues related to long-term aquifer capacity are beyond the planning period and beyond the scope of this study. However, aquifer management is inextricably tied to long-range water system planning and operations for all the regional communities relying on the Rathdrum Prairie Aquifer. The City has long been active in aquifer management through membership on IDWR's Groundwater Management Plan Technical Advisory Committee, Kootenai County's Aquifer Protection District, and IWAC (Idaho Washington Aquifer Collaborative). Continued proactive participation with other water systems, IDEQ, IDWR, and other local municipalities, including Spokane, should help protect the City's rights to adequate water supply.

4.8 Telemetry

The current SCADA system appears to be adequate for well and reservoir control and alarm initiation, and was recently replaced with a program that is maintained locally. The SCADA should continue to monitor trend lines of pumping and reservoir data to aid staff in troubleshooting and system optimization as well as when to plan specific system improvements. Modifications to the SCADA system to allow data to be stored for a minimum of five years will help the City monitor long term pumping and storage trends.

4.9 Power Supply and Reliability

Avista Utilities and Kootenai Electric Cooperative provide power to the City's wells. The Hanley Well is currently served by Kootenai Electric Cooperative while Avista provides power to the remaining wells. The Prairie, Atlas, Ralph Capaul, Huetter, Linden and Annie wells contains standby power generation in the case of power outages.

4.10 Water Conservation

The Spokane Valley-Rathdrum Prairie Aquifer is the largest source of drinking water within our hydrologic area. The City has been implementing conservation methods for several years. A complete discussion of these processes is included in the City's Water Conservation Plan included in Appendix B.

Pumping water is becoming more expensive as energy costs continue to rise. The conservation program helps reduce the amount of energy the City uses and extends the estimated times for adding new well sources as well as reduces demands on the aquifer. The City implemented a block water rate structure in 2008 to promote equity in water charges and aid conservation. Reevaluating the commodity charge for water use has been an effective tool for water conservation in many areas and is continually evaluated by the City. A complete evaluation of the City's water conservation efforts and impacts is included in Appendix B.

4.11 Capital Costs

Table 4 8 presents a summary of budget costs for adding system supply to meet build-out demands.

Table 4-8- Opinion of Probable Costs-New Supply

Project No	Capital Project	Additional Supply (gpm)	Planned Year	Total Estimated Cost [a] [b]
S-1	New Well – High	4,000	2025	$2,800,000
S-2	New Well - General	2,000	2030	$2,500,000
S-3	New Well – High	4,000	2035	$2,800,000
S-4	New Well – High	4,000	2040	$2,500,000
S-13	New Well - General	2,000	2030	$2,800,000
	Total			**$13,400,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

(b) Cost of land acquisition not included since property is generally donated to the City.

These costs are based on data from other wells drilled over the aquifer in Kootenai County. Wells constructed in future years must account for inflation as detailed in **Chapters 6** and **7**.

Capital project budgets planned for improving the existing wellhouses and systems are included in **Table 4-9**.

Table 4-9 - Opinion of Probable Cost-Miscellaneous Water Supply Projects

Project No.	Capital Project	Planned Year	Capital Cost [a]
S-5	Pump to Waste Rerouting [b]	2029	$50,000
S-6	4th Street – Wellhouse Replacement	2037	$1,790,000
S-7	Atlas PRV Installation	2025	$90,000
S-8	Regular Pump Rehabilitation	Annual	$100,000
S-9	Onsite Chlorine Regeneration Maintenance	Annual	$100,000
S-10	Soft Starter Replacement	Biennial	$150,000
S-11	Water Rights (RAFN)	2024/ongoing	$20,000
S-12	SCADA Maintenance	Annual	$55,000
	Total		**$2,355,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

(b) Cost per each.

Capital project budgets for improvements to other pressure zone improvements are included in **Table 4-10**.

Table 4-10- Opinion of Probable Cost-Booster Station Upgrades

Project No.	Capital Project	Planned Year[b]	Total Estimated Cost [a]
B-1	Elm Street – Additional Pump & Upgrades	2028	$290,000
B-2	Elm Street – Booster Split	2032	$100,000
B-3	Fernan Hill – Split with Stanley	2032	$1,800,000
B-4	Fernan Booster – Additional Pump	2034	$100,000
B-5	Blackwell Hill – New Station	2026	$2,000,000
B-6	Armstrong Park – Booster Upgrades	2035	$1,000,000
	Total		**$5,290,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

(b) Timing of project is dependent on additional demands from future developments.

These opinions of cost are budgetary in nature based on manufacturer's quotations, similar construction projects, discussions with contractors, standard estimating guides, and engineering judgment. Preliminary designs of the improvement projects should be used to refine these budgets and update them for current market conditions as each project moves toward construction.

5 WATER STORAGE

5.1 Introduction

The existing water system has historically required less storage than similarly sized systems due to the high volume of groundwater available. As presented in Chapter 4, additional storage or supply is required to meet future PHD requirements. The emergency storage normally required in a typical system can continue to be provided by adding groundwater wells equipped with emergency generators. Storage will be provided based on Water Department criteria for MDD equalization, fire protection, and emergency storage. Equalization requirements vary greatly depending on available supply and system demands.

The total storage requirement in a typical water system includes equalization, fire protection, and emergency storage.

Equalization storage is the water volume required to meet peak hourly demands in excess of what the system can supply. It is generally more economical to provide water supply to meet the maximum day demand and storage to supplement the supply during peak usage hours. As noted in **Chapter 4**, however, the City of Coeur d'Alene can most efficiently meet peak demands through a combination of storage and additional supply. Equalization storage can also be used to decrease power costs by allowing pumps to operate during off-peak power demand periods and avoid excessive pump cycling. **Figure 2-3** showed the peak hourly demand of 196 percent of maximum day demand occurs around 4:00 a.m. during a “typical” maximum day. The sums of these peak demands comprise the required equalization storage volume.

Fire storage is the volume of water that must be stored in excess of available reliable supply to meet fire demands. The required volume was determined by the water system in conjunction with the local fire officials and building code requirements. The maximum fire demand multiplied by the fire duration within each zone determines the total volume. **Table 5-1** lists the fire demand criteria and corresponding storage need.

Table 5-1- Fire Storage Sizing Criteria

	Recommended Fire Demand (gpm)	Fire Duration (hrs)	Recommended Storage (gallons)
Commercial	3,500	3	630,000
Residential	1,750	2	210,000

Emergency Storage is the additional volume of water stored to meet unexpected events such as power outages. The volume of emergency storage provided by the system is a policy decision by the City. The criteria selected for total storage is to meet equalization and fire storage needs while maintaining 10 percent of total storage in reserve.

The total storage volume required is dependent on the supply available. Increased supply meets more of the peak demand, reducing the equalization volume required. Optimizing storage and supply volumes can help keep both capital and operation and maintenance costs down. This section balances supply and storage to achieve the lowest overall system cost.

5.2 Existing and Future Storage Evaluation and Recommendation

The following sections discuss existing storage as well as future storage requirements for each zone.

5.2.1 High Zone

The City's High Zone has 4.0 million gallons (MG) of storage, 2.0 MG of which is available elevated storage evenly divided between the Prairie and Industrial Standpipes. Chapter 4 presented the relationships between the amount of supply available and the storage required. This analysis showed that additional storage will be required to meet the City criteria.

In order to meet the storage criteria for the High Zone, it is recommended that 2.0 MG of storage be added to the High Zone. The City has procured property east of the City at the end of Thomas Lane and are in the process of designing 1.0 MG of storage to be added in the northeast quadrant of the system. This tank is anticipated to begin construction in 2025. The addition of storage in this area provides required storage to meet system criteria and improves the hydraulic balance of the pressure zone. Since the majority of the supply is located on the west side of the High Zone, peak hour demands on the east side require significant water transmission across US 95. The east side storage will help to attenuate the peak demands, moderate pressure swings, and minimize transmission piping upgrades.

A second potential location for 1.0 MG of additional storage is located adjacent to the City's proposed 1.0 MG tank for the NE Quadrant.

One additional option for meeting the emergency storage in the High Zone is to add a booster station at the Prairie or Industrial Standpipe that would allow the bottom million gallons of water to be utilized. It appears to be more cost effective to build a new supply well and utilize aquifer storage than to construct an emergency supply booster storage; however, if well sites or tank siting become difficult to identify due to location or water quality, this may be considered.

It is also recommended that the City continue with water conservation education with patrons and monitor potential changes in water use characteristics.

5.2.2 General Zone

The Tubbs Hill Tanks and Best Hill Tank provide a total of 5.0 MG of usable storage to the General Zone. The existing storage in this zone is adequate for the long term, providing that a new well is brought online when peak day demands in the area rise above 12,400 gpm as recommended in Chapter 4. As previously described, the addition of an additional supply well keeps the equalization storage volume to a minimum by the supply meeting the peak hour demand. If the zone supply is

lower, more storage is required to meet the peaks. By adding new wells in a timely manner, the equalization, fire, and emergency criteria can be maintained until system build-out, as previously illustrated in Figure 4-2.

The General Zone storage, while adequate, has hydraulic connectivity problems between the Best Hill Tank and Tubbs Hill Tanks. A large pipeline project was completed in 2001, which significantly improved the situation. Additionally, a booster station was constructed at the base of the Best Hill Tank in 2017. The intent of the station is to pull water from Best Hill Tank during peak periods, providing additional capacity to the General Zone and increasing tank turnover. The station is currently operating as anticipated.

No additional storage is recommended for the General Zone. There are several general maintenance projects recommended as shown in Table 5-3.

The storage analysis assumes that the City will make the recommended supply improvements as described in the previous chapter. If supply improvements are not made when recommended, storage needs will be much higher and could easily exceed available capacity.

5.2.3 Stanley Hill

The Stanley Hill Tank has a usable volume of 0.20 MG and supplies the Stanley Hill Zone. Based on the review criteria, the existing service area, and pump capacity at the Elm Street Booster, a total of 1.5 MG, is required. This zone has significant potential future development, so any improvements will likely be tied to system expansion.

As noted in Chapter 4, the Stanley Hill Zone is recommended to be divided into a Stanley Hill Zone and a Fernan Hill Zone. Following that division, the recommended storage for the Stanley Hill Zone can be reduced to 0.7 MG.

5.2.4 Fernan Hill

The Fernan Hill Zone is currently part of the Stanley Hill Zone. Once these zones are split, the Fernan Hill Zone will be independent and will require storage. The recommended storage for this zone is 0.7 MG. A full analysis of this zone and the division of the two zones was completed during the 2012 Comprehensive Plan update and is included in Appendix D for reference.

5.2.5 Armstrong Park

The Armstrong Park Tank has a current capacity of 0.16 MG, which is less than the current storage criteria of 0.42 MG of storage based on current system demands. It is expected that this area will see some additional development within the planning period, and any improvements in this zone will be driven by development. The recommended total storage for this zone is 0.6 MG and could be completed by adding approximately 0.5 MG of storage to the system.

5.2.6 Blackwell Hill

Blackwell Hill currently has only a small storage tank, providing minimal equalization storage to the High Pressure Zone. This area is not expected to see growth, as it lies outside the City's area of impact. Assuming a booster pump station is capable of providing a firm capacity equal to the MDD for the zone, a 0.6 MG tank will be required.

This area is also very steep and will require detailed planning (**Appendix E** includes a technical memorandum completed by J-U-B in 2012 which provides additional discussion of the pressure zone analysis for this area). The overall storage requirement for the built-out plan area is 0.6 MG and may be supplied by one or several tanks, depending on design.

5.2.7 Storage Summary

Table 5 2 shows the expected storage needs by zone for the water system.

Table 5-2- Storage Requirements by Zone

Scenario	Zone	Equalization Storage (MG)[(a)]	Fire Protection Demand (MG)	Total Min. Storage Required/Available (MG)
Current Requirements	High Zone	2.61	0.63	3.56 / 2.0
	General Zone	1.93	0.63	2.82 / 5.0
	Stanley Hill Zone	0.58	0.21	1.58 / 0.2
	Armstrong Park Zone	0.02	0.21	0.42 / 0.16
	Blackwell Hill Zone	0.00	0.21	0.42 / 0.0
Build-Out Requirements	High Zone	3.71	0.63	4.77
	General Zone	2.75	0.63	3.72
	Stanley Hill Zone	0.10	0.21	0.63
	Armstrong Park Zone	0.09	0.21	0.60
	Blackwell Hill Zone	0.04	0.21	0.60
	Fernan Hill Zone	0.10	0.21	0.62

(a) Equalization storage is based on firm pumping capacity exceeding maximum day demand.

5.3 Cost Opinions

A summary of the recommended storage projects and potential schedules is included in **Table 5 3.**

Table 5-3- Cost Opinions-Storage Recommendation

Project No.	Project	Anticipated Year of Construction	Capital Cost [(a)]
T-1	High Zone Storage – 1.0 MG	2025	$6,800,000
T-2	Stanley Hill Storage – 0.5 MG	2040	$1,700,000
T-3	Blackwell Hill – 0.6 MG	2033	$1,800,000
T-4	Armstrong Park – 0.5 MG	2038	$1,700,000
T-5	Fernan Hill – 0.7 MG	2032	$2,100,000
T-6	Recoating Prairie Standpipe - Exterior	2027	$600,000
T-7	Recoating Industrial Standpipe - Exterior	2031	$600,000
T-8	Recoating Tubbs Hill – 1.0 MG Tank	2038	$200,000
T-9	Recoating Prairie Standpipe - Interior	2034	$760,000
T-10	Recoating Industrial Standpipe - Interior	2036	$760,000
T-11	Recoating Stanley Hill – Interior/Exterior	2033	$130,000
T-12	High Zone Storage – 1.0 MG	2032	$6,800,000
T-13	High Zone Storage – 1.0 MG	2037	$6,800,000
	Total		**$30,750,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

6 DISTRIBUTION SYSTEM

6.1 Distribution System Analysis

A hydraulic computer model using WaterCAD Version 10.04 software produced by Haestad Methods was used to understand how the system reacts to various demands, and project how the system growth will impact existing infrastructure. The water model used data from the City's existing GIS database of their water distribution system.

Current water demand was added to the system based on existing summer water meter reading data. Future water demands were extrapolated from existing meter data by determining water usage per acre for existing land uses and assuming full build-out within the planning boundary.

Operating conditions for the various model components (wells, water storage tanks, well and booster pumps, PRVs, and PSVs) were reviewed and updated based on discussions with the City and City provided setpoint data. Missing or questionable data was reviewed with the City and/or record drawings and then updated as needed. Additional information regarding the development, calibration, and utilization of the water model can be found in **Appendix F**.

6.2 Evaluation of Distribution System

The water model was utilized to identify locations within the existing distribution system that do not meet the system criteria and to understand the impact of future demands on the system within the Water Department's planning boundary. The analysis examined velocities and headlosses in each pipe as well as minimum and maximum pressures in the system. This section summarizes the examination of the current system condition and the system under future demands. Detailed description of the evaluation, system deficiencies lists, and the review criteria developed with City staff is included in **Appendix F**.

6.2.1 Existing Demand Conditions

The existing system was evaluated under the following conditions:

- Existing Maximum Day Demand Extended Period Simulation (EPS)
    - 2023 Max Day Demand: 29,700 GPM
    - All wells and boosters operating on Summer Setpoints (reference **Appendix F** for setpoints).

Generally, the distribution system velocities, headloss and working pressure appear to be within criteria during the average day. Only localized high pressures and headloss gradients were observed near well and booster pumps in operation.

Under peak hour, several areas exhibit high velocities and headloss greater than the allowable system criteria of 10 feet per 1,000 feet (0.010 ft/ft). The map provided on **Figure 6-1** shows the

existing distribution system headloss in feet per 1,000 feet. Figure 6-2 and Figure 6-3 show the minimum and maximum existing system pressures observed over the 72-hour simulation.

6.2.2 Future Demand Conditions (Build Out)

As previously discussed, build-out conditions assume complete infill within the current service area and system expansion to the planning boundary according to City zoning. Future distribution pipes were routed to build-out areas (the actual location of future pipes will be determined by future development) to help understand impacts to the existing system under build out demand conditions, and additional supply was modeled as groundwater wells similar to the City's existing wells.

The build-out model was first run as an extended period simulation under MDD, utilizing the same daily demand diurnal as the existing system model to evaluate how the existing system responds throughout the day to the increased demand. Multiple areas exhibited pressure, velocity, and head loss outside of allowable criteria. Build out system (with no improvements) headloss in feet per 1,000 feet is shown on Figure 6-4.

The build-out model was also run as a static simulation under the following conditions:

- Minimum Pressures Static Simulation
    - Peak Hour Demand: 86,800 GPM
    - All Wells Except Huetter Operating
    - Tanks Half Full
- Maximum Pressures Static Simulation
    - Peak Hour Demand: 86,800 GPM
    - All Wells Except Huetter Operating
    - All Tanks Full

Figure 6-1- Existing System Peak Hour Headloss

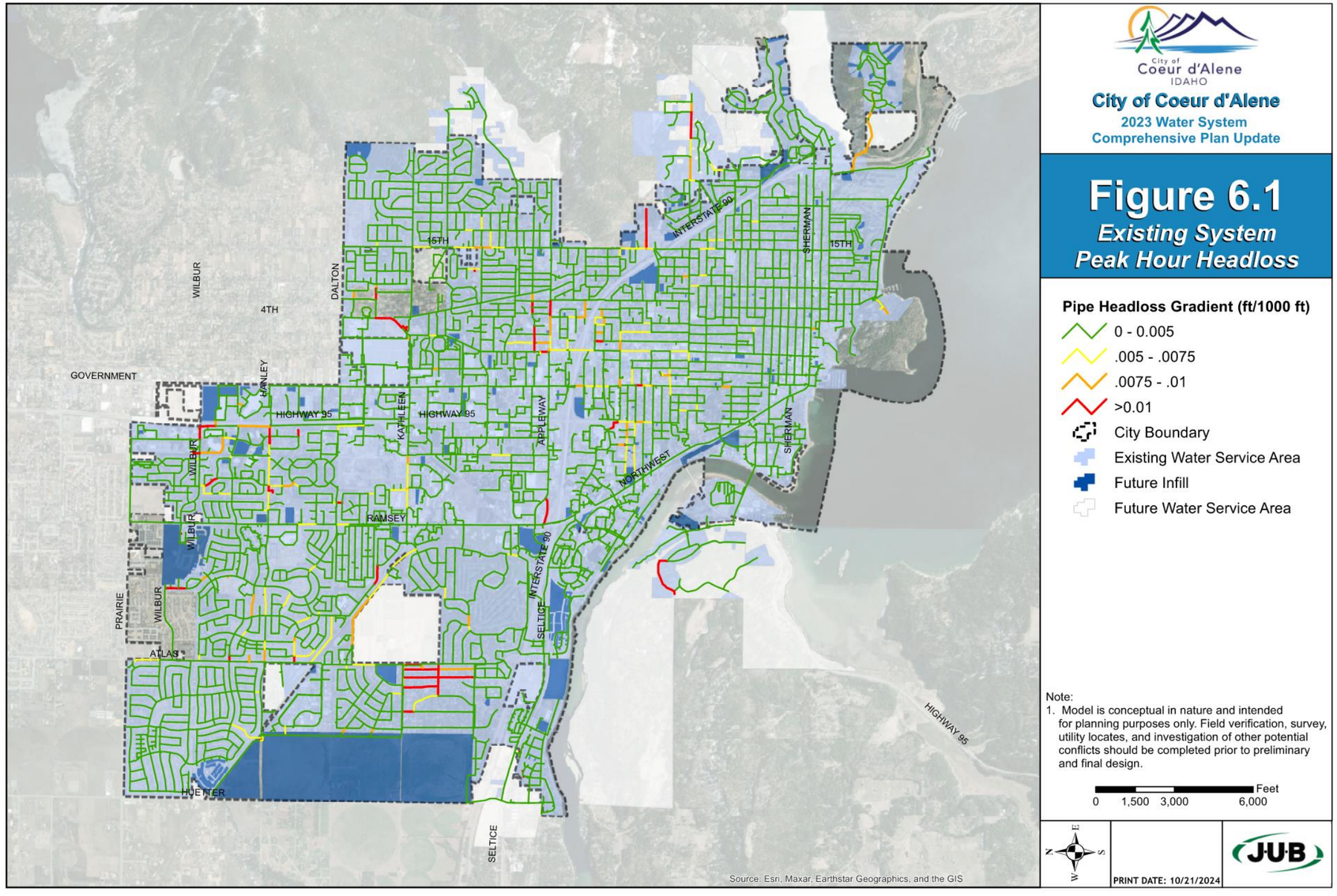


Figure 6-2- Existing System Minimum Pressures

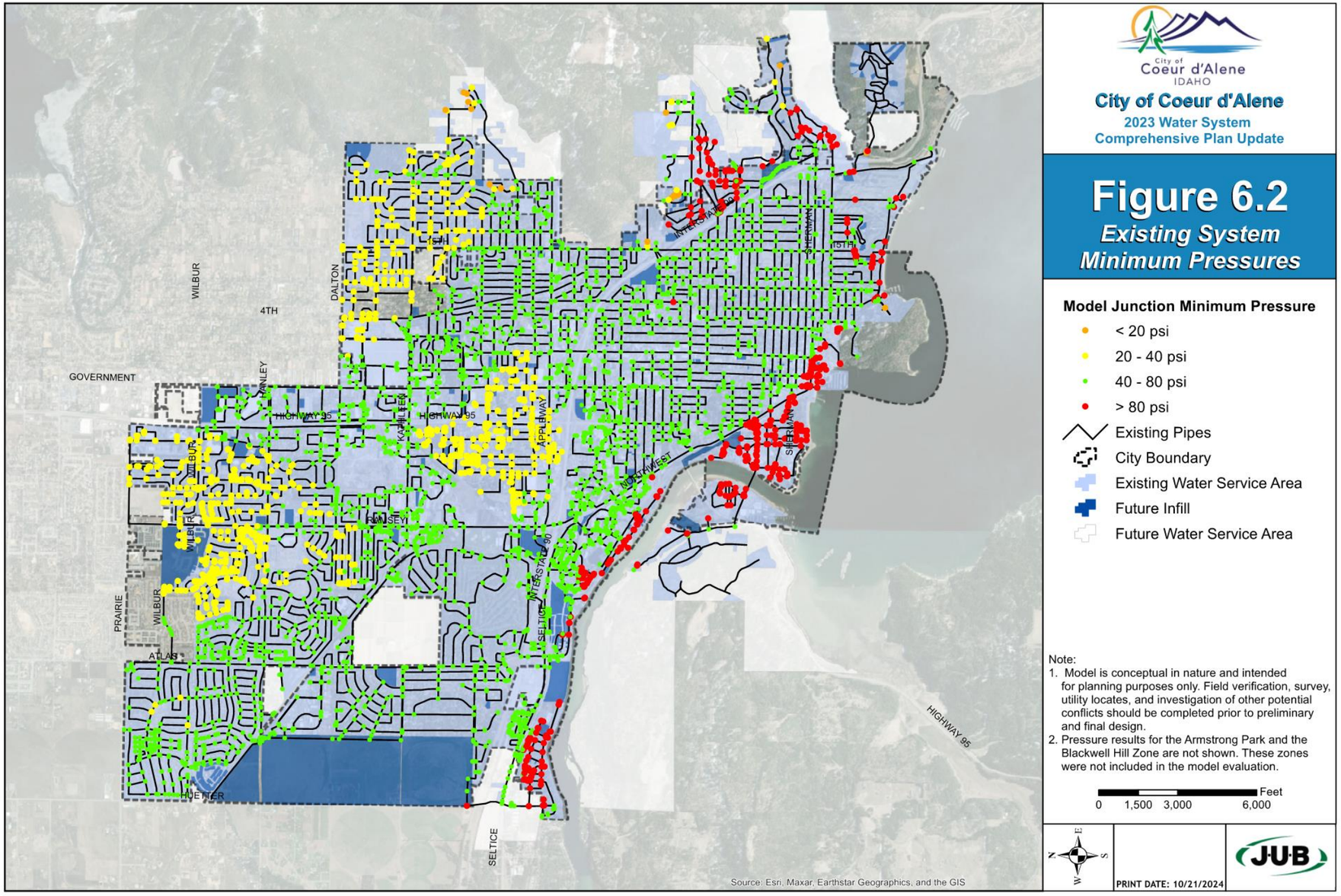


Figure 6-3 - Existing System Maximum Pressures

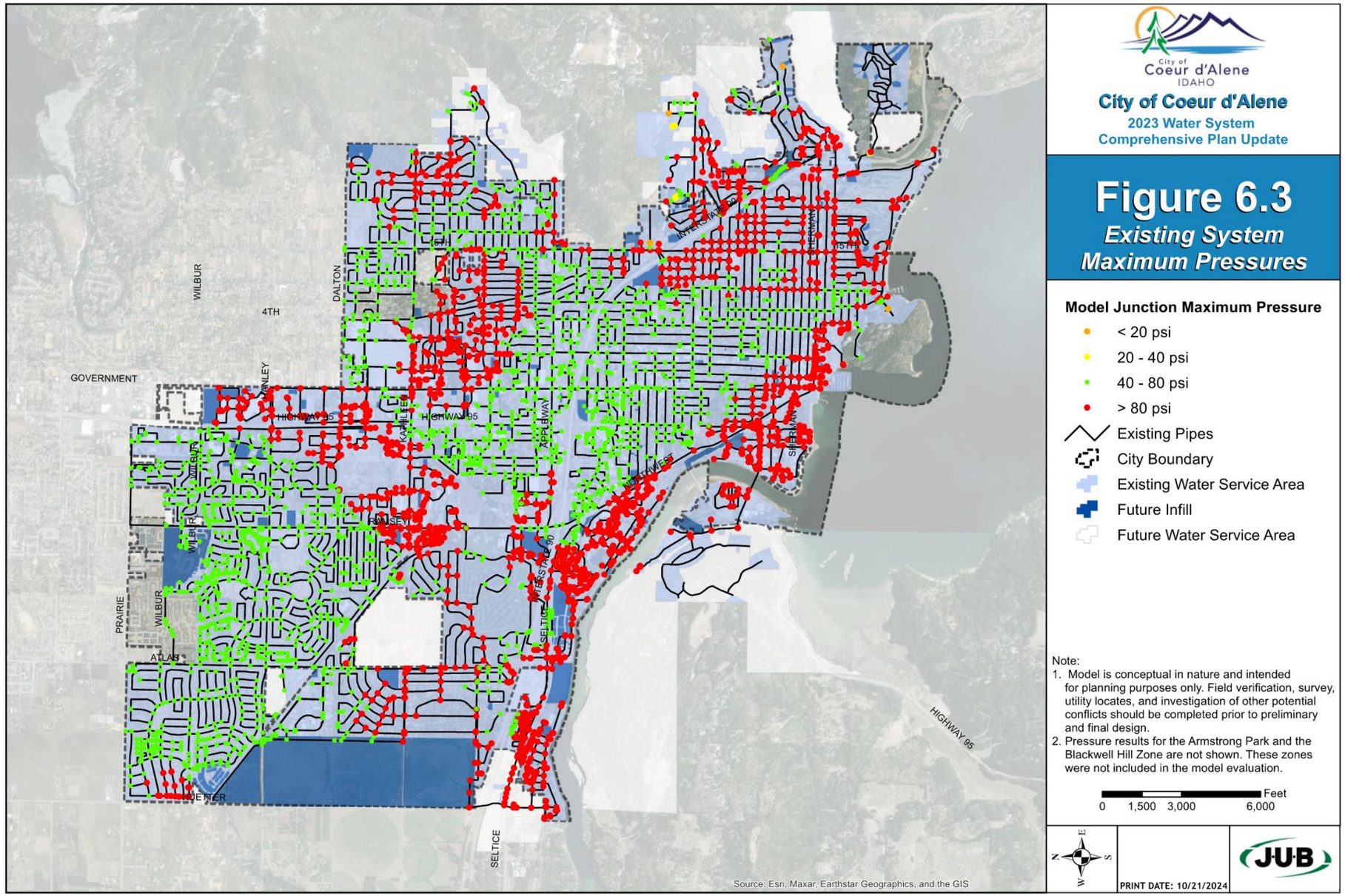
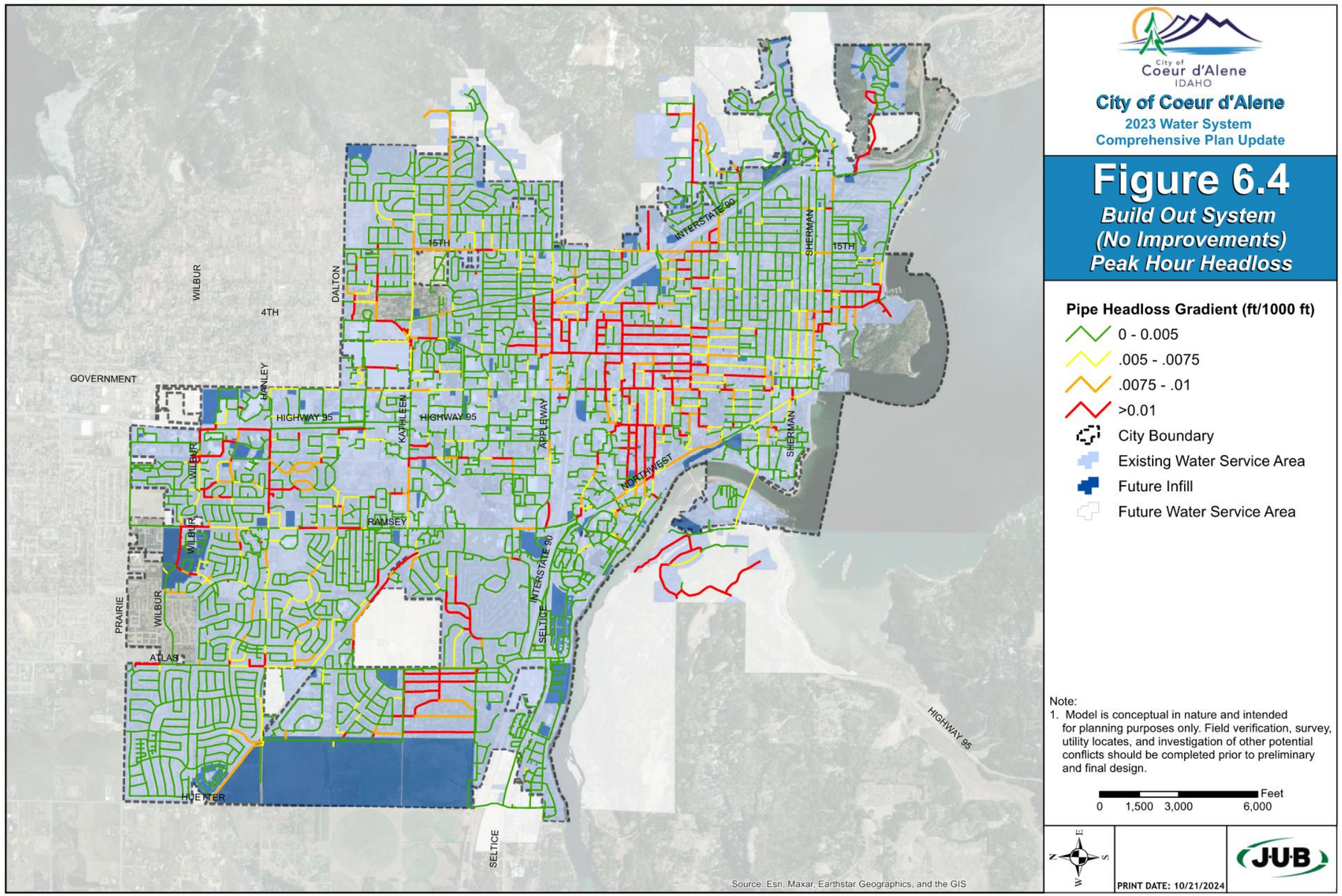


Figure 6-4- Build Out System Peak Hour Headloss (No Improvements)



6.3 Pressure Zone Boundary Analysis

6.3.1 High Zone/General Zone

The existing boundary was evaluated to determine if any changes are warranted. Current system pressures in both zones appear to be within existing pressure criteria, and system operators indicate the current boundaries are functioning well. Evaluation of supply and storage in each zone indicates that the High Zone has excess supply but is short on storage. The General Zone is short on supply but has adequate storage. Since the General Zone can be fed by the High Zone, supply needs can be met currently, however the addition of storage in the High Zone is recommended in the short term. At this time, no change in boundaries appears necessary.

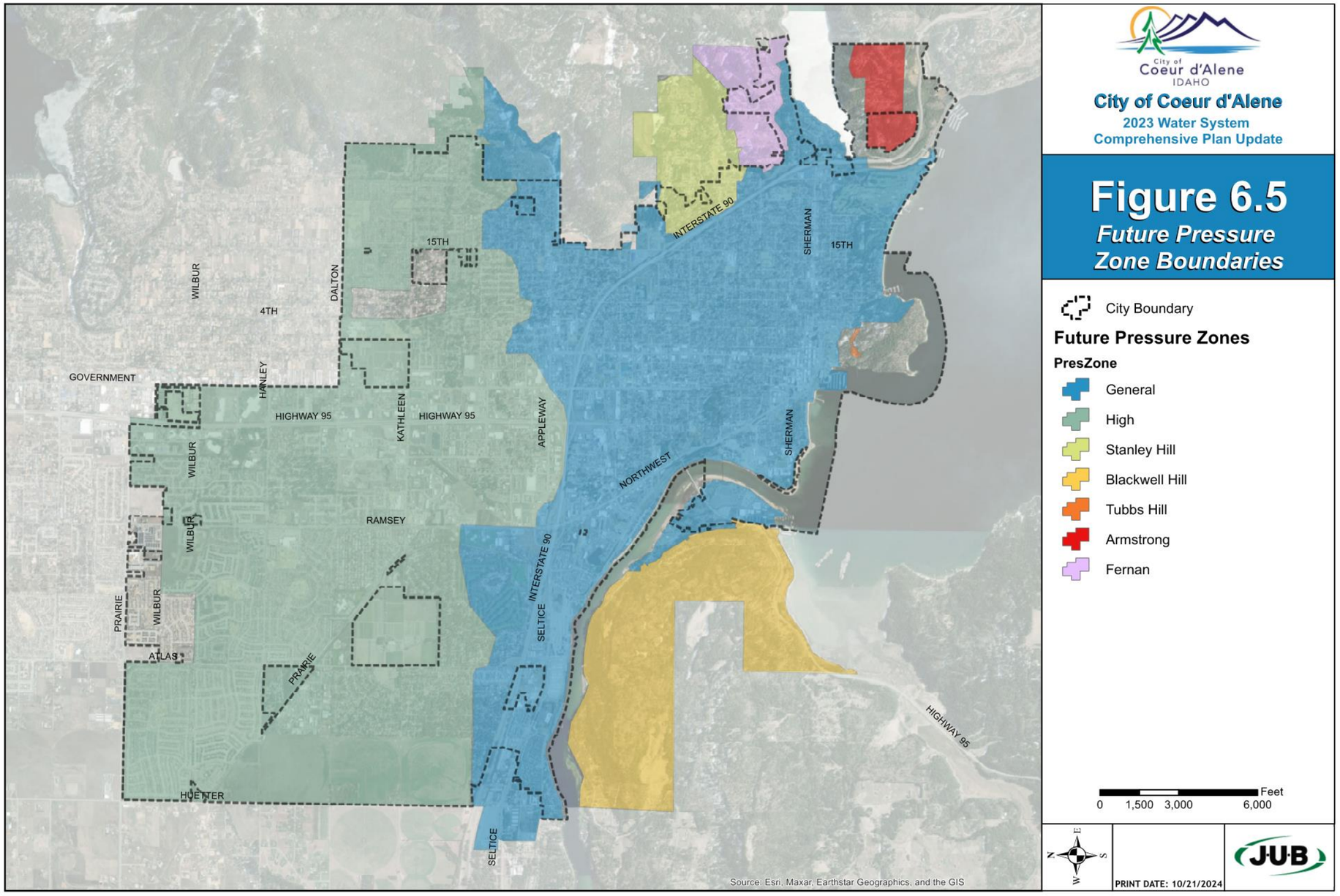
6.3.2 Stanley/Fernan Boundary

As discussed in previous sections, the Stanley Hill service will be split into the following three areas:

1. The higher elevation service area on Stanley Hill will be fed by the Elm Street boosters. Existing isolation valves near Ponderosa Golf Course will be closed.
2. The low-lying area near Ponderosa Golf Course will be served by the General Zone. This will require upsizing existing small lines under I-90 as part of the City's regular replacement program.
3. Service to residents on Fernan Hill will be from a new Fernan Hill booster pump station located adjacent to the Elm Street Booster. This will require construction of a new 12-inch transmission main to Fernan Hill Road.

The future system pressure zone boundaries are shown on Figure 6-5.

Figure 6-5 – Future Pressure Zone Boundaries



6.4 Recommended Improvements

Table 6-1 includes a summary of the deficiencies identified at the build-out scenario as well as the recommended solutions. Some observed problems do not necessitate an improvement project, therefore a detailed description of all build-out system deficiencies is included in Appendix F. The build out system (including improvements) is included on Figure 6-6 and system headloss in feet per 1,000 feet is shown on Figure 6-7. Figure 6-8 and Figure 6-9 show the minimum and maximum build out system pressures observed under the previously listed simulation conditions.

6.4.1 High Zone

The recommended improvements in the High Zone include new transmission mains along Wilbur Avenue, Industrial Loop, Kathleen Avenue/Prairie Trail, and Thomas Lane to improve distribution of water from the west side to the east side of the zone. Upsizing the lines between the Prairie and Hanley Wells is recommended to reduce bottlenecking between the supplies. Upsizing the lines to the west of the existing Atlas Well is recommended to reduce headloss and velocities in the area.

6.4.2 General Zone

Recommended improvements for the General Zone include upgrading the mains in 4th Street, Government Way, and Lincoln Way to allow for some transmission from the supply wells in the northern portion of the zone to downtown, as well as upsizing other undersized reaches to eliminate existing bottlenecks. A parallel river crossing to supply the Blackwell Hill Zone is recommended for redundancy in case of failure of the existing crossing.

6.4.3 Stanley Hill Zone

The Stanley Hill recommendations include upsizing the supply lines to the storage tank and upsizing undersized lines.

6.4.4 Fernan Hill Zone

The recommended Fernan Hill Zone will require a new transmission main to supply the new zone from the Elm Street (and Future Fernan) Booster Station site. In addition to this new 12-inch transmission main, areas of future growth will require additional 12-inch transmission mains.

6.4.5 Armstrong Park Zone

It is recommended that the existing supply line to the Armstrong Park Zone be upsized to a 12-inch line in order to supply adequate flows to the booster station at build-out.

6.4.6 Blackwell Hill Zone

No specific recommended improvements to the Blackwell Hill Zone are planned at this time. Improvements in this area will be dependent on locations and sizes of future development(s).

Table 6-1- Build-Out Deficiencies

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [(a)]
D-1	High Zone - Transmission main piping for addition of NE storage	Headloss gradients are greater than 0.01 ft/ft in the area of recommended NE storage.	Install new 16-inch transmission main for new addition of storage to NE quadrant.	2024/2025	$5,400,000
D-2	High Zone between Hanley and Prairie Wells	Existing pipes act as a bottleneck as demand is routed to the south-eastern portion of the zone.	Upsize mains between the Hanley Well and Prairie Well on Highway-95 to 24-inch.	2027	$3,370,000
D-3	High Zone – New Transmission Main	Existing pipes act as a bottleneck as demand is routed to east portion of the zone.	Install new 18-inch transmission main piping in Wilbur Avenue from Atlas Road to N Roche Road, and from Moselle Drive to Pinegrove Drive.	2029	$6,220,000
D-4	High Zone – New Transmission Main	16-inch main loop is incomplete.	Install new 16-inch main from Future Spiers Well in W Industrial Loop and connect to the existing 16-inch in Atlas Road.	2025	$2,480,000
D-5	High Zone – New Transmission Main	Insufficient supply to the east side of the High Zone causing low pressures.	Install new 16-inch transmission main piping in Kathleen Avenue and the Prairie Trail from Atlas Road to the intersection of Neider Avenue and Howard Street to route flow from wells on the west side to the east side of High Zone.	2038	$9,240,000
D-6	High Zone – Atlas Well Area	Headloss gradients are greater than 0.01 ft/ft in the area south of the future Spiers Well and west of the existing Atlas Well.	Upsize piping in Arrowhead Road, Sherwood Drive, Tamarack Road, and Nez Perce Road.	2031	$3,210,000
D-7	General Zone - 4th Street Well Area	Existing pipes act as a bottleneck as demand is routed from the north side of the General Zone.	Upsize mains in Appleway Avenue, Best Avenue, Haycraft Avenue, Gilbert Avenue, and N 4th Street.	2033	$7,520,000

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [a]
D-8	General Zone - River Crossing	There is no redundancy for serving the Blackwell Hill Zone if the existing river crossing were to fail.	Install parallel 12-inch to existing Blackwell river crossing.	2040	$670,000
D-9	General Zone – Government Way Piping	Headloss gradients are greater than 0.01 ft/ft along Government Way. I-90 widening construction will require replacement of piping on bridge overpass.	Replace the 12-inch main on the I-90 Overpass Bridge and upsize existing 8-inch pipes in Government Way from the I-90 Overpass to Lacrosse Avenue to 12-inch.	2030	$1,670,000
D-10	General Zone – Emma Avenue Piping	Headloss gradients are greater than 0.01 ft/ft along Medina Street and Emma Avenue.	Upsize existing piping in Medina Street and Emma Avenue to 10 and 12-inch respectively.	2034	$1,780,000
D-11	General Zone – Lincoln Way Piping	Headloss gradients are greater than 0.01 ft/ft along Lincoln Way. The single reach of existing 6-inch going east from the intersection of Lincoln Way and Emma Avenue creates a bottle neck.	Upsize existing mains in Lincoln Way, from Ironwood Drive to Emma Avenue to 12 and 16-inch. The 6-inch pipe reach going east on Emma Avenue should also be upsized to an 8-inch to eliminate the bottleneck.	2036	$810,000
D-12	Stanley Hill Zone - transmission piping within the zone	Negative pressures near the Stanley Hill Tank/Johnson Ranch area due to additional future storage and large build-out demands in very small distribution lines. Headloss gradients are greater than 0.01 ft/ft in Stanley Hill area.	Upsize mains on Harrison Avenue to 12-inch and extend 12-inch transmission main to new Stanley Hill Tank #2 (booster pumps will be required to serve some areas of future development).	2040	$2,390,000
D-13	Future Fernan Zone - new transmission piping from Elm Street Booster Site to Zone	Negative pressures near the Fernan build-out area due to large build out demands in distribution lines.	New Fernan Booster Station at the existing Elm Street site and new Fernan Hill Tank. 12-inch transmission piping between the booster and the new zone, as well as from the new tank will be required.	2032	$3,390,000
D-14	Armstrong Park Zone transmission line to supply booster station	Headloss gradients are greater than 0.01 ft/ft in 6-inch transmission line to Armstrong Park area.	Upsize transmission line to Armstrong Park to 12-inch.	2038	$2,000,000

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [(a)]
D-15	General Zone - I-90 Widening at Northwest Boulevard	I-90 widening construction will require replacement of piping on bridge overpass.	Replace the 12-inch mains on the I-90 Overpass Bridge.	2037	$430,000
D-16	Fernan Hill Future Development	Extensions will be required to service future areas.	Main extensions for future development.	2040	$1,380,000
D-17	Miscellaneous Areas around the system	High headloss gradient observed in various areas with undersized mains.	Annual main replacement.	Annual	$1,300,000
D-18	New/Replace Meter/ Hydrant/Service Line Work		Annual replacement projects.	Annual	$500,000
			Total		**$53,710,000**

(a) All Opinions of Cost are planning level in 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

Figure 6-6 – Build Out System (with Improvements)

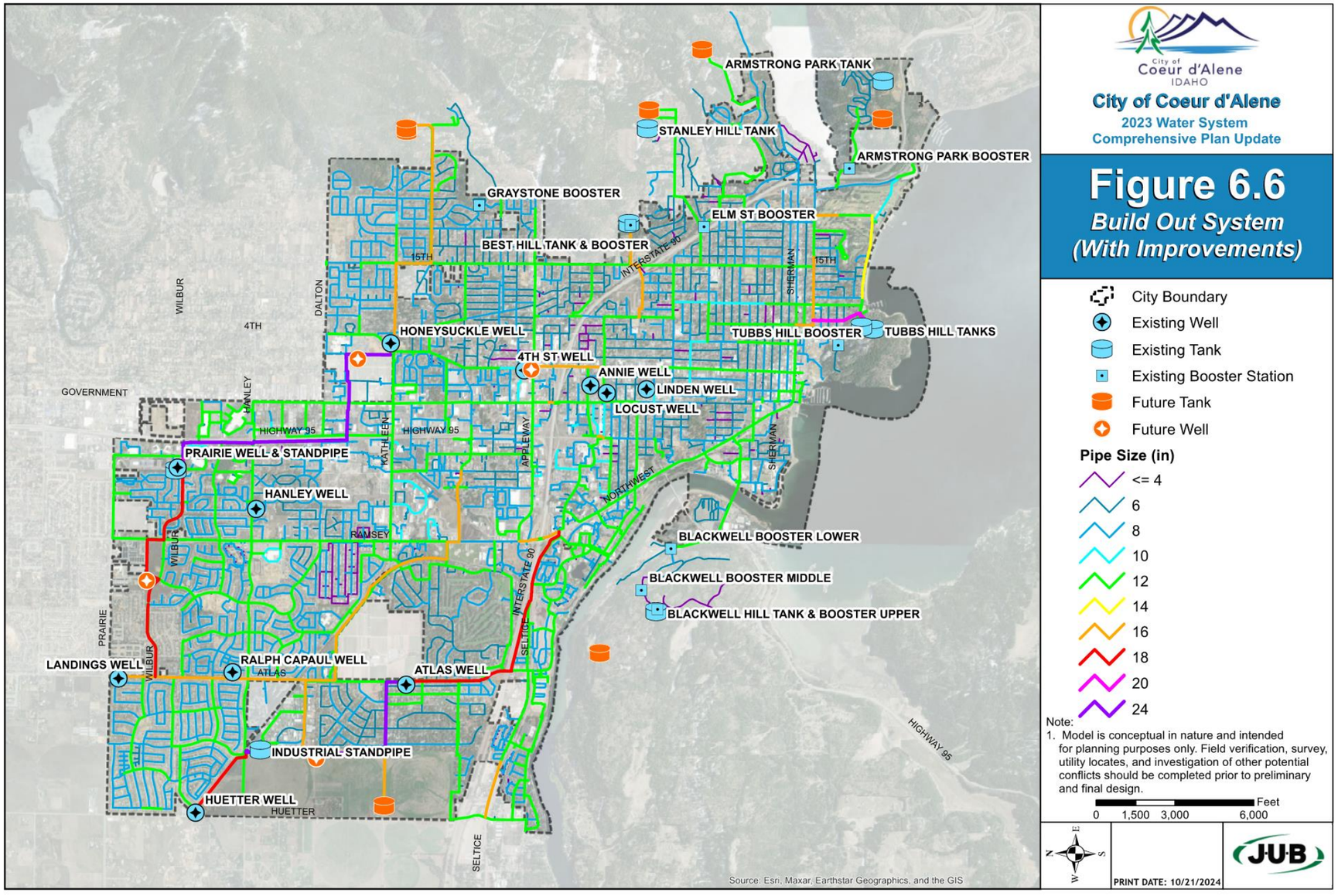


Figure 6-7 – Build Out System (with Improvements) Peak Hour Headloss

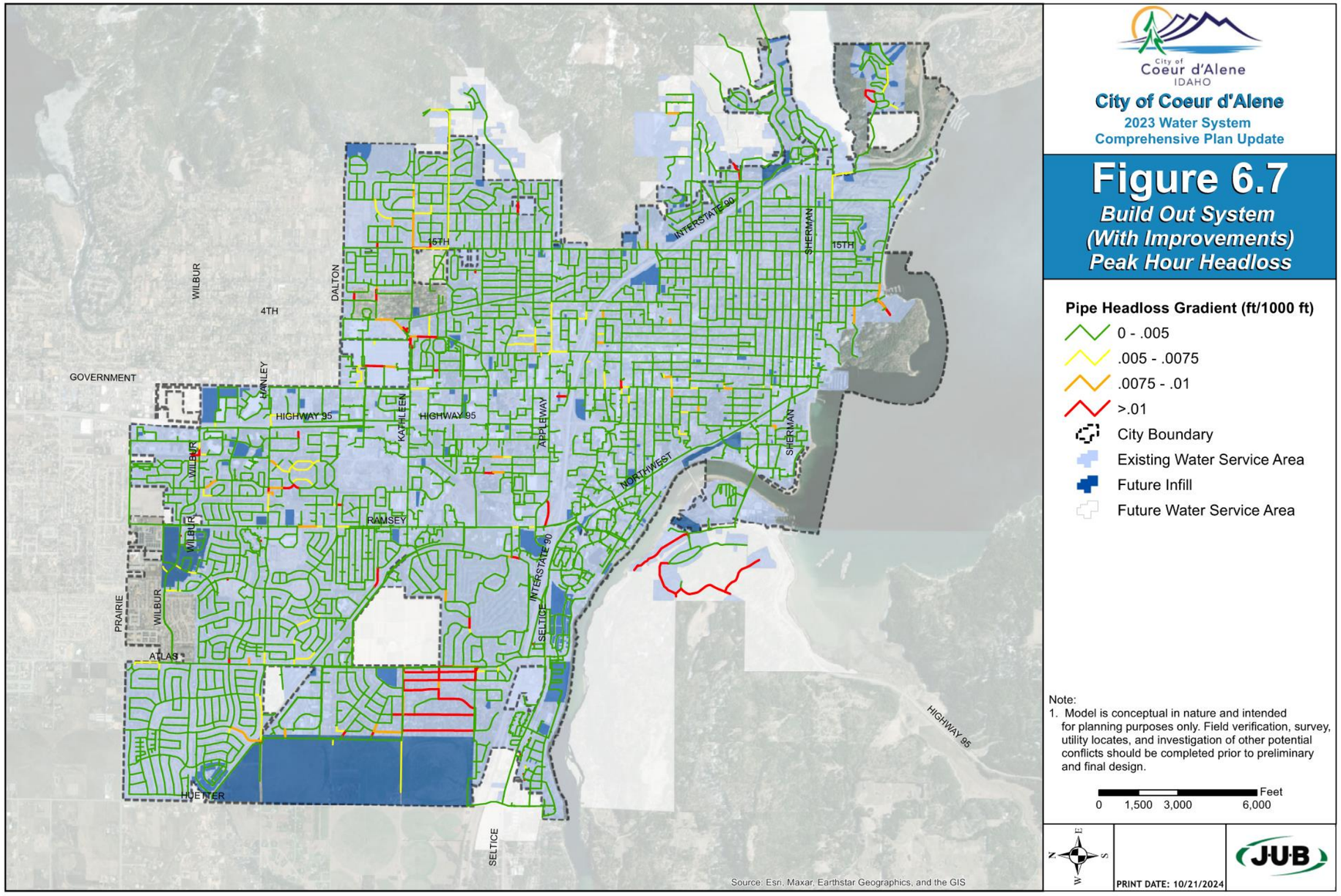


Figure 6-8 - Build Out System (with Improvements) Minimum Pressures

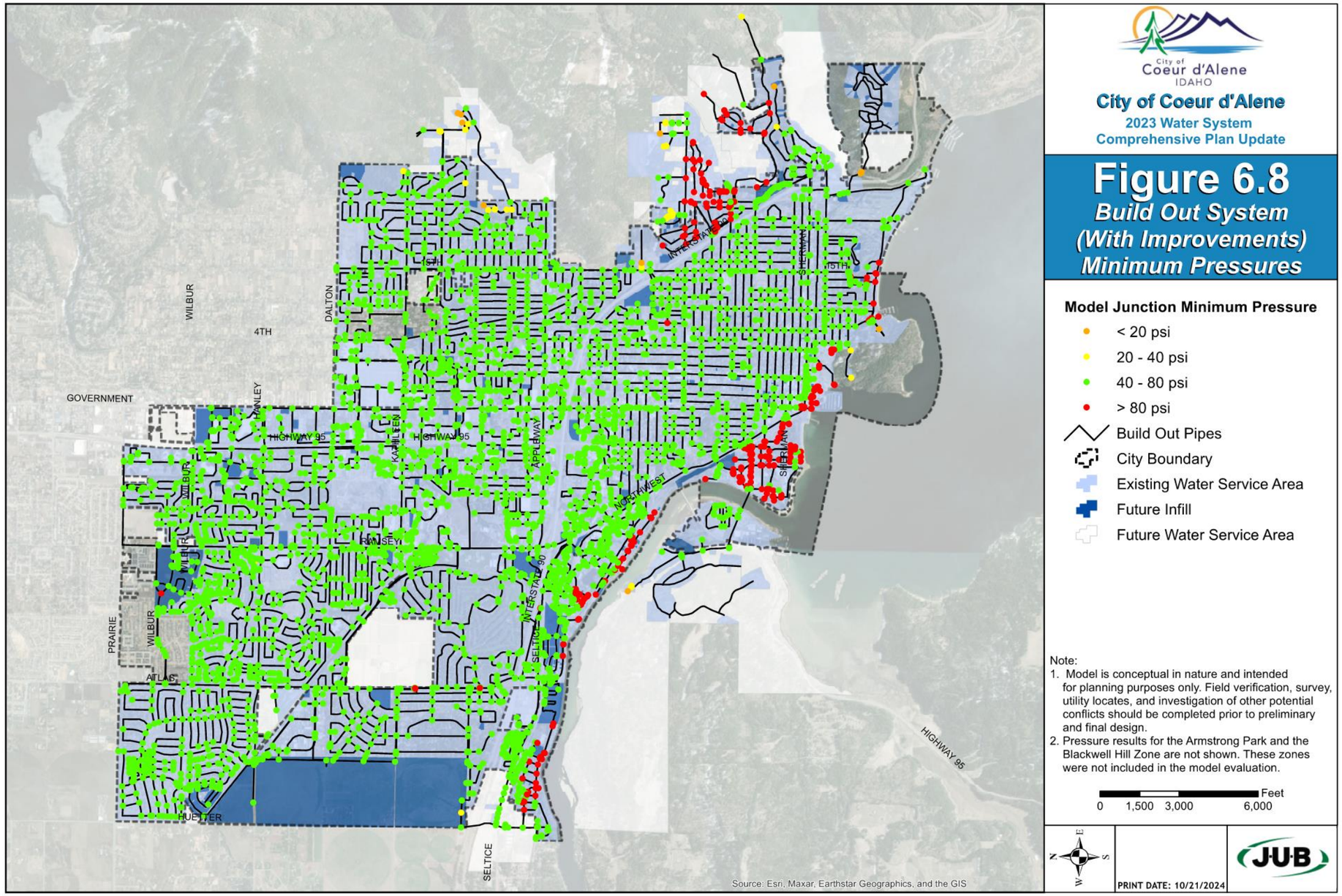
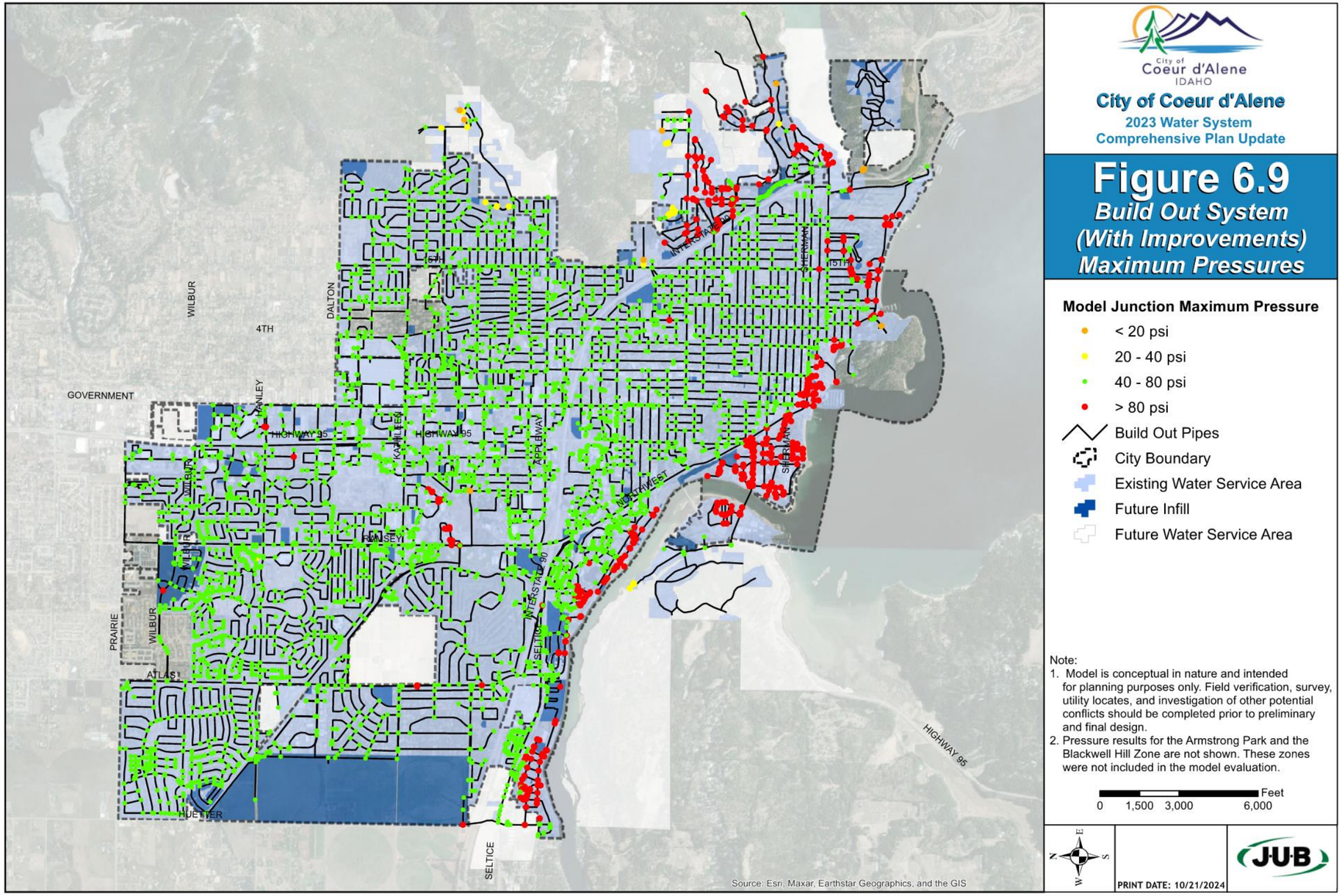


Figure 6-9 Build Out System (with Improvements) Maximum Pressures



7 CAPITAL IMPROVEMENT PLAN

Chapters 4, 5, and 6 described the recommended water system improvements for the City. These improvements and order of magnitude cost estimates are included in this chapter.

7.1 Order of Magnitude Cost Estimates

The order of magnitude estimates developed at this planning level are order-of-magnitude estimates without any detailed itemization. These estimates may have been based on:

- The advantages of recent bid prices for similar projects
- Budget pricing from specialty contractors or suppliers

These costs also include the following:

- 30 percent contingency
- 20 percent project soft costs (Engineering, etc.)
- 5 percent mobilization
- 2.5 percent bonding and administration

The accuracy of these numbers is expected to range from 50 percent above to 30 percent below the actual cost of design and construction.

7.2 Summary of Existing System Deficiencies and Improvements

Individual components of the system were identified and evaluated in previous sections of the Plan. They are generally grouped into three categories — water supply, water storage, and water distribution. Improvement recommendations and Opinions of Cost are summarized in the following sections. These costs are identified as either City-funded or developer-contribution. The City-funded portions are paid for by rates or cap fees, depending on if the project is due to replacement and rehabilitation (rates) or related to system growth (cap fees). The developer-contribution projects are projects fully funded by a property developer. Criteria for these future projects are included in Appendix G.

7.2.1 Water Supply

The water supply needs detailed in **Chapter 4** can be met by drilling additional wells. **Table 7-1** summarizes the City's water supply needs, timing/trigger flows for those improvements, and associated Opinion of Costs. This water supply is estimated to fulfill build out requirements for the Water Department.

Table 7-1- Water Supply Improvement Costs by Zone

Improvement	Trigger Maximum Day Demand for Upgrades by Zone gpm	Estimated Construction Date [a]	Recommended Pump Size gpm	Opinion of Capital Cost [b]
High Zone				
S-1: New Well	18,750	2025	4,000	$2,800,000
S-3: New Well	25,000	2035	4,000	$2,800,000
S-4: New Well	27,300	2040	4,000	$2,800,000
General Zone				
S-2 : New Well	12,400	2030	2,000	$2,500,000
S-13: New Well	13,800	2036	2,000	$2,500,000
		Total		**$13,400,000**

(a) Year is approximate based on projected growth rate City-wide.

(b) All Opinions of Cost are planning level in 2023 dollars and do not include land purchase costs. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

The dates listed are based on wells that produce 4,000 gpm & 2,000 gpm for the High and General Zone respectively and projected increases in water demand, consistent with planning values. However, growth rates and water conservation effects will fluctuate, so the maximum day demand requirements dictate when a new source is needed. The demand triggers are listed in **Table 7-1**.

In addition to the additional supply required to meet the future needs, there is one wellhouse that will require replacement during this planning period and some other supply improvements that will need to be completed. These improvements are summarized in **Table 7-2**.

Table 7-2 – Additional Supply Improvements

Project No.	Capital Project	Planned Year	Capital Cost [(a)]
S-5	Pump to Waste Rerouting	2029	$50,000
S-6	4th Street – Wellhouse Replacement	2037	$1,790,000
S-7	Atlas PRV Installation	2025	$90,000
S-8	Regular Pump Rehabilitation	Annual	$100,000
S-9	Onsite Chlorine Regeneration Maintenance	Annual	$100,000
S-10	Soft Starter Replacement	Biennial	$150,000
S-11	Water Rights (RAFN)	2024/ongoing	$20,000
S-12	SCADA Maintenance	Annual	$55,000
	Total		**$2,355,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

Several of the booster stations will also require upgrades within the planning period. These improvements are identified in **Table 7-3**.

Table 7-3- Booster Station Improvements

Project No.	Capital Project	Planned Year	Capital Cost (a)
B-1	Elm Street – Additional Pump & Upgrades	2028	$290,000
B-2	Elm Street – Booster Split	2032	$100,000
B-3	Fernan Hill – Split with Stanley	2032	$1,800,000
B-4	Fernan Booster – Additional Pump	2034	$100,000
B-5	Blackwell Hill – New Station	2026	$2,000,000
B-6	Armstrong Park – Additional Pump	2035	$1,000,000
	Total		**$5,290,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

7.2.2 Storage

The recommended storage projects will provide fire, equalization, and emergency storage to build-out of the planning boundary, with the completion of the supply recommendation at the specified demands.

The recommended storage improvements are summarized in **Table 7-4.**

Table 7-4- Storage Requirements

Project No.	Project	Planned Year	Capital Cost (a)
T-1	High Zone Storage – 1.0 MG	2025	$6,800,000
T-2	Stanley Hill Storage – 0.5 MG	2040	$1,700,000
T-3	Blackwell Hill – 0.6 MG	2033	$1,800,000
T-4	Armstrong Park – 0.5 MG	2038	$1,700,000
T-5	Fernan Hill – 0.7 MG	2032	$2,100,000
T-6	Recoating Prairie Standpipe - Exterior	2027	$600,000
T-7	Recoating Industrial Standpipe - Exterior	2031	$600,000
T-8	Recoating Tubbs Hill – 1.0 MG Tank	2038	$200,000
T-9	Recoating Prairie Standpipe - Interior	2034	$760,000
T-10	Recoating Industrial Standpipe - Interior	2036	$760,000
T-11	Recoating Stanley Tank – Interior & Exterior	2033	$130,000
T-12	High Zone Storage – 1.0 MG	2032	$6,800,000
T-13	High Zone Storage – 1.0 MG	2037	$6,800,000
	Total		**$30,750,000**

(a) All opinions of cost are planning level 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

7.2.3 Distribution/Piping

The primary piping and booster station deficiencies in the existing distribution system were presented in **Chapter 6**. The existing distribution system is generally capable of meeting system demands due to a good distribution network. The City's distribution system is reported to be in overall good condition. This can be attributed to an annual pipe replacement program. The City's replacement efforts have been focused on improving gaps in the distribution grid and replacing AC pipe less than 8 inches in diameter as well as galvanized, OD, steel, and less common sizes such as 10-inch. The City replaces an average of 1 to 2 miles of pipe per year. The City's target is 1.5 to 2 miles per year, which correlates to an average replacement cycle ranging from 150 to 200 years. Typical guidelines suggest that the useful life of domestic distribution systems ranges from 50 to 75 years, with PVC life as long as 125 years.

Table 7-5 identifies the cost of distribution lines anticipated to be necessary through build-out. These improvements are required to complete the City's distribution main grid and to provide firm pumping capacity in the booster pump stations.

Table 7-5- Build-Out Deficiencies

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [a]
D-1	High Zone - Transmission main piping for addition of NE storage	Headloss gradients are greater than 0.01 ft/ft in the area of recommended NE storage.	Install new 16-inch transmission main for new addition of storage to NE quadrant.	2024/2025	$5,400,000
D-2	High Zone between Hanley and Prairie Wells	Existing pipes act as a bottleneck as demand is routed to the south-eastern portion of the zone.	Upsize mains between the Hanley Well and Prairie Well on Highway-95 to 24-inch.	2027	$3,370,000
D-3	High Zone – New Transmission Main	Existing pipes act as a bottleneck as demand is routed to east portion of the zone.	Install new 18-inch transmission main piping in Wilbur Avenue from Atlas Road to N Roche Road, and from Moselle Drive to Pinegrove Drive.	2029	$6,220,000
D-4	High Zone – New Transmission Main	16-inch main loop is incomplete.	Install new 16-inch main from Future Spiers Well in W Industrial Loop and connect to the existing 16-inch in Atlas Road.	2025	$2,480,000
D-5	High Zone – New Transmission Main	Insufficient supply to the east side of the High Zone causing low pressures.	Install new 16-inch transmission main piping in Kathleen Avenue and the Prairie Trail from Atlas Road to the intersection of Neider Avenue and Howard Street to route flow from wells on the west side to the east side of High Zone.	2038	$9,240,000
D-6	High Zone – Atlas Well Area	Headloss gradients are greater than 0.01 ft/ft in the area south of the future Spiers Well and west of the existing Atlas Well.	Upsize piping in Arrowhead Road, Sherwood Drive, Tamarack Road, and Nez Perce Road.	2031	$3,210,000

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [a]
D-7	General Zone - 4th Street Well Area	Existing pipes act as a bottleneck as demand is routed from the north side of the General Zone.	Upsize mains in Appleway Avenue, Best Avenue, Haycraft Avenue, Gilbert Avenue, and N 4th Street.	2033	$7,520,000
D-8	General Zone - River Crossing	There is no redundancy for serving the Blackwell Hill Zone if the existing river crossing were to fail.	Install parallel 12-inch to existing Blackwell River crossing.	2040	$670,000
D-9	General Zone – Government Way Piping	Headloss gradients are greater than 0.01 ft/ft along Government Way. I-90 widening construction will require replacement of piping on bridge overpass.	Replace the 12-inch main on the I-90 Overpass Bridge and upsize existing 8-inch pipes in Government Way from the I-90 Overpass to Lacrosse Avenue to 12-inch.	2030	$1,670,000
D-10	General Zone – Emma Avenue Piping	Headloss gradients are greater than 0.01 ft/ft along Medina Street and Emma Avenue.	Upsize existing piping in Medina Street and Emma Avenue to 10 and 12-inch respectively.	2034	$1,780,000
D-11	General Zone – Lincoln Way Piping	Headloss gradients are greater than 0.01 ft/ft along Lincoln Way. The single reach of existing 6-inch going east from the intersection of Lincoln Way and Emma Avenue creates a bottle neck.	Upsize existing mains in Lincoln Way, from Ironwood Drive to Emma Avenue to 12 and 16-inch. The 6-inch pipe reach going east on Emma Avenue should also be upsized to an 8-inch to eliminate the bottleneck.	2036	$810,000
D-12	Stanley Hill Zone - transmission piping within the zone	Negative pressures near the Stanley Hill Tank/Johnson Ranch area due to additional future storage and large build-out demands in very small distribution lines. Headloss gradients are greater than 0.01 ft/ft in Stanley Hill area.	Upsize mains on Harrison Avenue to 12-inch and extend 12-inch transmission main to new Stanley Hill Tank #2 (booster pumps will be required to serve some areas of future development).	2040	$2,390,000
D-13	Future Fernan Zone - new transmission	Negative pressures near the Fernan build-out area due to large build out demands in distribution lines.	New Fernan Booster Station at the existing Elm Street site and new Fernan Hill Tank. 12-inch transmission piping between the	2032	$3,390,000

Project Number	Pressure Zone	Observed Problem	Recommended Solution	Planned Year	Capital Cost [a]
	piping from Elm Street Booster Site to Zone		booster and the new zone, as well as from the new tank will be required.		
D-14	Armstrong Park Zone transmission line to supply booster station	Headloss gradients are greater than 0.01 ft/ft in 6-inch transmission line to Armstrong Park area.	Upsize transmission line to Armstrong Park to 12-inch.	2038	$2,000,000
D-15	General Zone - I-90 Widening at Northwest Boulevard	I-90 widening construction will require replacement of piping on bridge overpass.	Replace the 12-inch mains on the I-90 Overpass Bridge.	2037	$430,000
D-16	Fernan Hill Future Development	Extensions will be required to service future areas.	Main extensions for future development.	2040	$1,380,000
D-17	Miscellaneous Areas around the system	High headloss gradient observed in various areas with undersized mains.	Annual main replacement.	Annual	$1,300,000
D-18	New/Replace Meter/ Hydrant/Service Line Work		Annual replacement projects.	Annual	$500,000
			Total		**$53,760,000**

(a) All Opinions of Cost are planning level in 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

7.2.4 Additional Improvements

In addition to the previously-recommended projects, an annual meter replacement program is recommended along with regular Comprehensive Rate Study and Comprehensive Plan Updates. Table 7 6.

Table 7-6- Additional Recommended Improvements

Project No.	Capital Project	Planned Year	Capital Cost [a]
M-1	Annual Meter Replacement Program	Ongoing	$590,000[b]
M-2	Comprehensive Rate Study	2028	$50,000
M-3	Comprehensive Plan Update	2033	$150,000
	Total		**$790,000**

(a) All opinions of cost are planning level 2023 dollars. Escalating factors are recommended for future budgeting.
(b) Cost varies per year, identified in Appendix H. Average value listed.

7.3 Alternatives Descriptions

The following alternatives have been identified for consideration for the City:

1. Alternative 1 – No-Action
2. Alternative 2 – All Identified Improvements

Each alternative is presented in more detail in the following sections, including potential advantages and disadvantages.

7.3.1 Alternative 1 – No Action

No improvements would be made to the distribution system through the planning period (2040). As a result, the system would likely experience decreased efficiency, and operation and maintenance costs will increase as components continue aging and degrading. This alternative is not recommended for the following reasons:

1. Mechanical equipment (e.g., well house pumps and booster stations) and controls will be beyond their useful life.
2. System becomes deficient in storage for all zones.
3. System becomes deficient in supply for all zones.
4. O&M cost increase due to aging water mains.
5. Decrease level of service to patrons due to aging water service lines and meters.
6. Increase in water loss with aging infrastructure (i.e. aging pipelines and meters).

7.3.2 Alternative 2 – All Identified Improvements

This alternative includes all identified improvements for the City's distribution system. Advantages and disadvantages for this alternative are presented in **Table 7-8.** Summary of improvements for Alternative 2 includes:

1. Replacement and maintenance of mechanical equipment (e.g., well house pumps and booster stations) and controls to extend their useful life.
2. Add storage to maintain compliance with City standards for each zone, including EQ storage, fire storage and excess storage.
3. Add supply facilities to maintain City standard for each zone.
4. Replace, and upsize, aging water mains as identified in the Chapter 6. Upgrades will reduce O&M costs for the City staff, reduce water loss, and assist with continuing to provide reliable water source to the users.
5. Ongoing maintenance and replacement of meters and services lines. Upgrades will reduce O&M costs, reduce water and continue to provide patrons with an outstanding level of service.

Table 7-7- Alt. 2 Advantages & Disadvantages

Advantages	Disadvantages
Distribution System	
• Mechanical equipment and controls are replaced. • Continues to provide compliance with Storage and Supply goals for City. • Reduces O&M costs • Reduces unaccounted for water or water loss • Continues to provide City patrons with outstanding level of service.	• Increased water rates to fund improvements. • Highest cost impact to rate payers.

7.4 Potential Environmental Impacts

At this time, the City does not intend to seek state or federal funding for any of the identified projects in the selected alternative. Therefore, preliminary evaluation of the potential environment impacts was not completed. If the City decides to pursue funding, environmental impacts for the individual project will be evaluated.

7.5 Alternative Selection

The City Water Department Staff indicated Alternative 2 – All Identified Improvements was their preferred alternative based on input from City staff and recommendations from J-U-B ENGINEERS, Inc. (J-U-B). Alternative 2 allows the City to focus on system-wide improvements for the distribution system.

An agency review draft of the Water System Plan was submitted to IDEQ on July 31, 2024. Review comments were received from IDEQ on October 2, 2024. The Plan was resubmitted to IDEQ on October 21, 2024 for review after addressing the initial review comments. Additional comments were provided from IDEQ on December 27, 2024.

7.6 Identification and Scheduling of Improvements

The projects detailed in the Plan have been scheduled based on priority and spread out over the planning period. Many of the projects are dependent on growth of the system and will be dependent on actual system demand. Individual development agreements may reduce capital requirements for the City but have not been considered here due to their unpredictable timing and scope. The overall summary of projected capital improvements is presented in **Table 7-8. Figure 7-1** includes a schematic of the locations of the improvements within the City. A detailed Capital Improvement Plan, sheet documents, all the projects and their anticipated funding source are included in **Appendix H.**

Table 7-8- City of Coeur d' Alene Capital Improvements

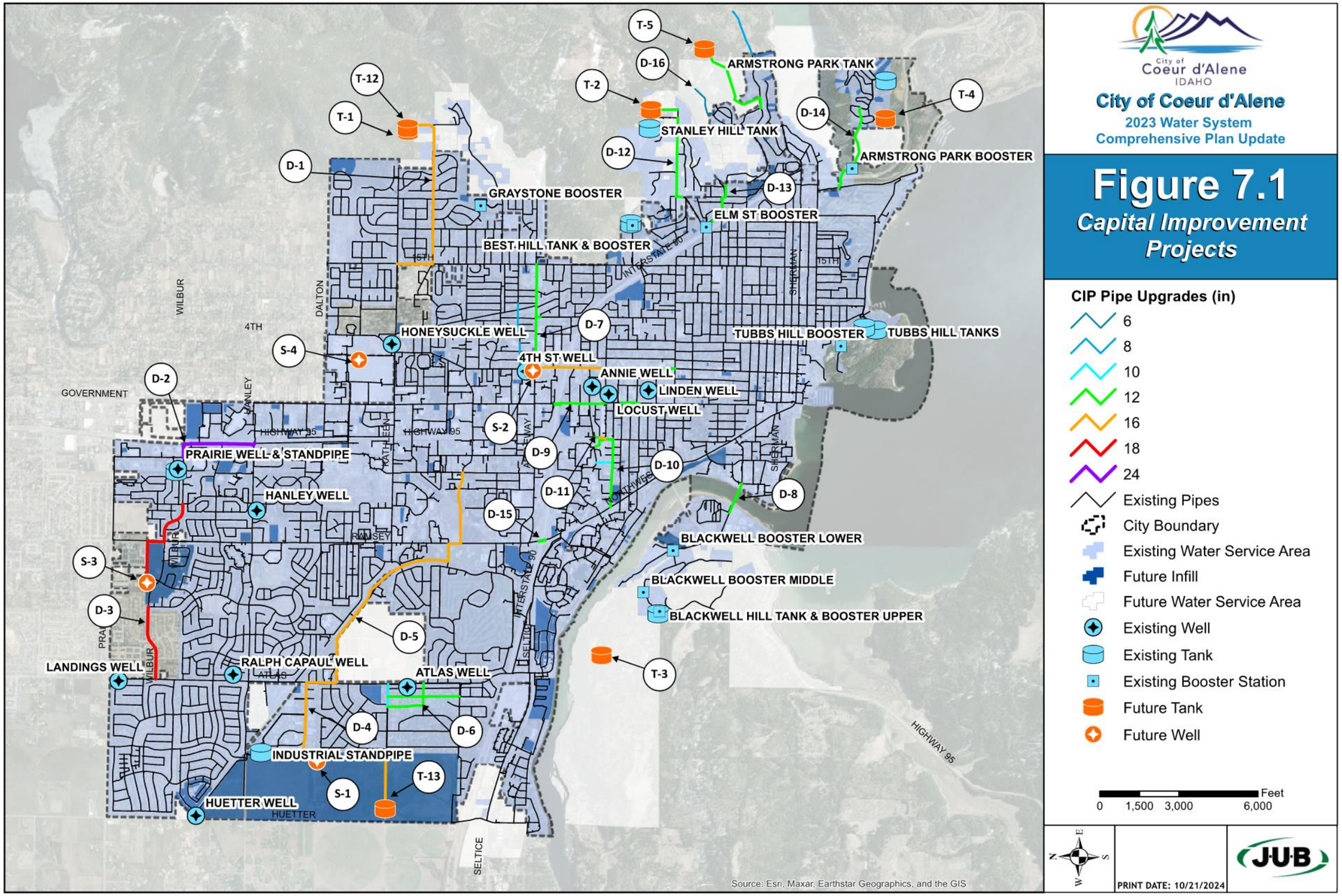
Item	City-Funded Capital Cost Opinion by Year [(a) (b)]		
	2023-2027	2028-2032	2033-2043
Supply Improvements			
New Wells	$2,800,000	$2,800,000	$8,100,000
Other Supply Improvements	$1,835,000	$1,680,000	$4,605,000
Storage Improvements			
New Tanks	$6,800,000	$8,900,000	$12,000,000
Other Storage Improvements	$600,000	$600,000	$1,850,000
Distribution Improvements			
Distribution Improvements	$11,250,000	$14,490,000	$26,220,000
Annual Water Main Replacement	$9,000,000	$9,000,000	$14,400,000
Booster Stations			
Booster Station Improvements	$2,000,000	$2,190,000	$1,100,000
Additional Capital Improvements			
Additional Improvements	$1,894,000	$3,323,000	$5,105,000
Totals	**$36,179,000**	**$42,983,000**	**$73,380,000**

(a) All Opinions of Cost are planning level in 2023 dollars. Detailed cost estimates can be located in Appendix H. Escalating factors are recommended for future budgeting.

(b) Development-driven improvements are included at no cost to the City.

An analysis of the funding requirements for the recommended improvements will be completed by FCS group and included as a separate report.

Figure 7-1- Capital Improvement Projects



APPENDICES

Appendix A – Coeur d'Alene Demographics Discussion/Evaluation

Appendix B – Water System Conservation Plan

Appendix C – Well Data

Appendix D – Technical Memorandum, 2012 Fernan Hill Evaluation, August 3, 2012

Appendix E – Technical Memorandum, 2012 Blackwell Hill Zone Analysis, Sept 26, 2012

Appendix F – Model Assumptions and Calibration

Appendix G – Minimum System Development Criteria

Appendix H – Capital Improvement Plan

Appendix I – DEQ Correspondence

Appendix J - City Council Meeting Minutes & Public Presentation

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Appendix A

Coeur d'Alene Demographics Discussion/Evaluation

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APPENDIX A

Coeur d'Alene Demographics

Prepared by:

J·U·B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

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A1. POPULATION GROWTH AND STUDY BOUNDARIES

A1.1 Population Data and Projections

The City of Coeur d'Alene has experienced variable rates of growth in its history. The most recent growth phases occurred in the late 1990s, between 2004 and 2008, and again after 2020. These periods of growth are bracketed with economic downturns; therefore, the last 30 years is considered representative of historical growth in the area. US Census data and annual average growth rates for the period of 1990 through 2020 are summarized in **Table A.1**.

Table A.1 - US Census Bureau Population Data for Coeur d'Alene and Kootenai County

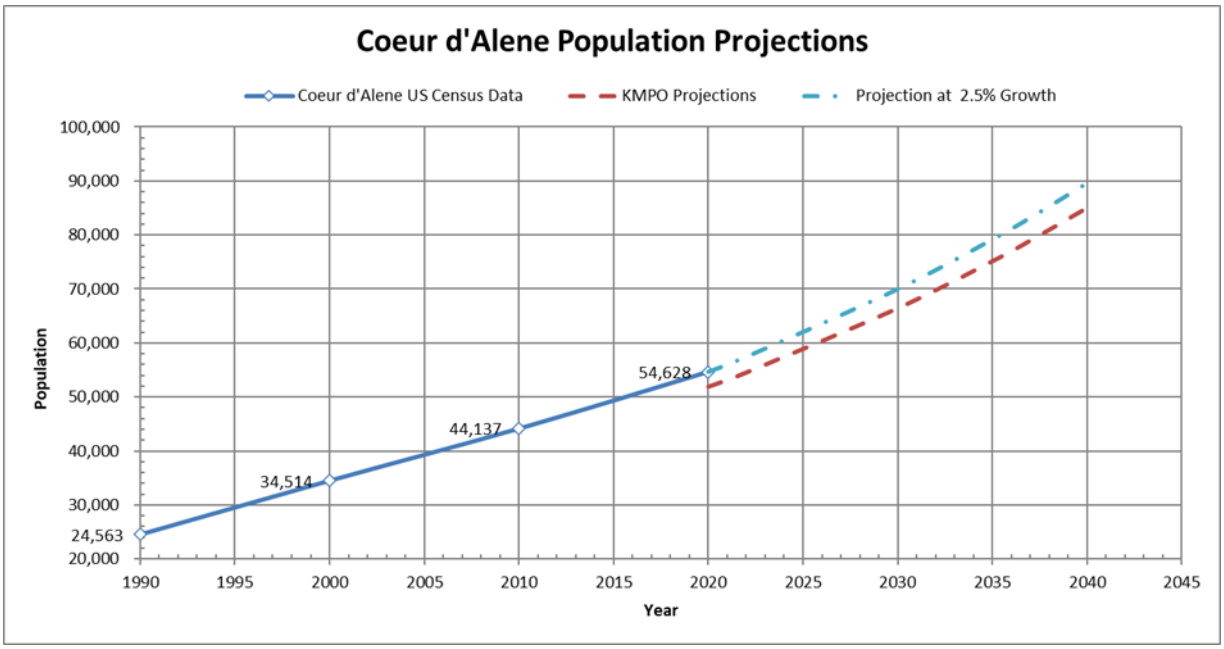
Year	Coeur d'Alene Population	Annual Growth Rate from Prior Period	Kootenai County Population	Annual Growth Rate from Prior Period
1990	24,563	-	69,795	
2000	34,514	3.46%	108,685	4.53%
2010	44,137	2.49%	138,494	2.45%
2020	54,628	2.16%	171,362	2.15%

Population projections for the City of Coeur d'Alene have been developed by the Kootenai Metropolitan Planning Organization, KMPO. KMPO utilized US Census Bureau data for Kootenai County and the individual cities within the county from 1990, 2000, and 2010 to formulate projections for 2016, 2020, 2035 and 2040. In 2018, KMPO updated their growth projections for 2020, 2035 and 2040. For the forecast period extending through 2040, KMPO assumed a consistent annual growth rate of 2.5 percent for the City of Coeur d'Alene, and a Kootenai County growth rate of 2.4 percent. Forecasts for Coeur d'Alene were made with a baseline population from the 2010 census.

Observed US Census Bureau annual average growth rates are shown in **Table A.1.** KMPO's most recent update in 2018 did not include the 2020 Census Data.

Additionally, population growth was coordinated with the City's current Comprehensive Plan, adopted in February of 2022. The City's 2022-2042 Comprehensive Plan references KMPO's estimated 2040 population for the City to be approximately 85,000 people. The population projections from the City and KMPO, as well as an assumed growth of 2.5 percent, are shown on **Figure A.1**. Projections were not extended beyond 2040 due to the limitations on the KMPO study and to approximately match the near-term objectives of the study.

Figure A.1 - City of Coeur d'Alene Population Projections (2020 to 2040)

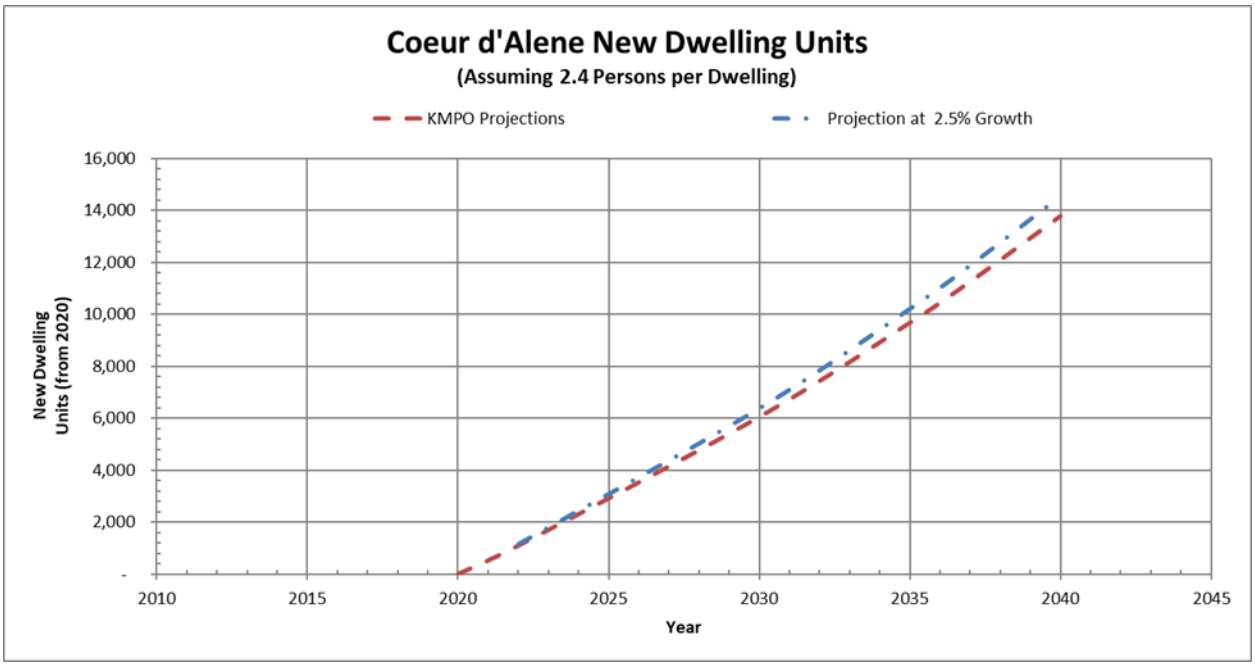


Based on discussions with the City's Water Department, a growth rate of 2.5 percent will be utilized for this study. This matches well with the City's 2022-2042 Comprehensive Plan and KMPO's planning documents. Actual growth rates should therefore be reviewed periodically and compared to the recommendations in this study.

The Census Bureau statistics indicate persons per household for the period of 2016 through 2020 was 2.27. The KMPO data shows a current value of 2.40 persons per household based on total occupied housing, which was used in KMPO's subsequent projections for the forecast period. For consistency with the stated KMPO assumption, it is assumed for this study that the number of persons per household will be 2.40 throughout the forecasting period. The corresponding number of new residential dwelling units (2020 baseline) based on the preceding population projections is shown on **Figure A.2**. In summary:

- The KMPO population estimates result in approximately 13,800 additional new residential households by 2040.
- At an assumed annual growth rate of 2.5 percent, approximately 14,000 additional new residential households will be developed by 2040.
- Although the water service area extends outside the City limits, there are areas within the City limits that are not served by the water system. These areas are approximately equal in size, so for the purposes of this study, the current City population will be assumed to be equal to the water system service population.

Figure A.2 - City of Coeur d'Alene New Dwelling Units (2020 to 2040)



A1.2 Infill within Existing City Limits

Approximately 908 acres of undeveloped land exist within the City limits and is identified by pressure zone in **Table A.2**. It is assumed that these areas will be developed consistently with the current zoning and the City's Comprehensive Plan (2022-2042). As growth occurs, these areas will likely be developed prior to growth outside the current City limits.

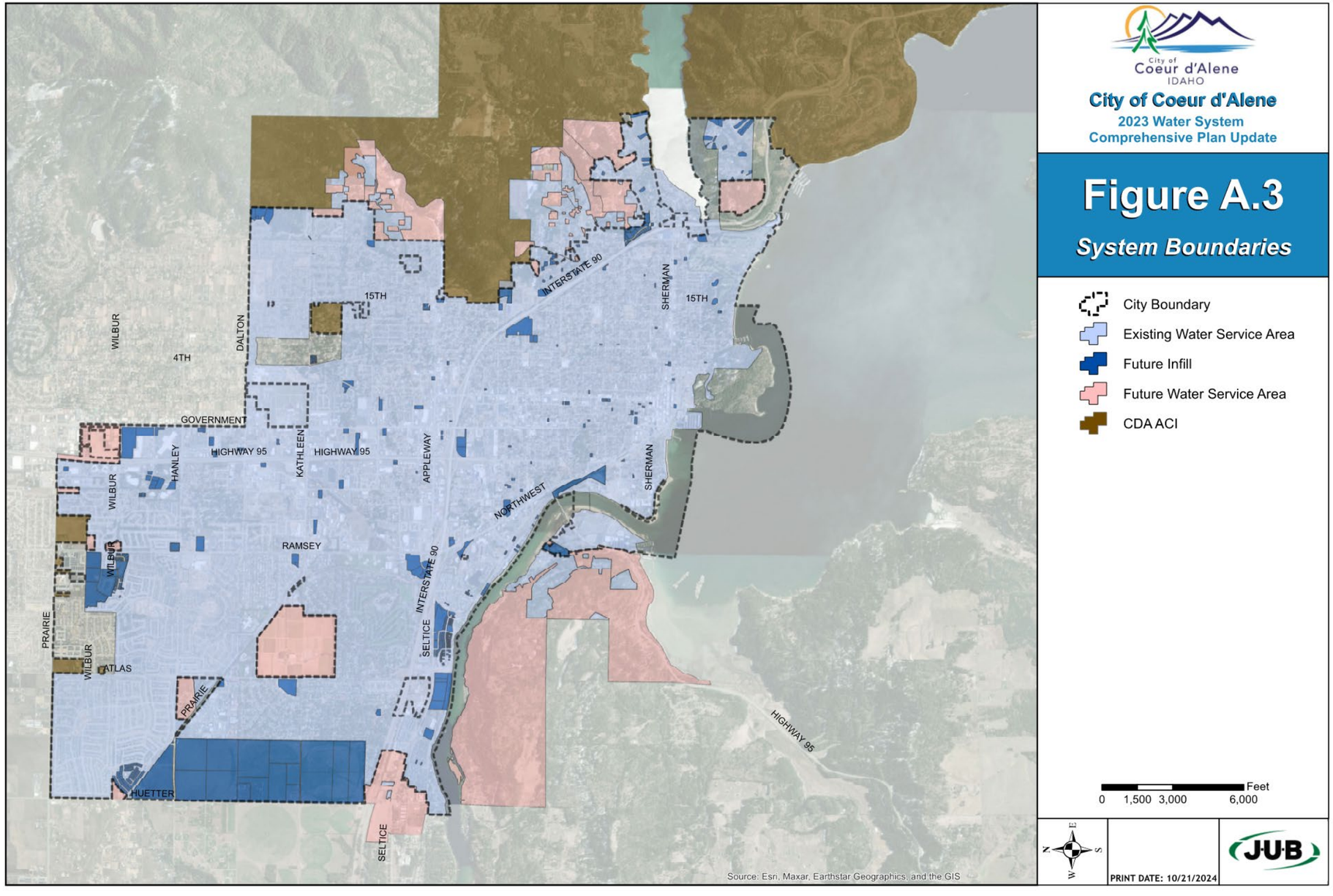
Table A.2 - Infill Acreage by Pressure Zone

Pressure Zone	Infill Area (Acres)
General	176.5
High	708.7
Stanley Hill	9.2
Blackwell Hill	-
Tubbs Hill	-
Armstrong	13.6
Total	**908**

A1.3 Future Service Boundary Extents

During the 2012 Comprehensive Plan Update, the City of Coeur d'Alene Water Department Staff coordinated with the City's Planning Department to define areas of anticipated growth outside the City limits, including identifying the City's future water service boundary and the City's Area of City Impact (ACI). For the current Comprehensive Plan Update, City Water Department Staff provided updates on modifications to the water system boundary since 2013. The City's ACI was updated to reflect the City's current Comprehensive Plan (2022 -2042). The preliminary growth boundaries for the water, wastewater systems, and City ACI were integrated into a single planning figure—reference **Figure A.3.** The total area of growth for water represented by these boundaries is approximately 2,040 acres. Although build-out growth is not expected to the southern and eastern edges of the ACI, expansion to the western and northern edges of the ACI is expected.

Figure A.3 – Study Boundaries



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THE LANGDON GROUP

GATEWAY MAPPING INC.

J-U-B FAMILY OF COMPANIES

Appendix B

Water System Conservation Plan

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APPENDIX B

Water Conservation Plan

Prepared by:

J·U·B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

(208) 762-8787 | www.jub.com

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B1. WATER SYSTEM CONSERVATION PLAN

B1.1 Introduction

The City of Coeur d'Alene operates a water system that has 321 miles of pipe, utilizes 11 groundwater wells, 8 water storage tanks, and provides water to 6 pressure zones. The water is supplied from the Spokane Valley / Rathdrum Prairie (SVRP) Aquifer. This aquifer supplies drinking water to over half a million people in northern Idaho and eastern Washington and maintaining this supply for future use has become a significant focus for water purveyors in these areas.

Working to standardize efforts of the water purveyors that are fed from the aquifer, a Ground Water Management Plan was developed by the Rathdrum Prairie Ground Water Advisory Committee, and the final order was adopted in 2005 by the Idaho Department of Water Resources (IDWR). The Management Plan, which is included at the end of this document, defines six goals for use in management of the aquifer resources. The fifth goal of the Management Plan is to "Encourage water conservation efforts by all users of the resource." Part of this goal requires that a water conservation plan be in place for all municipal purveyors that request new water rights, or changes to their existing water rights.

After the Management Plan was adopted, the Idaho Department of Water Resources developed a document for "Water Conservation Measures and Guidelines for Preparing Water Conservation Plans." The draft plan guidance was issued from IDWR in February 2006. These guidelines include the recommended components to be included in a water conservation plan. The recommended components, and those included in this plan, are as follows:

- Development of a water system profile
- Preparation of a demand forecast
- Description of planned facilities
- Development of conservation goals and methods for stakeholder involvement
- Identification of water conservation measures
- Analysis of conservation measures
- Integration of resources and forecast modification
- Implementation and evaluation strategies

This water conservation plan has been developed to meet the requirements of the Management Plan and the IDWR Guidelines for the purpose of applying for future water rights or modifying existing water rights for the City of Coeur d'Alene, as necessary. The recommended components are discussed and addressed hereafter.

B1.2 Water System Profile

B1.2.1 Source Water

The Spokane Valley / Rathdrum Prairie aquifer is supplied by several large surface water sources, including Coeur d'Alene Lake, the Spokane River, Lake Pend Oreille, and Hayden Lake. Other small lake watersheds such as Hauser, Spirit, and Twin supply the balance of the surface water input to the aquifer. In an average year, precipitation also supplies the aquifer with one quarter of its recharge water. Of course, surface water flows and precipitation are subject to natural variations and will affect aquifer recharge rates. Detailed quantity, flow, and level analyses have been performed on both the Idaho and Washington side of the aquifer as part of the 2007 U.S. Geologic Surveys' "Bi-State" Study and are available on the IDEQ website.

The Spokane Valley/Rathdrum Prairie Aquifer is comprised of a thin layer of soil overlaying 200 to 400 feet of coarse sands and gravels. The alluvial material was deposited by Ice Age floods from Glacial Lake Missoula approximately 12,000 years ago. The 2007 "Bi-State" aquifer study completed by the U.S. Geologic Survey shows that annual estimated aquifer withdrawals are approximately 22 percent of estimated annual recharge for the aquifer. While adequate aquifer supply appears to exist, pressure has been building from conservation groups to reduce per capita consumption in order to maintain Spokane River flows and water quality.

The Spokane Valley/Rathdrum Prairie Aquifer is the largest source of drinking water within the City's hydrologic area. Treating water from the nearby Spokane River or other surface sources would remove water that recharges the aquifer. It is significantly more costly than continued use of groundwater and could also introduce minimum river flow constraints directly into water supply planning. As a result, it is assumed that the City will continue to use groundwater as its sole water supply.

B1.2.2 Existing Water Rights

The City currently has a total of 81.0 cfs in claimed groundwater rights and 16.78 cfs in claimed surface water rights. A summary of the rights and their priority dates is included in Table B.1.1.

Table B.1.1 - Summary of Water Rights

Right Number	Priority	Amount (cfs)	Source	Nature of Use	Period of Use
95-2111	04/20/1955	3.00	Ground Water	Municipal	1/1 to 12/31
95-2133	07/21/1960	2.27	Ground Water	Municipal	1/1 to 12/31
95-2164	10/03/1964	3.61	Ground Water	Municipal	3/15 to 11/15
95-2198	12/13/1966	5.12	Ground Water	Municipal	1/1 to 12/31
95-4322	*10/31/1921*	*13.04*	*Surface Water*	*Municipal*	*1/1 to 12/31*
95-7142	05/03/1971	2.45	Ground Water	Municipal	1/1 to 12/31
95-7181	03/14/1972	5.73	Ground Water	Municipal	1/1 to 12/31
95-8565	12/07/1987	7.55	Ground Water	Municipal	1/1 to 12/31
95-8647	03/19/1990	7.30	Ground Water	Municipal	1/1 to 12/31
95-8672	08/27/1990	3.00	Ground Water	Municipal	1/1 to 12/31
95-8938	02/08/1996	4.57	Ground Water	Municipal	1/1 to 12/31
95-9007	01/25/1999	7.80	Ground Water	Municipal	1/1 to 12/31
95-16580	5/14/2013	9.00	Ground Water	Municipal	1/1 to 12/31
95-17815	5/5/2019	9.00	Ground Water	Municipal	1/1 to 12/31
Municipal Sub Total		**70.4**	**Ground Water Only**		
95-2131		8.0		Irrigation	
95-8262	*2/14/1983*	*3.31*	*Surface Water*	*Fire Protection/Industrial*	*1/1 to 12/31*
95-8716	*9/11/1991*	*.03*	*Surface Water*	*Irrigation*	*04 /01 to 11/01*
95-7216	*10/19/1972*	*0.4*	*Surface Water*	*Irrigation*	*3/15 to 11/15*
95-7096	3/10/1970	2.60	Ground Water	Irrigation	4/15 to 10/15
Other Sub Total		**10.6**	**Ground Water Only**		
TOTAL		**81.0**	**Ground Water Only**		

B1.2.3 Coeur d'Alene Water Service Boundary

The Coeur d'Alene Water Department serves an area that differs only slightly from the City limits. The existing water service boundary encompasses approximately 10,300 acres and is shown on **Figure B.1.1**. Most of the service area is relatively flat and is served by two main pressure zones and several smaller boosted zones. The perimeter of the service area along the east and south sides is more mountainous and is served by several relatively small pressure zones.

B1.2.4 Coeur d'Alene Population and Connections Served

Coeur d'Alene has been growing rapidly over the last decade. U.S. Census data indicates the City population in 2010 was 44,137 and grew to 54,628 in 2020, an increase of approximately 2.16 percent year-over-year.

The City Water Department service area differs slightly from the City boundary. The Water Department currently has 20,148 total metered connections, of which, 18,449 (2022 max month,

June) are identified as residential connections. Using the 2020 Census information of 2.40 persons per household, the population of the service area is approximately 55,836 people.

B1.2.5 Existing Facilities and Water Use Categories

The City is currently supplied by eleven groundwater wells. These wells and their relative capacities are shown in Table B.1.2.

Table B.1.2 – Wells and Capacities

Well	Capacity (gpm)
1. Atlas	4,150
2. 4th Street	3,600
3. Hanley	3,600
4. Honeysuckle	2,000
5. Linden	3,200
6. Locust	2,800
7. Landings	3,450
8. Prairie	3,500
9. Annie	2,180
10. Huetter	4,300
11. Ralph Capaul	4,200
Total	**36,980**

The water use for the system has been divided into 13 key categories for planning purposes. The water use for each of these categories was evaluated and given a peak day usage designation in gallons per minute per acre (GPM/Ac). The key categories and land use designations are included in Table B.1.3.

Table B.1.3 - Categories and Land Use Designations

Customer Type	Max Month (gpd)	Total AC Served	Demand/AC (gpm)
Assisted Living Facility	262,933	51	3.60
Church	239,867	93	1.79
Commercial	2,733,133	1,437	1.32
Hospital	108,300	16	4.80
Hotel	514,234	42	8.54
Industrial	41,533	37	0.79
Office	213,900	61	2.43
Open Space	978,967	289	2.35
Public	1,079,733	740	1.01
Residential – High Density	2,083,400	362	3.99
Residential – Low Density	15,636,670	3,828	2.84
Residential – Medium Density	2,105,366	522	2.80
Restaurant	471,366	79	4.16
School	1,149,266	266	3.01
Total	**27,618,668**	**7,821**	

Historic monthly water use for the system from 2018 to 2022 is shown on **Figure B.1.2**. The trend line shown in the figure indicates there has been consistent water use over this period. The City water production is measured on an ongoing basis at the wells with flow meters. Individual services are all metered to accurately account for water sold. The service line meters are read monthly with a radio read metering system. For 2022, the total water produced was 4,656,703,350 and the total water sold was 4,097,693,000. The lost water was 12.0 percent for 2022. This unaccounted water total includes volumes for regular maintenance items such as hydrant flushing, street cleaning and other City maintenance issues. It is estimated that these maintenance uses account for about half of the unaccounted-for water.

To examine the difference between indoor and outdoor use, losses were also examined for summer months versus winter months. In 2022, the lost water over the year varied between 4 percent in July and 10 percent in January and February.

B1.2.6 Water System Growth and Planning Period

Growth of the water system is restricted on several sides due to adjacent water systems. Adjacent water purveyors exist on the north and west sides of the City along with one small private system within the City. Ross Point Water serves a large portion of the area north of Seltice and west of

Huetter, and the Hayden Lake Irrigation District (HLID) borders the City system to the north along Prairie Avenue. The south side of the system is bound by Coeur d'Alene Lake.

The majority of the expected growth in the City of Coeur d'Alene is generally progressing toward the east and south with infill in the northwest, as shown on **Figure B.1.1**. Specific areas of growth in the water system include:

- The northwestern portion of town as development fills in toward Prairie Avenue and Huetter
- The portion of town south of Seltice and north of the Spokane River, currently under development
- The area south of the Spokane River
- The area east of the existing City boundary in the foothills

There are also several relatively small areas within the future City water boundary serviced by smaller, independent water systems. These specific areas are Hoffman Water, the Kootenai County Fairgrounds, and the USFS Nursery. These water systems may become part of the City system in the future, increasing demands to the City water system. Build-out water demand projections include the incorporation of the USFS nursery and fairgrounds into the City for planning purposes. Hoffman Water is assumed to remain independent.

The equivalent served acreage for the City was estimated by comparing build-out water demands with current water usage for land use areas within the system boundary. Based on this equivalent area, it is assumed that there will be a significant increase in water demands within the current system boundary. The total serviceable area for the build-out scenarios of the water system is approximately 12,800 acres.

B1.2.7 Large Water Users

There were five water users identified as year-round large users when reviewing meter data from July 2022 through December 2022. These consistent large users were the Coeur d'Alene Resort, Metro Car Wash, Kootenai Health, Oak Crest Mobile Home Park, and Lake Villa Apartment. In December 2022, the total water use for these five facilities was 9,435,000 gallons, which was 7.28% percent of the total 129,637,000 gallons sold that month.

For the 2022 summer months, there were thirteen users that registered water uses greater than 3,000,000 gallons for the September reading. These users are listed in **Table B.1.4.**

Table B.1.4 – Highest Water Users

User	Water Use Gallons	Percent of Monthly Total (%)
1. Courcelles Parkway Irrigation	8,304,000	0.91
2. Oak Crest Mobile Home Park	5,301,000	0.58
3. Coeur d'Alene High School	4,737,000	0.52
4. Riverstone Irrigation	4,553,000	0.50
5. Forest Cemetery Irrigation	4,291,000	0.47
6. Coeur d'Alene Resort	3,855,000	0.42
7. Metro Car Wash	3,830,000	0.42
8. Home Depot	3,734,000	0.41
9. Lake City High School Irrigation	3,712,000	0.41
10. Bluegrass Park Irrigation	3,596,000	0.40
11. Woodland Middle School Irrigation	3,480,000	0.38
12. Canfield Park Irrigation	3,241,000	0.36
13. Lake Villa Apartment	3,169,000	0.35
Total	**55,803,000**	**6.14**

B1.3 System Demand Forecast

The anticipated increase in system demand for the water service area is accounted for by applying the growth rate of 2.5 percent for Coeur d'Alene to current peak day flow. Build-out demand for the system was estimated in conjunction with the City Planning Department using current zoning and water demand factors developed for major usage categories and applying these demands to the full build-out acreage. The growth rates were used to estimate approximate timing for service area build-out by projecting flows forward from today's MDD at a 2.5 percent increase. Future projects described in this Plan include dates for planning purposes; however, observed system demand is the more accurate and critical component to scheduling upgrades. The City's 2022-2042 Comprehensive Plan references KMPO's estimated 2040 population for the City to be approximately 85,000 people.

B1.3.1 Current and Future Water Consumption Demands

Water demands within the City are similar to nearby municipalities, with peak summer demands nearing three times the average daily demand (ADD). The terms below are typically used to define water consumption demands:

Average Day Demand (ADD): The average number of gallons of water consumed per day as calculated over the course of a year.

Maximum Day Demand (MDD): The maximum number of gallons of water used in one day as determined from well production records.

Peak Hour Demand (PHD): The maximum amount of water used in a one-hour period. This number is extrapolated from well production and tank level records.

Daily and hourly pumping records are kept at each well site. The maximum historical recorded maximum day demand on July 1, 2021, was 42.8 MG. The observed production has generally remained consistent, or slightly increased, from 2018 to 2022. Due to this consistent water use, an average of the observed peaks over the last five years has been used to develop a daily use for projections. The average maximum day from 2018 to 2022 is 39.02 MG, with an average MDD per capita water use of 714 gallons per capita per day. This value will be used in combination with the projected growth rate to develop future projected demands. **Table B.1.5** illustrates current and future water use within the City's water service area utilizing an annual growth rate of 2.5 percent.

Table B.1.5 – City of Coeur d' Alene Current and Future Water Demand

	2023 (mgd)	2028 (mgd)	2033 (mgd)	Build-Out 2040 (mgd)
Average Daily Demand	14.11	16.0	18.1	20.5
Maximum Daily Demand	42.8	48.5	54.9	62.2
Peak Hour Demand	77.0	87.2	98.8	112.0

The fluctuation in demands over a 24-hour period was developed during the 2012 Water System Comprehensive Plan Update using hourly SCADA information from the maximum day demand in 2011, taking into account pump run times, starts, and stops. The peak hour demand represents the highest rate of water use occurring in a one-hour period during the maximum day. Observed reservoir level fluctuations and pumping records indicate the PHD is approximately 1.8 times the MDD. This peak hour occurs at approximately 5:00 a.m., with a second lesser peak (1.2) at approximately 8:00 p.m. Demands above the base line show periods when equalization storage would be required if firm production capacity matched the peak day demand.

Domestic water use varies yearly primarily due to irrigation use. **Figure B.3** shows the maximum day pumping averages from 2018 through 2022. Comparing the average annual water demand of 14.1 mgd (9,800 gpm) to the maximum day demand of 42.8 mgd (29,700 gpm) yields a peaking factor of 3.0. This peaking factor is assumed to remain consistent through the planning period.

In addition to the domestic water use and irrigation, typical system demands include fire flow.

B1.4 Planned Facilities

In order to meet the projected build out demands new water supply sources will be required for the City in addition to other improvements outlined in The Comprehensive Plan Update. Four new, 4,000 gpm wells are required to be added to the system. **Table B.1.6** includes the projected supply improvements and the estimated date that the improvements will be required.

Table B.1.6 – Supply Improvements

Improvement	Estimated Date of Construction	Recommended Pump Size gpm	Opinion of Capital Cost
High Zone			
New Well	2025	4,000	$2,800,000
New Well	2035	4,000	$2,800,000
New Well	2040	4,000	$2,800,000
General Zone			
New well	2030	4,000	$2,800,000

B1.5 Conservation Goals

A. The City has implemented a number of conservation measures that have had an impact on water production. The following goals for the City are in accordance with Idaho Washington Aquifer Collaborative (IWAC)

The goals the City has selected are as follows:

1. Maintain a low unaccounted for water measurement. Industry standard for lost water is approximately 10 percent, and the City's monthly average for water loss is at or below industry standard. Maintaining or reducing this low value over the next few years is a goal for the City. The City plans to continue replacing aging or poor quality piping within the system to help maintain the unaccounted for water percentage below industry standards. The impact of this Plan can be measured from one year to the next. Keeping this value low and keeping the system in excellent condition will allow the City to minimize the lost water value from future demands.
2. Continue their public education program and promote IWAC efficient irrigation standards.
3. Continue to participate in xeriscaping promotions, including working towards creating a job position for a Conservation Specialist/Coordinator. The City will continue working towards a metering system with an App for customers to monitor their own usage in real time.

B1.6 Water Conservation Measures

This section includes a discussion of the conservation measures the City has implemented and is currently using.

B1.6.1 Water Rate Structure

The City of Coeur d'Alene implemented a block rate structure in 2008. This structure included a base rate and three blocks for usage for residential, non-residential and irrigation only users, with the upper block designed to discourage high water use. A summary of the residential rate structure for 2018 to 2023 is summarized in **Table B.1.7**. Rates begin April 1st of each year and are updated yearly. Rates for Non-Residential (Commercial) and Irrigation Only Users can be located on the City's Website.

Table B.1.7 - Residential Rate Structure

Year	Block 1 (0-30,000 gal)	Block 2 (31,000 – 50,000 gal)	Block 3 (Over 50,000 gal)	Base Rate (3/4" Meter)[1]
2018	0.94	1.35	1.35	8.45
2019	0.95	1.37	1.86	8.78
2020	0.98	1.42	1.93	9.09
2021	1.01	1.47	2.00	9.41
2022	1.05	1.52	2.07	9.74
2023	1.09	1.57	2.14	10.08

(1) *Base Rates for additional meter sizes (i.e. 1", 1.5", 2" and etc.) can be located on the City's Website.*

B1.6.2 Promoting Xeriscaping

The Water Department funded the installation of a Xeriscape demonstration garden adjacent to their Water Shop. The Department funded this project to demonstrate the look of native and low-water landscaping.

B1.6.3 Data Collection

Water production and sales are closely monitored by the City. Pumping data is collected daily, and water meters are read monthly. These data are used to monitor non-revenue water on a regular basis.

B1.6.4 Non-Revenue Water Control

The City has been reading meters on a monthly basis since 2005. The billing software identifies areas of unexpectedly high consumption, flagging a visit by City staff to determine if there is a leak on the customer's side of the meter. Since the meters are read monthly, this allows the City to rapidly identify any leaks and encourage repairs.

The City has replaced the larger meters within the system with compound meters that more accurately read both high and low flows to improve the reliability of the non-revenue water data. Smaller meters within the system were replaced during the conversion to radio read meter capabilities, increasing the overall accuracy of the system.

The City is in the process of installing several real-time monitoring meters throughout the system. This will allow City staff to monitor flow, pressure and temperature in real-time at several locations throughout the system using a web based program.

The City has an aggressive water main replacement program. The mains within the system are ranked based on age, size, and pipe material, with the oldest mains receiving a high replacement priority. Replacement of these mains helps minimize the length of leaky pipes within the system.

Any known leaks are immediately repaired.

The City is in the process of adding mag meters to all well sites to improve accuracy of overall production records. This will include real time reporting using the City's SCADA system. All mag meters are anticipated to be fully functional by 2024.

B1.6.5 Partnerships

The City actively participates in several local organizations including Idaho Washington Aquifer Collaborative (IWAC), Spokane Aquifer Joint Board (SAJB), and Spokane River Forum (SRF). These local organizations strive to encourage water conservation and protect the Spokane Valley / Rathdrum Prairie Aquifer.

The City coordinates with the local Parks Department to encourage water conservation and xeriscaping. They coordinate with local school districts including City of Coeur d'Alene School District, University of Idaho – Water Education Program and Idaho Water Education Foundation (IWEF).

B1.6.6 Public Outreach and Publicity

The City is obligated as part of "CDA 2030" to be the lead agency on conservation, meaning promoting water conservation within the local community. The City actively participates with the production and distribution of educational videos and materials through IWAC, SAJB and IWEF on various social media and public television channels.

Throughout the year, the City does tours of well sites for the local Coeur d'Alene School District science classes. They also attend local career fairs, providing education to local students on the aquifer and wells. The City has purchased the most recent aquifer maps to distribute to students and other members of the community.

City staff is continuing to work with the City Planning and Zoning department to discuss modifying the 10% required green space to include xeriscaping requirements or reduction in required percentage. City staff is working towards hosting a class on home irrigation care and sprinkler adjustments for their users.

B1.7 Effects of Conservation Measures

Prior to the 2012 Comprehensive Plan update, the following conservation measures were implemented:

- Block water rate structure for residential customers, which was implemented in 2008
- Monthly reading of water meters, which was implemented in 2005
- Funding of smart controllers which happened in 2008

The distinct impacts of these conservation measures were easily tracked when looking at water use over a period of years, as shown in the previous 2012 Comprehensive Plan Update. Following the 2012 Update, the City implemented the following conservation measures, in addition to the ones previously in place:

- Public outreach
- Partnerships with IWAC, SAJB, SRF, and IWEF
- Block water rate updates for all customers, including residential, non-residential and irrigation users.

To analyze potential impacts, the produced and sold water were both plotted on a per connection basis along with the average daily temperature for the month. This chart is included as **Figure B.1.1**.

City wide, the per capita water use in the peak months of July and August ranges from 488 to 622 over the previous five years (2018 to 2022). The trendline shown in **Figure B.1.1**, demonstrates a small amount of fluctuation in the per capita use over time.

B1.8 Expected Savings

While it is difficult to identify the impact on specific conservation measures, the United States Environmental Protection Agency (USEPA) has provided benchmark data for what can be expected. Specific conservation measures and the expected savings for these measures are included in Appendix B of the USEPA Water Conservation Guidelines. A summary of the expected savings for some specific measures according to EPA is included in **Table B.1.8**.

Table B.1.8 - USEPA Water Conservation Measure Benchmark Savings (1)

Conservation Measure	Expected Reduction in Use (%)	Water Use Category Impacted
Universal Metering	20	All
10% Increase in residential rates	2-4	Residential
10% Increase in non-residential rates	5-8	Non-Residential
Increasing -block rate	5	All
Public Education	2-5	All
Outdoor Residential Use Audits	5-10	Residential
Large Landscape Water Audits	10-20	Non-Residential
Landscape Requirements for New Developments	10-20	All
Lawn Watering Guidelines	15-20	All
Low Water Use Plants	7.5	All

(1) USEPA Water Conservation Plan Guidelines Appendix B

The implementation of any or all of these measures would be expected to reduce or maintain peak water demand and not expected to drastically impact revenue from water sales.

B1.9 Future Conservation Measures

Conservation Goals: The City has three main conservation goals moving forward:

(1) To maintain non-revenue water at a level below 10 percent
(2) To reduce or maintain the peak day and peak month consumption to optimize the use of their existing supply capacity
(3) Continue to participate in educational programs, data collection, non-revenue water control, and maintaining their partnership that promotes conservation. Reach a greater audience through social media and potentially hiring new staff to spearhead water conservation promotion.

In order to meet these goals, the City should continue with the water conservation measures they have been implementing, with continued focus on the following activities:

- Monitor meter reads to identify potential leaks at metered connections. Install real time meters that allow users to monitor their real time water usage via an App to encourage a better understanding of overall water use and catch leaks on irrigation systems quicker.
- Compare monthly pumped data with billed data to identify potential distribution system leaks.
- Regularly scheduled water main replacement
- Immediate leak repairs

- Continue use of smart controllers, especially for large irrigated spaces
- Partnerships with area groups such as IWAC, SAJB, SRF and IWEF
- Public education
- Block Rate Structure
- Coordination with Planning and Zoning

Some other measures the City may want to consider in the future are as follows:

- The use of reclaimed water for City irrigation
- Mandatory installation of moisture sensors for services that provide irrigation

Figure B.1.1 – Water System Planning Boundary

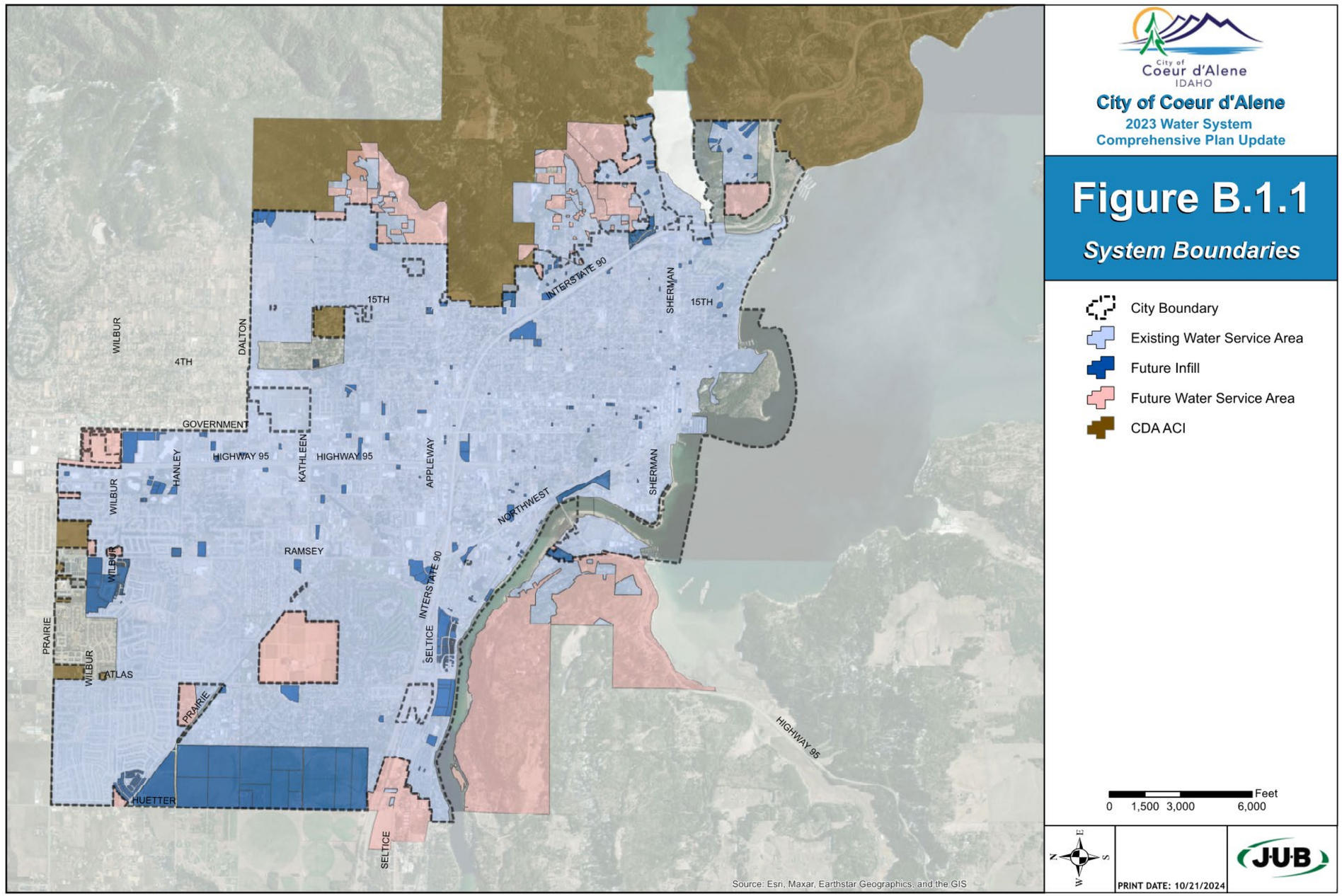


Figure B.1.2 - Per Capita Water Use vs Temperature

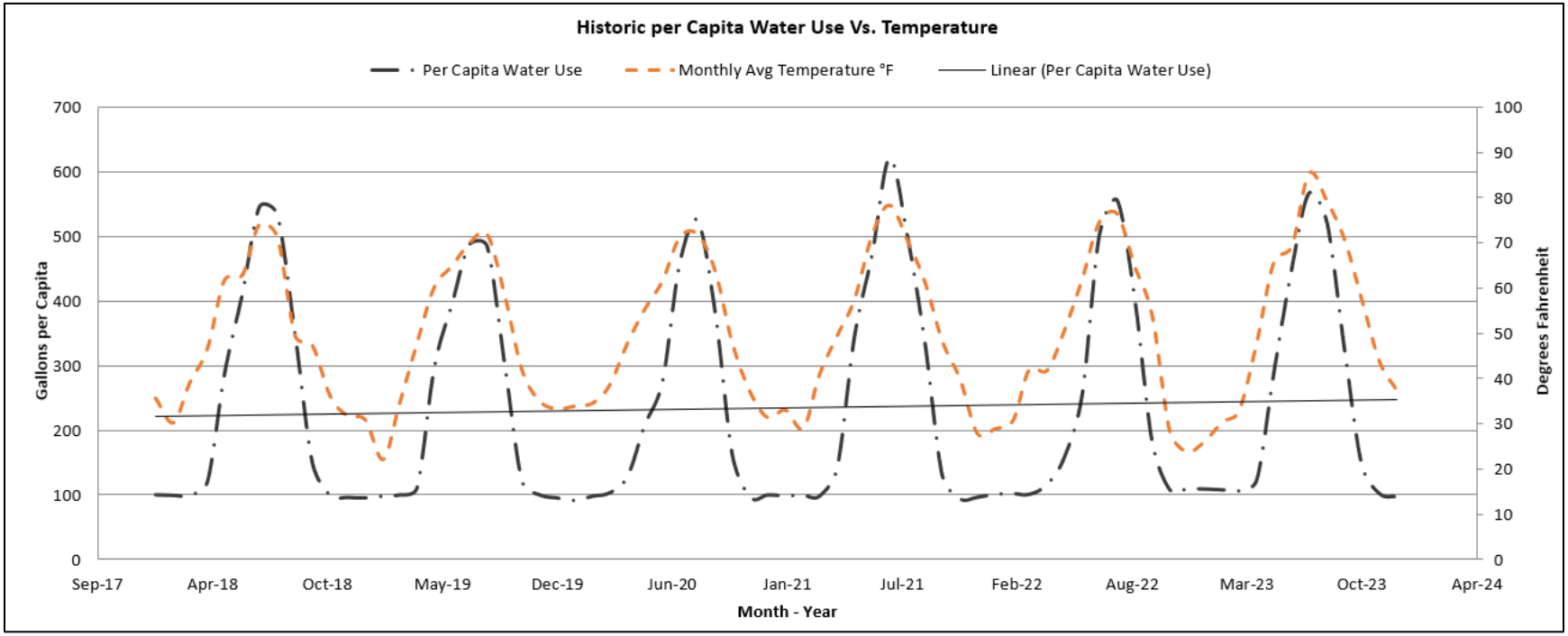
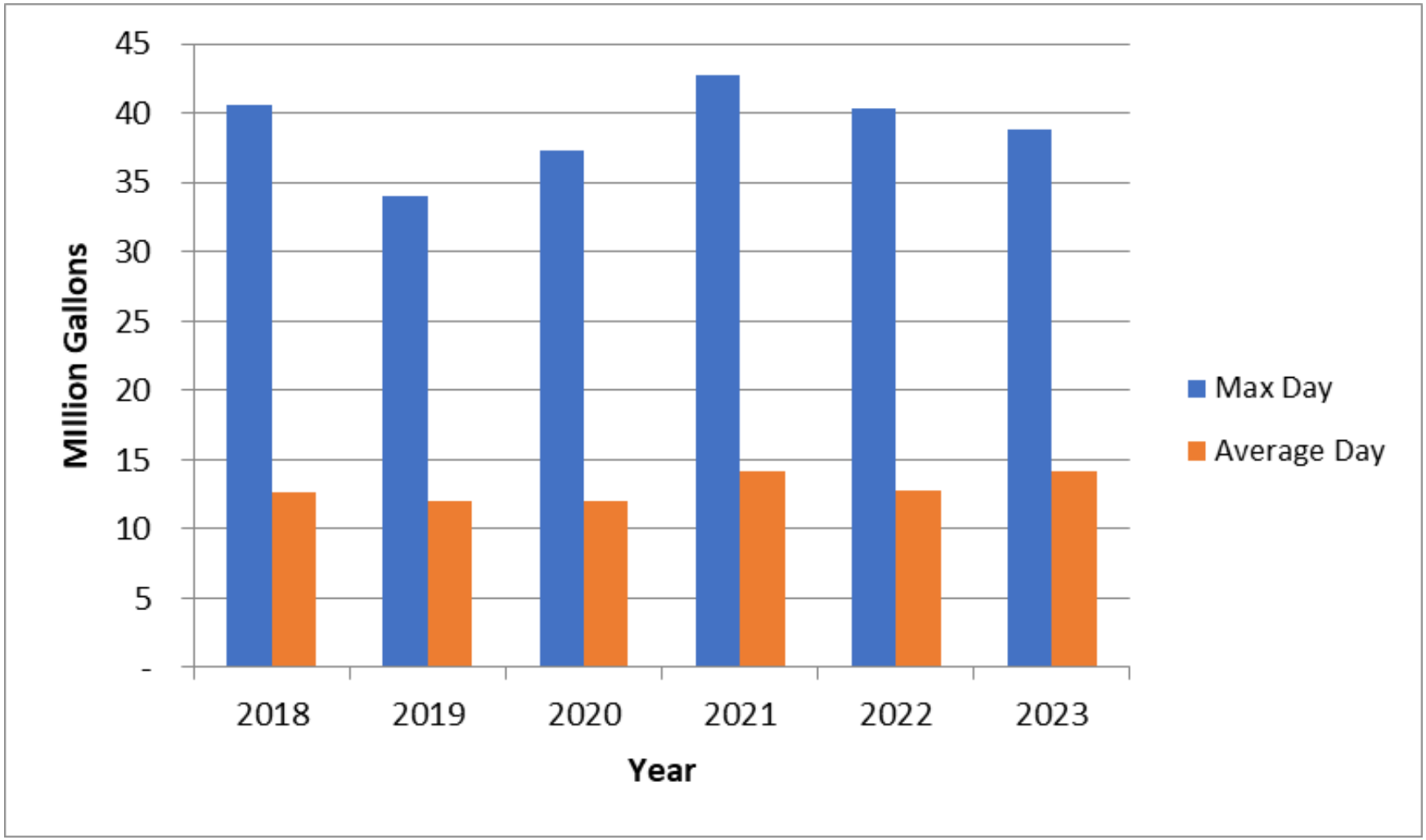


Figure B.3 - MDD vs. ADD Comparison (2018 to 2023)



J-U-B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

J-U-B FAMILY OF COMPANIES

Appendix C

Well Data

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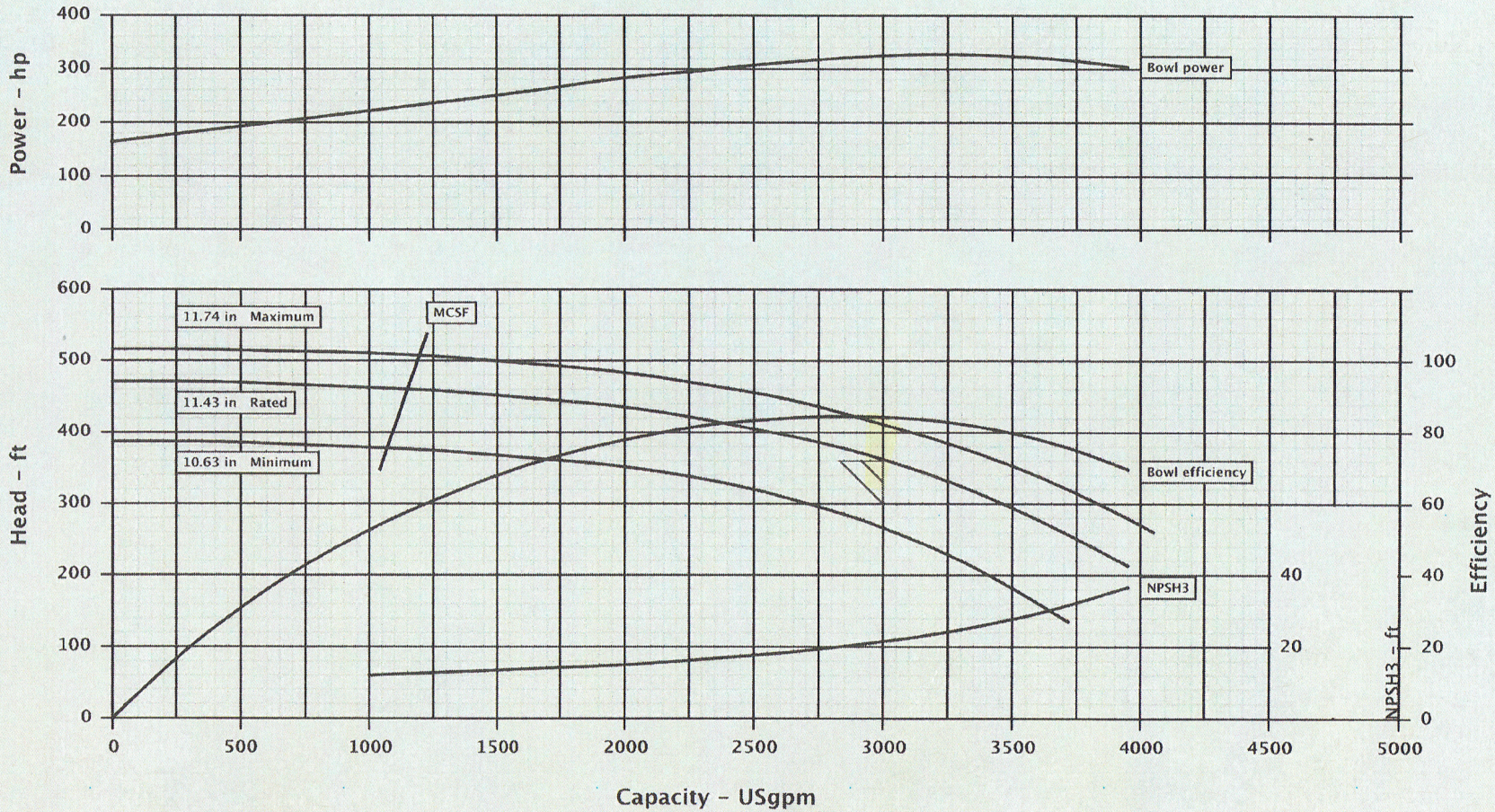
Customer	: FLOWSERVE PUMP DI...			Pump size & type	: 15EHM
Item number	: 4TH ST WELL			Based on curve no.	: EC-2392
Service	:			Number of stages	: 4
Flowserve reference	: 475072974			Test tolerance	: Hydraulic Institute Level A
Date	: December 8, 2015	Capacity	: 3000.0 USgpm	Specific gravity	: 1.000
		Head	: 361.00 ft	Pump speed	: 1775 rpm

CURVES ARE APPROXIMATE, PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS; CAPACITY, HEAD, AND EFFICIENCY.

Bowl performance shown below is corrected for materials, viscosity and construction.



Bowl head of 361.87 ft corresponds with 361 ft head at low liquid level adjusted for elevation and friction losses.

Affinity v1.4

4th Street Pump Curve

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No.
Inspected by
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D D0046175
DRILLING PERMIT NO. 850685
Water Right or Injection Well No. 95-2133

2. OWNER:
Name City Of Coeur d Alene Water Dept
Address 3820 Ramsey Rd
City Coeur d Alene State ID Zip 83815

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 50 North [x] or South [ ]
Rge. 04 East [ ] or West [x]
Sec. 1, ____ 1/4 (10 acres) SW 1/4 (40 acres) SW 1/4 (160 acres)
Gov't Lot ____ County Kootenai
Lat: : : Long: : :
Address of Well Site 4th Ave & Best Street
City Coeur d Alene
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name ____

4. USE:
[ ] Domestic [x] Municipal [ ] Monitor [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
[ ] New Well [ ] Modify [ ] Abandonment [x] Other ____

6. DRILL METHOD:
[ ] Air Rotary [ ] Cable [ ] Mud Rotary [ ] Other ____

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method

Was drive shoe used? [ ] Y [ ] N Shoe Depth(s) ____
Was drive shoe seal tested? [ ] Y [ ] N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Length of Headpipe ____ Length of Tailpipe ____
Packer [ ] Y [ ] N Type ____

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ____
Screen Type & Method of Installation ____

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
185 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: ____

5 0N 4W 1

12. WELL TESTS:
[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: ____
Depth first Water Encounter ____

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
			PERFORMED AQUA FREED PROCESS		
			1. Brushed all screen surfaces		
			2. Bailed out sediments		
			3, Injected 26,700 lbs CO2		
			4. Rebrushed all screen surfaces		
			5. Bailed out sand & sedimets Final depth 306.5 ft.		
			6. Owner to test pump well		

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MAR 04 2008
IDWR/North

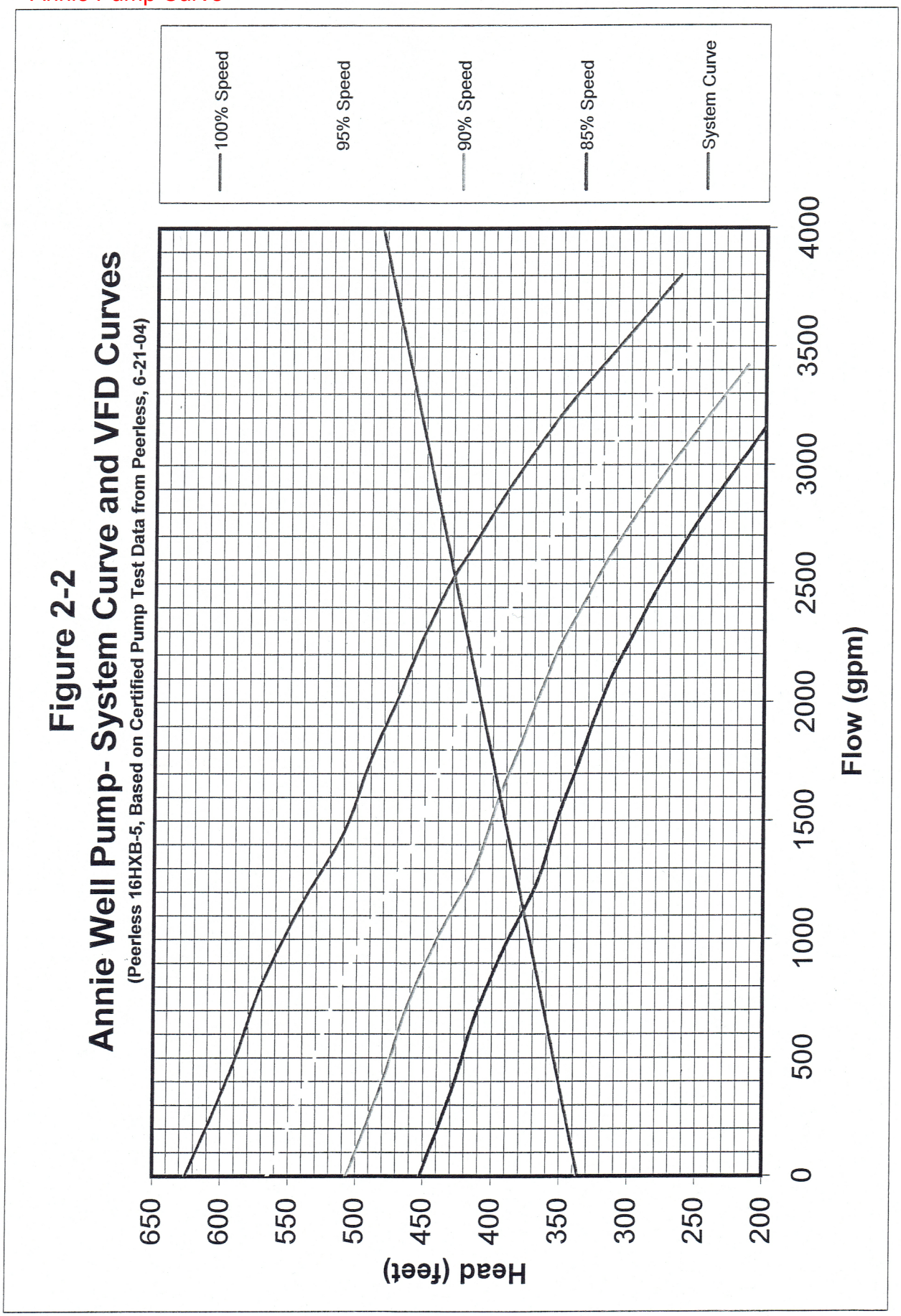
Completed Depth 306.5' ____ ____ (Measurable)
Date: Started 2-15-08 ____ Completed 2-29-08

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Water Recovery Services Firm No. 584
Principal Driller Scott Barratt Date 2-29-08
and
Driller or Operator II Scott Barratt Date 2/29/08
Operator I ____ Date ____
Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

Annie Pump Curve



Annie Pump Curve

CHAPTER 2 - ANNIE AVENUE WELL HOUSE

2.1 Description

The Annie Avenue Well House is located on Annie Avenue just west of 3rd Street at the end of a cul-de-sac. The Annie Avenue well site was purchased by the City from the Seventh-Day Adventist Church in January 2004. The Annie Avenue well serves the City's lower pressure zone and is operated based on water level in the Tubbs Hill tanks. **Figure 1-1** shows the location of the Annie well in relation to the other City wells, while **Figure 2-1** shows the existing site plan. Water leaves the well house through a 16-inch ductile iron main, then enters a 16-inch tee that delivers water to the east and the west through 12-inch PVC mains. The main to the west connects to another 12-inch main shown in **Figure 2-1** in Ironwood Drive. A second 12-inch main extends east where it ties into an existing 12-inch main that runs north-south in 4th Street.

2.2 Annie Avenue Well Pump and Motor

The Annie Avenue well pump was supplied by H_2O Well Service and manufactured by Sterling Fluid Systems, Inc.

H_2O Well Service
Jim Johnston
582 W. Hayden Avenue
Hayden, ID 83835
Phone: 208-772-4004
FAX: 208-772-4892

Sterling Fluid Systems, Inc.
2005 Dr. Martin Luther King Jr. Street
PO Box 7026
Indianapolis, IN 46207-7026
Phone: 371-925-9661
FAX: 371-924-7388

The Annie Avenue well pump is a Peerless Model 16 HXB, 5-stage, vertical line shaft rated at 2500 gpm at 429 feet TDH. The serial number is 635702A and the impeller number is 4601399-023. The motor is a premium efficiency 350 HP unit manufactured by U.S. Motors.

A variable frequency drive (VFD) controls the speed of the 350 hp motor and in turn controls the amount of water pumped. The pump ramps to full frequency at each call to start from the Tubbs Hill tanks. The frequency lowers as the tanks reach their maximum levels. The minimum frequency set point utilized is 48 Hz, which produces approximately 900 gpm. The pump curves are included in the manufacturer's O&M Manual. The pump curve shown in **Figure 2-2** shows the approximate system performance based on well drawdown and distribution system data. The figure also shows pump operation at several points based on different percentages of full speed.

2.3 Operations—Annie Avenue Pumping System

Operation of the Annie well pump begins when a signal from the City's telemetry system indicates a pump-start elevation has been reached in the Tubbs Hill tanks. The

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No.
Inspected by
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

RECEIVED
SEP 20 2004
IDWR/North

1. WELL TAG NO. D 0033505
DRILLING PERMIT NO. 810405
Water Right or Injection Well No. N 016062

2. OWNER:
Name City of Coeur D Alene
Address 3800 Ramsey Rd
City Coeur D Alene State ID Zip 83815

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 50 N North ☐ or South ☐
Rge. 4 W East ☐ or West ☐
Sec. 12, SW 1/4 (10 acres) NW 1/4 (40 acres) ____ 1/4 (160 acres)
Gov't Lot ____ County Kootenai
Lat: : : Long: : :
Address of Well Site 3rd St and Anne Ave
City Coeur D Alene
(Give at least name of road + Distance to Road or Landmark)
Lt. ____ Blk. ____ Sub. Name ____

ENTERED

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD:
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
Bentonite	0	60	8 lb	tremie

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 301
Was drive shoe seal tested? ☐ Y ☒ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
24"	+2	301	.375	steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe 10 Length of Tailpipe 10
Packer ☒ Y ☐ N Type Neoprene ε 293

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ____
Screen Type & Method of Installation 304 stainless

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
303	343	60		22"	stainless	☐	☐
						☐	☐
						☐	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method
N/A				

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
187 ft. below ground Artesian pressure ____ lb.
Depth flow encountered 280 ft. Describe access port or control devices: ____

12. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
2500	93	280'	4 hrs

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: quality - good
Depth first Water Encounter 250

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
30"	0	60	Brown silty sand + gravel		X
24"	60	65	Brown silty sand + gravel		X
24"	65	117	loose brown sand + gravel		X
24"	117	180	loose brown sand - gravel cobbles		X
24"	180	235	brown sand some gravel		X
24"	235	250	brown - gray sand w silt		X
24"	250	353	brown course sand some gravel	X	

RECEIVED
OCT 01 2004
IDWR/North

Completed Depth 353 (Measurable)
Date: Started 2/4/04 Completed 4/20/04

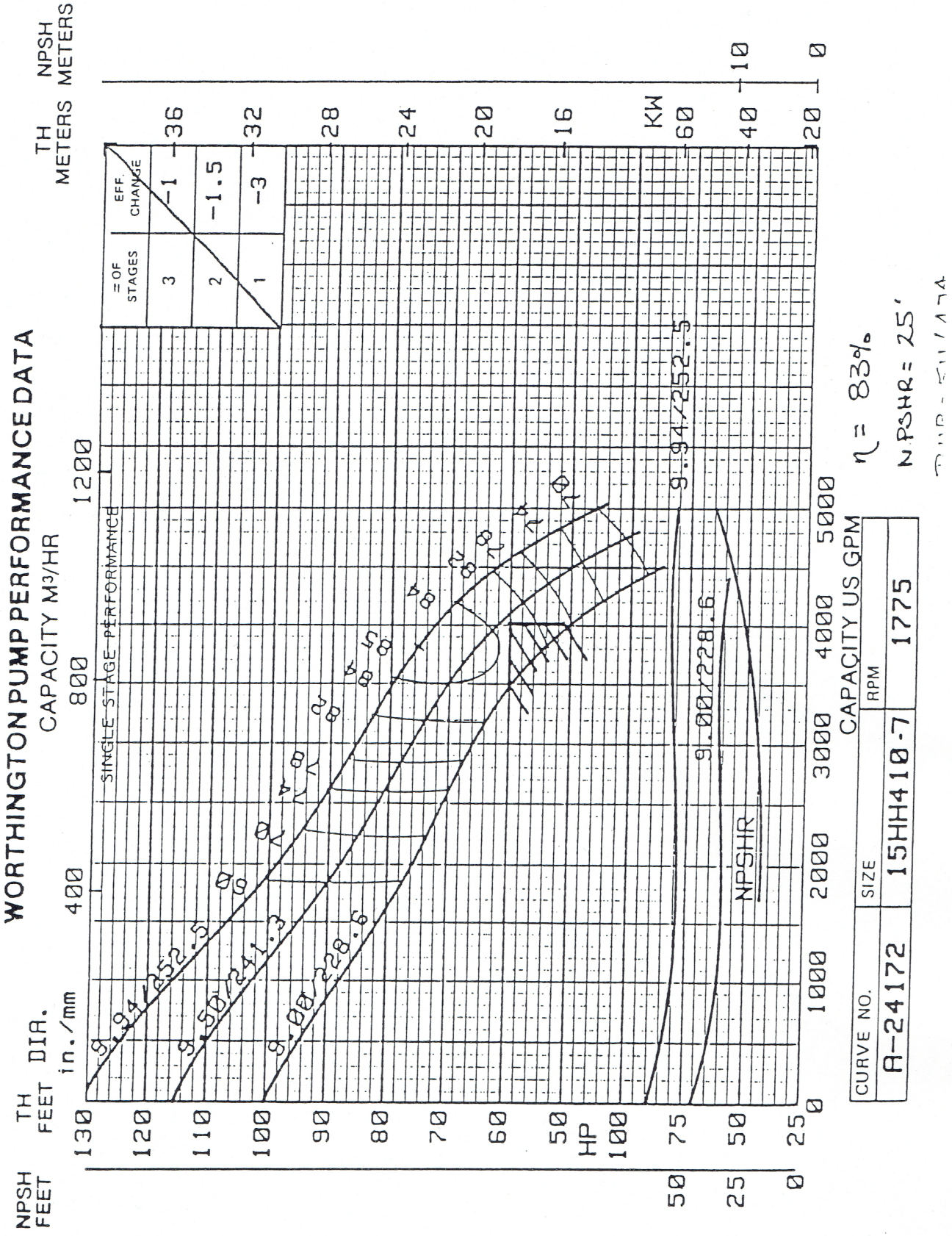
14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Holt Drilling Inc Firm No. 596
Principal Driller Iversen Date ____
and
Driller or Operator II ____ Date ____
Operator I Walt Iversen Date 9/9/04
Principal Driller and Rig Operator *Required.*
Operator I must have signature of Driller/Operator II.

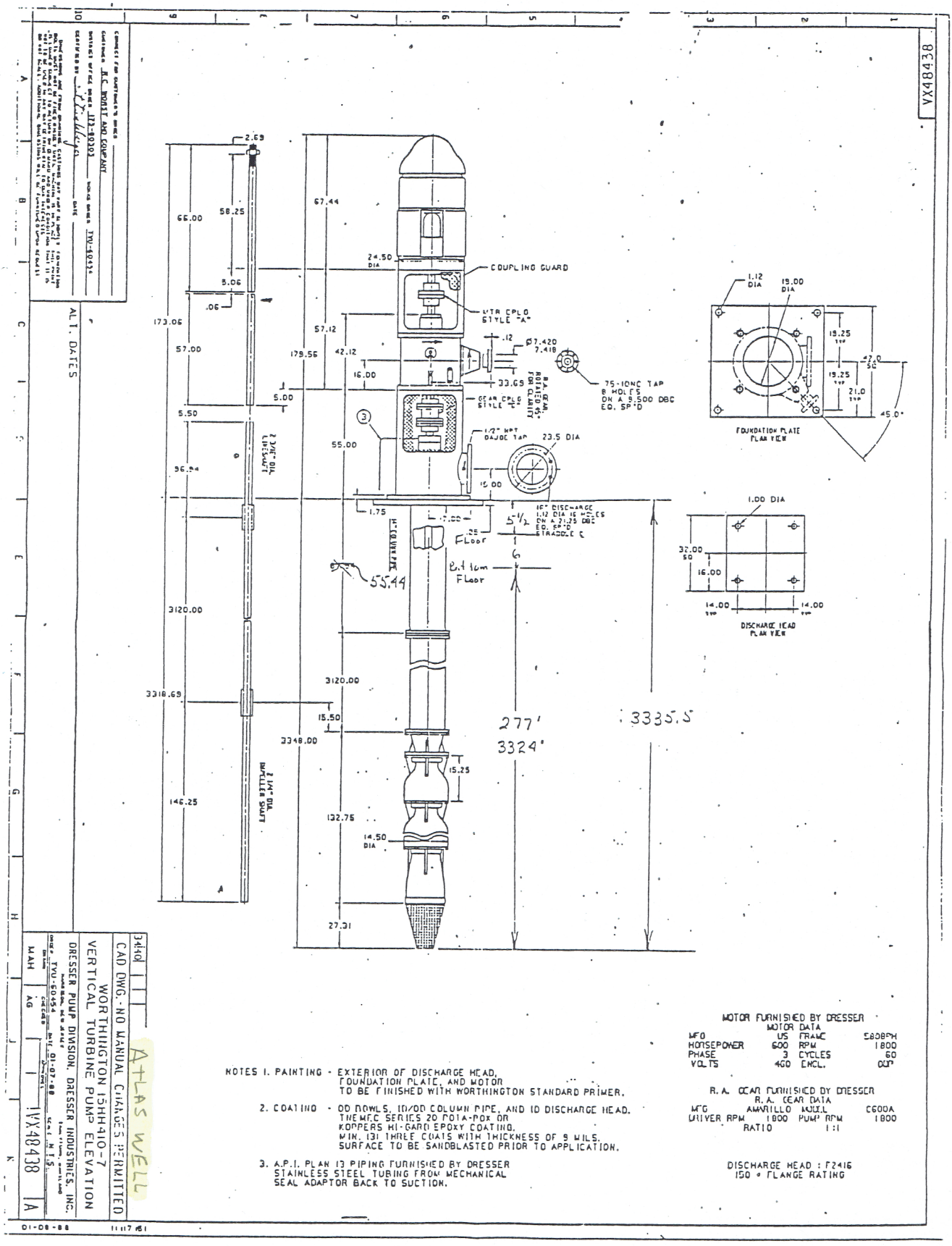
FORWARD WHITE COPY TO WATER RESOURCES

Customer R.C. Worst Company — Worthington S.O. Portland
Project City of Coeur D'Alene — Proposal/Order No. 3-80303
Cust. Proposal/Order No. 0000984 — Certified By T. Knappich
Customer Item No. — — Date 1-12-88
ATLAS WELL
Liquid/Service Water — Sp. Gr. 1.0 — Visc. — SSU
Capacity 4000 — Head 420 — Temp. 60 °F °C

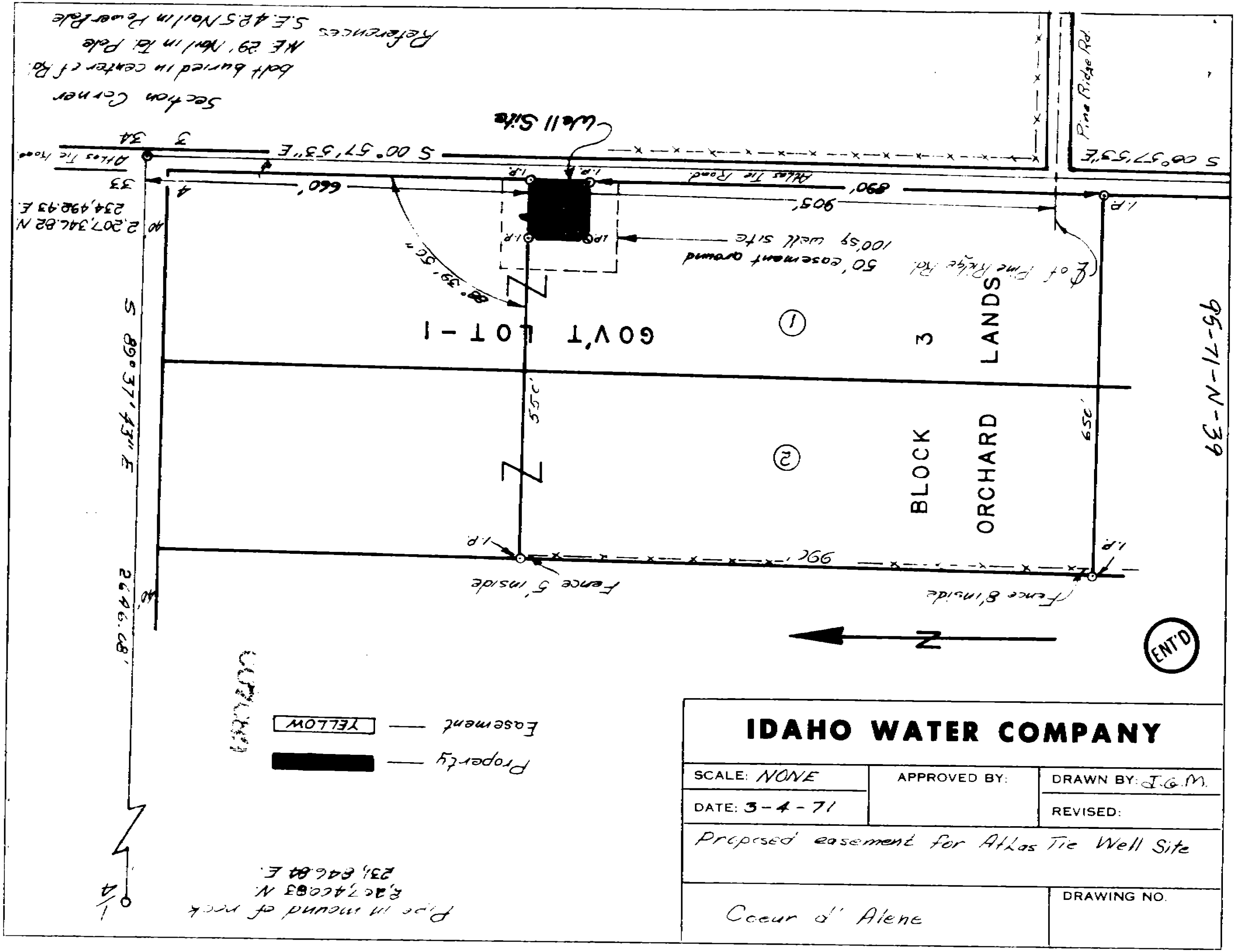
2400-8 Page
May 19
15HH4
1775 RP



Atlas Pump Curve


VX48438
COUPLING GUARD
MTR CPLG STYLE "AA"
GEAR CPLG STYLE "C"
75-IONIC TAP 8 MILES ON A 9,500 DBC EQ. SP'D
1.72" NPT DAJOE TAP
23.5 DIA
16" DISCHARGE 1.12 DIA 16 HOLES ON A 21.25 DBC EQ. SP'D STRADDLE ℄
FOUNDATION PLATE PLAN VIEW
DISCHARGE HEAD PLAN VIEW
277'
3324"
3335.5
55.44
MOTOR FURNISHED BY DRESSER
MOTOR DATA
MFG US FRAME 580BPH
HORSEPOWER 600 RPM 1800
PHASE 3 CYCLES 60
VOLTS 460 ENCL. DUP
R.A. GEAR FURNISHED BY DRESSER
R.A. GEAR DATA
MFG AMARILLO MODEL C600A
DRIVER RPM 1800 PUMP RPM 1800
RATIO 1:1
DISCHARGE HEAD : F2416
150 # FLANGE RATING
NOTES 1. PAINTING - EXTERIOR OF DISCHARGE HEAD, FOUNDATION PLATE, AND MOTOR TO BE FINISHED WITH WORTHINGTON STANDARD PRIMER.
2. COATING - OD BOWLS, ID/OD COLUMN PIPE, AND ID DISCHARGE HEAD. THEMEC SERIES 20 POLY-POX OR KOPPERS HI-GARD EPOXY COATING. MIN. (3) THREE COATS WITH THICKNESS OF 9 MILS. SURFACE TO BE SANDBLASTED PRIOR TO APPLICATION.
3. A.P.I. PLAN 13 PIPING FURNISHED BY DRESSER STAINLESS STEEL TUBING FROM MECHANICAL SEAL ADAPTOR BACK TO SUCTION.
CAD DWG. - NO MANUAL CHANGES PERMITTED
WORTHINGTON 15HH410-7
VERTICAL TURBINE PUMP ELEVATION
DRESSER PUMP DIVISION, DRESSER INDUSTRIES, INC.
VX48438
ATLAS WELL

Atlas Well


IDAHO WATER COMPANY
SCALE: NONE
APPROVED BY:
DRAWN BY: J.G.M.
DATE: 3-4-71
REVISED:
Proposed easement for Atlas Tie Well Site
DRAWING NO.
Coeur d' Alene
GOV'T LOT-1
BLOCK 3
ORCHARD LANDS
Well Site
50' easement around 100'sq well site
S 00° 57' 53" E
S 89° 37' 43" E
2646.08'
2,207,346.82 N.
234,498.93 E.
Section Corner
bolt buried in center of Rd.
References
NE 29' Nail in Tel. Pole
S.E. 4.25 Nail in Power Pole
Atlas Tie Road
Pine Ridge Rd.
℄ of Pine Ridge Rd.
660'
905'
890'
550'
650'
990'
88° 39' 50"
I.P.
Fence 5' inside
Fence 8' inside
Property
Easement
YELLOW
Pipe in mound of rock
2,207,40083 N.
231,846.84 E.
1/4
N
ENT'D
95-71-N-39

COLUMN SHAFT DATA

Column Size 14"

Type Column Couplings THREADED

Lineshaft Size 2 3/16

Lineshaft Insert Material (SLEEVE) 18-8 SS

Lineshaft Coupling Material STEEL

No. Lineshaft Bearing Spacers 25

Lineshaft Bearing Materials RUBBER

Lineshaft Bearing Description SLEEVE

Lineshaft Bearing Spider Material CAST IRON

DISCHARGE HEAD

Manufacturer WORTHINGTON

Model No. F-2416

Guide Bearing Material BRONZE

Guide Bearing Lubrication PUMPED FLUID

Guide Bearing Type SLEEVE

Weight 1270 #

THRUST BEARING

Manufacturer U.S. MOTOR

Manufacturer's No. SKF-29430-MC

Max. Total Thrust at Guar. Point 14757 LBS

Rating Life in Hours MIN. 50,000 HRS

MOTOR

Manufacturer U.S MOTOR

Model No. and Type 5808 PH / HU

Nominal HP 600

Power Factor at Guar. Point 89.0

Weight 3600

Overall Efficiency at Guar. Point 94.6 motor

Heater Rating - Watts NONE

Max. Diameter 39 1/2

The following data are the actual performance characteristics of the pump proposed for installation as specified, but the quantity, head, horsepower, and efficiency at points other than the guarantee point proposed are not guaranteed.

OPERATING CHARACTERISTICS

Quantity GPM	Total Head Feet	Hp Demand by Pump	Overall Efficiency Percent
0 (Shutoff)	791	580	0
1500	651	493	50.0
3000	525	513	77.5
4000 (Guar.)	420	527	80.5
4700	287	512	66.5

* INCLUDES COLUMN FRICTION AND SHAFT H.P. LOSSES

COMBINATION RIGHT-ANGLE GEAR DRIVE DATA

Manufacturer AMARILLO

Model No. A-600

RPM 1775 Speed Ratio (Drive - Driven) 1:1

Rated HP 600

AGMA Service Factor 1.5

Atlas Well

USE TYPEWRITER OR BALL POINT PEN

State of Idaho
Department of Water Administration

WELL DRILLER'S REPORT

ENT'D

RECEIVED
SEP 15 1971
Department of Water Administration

State law requires that this report be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

1. WELL OWNER

Name IDAHO WATER CO.

Address COEUR D'ALENE IDAHO

Owner's Permit No. 95-7142

2. NATURE OF WORK 95-71-N-39

☒ New well ☐ Deepened ☐ Replacement

☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☐ Domestic ☐ Irrigation ☐ Test

☒ Municipal ☐ Industrial ☐ Stock

4. METHOD DRILLED

☒ Cable ☐ Rotory ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 20 inches Total depth 350 feet

Casing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
20 inches	.375 inches	+2 feet	278 feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet

Was a packer or seal used? ☒ Yes ☐ No

Perforated? ☐ Yes ☒ No

How perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation ____ inches by ____ inches

Number	From	To
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet

Well screen installed? ☒ Yes ☐ No

Manufacturer's name U.O.P. JOHNSON

Type STAINLESS Model No. PIPE SIZE 18"

Diameter 18 Slot size 150 RD40 Set from 280 feet to 340 feet

Diameter ___ Slot size ___ Set from ____ feet to ____ feet

Gravel packed? ☐ Yes ☒ No Size of gravel ____

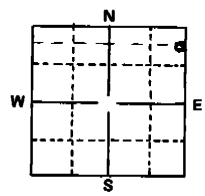
Placed from ____ feet to ____ feet

Surface seal? ☒ Yes ☐ No To what depth 20 feet

Material used in seal ☒ Cement grout ☐ Puddling clay

6. LOCATION OF WELL

Sketch map location must agree with written location.



9 S

County KOOTENAI

Govt. Lot 1 of sec. 4 Township 50N. Range 4W

____¼ ____¼ Sec. ____, T. ____N/S, R. ____E/W

7. WATER LEVEL

Static water level 231 feet below land surface

Flowing? ☐ Yes ☒ No G.P.M. flow ____

Temperature 48 ° F. Quality GOOD

Artesian closed-in pressure ____ p.s.i.

Controlled by ☐ Valve ☐ Cap ☐ Plug

8. WELL TEST DATA

☒ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped
5000	19.5 FT	11
6000	23.2 FT	1

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
20	0	255	SAND + GRAVEL 1½ MINUS		X
20	255	315	SAND + GRAVEL 1" MINUS	X	
20	315	340	SAND MED.	X	
20	340	350	SANDY CLAY (BLUE)		X

10.

Work started JUNE 30-71 finished AUG 19-71

11. DRILLER'S CERTIFICATION

This well was drilled under my supervision and this report is true to the best of my knowledge.

HOLMAN DRILLING CORP 108
Driller's or Firm's Name Number

E 3410 9TH AVE SPOKANE WN
Address

Arnold E. Holman SEPT 3-71
Signed By Date

USE ADDITIONAL SHEETS IF NECESSARY

FORWARD THE WHITE, BLUE, AND PINK COPIES TO THE DEPARTMENT

ATLAS WELL

PUMP DATA SHEET NO. 1
VERTICAL TURBINE PUMPS

BIDDER'S NAME _____ DATE _____

PUMP DATA

RPM	1775
Manufacturer	WORTHINGTON
Model No.	15HH410
No. of Stages	7
Nominal Size of Bowls	15"
Max. OD of Bowls	14 1/2
Overall Length Bowl Section	169.38
Pump Shaft Diameter	2 1/4
Pump Shaft Material	416 SS
No. of Pump Bearings	8
Pump Bearing Material	BRONZE
Description of Pump Bearings	SLEEVE
Pump Bowl Catalog No.	15 HH
Pump Bowl Material	C.I.
Pump Bowl Lining	PORCELAIN ENAMEL
Impeller Type (Open, Closed)	CLOSED
Impeller No.	15HH410
Impeller Material	BRONZE
Type Lubrication	PUMPED FLUID
HP Demand at Guar. Point	527

Atlas Well

Hanley Pump Curve

STERLING

Sterling Fluid Systems (USA), Inc

P O Box 7026, Indianapolis, Indiana, 46202

Customer : Welch Comer
1626 Lincoln Way
Couer d' Alene, ID
83814

Contact : Steve Cordes
Phone : 208-664-5946 **Fax :** 208-664-9382
Date : Tuesday, January 21, 2003

Project : Hanley Well for the city of Couer d' Alene
Quote No. : US-6965-11 **Page No :** 1

Pump Model: **Peerless Vertical - 16HXB 5 Stages**
Nom. Speed: **1770 RPM, 60 Hz Electric**

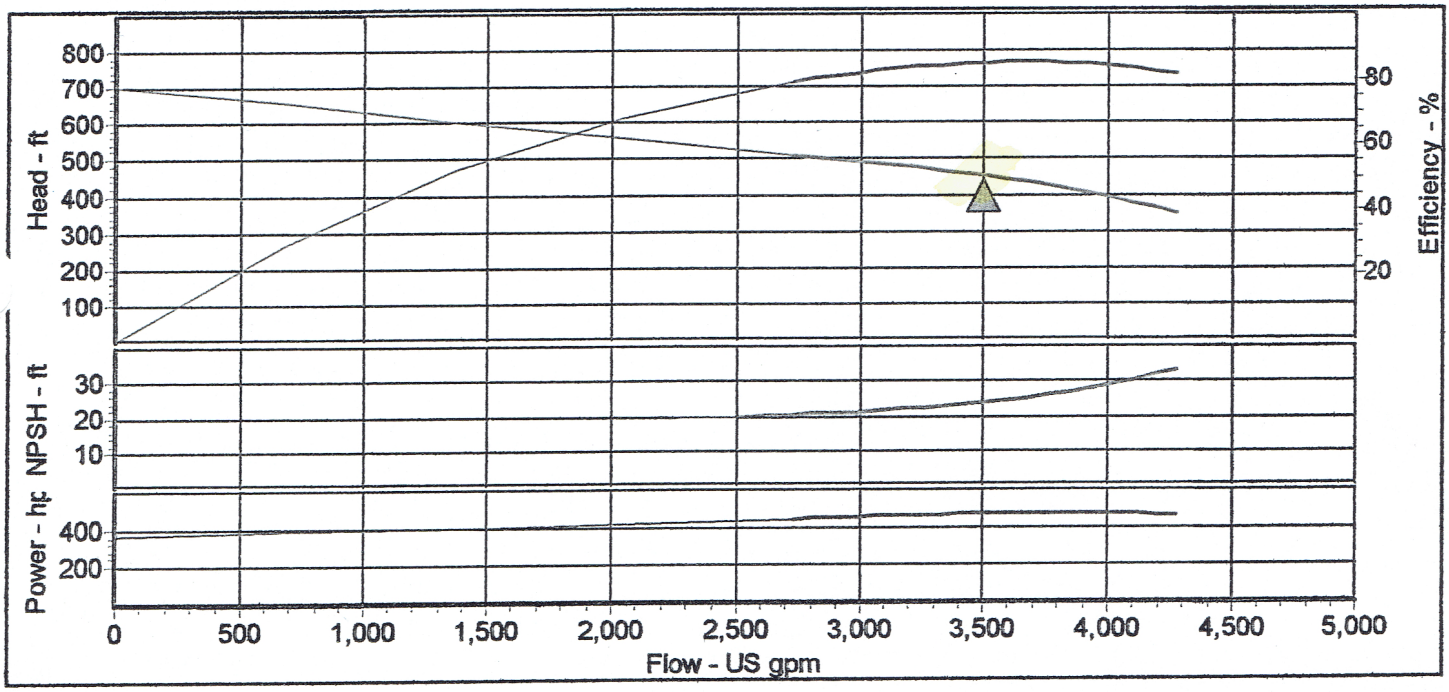
Market : **Vertical Turbine Pump**
Impeller No.: **4601389**
Material Spec. Group: **A - B: CIE; I: Brz = Standard**

Item : **1**
Your Ref. :

Fluid: **Water**
Viscosity: **1.007** cSt
Sp. Gravity: **1**

Flow rate Q:	**3500**	US gpm
Bowl Total Head:	**440**	ft
Efficiency :	**86**	%
Power Required :	**469.69**	hp
NPSH Required :	**23.788**	ft

Performance curve according to Hyd Inst-Peerless Std

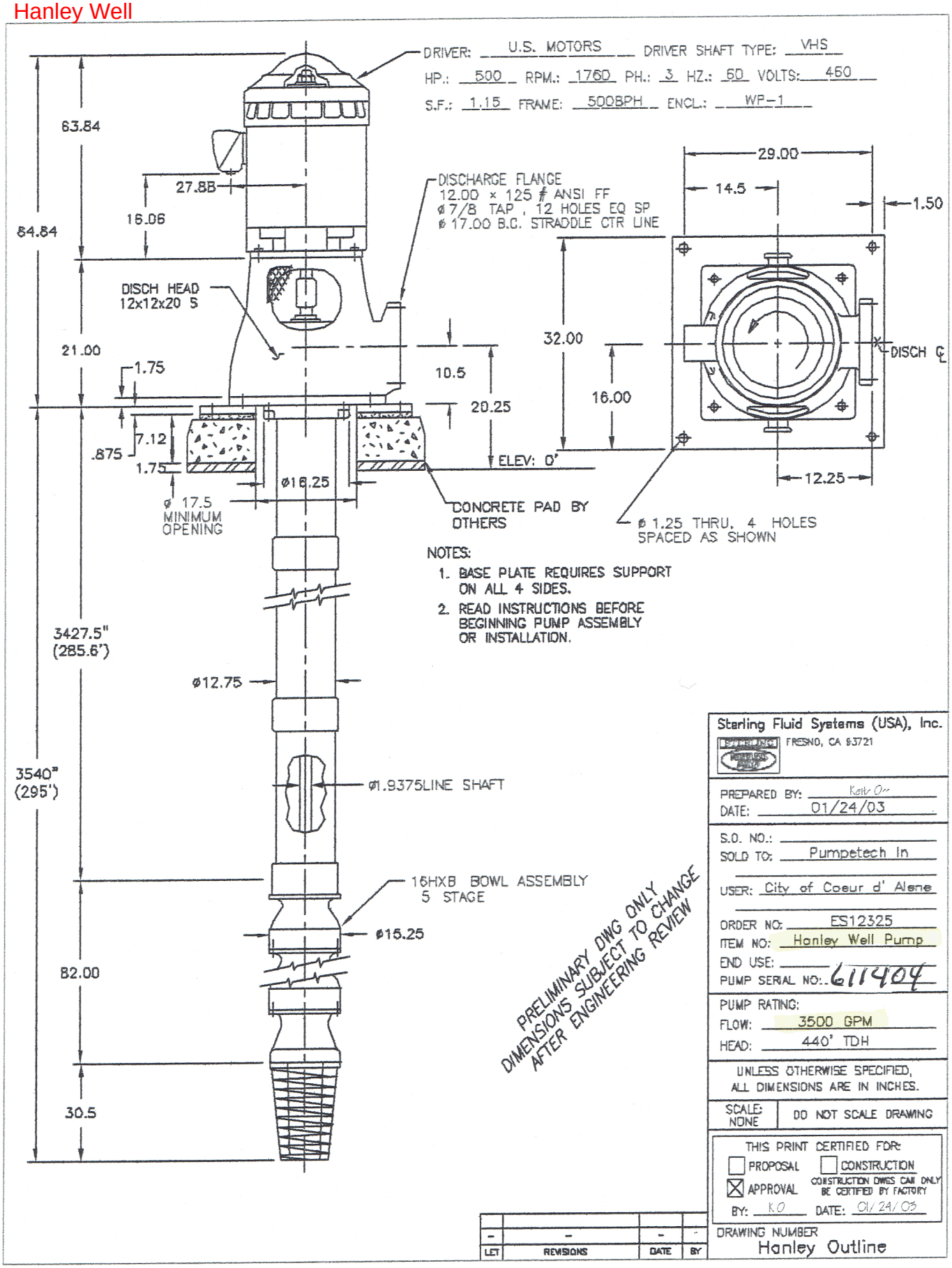


Comments

Refer to factory for all single point bowl performance guarantees. Pumps must be selected with Hydraulic Institute-Peerless Std. See Std Hydraulic Performance document in RAPID for testing tolerances & contractual guarantees.

Flow (US gpm)	Head (ft)	Pump Efficiency (%)	Power Required (hp)	NPSH Required (ft)	Thrust (lb)
0.0	702.51	0.0	360.45		17745.65
534.7	665.07	23.9	376.21		15724.84
1069.5	626.24	43.0	392.96		14223.36
1604.2	587.06	58.2	408.37		12977.86
2138.9	549.35	70.0	424.07		11693.23
2673.6	513.39	78.4	442.10	20.34	10178.14
3208.4	475.59	83.5	461.26	22.01	8348.87
3743.1	426.12	85.1	473.50	25.77	6192.16
4277.8	346.62	81.3	460.29	33.20	3765.26

Hanley Well



Sterling Fluid Systems (USA), Inc.
FRESNO, CA 93721

PREPARED BY: Kelly Orr
DATE: 01/24/03

S.O. NO.:
SOLD TO: Pumpetech In
USER: City of Coeur d' Alene
ORDER NO: ES12325
ITEM NO: Hanley Well Pump
END USE:
PUMP SERIAL NO.: 611404

PUMP RATING:
FLOW: 3500 GPM
HEAD: 440' TDH

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES.

SCALE: NONE | DO NOT SCALE DRAWING

THIS PRINT CERTIFIED FOR:
☐ PROPOSAL ☐ CONSTRUCTION
☒ APPROVAL
CONSTRUCTION DWGS CAN ONLY BE CERTIFIED BY FACTORY
BY: K.O DATE: 01/24/03

LET	REVISIONS	DATE	BY
-	-	-	-

DRAWING NUMBER
Hanley Outline

HONEYSUCKLE WELL

Honeysuckle Pump Curve

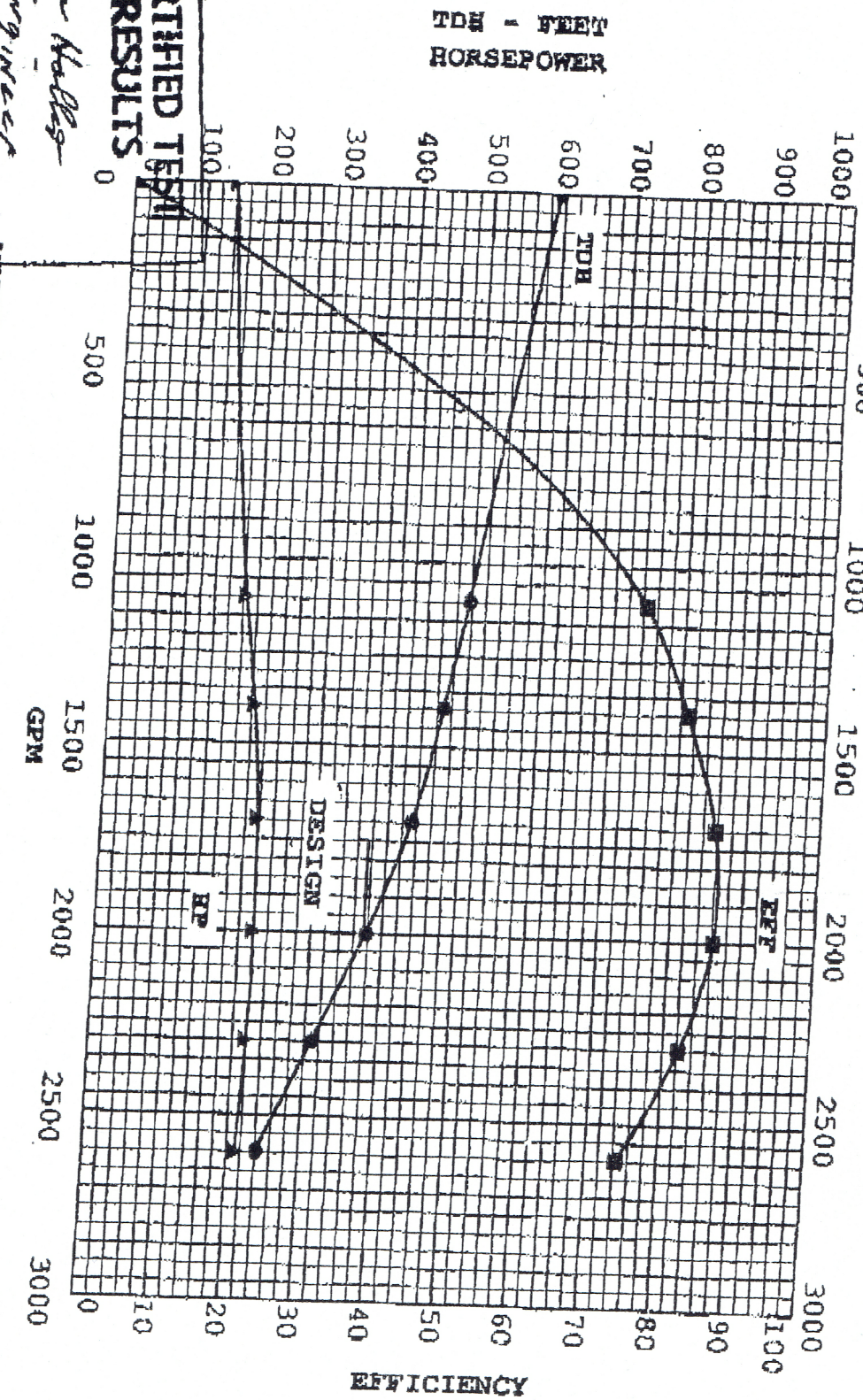
CERTIFIED TEST RESULTS

BY Ron Hollis
TITLE Engineer
DATE May 9, 1997
GOULDS PUMPS
TEXAS DIVISION

GOULDS PUMPS INC
WTG-TURBINE DIVISION

CUSTOMER: H2O WELL SERVICE
P/O: 18209

DATE: 05/08/97
DRAWN BY: R. LEWIS



MODEL: 14RJMC
STAGES: 5
SG: 1.00

RPM: 1770

S/O: 385209
IMP DIA: 9.82
VISC: 32

HP Readings are adjusted by SG

GOULDS PUMPS, INC. - WTG TURBINE DIVISION
HYDROSTATIC TEST CERTIFICATION

CUSTOMER:	H2O WELL SERVICE	S.O. NUMBER:	385209
P.O. NUMBER:	18209	DATE:	05/07/97
PUMP MODEL:	14RJMC	CUST. SPECS:	YES
PUMP TYPE:	DWT	WITNESSED:	NO

Goulds Pumps, Inc. certifies that the parts or assemblies listed below have been hydrostatically tested to the pressures and length of time indicated, in accordance with the Goulds Pumps Hydrostatic Test Procedure, QA SPI-40135, or the Customer Specification below.

PART	QTY	PART NUMBER	MATERIAL	PSI	TIME
INTERBOWL	1	C00880B 01	6911	425	5 MIN
INTERBOWL	4	C00880B 03	6911	425	5 MIN

CERTIFIED BY: Raymond Lewis

RAYMOND LEWIS

Form 238-7
6/93

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Use Typewriter
Ball Point Pen

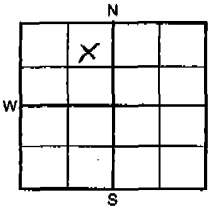
FEB 1 1 1994
Department of Water Resources
55230

400 Suffix changed

1. DRILLING PERMIT NO. 95 - 90 - N - 16 - 1
Other IDWR No. 95-08647

2. OWNER:
Name CITY OF COEUR D'ALENE
Address C 1306 HANLEY
City COEUR D'ALENE State ID Zip 83814

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.



T. 51 North ☒ or South ☐
R. 4 East ☐ or West ☒
Sec. 35, NE 1/4 (10 acres) NW 1/4 (40 acres) 1/4 (160 acres)
Gov't Lot ____ County KOOTENAI

Address of Well Site 1306 HANLEY
COEUR D'ALENE, ID 83814
(Give at least Direction + Distance to Road or Landmark)

Lot No. ____ Block No. ____ Subd. Name ____

4. PROPOSED USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK
☐ New Well ☒ Modify or Repair ☐ Replacement ☐ Abandonment

6. DRILL METHOD
☐ Mud Rotary ☐ Air Rotary ☐ Cable ☒ Other AUGER

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
CEMENT/BENTONITE 5%	338	334	9	GROUT PUMP & TREMIE PIPE

Was drive shoe seal tested? Y☐ N☐ How? ____

8. CASING/LINER:

Diameter	From	To	Guage	Casting	Liner	Steel	Plastic	Welded	Threaded
						☐	☐	☐	☐
						☐	☐	☐	☐
						☐	☐	☐	☐
						☐	☐	☐	☐

Final location of shoes ____
Top Packer or Headpipe ____ Bottom Tailpipe ____

9. PERFORATIONS/SCREENS
☐ Perforations Method ____
☐ Screens Type ____ Material ____

From	To	Slot Size	Number	Diameter	Tele/Pipe Size	Casting	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

NENW 35 51N 4W

10. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Depth	Time

Temperature of water ____ Was a water analysis done? Yes ☐ No ☐
By whom? ____
Water Quality (odor, etc.) ____
Bottom Hole Temperature ____

11. STATIC WATER LEVEL:
____ ft. below surface Depth artesian flow found ____
Artesian pressure ____ lb. Describe access port ____
Describe Controlling Devices: ____

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	GPM	SWL
24	0	338	PLUGGED BOTTOM OF WELL		
			INSTALLED TREMIE PIPE TO 338		
			AND PUMPED IN CEMENT GROUT		
			5% BENTONITE TO 334'		
			PULLED TREMIE PIPE AND		
			COVERED WELL HEAD.		

RECEIVED
AUG 1 1 1994
Department of Water Resources

RECEIVED
SEP 2 7 1993
IDWR

RECEIVED
JUL 2 6 1993
NORTHERN REGION
IDWR

SCANNED
MAY 0 8 1995

Date: Started 7/12/93 Completed 7/12/93

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name PONDEROSA DRILLING Firm No. 228
Firm Official ____ Date 7/20/93
and W. SCOTT BARRATT
Supervisor or Operator ____ Date 7/20/93
(Sign once if Firm Official & Operator) RON LINNEMON

FORWARD WHITE COPY TO WATER RESOURCES

Honeysuckle Well

GOULDS PUMPS, INC. - WTG TURBINE DIVISION
PERFORMANCE TEST RESULTS

CUSTOMER: H2O WELL SERVICE
P.O. NUMBER: 18209
ITEM: HONEY SUCKLE PUMP STATION
S.O. NUMBER: 385209
DATE: 05/08/97

CONDITIONS

PUMP NUM:	1	SP. GR:	1.00	BOWL TDH:	375.0
PUMP TYPE:	DWT	VISC. SSU:	32	PUMP TDH:	0.0
PUMP MODEL:	14RJMC	WATER TEMP:F	66	REQ GPM:	2000
STAGES:	5	WITNESSED:	N	MAX. GPM:	2600
IMP. MATL:	1102			EFFICIENCY:%	84.5
1ST IMP. DIA:	9.82	1ST IMP. QTY:	5	TEST RPM:	1185
2ND IMP. DIA:	0.00	2ND IMP. QTY:	0	TEST MOTOR:	150
CUST RPM:	1770			TEST LINE:	8
CUST HP:	250	TESTED BY:	RAYMOND LEWIS	CURVE RPM:	1770

READINGS DURING TEST

POINTS	1	2	3	4	5	6	7
PSI	115.2	95.9	90.3	83.1	72.0	58.6	44.8
DISCH. FT.	266.11	221.53	208.59	191.96	166.32	135.37	103.49
ELEV. FT.	5.00	5.00	5.00	5.00	5.00	5.00	5.00
VEL. FT.	0.00	0.14	0.23	0.34	0.47	0.62	0.79
PIPE FRIC.	0.00	0.01	0.01	0.02	0.03	0.03	0.04
TORQUE	90.15	118.05	130.20	138.00	140.55	139.20	134.70
INPUT KW	36.45	46.60	50.95	53.80	54.65	54.15	52.45
AMPERES	63.40	76.10	82.70	84.60	85.20	86.40	84.60
VIBRATION							

TEST DATA RECORDED AT TEST RPM

RPM	1197	1196	1196	1195	1195	1195	1195
GPM	0	743	946	1148	1350	1553	1755
TDH	271.1	226.7	213.8	197.3	171.8	141.0	109.3
HP	43.7	57.1	63.0	66.7	68.0	67.3	65.1
PUMP EFF	0.0	74.5	81.1	85.7	86.2	82.2	74.4

TEST DATA CONVERTED TO CUSTOMER RPM

RPM	1770	1770	1770	1770	1770	1770	1770
GPM	0	1100	1400	1700	2000	2300	2600
TDH	592.9	496.5	468.3	432.9	376.9	309.4	239.8
HP	141.2	185.2	204.2	216.8	220.9	218.7	211.6
PUMP EFF	0.0	74.5	81.1	85.7	86.2	82.2	74.4

CERTIFIED TEST RESULTS
BY Don Hall
TITLE Engineer
May 9, 1997
GOULDS PUMPS
TEXAS DIVISION

RECEIVED
JAN 13 1997
NORTH... REGION

Form 238-7
3/95

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Use Typewriter or Ballpoint Pen

097117

Office Use Only
Inspected by _____
Twp____ Rge____ Sec____
____1/4 ____1/4 ____1/4
Lat: : : Long: : :

1. DRILLING PERMIT NO. 95-96- -N -71
Other IDWR No. 95-08938

2. OWNER:
Name CITY OF COEUR d'ALENE
Address 710 MULLAN AVE
City COEUR d'ALENE State ID Zip 83814

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S

Twp. 51 North ☒ or South ☐
Rge. 4 East ☐ or West ☒
Sec. 36, SE 1/4 (10 acres) SE 1/4 (40 acres) SW 1/4 (160 acres)
Gov't Lot ____ County ____
Lat: : : Long: : :
Address of Well Site KATHLEEN + 4TH ST City COEUR d'ALENE
(Give at least name of road + Distance to Road or Landmark)

Lt.____ Blk.____ Sub. Name____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other____

6. DRILL METHOD
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
NEAT CEMENT	0	20	3 yds	TEMP. CASING

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 228
Was drive shoe seal tested? ☐ Y ☒ N How?____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
22"	208	218	.375	STEEL	☐	☒	☒	☐
22	271	291	.375	STEEL	☐	☒	☒	☐
					☐	☐	☐	☐

Length of Headpipe 10 FT Length of Tailpipe 20FT

9. PERFORATIONS/SCREENS
☐ Perforations Method____
☒ Screens Screen Type TELESCOPE X-HEAVY

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
218	231	80-100	80-100	22	S. STEEL	☐	☒
231	271	100-50	100-50	22	S. STEEL	☐	☒
						☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
191 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: 2" PIPE + THREADED CAP

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
1000	9' 10"	200' 10"	2 HR
2000	20' 11"	211' 11"	1 HR
2500	34' 6"	225' 6"	8 HR

Water Temp. 51° Bottom hole temp. 51°
Water Quality test or comments: GOOD
Depth first Water Encountered 207

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
30	0	20	SAND + GRAVEL 3" MINUS		X
24	20	65	SAND + GRAVEL 4" MINUS		X
24	65	148	SAND MED + GRAVEL 1" MINUS		X
24	148	165	SAND MED TO FINE		X
24	165	191	SANDY CLAY BRN		X
24	191	207	SANDY CLAY BLU		X
24	207	210	SAND MED TO FINE	X	
24	210	224	SAND + GRAVEL ½" MINUS	X	
24	224	230	SAND + GRAVEL 2" MINUS	X	
24	230	255	SAND + GRAVEL ½" MINUS	X	
24	255	271	SAND COARSE	X	
24	271	273	SAND + GRAVEL ½" MINUS	X	
24	273	275	SAND FINE + GRAY CLAY		X
24	275	293	SANDY CLAY - GRAY		X
24	293	300	SANDY CLAY - BRN		X

Completed Depth 291 (Measurable)
Date: Started 7-8-96 Completed 11-15-96

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

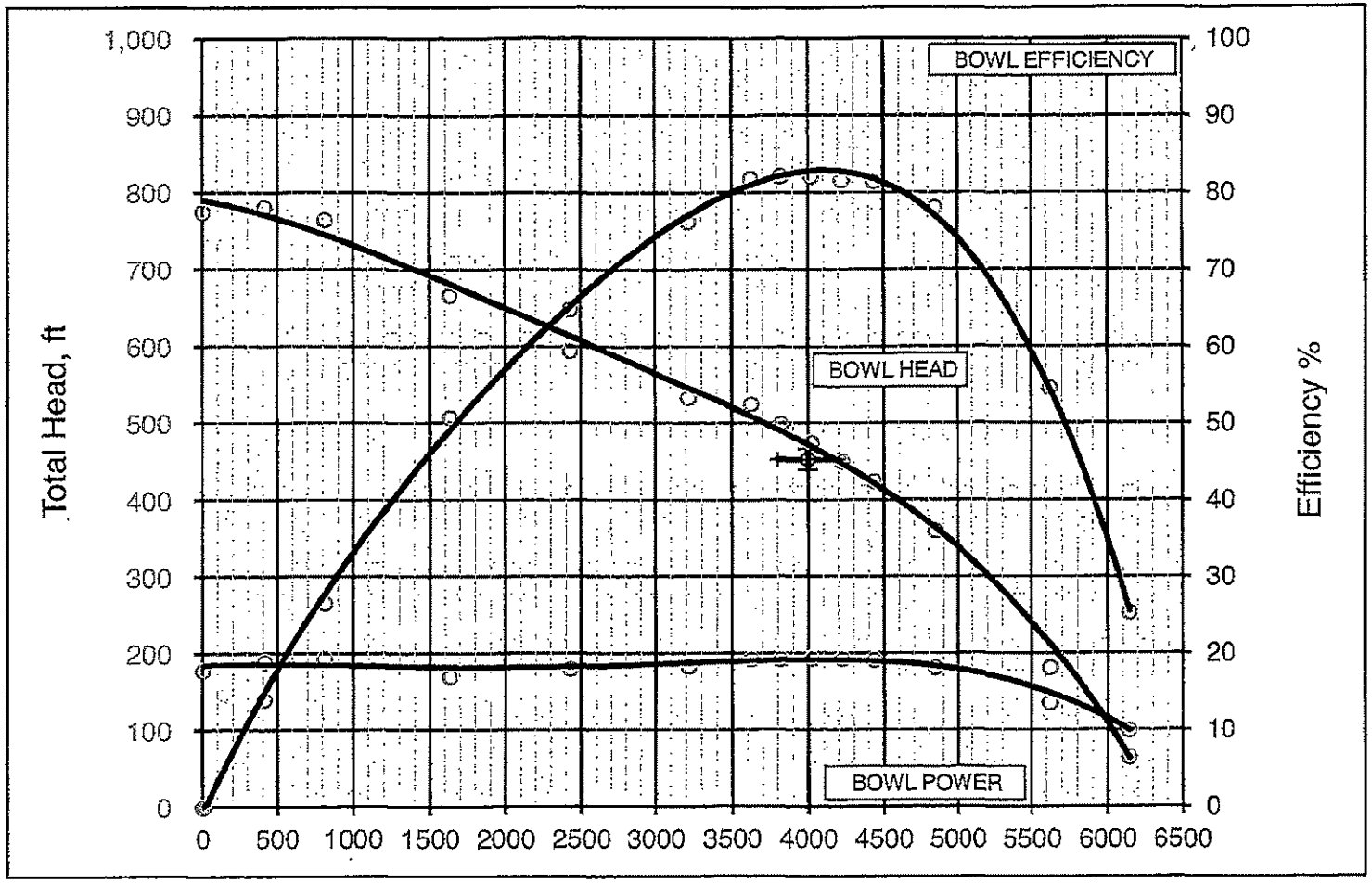
Firm Name HOLMAN DRILLING CORP Firm No. 108
Firm Official Ronald E. McGuire Date 12-13-96
and
Supervisor or Operator Hank Fleming Date 12/13/96
(Sign once if Firm Official & Operator)

SESESW 36 51N 4W

FORWARD WHITE COPY TO WATER RESOURCES

Huetter Well

Pump # 1 Tested trim 9.38



1B - bilateral tollerance

Capacity USGPM

Design Conditions	
4000 USGPM	452 Ft.

Certified Performance Test

By: Karl Launchbaugh Date: 27-Oct-21

FLOWSERVE

MODEL	15HH410
Speed	1775
Test and Curve Number	
15HH410AI19	

Huetter Pump Curve

Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 0082293
Drilling Permit No. 492143
Water right or injection well # 95-17815
2. OWNER: City OF Coeur D Alene
Name
Address Water Dept. 710 Mullan Ave
City Coeur D Alene State ID Zip 83814

3. WELL LOCATION:
Twp. 51 North ☒ or South ☐ Rge. 04 East ☐ or West ☒
Sec. 28 10 acres 1/4 40 acres 1/4 160 acres 1/4
Gov't Lot ____ County Kootenai
Lat. ____ ° ____ (Deg. and Decimal minutes)
Long. ____ ° ____ (Deg. and Decimal minutes)
Address of Well Site East of Huetter Rd.
1835 N Poline Ave (Give at least name of road + Distance to Road or Landmark) City Coeur D Alene I.D
Lot. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other ____

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other ____

6. DRILL METHOD:
☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other ____

7. SEALING PROCEDURES:

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
Bent. chips	0	115	276 bags	DRY

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
24"	+2	320	.50	Steel	☒	☐	☐	☒
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Was drive shoe used? ☐ Y ☐ N Shoe Depth(s) ____

9. PERFORATIONS/SCREENS:
Perforations ☐ Y ☐ N Method ____
Manufactured screen ☒ Y ☐ N Type Stainless Steel
Method of installation ____

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
320	363	.100	43	22"	SS	

Length of Headpipe 3' Length of Tailpipe ____
Packer ☒ Y ☐ N Type K packer

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG) ____
Describe control device ____

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 250 Static water level (ft) 262'
Water temp. (°F) ____ Bottom hole temp. (°F) ____
Describe access port ____

Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
3'	4000	4/20

Test method: Pump ☒ ☐ Bailer ☐ ☐ Air ☐ ☐ Flowing artesian ☐ ☐
Water quality test or comments: ____

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
36	0	55	GRAVELS Few cobbles		
30	55	115	silty sand		
			Some GRAVELS		
24	115	147	Silty SAND		
	147	180	GRAVELS		
	180	225	Boulders & Cobbles		
	225	363	GRAVELS and SAND		
			Water at 250'		

Completed Depth (Measurable): 363
Date Started: NOV 19 Date Completed: Feb 18, 20

14. DRILLER'S CERTIFICATION:
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.
Company Name O'Keefe Co. No. 2977
*Principal Driller Larry Gagnon Date Feb 24, 20
*Driller ____ Date ____
*Operator II ____ Date ____
Operator I ____ Date ____
* Signature of Principal Driller and rig operator are required.

Landings Pump Curve

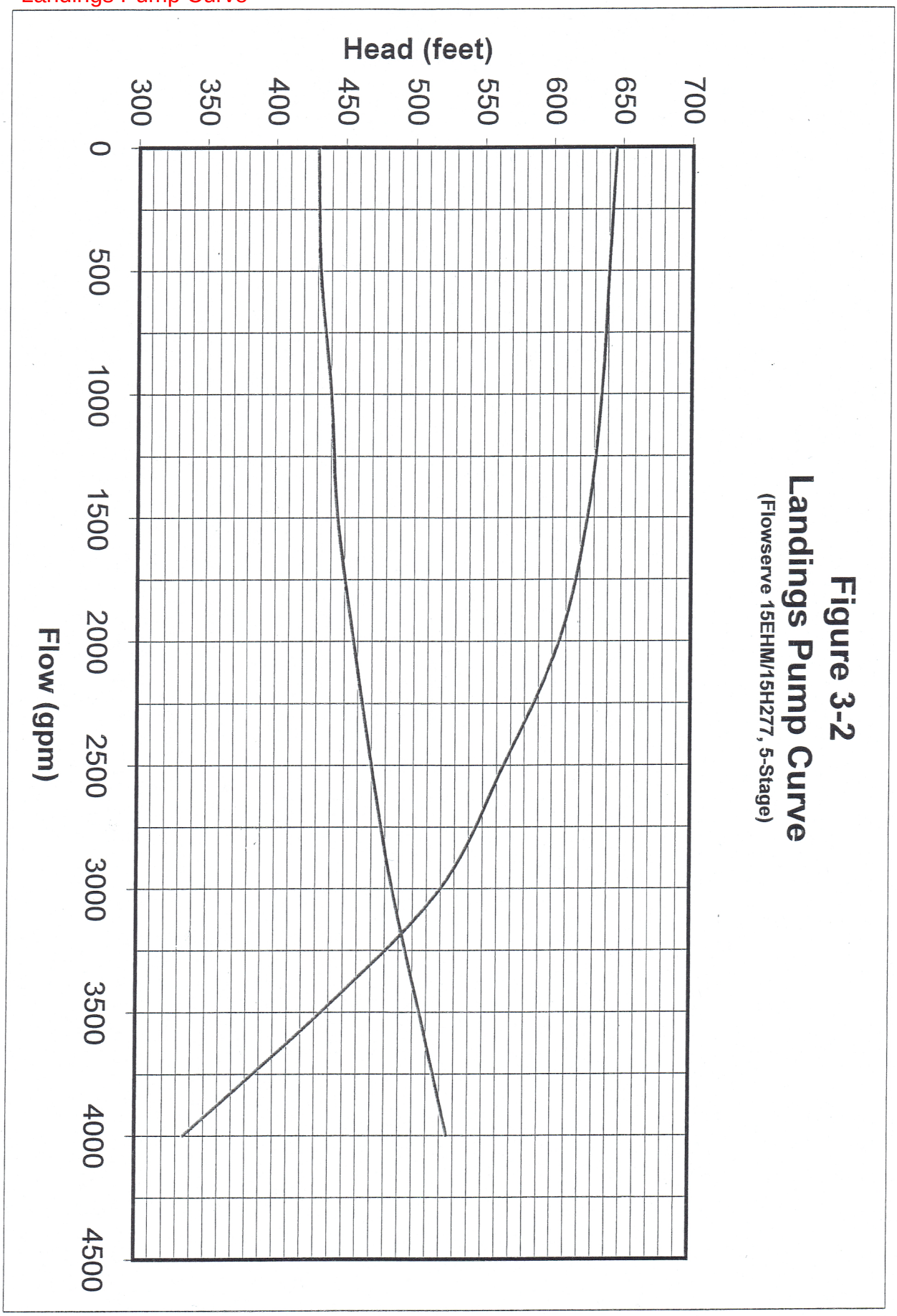


Figure 3-2
Landings Pump Curve
(Flowserve 15EHM/15H277, 5-Stage)

CHAPTER 3 - LANDINGS WELL HOUSE

3.1 Description

The Landings Well House is located in the northwest corner of Coeur d'Alene on Atlas Road just south of Prairie Avenue. The Landings Well House serves the City's upper pressure zone and is operated on water level signals from the Industrial Park standpipe. **Figure 1-1** shows the location of the Landings well in relation to the other City wells, while **Figure 3-1** shows the existing site plan. Water leaves the well house through a 16-inch ductile iron main, then enters an existing 16-inch PVC main that delivers water south on Atlas Road to the upper zone distribution system and storage. **Figure 3-1** shows the Landings Well site plan.

3.2 Landings Well Pump and Motor

The Landings well pump was supplied by Dickerson Pump manufactured by Flowserve.

Dickerson Pump	Flowserve
Chuck Goodman	Richard Audler
E. 3627 Broadway	2349 South Orange Avenue
Spokane, WA 99201	Fresno, CA 93725
Phone: 509-534-2671	Phone: 559-268-9243
FAX: 509-534-2616	FAX: 559-268-6709

The Landings well pump is a Flowserve Model 15 EHM, 5-stage, vertical line shaft rated at 3000 gpm at 512 feet TDH. The curve number for the pump provided is EC-2392. The motor is a 500 hp unit manufactured by U.S. Motors. The pump and motor at the Landings well operate at a constant speed. **Figure 3-2** shows the pump curve for the Landing Well

3.3 Operations—Landings Pumping System

Operation of the Landings well pump begins when a signal from the City's telemetry system indicates a pump-start elevation has been reached at the Industrial Park standpipe. The system operator selects pump-start and pump-stop elevations through the City's SCADA (telemetry) system interface at the Water Department office. These operational setpoints vary with season and are directly dependent on the water demands within the City.

3.4 Pump-Start Sequence

The pump-start sequence for the Landings well house includes several steps. Please refer to Sheet C6 of the **Record Drawings** in **Appendix A** for specific appurtenances described in the list below, which describes the steps involved with each pump-start.

Form 238-7
6/02

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Well ID No.
Inspected by
Twp ____ Rge ____ Sec ____
____ 1/4 ____ 1/4 ____ 1/4
Lat: : : Long: : :

1. WELL TAG NO. D 0033506
DRILLING PERMIT NO. 810406
Water Right or Injection Well No.

2. OWNER:
Name City of Coeur d Alene
Address 3800 Ramsey Rd
City Coeur d Alene State ID Zip 83815

3. LOCATION OF WELL by legal description:
You must provide address or Lot, Blk, Sub. or Directions to well.
Twp. 51 N North ☐ or South ☐
Rge. 4 W East ☐ or West ☐
Sec. 28, NE 1/4 (10 acres) NE 1/4 (40 acres) ____ 1/4 (160 acres)
Gov't Lot ____ County Kootenai
Lat: : : Long: : :
Address of Well Site Prairie Ave - Atlas Rd Landings
(Give at least name of road + Distance to Road or Landmark) City Coeur d Alene
Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD:
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

Seal Material	From	To	Weight / Volume	Seal Placement Method
bentonite	0	60	8 lb	Tremie

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 340
Was drive shoe seal tested? ☐ Y ☒ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
24"	+2	340	.325	Steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe 10' Length of Tailpipe 10'
Packer ☒ Y ☐ N Type Neoprene 333'

9. PERFORATIONS/SCREENS PACKER TYPE
Perforation Method ____
Screen Type & Method of Installation 304 Stainless

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
345	395	80		22"	Stainless	☐	☐
						☐	☐
						☐	☐

10. FILTER PACK

Filter Material	From	To	Weight / Volume	Placement Method
N/A				

11. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
282 ft. below ground Artesian pressure ____ lb.
Depth flow encountered 320 ft. Describe access port or control devices: ____

51N 4W 28

12. WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
3400	14'	296	4 hr

Water Temp. ____ Bottom hole temp. ____
Water Quality test or comments: good
Depth first Water Encounter 320

13. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
30"	0	60	Brown silty sand - gravel cobbles		X
24"	60	320	Brown silty sand & gravel cobbles		X
24"	320	410	Sand - gravel cobbles water	X	

RECEIVED
SEP 20 2004
IDWR/North

RECEIVED
OCT 01 2004
IDWR/North

Completed Depth 405 (Measurable)
Date: Started 5/18/04 Completed 8/27/04

14. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name Holt Drilling Inc Firm No. 596
Principal Driller Wade Iversen Date 9/9/04
and
Driller or Operator II Wade Iversen Date ____
Operator I ____ Date ____
Principal Driller and Rig Operator *Required*.
Operator I must have signature of Driller/Operator II.

FORWARD WHITE COPY TO WATER RESOURCES

Locust Pump Curve

STERLING

Sterling Fluid Systems (USA), Inc

P O Box 7026, Indianapolis, Indiana, 46202

Customer : Welch Comer
1626 Lincoln Way
Couer d' Alene, ID
83814

Contact : Steve Cordes
Phone : 208-664-5946 **Fax :** 208-664-9382
Date : Tuesday, January 21, 2003

Project : Locust Well for the City of Couer d' Alene
Quote No. : US-6965-8 **Page No :** 1

Pump Model: **Peerless Vertical - 14HH 7 Stages**
Nom. Speed: **1770 RPM, 60 Hz Electric**

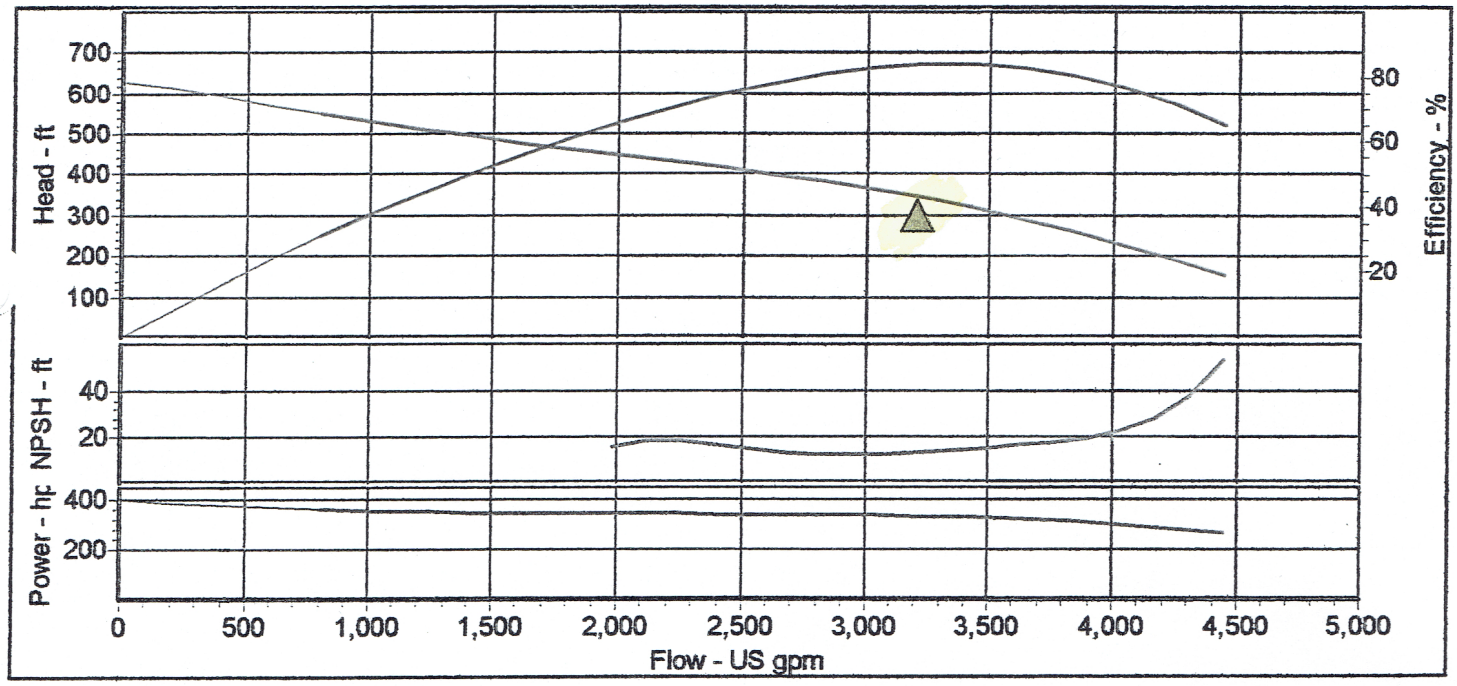
Market : **Vertical Turbine Pump**
Impeller No.: **2621959 / HC**
Material Spec. Group: **A - B: CIE; I: Brz = Standard**

Item : 1
Your Ref. :

Fluid: Water
Viscosity: 1.007 cSt
Sp. Gravity: 1

Flow rate Q:	3200 US gpm
Bowl Total Head:	337 ft
Efficiency :	84.1 %
Power Required :	332.73 hp
NPSH Required :	12.944 ft

Performance curve according to Hyd Inst-Peerless Std

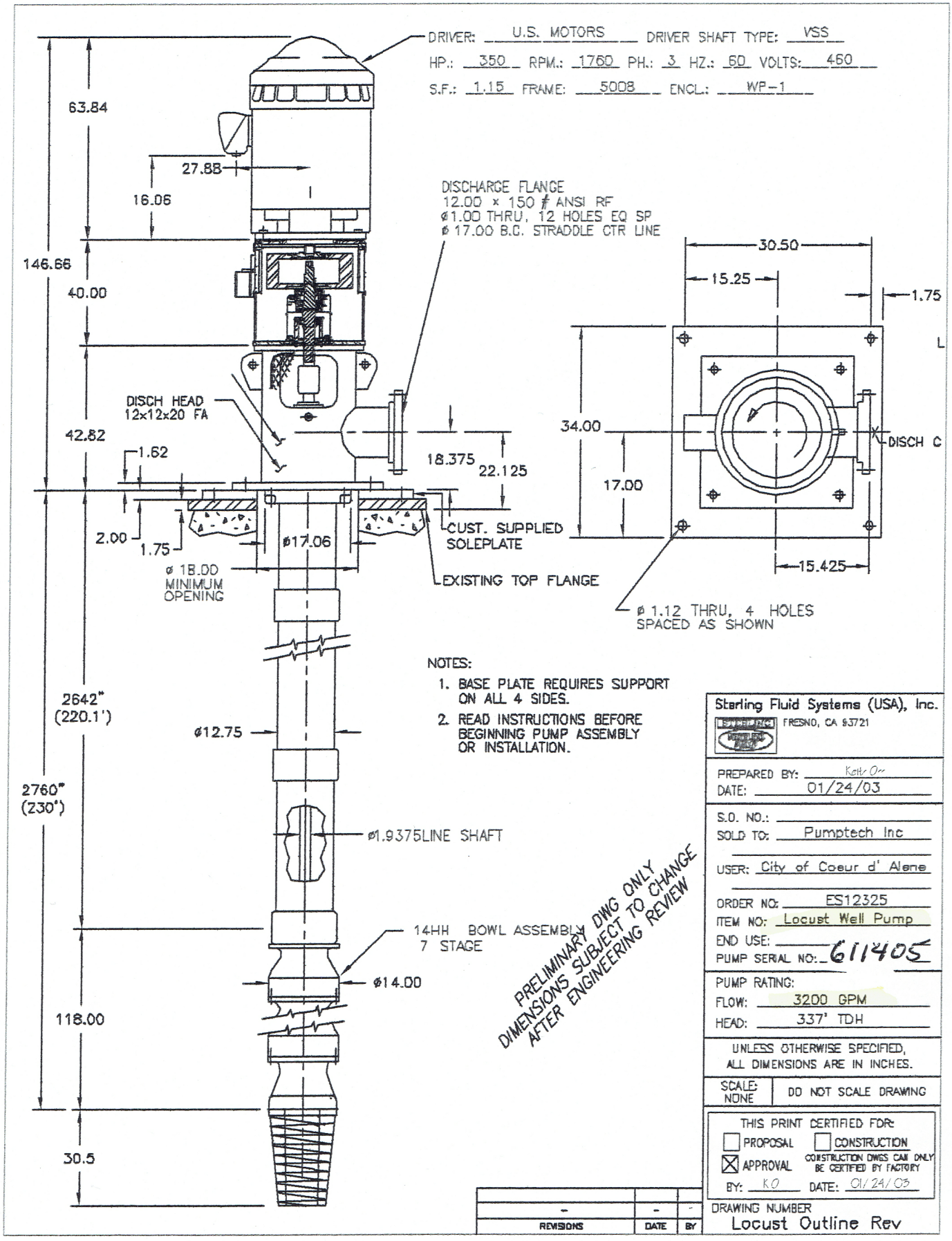


Comments

Refer to factory for all single point bowl performance guarantees. Pumps must be selected with Hydraulic Institute-Peerless Std. See Std Hydraulic Performance document in RAPID for testing tolerances & contractual guarantees.

Flow (US gpm)	Head (ft)	Pump Efficiency (%)	Power Required (hp)	NPSH Required (ft)	Thrust (lb)
0.0	628.79	0.0	403.58		18543.09
555.4	576.40	21.9	369.85		16224.61
1110.8	520.45	41.3	353.49		13845.84
1666.2	472.23	57.5	345.70		12213.16
2221.6	430.58	70.7	341.65	18.06	10977.54
2777.0	386.90	80.3	337.97	12.28	9531.95
3332.4	330.18	84.2	330.13	13.91	7503.65
3887.8	252.02	79.8	309.91	19.31	5036.94
4443.2	151.66	64.7	262.82	52.83	2702.14

Locust Well


DRIVER: U.S. MOTORS DRIVER SHAFT TYPE: VSS
HP.: 350 RPM.: 1760 PH.: 3 HZ.: 60 VOLTS: 460
S.F.: 1.15 FRAME: 5008 ENCL.: WP-1
63.84
27.88
16.06
146.66
40.00
DISCHARGE FLANGE
12.00 x 150 # ANSI RF
ø1.00 THRU, 12 HOLES EQ SP
ø 17.00 B.C. STRADDLE CTR LINE
30.50
15.25
1.75
L
DISCH HEAD
12x12x20 FA
42.82
1.62
18.375
22.125
34.00
17.00
DISCH C
2.00
1.75
ø17.06
CUST. SUPPLIED
SOLEPLATE
ø 18.00
MINIMUM
OPENING
EXISTING TOP FLANGE
15.425
ø 1.12 THRU, 4 HOLES
SPACED AS SHOWN
NOTES:
1. BASE PLATE REQUIRES SUPPORT ON ALL 4 SIDES.
2. READ INSTRUCTIONS BEFORE BEGINNING PUMP ASSEMBLY OR INSTALLATION.
2642"
(220.1')
ø12.75
2760"
(230')
ø1.9375LINE SHAFT
14HH BOWL ASSEMBLY
7 STAGE
ø14.00
118.00
30.5
PRELIMINARY DWG ONLY
DIMENSIONS SUBJECT TO CHANGE
AFTER ENGINEERING REVIEW
Sterling Fluid Systems (USA), Inc.
FRESNO, CA 93721
PREPARED BY: Keh Or
DATE: 01/24/03
S.O. NO.:
SOLD TO: Pumptech Inc
USER: City of Coeur d' Alene
ORDER NO: ES12325
ITEM NO: Locust Well Pump
END USE:
PUMP SERIAL NO: 611405
PUMP RATING:
FLOW: 3200 GPM
HEAD: 337' TDH
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES.
SCALE: NONE
DO NOT SCALE DRAWING
THIS PRINT CERTIFIED FOR:
PROPOSAL
CONSTRUCTION
APPROVAL
CONSTRUCTION DWGS CAN ONLY BE CERTIFIED BY FACTORY
BY: KO DATE: 01/24/03
DRAWING NUMBER
Locust Outline Rev
REVISIONS
DATE
BY

202 overall.

RECEIVED
JAN 2 5 1960
Department of Reclamation

WELL LOG AND REPORT TO THE STATE RECLAMATION ENGINEER OF IDAHO

Log No. 025964
Rec. ____, 19____
Well No. 95-55-N-1
Permit No. 2-25-67

025964

(DO NOT FILL IN)

Owner Idaho Water Co. Address Coeur d'alene, Idaho

Driller C. F. Walker. Address Post Falls, Lic. No. log. 123

Location of Well: NW ¼ SW ¼ Sec. 12, T. 50 N., R. 4 W., B. M.

and ____ feet N/S, and ____ feet E/W from ____ Corner of ____ ¼ ____ ¼ Sec. ____

Size of Drilled Hole 24" Total depth of Well 202.

Give depth of standing water from surface 148. Water Temp. 51 °Farenheit

On pumping test delivery was 1500 g.p.m. or ____ c.f.s. Drawdown was none feet.

Size of pump and motor used to make the test 150 H.P. Byron Jackson Turbine

Length of time pumped during check was 8 hr., ____ minutes.

If flowing well, give flow in c.f.s. ____ or g.p.m. ____ and shut in pressure ____

If flowing well, describe control works ____
(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for Domestic Weight of casing per linear foot ____

Thickness of casing ¼ Casing material Steel Pipe.
E.G., PIPE, CONCRETE, WOOD.

Diameter, length and location of casing 24" Dia. ¼ Wall. 202 ft.
(CASING 12" IN DIAMETER AND UNDER GIVE INSIDE DIAMETER; CASING OVER 12" IN DIAMETER GIVE OUTSIDE DIAMETER.)

Number and size of perforations 700 slots ¼" X 4" located from 176 feet to 200. feet from surface of ground.

Other perforations ____

Date of commencement of well May 1 1955 Date of completion of well July 1 1955

Type of well rig ____

CASING RECORD

DIAM. CASING	FROM FEET	TO FEET	LENGTH	"REMARKS" -- SEALS, GROUTING, ETC.
24"	0	202	202	

GENERAL INFORMATION—Pumping Test, Quality of Water, Etc.

Hand Dug. 32'x32" Lower. Timbered.
Casing Rest on and back filled with
material from excavation.

NW SW S12 50N4W

95

025965

WELL LOG

From Feet	To Feet	Type of Material	Drilling Time Hrs.	Drilling Time Min.	Water-bearing Formation Ans. Yes or No	Casing Perforated Ans. Yes or No
0	10	Sand				
10	20	"				
20	30	"				
30	40	"				
40	50	"				
50	60	"				
60	70	"				
70	80	loose pea gravel				
80	90	" " "				
90	100	" " "				
100	110	" " "				
110	120	pea gravel with lime dynamite				
120	130	" " " " "				
130	140	" " " " "				
140	150					
150	160	" " " " "				
160	170					
170	180	" " " " "				
~~180~~	~~190~~					
190	200	" " " " "				
~~200~~	~~202~~					
		If more space is required use Sheet No. 2				

WELL DRILLERS STATEMENT

This well was drilled under my jurisdiction and the above information is true and correct to the best of my knowledge and belief.

Signed E. J. Waller

By .....

Dated Jan 18, 1960.

License No. ~~168~~ 123

COEUR D`ALENE ID
PRAIRE PUMPING STATION
500 HP DEEP WELL PUMP

PUMP TEST: PC # 24208

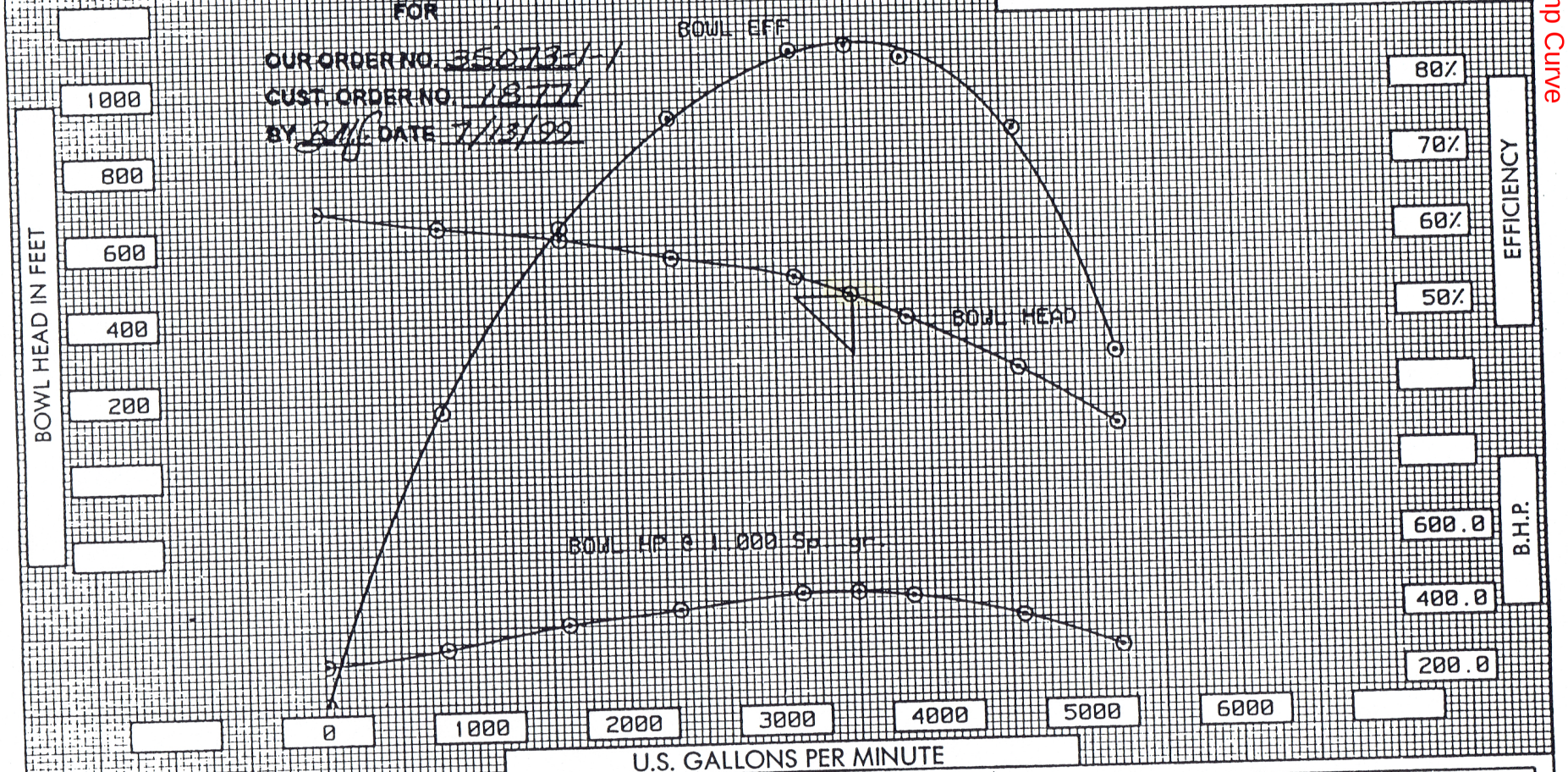
CERTIFIED CORRECT

FOR

OUR ORDER NO. 35073-1-1

CUST. ORDER NO. 43-771

BY [signature] DATE 7/13/99



R.C. WORST & COMPANY
625 BEST AVE.
COEUR D`ALENE ID 83814

DWG. NO. 35073-1-1-T1 REV.#-1

FLOWAY PUMPS
FRESNO, CALIFORNIA

A WICOR COMPANY

TYPE 16 MKM
NO. OF STAGES 6
R.P.M. 1785
PUMP SERIAL NO. 35073-1-1

DWN. BY B.M.S. DATE 13-Jul-99

PF-614

Prairie Pump Curve

Prairie Well

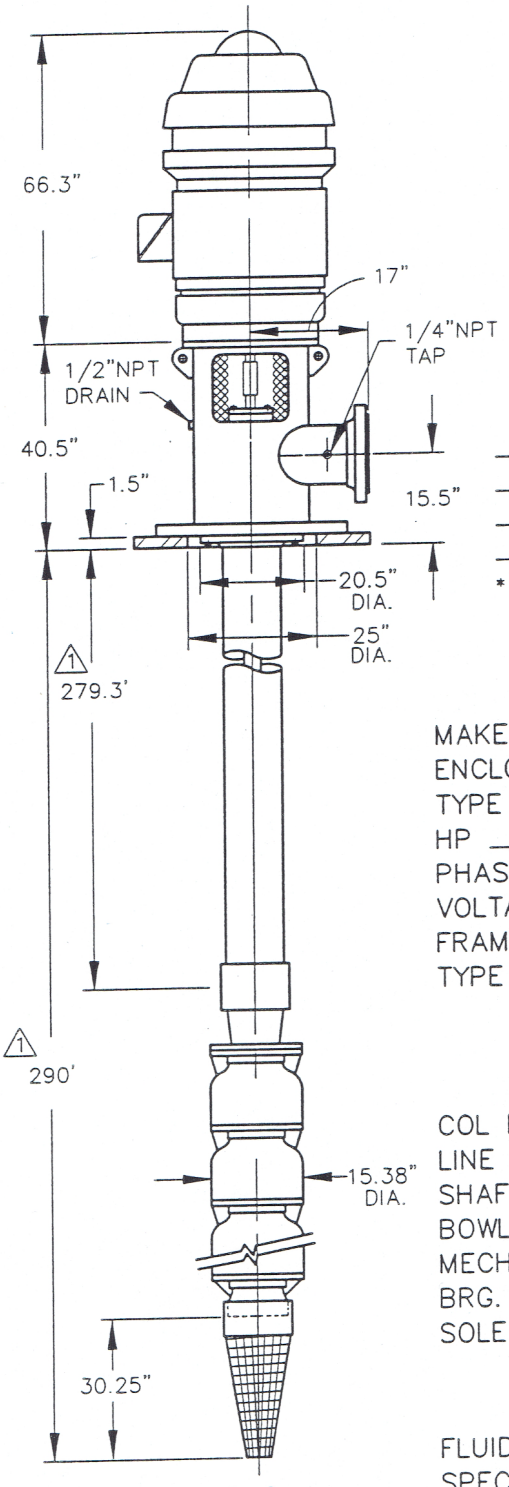
D-1093-T

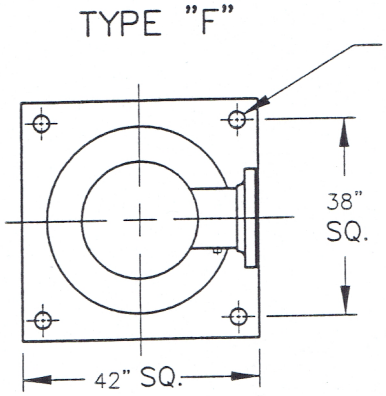
FLOWAY PUMPS

FRESNO, CALIFORNIA

VERTICAL TURBINE PUMP

TYPE "F"





DISCHARGE

12"– 300# –R.F.ANSI. FLG.

(16)– 1.25" DIA. HOLES *

17.75" DIA. BOLT CIRCLE

20.5" DIA. FLANGE

* BOLT HOLES STRADDLE VERTICAL ℄

THIS DRAWING IS CERTIFIED

☐ FOR APPROVAL
NO PRODUCTION WILL START UNTIL APPROVED IN WRITING.

☐ FOR CONSTRUCTION
PRODUCTION HAS STARTED. ANY CHANGES MAY AFFECT PRICE AND DELIVERY.

OUR ORDER No.: 35073

CUST. ORDER No.: 18771 1

BY: HP DATE: 7-14-99

EST. WEIGHT 30,000 lbs

EST. DOWN THRUST 13,458 lbs

MOTOR

MAKE GENERAL ELECTRIC

ENCLOSURE WP–1

TYPE VHS NRR YES

HP 500 RPM 1785

PHASE 3 HERTZ 60

VOLTAGE 460

FRAME NO. L509TP24 1

TYPE COUPLING THREADED

PUMP

12"x24.5" "F" STL. DISCH HD.

2.25" LINE SHAFT 12" COL

--- SHAFT TUBE

PROD.LUBE YES OIL LUBE NO

TYPE 16 MKM STAGE 6

2 3500 GPM 450' BOWL HD

IMPELLER ENCLOSED

STRAINER YES

MATERIAL

COL PIPE A53–GR.B SCH.30 STL

LINE SHAFT A108–GR.1045 STL

SHAFT TUBE ---

BOWL SHAFT A582–416 SS

MECH. SEAL JC #5610 1

BRG. RETAINER A536–GR.60 DI

SOLE PLATE A516–GR.70 STL

PUMP BOWL A48–CL.30 CIE

IMPELLER B584–838 BRZ

BEARINGS (BOWL) B505–932 BRZ

BEARINGS (LINESHAFT) NEOPRENE

STRAINER GALV. STL

BOWL W/R STAINLESS STEEL

IMPELLER W/R ---

FLUID WATER

SPEC. GRAVITY 1.0

VISCOSITY ---

TEMPERATURE AMBIENT

PH ---

CUSTOMER CITY OF COEUR d' Alene
PRAIRE PUMP STATION

ORDER NO. 18771 1

SUPPLIER R.C. WORST & COMPANY INC 1
625 BEST AVENUE
COEUR D'ALENE, ID 83814

DWG. NO. 3507301COD

SERIAL NO. 35073–1–1

A WEIR COMPANY

REMARKS

NO. UNITS REQ'D. 1

DEEP WELL PUMP

2 REV #2, MWA 7/14/99

1 REV #1, MWA 5/18/99

By : MWA/MFC Date : 3/18/99

NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED

3507301COD

LAB TEST REPORT

FLOWAY PUMPS, FRESNO, CALIFORNIA

COMMENTS:

DATE 6-11-99 TEST NO. PC- 24208 CUSTOMER P.C. Worst & Co S/N # 35073-1-1

PUMP DESCRIPTION 16 MKM NO OF STAGES 6STG's COL. SIZE & LENGTH 12"x10'LG SHAFT SIZE 2"

HEAD SIZE & TYPE 12"x24½"C BOWL (O.L.) IMPELLER (~~BRONZE~~) (ENCLOSED) (BRZ.) #7 POLISH IMPELLER DIA 10.650 U.F STD

MOTOR DATA: MAKE LAB SERIAL NO #7 HP 125 POLES 6 PH 3 HZ 60 VOLTS 460 TYPE X-H.S.

METER SIZE & TYPE: 12"x6" GAGE DESCRIPTION 300#/100# AXIAL ADJUSTMENT @1½ (TURNS) ~~MARKS~~ 8 TPI

MANIFOLD ADAPTER: SIZE 12"x14" OFFSET ☐ STRAIGHT ☒

TIME: START 7:90 AM FINISH 7:55 AM

	TEST RPM	MANOMETER READING IN GPM	TOTAL GPM READING x 5957	GPM @ 1785 RPM K=	PRESSURE GAGE	DISCHARGE GAGE READING IN P.S.I.	DISCHARGE GAGE CORRECTION	TOTAL P.S.I.	(A) GAGE HEAD IN FEET	(B) SYSTEM LOSSES IN FEET	(C) GAGE ELEV. IN FEET	(D) VELOCITY HEAD IN FEET	TOTAL HEAD IN FEET (A)+(B)+(C)+(D)	HEAD IN FEET @ 1785 RPM K²=	POWER METER RDGS ~~HP~~ KW (REF ONLY)	(T) SCALE READING IN LBS	(U) SCALE DEAD WT IN LBS	(V) TOTAL SCALE WT IN LBS = (T) + (U)	(W) CORR SCALE WT CORR FACTOR = x (V)	(X) COUNTER DEAD WEIGHT IN LBS	(Z) CORR DEAD WT CORR FACTOR = x (X)	TOTAL LBS = (W) + (Z)	BHP	BHP @ 1785 RPM K=	BHP @ 1.000 SPEC GRAVITY		EFFICIENCY		
1	1193	0			300#	140.3	-.10				5.11			105.13	78.4	61.2				263.6									
2	1192	550				130.5	-.10							117.73	87.8	40.7				327.9									
3	1190	1100				122.8	-.10							131.31	102.4	102.1				↓									
4	1189	1600				111.7	-.15							148.44	110.7	73.5				393.9									
5	1188	2150				100.1	-.20							161.05	120.1	46.2				440.8									
6	1188	2400				90.1	-.25							161.18	120.2	46.4				↓									
7	1188	2650			100#	77.3	.00							157.03	117.1	34.8				393.9									
8	1190	3150				49.4	.00							137.58	102.6	39.4				263.6									
9	1193	3600				19.0	-.10				↓			109.73	81.1	78.6													
10																													
11																													
12																													
13																													
14																													

FORMULAE: GAGE HEAD P.S.I. x 2.3105 BHP = RPM x TOTAL LBS. / SCALE CONSTANT — SCALE CONSTANT ☒ 4039 TT #1 ☐ 4185 TT #2 EFF = TOTAL HEAD GPM / BHP (3960) K = JOB SPEED / TEST RPM

CONDITION POINT: ~~3600~~ 3500 7/13/99 GPM @ ~~46.60~~ 450 ~~60~~ T.D.H. @ 1785 RPM

NOTES:

TESTED BY: [signature] DATE: 6-11-99 WITNESSED BY: DATE:

TURN TABLE HT ____ COUNTER WEIGHT PULLEY HEIGHT ____

SCALE PULLEY HT ____ COUNTER WEIGHT PULLEY DIFF HT ____

SCALE PULLEY DIFF. HT ____

TEST EQUIPMENT

DESCRIP	EQUIP NO	CALIB	DUE DATE
300#	TL/1206	5-28-99	6-29-99
100#	TL/1259	5-26-99	6-26-99
SCALE	TL/1800	5-3-99	8-3-99
AIR PAX	TL/2032	SELF/CALL	SELF/CALL

PG 1 OF 1

TL-003RO

Prairie Well

Form 238-7
11/97

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

Office Use Only
Inspected by TDK
Twp 51N Rge 04W Sec 26
SW 1/4 SW 1/4 NE 1/4
Lat: : : Long: : :

95466

1. WELL TAG NO. D 0005794
DRILLING PERMIT NO. 95-99-N-0017-000
Other IDWR No. water Right #95-09007

2. OWNER:
Name City of Coeur D Alene
Address 710 Mullan Ave
City Coeur d Alene State Id Zip 83814

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S

Twp. 51 N North ☐ or South ☐
Rge. 04 W East ☐ or West ☐
Sec. 26, SW 1/4 (10 acres) SW 1/4 (40 acres) NE 1/4 (160 acres)
Gov't Lot ____ County Kootenai
Lat: : : Long: : :
Address of Well Site Wilbur St. 1/4 mile west of Highway 95 City Coeur d Alene
(Give at least name of road + Distance to Road or Landmark)

Lt. ____ Blk. ____ Sub. Name ____

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other ____

5. TYPE OF WORK check all that apply (Replacement etc.)
☒ New Well ☐ Modify ☐ Abandonment ☐ Other ____

6. DRILL METHOD
☐ Air Rotary ☒ Cable ☐ Mud Rotary ☐ Other ____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
Cement grout	0	20	26 sks	slurry

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 292'
Was drive shoe seal tested? ☐ Y ☒ N How? ____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
24	+2	292	.375	Blank Steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe 10' Length of Tailpipe 20'

MICROFILMED AUG 25 1999

RECEIVED MAY 12 1999 Department of Water Resources

9. PERFORATIONS/SCREENS
Perforations Method ____
Screens Screen Type Johnson 304 Stainless

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
295	310	150		22"	Stainless	☐	☐
310	345	100		22"	Stainless	☐	☐
345	370	20		22"	Stainless	☐	☐

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
252 ft. below ground Artesian pressure ____ lb.
Depth flow encountered ____ ft. Describe access port or control devices: 2" threaded plug

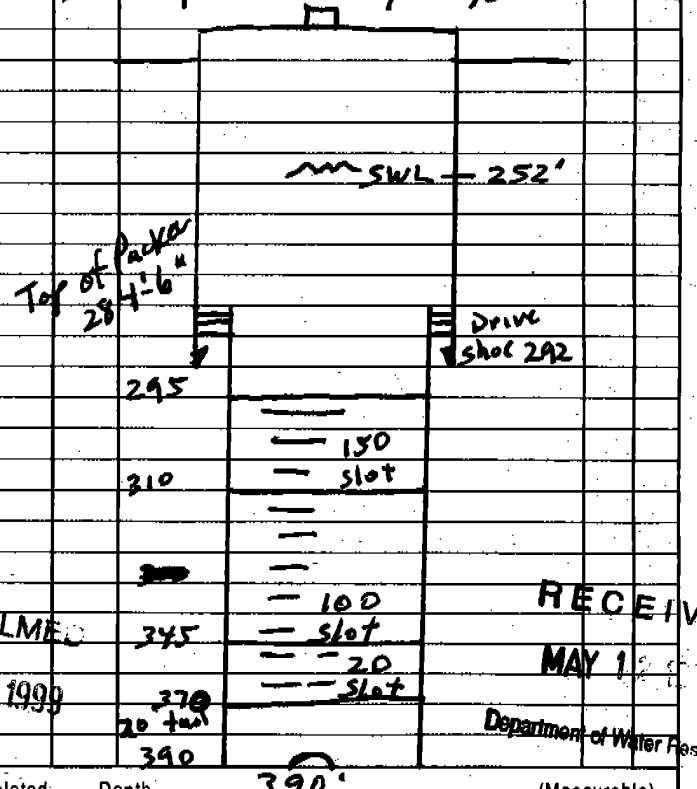
11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
4011	1'	253	6 hrs

Water Temp. very cold Bottom hole temp. ____
Water Quality test or comments: very clear no sand
Depth first Water Encounter ____

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
8					
30"	0	6	Brown silty sand + gravel		
30"	6	22	Brown sand + gravel		
24"	22	132	Brown sand + gravel cobbles		
24"	132	260	Brown silty sand + gravel cobbles		
24"	260	332	Brown sand + gravel some silt	X	
24"	332	413	Gray sand + silt		
24"	413	425	Gray sand + silty clays		



Completed Depth 390' (Measurable)
Date: Started 2-22-99 Completed 5-1-99

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

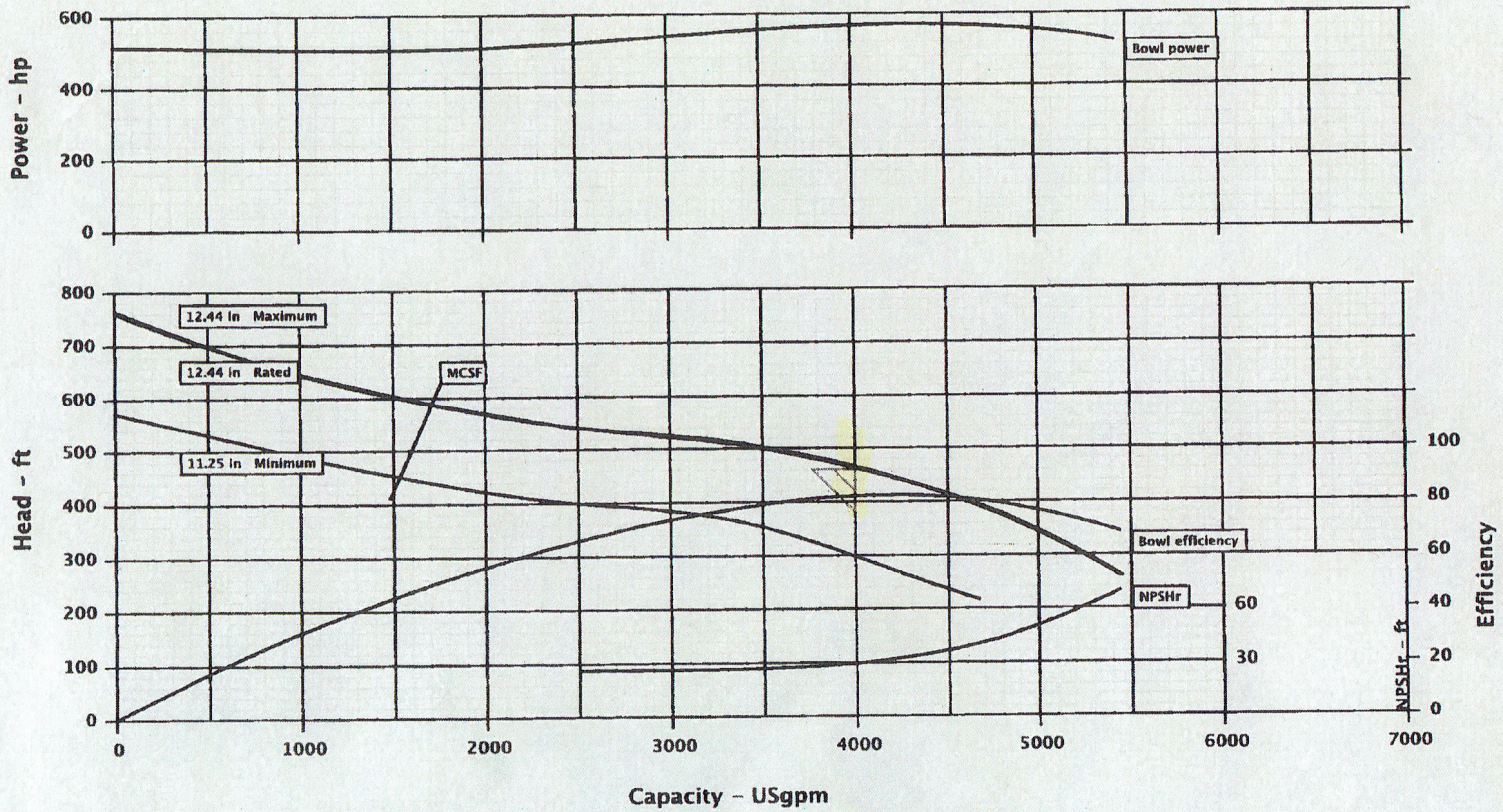
Company Name Holt Drilling Inc Firm No. 596
Firm Official Randy Holt Date 5-6-99
and
Driller or Operator Wade Iversen Date 5-6-99
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Customer	: Flowserve			Pump size & type	: 16ENH
Item number	: -			Based on curve no.	: EC-1822
Service	: Coeur D' Alene - Atlas			Number of stages	: 5
Flowserve reference	: Default 0.1			Test tolerance	: Hydraulic Institute Level A
Date	: February 10, 2014	Capacity	: 4000.0 USgpm	Specific gravity	: 1.000
		Head	: 461.00 ft	Pump speed	: 1785 rpm

CURVES ARE APPROXIMATE. PUMP IS GUARANTEED FOR ONE SET OF CONDITIONS: CAPACITY, HEAD, AND EFFICIENCY

Bowl performance shown below is corrected for materials, viscosity and construction.



Bowl head of 463.05 ft corresponds with 461.0 ft head at low liquid level adjusted for elevation and friction losses.

FlowSelex v2.2

Ralph Capaul Well

RALPH CAPAUL WELL

FLOWSERVE PUMP GROUP
PUMP INSPECTION & START-UP

PUMP NAMEPLATE DATA

Size & Type 16ENH
Serial No. 1405CGC91770-1
Liquid Water
Tag No. GC91770-001
Discharge Head 14W Ft.
Discharge Head 150 PSI

Driver-Mfg. US Motors
Driver-HP 600 HP
Motor Enclosure WPI
Volts 460
Phase 3Ø
Hertz Cycles 60 Cx.

INSTALLATION

1. Are suction and discharge pipes independently supported? (NOT by pump)
   Yes ✓ No
2. Were suction and discharge pipe flanges carefully aligned with discharge head flanges?
   Yes ✓ No
   Comments:
3. Does rotating element turn freely? Does it coast to a stop after being rotated?
   Comments: yes
4. Is direction of rotation correct? (Agrees with nameplate.)
   Yes ✓ No
5. Has impeller lift been checked?
   Yes ✓ No
   Lift = 3/8" (Measured By Derek Socci)

Ralph Capaul Well

OPERATION

Liquid pumped Water Specific Gravity 1

Suction pressure In Well 0

Discharge pressure 85 PSI

Distance from liquid level to centerline of discharge _____

GENERAL

1. Have operating and maintenance procedures been reviewed and discussed with customer's personnel?
   Yes ✓ No _____
2. Have customer's personnel received operating and maintenance instructions?
   Yes ✓ No _____
3. Does customer have adequate spares for wearing parts?
   Yes ✓ No _____
   If not, have parts been ordered?
   Yes _____ No ✓
4. Overall appearance, OK ✓ Transit Damage _____
5. Does customer want serviceman to call? NO When? _____
6. Miscellaneous comments below:

Specialty Pump Service Inc. Distributor

(Signed) _____ Flowserve Co. Date 12/4/14

(Signed) _____ Customer Date _____

Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 006173
Drilling Permit No. 829660
Water right or injection well #

2. OWNER: COEUR d' ALENE
Name
Address 710 E MULLAN
City COEUR d' ALENE State IDAHO Zip 83816

3. WELL LOCATION:
Twp. 51 North ☒ or South ☐ Rge. 4 East ☐ or West ☒
Sec. 27 SW 10 acres 1/4 SW 40 acres 1/4 ____ 160 acres 1/4
Gov't Lot ____ County KOOTENAI
Lat. 47 ° 43.908 (Deg. and Decimal minutes)
Long. 116 ° 49.73 (Deg. and Decimal minutes)
Address of Well Site ATLAS ROAD
(Give at least name of road + Distance to Road or Landmark) City COEUR d'ALENE
Lot. ____ Blk. ____ Sub. Name

4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other

5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other

6. DRILL METHOD:
☐ Air Rotary ☐ Mud Rotary ☒ Cable ☐ Other

7. SEALING PROCEDURES:

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
BENTONITE CHIPS	0	60	7600 LBS.	POUR

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
~~22"~~	~~+2'-6"~~	3			☐	☐	☐	☐
24	+2'-6"	316'-9"	.375	STEEL	☒	☐	☐	☒
					☐	☐	☐	☐
					☐	☐	☐	☐

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 316'-9"

9. PERFORATIONS/SCREENS:
Perforations ☐ Y ☒ N Method
Manufactured screen ☒ Y ☐ N Type JOHNSON
Method of installation LOWERED WITH HOOK ON DRILL STEM

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
316'-9"	357'-5"	.120	40'-8"	22"	304 STAINLESS	.5
357'-5	377'-9"	.130	20'-4"	22"	304 STAINLESS	.5

Length of Headpipe 5'-6" Length of Tailpipe 5'
Packer ☒ Y ☐ N Type RUBBER

10. FILTER PACK:

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG)
Describe control device

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 260 Static water level (ft) 260
Water temp. (°F) 56° Bottom hole temp. (°F) 56°
Describe access port 2" COUPLING WITH PLUG

Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)
2.33	4000	200

Test method:

Pump	Bailer	Air	Flowing artesian
☒	☐	☐	☐
☐	☐	☐	☐

Water quality test or comments:

13. LITHOLOGIC LOG and/or repairs or abandonment:

Bore Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
30"	0	15	BROWN SAND & GRVLS.		X
30"	15	60	BROWN SAND, GRVLS. COBBLES		X
			+ BOULDERS		
24"	60	149	BLACK/GRAY FINE-MED SAND,		X
			GRVLS, + COBBLES		
24"	149	260	BROWN SILT BOUND SAND & GRVLS.		X
24"	260	285	BROWN SILTY SAND + GRVLS.	X	
24"	285	360	GRAY FINE-COARSE SAND & GRVLS.	X	
24"	360	383	BROWN FINE-COARSE SAND+GRVLS	X	

Completed Depth (Measurable): 382'-9" FROM GRND.
Date Started: 8-7-14 Date Completed: 1-4-14

14. DRILLER'S CERTIFICATION:
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Company Name HOLT SERVICES INC. Co. No. 596
*Principal Driller [signature] Date 1-17-14
*Driller [signature] Date 1-17-14
*Operator II Date
Operator I Date

* Signature of Principal Driller and rig operator are required.

REPORT OF WELL DRILLER
State of Idaho

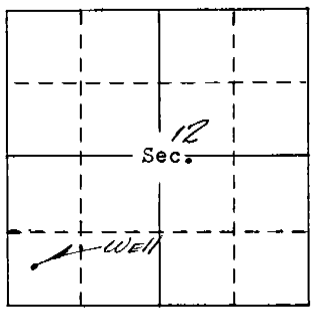
ENT'D

RECEIVED
DEC 16 1966
Department of Reclamation

State law requires that this report shall be filed with the State Reclamation Engineer within 30 days after completion or abandonment of the well.

WELL OWNER:
Name IDAHO WATER Co
Address COEUR D'ALENE IDAHO
95-66-N-4
Owner's Permit No. 23413
NATURE OF WORK (check): Replacement well ☐
New well ☒ Deepened ☐ Abandoned ☐
Water is to be used for: MUNICIPAL SUPPLY
METHOD OF CONSTRUCTION: Rotary ☐ Cable ☒
Dug ☐ Other (explain)
CASING SCHEDULE: Threaded ☐ Welded ☒
20 "Diam. from +2 ft. to 218.6 ft.
18" "Diam. from 261 ft. to 267 ft.
"Diam. from ft. to ft.
"Diam. from ft. to ft.
Thickness of casing: .375 Material:
Steel ☒ concrete ☐ wood ☐ other ☐
PERFORATED? Yes ☐ No ☒ Type of perforator used: (explain)
Size of perforations: " by "
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
WAS SCREEN INSTALLED? Yes X No
Manufacturer's name Johnson
Type Armco Iron Model No. Telescope
Diam. 18 Slot size 50 Set from 216 ft. to 234 ft.
Diam. 18 Slot size 60 Set from 234 ft. to 242 ft.
Diam. 18 Slot size 50 Set from 242 ft. to 252 ft.
Diam. 18 Slot size 35 Set from 252 ft. to 261 ft.
provided? Yes ☒ No ☐ To what depth? 56 ft. Material used in seal: BENTONITE SLURRY
Did any strata contain unusable water? Yes ☐
No. ☒ Type of water:
Depth of strata ft. Method of sealing strata off:
Surface casing used? Yes ☐ No. ☒
Cemented in place? Yes ☐ No ☐

Locate well in section



LOCATION OF WELL: County KOOTENAI
SW¼ SW¼ Sec. 12 T. 50 N R. 4 W, B.M.

Size of drilled hole: 20" Total depth of well: 267 Standing water level below ground: 161.5 FT Temp. 53° Fahr. 53° Test delivery: 3100 gpm or cfs Pump? ☒ Bail ☐
Size of pump and motor used to make test: 14"x12" COLUMN, PEERLESS 3 STAGE 450 H.P. DIESEL
Length of time of test: 2 Hrs. 15 Min.
Drawdown: 10.7 ft. Artesian pressure: ft. above land surface Give flow cfs or gpm. Shutoff pressure:
Controlled by: Valve ☐ Cap ☐ Plug ☐
No control ☐ Does well leak around casing? Yes ☐ No ☒

DEPTH FROM FEET	DEPTH TO FEET	MATERIAL	WATER YES OR NO
0	4	BLACK DIRT	NO
4	57	SAND + GRAVEL 1¾ MINUS	NO
57	60	BLUE CLAY	NO
60	73	HARD PAN	NO
73	90	SAND + LARGE GRAVEL TO 6"	NO
90	123	GRAVEL + LARGE ROCK TO 6"	NO
123	124	BOULDER	NO
124	142	GRAVEL + LARGE ROCK TO 6"	NO
142	170	COARSE SAND + GRAVEL 1" MINUS	NO
170	250	COARSE SAND + PEA GRAVEL	YES
250	264	FINE SAND	YES
264	269	GREY CLAY	NO
269	270	BED ROCK (BASALT)	NO

Work started: APRIL 11 1966
Work finished: MAY 25 1966
Well Driller's Statement: This well was drilled under my supervision and this report is true to the best of my knowledge.
Name: HOLMAN DRILLING CORP.
Address: 3410 E 9TH SPOKANE WN.
Signed by: Arnold E Holman PRES.
License No. 108 Date: June 20 1966

Use other side for additional remarks

USGS

95

Form 238-7
1/94

RECEIVED
FEB 05 2004
IDWR/North

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

RECEIVED
FEB 1 2004
IDWR/North

Use Typewriter or Ball Point Pen

1. DRILLING PERMIT NO. 7-9-7-063
Other IDWR No. Well Tag D0028286

POSTED

2. OWNER:
Name City of Coeur D Alene
Address 3860 Ramsey Rd.
City Coeur D Alene State Id Zip 83815
Clayton Ave. Well

3. LOCATION OF WELL by legal description:
Sketch map location must agree with written location.

N / W / E / S

Twp. 51N North ☐ or South ☐
Rge. 04W East ☐ or West ☐
Sec. 35, NE (10 acres) 1/4 SE (40 acres) 1/4 _____ (160 acres) 1/4
Gov't Lot ____ County Kootenai

Address of Well Site Clayton Ave
City Coeur D Alene
(Give at least name of road + Distance to Road or Landmark)

Lt. _____ Blk. _____ Sub. Name _____

4. PROPOSED USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other _____

5. TYPE OF WORK
☒ New Well ☐ Modify or Repair ☐ Replacement ☐ Abandonment

6. DRILL METHOD
☐ Mud Rotary ☐ Air Rotary ☒ Cable ☐ Other _____

7. SEALING PROCEDURES

SEAL/FILTER PACK Material	From	To	AMOUNT Sacks or Pounds	METHOD
High solid Grout	0	60	94	Tremie

Was drive shoe used? Y ☒ N ☐ 340'
Was drive shoe seal tested? Y ☐ N ☒ How? _____

8. CASING/LINER:

Diameter	From	To	Gauge	Material	Casing	Liner	Welded	Threaded
20"	+2	340	.375	steel	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Length of Headpipe 10 Length of Tailpipe 10

9. PERFORATIONS/SCREENS
☐ Perforations Method _____
☒ Screens Screen Type 304 stainless Screen

From	To	Slot Size	Number	Diameter	Material	Casing	Liner
340	360	030		18	SS	☐	☐
360	380	050		18"	SS	☐	☐
380	390	070		18"	SS	☐	☐
390	400	080		18"	SS		

10. STATIC WATER LEVEL OR ARTESIAN PRESSURE:
205 ft. below ground Artesian pressure _____ lb.
Depth flow encountered 225' ft. Describe access port or control devices: 2" nipple welded to top of well
T1N R4W S35

11. WELL TESTS:
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal./min.	Drawdown	Pumping Level	Time
3500	27'	232	8 hrs

Water Temp. 48° Bottom hole temp. _____
Water Quality test or comments: Arsenic in water
Depth 1st Wtr. 225'

12. LITHOLOGIC LOG: (Describe repairs or abandonment)

Bore Dia.	From	To	Remarks: Lithology, Water Quality & Temperature	Water Y	Water N
20	0	85	Brown sand + gravel cobbles		X
"					
"	85	110	Sand + pea gravel		X
"					
"	110	195	Brown sand + gravel cobbles		X
"					
"	195	210	Sand + clay		X
"	210	225	Sand + gravel clay binder		X
"	225	267	Sand + gravel	X	
"	267	283	Gray silty clay		X
"	283	310	Sand with clay layers	X	
"	310	318	Gray clay		X
"	318	340	Sand with clay layers	X	
"	340	410	Sand + gravel water	X	
			10' riser → Drive shoe 340' / Top of Screen 340		
			Bottom of Screen 400'		
			10' tailpipe → 410' Bottom of Tail		

Completed Depth 409' (Measurable)
Date: Started 4/7/03 Completed 8/4/03

13. DRILLER'S CERTIFICATION
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name H & H Drilling Inc Firm No. 596
Firm Official Randy Holt Date 2/2/04
and
Supervisor or Operator Wade Iversen Date 2/2/04
(Sign once if Firm Official & Operator)

FORWARD WHITE COPY TO WATER RESOURCES

Appendix D

Technical Memorandum, 2012 Fernan Hill Evaluation, August 3, 2012

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J·U·B ENGINEERS, INC.

J-U-B COMPANIES | THE LANGDON GROUP | GATEWAY MAPPING INC.

MEMORANDUM

DATE: 8/3/12

TO: Steve James, PE

CC: Michelle Johnson, PE

FROM: Nicolas Hiebert, EIT

SUBJECT: **2012 Coeur d'Alene Water Update – Fernan Hill Build-Out Area**

The purpose of this technical memorandum is to present a conceptual layout of a future water system in the Fernan Hill area. This includes necessary components and pressure zones required to serve the existing and build-out areas as dictated by City. This analysis was conducted using the following information and assumptions:

- Existing Fernan Hill service elevations range from 2300' to 2450'
- Highest future build-out area elevation of 2560' to the east.
- Sole 12" transmission pipe feeding the Fernan Hill area via new booster pump station near existing Elm St. Booster Station.
- Future Fernan Hill storage reservoir necessary to regulate pressures at high demands
- Future intermediate booster station required to service build-out area.

A cursory review of the Fernan Hill area shows steep contours, indicating multiple pressure zones will likely be required to maintain a desired 50 – 90 psi pressure range. The following conceptual layout was developed and can be seen in the attached Figure:

A. A minimum pressure of 50psi at the highest elevation in the build-out area (2560') requires an system hydraulic grade line (HGL) of approximately 2675'. Therefore, a future storage reservoir overflow elevation should be set to 2675'-2680'. This elevation can be achieved following the ridge line contours east of the existing Fernan Hill area.
B. A high pressure of 90 psi would be reached at an elevation of approximately 2445'. Therefore, Fernan Hill area should be split into two pressure zones, an Upper Fernan Hill and a Lower Fernan Hill pressure zone. A reduction of 40 psi across this boundary would allow for a minimum pressure of 50 psi in the Lower Fernan Hill zone.
C. The Lower Fernan Hill zone would reach a high pressure of 90 psi at an elevation of approximately 2375'. This elevation should be the lowest elevation served by Fernan Hill under the conceptual layout.

D. However, this layout appears to leave a gap in the service areas between the General Zone and the conceptual Lower Fernan Hill zone. The existing HGL in the General Zone is approximately 2350', yielding allowable service pressures at ground elevations of approximately 2240' – 2250'. This leaves a gap between the Lower Fernan Hill zone (2375') and the General Zone (2250') of approximately 125' of head or 55 psi. Potential solutions include:
    1. Serve residents within the gap from Lower Fernan Hill Zone utilizing pressure reducers at the service connection.
    2. Distribute the pressure difference evenly between the Upper and Lower Fernan Hill zones by lowering the zone boundary elevations approximately 75' (thus increasing pressures in the by 25 - 30 psi). This would increase maximum pressures from 90 psi to approximately 120 psi in both the Upper and Lower zones.

Depending on where these pressure zone are established, existing pressures to the Fernan Hill residents may change. This should be given consideration before future layout improvements are selected.

Coeur d' Alene 2012 Water Model Potential Fernan Hill Layout

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Appendix E

Technical Memorandum, 2012 Blackwell Hill Zone Analysis, September 26, 2012

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J·U·B ENGINEERS, INC.

J-U-B COMPANIES | THE LANGDON GROUP | GATEWAY MAPPING INC.

MEMORANDUM

DATE: 9/26/12

TO: Steve James, PE

CC:

FROM: Michelle Johnson, PE

SUBJECT: **2012 Coeur d'Alene Water Update – Blackwell Hill Zone Analysis**

This technical memorandum presents a conceptual analysis of the Blackwell Hill Area at build-out of the current planning boundary. This analysis includes the necessary components and multiple pressure zones required to serve the area. This analysis was conducted using the following information and assumptions:

- The Blackwell Hill planning boundary as established by the City.
- The General Zone serves elevations up to 2225'.
- Highest elevation within the planning boundary is approximately 2455'.
- The future area will be served by two river crossings; the existing crossing will be upsized to a 16-inch crossing and a new 18-inch crossing near the Mill River area on the north west corner of the service area.
- A future Blackwell Hill storage tank will be included to meet City criteria.
- Future intermediate booster stations and pressure reducing valves will be required to service the area.

The Blackwell Hill area is a steep, wooded area overlooking the Spokane River and Coeur d'Alene Lake. The contours indicate that multiple pressure zones will be required to maintain a pressure range of 50 – 90 psi. This approach for this concept is to serve the entire zone with one booster pump station that boosts from the General Zone up to a common storage tank for the entire Blackwell Zone. Several pressure reducing valves would then be required to supply the lower elevations within the zone. This operational scenario is expected to have lower cost and maintenance for the system than the installation of multiple storage tanks and booster stations.

A triplex booster station is recommended, and the required pump capacity for a single pump would be 310 gpm at 140 psi head. This setup would provide a firm capacity equal to the

projected peak day flow of 620 gpm. The required storage for a single tank for this zone would be 0.6 million gallons.

The following conceptual layout was developed and can be seen in the attached Figure:

A. A minimum pressure of over 40 psi at the highest elevation in the build-out area (2450') requires a minimum system hydraulic grade line (HGL) of at least 2550'. In order to maintain this minimum pressure, a future elevated storage reservoir would be required with an overflow elevation set at a minimum of 2550'.
B. Based on a tank overflow elevation of 2550', a high pressure of 90 psi would be reached at an elevation of approximately 2440', requiring a second pressure zone.
C. A third pressure zone would cover elevations from 2340 to 2225.

Depending on the final elevations selected for the future pressure zones, pressure for the existing Blackwell Hill residents may change. Consideration of existing water pressures and any significant changes should be taken into consideration and addressed with the property owners when establishing future pressure zones.

Appendix F

Model Assumptions and Calibration

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APPENDIX F

Model Assumptions and Calibration

Prepared by:

J·U·B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

(208) 762-8787 | www.jub.com

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CONTENTS

Figures

Tables

F1. MODEL ASSUMPTIONS AND CALIBRATION

F1.1 Background

This appendix summarizes the development and analysis of the City of Coeur d'Alene's 2023 water model. The primary purpose of the water model is to provide a hydraulic analysis of the system and to identify system deficiencies. This generally includes:

- A 72-hour extended period simulation (EPS) of the current system
- Identification of potential existing capacity issues
- An estimate of build-out conditions for the future system
- Identification of potential future capacity issues

The existing model is based on assumptions and parameters that characterize the area and existing system. The assumptions are based on the City's GIS data, characteristics learned from the physical system, similar studies done in the region, as well as general and historical knowledge gained through previous work for the City.

F1.2 Existing Model

F1.2.1 GIS Development

The City operates and maintains a detailed GIS database of their water distribution system. This database was used as the main source to develop the base water model and included information of pipe size, length, material, and connectivity. The GIS database was provided in shapefile format and converted into a WaterCAD database utilizing software interface tools. The pipe connectivity and pressure zone boundaries were updated based on GIS isolation valve data, City comments, and the previous water model updated for the Northeast Quadrant Pressure Stabilization analysis (J-U-B Engineers, 2016). Elevation data was assigned to the base model junctions by use of Kootenai County contour data in shape file format. The base model generated by the above process was validated without errors or warnings.

Model components, including wells, water storage tanks, booster stations, PRVs, and PSVs were imported from a combination of City provided shapefile data and the previous (2016) water model. Operating conditions for these components were reviewed and updated based on City provided data and discussion with City staff. These operating conditions included:

- PRV setpoints for maintaining downstream pressures
- Storage tank elevations
- Well and booster station pump curves and control setpoints

Missing or conflicting data was reviewed with the City and/or record drawings and then updated as necessary.

F1.2.2 Existing Demand Development

The demand for the existing model was developed from City of Coeur d'Alene recorded water meter data from July 2023 and exclude water meter data from KC District No. 1, Hoffman, and HLID. The City's water meters were supplied in a geo-referenced shape file showing the location of each meter and the monthly usage data reported as a volume in thousands of gallons. This data was used to establish a daily maximum month usage (July) for each meter within the shape file. The customer meter data was then imported into the water model using the "Model Builder" feature within WaterCAD. This feature geospatially analyzes the location of the meter and corresponding usage and then distributes the usage for each individual meter to the nearest model junction.

The average maximum month demand applied to the model was compared to the maximum day demand (MDD) that was established by historical usage. The average maximum month demand was found to be less than the MDD by a factor of 1.40; this factor was then used to escalate demands, establishing a system MDD. Similarly, peak hour demand (PHD) was established by applying a peaking factor of 1.96 to the MDD. This peaking factor is based on the demand diurnal pattern generated through model calibration (reference Section 1.1.3 for additional discussion on the daily diurnal pattern). **Table F.1.1** summarizes the existing demands assigned to the model:

Table F.1.1 - Existing Demands

Demand	Value	
	GPM	MGD
Maximum Month	19,241	27.7
Maximum Day (MDD)	26,947	38.8
Peak Hour	52,816	76.1

F1.2.3 Model Calibration

Field data obtained for the basis of calibration consists of the following:

- System pressure monitoring – Recording pressure gauges were set to record on a 5-minute interval from July 10th to July 24th, with a greater level of detail when hydrant flow testing occurred (15-seconds). Data was gathered from five locations across the High and General Zones.
- Hydrant flow testing – Performed at five sites with assistance from City Staff the morning of July 19, 2023. The process involves measuring flow from fire hydrants at strategic locations inducing high demands to reduce pressure in the immediate vicinity of the flow test. System pressure drop was recorded in the immediate vicinity as well as in key locations in the High and General Zones with pressure data loggers.

Calibration is the process of modifying assumptions and parameters in order to best approximate the actual system performance observed in multiple locations. The calibration process requires an understanding of the limitations of the data and achievable system accuracies (typically ± 15%

accuracies are considered acceptable for water models per industry standards). Both static (snapshots in time) and 72-hour extended period simulations (EPS) were run using the water meter demand data. Comparison of model results to the field data was followed by modulating several factors in the hydraulic model to achieve calibration.

F1.2.3.1 Model Assumptions and Parameters

Hazen Williams Roughness Coefficient

Calibration of the water model can be affected by adjusting the Hazen-Williams roughness coefficient, C, of system pipes. These adjustments were based on typical values observed and applied globally based on pipe material. **Table F.1.2** provides a summary of Hazen-Williams C factors used in the model.

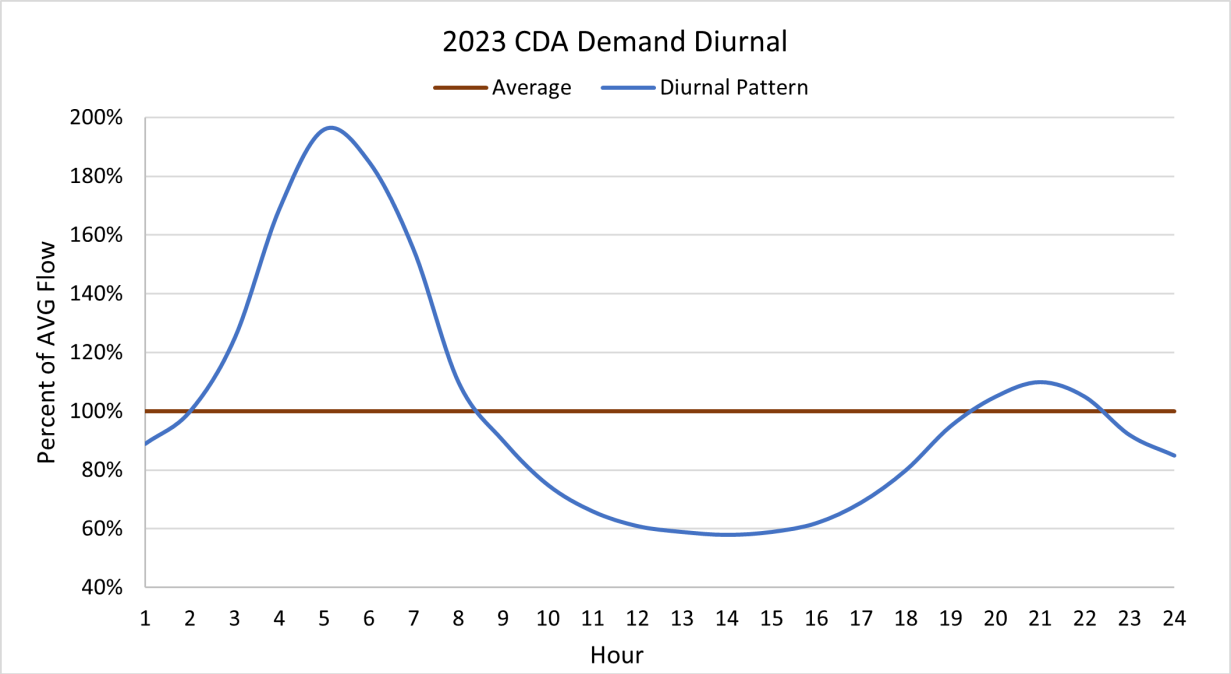
Table F.1.2 - Pipe C Factors

Pipe Material	"C" Factor
AC	139
Cast Iron	95
Ductile Iron	120
Galvanized Iron	125
HDPE	150
PVC	139
Steel	119

Diurnal Pattern

To proportion the demand over time in the system, a daily demand pattern, or diurnal, is applied at each junction. The result is a 72-hour calibration scenario that simulates the reactions of tank levels, pump operation, and system pressures to the demands at various times of the day. **Figure F.1.1** shows the diurnal pattern applied to each junction.

Figure F.1.1 - Demand Diurnal Pattern



Controls Setpoints

Model calibration is greatly dependent on the controls setpoints utilized for interconnected components such as water storage tanks, well and booster station pumps, pressure reducing and/or sustaining valves (PRV/PSVs). Controls setpoints utilized for this model were provided by City Staff based on their summer month settings and are presented in **Table F.1.3** and **Table F.1.4**.

Table F.1.3 - Well & Booster Pump Setpoints

Pump	Pressure Zone	Looks To Tank	Setpoint	
			Start (ft)	Stop (ft)
Atlas Well	High	Industrial	125	142
4th Street Well	General	Tubbs Hill	18	20
Hanley Well	High	Prairie	125	135
Honeysuckle Well	High	Prairie	142	150
Linden Well	General	Tubbs Hill	17	19
Locust Well	General	Tubbs Hill	16	19
Landings Well	High	Prairie	135	148
Prairie Well	High	Prairie	139	150
Annie Well	General	Tubbs Hill	15	18
Ralph Capaul Well	High	Prairie	137	149
Huetter Well	High	Industrial & Prairie	126 (Ind.)	149 (Prairie)
Elm Street Booster	Stanley	Stanley	22	28
Best Hill Booster	General	Tubbs Hill	17	18

Table F.1.4 - PRV/PSV Setpoints

Valve Location	Setpoint (psi)
PRV-1 Atlas and Appaloosa	45
PRV-2 Lee Ct and Appleway	50
PRV-4 Blackwell Lower	170
PRV-5 15th and Lunceford	60
PRV-6 Huetter Rd	60
PRV-7 12th and Crawford	60
PRV-8 Newbrook and Atlas	Inactive

F1.2.3.2 Model Verification Results

Static Calibration

Verification of the model calibration was performed by comparing the fire flow testing data to the model output. As listed in **Table F.1.5**, the calibration results for all five fire hydrants are within the target 15% accuracy range. Given the size and complexity of the City's water system and the limited accuracy of the hydrant tests, this is an acceptable amount of error. Therefore, the model is considered calibrated.

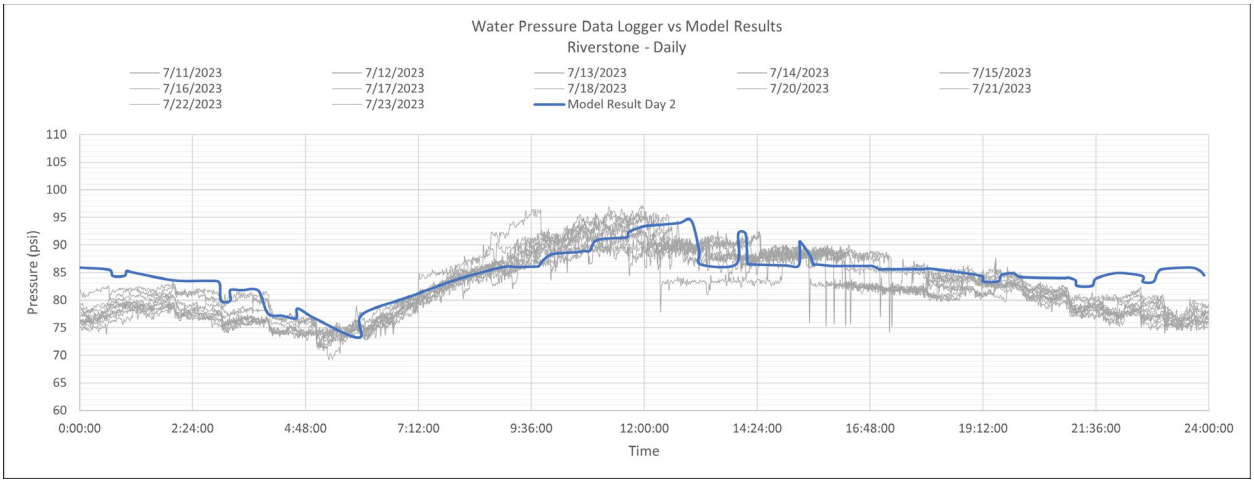
Table F.1.5 - Static Model Verification Results

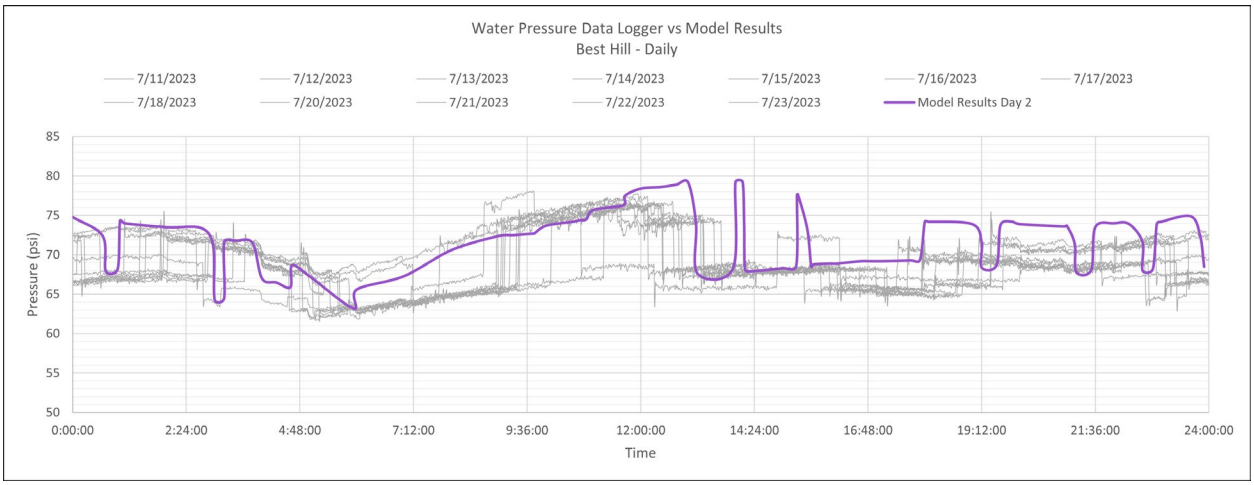
Location	Flow Hydrant ID	Residual Hydrant ID	Static or Hydrant Flow (gpm)	Observed Pressure (psi)	Model Pressure (psi)	Pressure Difference (psi)	% Error
Riverstone	286-F	287-J	Static	82	76	6	7.3%
			3,438	70	65	5	7.3%
Best Hill (Booster Off)	214-J	214-G	Static	66	69	3	4.4%
			2,978	68	67	1	1.8%
Mullan Ave	096-C	096-E	Static	80	82	2	2.0%
			3,727	78	78	0	0.3%
Landings	504-N	504-O	Static	56	58	2	2.7%
			2,978	50	55	5	9.2%
Shadduck Park	396-E	396-B	Static	77	79	2	2.5%
			3,438	65	66	1	2.0%

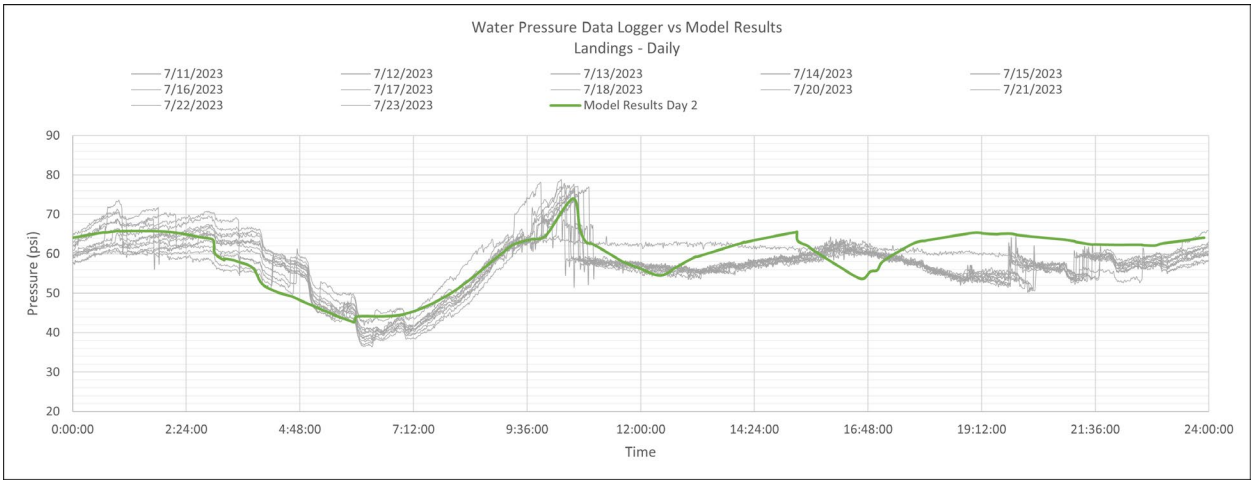
Dynamic Calibration

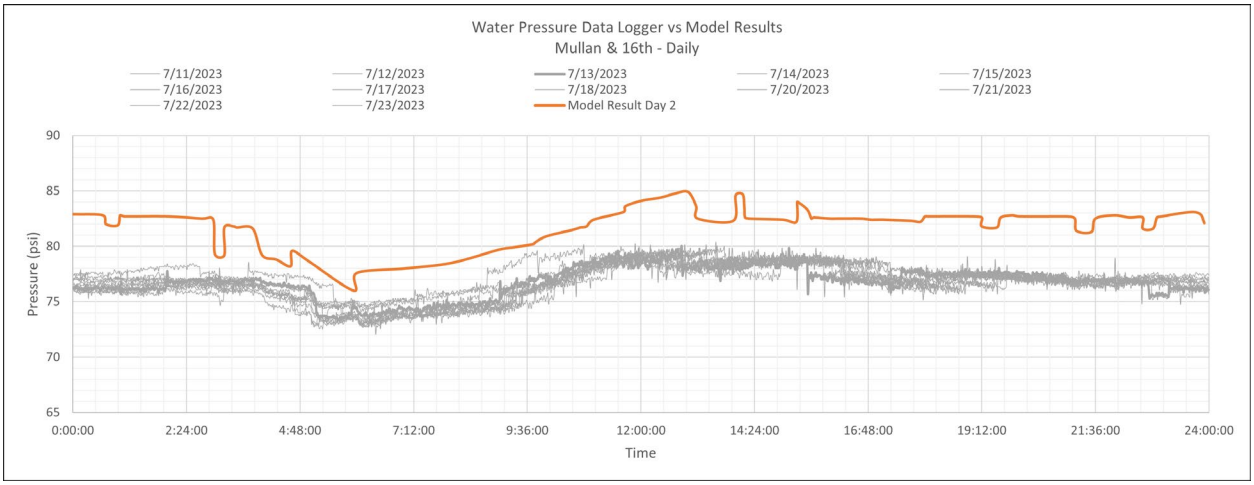
The model output from the EPS scenario is compared to the pressure monitoring data to verify the controls logic, daily demand pattern, and model system reactions are representative of the actual system. Weighted calibration results for the system are within the 8% accuracy range. **Figure F-1.2** displays the model system pressure at the five locations pressure data logger information was obtained over a 24-hour period.

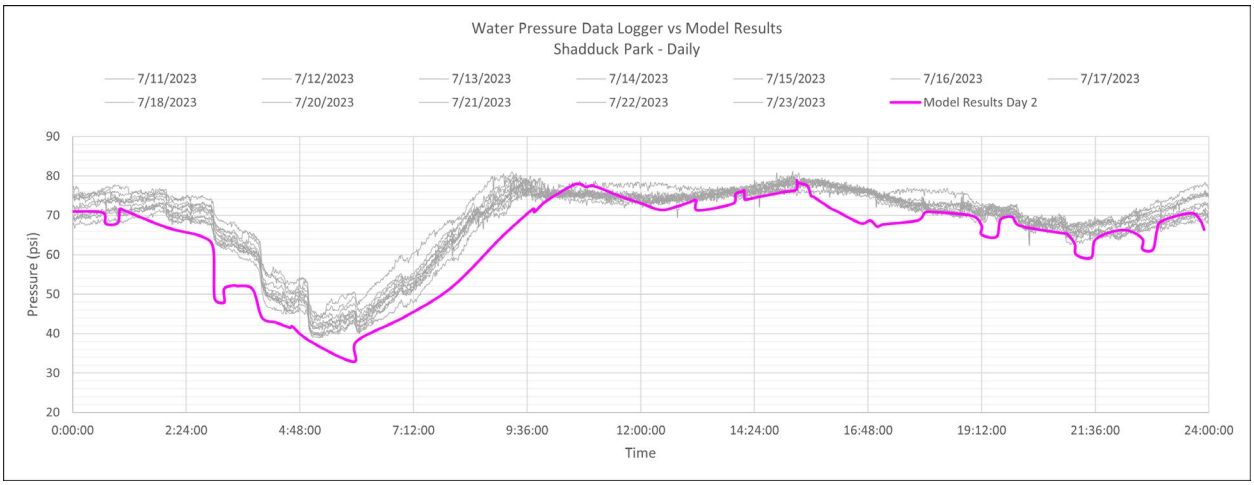
Figure F-1.2 – Dynamic Calibration Results




Water Pressure Data Logger vs Model Results
Best Hill - Daily
7/11/2023
7/12/2023
7/13/2023
7/14/2023
7/15/2023
7/16/2023
7/17/2023
7/18/2023
7/20/2023
7/21/2023
7/22/2023
7/23/2023
Model Results Day 2
Pressure (psi)
Time
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
24:00:00


Water Pressure Data Logger vs Model Results
Landings - Daily
7/11/2023
7/12/2023
7/13/2023
7/14/2023
7/15/2023
7/16/2023
7/17/2023
7/18/2023
7/20/2023
7/21/2023
7/22/2023
7/23/2023
Model Results Day 2
Pressure (psi)
Time
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
24:00:00


Water Pressure Data Logger vs Model Results
Mullan & 16th - Daily
7/11/2023
7/12/2023
7/13/2023
7/14/2023
7/15/2023
7/16/2023
7/17/2023
7/18/2023
7/20/2023
7/21/2023
7/22/2023
7/23/2023
Model Result Day 2
Pressure (psi)
Time
0:00:00
2:24:00
4:48:00
7:12:00
9:36:00
12:00:00
14:24:00
16:48:00
19:12:00
21:36:00
24:00:00



F1.2.4 Existing System Deficiencies

The existing system model was evaluated for compliance within the parameters summarized in **Table F.1.6.** High pipe velocities and headloss indicates a pipe may be undersized and restricting flow. Extreme high or low pressures indicates there may be a supply issue in certain areas or zones. Any areas in the model resulting in deficiencies are reviewed for potential upgrades.

Table F.1.6 - System Deficiency Parameters

Parameter	Minimum Value	Maximum Value
Velocity	-	7 fps
Pressure	20 psi Fire Flow 40 psi Normal	80 psi
Headloss Gradient	-	0.01 ft/ft

System deficiencies in the existing model were identified under MDD.

Table F.1.7 details the existing system deficiencies observed in each scenario and discusses potential solutions to each deficiency, although not all observed problems are recommended for action.

Table F.1.7 - Existing System Deficiencies

Observed Problem	Type	Zone	Potential Solution
Localized high velocities and headloss gradients observed near the wells in operation.	-	General & High	None
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft in the 6" and 8" lines east of the 4th Street Well in Haycraft, Gilbert, and Best Avenue.	Undersized	General	Upsize mains in Best Avenue, Haycraft Avenue, and Gilbert Avenue.
Headloss gradient greater than 0.01 ft/ft in the 8" line in Lee Court from Ramsey Road to Appleway Avenue.	Bottleneck	General	None
Headloss gradient greater than 0.01 ft/ft in the 2" dead end lines near the Mill River apartment complexes.	Dead-Ends	General	None
Headloss gradient greater than 0.01 ft/ft in the 8" line from Lincoln Way, crossing through the Kootenai Health parking lot to Ironwood Drive.	Bottleneck	General	Upsize existing mains in Lincoln Way, from Ironwood Drive to Emma Avenue.
Headloss gradient greater than 0.01 ft/ft in the 2" line in N 5th Street from Annie Drive to E Hattie Avenue.	Bottleneck	General	None
Headloss gradient greater than 0.01 ft/ft in the 2" line in N Medina Street between Emma Avenue and Ironwood Drive.	Bottleneck	General	Upsize existing piping in Medina Street and Emma Avenue.
Headloss gradient greater than 0.01 ft/ft in the 8" line in Government Way from Spruce Avenue to just North of Davidson Avenue.	Bottleneck	General	Upsize existing 8-inch piping in Government Way.
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft within 4-inch line to/from Blackwell Hill tank.	-	Blackwell	None
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft in the 6" and 8" lines West of the Atlas Well site.	Undersized	High	Upsize piping in Arrowhead Road, Sherwood Drive, Tamarack Road, and Nez Perce Road.
Headloss gradient greater than 0.01 ft/ft in the 8" line in Shawna Avenue West of the intersection with Daly Drive.	Bottleneck	High	None
Headloss gradient equal to 0.01 ft/ft at Peak Hour in the 8" lines in Trinity Court from N Anne Street to N Cynthia Street and in Hoffman Avenue from N Anne Street to Mount Carol Street.	Bottleneck	High	None
Headloss gradient equal to 0.01 ft/ft at Peak Hour in the 6" line in N Isabella Drive from Ocean Avenue to Dalton Avenue.	Bottleneck	High	None

Headloss gradient equal to 0.01 ft/ft at Peak Hour in the 2” dead end line in W Horizon Court, East of N Sunrise Terrace.	Dead-End	High	None
Headloss gradient greater than 0.01 ft/ft in the 6” and 12” lines in Hanley Avenue from N Sunrise Terrace to Highway 95.	Bottleneck	High	None
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft in the 12” line in Wilbur Avenue, just East of the Prairie Well and Standpipe, from Mineral Drive to Highway 95, continuing South on the Highway.	Undersized	High	Upsize mains between the Hanley Well and Prairie Well on Highway-95.
Headloss gradient equal to 0.01 ft/ft during Peak Hour in the 8” line in Pinegrove Drive from W Sumac Avenue to Grove Way.	Bottleneck	High	None
Headloss gradient greater than 0.01 ft/ft in the short 8” line from the intersection of W Industrial Loop to the North.	Bottleneck	High	None
Velocity equal to 7 fps and headloss gradients greater than 0.01 ft/ft during Peak Hour in the 12” line in La Rochelle Drive from Atlas Road to Versailles Drive.	Bottleneck	High	None
Headloss gradient greater than 0.01 ft/ft in the 8” line in W Sorbonne Drive from Atlas Road to Pascal Drive.	Undersized	High	None
Headloss gradient greater than 0.01 ft/ft in the 8” line in N Roche Drive from Wilbur Avenue to Rubel Loop.	Undersized	High	None
Pressures less than 40 psi observed in the North end of the High Zone at Peak Hour.	Supply	High	Install new transmission main to improve flow across the zone.
Pressures less than 40 psi observed in the North-East quadrant of the system at Peak Hour.	Supply	High	Install 16-inch transmission main for new addition of storage to NE quadrant.
Pressures less than 40 psi observed in the higher elevation reaches of the Stanley Hill area on E Royal Anne Drive and Elton Lane at most times of day.	Supply	Stanley	Addition of storage to the Stanley Zone.
Headloss gradient greater than 0.01 ft/ft in the 6” line in Harrison Avenue from Elton Lane to N Hill Drive.	Undersized	Stanley	Upsize mains on Harrison Avenue to 12-inch.
Pressures less than 40 psi observed in the higher elevation reaches of the Fernan Hill area on E Fernan Hill Road at all times of day.	Supply	Stanley	Create new Fernan Pressure Zone with future Fernan Booster and addition of storage to the future zone.

Pressures less than 40 psi observed in the higher elevation portion of the Blackwell Hill area.	Supply	Blackwell	Addition of storage to the zone and booster station upgrades.
Pressures higher than 80 psi observed in the North-East quadrant in the early afternoon time period.	Supply	High	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed in the area between Highway 95, Kathleen Avenue, and Ramsey Road in the early afternoon. Pressures higher than 80 psi area observed most other times of the day.	Supply	High	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed in the Mill River Development area for the majority of the day with pressure spike above 95 psi observed in the early afternoon.	Supply	General	None – future development in the area will increase demand.
Pressures higher than 90 psi observed in the Riverstone Development area for the majority of the day with pressure spike above 95 psi observed in the early afternoon.	Supply	General	None – future development in the area will increase demand.
Pressures higher than 90 psi observed in the North Idaho College area West of Northwest Boulevard for the majority of the day.	Supply	General	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed on the West end of Sherman Avenue during the early afternoon. Pressures higher than 80 psi observed most other times of the day.	Supply	General	Consider pressure reduction at the customer tap.
Pressures higher than 80 psi observed east of I-90 along S Sherman Avenue, N Bruce Drive, and Lakeview Drive at all times of the day.	Supply	General	Consider pressure reduction at the customer tap.
Pressures higher than 90 psi observed in the lower elevation areas of Stanley Hill near Ponderosa Springs Golf Course at all times of the day.	Supply	Stanley	Consider closing the pipe at the intersection of Lilly Drive, N Hill Drive, and N Galena Drive to separate the lower portions of Stanley Hill Zone into the General Zone.
Pressures higher than 90 psi observed in the Armstrong Zone at all times of the day.	Supply	Armstrong	Consider pressure reduction at the customer tap.

F1.3 Future Model

F1.3.1 Build-Out Demand Development

The build-out model considers future conditions within the water system when it is fully developed. This includes infill to undeveloped areas within the current service area and future expansion within the planning area.

The build-out demands were developed by using GIS data from the City's water meter and zoning shape file, and parcel and structure shape files from Kootenai County. Each water meter was linked to multiple shape files to determine the land use type for each water meter. Parcel and structure shape files from Kootenai County were used in this process. Zoning was used as the primary designation to determine the land use type. The commercial zoning designations were further refined using additional characteristics found in the structure shape file. The Low-Density Residential land use type comprised all of the single-family dwelling units. Medium Density Residential consisted of multi-family dwelling units that contain between two to four dwelling per units, as well as mobile home and RV parks. High Density Residential included all apartments and multi-family dwelling units with over four dwellings per unit.

Once land use types were established, unit flows on a per acre basis were developed by analyzing water meter data of various zoning categories. The various land use types and unit flows are listed below in Table F.1.8.

Table F.1.8 - Land Use Types and Unit Flows

Land Use Types	Maximum Summer Usage (Gal)	Net Land Use Area (Acre)	Unit Demand (Gal/Day/Ac)
Assisted Living	262,933	51	5,184
Church	239,867	93	2,578
Commercial [a]	2,733,133	1,437	1,902
Hotel	514,234	42	12,298
Industrial	41,533	37	1,132
Office	213,900	61	3,506
Open Space [b]	978,967	289	3,390
Public	1,079,733	740	1,459
Residential High	2,083,400	362	5,749
Residential Medium	2,105,366	522	4,030
Residential Low	15,636,670	3,828	4,085
Restaurant	471,366	79	5,988
School	1,149,266	266	4,328
Total	**27,618,668**	**7,821**	**3,531**

[a] Includes Hospitals usages in commercial. Hospitals likely have higher usage than typical commercial.

[b] Open Space analysis results are not trustworthy. Multiple parcels are associated with one meter, therefore unit demands are likely much lower than reported.

Unit flows were applied within the GIS shape file to the centroid of individual future service parcels associated with the City's zoning map. The unit flows were then multiplied by the parcel area to establish the build-out demands for future connections. Existing meter demands were also evaluated and additional demands were applied to parcels not meeting their full potential demand as allowed per the City's zoning. Existing and future meter GIS shapefile data was then combined to represent all build out demands as shown in **Table F.1.9**. The result was a GIS shape file that was then imported into the water model using the "Load Builder" feature similar to the existing demand development. The same MDD and PHD demand multipliers as used in the existing model calibration were applied to the model resulting in MDD and PHD demands of 63.8 MGD and 125.09 MGD, respectively.

Table F.1.9 - Build Out Average Day Demands by Land Use Type

Land Use Types	Net Land Use Area (Acre)	Build Out ADD(Gallon/Day)
Assisted Living	51	491,746
Church	93	452,398
Commercial	1674	5,359,787
Hotel	43	909,556
Industrial	74	112,136
Office	61	366,849
Open Space	290	1,111,758
Public	751	1,952,503
Residential High	600	5,696,850
Residential Medium	589	3,115,779
Residential Low	5617	21,833,712
Restaurant	79	855,669
School	266	2,242,763
Total	***10,187***	**44,501,507**

F1.3.2 Build-Out System

In order to accommodate build-out demands, additional storage, supply, and future distribution pipes were required, including:

- New wells in the High and General Zones (reference the Water Supply Recommendations discussed in **Chapter 4**).
- New storage tanks in the High, General, Stanley Hill, and Future Fernan Zones (reference the Storage Recommendations discussed in **Chapter 5**).
- General future transmission lines routed into future build-out areas. These lines are shown in a general way to help understand impacts to the existing system under build-out conditions.
- Future transmission lines from new wells and tanks to route flow through the system and;
- Upgrades to existing piping to eliminate bottlenecks and undersized lines.

F1.3.3 Build-Out System Deficiencies

The build-out model was run both as an extended period simulation under MDD utilizing the same daily demand diurnal as the existing system model, and also as a static simulation under PHD.

Multiple areas exhibited pressure, velocity, and head loss greater than allowable criteria. A summary of these deficiencies and potential solutions are listed in **Table F.1.10**.

Table F.1.10 - Build-Out System Deficiencies

Observed Problem	Type	Zone	Potential Solution
Localized high velocities and headloss gradients observed near the wells in operation.	-	General & High	None
Various high velocities and/or headloss gradients observed in short pipe reaches.	Undersized	All	Consider upsizing pipes with annual main replacements.
Existing pipes act as a bottleneck as demand is routed from the north side of the General Zone.	Undersized	General	Upsize mains in Appleway Avenue, Best Avenue, Haycraft Avenue, Gilbert Avenue, and N 4th Street.
Headloss gradient greater than 0.01 ft/ft in the 8" line in Lee Court from Ramsey Road to Appleway Avenue.	Bottleneck	General	None
Headloss gradient greater than 0.01 ft/ft in the 2" dead end lines near the Mill River apartment complexes.	Dead-Ends	General	None
Headloss gradients are greater than 0.01 ft/ft along Lincoln Way.		General	Upsize existing mains in Lincoln Way, from Ironwood Drive to Emma Avenue to 12 and 16-inch. The 6-inch pipe reach going east on Emma Avenue should also be upsized to an 8-inch to eliminate the bottleneck.
Headloss gradient greater than 0.01 ft/ft in the 2" line in N 5th Street from Annie Drive to E Hattie Avenue.	Bottleneck	General	None
Headloss gradients are greater than 0.01 ft/ft along Medina Street and Emma Avenue.	Bottleneck	General	Upsize existing piping in Medina Street and Emma Avenue.
Headloss gradients are greater than 0.01 ft/ft along Government Way.	Bottleneck	General	Upsize existing 8-inch pipes in Government Way from the I-90 Overpass to Lacrosse Avenue to 12-inch.
There is no redundancy for serving the Blackwell Hill Zone if the existing river crossing were to fail.	-	General	Install parallel 12-inch to existing Blackwell river crossing.
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft within 4-inch line to/from Blackwell Hill tank.	-	Blackwell	None
Headloss gradients are greater than 0.01 ft/ft in the area south of the future Spiers Well and west of the existing Atlas Well.	Undersized	High	Upsize piping in Arrowhead Road, Sherwood Drive, Tamarack Road, and Nez Perce Road.

Headloss gradient equal to 0.01 ft/ft at in the 8” lines in Trinity Court and in Hoffman Avenue.	Bottleneck	High	None
Headloss gradient equal to 0.01 ft/ft in the 6” line in N Isabella Drive from Ocean Avenue to Dalton Avenue.	Bottleneck	High	None
Headloss gradient equal to 0.01 ft/ft in the 2” dead end line in W Horizon Court, East of N Sunrise Terrace.	Dead-End	High	None
Velocity higher than 7 fps and headloss gradients greater than 0.01 ft/ft in the lines between the Prairie Well and Hanley Well.	Undersized	High	Upsize mains between the Hanley Well and Prairie Well on Highway-95.
Headloss gradient greater than 0.01 ft/ft in the short 8” line from the intersection of W Industrial Loop to the North.	Bottleneck	High	None
Headloss gradients are greater than 0.01 ft/ft in the area of recommended NE storage.	Undersized	High	Install new 16-inch transmission main for new addition of storage to NE quadrant.
Existing pipes act as a bottleneck as demand is routed to east portion of the zone.	Bottleneck	High	Install new 18-inch transmission main piping in Wilbur Avenue from Atlas Road to N Roche Road, and from Moselle Drive to Pinegrove Drive.
16-inch main loop is incomplete on the west side of the High Zone.	Supply	High	Install new 16-inch main from Future Spiers Well in W Industrial Loop and connect to the existing 16-inch in Atlas Road.
Insufficient supply to the east side of the High Zone causing low pressures.	Supply	High	Install new 16-inch transmission main piping in Kathleen Avenue and the Prairie Trail from Atlas Road to the intersection of Neider Avenue and Howard Street to route flow from wells on the west side to the east side of High Zone.
Pressures higher than 80 psi observed in the North-East quadrant in the early afternoon time period.	Supply	High	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed in the area between Highway 95, Kathleen Avenue, and Ramsey Road in the early afternoon. Pressures higher than 80 psi area observed most other times of the day.	Supply	High	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed in the Mill River and Riverstone Development area for the	Supply	General	Evaluate for potential areas that can be separated by PRVs.

majority of the day with pressure spike above 95 psi observed in the early afternoon.			
Pressures higher than 90 psi observed in the North Idaho College area West of Northwest Boulevard for the majority of the day.	Supply	General	Evaluate for potential areas that can be separated by PRVs.
Pressures higher than 90 psi observed on the West end of Sherman Avenue during the early afternoon. Pressures higher than 80 psi observed most other times of the day.	Supply	General	Consider pressure reduction at the customer tap.
Pressures higher than 80 psi observed east of I-90 along S Sherman Avenue, N Bruce Drive, and Lakeview Drive at all times of the day.	Supply	General	Consider pressure reduction at the customer tap.
Negative pressures near the Stanley Hill Tank/Johnson Ranch area due to additional future storage and large build-out demands in very small distribution lines. Headloss gradients are greater than 0.01 ft/ft in Stanley Hill area.	Supply	Stanley	Upsize mains on Harrison Avenue to 12-inch and extend 12-inch transmission main to new Stanley Hill Tank #2.
Pressures higher than 90 psi observed in the lower elevation areas of Stanley Hill near Ponderosa Springs Golf Course at all times of the day.	Supply	Stanley /General	Consider closing the pipe at the intersection of Lilly Drive, N Hill Drive, and N Galena Drive to separate the lower portions of Stanley Hill Zone into the General Zone.
Negative pressures near the Fernan build out area due to large build out demands applied on distribution lines.	Supply	Fernan	New Fernan Booster Station at the existing Elm Street site and new Fernan Hill Tank. 12-inch transmission piping between the booster and the new zone, as well as from the new tank will be required.
Headloss gradients are greater than 0.01 ft/ft within 6-inch transmission line to Armstrong Park area.	Supply	Armstrong	Upsize transmission line to Armstrong Park, and upgrade pump capacities.

F1.3.4 Recommended Improvements

Recommended improvements for the existing and build-out systems are identified in Chapter 6.

WORKS CITED

J-U-B ENGINEERS, Inc. “Northeast Quadrant Pressure Stabilization Analysis.” 2016.

J-U-B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

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Appendix G

Minimum System Development Criteria

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APPENDIX G

Minimum System Development Criteria

Prepared by:

J-U-B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

(208) 762-8787 | www.jub.com

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CONTENTS

G1. MINIMUM SYSTEM DEVELOPMENT CRITERIA

G1.1 Introduction

The 2023 Water System Comprehensive Plan Update summarizes system design criteria for system evaluation regarding regulatory requirements, specific performance criteria, and fire flow. This section presents minimum criteria for system expansion by the City and private development. The criteria to be maintained by the City water system are detailed in the below sections.

G1.1.1 General

General criteria are as follows:

- A normal operating pressure range of 50 to 80 psi at the meter.
- Maximum system pressure of 80 psi at the bottom floor of the service address.
- A minimum pressure of 40 psi at the top story of the service address.
- Minimum residual pressure of 20 psi during fires meeting the fire flow criterion.
- A minimum fire flow in commercial areas of 3,500 gpm and 1,750 gpm in residential areas, or as determined by the current City Fire Code, whichever is greater.
- All system pipelines must be looped unless otherwise agreed to by the City.
- All improvements meet IDEQ and AWWA criteria.
- All improvements meet City of Coeur d'Alene standards.

G1.1.2 Boosted System

Criteria for boosted system include:

- Water supply at least equal to the maximum day demand with the largest pump out of service.
- Storage capable of meeting the maximum fire demand plus equalization demand with the largest pump out of service during the maximum day while maintaining 50 percent storage in reserve. The City reserves the right to pay the incremental cost to oversize the storage at the City's discretion.
- A minimum fire flow in commercial areas of 3,500 gpm and 1,750 gpm in residential areas, or as determined by the current City Fire Code, whichever is greater.
- Ability to return water to lower pressure zones as determined by City staff.

G1.1.3 Booster Pump Station

Criteria for boosted pump stations are:

- Minimum number of service connections = 100

- Minimum of two pumps, each capable of handling maximum day demand
- Standby power required
- Provisions for supplemental disinfection as determined by City staff.
- Building configuration as determined by City staff but that has a minimum of 36-inch clear space around all pumps/pipes/electrical panels and provisions for pump removal.
- SCADA/telemetry as determined by City staff.

G1.1.4 Water Storage Tanks

Water Storage Tank criteria are as follows:

- Welded steel or precast concrete construction with coating systems as approved by City staff.
- Adequate access to and around tank for maintenance (minimum 20-foot-wide access)
- Separate fill/draw lines
- Telemetry as determined by City staff.

G1.1.5 Other Provisions

Other provisions that shall be followed include:

- Compound meters required on meters greater than 1½ inches

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Appendix H

Capital Improvement Plan

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Appendix H - Capital Improvement Plan

City of Coeur d'Alene Water Department

Project Number	Capital Improvement Project Title	Description of Project	Targeted Date When Project will Start	Estimated Cost of Improvement in 2023 Dollars	% Allocated to Growth	% Required by City	$ Growth (CAP Fees)	$ Existing Users (Rates)	2023		2024		2025		2026		2027		2028		2029	
									Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth
Supply																						
S-1	High Zone Additional Supply	4,000 gpm well	2025	$ 2,800,000	100%		$ 2,800,000	$ -						$ 560,000		2,240,000						
S-2	General Zone Additional Supply	2,000 gpm well	2030	$ 2,500,000	100%		$ 2,500,000	$ -														
S-3	High Zone Additional Supply	4,000 gpm well	2035	$ 2,800,000	100%		$ 2,800,000	$ -														
S-4	High Zone Additional Supply	4,000 gpm well	2040	$ 2,800,000	100%		$ 2,800,000	$ -														
S-5	Pump to waste rerouting	Modify existing wells pump to waste structures	2029	$ 50,000		100%	$ -	$ 50,000													$ 50,000	
S-6	4th Street - Well House Replacement	Replace existing 4th Street Well House	2037	$ 1,790,000	100%		$ 1,790,000	$ -														
S-7	Atlas PRV Installation	Installation of PRV downstream Atlas	2025	$ 90,000		100%	$ -	$ 90,000					$ 90,000									
S-8	Regular Pump Rehabilitation	Annual Pump Rehabilitation	Ongoing	$ 100,000		100%	$ -	$ 100,000	$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000	
S-9	Onsite Chlorine Generation Maintenance	Annual Chemical Feed System Maintenance	Ongoing	$ 100,000		100%	$ -	$ 100,000	$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000	
S-10	Soft Start Replacement	Biennial Soft Start Replacement	Ongoing	$ 150,000		100%	$ -	$ 150,000	$ 150,000				$ 150,000				$ 150,000				$ 150,000	
S-11	Water Rights (RAFN)	Reasonably Anticipated Future Needs - Water Rights	2024	$ 20,000	100%		$ 20,000	$ -			$ 20,000										$ 55,000	
S-12	SCADA Maintenance	Annual SCADA Maintenance	Ongoing	$ 55,000		100%	$ -	$ 55,000	$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000	
S-13	General Zone Additional Supply	2,000 gpm well	2036	$ 2,500,000	100%		$ 2,500,000	$ -														
Booster Stations																						
B-1	Elm Street Booster	Additional Pump & Station Upgrades	2028	$ 290,000		100%	$ -	$ 290,000												$ 290,000		
B-2	Elm Street Booster	Pump Modifications with Fernan Split	2032	$ 100,000	100%		$ 100,000	$ -														
B-3	Fernan Booster	Split Fernan and Elm, New Station to Fernan	2032	$ 1,800,000	100%		$ 1,800,000	$ -														
B-4	Fernan Booster	Additional Pump	2034	$ 100,000	100%		$ 100,000	$ -														
B-5	Blackwell Hill	Booster Station Upgrade	2026	$ 2,000,000		100%	$ -	$ 2,000,000							$ 2,000,000							
B-6	Armstrong Park	Additional Pump	2035	$ 1,000,000	100%		$ 1,000,000	$ -														
Storage																						
T-1	High Zone Storage	1 MG Storage in the NE quadrant	2025	$ 6,800,000	100%		$ 6,800,000	$ -						$ 3,400,000		$ 3,400,000						
T-2	Stanley Hill Storage	0.5 MG of Storage	2040	$ 1,700,000	20%	80%	$ 340,000	$ 1,360,000														
T-3	Blackwell Hill Storage	0.6 MG of Storage	2033	$ 1,800,000		100%	$ -	$ 1,800,000														
T-4	Armstrong Park Storage	0.5 MG of Storage	2038	$ 1,700,000		100%	$ -	$ 1,700,000														
T-5	Fernan Hill Storage	0.7 MG of Storage	2032	$ 2,100,000		100%	$ -	$ 2,100,000														
T-6	Recoating of Prairie Standpipe	Recoating of the Exterior	2027	$ 600,000		100%	$ -	$ 600,000										$ 600,000				
T-7	Recoating of Industrial Standpipe	Recoating of the Exterior	2031	$ 600,000		100%	$ -	$ 600,000														
T-8	Recoating Tubbs Hill 1M Gal Tank	Recoat the Exterior	2038	$ 200,000		100%	$ -	$ 200,000														
T-9	Recoating of Prairie Standpipe	Recoating of the Interior	2034	$ 760,000		100%	$ -	$ 760,000														
T-10	Recoating of Industrial Standpipe	Recoating of the Interior	2036	$ 760,000		100%	$ -	$ 760,000														
T-11	Recoating of Existing Stanley Hill Tank	Recoating of Interior and Exterior	2033	$ 130,000		100%	$ -	$ 130,000														
T-12	High Zone Storage	1.0 MG of Storage	2032	$ 6,800,000	100%		$ 6,800,000	$ -														
T-13	High Zone Storage	1.0 MG of Storage	2042	$ 6,800,000	100%		$ 6,800,000	$ -														
Distribution																						
D-1	High Zone Transmission Main	16-inch NE Tank Transmission Main	2024	$ 5,400,000	100%		$ 5,400,000	$ -				$ 5,400,000										
D-2	High Zone Transmission Main	24-inch main between Hanley Well and Prairie Well	2027	$ 3,370,000		100%	$ -	$ 3,370,000										$ 3,370,000				
D-3	High Zone Transmission Main	18-inch main along Wilbur	2029	$ 6,220,000		100%	$ -	$ 6,220,000													$ 6,220,000	
D-4	High Zone Transmission Main	16-inch main for future spiers well	2025	$ 2,480,000	100%		$ 2,480,000	$ -						$ 2,480,000								
D-5	High Zone Transmission Main	16-inch main adjacent to Kathleen	2038	$ 9,240,000	100%		$ 9,240,000	$ -														
D-6	High Zone Transmission Main	Upsizing Piping near Atlas Well	2031	$ 3,210,000	100%		$ 3,210,000	$ -														
D-7	General Zone Main Upsize	Upsizing mains near 4th Street Well	2033	$ 7,520,000	100%		$ 7,520,000	$ -														
D-8	General Zone - River Crossing	Parallel 12-inch to Blackwell River Crossing	2041	$ 670,000		100%	$ -	$ 670,000														
D-9	General Zone - Government Way Piping	Replace & upsize piping near I90 Overpass	2030	$ 1,670,000		100%	$ -	$ 1,670,000														
D-10	General Zone - Emma Ave Piping	Upsize piping to 10-inch and 12-inch	2034	$ 1,780,000	100%		$ 1,780,000	$ -														
D-11	General Zone - Lincoln Way Piping	Upsize piping to 12-inch and 16-inch	2036	$ 810,000	100%		$ 810,000	$ -														
D-12	Stanley Hill Zone Transmission Main	Upsize main to new Stanley Hill Tank	2040	$ 2,390,000		100%	$ -	$ 2,390,000														
D-13	Future Fernan Zone Transmission Main Piping	New transmission main from new BPS to new tank	2032	$ 3,390,000		100%	$ -	$ 3,390,000														
D-14	Armstrong Park Transmission Main	Upsize main to new Armstrong Park Tank	2038	$ 2,000,000		100%	$ -	$ 2,000,000														
D-15	General Zone I -90 Widening at NW Blvd	Replace 12-inch main on I90 overpass	2037	$ 430,000		100%	$ -	$ 430,000														
D-16	Fernan Hill Future Development	Main Extension for future development	2040	$ 1,380,000	100%		$ 1,380,000	$ -														
D-17	Misc. areas around system	Ongoing main replacement	Ongoing	$ 1,300,000		100%	$ -	$ 1,300,000	$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000	
D-18	New/Replace Meter/Hydrant/Service Line Work	Ongoing replacement	Ongoing	$ 500,000		100%	$ -	$ 500,000	$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000	
Additional Capital Improvements																						
M-1	Meter Replacement	Yearly Meter Replacement Program	Ongoing	Varies		100%	$ -	$ 590,000			$ 167,000		$ 541,000		$ 480,000		$ 706,000		$ 529,000		$ 485,000	
M-2	Comprehensive Rate Study	Update Every 5 Years	2028	$ 50,000		100%	$ -	$ 50,000											$ 50,000			
M-3	Comprehensive Plan Update	Update Every 10 Years	2033	$ 150,000		100%	$ -	$ 150,000														

2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043	
Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth	Existing Users	Growth
	$ 560,000		1,940,000																								
											$ 560,000		2,240,000														
																					$ 560,000		$ 2,240,000				
								$ 50,000										$ 50,000									
														$ 1,790,000													
$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000	
$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000		$ 100,000	
		$ 150,000				$ 150,000				$ 150,000				$ 150,000				$ 150,000									
								$ 55,000										$ 20,000									
$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000		$ 55,000	
													$ 560,000		1,940,000												
					$ 100,000																						
					$ 1,800,000																						
									$ 100,000																		
											$ 1,000,000																
																				$ 1,360,000	$ 340,000						
						$ 1,800,000																					
																$ 1,700,000											
				$ 2,100,000																							
		$ 600,000																									
																$ 200,000											
								$ 760,000																			
												$ 760,000															
						$ 130,000																					
				$ 6,800,000																							
																									$ 3,400,000		$ 3,400,000
																	$ 9,240,000										
			$ 3,210,000																								
							$ 7,520,000																				
																						$ 670,000					
$ 1,670,000																											
									$ 1,780,000																		
													$ 810,000														
																				$ 2,390,000							
				$ 3,390,000																							
																$ 2,000,000											
														$ 430,000													
																					$ 1,380,000						
$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000		$ 1,300,000	
$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000		$ 500,000	
$ 829,000		$ 626,000		$ 804,000		$ 725,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000		$ 590,000	
						$ 50,000										$ 50,000											
						$ 150,000																					

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: 4,000 gpm well

CIP Code: S-1, S-3, S-4

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 85,000
2	Construction Traffic Control			0.0%	$ -
3	Well Drilling				
3.1	Test Well	1	LS	$ 50,000	$ 50,000
3.2	Well Drilling - Production Well	1	LS	$ 350,000	$ 350,000
4	Well House				$ -
4.1	Piping and Appurtenances	1	LS	$ 150,000	$ 150,000
4.2	4000 gpm well pump	1	LS	$ 200,000	$ 200,000
4.3	Electrical & SCADA	1	LS	$ 350,000	$ 350,000
4.4	Building	1	LS	$ 200,000	$ 200,000
4.5	Site Work	1	LS	$ 120,000	$ 120,000
4.6	Backup Power	1	LS	$ 110,000	$ 110,000
4.7	On-Site Disinfection	1	LS	$ 125,000	$ 125,000
5	Bonding and Insurance		-	2.5%	$ 41,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,781,000**
				Contingency [1]	**$ 534,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 463,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,800,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: 2,000 gpm well

CIP Code: S-2, S-13

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 75,000
2	Construction Traffic Control			0.0%	$ -
3	Well Drilling				
3.1	Test Well	1	LS	$ 50,000	$ 50,000
3.2	Well Drilling - Production Well	1	LS	$ 275,000	$ 275,000
4	Well House				$ -
4.1	Piping and Appurtenances	1	LS	$ 150,000	$ 150,000
4.2	2000 gpm well pump	1	LS	$ 150,000	$ 150,000
4.3	Electrical & SCADA	1	LS	$ 300,000	$ 300,000
4.4	Building	1	LS	$ 200,000	$ 200,000
4.5	Site Work	1	LS	$ 120,000	$ 120,000
4.6	Backup Power	1	LS	$ 100,000	$ 100,000
4.7	On-Site Disinfection	1	LS	$ 125,000	$ 125,000
5	Bonding and Insurance		-	2.5%	$ 37,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,582,000**
				Contingency [1]	**$ 475,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 411,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,500,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Upper Zone Storage - 1.0 MG

CIP Code: T-1, T-12, T-13

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 207,000
2	Construction Traffic Control			2.0%	$ 81,000
3	Storage Improvements				
3.1	Storage Tank (Working Volume 1.0 MG)	1	LS	$ 2,500,000	$ 2,500,000
3.2	Foundation	1	LS	$ 350,000	$ 350,000
3.3	Excavation	1	LS	$ 250,000	$ 250,000
3.4	Fencing	500	LF	$ 150	$ 75,000
4	Miscellaneous Other				
4.1	Electrical and Instrumentation			10%	$ 318,000
4.2	Site Piping			10%	$ 349,000
4.3	Site Restoration			10%	$ 134,000
5	Bonding and Insurance		-	2.5%	$ 87,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 4,351,000**
				Contingency [1]	**$ 1,305,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 1,131,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 6,800,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 5/1/2024

2023 Comprehensive Plan Update

DESCRIPTION: Stanley Hill Tank

CIP Code: T-2

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 52,000
2	Construction Traffic Control				$ -
3	Storage Improvements				
3.1	Property Acquisition	6,000	SF	$ 15	$ 90,000
3.2	Site Work	1	LS	$ 30,000	$ 30,000
3.4	Storage Tank and Foundation (0.5 MG)	1	LS	$ 800,000	$ 800,000
4	Miscellaneous Other				
4.1	Electrical and Instrumentation			5%	$ 46,000
4.2	Site Piping			5%	$ 48,000
5	Bonding and Insurance		-	2.5%	$ 24,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,090,000**
				Contingency [1]	**$ 327,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 283,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,700,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 5/1/2024
2023 Comprehensive Plan Update

DESCRIPTION: Blackwell Hill Tank

CIP Code: T-3

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 55,000
2	Construction Traffic Control				$ -
3	Storage Improvements				
3.1	Property Acquisition	-	SF	$ 15	$ -
3.2	Site Work	1	LS	$ 100,000	$ 100,000
3.4	Storage Tank and Foundation (0.6 MG)	1	LS	$ 875,000	$ 875,000
4	Miscellaneous Other				
4.1	Electrical and Instrumentation			5%	$ 49,000
4.2	Site Piping			5%	$ 51,000
5	Bonding and Insurance		-	2.5%	$ 26,000
	ESTIMATED CONSTRUCTION SUBTOTAL				**$ 1,156,000**
	Contingency [1]				**$ 347,000**
	Planning, Engineering, & Administrative Costs [2]				**$ 301,000**
	TOTAL PROBABLE COST IN 2023 DOLLARS				**$ 1,800,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 5/1/2024

2023 Comprehensive Plan Update

DESCRIPTION: Armstrong Park Tank

CIP Code: T-4

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 52,000
2	Construction Traffic Control				$ -
3	Storage Improvements				
3.1	Property Acquisition	6,000	SF	$ 15	$ 90,000
3.2	Site Work	1	LS	$ 30,000	$ 30,000
3.4	Storage Tank and Foundation (0.5 MG)	1	LS	$ 800,000	$ 800,000
4	Miscellaneous Other				
4.1	Electrical and Instrumentation			5%	$ 46,000
4.2	Site Piping			5%	$ 48,000
5	Bonding and Insurance		-	2.5%	$ 24,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,090,000**
				Contingency [1]	**$ 327,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 283,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,700,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 5/1/2024
2023 Comprehensive Plan Update

DESCRIPTION: Fernan Hill Tank

CIP Code: T-5

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 65,000
2	Construction Traffic Control				$ -
3	Storage Improvements				
3.1	Property Acquisition	8,000	SF	$ 15	$ 120,000
3.2	Site Work	1	LS	$ 40,000	$ 40,000
3.4	Storage Tank and Foundation (0.7 MG)	1	LS	$ 1,000,000	$ 1,000,000
4	Miscellaneous Other				
4.1	Electrical and Instrumentation			5%	$ 58,000
4.2	Site Piping			5%	$ 61,000
5	Bonding and Insurance		-	2.5%	$ 30,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,374,000**
				Contingency [1]	**$ 412,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 357,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,100,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Standpipe Coatings

CIP Code: T-6, T-7

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 18,000
2	Construction Traffic Control			0.0%	$ -
3	Coating				
3.1	Exterior Coating of Standpipe	30,000	SF	$ 8	$ 240,000
4	Miscellaneous Other				$ -
4.1	Coordination around Communication Utilities & Misc.	1	LS	50%	$ 120,000
5	Bonding and Insurance		-	2.5%	$ 9,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 387,000**
				Contingency [1]	**$ 116,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 101,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 600,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Tubbs 1.0 MG Coating

CIP Code: T-8

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 6,000
2	Construction Traffic Control			0.0%	$ -
3	Coating				
3.1	Exterior Coating	12,300	SF	$ 8	$ 98,400
4	Miscellaneous Other				$ -
4.1	Coordination around Communication Utilities & Misc	1	LS	25%	$ 25,000
5	Bonding and Insurance		-	2.5%	$ 3,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 132,400**
				Contingency [1]	**$ 40,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 34,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 200,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Standpipe Coatings

CIP Code: T-9, T-10

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 23,000
2	Construction Traffic Control			0.0%	$ -
3	Coating				
3.1	Interior Coating of Standpipe	30,000	SF	$ 10	$ 300,000
4	Miscellaneous Other				$ -
4.1	Coordination around Communication Utilities & Misc.	1	LS	50%	$ 150,000
5	Bonding and Insurance		-	2.5%	$ 11,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 484,000**
				Contingency [1]	**$ 145,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 126,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 760,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Stanley Coatings

CIP Code: T-11

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 4,000
2	Construction Traffic Control			0.0%	$ -
3	Coating				
3.1	Exterior Coating	3,214	SF	$ 8	$ 25,711
3.2	Interior Coating	3,214	SF	$ 12	$ 38,566
4	Miscellaneous Other				$ -
4.1	Coordination around Communication Utilities & Misc.	1	LS	25%	$ 16,000
5	Bonding and Insurance		-	2.5%	$ 2,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 86,277**
				Contingency [1]	**$ 26,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 22,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 130,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Elm Street Additional Pump & Upgrades

CIP Code: B-1

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 9,000
2	Construction Traffic Control			0.0%	$ -
3	General Site Work, Mechanical Upgrades, Building Upgrades	1	LS	$ 70,000	$ 70,000
4	Pump (400 gpm)	1	EA	$ 30,000	$ 30,000
5	*Installation and Markup*			50%	$ 15,000
6	Electrical & Programming	1	LS	50%	$ 58,000
7	Bonding and Insurance		-	2.5%	$ 4,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 186,000**
				Contingency [1]	**$ 56,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 48,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 290,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Additional Pump

CIP Code: B-2, B-4

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 4,000
2	Construction Traffic Control			0.0%	$ -
3	Mechanical Upgrades	1	LS	$ 10,000	$ 10,000
4	Pump (200 +/- gpm)	1	EA	$ 25,000	$ 25,000
5	*Installation and Markup*			50%	$ 12,500
6	Electrical & Programming	1	LS	50%	$ 24,000
7	Bonding and Insurance		-	2.5%	$ 2,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 77,500**
				Contingency [1]	**$ 23,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 20,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 100,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Fernan Hill - Split with Stanley

CIP Code: B-3

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 56,000
2	Construction Traffic Control			0.0%	$ -
3	General Site Work, Mechanical Upgrades, Building	1	LS	$ 600,000	$ 600,000
4	Pump (250 gpm)	3	EA	$ 27,500	$ 83,000
5	*Installation and Markup*			50%	$ 42,000
6	Electrical & Programming	1	LS	50%	$ 363,000
7	Bonding and Insurance		-	2.5%	$ 27,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,171,000**
				Contingency [1]	**$ 351,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 304,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,800,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 5/1/2024

DESCRIPTION: Armstrong Park Upgrades

CIP Code: B-6

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 33,000
2	Construction Traffic Control			0.0%	$ -
3	General Site Work, Mechanical Upgrades, Building	1	LS	$ 300,000	$ 300,000
4	Pump (220 gpm)	3	EA	$ 27,500	$ 83,000
5	*Installation and Markup*			50%	$ 42,000
6	Electrical & Programming	1	LS	50%	$ 213,000
7	Bonding and Insurance		-	2.5%	$ 16,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 687,000**
				Contingency [1]	**$ 206,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 179,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,100,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 20% of subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: High Zone - Transmission Main Piping for Addition of NE Storage

CIP Code: D-1

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 165,000
2	Construction Traffic Control			2.5%	$ 80,000
3	Water Main Installation				
	16-inch PVC	7,300	LF	$ 250	$ 1,825,000
	Trench Excavation, Bedding and Backfill	7,300	LF	$ 42	$ 309,068
4	Water Service Installation/Replacement			0.0%	$ -
5	Surface Repair (half width) [2]	7,300	LF	$ 137	$ 1,001,733
6	Construction Facilities and Temporary Controls		-	1.0%	$ 31,000
7	Bonding and Insurance		-	2.5%	$ 53,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 3,464,802**
				Contingency [3]	**$ 1,039,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 901,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 5,400,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 6/18/2024
2023 Comprehensive Plan Update

DESCRIPTION: High Zone between Hanley & Prairie Wells

CIP Code: D-2

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 103,000
2	Construction Traffic Control			2.5%	$ 50,000
3	Water Main Installation				
	24-inch PVC	3,200	LF	$ 420	$ 1,344,000
	Trench Excavation, Bedding and Backfill	3,200	LF	$ 42	$ 135,482
4	Water Service Installation/Replacement			2.0%	$ 30,000
5	Surface Repair (half width) [2]	3,200	LF	$ 137	$ 439,116
6	Construction Facilities and Temporary Controls		-	1.0%	$ 19,000
7	Bonding and Insurance		-	2.5%	$ 38,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,158,598**
				Contingency [3]	**$ 648,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 561,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 3,370,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: High Zone - New Transmission Main Piping in Wilbur

CIP Code: D-3

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 190,000
2	Construction Traffic Control			2.5%	$ 93,000
3	Water Main Installation				
	18-inch PVC	6,700	LF	$ 350	$ 2,345,000
	Trench Excavation, Bedding and Backfill	6,700	LF	$ 42	$ 283,665
4	Water Service Installation/Replacement			2.0%	$ 53,000
5	Surface Repair (half width) [2]	6,700	LF	$ 137	$ 919,399
6	Construction Facilities and Temporary Controls		-	1.0%	$ 36,000
7	Bonding and Insurance		-	2.5%	$ 67,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 3,987,065**
				Contingency [3]	**$ 1,196,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 1,037,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 6,220,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: High Zone - New Transmission Main Piping for Spiers Well

CIP Code: D-4

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 76,000
2	Construction Traffic Control			2.5%	$ 37,000
3	Water Main Installation				
	16-inch PVC	3,300	LF	$ 250	$ 825,000
	Trench Excavation, Bedding and Backfill	3,300	LF	$ 42	$ 139,716
4	Water Service Installation/Replacement			2.0%	$ 19,000
5	Surface Repair (half width) [2]	3,300	LF	$ 137	$ 452,838
6	Construction Facilities and Temporary Controls		-	1.0%	$ 14,000
7	Bonding and Insurance		-	2.5%	$ 25,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,588,554**
				Contingency [3]	**$ 477,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 413,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,480,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 6/18/2024
2023 Comprehensive Plan Update

DESCRIPTION: High Zone - New Transmission Main Piping Adjacent to Kathleen

CIP Code: D-5

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 282,000
2	Construction Traffic Control			2.5%	$ 138,000
3	Water Main Installation				
	16-inch PVC	12,300	LF	$ 250	$ 3,075,000
	Trench Excavation, Bedding and Backfill	12,300	LF	$ 42	$ 520,759
4	Water Service Installation/Replacement			2.0%	$ 72,000
5	Surface Repair (half width) [2]	12,300	LF	$ 137	$ 1,687,852
6	Construction Facilities and Temporary Controls		-	1.0%	$ 54,000
7	Bonding and Insurance		-	2.5%	$ 92,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 5,921,611**
				Contingency [3]	**$ 1,776,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 1,540,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 9,240,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 6/18/2024
2023 Comprehensive Plan Update

DESCRIPTION: High Zone - New Transmission Main Piping Near Atlas Well

CIP Code: D-6

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 98,000
2	Construction Traffic Control			2.5%	$ 48,000
3	Water Main Installation				
	10-inch PVC	890	LF	$ 100	$ 89,000
	12-inch PVC	5,000	LF	$ 140	$ 700,000
	Trench Excavation, Bedding and Backfill	5,890	LF	$ 42	$ 249,372
4	Water Service Installation/Replacement			2.0%	$ 21,000
5	Surface Repair (half width)	5,890	LF	$ 137	$ 808,248
6	Construction Facilities and Temporary Controls		-	1.0%	$ 19,000
7	Bonding and Insurance		-	2.5%	$ 26,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,058,619**
				Contingency [3]	**$ 618,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 535,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 3,210,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department — **DATE:** 6/18/2024
2023 Comprehensive Plan Update

DESCRIPTION: General Zone - New Transmission Main Piping Near 4th Street Well

CIP Code: D-7

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 229,000
2	Construction Traffic Control			2.5%	$ 112,000
3	Water Main Installation				
	8-inch PVC	2,100	LF	$ 70	$ 147,000
	12-inch PVC	4,800	LF	$ 140	$ 672,000
	16-inch PVC	5,000	LF	$ 250	$ 1,250,000
	18-inch PVC	200	LF	$ 350	$ 70,000
	Trench Excavation, Bedding and Backfill	12,100	LF	$ 42	$ 512,291
4	Water Service Installation/Replacement			2.0%	$ 53,000
5	Surface Repair (half width) [2]	12,100	LF	$ 137	$ 1,660,407
6	Construction Facilities and Temporary Controls		-	1.0%	$ 44,000
7	Bonding and Insurance		-	2.5%	$ 68,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 4,817,699**
				Contingency [3]	**$ 1,445,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 1,253,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 7,520,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: General Zone - River Crossing

CIP Code: D-8

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 20,000
2	Construction Traffic Control			2.5%	$ 10,000
3	Water Main Installation				
	12-inch PVC	1,200	LF	$ 140	$ 168,000
	Trench Excavation, Bedding and Backfill	1,200	LF	$ 42	$ 50,806
4	Water Service Installation/Replacement			2.0%	$ 4,000
5	Surface Repair (half width) [2]	1,200	LF	$ 137	$ 164,669
6	Construction Facilities and Temporary Controls		-	1.0%	$ 4,000
7	Bonding and Insurance		-	2.5%	$ 6,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 427,474**
				Contingency [3]	**$ 128,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 111,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 670,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: General Zone - Government Way Piping

CIP Code: D-9

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 51,000
2	Construction Traffic Control			2.5%	$ 25,000
3	Water Main Installation				
	12-inch PVC	3,000	LF	$ 140	$ 420,000
	Trench Excavation, Bedding and Backfill	3,000	LF	$ 42	$ 127,014
4	Water Service Installation/Replacement			2.0%	$ 11,000
5	Surface Repair (half width) [2]	3,000	LF	$ 137	$ 411,671
6	Construction Facilities and Temporary Controls		-	1.0%	$ 10,000
7	Bonding and Insurance		-	2.5%	$ 14,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,069,686**
				Contingency [3]	**$ 321,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 278,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,670,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: General Zone - Emma Ave Piping

CIP Code: D-10

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 54,000
2	Construction Traffic Control			2.5%	$ 26,000
3	Water Main Installation				
	10-inch PVC	700	LF	$ 100	$ 70,000
	12-inch PVC	2,600	LF	$ 140	$ 364,000
	Trench Excavation, Bedding and Backfill	3,300	LF	$ 42	$ 139,716
4	Water Service Installation/Replacement			2.0%	$ 10,000
5	Surface Repair (half width) [2]	3,300	LF	$ 137	$ 452,838
6	Construction Facilities and Temporary Controls		-	1.0%	$ 10,000
7	Bonding and Insurance		-	2.5%	$ 13,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,139,554**
				Contingency [3]	**$ 342,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 296,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,780,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: General Zone - Lincoln Way Piping

CIP Code: D-11

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 25,000
2	Construction Traffic Control			2.5%	$ 12,000
3	Water Main Installation				
	8-inch PVC	30	LF	$ 70	$ 2,100
	12-inch PVC	1,100	LF	$ 140	$ 154,000
	16-inch PVC	240	LF	$ 250	$ 60,000
	Trench Excavation, Bedding and Backfill	1,370	LF	$ 42	$ 58,003
4	Water Service Installation/Replacement			2.0%	$ 5,000
5	Surface Repair (half width) [2]	1,370	LF	$ 137	$ 187,997
6	Construction Facilities and Temporary Controls		-	1.0%	$ 5,000
7	Bonding and Insurance		-	2.5%	$ 7,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 516,100**
				Contingency [3]	**$ 155,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 134,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 810,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: Stanley Hill Zone Piping

CIP Code: D-12

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 73,000
2	Construction Traffic Control			2.5%	$ 36,000
3	Water Main Installation				
	12-inch PVC	4,300	LF	$ 140	$ 602,000
	Trench Excavation, Bedding and Backfill	4,300	LF	$ 42	$ 182,054
4	Water Service Installation/Replacement			2.0%	$ 16,000
5	Surface Repair (half width) [2]	4,300	LF	$ 137	$ 590,062
6	Construction Facilities and Temporary Controls		-	1.0%	$ 14,000
7	Bonding and Insurance		-	2.5%	$ 20,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,533,116**
				Contingency [3]	**$ 460,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 399,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,390,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: Future Fernan Zone Piping

CIP Code: D-13

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 103,000
2	Construction Traffic Control			2.5%	$ 50,000
3	Water Main Installation				
	12-inch PVC	6,100	LF	$ 140	$ 854,000
	Trench Excavation, Bedding and Backfill	6,100	LF	$ 42	$ 258,263
4	Water Service Installation/Replacement			2.0%	$ 22,000
5	Surface Repair (half width) [2]	6,100	LF	$ 137	$ 837,065
6	Construction Facilities and Temporary Controls		-	1.0%	$ 20,000
7	Bonding and Insurance		-	2.5%	$ 28,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,172,327**
				Contingency [3]	**$ 652,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 565,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 3,390,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: Armstrong Zone Piping

CIP Code: D-14

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 61,000
2	Construction Traffic Control			2.5%	$ 30,000
3	Water Main Installation				
	12-inch PVC	3,600	LF	$ 140	$ 504,000
	Trench Excavation, Bedding and Backfill	3,600	LF	$ 42	$ 152,417
4	Water Service Installation/Replacement			2.0%	$ 13,000
5	Surface Repair (half width) [2]	3,600	LF	$ 137	$ 494,006
6	Construction Facilities and Temporary Controls		-	1.0%	$ 12,000
7	Bonding and Insurance		-	2.5%	$ 17,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 1,283,423**
				Contingency [3]	**$ 385,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 334,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 2,000,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: General Zone I90 Widening

CIP Code: D-15

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	**Description**	**Est. Quant.**	**Unit**	**Unit Price**	**Total Price**
1	Mobilization, Administration, Demobilization			5.0%	$ 13,000
2	Construction Traffic Control			2.5%	$ 6,000
3	Water Main Installation				
	12-inch PVC	600	LF	$ 140	$ 84,000
	Trench Excavation, Bedding and Backfill	600	LF	$ 42	$ 25,403
	Misc. Items (bridge hangings and etc.)			50.0%	$ 55,000
4	Water Service Installation/Replacement			2.0%	$ 2,000
5	Surface Repair (half width) [2]	600	LF	$ 137	$ 82,334
6	Construction Facilities and Temporary Controls		-	1.0%	$ 2,000
7	Bonding and Insurance		-	2.5%	$ 4,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 273,737**
				Contingency [3]	**$ 82,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 71,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 430,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

ENGINEER'S OPINION OF PROBABLE COST

7825 Meadowlark Way, Coeur d'Alene, ID 83815 / 208.762.8787

PROJECT: Coeur d'Alene Water Department
2023 Comprehensive Plan Update

DATE: 6/18/2024

DESCRIPTION: Fernan Hill Future Development

CIP Code: D-16

J-U-B PROJ. NO.: 20-22-058

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
ITEM No.	Description	Est. Quant.	Unit	Unit Price	Total Price
1	Mobilization, Administration, Demobilization			5.0%	$ 42,000
2	Construction Traffic Control			2.5%	$ 21,000
3	Water Main Installation				
	8-inch PVC	3,200	LF	$ 70	$ 224,000
	Trench Excavation, Bedding and Backfill	3,200	LF	$ 42	$ 135,482
4	Water Service Installation/Replacement			2.0%	$ 7,000
5	Surface Repair (half width) [2]	3,200	LF	$ 137	$ 439,116
6	Construction Facilities and Temporary Controls		-	1.0%	$ 8,000
7	Bonding and Insurance		-	2.5%	$ 9,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 885,598**
				Contingency [3]	**$ 266,000**
				Planning, Engineering, & Administrative Costs [1]	**$ 230,000**
				TOTAL PROBABLE COST IN 2023 DOLLARS	**$ 1,380,000**

1 Estimated at 30% of construction subtotal.

2 Estimated at 4"HMA/8" Base for 1/2 Street

3 Estimated at 20% of the subtotal.

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Appendix I

DEQ Correspondence

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APPENDIX I

DEQ Correspondence

Prepared by:

J-U-B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

(208) 762-8787 | www.jub.com

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Jessica Waller

From: MARINE, KYLE <KMARINE@cdaid.org>
Sent: Tuesday, October 8, 2024 12:04 PM
To: Jessica Waller; POELSTRA, GLEN
Cc: Michelle L. Johnson; Avery Postera
Subject: [EXTERNAL] RE: Fire Flows.
Attachments: 20241008112402429.pdf

See below for Craig Etherton comments. (CDA fire dep inspector) he is willing to right a sporting letter if needs be.

Kyle

Here is the currently adopted Appendix B from the 2018 International Fire Code (IFC). The FD adopts whatever version of the fire code that the State Fire Marshal's office adopts. Perhaps in your reference to DEQ you can word it in a similar way. I do not foresee a time when we would not adopt this appendix with a new code adoption.

Let me know if you think this will work for you.

Craig Etherton
Coeur D'Alene Fire Department

Deputy Fire Marshal
IAAI-CFI
Public Information Officer-PIO
Youth Fire Intervention Specialist
(208) 769-2245 office
(208) 659-8986 cell

Kyle Marine
Cell: 208-449-4021
Fax: 208-769-2336
kmarine@cdaid.org

From: Jessica Waller <jwaller@jub.com>
Sent: Tuesday, October 8, 2024 8:46 AM
To: MARINE, KYLE <KMARINE@cdaid.org>; POELSTRA, GLEN <GPOELSTRA@cdaid.org>
Cc: Michelle L. Johnson <mjohnson@jub.com>; Avery Postera <apostera@jub.com>
Subject: FW: Fire Flows.

Good morning Kyle,

We are working on addressing comments from DEQ on the Water System Plan Update. They have asked for documentation from the local fire authority supporting the required fire flows. All we have for documentation is the below email String from Terry.

Would you be able to get a letter or even email from the Fire Department supporting the fire flows listed in the original email? We could include the letter in an appendices for DEQ.

Let us know if you have any questions, thank you!

JESSICA WALLER

From: PICKEL, TERRY <TPICKEL@cdaid.org>
Sent: Tuesday, April 18, 2023 4:04 PM
To: Jessica Waller <jwaller@jub.com>
Cc: MARINE, KYLE <KMARINE@cdaid.org>; Michelle L. Johnson <mjohnson@jub.com>; Avery Postera <apostera@jub.com>
Subject: [EXTERNAL] RE: Fire Flows.

External Email - This Message originated from outside J-U-B ENGINEERS, Inc.

Hi Jessica,

I have confirmed with Bobby Gonder that the fire flow requirements have not changed.

Thanks,

Terry W Pickel
Director
CDA Water Dept.
(208)769-2210

From: Jessica Waller <jwaller@jub.com>
Sent: Monday, April 17, 2023 10:04 AM
To: PICKEL, TERRY <TPICKEL@cdaid.org>
Cc: MARINE, KYLE <KMARINE@cdaid.org>; Michelle L. Johnson <mjohnson@jub.com>; Avery Postera <apostera@jub.com>
Subject: RE: Fire Flows.

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Good morning Terry,

Just wanted to follow-up and see if you had received information back from Bobby on the Fire Flows listed below.

TABLE B105.1(1)
REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0–3,600	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	500	$^1/_2$
3,601 and greater	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	$^1/_2$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *International Building Code*.

b. Measured at 20 psi residual pressure.

Thank you for helping us track down these items, much appreciated!

JESSICA WALLER

J-U-B ENGINEERS, Inc.
7825 Meadowlark Way, Coeur d'Alene, ID 83815
e jwaller@jub.com *w* www.jub.com
p 208 762 8787 *f* 208 762 9797

From: PICKEL, TERRY <TPICKEL@cdaid.org>
Sent: Thursday, February 16, 2023 8:07 AM
To: GONDER, ROBERT <RGONDER@cdaid.org>
Cc: MARINE, KYLE <KMARINE@cdaid.org>; Michelle L. Johnson <mjohnson@jub.com>; Jessica Waller <jwaller@jub.com>
Subject: [EXTERNAL] Fire Flows.

Good morning Bobby,

We are working on our Comprehensive Plan Update and I wanted to check with you to make sure we still have correct fire flow requirements prior to the consultant modeling the system. They have listed at this point:

Residential(R-1, R-3, R-8, R-12) Home < 3600 Sq Ft. = 1000 gpm for a duration of 2 hours with a minimum 20 psi pressure.
Residential(R-1, R-3, R-8, R-12) Home 3600 to 5000 Sq Ft. = 1750 gpm for 2 hours with a minimum 20 psi pressure.
Commercial (C-17, C-34) at 3500 gpm for 3 hours with a minimum 20 psi pressure.
Industrial (LM, M) at 3500 gpm at 3 hours with a minimum 20 psi pressure.

Please let us know if there are any changes or additions to that.

Thanks Bobby.

Terry W Pickel
Director
CDA Water Dept.
(208)769-2210

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J-U-B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

J-U-B FAMILY OF COMPANIES

Appendix J

City Council Meeting Minutes & Public Presentation

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APPENDIX J

City Council Meeting Minutes & Public Presentation

Prepared by:

J-U-B ENGINEERS, INC.

7825 Meadowlark Way

Coeur d'Alene, ID

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