COFFMAN ENGINEERS

CCWUA Public Water System

Water Facility Plan

COFFMAN PROJECT NO. 240801

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Prepared for: IDEQ

COUGAR CREEK WATER USERS ASSOCIATION PUBLIC WATER SYSTEM
WATER FACILITY PLAN

FOR

Idaho Department of Environmental Quality

Project Number: 240801

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I. INTRODUCTION

The Cougar Creek Water User's Association (CCWUA) maintains a Very Small Water System (VSWS), Public Water System No. ID1090030, at Cavanaugh Bay, Priest Lake, located near Coolin, ID in Bonner County. The system consists of two water supply wells, approximately 12,250 ft of distribution piping, and an aboveground 120,000-gallon storage tank reservoir. The system currently serves 107 total residential lots and one commercial property. The system meets the definition of a Community Water System, with at least twenty-five year-round residents.

This document has been organized to meet Facility Plan requirements detailed in IDAPA 58.01.08.502. Per section 502.01 "The owner of all new PWSs, and existing PWSs undergoing material modification, are required to have a current facility plan that addresses all applicable issues specifically required in sections 500 through 552." The Plan was reviewed according to relevant checklists provided by Idaho Department of Environmental Quality (IDEQ) to facilitate IDEQ review and approval. The Drinking Water Outline and Checklist for Planning Document is included for reference in Attachment A.

The Cougar Creek Water User's Associated is managed by the Water Board (CCWUA Board) and funded through the collection of annual fees from each user. CCWUA is an Idaho nonprofit corporation registered under Secretary of State file no. 0000160349. The CCWUA bylaws and ownership information is included in Attachment B. The CCWUA Board solicited the services of an experienced Professional Engineer to evaluate the system. This assessment was performed by a licensed Professional Engineer who is qualified and experienced in the design and evaluation of water systems.

II. EXISTING CONDITIONS

A. PROJECT SITE

The CCWUA public water system is located on the southeast shore of Cavanaugh Bay, on Priest Lake, in Bonner County, Idaho. The community is accessible via Cavanaugh Bay Road, a paved access road that connects to State Highway 57 via Dickensheet Road. Residential properties are accessed via well-established gravel roads which connect to Cavanaugh Bay Road. Management of the public water system is performed by the CCWUA Board. Each developed parcel is connected to the Coolin Sewer District wastewater system and maintains an individual sewage pump to transport wastewater via a pressure and gravity sewer collection system to the Coolin Sewer District operated centralized wastewater treatment plant. The wastewater treatment plant is located south of Cavanaugh Bay.

The CCWUA system primarily serves residential properties, most of which are seasonally occupied during the summer. The area is a rural, natural area populated with residential dwellings lining the shoreline of Cavanaugh Bay to the north, and Priest Lake State Forest to the east and south. The system includes 107 domestic service connections with additional undeveloped lots with potential future development anticipated. A single commercial restaurant and resort property is served by the system. The system does not serve any industrial users. A system site plan is included in the design plans in Attachment C.

B. SITE PHYSICAL CONDITIONS

The vegetative community is dominated by large pine and spruce species with undergrowth of grasses, ferns, and small shrubs. Domestic parcels located along the flat portion adjacent to Cavanaugh Bay Rd maintain grassy lawns. The southern shore of Cavanaugh Bay along which the restaurant/resort and ten of the residences are located consists of an unvegetated gravelly sandy beach with a gentle slope.

The area experiences a humid continental climate, characterized by four distinct seasons and significant temperature variations throughout the year. Most of the precipitation occurs during the fall and winter months. Precipitation data taken from the Priest River Experimental Weather Station No. USC00107386, Priest River, Idaho, recorded 36.4 inches of rainfall and 58.2 inches of snowfall in water year 2024. Average annual precipitation is 23.8 inches per year with temperatures averaging between 32.9° F and 45.0° F during winter months (Jan-Mar), and 70.7° F and 71.8° F during summer months (Jun-Aug).

C. GEOLOGY AND HYDROGEOLOGY

The area's surficial geology consists of glacial and alluvial sediments overlying granitic and basement rock of the Priest River Complex. Sediments in the area extend up to approximately 200 feet thick and consist of interbedded clay, silt, and sand. Although the full extent near the project area is uncertain, granitic bedrock was encountered in Well 1 at about 213 feet below ground surface. The surface soils present are generally well draining. The northeast portion of the system has slopes of 35% to 60% with well-draining gravelly coarse sand to a depth of 30-60 inches.

The primary aquifer serving the Cavanaugh Bay community is situated within relatively shallow, interbedded Quaternary glacial and alluvial deposits. This aquifer is predominantly composed of sand, silt, clay, and gravel deposits with significant localized variance throughout. Reported aquifer thicknesses vary, with the maximum reaching up to 89 feet. It is generally classified as semi-confined to confined. Recharge to the aquifer occurs through several pathways: hydraulic interaction with surface water and precipitation originating in the Selkirk Mountains to the east, direct infiltration of local precipitation, and leakage from nearby residential irrigation systems and ditches. Subsurface investigations reveal the presence of shallow plutonic bedrock, which may impose negative hydraulic boundary conditions, potentially restricting groundwater flow within the aquifer.

Groundwater discharges from the aquifer primarily through pumping at supply wells and through subsurface outflow into Priest Lake. The direction of groundwater flow is influenced by local topography, surface water drainage patterns, and seasonal snowmelt originating from the mountains with flow moving predominantly northwest toward Priest Lake.

D. ENVIRONMENTAL CONDITIONS AND CULTURAL RESOURCES

The Idaho Cultural Resource Information System (ICRIS), a map-based database containing approximately 51,000 historic sites across the state, was reviewed to screen for archaeological and historic resources within the project’s Area of Potential Effects (APE). No historic or culturally significant sites were identified within the APE based on ICRIS data. However, an inadvertent discovery plan will be included in the construction documents as a precaution.

A review of the applicable FEMA Flood Insurance Rate Map (FIRM) indicates all proposed project actions (please refer to Recommended Improvements Schematic Plans in Attachment C) will be located outside of the 100-year Special Flood Hazard Area defined for FIRM 16017C0225F as area below the base flood elevation of 2445.5 feet.

For additional environmental condition information, please refer to the Environmental Information Document in Attachment D to this Water Facility Plan.

III. SYSTEM DEMAND

The CCWUA system consists of 107 total domestic service connections and one resort/restaurant. There is a total of 132 parcels inside the service area boundary. Any significant changes in the function or capacity of the CCWUA public water system will require the update and submittal of the water facility plan to IDEQ for approval.

The total existing system demand has been determined and presented in units of Equivalent Dwelling Units (EDU), as required by IDAPA 58.01.08. An EDU can be quantified as the amount of water used by a single residence, assuming each residence contains 2.5 individuals on average, with each individual using 100 gallons per day. Each residence will be considered a single EDU, and the Restaurant/Resort will be considered equivalent to three residential properties. The total existing number of EDUs for the CCWUA System is thus determined to be 110. At an Average Day Demand (ADD) of 250 gallons per day per EDU, the existing ADD of the entire CCWUA system is calculated to be 27,500 gpd, not including irrigation. This information is contained in Table 1.

Table 1 – CCWUA Water System Existing EDUs and ADD

Property Type	# of EDU's	Gal per EDU	Average Day Demand (ADD)
Residential	107	250	26,500 gal
Commercial	3	250	750 gal
Total EDU's	110	250	27,250 gal

The Cougar Creek/Cavanaugh Bay community consists of a total of 132 parcels including currently undeveloped properties. Should all currently undeveloped parcels within the CCWUA system be developed, the total EDUs would be increased to a total of 131 residential units, with commercial EDUs remaining the same. The buildout scenario represents the maximum future conditions that the CCWUA system will be designed to serve. A summary of the buildout conditions of the system, not including irrigation, is contained in Table 2.

Table 2 – CCWUA Water System Future Buildout EDUs and ADD

Property Type	# of EDU's	Gal per EDU	Average Day Demand (ADD)
Residential	131	250	32,500 gal
Commercial	3	250	750 gal
Total EDU's	134	250	33,250 gal

Maximum Day Demand (MDD) for Public Water Systems according to IDAPA 58.01.08.552.01.a must be at least 800 GPD per residence, not including water used for irrigation or fire protection unless the owner demonstrates to the Department's satisfaction that a lower rate is justified. As detailed in Attachment L, CCWUA collected flow data during 2025 demonstrating a maximum day demand of 684 GPD per EDU.

To represent irrigation demand, MDD can be further divided into MDD_{INT}, representing the internal water uses for an average residential dwelling, and MDD_{EXT} representing the external water demands such as lawn and garden irrigation. Based on lot sizes and Northern Idaho weather conditions, MDD_{EXT} is estimated at 700 gallons per day per EDU.

To convert total MDD to Peak Hourly Demand (PHD), the WADOH Water System Design Manual equation 3-1 and Table 3-1 can be used. PHD can be similarly calculated for system buildout conditions (denoted as PHD_{BO}). MDD_{INT} and MDD_{EXT} would remain the same, with PHD_{BO} increasing based on the increased system EDUs. PHD_{BO} and water system characteristics are included in Equation 1 and Table 4 respectively. In Equation 1 below, N is the number of EDUs in each scenario.

Eq. 1: $PHD = (EDU_{MDD}/1440)(C*N + F) + 18$ where C = 2.5, and F = 25

$$PHD = ((684+700)/1440)(2.5*110 + 25) + 18$$

$$= 306 \text{ gpm}$$

$$PHD_{BO} = ((684+700)/1440)(2.5*134 + 25) + 18$$

$$= 364 \text{ gpm}$$

Table 3 – CCWUA Water System Existing Conditions Summary

Water Demand Characterization	Value	Units
Equivalent Domestic Units – EDU	110	N/A
Average Day Demand – ADD	250	gal/day/EDU
Maximum Day Demand – MDD_{INT}	684	gal/day/EDU
Maximum Day Demand – MDD_{EXT}	700	gal/day/EDU
Peak Hourly Demand – PHD	306	gpm

Table 4 – CCWUA Water System Future Buildout Conditions Summary

Water Demand Characterization	Value	Units
Equivalent Domestic Units – EDU	134	N/A
Average Day Demand – ADD_{BO}	250	gal/day/EDU
Maximum Day Demand – MDD_{INT-BO}	684	gal/day/EDU
Maximum Day Demand – MDD_{EXT-BO}	700	gal/day/EDU
Peak Hourly Demand – PHD_{BO}	364	gpm

IV. SYSTEM STORAGE

Water systems shall be designed to meet the requirements of IDAPA 58.01.08.544. Storage in the CCWUA Water System is provided by a 120,000-gallon storage tank located at the northern extent of the system. The tank is positioned at the highest elevation in the system to provide adequate pressure for distribution. Since Chapter 544 does not provide specific sizing calculations for the sizing of water storage tanks, where compatible with Chapter 544, guidance contained within the Water System Design Manual, published by the Washington State Department of Health, has been provided for reference.

Dead Storage (DS) is storage that is either not available for use in the system or can provide only substandard flows and pressures (IDAPA 58.01.08.003.04.a). The outlet pipe of the existing water tank was installed flush with the interior tank bottom; thus, dead storage is not currently provided by the storage system. It is recommended that the outlet pipe be modified with a 6-inch vertical extension to provide dead storage, allowing particles to settle and thereby protecting water quality in the distribution system. Dead storage will differ between existing and buildout conditions due to a second storage tank being added in buildout. Dead storage is calculated using the following volume calculation.

Eq 3: $DS = \pi * r^2 * h * 7.48\ gal/ft^3$

$= \pi * (18.5\ ft)^2 * 0.5\ ft * 7.48\ gal/ft^3$

= 4,022 gallons

DS_{BO} = 4,022 gallons * 2 tanks

DS_{BO} = 8,044 gallons total

Operational Storage (OS) is the supply of water when, under normal conditions, the sources of water are not actively operating. This component is the larger of either the volume required to prevent excess pump cycling and ensure that water is provided in sufficient capacity for fire suppression and standby operating conditions, or the volume needed to compensate for the sensitivity of the water level sensors. (IDAPA 58.01.08.003.04.c). For the CCWUA system, the volume required to prevent excess pump cycling would be the largest of these values. To limit starts to no more than six starts per hour, Operational Storage is calculated as the peak hourly demand multiplied by ten minutes.

Eq. 4: OS = PHD * 10 minutes

= 306 gpm * 10 minutes

= 3,063 gallons

$OS_{BO} = PHD_{BO}$ * 10 minutes

= 364 gpm * 10 minutes

= 3,640 gallons

Fire Suppression Storage (FSS) is the water needed to support fire flow in systems which provide it. The CCWUA water system is designed to provide 500 gpm of water at a minimum pressure of 20 psi for a duration of 2 hours. CCWUA has coordinated this design scenario with the Coolin-Cavanaugh Bay Fire Protection District with a Letter of Concurrence included for reference in Attachment M. Fire suppression storage would remain the same between existing conditions and buildout conditions.

Eq. 5: FSS = 500 gpm * 120 minutes

= 60,000 gallons

Equalization Storage (ES) is the storage of finished water in sufficient quantity to compensate for the difference between a water system's maximum source capacity and peak hour demand. According to the operating conditions of the pump installed in Well #2, the rated flow rate into the system is 40 gpm.

Eq. 6: ES = (PHD – Qs) (150 Minutes)

= (306 gpm – 40 gpm) (150 min)

= 39,950 gallons

ES_{BO} = (PHD_{BO} – Qs) (150 Minutes)

= (364 gpm – 40 gpm) (150 min)

= 48,600 gallons

Standby Storage (SB) is water providing a measure of reliability or safety factor if sources fail or when unusual conditions impose higher than anticipated demands (IDAPA 58.01.08.003.04.f). Normally used for emergency operations, if standby power is not provided, standby storage shall provide water for a minimum of 8 hours of operation at average daily demand. As an added measure of safety, the chosen standby duration of 2 days has been used for the buildout condition. This duration of standby storage is provided due to the system's remote location that may potentially result in a slower time until repairs are performed, and due to current operational experience during the summer with high irrigation demands.

Eq 7: SB = ADD * EDUs * 8 hours

= 27,200 gpd * 1/3 day

= 9,167 gallons

SB_{BO} = ADD_{BO} * EDUs * 2 days

= 33,250 gpd * 2 days

= 67,000 gal

Effective Storage (EFS) is all storage other than dead storage that is comprised of operational storage, equalization storage, fire suppression storage, and standby storage. (IDAPA 58.01.08.003.04.b).

Eq. 8: $EFS = OS + ES + SB + FSS$

$= 3{,}063 \text{ gal} + 39{,}950 \text{ gal} + 9{,}167 \text{ gal} + 60{,}000 \text{ gal}$

$= 112{,}180 \text{ gal}$

$EFS_{BO} = OS_{BO} + ES_{BO} + SB_{BO} + FSS$

$= 3{,}640 \text{ gal} + 48{,}600 \text{ gal} + 67{,}000 \text{ gal} + 60{,}000 \text{ gal}$

$= 179{,}240$ gallons

Total Finished Water storage is the sum of dead storage and effective storage. Water Storage components and Total Finished Storage for existing and buildout conditions is summarized in Table 5.

Table 5 – Storage Summary

Storage Component	Existing Conditions (gal)	Buildout Conditions (gal)
Dead Storage	4,022	8,044*
Operational Storage	3,063	3,640
Fire Suppression Storage	60,000	60,000
Equalization Storage	39,950	48,600
Standby Storage	9,167	67,000
Effective Storage	112,180	179,240
Total Finished Storage	116,202	187,284
Total Available Storage	120,000	240,000

*Note: Dead Storage for two tanks

V. WATER QUALITY AND TREATMENT

The system is exempt from treatment requirements, as its water source is groundwater not under the direct influence of surface water. The system is not equipped with any treatment components and has consistently tested negative for coliform bacteria during annual sampling procedures. Water is currently supplied from a confined aquifer via Well #1 and Well #2, with intake screens located approximately 115 feet below ground surface. A new Well #3 is proposed to access the same aquifer as Well #2 and will replace Well #1. Water quality from Well #3 is expected to be comparable. Since Well #1 is located on private property without an easement, it will be disconnected from the system once a new backup source is operational.

VI. SYSTEM MODEL

A water model was developed using AFT Fathom (version 13) to model the hydraulic capacity of the CCWUA system. The topographic survey completed in spring 2024 served as the basis of the hydraulic model for information including elevations, pipe lengths, pipe sizes, and pipe routing. To complete the system model, assumptions were made for information that was not displayed on available drawings or gathered during the topographic survey. Any assumptions made were verified by calibrating the Fathom model from a pressure/flow test performed on May 19, 2022. The following operational conditions were used to calibrate the model. Calibration involves adjusting model parameters to match observed field data. This process ensures that the simulated results closely reflect real-world conditions. Iterative adjustments were made until discrepancies are minimized within an acceptable range.

Domestic Demands

- 100 gallons per day per capita
- 2.5 people/parcel
- 2.736 Max Daily Demand (MDD) peaking factor
- Results in 0.475 gpm/parcel domestic demand
- 10 gpm demand assumed for Cavanaugh’s (restaurant)

The ADD flows are schematically represented in the model as “Domestic Groups” consisting of 4-6 parcels each. The groups are dispersed evenly throughout the water system. The model simulates domestic ADD flow occurring concurrently with fire suppression flow for the analysis. The domestic group map is included in the design plans in Attachment C.

Model Setup

- Pipe locations, lengths, and elevations from 2024 survey
- Piping located 3.5’ below grade unless otherwise noted in the survey
- Domestic demands 10’ above grade
- Valves and bends included per System Map
- Each domestic service line assumed to have check valve, corporation stop (ball) valve, and one 90-degree bend

CCWUA provided measured values of pressures and flows in the field during a pressure/flow test performed on May 19, 2022. The pressure and flow test report can be found in Attachment E. The flow and pressure were measured at separate locations to provide the residual pressure information. Flush Hydrant #2 was flowing at approximately 150 gpm while the pressure was simultaneously measured at a test residence located at the far southwest corner of the system near Well #1. The test was performed by CCWUA with assistance from a representative of Idaho Rural Water Association. The static pressures without the use of either well were used to check the accuracy of the model. After minor calibration, the water model produced results within acceptable tolerances of the reported static pressures and residual pressure. See table below for a summary of field measurements compared to model results.

Model Results

Table 6 – Water Model Calibration Results

Flush Hydrant	**Measured Values**		**Model Values**		**Accuracy**
	Static Pressure (psi)	**Residual Pressure (psi)**	**Static Pressure (psi)**	**Residual Pressure (psi)**	**Model Difference (psi)**
#1	67	-	65	-	-2
#2	85	-	82	-	-3
#3	90	-	91	-	+1
#4	85	-	83	-	-2
#5	92	-	94	-	+2
Test Residence	-	30	-	35	+5

* Residual pressure measured at test residence basement with flush hydrant #2 flowing at 150 gpm and well pumps off. Residual pressure readings were not taken at Flush hydrants during field testing.

The water model calibration results indicate the water model is within tolerance of observed hydraulic conditions. The water model calibration output is included in Attachment F, Hydraulic Model Reports. The water model is used to perform hydraulic analysis outlined in Section VII Recommended Improvements” of this report.

Model Scenario 1 – Existing System

In AFT Fathom, a model of the existing water system was created, and the following fire flow scenarios were modeled. The results of the modeling scenarios are summarized in the following table:

- 500 gpm at Flush Hydrant #1
- 500 gpm at Flush Hydrant #2
- 500 gpm at Flush Hydrant #3
- 500 gpm at Flush Hydrant #4
- 500 gpm at Flush Hydrant #5
- 500 gpm at Flush Hydrant #6
- 500 gpm at Flush Hydrant #8
- 500 gpm at Flush Hydrant #9
- 500 gpm at Flush Hydrant #10
- 250 gpm at the Restaurant Hydrant (A)
- 500 gpm at the Restaurant Hydrant (B)
- 600 gpm at the Tanglefoot Hydrant

Model results were evaluated to show which pipes appear to be adequate, and which pipes will need to be replaced to provide sufficient fire flow per the list above. As can be seen in Table 7, nearly all of the existing system has undersized pipe, insufficient for the modeled demand. Please refer to the Existing Conditions Map, C1, in Attachment C and Model Results in Attachment F for more details.

Table 7 – Existing Conditions – Hydrant Results Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Modeled FF Flow Scenario (gpm)	Min Pressure During FF Scenario (psi)
67	27	2-1/2 inch	Hydrant 1	500	-282.306
88	492.7	4 inch	Hydrant 2	500	-156.756
103	7	2-1/2 inch	Hydrant 3	500	-58.324
93	12	2-1/2 inch	Hydrant 4	500	-92.165
79	50	2-1/2 inch	Hydrant 5	500	-698.129
11	114.6	2-1/2 inch	Hydrant 6	500	-123.337
105	6	2-1/2 inch	Hydrant 8	500	-89.881
99	132	2 inch	Hydrant 9	500	-575.856
113	12	6 inch	Hydrant 10	500	40.89
69	10	2-1/2 inch	Hydrant Restaurant	A - 250	32.94
69	10	2-1/2 inch	Hydrant Restaurant	B - 500	-60.4241
78	10	2-1/2 inch	Hydrant Tanglefoot	600	-924.35

As shown in the modeling results, existing hydrants are not connected to 6” water mains as required by IDAPA 58.01.08.542.06. Flush Hydrant #7 was not modeled during any model scenario since it is not intended to be upgraded; adjacent hydrants provide the required coverage needed for firefighting.

With the existing water lines, it is impossible to provide 500 gpm of fire flow to any hydrant other than Flush Hydrant #10. The Restaurant Hydrant was only capable of 250 gpm while maintaining pressure greater than 25 psi at the Hydrant.

Table 8 illustrates that most of the small pipes supplying water to only the homes, not fire hydrants, would also have hypothetically negative pressures were it possible to provide 500 gpm to any of the hydrants within the existing water system.

Table 8 – Existing Conditions – Domestic Group Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Min Modeled Flow During FF Scenario (gpm)	Min Pressure During FF Scenario (psi)
22	300	3/4 inch	Domestic Group 1	0.6944	66.925
81	354	3/4 inch	Domestic Group 1	0.6944	37.551
25	300	1-1/2 inch	Domestic Group 2	0.6944	45.97
5	300	1-1/2 inch	Domestic Group 3	1.2153	17.4
8	130	1-1/2 inch	Domestic Group 4	0.5208	-2.89
65	50	1-1/2 inch	Domestic Group 5	0.6944	-33.907
101	50	3/4 inch	Domestic Group 6	1.0417	-53.552
26	50	1-1/2 inch	Domestic Group 7	0.5208	-23.091
28	172	1-1/2 inch	Domestic Group 8	0.3472	-30.241
98	45	1-1/2 inch	Domestic Group 9	0.8681	-404.131
32	125	3/4 inch	Domestic Group 10	0.6944	-27.176
34	100	1-1/2 inch	Domestic Group 11	0.5208	-30.1818
21	120	1-1/2 inch	Domestic Group 12	0.1736	-80.6401
39	70	1-1/2 inch	Domestic Group 13	0.3472	-83.054
35	60	3/4 inch	Domestic Group 14	0.1736	-68.3028
37	116	1-1/2 inch	Domestic Group 15	0.3472	-77.4262
41	200	1-1/2 inch	Domestic Group 16	0.6944	-52.8299
17	115	3 inch	Domestic Group 17	1.2153	-56.2984
125	23	1-1/2 inch	Domestic Group 18	0.3472	-57.6076
44	90	3/4 inch	Domestic Group 19	0.5208	-54.6068
46	50	3/4 inch	Domestic Group 20	0.8681	-55.5151
130	19	3/4 inch	Domestic Group 20	0.8681	-47.7276
48	160	1-1/2 inch	Domestic Group 21	0.6944	-35.176
49	400	3/4 inch	Domestic Group 22	0.6944	-69.754
50	115	3/4 inch	Domestic Group 23	0.6944	-71.346
107	340	3/4 inch	Domestic Group 24	0.8681	-101.768
52	121	3/4 inch	Domestic Group 25	0.6944	-112.345
53	247	3/4 inch	Domestic Group 26	0.3472	-138.325
54	225	3/4 inch	Domestic Group 27	0.3472	-163.475
56	229	3/4 inch	Domestic Group 28	0.1736	-189.004

Pipe	Length (ft)	Size	Pipe Classification	Min Modeled Flow During FF Scenario (gpm)	Min Pressure During FF Scenario (psi)
97	205	3/4 inch	Domestic Group 29	0.3472	-227.687
109	370	2 inch	Domestic Group 30	1.0417	-227.572
110	146	3/4 inch	Domestic Group 30	1.0417	-246.888
71	130	1-1/2 inch	Domestic Group R	0.5208	-30.6086
111	10	2-1/2 inch	Domestic Group T	0.1736	-669.59
112	250	3/4 inch	Domestic Group T	0.1736	-669.618

Scenario 2 – Proposed Future Upgrades, without Loop Additions
A model of the water system was created, with most water main pipes replaced with 6" and 8" PVC. All mains feeding hydrants are a minimum 6" diameter. All hydrants are assumed to be modern fire hydrants. The following fire flow scenarios were modeled:

- 500 gpm at Fire Hydrant #1
- 500 gpm at Fire Hydrant #2
- 500 gpm at Fire Hydrant #3
- 500 gpm at Fire Hydrant #4
- 500 gpm at Fire Hydrant #5
- 500 gpm at Fire Hydrant #6
- 500 gpm at Fire Hydrant #8
- 500 gpm at Fire Hydrant #9
- 500 gpm at Fire Hydrant #10
- 500 gpm at Fire Hydrant #11
- 500 gpm at Fire Hydrant #12
- 500 gpm at Fire Hydrant #14
- 500 gpm at Fire Hydrant #16
- 500 gpm at Fire Hydrant #17
- 500 gpm at the Restaurant Hydrant (A)
- 1,200 gpm at the Restaurant Hydrant (B)
- 600 gpm at the Tanglefoot Hydrant

Table 9 shows that with these proposed pipe size increases, all hydrants will have adequate pressure for the modeled fire flow. Please refer to Attachment F for additional information on this scenario.

Table 9 – Future Upgrades, No Loops – Hydrant Results Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Modeled FF Flow Scenario (gpm)	Min Pressure During FF Scenario (psi)
67	27	6 inch	Hydrant 1	500	32.7
88	492.7	6 inch	Hydrant 2	500	60.32
103	7	6 inch	Hydrant 3	500	86.25
93	12	6 inch	Hydrant 4	500	71.89

Pipe	Length (ft)	Size	Pipe Classification	Modeled FF Flow Scenario (gpm)	Min Pressure During FF Scenario (psi)
79	50	6 inch	Hydrant 5	500	73.47
11	114.6	6 inch	Hydrant 6	500	71.82
105	6	6 inch	Hydrant 8	500	74.81
99	132	6 inch	Hydrant 9	500	77.09
113	12	6 inch	Hydrant 10	500	41.2
115	12	6 inch	Hydrant 11	500	43.48
117	12	6 inch	Hydrant 12	500	50.74
125	12	6 inch	Hydrant 14	500	64.9
129	12	6 inch	Hydrant 16	500	58.7
158	12	6 inch	Hydrant 17	500	75.52
69	10	6 inch	Hydrant Restaurant	A - 500	85.08
69	10	6 inch	Hydrant Restaurant	B - 1,200	48.96
166	688	6 inch	Hydrant Tanglefoot	600	24.06

Table 10 shows that with the proposed pipe size increases to pipes supplying fire hydrants, the pressures for the domestic flow demands on the pipes only connected to homes will also be adequate. The information in the right-hand column of Table 10 may be compared to the same column in Table 8 to see the difference between the existing and the non-looped future upgrades scenarios.

Table 10 – Future Upgrades, No Loops – Domestic Group Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Min Modeled Flow During FF Scenario (gpm)	Min Pressure During FF Scenario (psi)
22	300	3/4 inch	Domestic Group 1	0.6944	66.81
81	354	3/4 inch	Domestic Group 1	0.6944	37.44
25	300	1-1/2 inch	Domestic Group 2	0.6944	66.49
5	300	1-1/2 inch	Domestic Group 3	1.2153	64.86
8	130	1-1/2 inch	Domestic Group 4	0.6448	84.23
65	50	1-1/2 inch	Domestic Group 5	0.6944	83.62
101	50	3/4 inch	Domestic Group 6	1.0417	76.47
26	50	1-1/2 inch	Domestic Group 7	0.5208	84.01
28	172	1-1/2 inch	Domestic Group 8	0.3472	79.53
98	45	1-1/2 inch	Domestic Group 9	0.8681	81.34
32	125	3/4 inch	Domestic Group 10	0.6944	83.04
34	100	1-1/2 inch	Domestic Group 11	0.5208	82.47
21	120	1-1/2 inch	Domestic Group 12	0.1736	71.79
39	70	1-1/2 inch	Domestic Group 13	0.3472	70.82
35	60	3/4 inch	Domestic Group 14	0.1736	70.14

Pipe	Length (ft)	Size	Pipe Classification	Min Modeled Flow During FF Scenario (gpm)	Min Pressure During FF Scenario (psi)
37	116	1-1/2 inch	Domestic Group 15	0.3472	72.64
41	200	1-1/2 inch	Domestic Group 16	0.6944	74.48
17	115	3 inch	Domestic Group 17	1.0744	68.71
42	23	1-1/2 inch	Domestic Group 18	0.8596	61.94
44	90	3/4 inch	Domestic Group 19	0.8596	62.75
46	50	3/4 inch	Domestic Group 20	0.8596	53.76
128	19	3/4 inch	Domestic Group 20	0.8596	61.62
48	160	1-1/2 inch	Domestic Group 21	0.6944	76.72
49	400	3/4 inch	Domestic Group 22	0.6944	73.58
50	115	3/4 inch	Domestic Group 23	0.6944	60.86
107	340	3/4 inch	Domestic Group 24	0.8681	61.22
52	121	3/4 inch	Domestic Group 25	0.6944	62.2
53	247	3/4 inch	Domestic Group 26	0.3472	62.76
54	225	3/4 inch	Domestic Group 27	0.3472	58.69
56	229	3/4 inch	Domestic Group 28	0.1736	52.82
97	205	3/4 inch	Domestic Group 29	0.3472	35.86
109	370	2 inch	Domestic Group 30	1.0417	65.06
110	146	3/4 inch	Domestic Group 30	1.0417	58.95
71	130	1-1/2 inch	Domestic Group R	0.5208	81.61
111	10	2-1/2 inch	Domestic Group T	0.1736	64.35
112	250	3/4 inch	Domestic Group T	0.1736	64.69

Scenario 3 – Proposed Future Upgrades, with Loop Additions
A model of the water system with proposed 6" PVC pipe loop additions was created to provide operational redundancy and additional hydraulic capacity. All mains feeding hydrants are a minimum 6" diameter. All hydrants are assumed to be modern fire hydrants. The following fire flow scenarios were modeled:

- 500 gpm at Fire Hydrant #1 (B)
  - 125 gpm at Fire Hydrant #1 with pipe 108 closed for maintenance (A)
- 500 gpm at Flush Hydrant #2
  - 500 gpm at Fire Hydrant #2 with pipe 88 closed for maintenance (B)
- 500 gpm at Fire Hydrant #3
- 500 gpm at Fire Hydrant #4
- 500 gpm at Fire Hydrant #5
- 500 gpm at Fire Hydrant #6
  - 500 gpm at Fire Hydrant #6 with pipe 100 closed for maintenance
- 500 gpm at Fire Hydrant #8 with pipe 104 closed for maintenance
- 500 gpm at Fire Hydrant #9 with pipe 30 closed for maintenance
- 500 gpm at Fire Hydrant #10
- 500 gpm at Fire Hydrant #11
- 500 gpm at Fire Hydrant #12

- 500 gpm at Fire Hydrant #14
- 500 gpm at Fire Hydrant #16
- 500 gpm at Fire Hydrant #17
- 500 gpm at the Restaurant Hydrant (A)
- 1,200 gpm at the Restaurant Hydrant (B)
- 600 gpm at the Tanglefoot Hydrant

Table 11 shows that under this scenario, all pipes are sized to supply each hydrant with adequate pressure above 20 psi during fire flow.

Table 11 – Future Upgrades, With Loops – Hydrant Results Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Modeled FF Flow Scenario (gpm)	Min Pressure During FF Scenario (psi)
67	27	6 inch	Hydrant 1	A - 125	25.92
67	27	6 inch	Hydrant 1	B - 500	41.93
161	492.7	6 inch	Hydrant 2	B - 500	64.97
103	7	6 inch	Hydrant 3	500	84.62
93	12	6 inch	Hydrant 4	500	71.56
79	50	6 inch	Hydrant 5	500	72.14
11	114.6	6 inch	Hydrant 6	500	67.71
105	6	6 inch	Hydrant 8	500	70.45
99	132	6 inch	Hydrant 9	500	77.93
113	12	6 inch	Hydrant 10	500	40.87
115	12	6 inch	Hydrant 11	500	42.9
117	12	6 inch	Hydrant 12	500	49.94
125	12	6 inch	Hydrant 14	500	71.02
129	12	6 inch	Hydrant 16	500	65.56
131	38	6 inch	Hydrant 17	500	74.28
69	10	6 inch	Hydrant Restaurant	A - 500	83.67
69	10	6 inch	Hydrant Restaurant	B - 1,200	46.16
78	356	6 inch	Hydrant Tanglefoot	600	23.16

Table 12 shows that with the proposed pipe size increases and added loop pipes supplying fire hydrants, the pressures for the domestic flow demands on the pipes only connected to homes will also be adequate. The information in the right-hand column of Table 12 may be compared to the same columns in Tables 8 and 10 to see the difference between the existing and the non-looped and looped future upgrades scenarios.

Table 12 – Future Upgrades, With Loops – Domestic Group Summary Table

Pipe	Length (ft)	Size	Pipe Classification	Min Modeled Flow During FF Scenario (gpm)	Min Pressure During FF Scenario (psi)
22	300	3/4 inch	Domestic Group 1	0.69444	67.02
81	354	3/4 inch	Domestic Group 1	0.6944	37.65
25	300	1-1/2 inch	Domestic Group 2	0.6944	66.76
5	300	1-1/2 inch	Domestic Group 3	1.21528	65.28
8	130	1-1/2 inch	Domestic Group 4	0.6448	84.88
65	50	1-1/2 inch	Domestic Group 5	0.6944	83.98
101	50	3/4 inch	Domestic Group 6	1.0417	72.36
26	50	1-1/2 inch	Domestic Group 7	0.5208	84.78
28	172	1-1/2 inch	Domestic Group 8	0.3472	80.33
98	45	1-1/2 inch	Domestic Group 9	0.8681	77.67
32	125	3/4 inch	Domestic Group 10	0.6944	83.97
34	100	1-1/2 inch	Domestic Group 11	0.5208	83.39
21	120	1-1/2 inch	Domestic Group 12	0.1736	67.43
39	70	1-1/2 inch	Domestic Group 13	0.3472	72.03
35	60	3/4 inch	Domestic Group 14	0.1736	70.42
37	116	1-1/2 inch	Domestic Group 15	0.3472	73.37
41	200	1-1/2 inch	Domestic Group 16	0.6944	73.67
17	115	3 inch	Domestic Group 17	1.2153	70.18
42	23	1-1/2 inch	Domestic Group 18	0.3472	68.05
44	90	3/4 inch	Domestic Group 19	0.5208	69.95
46	50	3/4 inch	Domestic Group 20	0.8681	60.62
128	19	3/4 inch	Domestic Group 20	0.8681	67.6
48	160	1-1/2 inch	Domestic Group 21	0.6944	79.76
49	400	3/4 inch	Domestic Group 22	0.6944	79.19
50	115	3/4 inch	Domestic Group 23	0.6944	65.43
107	340	3/4 inch	Domestic Group 24	0.8681	67.35
52	121	3/4 inch	Domestic Group 25	0.8681	68.22
53	247	3/4 inch	Domestic Group 26	0.3472	69.28
54	225	3/4 inch	Domestic Group 27	0.3472	65.81
56	229	3/4 inch	Domestic Group 28	0.1736	60.59
97	205	3/4 inch	Domestic Group 29	0.3472	44.44
110	146	3/4 inch	Domestic Group 30	1.0417	49.12
71	130	1-1/2 inch	Domestic Group R	0.5208	83.2
111	10	2-1/2 inch	Domestic Group T	0.1736	72.87
112	250	3/4 inch	Domestic Group T	0.1736	72.85

All domestic group summary table conditions (Tables 8, 10, and 12) show the minimum modeled flow that would occur during a fire flow scenario. Regardless of whether the hydrant is active or the position of the domestic group within the system, the minimum pressure provided to each domestic group in both the Looped and Unlooped scenarios exceed the minimum 20 psi required.

The lowest pressure observed in any future scenario is in the Looped scenario when the Tanglefoot Hydrant, located on the same parcel as Well #1, is supplying 600 gpm with a pressure of 23.16 psi. The second lowest pressure observed in any future scenario is in the Unlooped scenario when the Taglefoot Hydrant is supplying 600 gpm at 24.06 psi. Attachment F contains a summarized table of all system piping for each model scenario as well as the raw output maps for each scenario's hydraulic model.

In the pipe loop addition scenario, it is not possible to provide 500 gpm of fire flow at Hydrant #1 while pipe 108 is closed for maintenance. If a pipe loop supplying Hydrant #1 must be closed, it is possible to provide 125 gpm while still maintaining approximately 25 psi of pressure at the hydrant. To reduce wildfire risk in this area of the water system, it will be important to minimize maintenance downtime with proactive maintenance such as system flushing.

VII. RECOMMENDED IMPROVEMENTS

A. ROUGH ORDER OF MAGNITUDE COST ESTIMATE

A rough order of magnitude cost estimate has been prepared to provide CCWUA with information to plan funding allocation to strategically address project components which would improve the public water system. A full line-item breakdown of the estimated costs for each portion of the recommended improvements is included in Attachment K and is summarized in Table 13.

Table 13. Rough Order of Magnitude Cost Estimate Summary

Approximate Cost Per Activity	
Base Piping Replacement	$ 1,277,389.91
New Loop Piping	$ 570,054.11
New 120,000 Gallon Reservoir	$ 960,287.51
Well and Wellhouse	$ 355,360.80

B. WELL #3 WATER RIGHT APPLICATION

CCWUA currently holds active Water Right 97-7580 which serves as the system's sole source of drinking water. The installation of Well #3 would constitute a Water Right Transfer to add a new point of diversion. CCWUA will submit an Application for Transfer of Water Right – Point(s) of Diversion to the Idaho Department of Water Resources (IDWR) for the purpose of adding the Well #3 location to the active water right after IDEQ approval of this Water Facility Plan. The Water Right Transfer Application is included in Attachment G.

C. WELL #3 DESIGN

The proposed Well #3 has been evaluated by a licensed geotechnical engineer with findings summarized in the Well Site Evaluation Report, included in Attachment H.

From the well, the 2" DR-11 HDPE outlet pipe will exit the pitless adapter at 3' subgrade and be routed through a Sensus SR II water source meter then directly to the distribution system via 2" schedule 80 PVC or 2" DR-11 HDPE potable water pipe. A sampling tap, check valve, and isolation valve will be located between the well and the mainline connection to the new 6" transmission main located in Cavanaugh Bay Road.

The well control structure is accessed via two facing 36" doors with adequate clearance provided to the wall mounted electrical panels and control panels. Ventilation is provided to the well control structure to provide acceptable conditions for the variable frequency drive pump controller. Schematic plans have been developed to detail the recommended improvements, included in Attachment C.

D. ADDITIONAL STORAGE RESERVOIR

The CCWUA system will require additional water storage to maintain adequate water supply during peak usage. A new 120,000-gallon storage tank is proposed to be installed adjacent to the existing 120,000-gallon tank. The new tank will be installed at the same elevation as the existing tank to maintain consistent level and operating pressure as the existing tank. The proposed tank will provide more than the calculated storage required as determined in report section IV with the additional size requested by the CCWUA board. The additional tank will allow CCWUA system operators to maintain their current operational practices while meeting the required operational storage volume for the system.

E. DEAD STORAGE

The existing water storage tank lacks a designated dead storage zone, as the outlet pipe was constructed with its invert elevation flush with the tank bottom. Modification of the outlet to provide dead storage will improve drinking water quality by providing an area for heavier particles to settle out of suspension. Raising the outlet pipe six inches vertically provides dead storage that meets IDAPA 58.01.08.003.04.a. A schematic plan detailing this recommendation is included in Attachment C.

F. PIPE DIAMETER INCREASE

To improve the CCWUA distribution system, an increase in pipe diameter to decrease friction losses and increase available flow and pressure during high flow is proposed. Increasing pipe diameter reduces velocity in the pipe for a given flow rate; the friction between water and pipe material it is moving through increases roughly in proportion to the square of the velocity. Therefore, a relatively small reduction in velocity has a large impact in improving pressure and flow rate capacity in a piped distribution system. System modeling was conducted with the existing pipe, calibrated to measure pressure and flow rates at selected hydrants, and then modeled again with increased pipe diameters for 500 gpm fire flow scenarios. Please see Attachment F for hydraulic model results, and Attachment C for a map of the system showing locations of recommended pipe diameter increases.

G. PIPE LOOPING

To improve the CCWUA distribution system, additional piping is proposed to transition the network from a branched configuration to a looped system. A looped configuration would improve pressure in the distribution network and add redundancy during future maintenance or expansion operations. The looped system will also deliver more adequate water pressure to fire hydrants located throughout the system. System modeling was conducted with and without pipe looping, and results indicate the system is adequate in both scenarios; however, looping is still recommended to enhance future resilience and maintenance accessibility.

Air relief valves will be installed at high points in the distribution piping to relieve accumulated air pockets. The locations of proposed relief valves are included in the schematic design plans in Attachment C, Sheet C2.

H. STANDBY POWER GENERATION

Standby power, if implemented, would consist of a 7.5 KW propane generator in a sound attenuated outdoor enclosure. The generator would provide 208/120-volt three phase power to a 60-amp outdoor rated transfer switch suitable for use as service equipment that would provide power to the entire pump house for well 3 including the pump. The transfer switch would automatically transfer in the event of a power outage and have provision for generator start and exercise functions. The generator would be exercised for 30 minutes once a week to keep the fuel in the lines fresh and to move oil and fluids around in the generator. The generator would have a circulating heater with thermostatic control that heats and circulates the coolant to keep the generator warm and ready for operation. Generator or transfer switch alarms would be fed into the alarm dialer along with a generator running signal to alert the operators that the system is running.

The generator, if included in the selected improvements by CCWUA, would sit on a double walled day tank with leak alarms, overfill control, and venting to comply with current EPA codes. The fuel would need additives to stabilize due to the limited use of the generator and the long fuel storage times. Fuel would also have additives for cold weather operations to keep the fuel liquid. The fuel tank would be sized to allow the generator to run for 8 hours at full load.

I. CROSS CONNECTION CONTROL PROGRAM

A Cross Connection Control Plan has been prepared to describe the roles and responsibilities of the CCWUA Board in planning, constructing and repairing, operating, sampling, maintaining, and protecting the public drinking water system and water supply connections throughout the CCWUA service area to meet the requirements in IDAPA 58.01.08 Chapter 543 and Chapter 552.06 and 40 CFR Part 141. The CCWUA Board must coordinate with local administrative authorities in all matters concerning cross-connection control (and other drinking water issues). The CCWUA Board must document and describe such coordination, including delineation of responsibilities, in the Cross Connection Control Plan document. The CCWUA Board has adopted the Cross Connection Control Plan and provided a copy to IDEQ.

The Cross Connection Control Plan is included in Attachment I.

J. METERING PROGRAM

Metering of all sources is required for public water systems in accordance with IDAPA 58.01.08 Chapter 501.11. All existing sources are currently equipped with meters and recorded once per month. All future proposed CCWUA sources will be equipped with a source meter prior to operation. A Source Metering Plan has been prepared and is included in Attachment J.

Source metering data is used to evaluate pump performance and total run times, to ensure pump operation is within acceptable ranges according to manufacturer's recommendations. Additionally, pumping data is compared to water storage tank level indicators to compare influent data with tank effluent data. This comparison is used to identify potential leaks within the system and total demand. As stated in Section IV source metering has been utilized to estimate the peak demand conditions experienced by the CCWUA system, and the 2025 results of that metering are included in Attachment L.