NORTH YUBA WATER DISTRICT

AGENDA

REGULAR MEETING OF THE BOARD OF DIRECTORS OF THE NORTH YUBA WATER DISTRICT

5:30 PM ◆ THURSDAY ◆ JANUARY 30, 2025

NOTICE: THIS MEETING WILL BE PHYSICALLY OPEN TO THE PUBLIC AT THE DISTRICT OFFICE LOCATED AT 8691 LA PORTE RD, BROWNSVILLE, CA 95919. HOWEVER, THE MEETING WILL ALSO TAKE PLACE VIA ZOOM. MEMBERS OF THE PUBLIC MAY ATTEND AND PARTICIPATE IN THE MEETING VIA VIDEOCONFERENCE AT:

NYWD BoardRoom is inviting you to a scheduled Zoom meeting.
Join Zoom Meeting
https://us02web.zoom.us/j/85204733103?pwd=94Peafo9H3w2cifPtQEtsg2jwd0FtC.1

Meeting ID: 852 0473 3103
Passcode: 910859

One tap mobile
+16699009128,,85204733103#,,,,*910859# US (San Jose)
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Passcode: 910859

Find your local number: https://us02web.zoom.us/u/kyu5GTYEK

COMMENCEMENT OF MEETING

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in this meeting, please contact North Yuba Water District office staff at 530-675-2567 or fax 530-675-0462. Requests must be made as early as possible and at least one-full business day before the start of the meeting.

The Board of Directors will provide at least twice the allotted time to a member of the public who utilizes a translator to ensure that non-English speakers receive the same opportunity to directly address the Board. Please contact District office staff at 530-675-2567 or fax 530-675-0462 at least 24 hours prior to the board meeting so a translator can be provided. Non-English speakers are welcomed to provide their own translator.

A. **CALL TO ORDER/ROLL CALL**

B. **PLEDGE OF ALLEGIANCE**

C. **OPPORTUNITY FOR PUBLIC COMMENT – Topics Not on the Agenda:**

At the beginning of a regular meeting, the public has the opportunities to address the District Board of Directors about matters not on the agenda that are within the jurisdiction of the Board of Directors. Public comment is limited to no more than four (4) minutes per person, twenty (20) minutes total for all speakers.

D. **OPPORTUNITY FOR PUBLIC COMMENT – Topics on the Agenda:**

The public has the opportunities to address the District Board of Directors about matters on the agenda, including closed session items. Public comment is limited to no more than four (4) minutes per person, twenty (20) minutes total for all speakers.

OPEN SESSION ACTION CALENDAR

E. **CONSENT ITEMS**

1. Approval of **Minutes for Regular Board Meeting of December 19, 2024:**
2. Approval of **Payroll for the Month of December 2024** **$ 52,199.49**
3. Approval of **Bills for the Month of December 2024:** **$ 493,689.26**

F. **PUBLIC COMMENT** – The Board will discuss and possibly act on revising the individual and total time the District provides for public comment, including but not limited to the possibility of reducing the time for individual and total public comments, combining comments for matters not on the agenda and matters on the agenda into one agenda item, and/or providing time for comment on each individual agendized item.

G. **GANNET FLEMMING** – The board will discuss and possibly act to approve Draft Alternative Analysis Report for Forbestown and Dobbins-Oregon House Canal as final

H. **STAFF REPORTS AND RECOMMENDATION**

The Board will hear reports by District staff and receive their recommendations for future Board action, including but not necessarily limited to:

Financial Manager's Report/Requests

General Managers' Report/Requests

The General Manager will update the board on District operations, including the status of an Operations Memorandum.

Legal Counsel's Report

I. DIRECTORS REPORTS

CLOSED SESSION

J. Conference with Legal Counsel — existing litigation (2 Cases) – pursuant to Government Code section 54956.9, subdivision (d) (1):

1. *South Feather Water & Power Agency v. North Yuba Water District,* Sutter County Superior Court Case No. CVCS2 l -0002073

2. *North Yuba Water District v. South Feather Water and Power District*, Yuba County Superior Court Case No. Case No. CVCS21-0001857

K. Conference with Legal Counsel — Anticipated litigation (3 case) – pursuant to Government Code section 54956.9, subdivision (d) (2):

L. Conference With Labor Negotiator:

North Yuba Water District representative: General Manager Leona Harris
Employee organization: The United Public Employees of California, Local 792

RETURN TO OPEN SESSION

M. REPORT OF CLOSED SESSION ACTIONS

ADJOURNMENT

REGULAR MEETING MINUTES OF THE BOARD OF DIRECTORS OF THE
NORTH YUBA WATER DISTRICT
Held at the District Office and Zoom
8691 LaPorte Road, Brownsville
Thursday, December 19th, 2024

NOTICE: This meeting will be physically open to the public at the District OFFICE located at 8691 La Porte Rd, Brownsville, Ca 95919. The meeting will also take place via zoom. Members of the public may attend and participate in the meeting via video conference at:

Join Zoom Meeting
NYWD BoardRoom is inviting you to a scheduled Zoom meeting.
Topic: NYWD BoardRoom's Zoom Meeting
Time: Dec 19, 2024 05:30 PM Pacific Time (US and Canada)

Join Zoom Meeting
https://us02web.zoom.us/j/89827839541?pwd=rrDMhmyUYSRrtenyu0aaCJ3kXAkqCC.1

Meeting ID: 898 2783 9541
Passcode: 623623

One tap mobile
+16699009128,,89827839541#,,,,*623623# US (San Jose)
+16694449171,,89827839541#,,,,*623623# US

Dial by your location
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• +1 669 444 9171 US

Meeting ID: 898 2783 9541
Passcode: 623623

COMMENCEMENT OF MEETING

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in the meeting, please contact North Yuba Water district office staff at 530-675-2567 or fax 530-675-0462. Requests must be made as early as possible and at least one-full day before the start of the meeting. The Board of Directors shall provide at least twice the allotted time to a member of the public who utilizes a translator to ensure that non-English speakers receive the same opportunity to directly address the Board.

A. CALL TO ORDER/ROLL CALL

The meeting was called to order at 5:31 PM, at the District Office in Brownsville, CA.

NAME	*PRESENT*	*ABSENT*	*VISITORS INCLUDING:*
PRESIDENT	Marieke Furnee		Charles Sharp
VICE PRESIDENT	Ann Plumb		
DIRECTORS:	Gloria Bozza		
		Steven Ronneberg	
	Mike Mayo		
GENERAL MANAGER	Leona Harris		
FINANCIAL MANAGER		Heidi Naether	
ATTORNEY	Paul Boylan		

B. PLEDGE OF ALLEGIANCE:

The Pledge of Allegiance was led by Director Mayo.

C. OPPORTUNITY FOR PUBLIC COMMENT ON NON AGENDIZED ITEMS:

The public has the opportunity to address the District Board of Directors about matters not on the agenda. Public comment is limited to no more than four (4) minutes per person, twenty (20) minutes total for all speakers. **NOTE: ALL PUBLIC PARTICIPANTS WILL BE MUTED UPON ENTRY INTO THE MEETING AND WILL ONLY BE UNMUTED TO ALLOW THEIR COMMENT. TO PROVIDE PUBLIC COMMENT BY TELECONFERENCE PRESS *9.**

PUBLIC COMMENT: Comments from the public included Legal costs, Lawsuits and local control of water. Also commenting was Dane Wadle, a field coordinator with the California Special Districts Association, to give a year-end legislative report of activities the CSDA was engaged in on behalf of the district.

DISCUSSION/OPEN SESSION ACTION CALENDAR

D. OPPORTUNITY FOR PUBLIC COMMENT – Topics on the Agenda:

Members of the public may address the Board concerning any item on the agenda. No other comments will be allowed. Any member of the public wishing to make a comment shall identify the agenda item they intend to address, and they will be provided an opportunity to make comment on that item only. Public comment is limited to no more than two (4) minutes per person, twenty (20) minutes total for all speakers. **NOTE: ALL PUBLIC PARTICIPANTS WILL BE MUTED UPON ENTRY INTO THE MEETING AND WILL ONLY BE UNMUTED TO ALLOW THEIR COMMENT. TO PROVIDE PUBLIC COMMENT BY TELECONFERENCE PRESS *9.**

PUBLIC COMMENT: No public comments

E. ELECTION OF BOARD OF DIRECTORS OFFICERS:

Director Bozza made a motion to nominate Ann Plumb for President of the Board. President Furnee seconded the motion. The motion was approved with a unanimous vote.

Director Mayo made a motion to nominate Marieke Furnee for Vice President of the Board. Director Bozza seconded the motion. The motion was approved with a unanimous vote.

F. CONSENT ITEMS

1. Approval of **Minutes for Regular Board Meeting of October 30, 2024**
2. Approval of **Minutes for Regular Board Meeting of November 20, 2024**
3. Approval of **Payroll for the Month of November 2024 - $49,796.77**
4. Approval of **Bills for the Month of November 2024 - $1,255,138.11**

Vice President Furnee made a motion to approve consent items 1-4. Director Bozza seconded the motion. The motion was approved with a unanimous vote.

G. STAFF REPORTS AND RECOMMENDATION

The Board will hear reports by District staff and receive their recommendations for future Board action, including but not necessarily limited to:

Financial Manager's Report/Requests:

Leona Harris read the financial report. Cash on Hand and Income Statements for the period ending November 30, 2024. Total cash on hand in all accounts including reserves was $12,011,626.66. Total income for the fiscal year to date (July 01, 2024 – November 31, 2024) was $2,922,094.51. Total expenses were $909,748.13, leaving a net revenue over expenses of $2,012,346.38. Expenses out of Reserves/Savings Fiscal year to date totaled $2,039,092.10.

General Manager's report/requests:

-The General Manager updated the board on District operations, including the status of an Operations Memorandum.

-Request to reschedule the January Board meeting resulted in the meeting being rescheduled to January 30th.

-Director Mayo addressed the ditch improvements and how much loss is being saved by shotcreting and the potential increased capacity of the ditch.

-Vice President Furnee asked about future hydrants and when they will be put in

Legal Counsel's Report:
Paul Boylan had nothing to report outside of closed session.

H. DIRECTORS REPORTS

Director Bozza shared the plans for directors Bozza and Mayo going to the local schools as a community activity to play Mr. and Mrs. Santa Claus.

Vice President Furnee shared that she attended the ACWA conference as North Yuba Water District's representative. She found it very useful and made many positive connections with other districts.

CLOSED SESSION

Entered into closed session at 5:57: p.m.

I. Conference with Legal Counsel — existing litigation (1Cases) – pursuant to Government Code section 54956.9, subdivision (d) (1):

1. ***South Feather Water & Power Agency v. North Yuba Water District,*** **Sutter County Superior Court Case No. CVCS2 l -0002073**

2. ***North Yuba Water District v. South Feather Water and Power District*****, Yuba County Superior Court Case No. Case No. CVCS21-0001857**

J. Conference with Legal Counsel — Anticipated litigation (1 case) – pursuant to Government Code section 54956.9, subdivision (d), paragraph (2):

K. Conference With Labor Negotiator:

North Yuba Water District representative: General Manager Leona Harris
Employee organization: The United Public Employees of California, Local 792

RETURN TO OPEN SESSION

Returned to Open Session at 6:50 p.m.

K. REPORT OF CLOSED SESSION ACTIONS

Board met with legal council and gave direction.

ADJOURNMENT

The meeting was adjourned at 6:50 p.m.

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Amanda Gilmore, Recording Secretary

North Yuba Water District
Monthly Net Payroll Report

TOTAL MONTHLY NET PAYROLL FOR THE MONTH OF DECEMBER, 2024

TOTAL DECEMBER, 2024 **$ 52,199.49**

North Yuba Water District
Monthly Check Listing
DECEMBER 2024

	Type	Date	Num	Name	Amount
1000A · Cash - GC Seperate Accounts					
Paypal					
PayPal Fees	Check	12/31/2024	FEES	PayPal	-71.48
Total Paypal					-71.48
11007 · River Valley Bank Checking					
2025 Membership Dues	Bill Pmt -Check	12/02/2024	27611	California Special District Association	-9,495.00
Electricity	Bill Pmt -Check	12/02/2024	27612	Pacific Gas & Electric	-5,040.50
Dental Insurance	Bill Pmt -Check	12/02/2024	27613	Premier Access Insurance Co.	-1,018.79
Credit Card Service Fee	Check	12/02/2024	CLOVER	Clover Credit Card Services	-49.95
Credit Card Fees	Check	12/02/2024	BANKARD	Merchant Services	-135.61
Employee Paid Insurance	Liability Check	12/03/2024	27614	AFLAC	-395.76
Legal	Bill Pmt -Check	12/03/2024	27615	BoutinJones Inc	-73,889.56
Propane Gas	Bill Pmt -Check	12/03/2024	27616	Brown's Gas Co.	-406.89
Sand & Gravel	Bill Pmt -Check	12/03/2024	27617	Brownsville Sand & Gravel-V	-1,480.00
Phone Service	Bill Pmt -Check	12/03/2024	27618	CALNET3	-303.26
Public Outreach	Bill Pmt -Check	12/03/2024	27619	Elevate Public Relations & Marketing, LLC	-1,662.00
Wages for Temporary Employee	Bill Pmt -Check	12/03/2024	27620	Express Employment Professionals	-1,156.68
Vision Insurance	Bill Pmt -Check	12/03/2024	27621	Eye Med	-150.00
4 Wiper Blades	Bill Pmt -Check	12/03/2024	27622	Foothill Hardware	-41.09
Alarm Service	Bill Pmt -Check	12/03/2024	27623	Golden Bear Alarms	-96.00
Employee Pension Fund	Bill Pmt -Check	12/03/2024	27624	LIU of NA Nat'l Pension Fund	-3,993.00
Water Treatment Plant Chemicals	Bill Pmt -Check	12/03/2024	27625	NTU Technologies Inc.	-2,327.80
Water Treatment Plant Chemicals	Bill Pmt -Check	12/03/2024	27626	SCP DISTRIBUTORS LLC	-2,202.49
12 Confined Space Signs, 2 Adjustable Hydrant Wrenches, Submers Level Transmitter for Tanks	Bill Pmt -Check	12/03/2024	27627	USA Bluebook	-147.69
Cellphone Service	Bill Pmt -Check	12/03/2024	27628	VERIZON WIRELESS	-204.78

North Yuba Water District
Monthly Check Listing
DECEMBER 2024

	Type	Date	Num	Name	Amount
Cack Filler, Brush Set, Rope, Seal Wax, 6 Sacks Concrete, 3 Gloves, Screw, 4 Doug Fir, 30 Rebar, 8 Anchor Wedges, 4 Galv Nipples, 2 Galv Ellbows, 60 Lb Black Top, 2 Cleaning Wipes, Tarp, PVC Coupling, 4 Wipers, 90 Galv Cables, 3 Turnbkl, 6 Ropes, 5 Keys, 1 Key Ring, 5 Key Identifier, Cleaning Cloth, 2 Tire Refill Dits, 2 Pipe Wraps, 2 Pipe Insulations	Bill Pmt -Check	12/06/2024	27629	Ray's General Hardware	-590.23
Health Insurance	Bill Pmt -Check	12/09/2024	27630	ACWA/Jt Powers Ins Authority	-14,182.46
Cabinet	Bill Pmt -Check	12/09/2024	27631	Brown, Kathy	-15.00
FT Ditch Water Measurement - Special Project	Bill Pmt -Check	12/09/2024	27632	Davids Engineering, Inc	-11,413.75
23.17 tons Screened Rock	Bill Pmt -Check	12/09/2024	27633	Hansen Bros.	-1,072.43
Fuel, Diesel, Diesel Additive	Bill Pmt -Check	12/09/2024	27634	Ramos Oil Company Inc.	-1,603.68
Wages for Temporary Employee	Bill Pmt -Check	12/09/2024	27635	Express Employment Professionals	-660.96
Domestic Customer Deposit Refund	Check	12/09/2024	27636	Cavagnaro, Patty	-95.00
Direct Deposit Fees	Liability Check	12/11/2024	DirD	QuickBooks Payroll Service	-56.00
State Payrell Taxes	Liability Check	12/12/2024	E-pay	EDD	-1,496.79
Federal Payroll Taxes	Liability Check	12/12/2024	E-pay	United States Treasury	-8,930.16
Employee Retirement Fund	Liability Check	12/12/2024	27652	ICMA-457	-1,791.08
Pest Control	Bill Pmt -Check	12/12/2024	27653	CAL KING PEST CONTROL	-176.00
Phone Service	Bill Pmt -Check	12/12/2024	27654	CALNET3	-560.46

North Yuba Water District
Monthly Check Listing
DECEMBER 2024

	Type	Date	Num	Name	Amount
Digital Path ($110.95), Wix Website ($34.00), 1099 Tax Service ($15.00), Meals ($101.32), 6 Monthly Planners, Kleenex, W-2 Forms, 1099 Forms, Soft Soap, 5 Wall Calendars ($308.98), 3 Shirts, 2 Pants ($296.28), Welding Sleeve ($19.56), Monthly Planner, Binder, Scissor, 2 Notebooks, Copy Paper, 500 Envelopes ($249.40), 2 Leather Aprol's, Boots ($166.96), Post Driver for Markers ($241.32), Pesticide License Application ($140.00), 11 Batteries ($486.56), Parking Fee ($15.00), Paper Plates, Ziploc Bags, Plastic Forks, Kleenex, Coffe ($126.87), Shop Towels, 4 Batteries ($156.83), Zoom ($14.67), 2 Flags ($87.00), Tire Repair ($95.98), 3 Galvanized Pipes ($704.53), Employee Appreciation Meals ($140.63), Bottled Water ($18.57), WTP Seminar ($224.00), Drinking Water Certification Application ($51.38), 6 Pants, 2 Socks, Boots ($442.84)	Bill Pmt -Check	12/12/2024	27655	Mechanics Bank	-4,248.63
Trash Pick-up	Bill Pmt -Check	12/12/2024	27656	Recology - Yuba Sutter	-250.29
Annual Permit Fee - Forbestown WTP Facility	Bill Pmt -Check	12/12/2024	27657	SWRCB-WTP	-199.00
Domestic Customer Deposit Refund	Check	12/16/2024	27658	Supnet, Debbie	-25.00
Legal	Bill Pmt -Check	12/16/2024	27659	BoutinJones Inc	-4,191.55
Wages for Temporary Employee	Bill Pmt -Check	12/16/2024	27660	Express Employment Professionals	-867.51
Dental Insurance	Bill Pmt -Check	12/16/2024	27661	Premier Access Insurance Co.	-1,018.79
Legal	Bill Pmt -Check	12/16/2024	27662	The Water Group	-975.00
Copier Lease	Bill Pmt -Check	12/16/2024	27663	Wells Fargo Vendor Financial Services, LL	-129.90
1/2 of Yuba City Water Sale Income	Bill Pmt -Check	12/17/2024	27664	South Feather Water & Power	-223,515.00
2024 Quarterly Calibrations and Maintenance	Bill Pmt -Check	12/19/2024	27665	Aqua Sierra Controls Inc.	-1,999.47
Oregon Peak Rent (Tower use for Radio's)	Bill Pmt -Check	12/19/2024	27666	EIP Holdings II, LLC	-505.00
Canal Stabilization Project	Bill Pmt -Check	12/19/2024	27667	Gannett Fleming, Inc.	-23,172.50
Legal	Bill Pmt -Check	12/19/2024	27668	Paul Nicolas Boylan, Esq.	-54,505.00
Cleaning Service	Bill Pmt -Check	12/19/2024	27669	Shelton's Janitorial	-560.00
Medical	Bill Pmt -Check	12/19/2024	27670	Sutter Medical Center Sacramento	-2,592.80
Legal	Bill Pmt -Check	12/19/2024	27671	Herr Pederson & Berglund LLP	-9,552.76
Fee for Trailer	Bill Pmt -Check	12/19/2024	27673	DMV Renewal	-10.00

North Yuba Water District
Monthly Check Listing
DECEMBER 2024

	Type	Date	Num	Name	Amount
Vehicle Charging	Bill Pmt -Check	12/20/2024	27691	Furnee, Marie	-192.77
Direct Deposit Fees	Liability Check	12/23/2024	DirD	QuickBooks Payroll Service	-60.00
State Payroll Taxes	Liability Check	12/23/2024	E-pay	EDD	-1,340.97
Federal Payroll Taxes	Liability Check	12/23/2024	E-pay	United States Treasury	-7,791.20
State Payroll Taxes	Liability Check	12/23/2024	E-pay	EDD	-315.38
Federal Payroll Taxes	Liability Check	12/23/2024	E-pay	United States Treasury	-52.10
Employee Retirement Fund	Liability Check	12/23/2024	27692	ICMA-457	-1,791.08
Employee Paid Union Dues	Liability Check	12/23/2024	27693	UPEC	-454.50
Election Cost Reimbursement	Bill Pmt -Check	12/23/2024	27694	Butte Co. Clerk-Recorder (Elections)	-889.56
Wages for Temporary Employee	Bill Pmt -Check	12/23/2024	27695	Express Employment Professionals	-784.89
Minutes	Bill Pmt -Check	12/23/2024	27696	Fonseca, Catherine L.	-400.00
Annual Per Computer Monitoring & Remote Access Charge, Attended board meeting and administered Zoom	Bill Pmt -Check	12/23/2024	27697	Gilmore Computer Services	-787.50
Legal	Bill Pmt -Check	12/23/2024	27698	Carol Nygard & Associates	-889.21
Alarm Permit (3 Years)	Bill Pmt -Check	12/23/2024	27699	Yuba County Sheriff's Office	-120.00
Bank fee NSF Ck	Check	12/23/2024	BANKFEE	River Valley Community Bank	-10.00
Water Testing	Bill Pmt -Check	12/27/2024	27700	Cranmer Engineering Inc	-1,460.00
Wages for Temporary Employee	Bill Pmt -Check	12/27/2024	27701	Express Employment Professionals	-564.57
Postage	Bill Pmt -Check	12/27/2024	27702	Reserve Account	-500.00
T1 Employee Certification	Bill Pmt -Check	12/27/2024	27704	SWRCB-DWOCP	-55.00
Total 11007 · River Valley Bank Checking					-493,617.78
Total 1000A · Cash - GC Seperate Accounts					-493,689.26
TOTAL					**-493,689.26**

VOID: Check 27672

Finance Report for January 30, 2025 Board Meeting:

As of December 31, 2024 total cash in all accounts including reserves was $12,594,317.17.

Total income for the fiscal year to date (July 1st, 2024 to December 31, 2024) is $3,174,535.15. Total expenses were $1,196,430.48

Net revenue over expenses were $1,978,104.67

Expenses out of Reserves/Savings total $1,422,448.04 for this fiscal year.

Accrual Basis

North Yuba Water District
UNAUDITED FINANCIAL REPORT
July 2024 - December 2024

	Jul - Dec 24	YTD Budget	$ Over Budget	% of Budget	Annual Budget
Ordinary Income/Expense					
Income					
4000A · Irrigation	10,465.42	16,480.17	-6,014.75	63.5%	32,325.65
4050A · Domestic	156,805.06	149,868.02	6,937.04	104.63%	264,930.74
4100.10 · Power Revenue SFPP	354,500.00	354,500.00	0.00	100.0%	709,000.00
4100.11 · SFPW Net Revenues 50% Distr.	2,073,694.56	1,600,000.00	473,694.56	129.61%	1,600,000.00
4150.10 · Younglife-Water Sales	0.00	0.00	0.00	0.0%	2,161.00
4200.10 · Yuba City-Water Sales	447,030.00	447,030.00	0.00	100.0%	447,030.00
4215.13 · Other Revenue	10.00	100.02	-90.02	10.0%	200.00
4250.10 · Taxes - General	781.60	4,963.87	-4,182.27	15.75%	269,726.51
4250D · Taxes - Domestic	1,109.07	6,913.79	-5,804.72	16.04%	83,591.50
4250I · Taxes - Irrigation	0.00	0.00	0.00	0.0%	122,056.77
4300A · Interest	130,139.44	27,050.30	103,089.14	481.1%	60,000.00
Total Income	3,174,535.15	2,606,906.17	567,628.98	121.77%	3,591,022.17
Gross Profit	3,174,535.15	2,606,906.17	567,628.98	121.77%	3,591,022.17
Expense					
5050.30 · F/T Ditch	47,759.37	60,854.02	-13,094.65	78.48%	131,470.00
5050.95 · Yuba City Water Sale (1/2)	223,515.00	223,515.00	0.00	100.0%	223,515.00
5100.00 · Water Treatment Plant (WTP)	132,917.99	191,934.88	-59,016.89	69.25%	360,813.84
5200.00 · Irrigation Expense	95,925.92	97,978.14	-2,052.22	97.91%	205,006.27
5251 · Domestic Expenses	160,942.27	150,358.03	10,584.24	107.04%	284,144.38
5400 · Board of Dir	5,920.29	16,099.98	-10,179.69	36.77%	35,400.00
5500 · Admin	270,249.21	326,166.85	-55,917.64	82.86%	597,253.18
5500U · Admin-Utilities	16,573.92	19,580.53	-3,006.61	84.65%	36,635.53
5600R · Regulator Driven	105,765.05	141,897.46	-36,132.41	74.54%	179,283.82
5700 · General	117,986.74	129,412.30	-11,425.56	91.17%	189,135.49
5700F · Fuel	12,748.23	14,708.18	-1,959.95	86.67%	31,770.91
5800 · OSHA/Safety	6,126.49	6,083.95	42.54	100.7%	10,000.00
5900A · Benefits- V/S/H-Ins/Pen/W/C-Tax	0.00	0.00	0.00	0.0%	0.00
Total Expense	1,196,430.48	1,378,589.32	-182,158.84	86.79%	2,284,428.42
Net Ordinary Income	1,978,104.67	1,228,316.85	749,787.82	161.04%	1,306,593.75
Net Income	**1,978,104.67**	**1,228,316.85**	**749,787.82**	**161.04%**	**1,306,593.75**

North Yuba Water District

2024-25 EXPENSES OUT OF RESERVES/SAVINGS (July 01, 2024 - December 31, 2024)

MEMO	AMOUNT BILLED/PAID UP TO DATE	GRANT FUNDS RECEIVED UP TO DATE	NET AMOUNT BILLED/PAID UP TO DATE	ANNUAL BUDGET
L.U.I. Union Retirement Stabilization Fund			**$0.00**	$26,208.00
Additional Legal	$607,391.28		**$607,391.28**	$720,000.00
Public Relations	$16,844.00		**$16,844.00**	$30,000.00
Grant Pursuits			**$0.00**	$50,000.00
Special Projects/Emergency Repairs				
Median Household Income Study	$5,986.00			
7 Motorola Radios	$11,219.07			
Total Special Projects/Emergency Repairs to date			**$17,205.07**	$200,000.00
Water Treatment Plant Improvements/Repairs			**$0.00**	$350,000.00
FT Ditch				
Halversterm Flume	$14,079.55			
Shortcrete-Gunite-Cribbing - FT Ditch	$146,829.00			
Canal Stabilization FT Ditch	$136,518.28			
(Grant Income from Yuba Water Agency) for Canal Stabilization FT Ditch)		-$113,345.78		
Water Measurements	$43,996.21			
Total FT Ditch			**$228,077.26**	$500,000.00
Office Maintenance/Shop			**$0.00**	$50,000.00
Radio Read Meters			**$0.00**	$250,000.00
Tanks				
Tanks	$1,007.00			
Tanks (Paint)	$175,912.00			
(Grant Income from DWR) for Tanks)				
Total Tanks			**$176,919.00**	$150,000.00
Truck-Pick-up	$89,550.43		**$89,550.43**	$100,000.00
Water Losses			**$0.00**	$100,000.00
Irrigation Ditch				
Shotcrete	$1,047,544.00			
(Grant Income from Yuba Water Agency) for Irrigation Ditch Shortcrete)		-$761,083.00		
Total Irrigation Ditch			**$286,461.00**	$500,000.00
	$2,296,876.82	-$874,428.78	**$1,422,448.04**	**$3,026,208.00**

North Yuba Water District

Cash In Accounts prior Month Comparison

December 2024 compared to November 2024

	12/31/2024	11/30/2024	
	Amount	Amount	Increase/Decrease
River Valley Bank Checking	$271,344.06	$117,918.66	$153,425.40
Savings Money Market Account (River Valley Bank)	$3,804,230.78	$3,196,546.65	$607,684.13
PayPal Account	$126.22	$1,488.66	($1,362.44)
Petty & Register Cash	$830.00	$830.00	$0.00
Tri Counties Bank (6 Month CD-matures 06/30/25-3.94%)	$1,022,272.66	$0.00	$1,022,272.66
River Valley Bank (6 Month CD-matures 06/26/25-3.94%)	$1,022,186.38	$0.00	$1,022,186.38
Tri Counties Bank (6 Month CD-matures 07/10/25-4.5%)	$510,300.43	$510,300.43	$0.00
Tri Counties Bank (6 Month CD-matures 03/18/25-4.43%)	$523,070.41	$523,070.41	$0.00
Tri Counties Bank (6 Month CD-matures 12/28/24-4.5%)	$0.00	$1,000,000.00	($1,000,000.00)
River Valley Bank (6 Month CD-matures 12/28/24-4.5%)	$0.00	$1,000,000.00	($1,000,000.00)
YC Treas Fund #637 (Gen Dist)	$806,963.11	$806,963.11	$0.00
YC Treas Fund #641 (ID #1)	$615,195.85	$615,195.85	$0.00
YC Treas Fund #642 (ID #2)	$138,986.37	$138,986.37	$0.00
YC Treas Fund #639 (Fac Fee Domestic)	$7,755.82	$7,755.82	$0.00
YC Treas Fund #640 (Savings)	$533,315.16	$533,315.16	$0.00
YC Treas Fund #644 (Equip Res)	$3,157.98	$3,157.98	$0.00
YC Treas Fund #646 (ID #6)	$11,993.83	$11,993.83	$0.00
YC Treas Fund #647 (Annex Irr)	$11.76	$11.76	$0.00
YC Treas Fund #648 (Annex Dom)	$92.71	$92.71	$0.00
YC Treas Fund #649 (Off Equip Res)	$5,768.48	$5,768.48	$0.00
YC Treas Fund #650 (Reserve)	$2,257,050.05	$2,257,050.05	$0.00
YC Treas Fund #393 (Trmt Plnt)	$2,882.64	$2,882.64	$0.00
Total Cash on Hand	**$11,537,534.70**	**$10,733,328.57**	**$804,206.13**
Reserve Accounts			
Reserve Savings Money Market (River Valley Bank)	$100,435.58	$100,263.40	$172.18
CIP Money Market Account (River Valley Bank)	$542,550.13	$541,620.02	$930.11
Total in Reserve	**$642,985.71**	**$641,883.42**	**$1,102.29**
Total in All Accounts not including FT Tank and YC Water Sale Account	**$12,180,520.41**	**$11,375,211.99**	$805,308.42
FT Tank Money Market Account (River Valley Bank)	$113,806.14	$113,611.04	$195.10
YC Water sale Account (River Valley Bank)	$299,990.62	$522,803.63	($222,813.01)
Total in All Accounts	**$12,594,317.17**	**$12,011,626.66**	$582,690.51

North Yuba Water District
Statement of Cash Flows
December 2024

	Dec 24
OPERATING ACTIVITIES	
Net Income	-34,435.15
Adjustments to reconcile Net Income	
to net cash provided by operations:	
1200A · Accounts Receivable:1200.50 · Accounts Receivable Module	95.00
A/R:A/R Domestic Water	1,238.84
1300.00 · Inventory-001	-245.02
1400.03 · Prepaid Worker's Comp Insurance	2,564.40
2000.00 · Accounts Payable	-3,349.10
Payroll Liabilities	-3.27
2150.30 · PR Tax-State Unemployment Tax	56.67
2150.50 · PR -Aflac Ins	-131.92
2250.10 · Deposits-Customers	256.00
Net cash provided by Operating Activities	-33,953.55
Expenses/Income from Reserves/Savings	
Public Relations	-1,662.00
Additional Legal	-221,536.47
Irrigation Ditch Shotcrete	761,083.00
Canal Stabilization FT Ditch	-23,172.50
Canal Stabilization Grant Income	113,345.78
FT Ditch Water Measurement	-11,413.75
Net Expenses/Income from Reserves/Savings	616,644.06
Net cash increase for period	582,690.51
Cash at beginning of period	12,011,626.66
Cash at end of period	**12,594,317.17**

GANNETT FLEMING

1420 Rocky Ridge Drive
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January 3, 2025
Gannett Fleming Project No. 075666 Task 300

Ms. Leona Harris
North Yuba Water District
8691 Quincy La Porte Road
Brownsville, CA 95919

Re: ALTERNATIVES ANALYSIS REPORT – DRAFT
Forbestown Ditch and Dobbins Oregon House Canal, Canal Improvements
Butte and Yuba Counties, California

Dear Ms. Harris,

Gannett Fleming, Inc. (Gannett Fleming) is pleased to submit this report presenting the results of our alternatives analysis for the above referenced project. Our services have been performed in general accordance with the scope of work contained in our Proposal for Engineering Consultation Services dated March 7, 2024 (Ref. 1).

We appreciate the opportunity to work with you on this project. Please call us should you have any questions.

Sincerely yours,
Gannett Fleming, Inc.

Johnny Prettyman, P.E.
Senior Project Engineer

Michelle Karlen, P.E.
Senior Project Engineer

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APPENDICES

GANNETT FLEMING

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ALTERNATIVES ANALYSIS REPORT – DRAFT
Forbestown Ditch and Dobbins Oregon House Canal – Canal Improvements
Gannett Fleming Project No. 075666, Task 300
Butte and Yuba Counties, California

1.0 PROJECT OVERVIEW

The Forbestown Ditch (Forbestown Canal) is approximately 10 miles long and the Dobbins Oregon House Canal (DOHC) is approximately 18 miles long, both were constructed in the 1860's. Figures 1 and 2, in Appendix A, provide overview figures of both systems. Together, these two canals provide domestic and irrigation water from the South Fork of the Feather River to the communities of Challenge, Brownsville, Rackerby, and Forbestown in Butte and Yuba Counties. North Yuba Water District (NYWD) operates both canals under agreement with the South Feather Water and Power Agency (SFWPA).

The two canal systems contain lined and unlined sections of canal, inverted siphons, wooden flumes, numerous culverts, weirs, and property owner water supply lines along their alignments. Both canals are experiencing deteriorating conditions after 100+ years in service with numerous dispersed areas of leakage. There is currently no backup water supply for these communities and any disruption to normal canal operations has the potential for significant downstream consequences depending on the time of year. Currently, the capacity of the Forbestown canal is approximately 22 cubic feet per section (cfs). The Forbestown canal is required to supply 1.5 to 2 cfs to the water treatment plant and 11 cfs to SFWPA. The current capacity of the DOHC is approximately 10.5 cfs and only supplies water to property owners for irrigation. NWYD has an ongoing/active maintenance program to install new shotcrete linings in sections in both canals, during routinely scheduled maintenance outages. The shotcrete liner consists of non-engineered shotcrete with fiber reinforcement. The program has also replaced the tallest flume in Forbestown canal, Hell4Stout, with an inverted siphon. Since 2023, continuous and ongoing improvements to Forbestown canal have decreased leakage related losses and increased flows reporting to the water treatment plant at the canal's downstream terminus by approximately 16%.

2.0 PROJECT SCOPE

NYWD requested that Gannett Fleming perform a canal improvement alternatives analysis for improving the reliability and flow capacity of the two canals. At the start of the project the following were established as the main goals of the analysis and potential future project(s): (1) to address existing defects and deteriorated conditions; (2) to reduce water losses from both canals; (3) to reduce the susceptibility of the system to wildfires; and (4) to increase the size of the conveyances to pass additional flows. NYWD's long-term desire is to supply additional water to the water treatment plant at the downstream terminus of the Forbestown canal and to increase clientele on DOHC.

In support of the alternatives analysis, Gannett Fleming reviewed existing project documentation; performed walkdown inspections of each of the canals; performed conceptual-level hydraulic modeling of different alternatives; and prepared this report presenting the findings of our evaluation.

Please note, the hydraulic analyses and alternative costs presented in this report are conceptual. Multiple geometric assumptions have been made for hydraulic analysis (Section 4) and a complete survey of the canals is required for final design to provide the most accurate hydraulics and resultant costs.

3.0 CANAL WALKDOWN

Gannett Fleming personnel performed a walkdown of Forbestown canal and DOHC from July 15th-18th, 2024, covering approximately 18 miles. The team consisted of Johnny Prettyman, PE; Michelle Karlen, PE, and Scott Savko, PG. The Gannett Fleming team's primary objectives for the walkdowns were to observe current conditions and to note key features in the systems to facilitate hydraulic modeling efforts. During the walkdown, the team used an iPad and ESRI Field Maps paired with a Trimble R2 GPS Antenna to locate the features and areas of concern within approximately 1-foot of horizontal accuracy. Both canals were in service during the walkdowns and therefore the interior of conveyances was not observed as part of this effort. Kyle Moulder from NYWD guided the team and was fundamental in helping the team identify features and providing valuable insights regarding the canal history and areas of past problems or repairs during the walkdown.

Key features observed during the walkdown for hydraulic modeling included typical cross sections and dimensions of the canal, siphons, flumes, culverts, weirs, and the NYWD supply lines to customers. Figures 1 and 2, in Appendix A, display the features that were mapped during the walkdowns along the canals. GIS data and notes are available upon request.

Areas of concern included flume leakage, canal embankment low spots, and erosion/leakage on canal embankments. Figures 3 to 6, in Appendix A, show the areas of concern identified during the inspection. NYWD routinely monitors these areas and understands the current maximum water level they can run without overtopping.

4.0 ALTERNATIVES

4.1 Objectives

As described previously, NYWD would like to improve the deteriorated canal conditions, reduce fire susceptibility, and increase the flow capacity of the canals. NYWD would like to accomplish this with the existing canals' alignments and profiles. As such, NYWD and Gannett Fleming selected four canal lining alternatives for evaluation as described below. The alternatives range from an extensive approach by piping the entire canal, to a minimal effort of lining sections of the canals as described below.

4.2 Identification Of Alternatives

Four conceptual alternatives were identified and considered as part of this analysis, including: (1) replacing open canal systems with a buried pressurized HDPE piping system (2) replacing open canal systems with a buried non-pressurized HDPE piping system; (3) installing shotcrete lining in the existing system; or (4) maintain the status quo. Each alternative is described in detail in the sections below. Each of the alternatives was evaluated for a range of representative flow rates as described further in Section 5 of this report.

Note that alternatives presented are conceptual and no engineering design has been performed. Therefore, items including, but not limited to, the structural supports for elevated sections of waterways, thrust blocks to restrain the HDPE pipe, and specific pipe fittings have not been included in this evaluation.

4.2.1 Alternative 1 – Pressurized HDPE Piping System

Alternative 1 replaces the entire canal system (with the exception of the existing siphons) with pressurized HDPE pipe. This alternative will require most culverts to be replaced unless culverts are large enough to fit the new HDPE pipe through the culvert. Alternative 1 assumes all flumes will be replaced with elevated HDPE pipe or siphons depending on site geometry. The system is gravity fed and would be designed to allow the HDPE pipe to be pressurized, thus increasing the capacity of the system while maintaining a smaller pipe diameter. This alternative will be able to supply pressurized flow to NYWD clients at the user connections. The HDPE pipe will be buried to protect the pipe from wildfire and to restrain or prevent movement due to thrusts developed at angle changes and thermal expansion. Piping the canal will reduce leakage, evaporation from the open canal, and will prevent debris from entering the system. Pipe size would vary throughout the system based on flow rate to maintain a pressurized system.

Construction of this alternative will be extensive. Most of culverts in the systems will need to be removed, access roads over HDPE pipes restored, HDPE pipe will need to be fitted to existing siphons, user connections will need to be updated, and the HDPE pipe will be required to be buried. NYWD does not have onsite fill available, requiring the fill to bury the pipes to be sourced locally or imported. Forbestown canal has sections with no access roads and installation of pipe will be difficult in those areas. DOHC system has an access road following the canal for the entire length and will be easily accessible for pipe installation.

The post-installation maintenance of this alternative would be to ensure that the pressurized system operates as designed and functions correctly. This might include maintenance of valves, pressure reducers, and vacuums/air relief valves. Routine debris and hazard tree removal would be less for this alternative compared to Alternative 3 due to the enclosed nature of the system. If repairs to the HDPE pipe are needed, a contractor would be required to repair the system as NYWD does not have the experience or proper equipment to make the repairs. Pipe inspections would require an ROV supported CCTV camera inspection. The lifespan of HDPE pipe is estimated to be at minimum, 50-years, in contrast to Alternative 3 which has an estimated maximum lifespan of 50-years.

4.2.2 Alternative 2 – Non-pressurized HDPE Piping System

Alternative 2 replaces the entire canal system (with the exception of the existing siphons) with HDPE pipe. This alternative will require most culverts to be replaced unless culverts are large enough to fit the new HDPE pipe through the culvert. Alternative 2 assumes all flumes will be replaced with elevated HDPE pipe or siphon depending on site geometry. The system is gravity fed and the HDPE pipe will be unpressurized in most locations. As a result of being unpressurized, this alternative requires a thinner walled pipe compared to Alternative 1. The HDPE pipe will be buried to protect the pipe from wildfire and to restrain or prevent movement due to thrusts developed at angle changes and thermal expansion. Piping the canal will reduce leakage, evaporation from the open canal, and will prevent debris from entering the system Pipe size would vary throughout the system based on flow rate and to reduce costs with smaller pipes where possible. Construction considerations for this alternative are the same as Alternative 1.

The post-installation maintenance of this alternative is similar to Alternative 1. Typical maintenance, debris maintenance, pipe inspections, pipe repairs, and lifetime considerations are the same as Alternative 1.

4.2.3 Alternative 3 – Shotcrete Liner

Alternative 3 installs shotcrete in the remaining unlined portions of the canal systems. This alternative will require modifications to low canal embankments, culverts, and flumes where capacity is insufficient for the proposed increased flow rates. Siphons are assumed to remain unchanged. This alternative will require the least amount of modifications to the systems. As stated previously, NYWD has recently been lining their canals with shotcrete, which has been effective at reducing water losses. This alternative will have the potential for more leakage and more evaporation losses than piping alternatives. Leakage in this alternative could still lead to unstable canal embankments.

Construction of this alternative would require several flumes and culverts in localized areas to be removed and replaced with structures (new flumes, pipes, or siphons) with greater flow capacity. Additionally, portions of the canal would need to be deepened to accommodate increased flows. This would be achieved by raising the canal embankments. Fill to increase canal embankments will be a small quantity and should be able to be sourced onsite. Although portions of Forbestown canal is difficult to access, NYWD's shotcrete contractor has been able to install shotcrete liner in these locations using a long supply line for installation. The DOHC system is accessible for its entire length and could be relatively easily shotcrete lined.

Maintenance for this alternative would be clearing debris in the system and maintaining shotcrete lining in good condition. Inspections and minor repairs can easily be performed by NYWD staff. The lifetime of shotcrete liner is estimated to be at most 50-years with surficial repairs occurring every 10-15 years.

4.2.4 Alternative 4 – Status Quo

Alternative 4 is maintaining status quo. Maintaining the status quo of the system means that the capacity cannot be increased. The canal evaluation observed multiple locations where water in the canal is nearly overtopping embankments at current flow rates. This alternative would be to continue as NYWD is currently maintaining the canal systems and continues installing shotcrete liner to improve canal conditions. Increased flows locally due to local liner improvements over time may require downstream berm raising to avoid overtopping the canal berm.

4.2.5 Alternatives Not Considered

Alternatives discussed but not considered as part of this analysis include unburied HDPE pipe, deviation from current canal alignments, and tunnels. Leaving HDPE pipe unburied exposes it to wildfires and it would be difficult to restrain against flows and thermal expansion for the entire system. If NYWD would like to consider unburied pipe, Gannett Flemings suggests considering an alternative material and possibly a concrete box culvert, that better withstands environmental exposure which may increase material costs, and would require further constructability access considerations.

Deviations from the current alignment with long siphons and/or tunnels could eliminate the need for removing and replacing several flumes and culverts and could potentially cut-off long segments of existing canal alignment. These considerations would require negotiations with landowners for easements and that may not be feasible. Considerations regarding access, construction, environmental/permitting and land

rights have not been explored as part of this study. These currently unexplored concepts would require further hydraulic analysis and research if NYWD would like to consider them.

5.0 HYDRAULIC ANALYSIS OF ALTERNATIVES

The four described alternatives were hydraulically evaluated to determine pipes sizes and required canal modifications to pass the proposed increased flow rates. The alternatives were modeled in the hydraulic modeling software Autodesk InfoWork ICM. Required inputs for the hydraulic model included proposed flow inputs, existing pipe and channel geometries and slopes, and estimated roughness coefficients.

Typical canal cross section dimensions, culverts dimensions, flume dimensions, and estimated siphon dimensions were gathered in the canal evaluation by Gannett Fleming and used in the hydraulic modeling. The pipe sizes, pipe lengths, and canal modifications from the hydraulic modeling results have assisted in determining feasibility and costs of each alternative.

Note that the presented hydraulic analysis is conceptual and focuses on canal capacity, pipe capacity, and pipe pressures. Multiple geometric assumptions have been made for hydraulic analysis and a complete survey of the canals is required for final design to provide the most accurate hydraulics. Further analysis will be required to design the system for pipe restraints, thrust blocks, pressure reducers, vacuums, air relief, and all further required fittings.

5.1 Hydraulic Modeling

5.1.1 Flows

Current capacity of the Forbestown canal is 22 cfs and the current capacity of the DOHC is 10.5 cfs. NYWD would like to increase the capacity of both canals. For this analysis, three flow options for Forbestown Canal and two flow options for DOHC were specified by NYWD. Forbestown canal flows were evaluated at 30, 40, and 50 cfs. DOHC flows were evaluated at 15 and 20 cfs.

5.1.2 Terrain Data

USGS LiDAR was available in the area of both systems and used to estimate elevations, slopes, and lengths. Tree cover is prevalent surrounding the Forbestown canal and significantly reduces the accuracy of the LiDAR near the canal making it difficult to obtain channel elevations. To supplement the LiDAR canal inaccuracies and estimate channel invert elevation, a pdf of a survey by NorthStar Engineering in 2019 (Ref. 2) was used. LiDAR for the DOHC had better accuracy than Forbestown canal, but still required some alterations to represent existing conditions and ensure positive drainage to the end of the system.

Siphon geometric properties, including pipe sizes, inverts, slopes, and lengths, of inverted siphons were assumed for both canal systems by using measurements from the walk down and the available terrain data for both Forbestown and DOHC. A detailed survey of the entirety of Forbestown and DOHC is required in order to accurately model both systems.

5.1.3 Canal Geometry

Typical canal sections and culvert geometries were measured during the canal evaluation and were used in the hydraulic modeling. Locations of canal sections, culverts, and siphons were georeferenced into the

hydraulic model. Siphons elevations, inlet and outlet geometry, and lengths were estimated based on the terrain data.

The pressurized (Alternative 1) and unpressurized (Alternative 2) pipe alternatives assumed canal, culverts, and flumes are replaced with new HDPE pipe and the siphons remain unchanged. The shotcrete lined alternative assumed all canal areas are lined with shotcrete. The shotcrete lined alternative does require increasing canal embankments and replacing multiple flumes and culverts to pass the desired flows. The required modifications are shown on Figures 7 and 8, in Appendix A. The shotcrete lined alternative assumes siphons remain unchanged. The status quo alternative has no changes to existing conditions.

All geometries follow the existing canals alignments and approximate profiles.

5.1.4 Canal and Pipe Roughness

Pipe and canal material roughness values were based on Manning's n roughness and are listed in Table 5-1. Pipe roughness values were used for culverts, siphons, and HDPE pipe. Canal roughness values were used for unlined and shotcrete lined areas.

Table 5-1 Material Roughness Values

Material Type	Manning's n
HDPE	0.012
Corrugated Metal Pipe (CMP)	0.030
Concrete	0.013
Unlined Canal	0.030
Shotcrete Lined Canal	0.020

5.2 Hydraulic Analysis Results

The hydraulic analysis results of the pipe alternatives are presented in this section. Table 5-2 and Table 5-3 report the required pipe sizes to pass the specified flow rates and maintain either pressurized or unpressurized systems. In cases where multiple pipes are listed for a flow rate, all pipes listed are required to maintain the flow and pressurized or unpressurized state. Although the unpressurized pipe sizes are larger than the pressurized pipe alternative, it is important to note that the pipe thickness is reduced for Alternative 2.

Table 5-2 Forbestown Pipe Size Results

Alternative	Flow		
	30 cfs	**40 cfs**	**50 cfs**
Alt 1 Pressurized Pipe	32, 36, and 42 inches	42 inches	42 inches
Alt 2 Unpressurized Pipe	42 inches	48 inches	48 inches

Table 5-3 DOHC Pipe Size Results

Alternative	Flow	
	15 cfs	**20 cfs**
Alt 1 Pressurized Pipe	12, 18, 24, 26, 28, 30 and 36 inches	12, 18, 24, 26, 28, 30 and 36 inches
Alt 2 Unpressurized Pipe	12, 18, and 30 inches	12, 24, and 36 inches

Alternative 3, shotcrete lined system, hydraulic results indicate the canals will require modifications to pass the increased flow rates. Forbestown canal will require the canal depths to be increased from 6 inches up to 2 feet in localized areas to increase capacity. Additionally, several flumes and culverts will need to be removed and replaced with larger structures to accommodate increased flows. DOHC canal will require one area of the canal depth to be increased by at least 3 inches and several culverts to be removed and replaced with larger structures for increased capacity. Figures 7 and 8, in Appendix A, shows where the modifications to Forbestown canal and DOHC are located.

Alternative 4 hydraulic results and field observations indicate that the existing canals are at full capacity, approximately 22 cfs for Forbestown and 10.5 cfs for DOHC, and cannot pass higher flow rates without overtopping the canal embankments and losing flows. Figures 9 and 10, in Appendix A, shows locations where the existing canals would likely overtop at the proposed increase flows and resultant flows at the end of each canal.

Full electronic hydraulic model with input and results can be provided upon request.

6.0 EVALUATION OF ALTERNATIVES

6.1 Summary of Alternatives

Table 6-1 Summary of Alternatives

Alternative 1: Pressurized Pipe		
Description	**Advantages**	**Disadvantages**
• Install HDPE pressurized pipe along whole canal system; except for siphons where there will be a transition • Existing flumes and culverts will also be removed and replaced; elevated flume sections will likely have elevated HDPE pipe sections • HDPE pipe will be fully buried; estimate does not include anchorage of pipe or elevated supports in existing flume sections	• Best leakage reduction • No overtopping of canal • No evapotranspiration losses • Reduce washouts caused by canal leakage • Minimal to no vegetative growth in system • 50-year design life • Less maintenance than Alternatives 3 and 4 • Some NYWD clients would have pressure • Increased capacity allows NYWD to increase distribution	• Expensive initial costs • Requires contractor for maintenance and repairs of HDPE pipe • Requires fill to bury pipe to protect from potential forest fires • Public likes appearance of open canals • Reconfigure user connections • Difficult to inspect • Requires full survey of each canal system for final piping system design.
Alternative 2: Non-pressurized Pipe		
Description	**Advantages**	**Disadvantages**
• Install HDPE unpressurized pipe along whole canal system; except for siphons where there will be a transition • Existing flumes and culverts will also be removed and replaced; elevated flume sections will have elevated HDPE pipe sections • HDPE pipe will be fully buried; estimate does not include anchorage of pipe or elevated supports in existing flume sections	• Best leakage reduction • No overtopping of canal • No evapotranspiration losses • Reduce washouts caused by canal leakage • Minimal to no vegetative growth in systems • 50-year design life • Less maintenance than Alternatives 3 and 4 • Simple modifications to this alternative could provide areas of open canal as aesthetic benefits for the public • Don't need to reconfigure user connections • Increased capacity allows NYWD to increase distribution	• Expensive initial costs • Requires contractor for maintenance and repairs of HDPE pipe • Requires fill to bury pipe to protect from potential forest fires • Public likes appearance of open canals • Difficult to inspect • Require full survey of each canal system for final piping system design

Alternative 3: Shotcrete Liner		
Description	**Advantages**	**Disadvantages**
• Shotcrete line the whole canal minus flumes, pipes, and siphons • Locally deepen or raise the berm for sections of canal to increase freeboard • Replace undersized and existing deteriorated flumes • Replace some culverts to increase capacity	• Cheaper initial cost than Alternatives 1 and 2 • NYWD may perform in-house maintenance and inspection • Increased resistant to fires in canal sections of the system • Less routine maintenance than Alternative 4. • Public likes appearance of open canals • Shotcrete reduces vegetative growth in the canal systems • 50-year design life. • Don't need to reconfigure user connections • Less modifications to system compared to piping alternatives • Increased capacity allows NYWD to increase distribution	• Requires increase in canal depths, as well as replacements/upgrades to culverts and flumes to increase capacity • Potential for leakage • Evapotranspiration losses • Flumes and other sections of the system maintain the existing risk of fire • If overtopped, washout could occur. • Requires full survey of each canal system for final system design for increased flows
Alternative 4: Status Quo		
Description	**Advantages**	**Disadvantages**
• No modifications to the systems • Flow rates will not be increased.	• Normal maintenance costs • Public likes appearance of open canals • Can continue normal updates to canal as required. • Don't need to reconfigure user connections	• Cannot increase flows • Greatest risk of failure of all the alternatives. • Continued leakage • Evapotranspiration losses • Flumes exposed to fires • If overtopped, washout could occur. • Limited to current water users

6.2 Criteria for Evaluation of Alternatives

The alternatives presented in Section 3 were evaluated based on the criteria presented below. Each alternative was given an initial score between 1 and 5 for each criterion, with 1 being the least desirable and 5 being the most desirable. The criteria were weighted according to the objectives of the project and discussions with NYWD.

6.2.1 Basis of Comparison for Alternatives

The proposed alternatives were evaluated considering relative comparisons between the following characteristics:

- Performance
- Construction cost
- Constructability
- Maintenance

Note that construction and environmental permitting are anticipated to be similar for all alternatives, and are therefore not considered as a part of this alternatives analysis. It is anticipated that a permit for near river work, coordination with California Department of Fish and Wildlife and the USFS, and a SWPPP may be required for the project regardless of which alternative is chosen.

6.2.2 Performance (40%)

Performance was evaluated based on how effective an alternative would be at meeting all of the project goals. Unless otherwise noted, each alternative is expected to meet the alternative analysis objectives in similar ways; however, each differ in the extent at which they meet NYWD's criteria for a low-maintenance permanent solution. Based on discussions with NYWD, canal improvements and reducing water losses are the highest priority. Accordingly, it is weighted the highest in the alternatives analysis matrix.

6.2.3 Construction Cost (30%)

Based on discussions with NYWD, construction cost is the secondary concern for this project. Therefore, it is weighted the second highest in the alternatives analysis matrix, although closely following the performance criteria. The cost estimates provided include rough order of magnitude (ROM) construction costs. Soft costs such as engineering, permitting, NYWD overhead, inspectors, etc. are not included as a part of this analysis because they are assumed to be of a similar order of magnitude for each alternative. The total costs for the three alternatives range from approximately $31M to $76M; these costs do not account for long term inflation if the project takes multiple years. Thrust blocks and/or pipe anchoring costs are not included for the pipe alternatives as a more detailed analysis of the conveyance is needed. Additionally, elevated supports for the flume sections, culvert replacements, or specialized connections to the existing siphons have not been included. These values include a 50% contingency given the preliminary nature of the conceptual design, which can be reduced as the design progresses. See Appendix B for specific unit costs and our complete cost breakdown. Important to note is the RS Means values location index used was Marysville, CA and may be lower than actual costs. Quantity estimates are rough order of magnitude and should be expected to become more accurate during the detailed design of the selected alternative.

6.2.4 Constructability (15%)

Constructability was evaluated based on how difficult and timely the alternatives would be to construct. Based on discussions with NYWD, constructability is the tertiary concern for this project and is weighted low in the alternatives analysis matrix.

6.2.5 Maintenance (15%)

Maintenance was evaluated based on the long-term maintenance activities that may be required for each of the alternatives. Although some maintenance will be required regardless of the selected alternative, several of the alternatives would require frequent maintenance to clear debris from trash racks.

6.3 Evaluation Summary

Our alternatives evaluation matrix, showing the results of our analysis, is provided in Table 6-2 for Forbestown canal and Table 6-3 for DOHC below.

Table 6-2 Alternatives Analysis Matrix for Forbestown Canal

Alternatives		Criteria	Performance	Construction Cost	Constructability	Maintenance	Total Weighted Score
		Weight	**40**	**30**	**15**	**15**	
1	Pressurize Pipe	Score =	5	1	1	4	***61***
		Weighted Score =	*40*	*6*	*3*	12	
2	Non-pressurize Pipe	Score =	5	2	1	4	***67***
		Weighted Score =	*40*	*18*	*3*	12	
3	Shotcrete Liner	Score =	4	3	3	3	***68***
		Weighted Score =	*32*	*18*	*9*	9	
4	Status Quo	Score =	1	5	5	3	***62***
		Weighted Score =	*8*	*30*	*15*	9	

Higher Score = More Desirable Alternative

Table 6-3 Alternatives Analysis Matrix for DOHC

Alternatives		Criteria	Performance	Construction Cost	Constructability	Maintenance	Total Weighted Score
		Weight	40	30	15	15	
1	Pressurize Pipe	Score =	5	1	2	4	**64**
		Weighted Score =	40	6	6	12	
2	Non-pressurize Pipe	Score =	5	2	2	4	**70**
		Weighted Score =	40	12	6	12	
3	Shotcrete Liner	Score =	4	3	3	3	**68**
		Weighted Score =	32	18	9	9	
4	Status Quo	Score =	1	5	5	3	**62**
		Weighted Score =	8	30	15	9	

Higher Score = More Desirable Alternative

7.0 CONCLUSIONS AND RECOMMENDATIONS

This report has identified four conceptual alternatives to be considered for Forbestown canal and DOHC to improve canal conditions. Evaluation of hydraulics and goal objectives of each alternative has been presented. Based on the evaluation of alternatives in Section 6.0 and in conjunction with discussions with NYWD, we recommend the preferred solution for meeting the project objectives is to proceed with a combination of Alternative 2 and 3, that is, to replace the open canal with non-pressurized HDPE pipe and shotcrete liner. A combination of these two alternatives allows for the project to be more easily staged in sections due to both budget as well as outage restrictions. Some items that need to be considered during choosing the liner type are, but not limited to:

- Access limitations for equipment to either install a pipe with backfill or supply hoses for shotcrete liner;
- Pipe will need to be constructed in long segments for both better performance and less maintenance. Examples may be cleaning trash racks and transitions from canal to pipe may increase losses; and
- Pipe should be considered in areas where siphoning water is a concern and/or where NYWD is concerned about contamination entering the system.

In Gannett Fleming's opinion, Alternative 1 does not provide enough benefit by supplying pressure to customers to offset the significantly higher costs. Alternatives 1 and 2 scored lower than Alternative 3 in constructability as getting pipe and equipment to remote areas in Forbestown may prove difficult. Alternative 3, shotcrete lining, would require several culverts and flumes to be upsized creating a similar construction cost to Alternative 2. Alternative 4 would not meet the objective of increasing flows, but continued maintenance would meet other objectives of reducing leakage and reducing fire susceptibility.

Gannett Fleming recommends that the preferred alternative cost estimate for non-pressurized HDPE pipe and shotcrete liner be benchmarked with a cost estimate provided by a contractor. Additionally, it is imperative that a complete and thorough survey be completed for the entirety of both systems when the canal is empty. This will ensure the most accurate hydraulic modeling and decrease uncertainties with assumed slopes, elevations, and geometries of pipes, siphons and canals.

8.0 LIMITATIONS

This report has been prepared for the sole use of NYWD, specifically for the evaluation of conceptual alternatives for improving water flow along both the Forbestown Canal and Dobbins Oregon House Canal by addressing the canal lining material. The conclusions and recommendations contained in this report are based upon information obtained from the references listed herein. No detailed subsurface investigation, slope stability analysis, engineering design, or structural analysis was performed as part of this alternatives analysis. Hydraulic analysis and costs presented in this report are conceptual. Multiple geometric assumptions have been made for hydraulic analysis and a complete survey of the canals is required for final design to provide the most accurate hydraulics and resultant costs. Gannett Fleming is not responsible for the data presented by others. The information provided in this report is valid as of the date shown on the cover page. Issues may arise that were not apparent at the time of this alternatives analysis (e.g., changes in site conditions, regulatory requirements, etc.). Accordingly, this report may be invalidated, wholly or partially, by changes outside of our control. Should changes occur that might affect the conceptual alternatives presented herein, Gannett Fleming should be notified to evaluate the validity of this report to those changes.

In providing rough order of magnitude construction costs, the Client understands that Gannett Fleming has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that Gannett Flemings's opinions of probable construction costs are made on the basis of professional judgment and experience.

9.0 REFERENCES

1. Proposal for Engineering Consultation Services: Canal Improvements Alternatives Analysis for Forbestown Ditch and Dobbins Oregon House Canal, Yuba County, California, prepared by Gannett Fleming, dated July 7, 2024.
2. *Forbestown Ditch Project*, Drawings, 45 Sheets, Prepared for North Yuba Water District, prepared by Northstar, dated June 2019.
3. Yuba County Water District Infrastructure Rehabilitation Feasibility Study: The Forbestown Pipeline Project, prepared by Bookman-Edmonston A Division of GEI Consultants, dated December 2004.
4. North Yuba Water District Irrigation and Domestic Water Delivery Feasibility Study, prepared by Kennedy/Jenks Consultants, dated August 3, 2012.
5. Technical Memorandum: Preliminary Engineering Evaluations for Raw Water Conveyance Systems in the North Yuba Water District, prepared by Forsgren Associates, Inc., dated September 25, 2015.

APPENDIX A

Figures

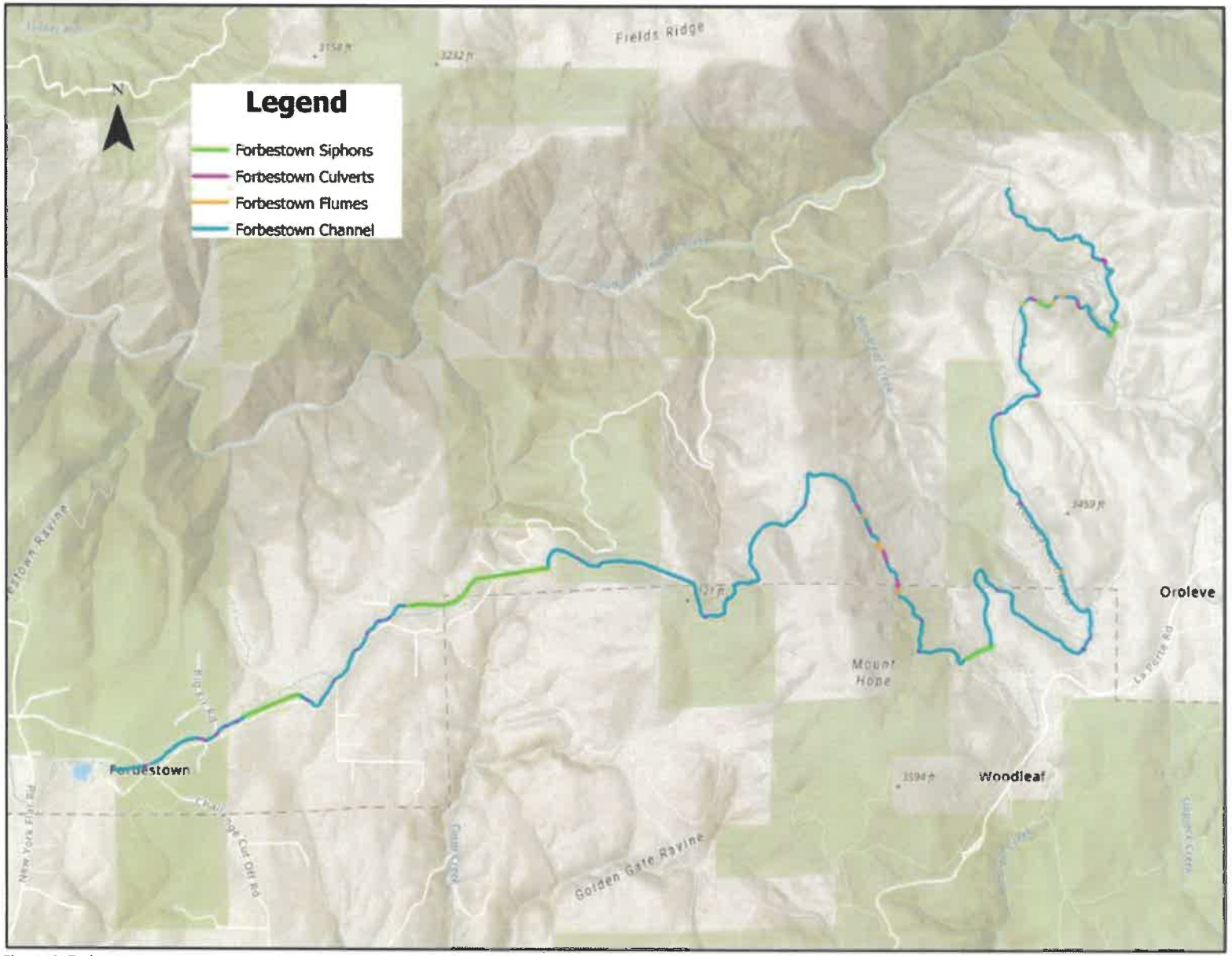


Figure 1: Forbestown Features

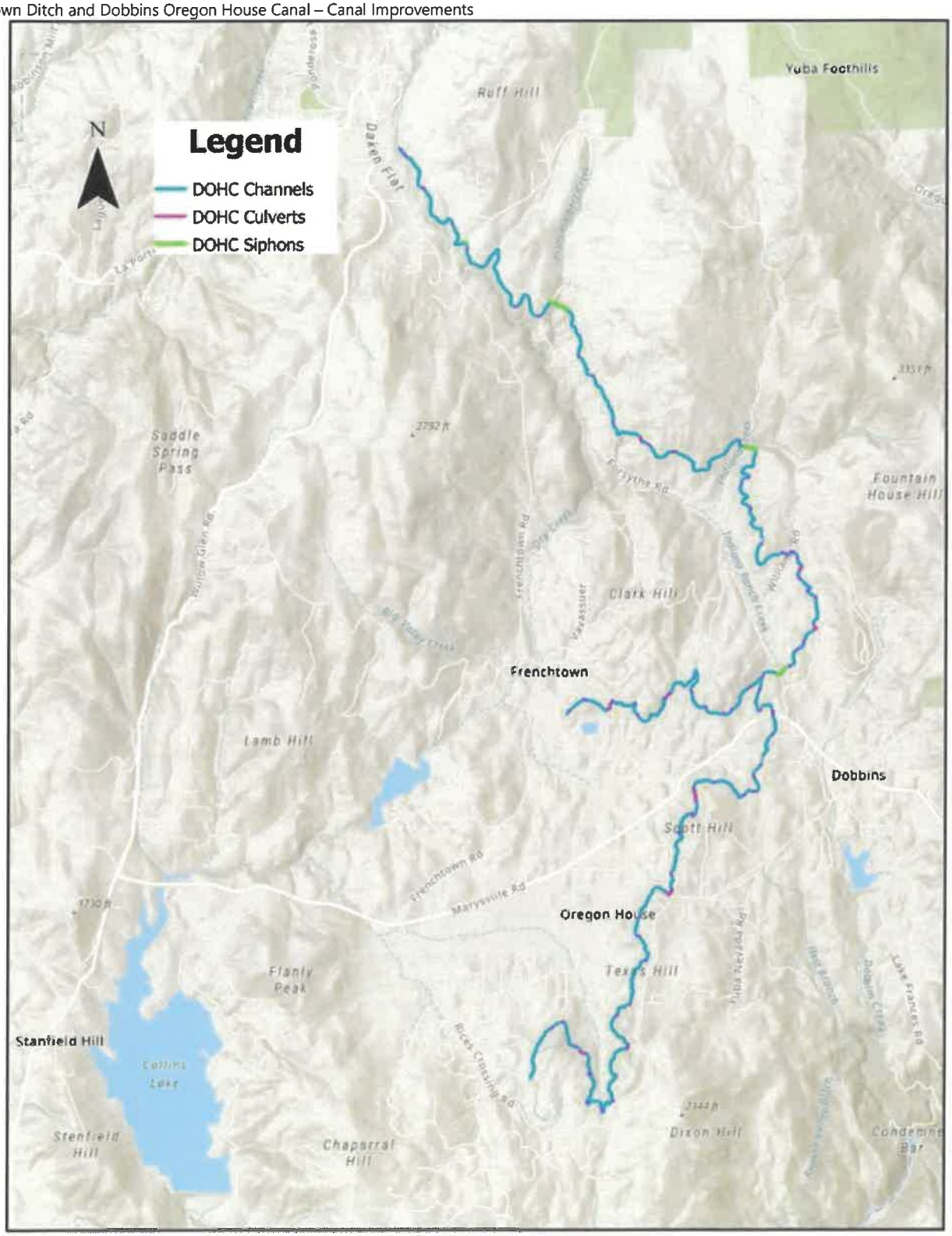


Figure 2: DOHC Features

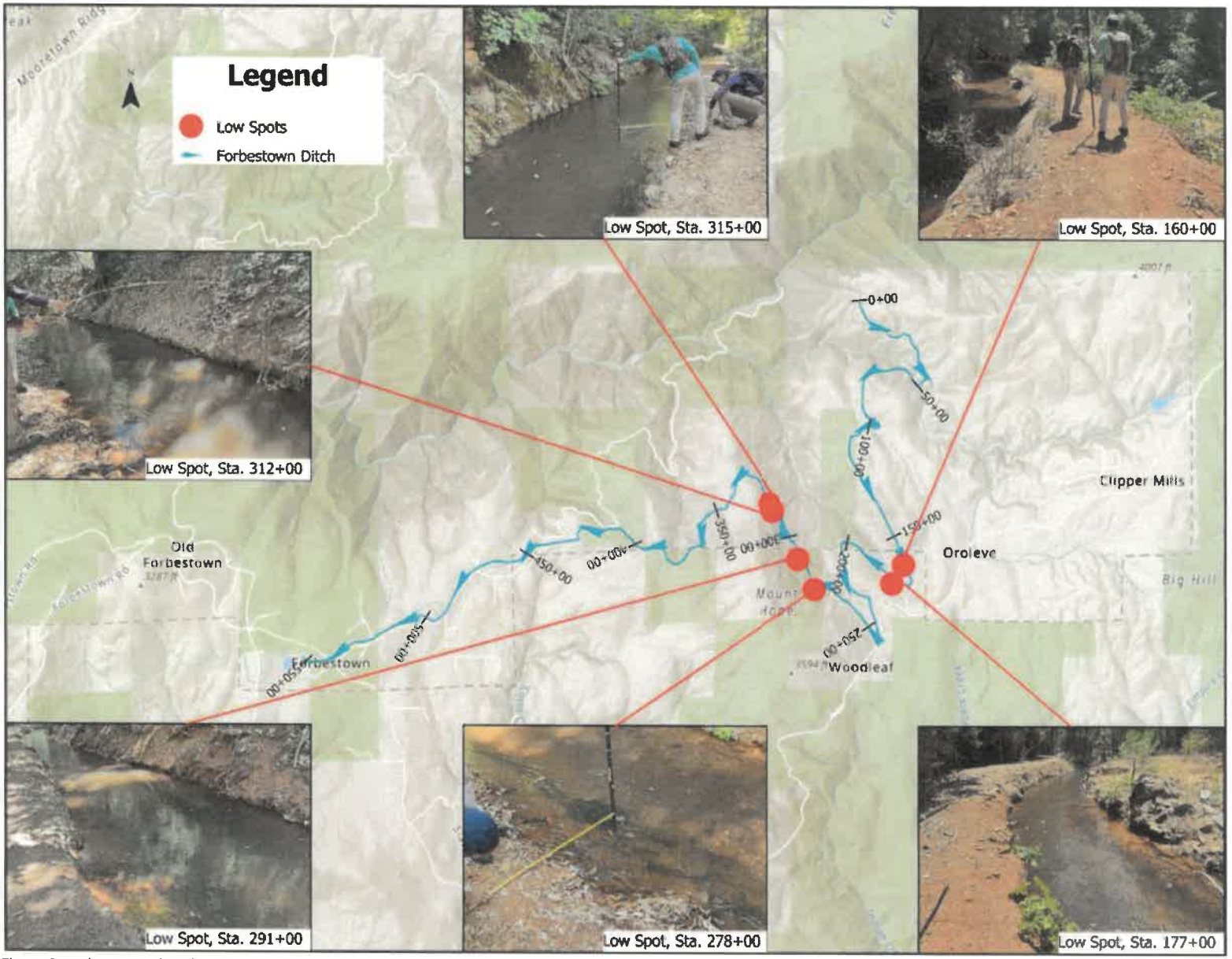


Figure 3: Forbestown Identified Areas of Concern

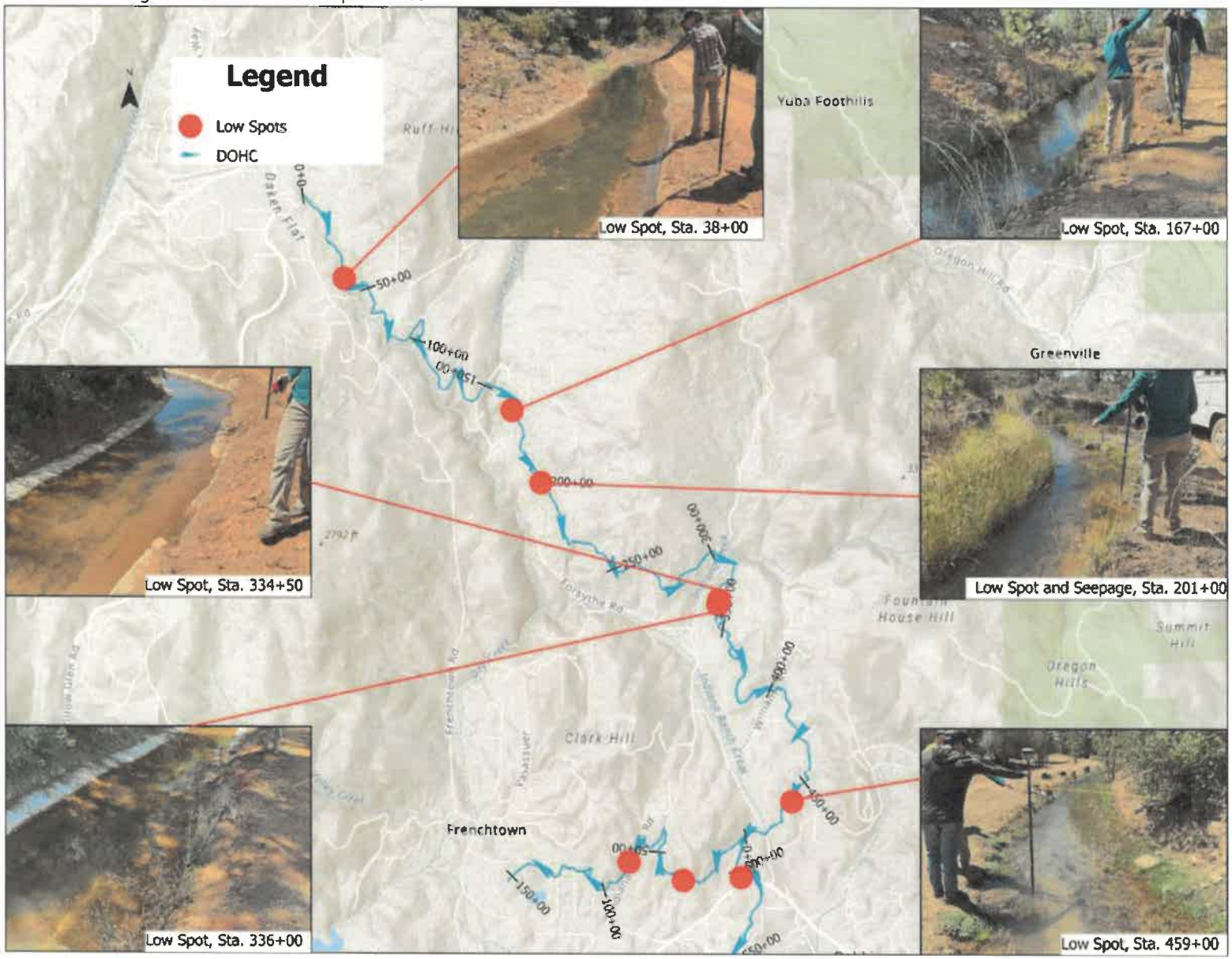


Figure 4: DOHC Canal 1 Sta. 0+00 to Sta 500+00 Identified Areas of Concern

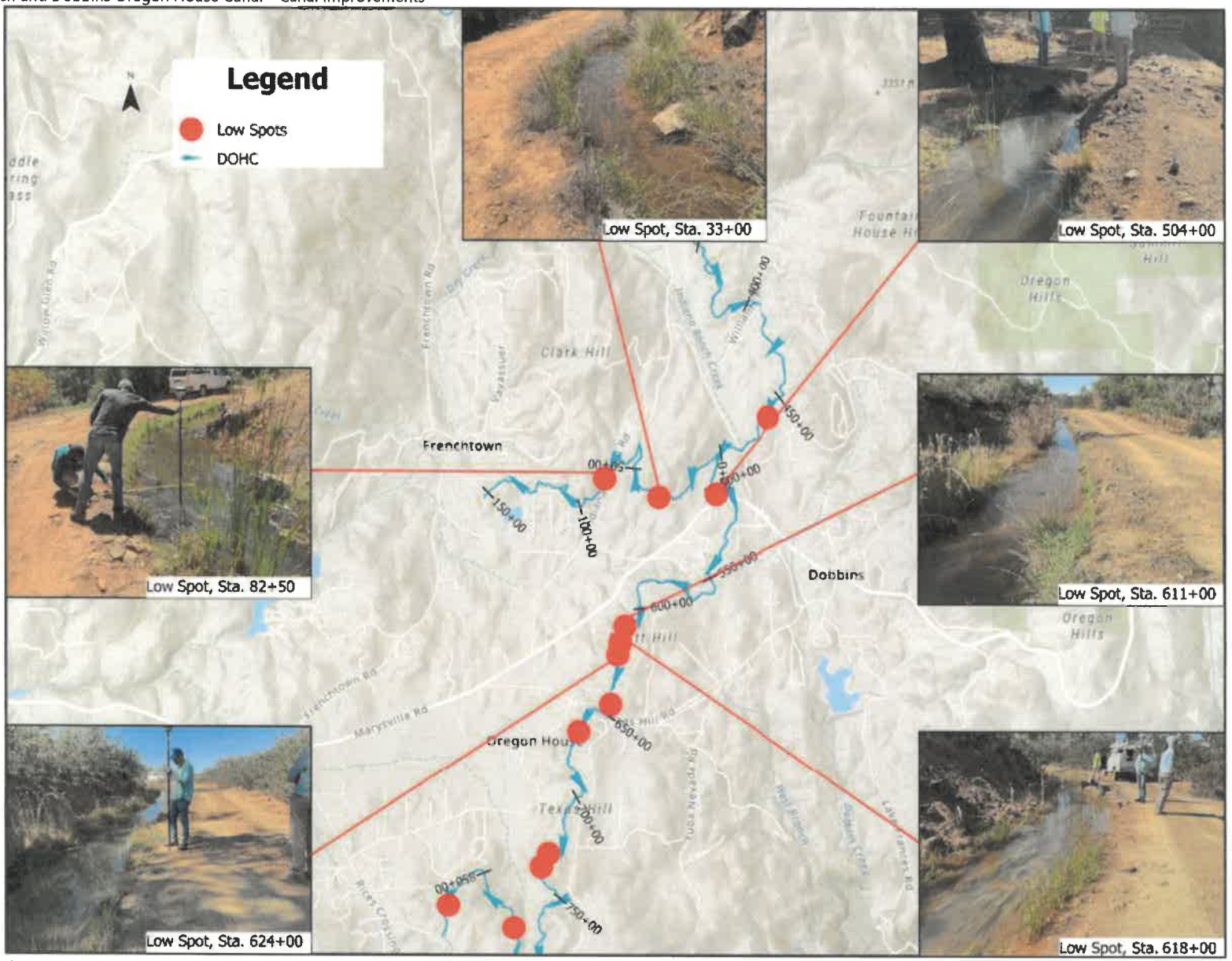


Figure 5: DOHC Canal 1 Sta. 500+00 to Sta. 625+00 and Canal 2 Identified Areas of Concern

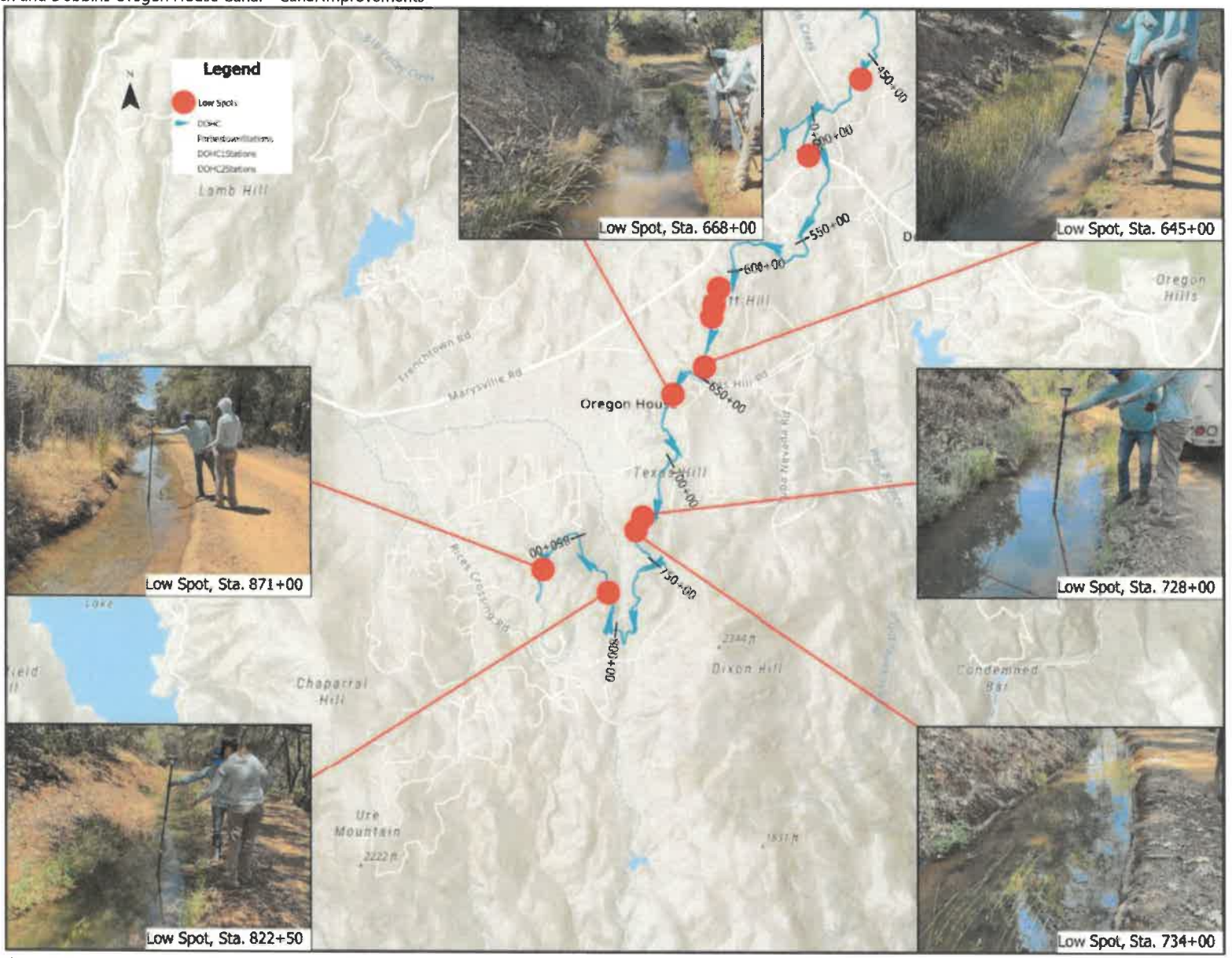


Figure 6: DOHC Canal 1 Sta 625+00 to End Identified Areas of Concern

ID	Required Upgrade	Length (ft)
1	Increase channel depth by 0.5-feet	382
2	Increase channel depth by 0.5-feet	1015
3	Upsize the box flume to 7' x 3.5' from 5' x 2.5'	157
4	Increase channel depth by 0.5-feet and width by 1-foot	355
5	Upsize the box flume to 7' x 3.5' from 5' x 2.5'	87
6	Increase channel depth by 0.5-feet	218
7	Upsize the box flume to 7' x 3.5' from 6' x 2.5'	102
8	Increase channel depth by 0.5-feet	150
9	Increase channel depth by 0.5-feet	854
10	Upsize the box flume to 6' x 3.5' from 6' x 2.5'	99
11	Widen the channel by 2-feet	57
12	Upsize 36" circular pipe to 5' x 3.5' box culvert	166
13	Increase channel depth by 2-feet	543
14	Increase channel depth by 2-feet	15
15	Increase channel depth by 2-feet	371
16	Increase channel depth by 2-feet	258
17	Increase channel depth by 1-foot	176
18	Increase channel depth by 1-foot	2240

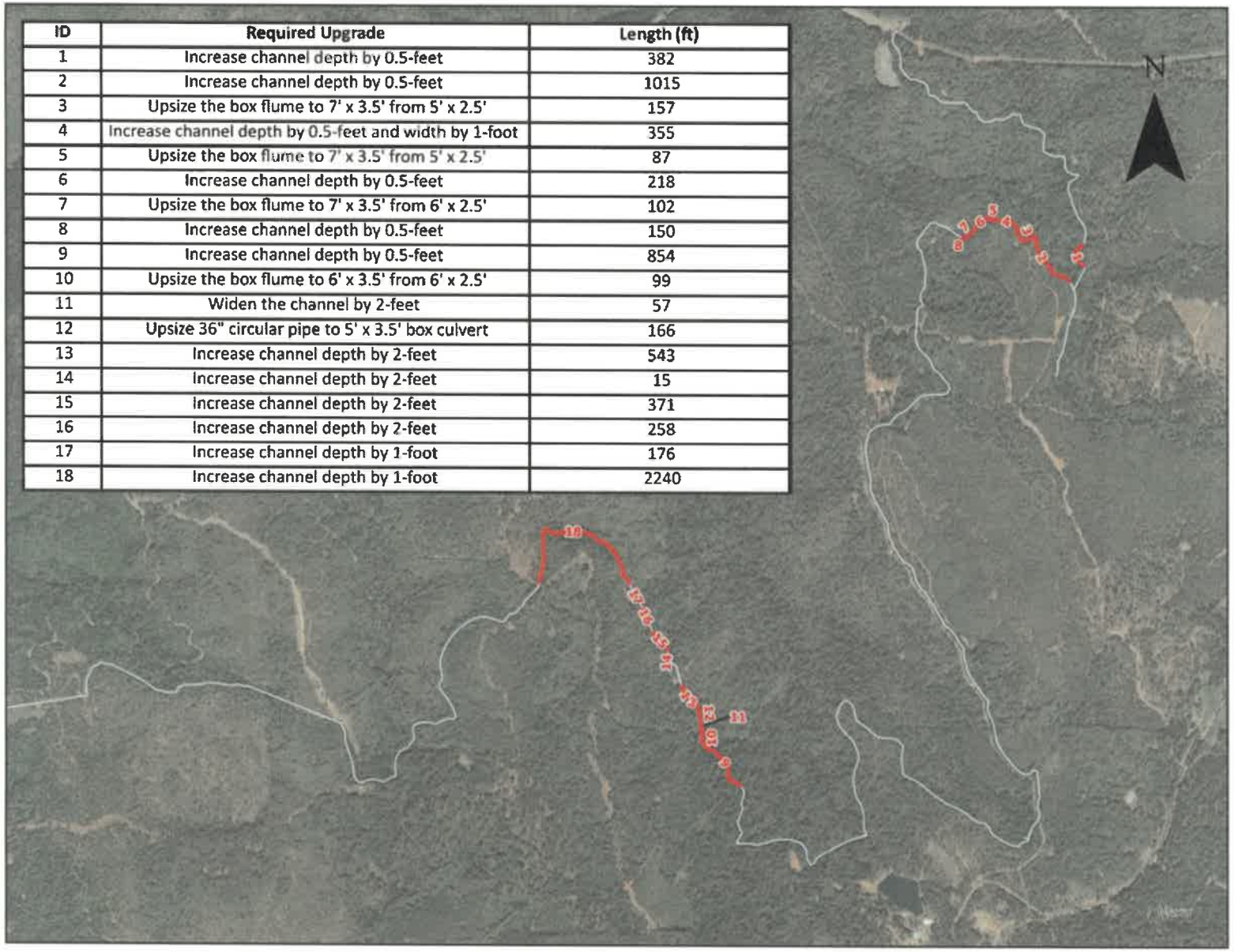
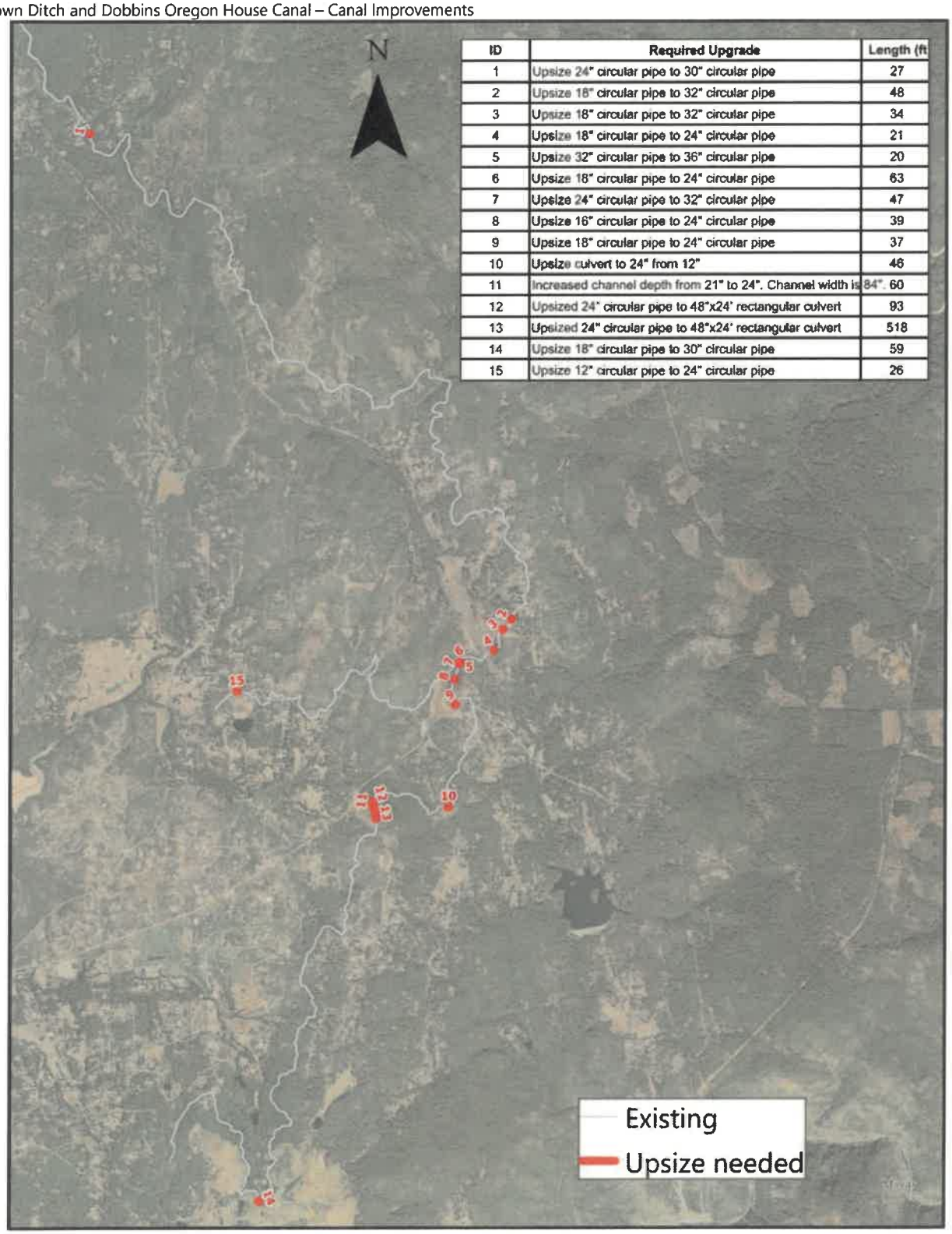


Figure 7: Forbestown Required Modifications for Alternative 3 – Shotcrete Lined Canal



ID	Required Upgrade	Length (ft
1	Upsize 24" circular pipe to 30" circular pipe	27
2	Upsize 18" circular pipe to 32" circular pipe	48
3	Upsize 18" circular pipe to 32" circular pipe	34
4	Upsize 18" circular pipe to 24" circular pipe	21
5	Upsize 32" circular pipe to 36" circular pipe	20
6	Upsize 18" circular pipe to 24" circular pipe	63
7	Upsize 24" circular pipe to 32" circular pipe	47
8	Upsize 16" circular pipe to 24" circular pipe	39
9	Upsize 18" circular pipe to 24" circular pipe	37
10	Upsize culvert to 24" from 12"	46
11	Increased channel depth from 21" to 24". Channel width is 84".	60
12	Upsized 24" circular pipe to 48"x24' rectangular culvert	93
13	Upsized 24" circular pipe to 48"x24' rectangular culvert	518
14	Upsize 18" circular pipe to 30" circular pipe	59
15	Upsize 12" circular pipe to 24" circular pipe	26

Figure 8: DOHC Required Modifications for Alternative 3 - Shotcrete Lined Canal

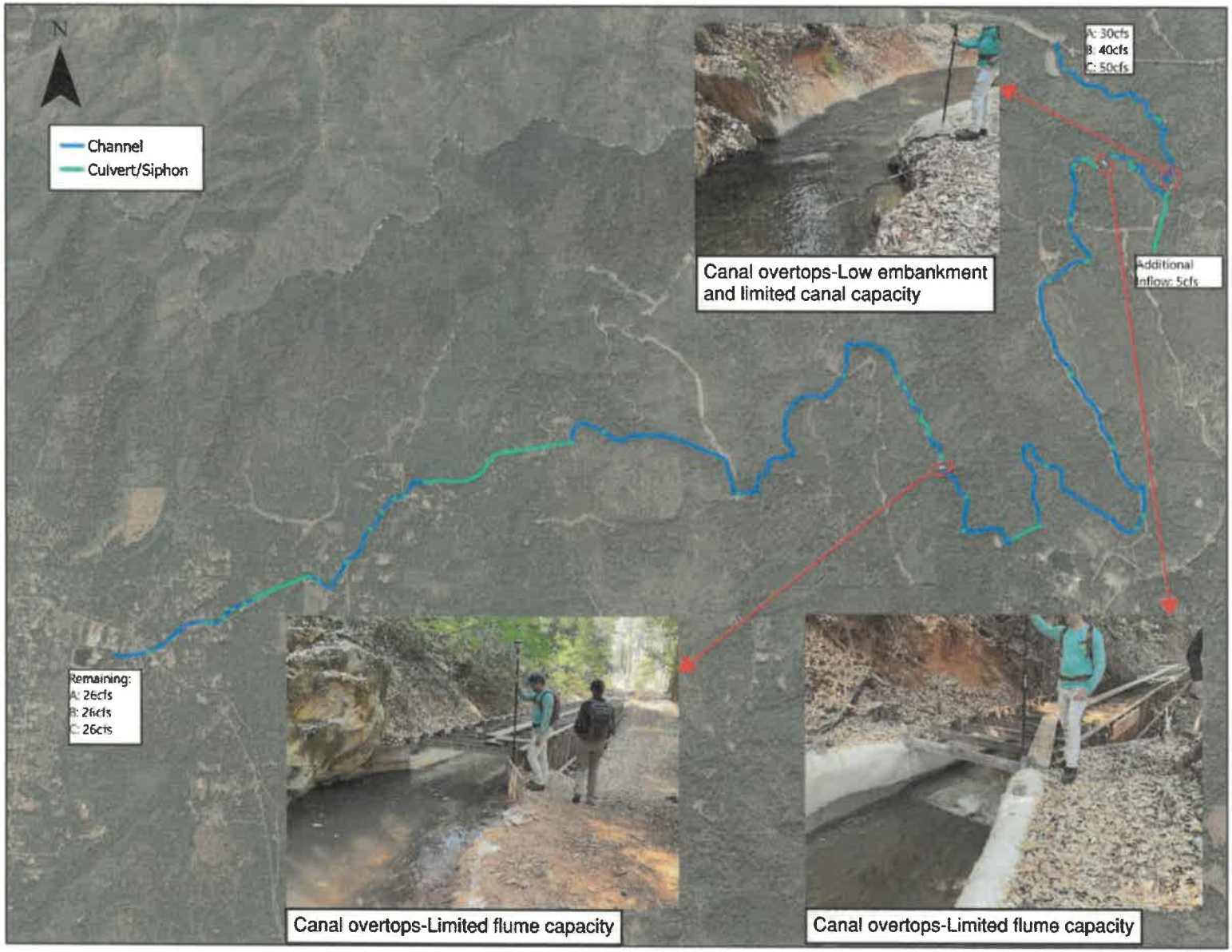


Figure 9: Forbestown Alternative 4 – Status Quo - Overtopping Locations

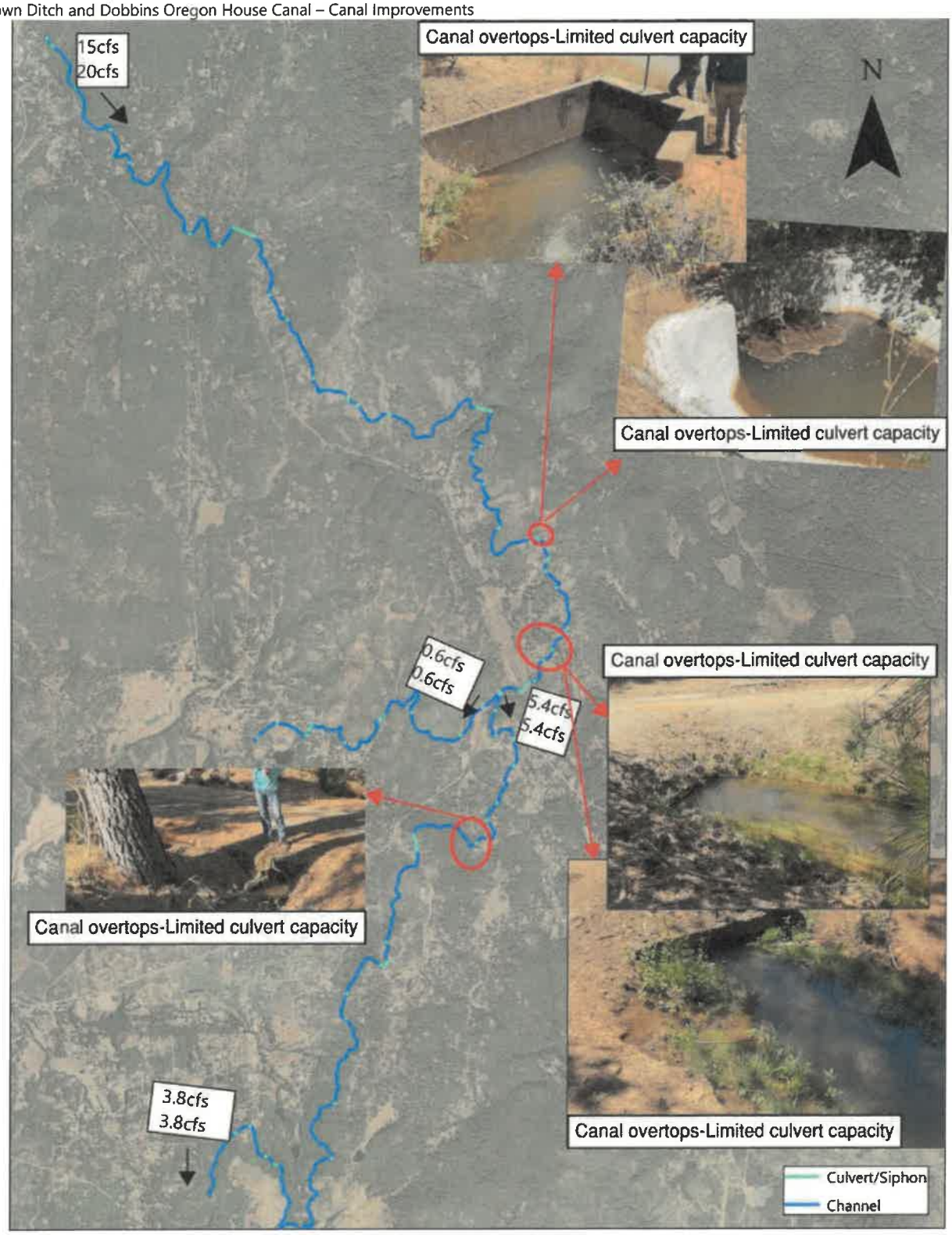


Figure 10: DOHC Alternative 4 – Status Quo - Overtopping Locations

APPENDIX B

ROM Opinion of Probable Construction Cost Estimates

GANNETT FLEMING

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

SUMMARY ESTIMATE

Alternative	Description	Cost
Alternative 1A - Pressurized Pipe (30 CFS)	Buried pressurized HDPE pipe system comprised of 32", 36", & 42" pipe sizes for 30-CFS flow capacity	$49,443,005
Alternative 1B - Pressurized Pipe (40 & 50 CFS)	Buried pressurized HDPE pipe system comprised of 42" pipe size for 40-CFS & 50-CFS flow capacities	$51,627,291
Alternative 2A - Unpressurized Pipe (30 CFS)	Buried unpressurized HDPE pipe system comprised of 42" pipe size for 30-CFS flow capacity	$34,625,617
Alternative 2B - Unpressurized Pipe (40 & 50 CFS)	Buried unpressurized HDPE pipe system comprised of 48" pipe size for 40-CFS & 50-CFS flow capacities	$38,507,613
Alternative 3 - Canal Gunite Liner (30, 40, & 50 CFS)	Open canal system comprised of fiber-reinforced shotcrete/gunite liner	$31,632,345

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

DETAILED ESTIMATE - ALTERNATIVE 1A - PRESSURIZED PIPE - 30 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	2,000	$41.00	$82,000	$82,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	7,200	$21.50	$154,800	$154,800
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	1,800	$253.00	$455,400	$455,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	2,100	$100.00	$210,000	$210,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	5,100	$5.16	$26,334	$26,334
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	90,000	$20.50	$1,845,000	$1,845,000
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	84,900	$7.85	$666,465	$666,465
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	5,100	$59.00	$300,900	$300,900
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	90,000	$3.57	$321,300	$321,300
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	81,500	$9.87	$804,405	$804,405

DETAILED ESTIMATE - ALTERNATIVE 1A - PRESSURIZED PIPE - 30 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
32" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "32 IPS DR11 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	1,400	$180.67	$252,938	$252,938
32" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter ***Unit cost multiplied by 1.067 to approximately account for size increase of a 30" to a 32" pipe***	LF	1,400	$14.23	$19,916	$19,916
36" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "36 IPS DR11 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	30,900	$231.70	$7,159,530	$7,159,530
36" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter ***Unit cost multiplied by 1.2 to approximately account for size increase of a 30" to a 36" pipe***	LF	30,900	$16.00	$494,519	$494,519
42" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "42 IPS DR13.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	13,600	$257.38	$3,500,368	$3,500,368
42" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0942: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 42" diameter	LF	13,600	$14.95	$203,269	$203,269
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$1,163,054	$1,163,054
Flume Work							
Repair, Removal, and/or Replacement of Existing Wooden Flumes for Elevated Pipe Crossings	*Not Applicable*	*Approximated average overall cost regarding the existing wooden flumes per linear foot based on Gannett Fleming's historical engineering consultant experience with full-scale wooden flume projects.*	LF	750	$3,712.00	$2,784,000	$2,784,000
						Construction Subtotal	*$20,444,198*
						Site Best Management Practices (BMPs) (3%)	$613,326
						Subtotal	$21,057,524
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,952,601
						Construction Subtotal	*$23,010,125*
						Bonds & Taxes (8.25%)	$1,898,335
						Contractor Overhead, Mobilization, and Demobilization (20%)	$4,602,025
						Engineering Construction/Post-Design Support (15%)	$3,451,519
						Subtotal	$32,962,004
						Contingency (50%)	$16,481,002
						Total Cost	**$49,443,005**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; diam. = diameter; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

DETAILED ESTIMATE - ALTERNATIVE 1B - PRESSURIZED PIPE - 40 & 50 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	2,000	$41.00	$82,000	$82,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	7,200	$21.50	$154,800	$154,800
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	1,800	$253.00	$455,400	$455,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	1,900	$100.00	$190,000	$190,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	5,100	$5.16	$26,334	$26,334
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	90,000	$20.50	$1,845,000	$1,845,000
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	84,900	$7.85	$666,465	$666,465
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	5,100	$59.00	$300,900	$300,900
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	90,000	$3.57	$321,300	$321,300
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	81,500	$9.87	$804,405	$804,405

DETAILED ESTIMATE - ALTERNATIVE 1B - PRESSURIZED PIPE - 40 & 50 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
42" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "42 IPS DR13.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	45,800	$257.32	$11,785,256	$11,785,256
42" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0942: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 42" diameter	LF	45,800	$14.95	$684,539	$684,539
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$1,246,979	$1,246,979
Flume Work							
Repair, Removal, and/or Replacement of Existing Wooden Flumes for Elevated Pipe Crossings	*Not Applicable*	*Approximated average overall cost regarding the existing wooden flumes per linear foot based on Gannett Fleming's historical engineering consultant experience with full-scale wooden flume projects.*	LF	750	$3,712.00	$2,784,000	$2,784,000
						Construction Subtotal	*$21,347,378*
						Site Best Management Practices (BMPs) (3%)	$640,421
						Subtotal	$21,987,800
						Inflation for Construction from 2025 to 2027 (9.3%)	$2,038,863
						Construction Subtotal	*$24,026,662*
						Bonds & Taxes (8.25%)	$1,982,200
						Contractor Overhead, Mobilization, and Demobilization (20%)	$4,805,332
						Engineering Construction/Post-Design Support (15%)	$3,603,999
						Subtotal	$34,418,194
						Contingency (50%)	$17,209,097
						Total Cost	**$51,627,291**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

GANNETT FLEMING

DETAILED ESTIMATE - ALTERNATIVE 2A - UNPRESSURIZED PIPE - 30 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	2,000	$41.00	$82,000	$82,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	7,200	$21.50	$154,800	$154,800
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	1,800	$253.00	$455,400	$455,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	1,900	$100.00	$190,000	$190,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	5,100	$5.16	$26,334	$26,334
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	90,000	$20.50	$1,845,000	$1,845,000
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	84,900	$7.85	$666,465	$666,465
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	5,100	$59.00	$300,900	$300,900
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	90,000	$3.57	$321,300	$321,300
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	81,500	$9.87	$804,405	$804,405

DETAILED ESTIMATE - ALTERNATIVE 2A - UNPRESSURIZED PIPE - 30 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
42" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "42 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	45,800	$117.78	$5,394,324	$5,394,324
42" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0942: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 42" diameter	LF	45,800	$14.95	$684,539	$684,539
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$607,886	$607,886
Flume Work							
Repair, Removal, and/or Replacement of Existing Wooden Flumes for Elevated Pipe Crossings	*Not Applicable*	*Approximated average overall cost regarding the existing wooden flumes per linear foot based on Gannett Fleming's historical engineering consultant experience with full-scale wooden flume projects.*	LF	750	$3,712.00	$2,784,000	$2,784,000
						Construction Subtotal	*$14,317,353*
						Site Best Management Practices (BMPs) (3%)	$429,521
						Subtotal	$14,746,874
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,367,433
						Construction Subtotal	*$16,114,307*
						Bonds & Taxes (8.25%)	$1,329,430
						Contractor Overhead, Mobilization, and Demobilization (20%)	$3,222,861
						Engineering Construction/Post-Design Support (15%)	$2,417,146
						Subtotal	$23,083,745
						Contingency (50%)	$11,541,872
						Total Cost	**$34,625,617**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

GANNETT FLEMING

DETAILED ESTIMATE - ALTERNATIVE 2B - UNPRESSURIZED PIPE - 40 & 50 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	620	$41.00	$25,420	$25,420
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	7,200	$21.50	$154,800	$154,800
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	1,300	$253.00	$328,900	$328,900
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	1,900	$100.00	$190,000	$190,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	5,100	$5.16	$26,334	$26,334
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	90,000	$20.50	$1,845,000	$1,845,000
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	84,900	$7.85	$666,465	$666,465
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	5,100	$59.00	$300,900	$300,900
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	90,000	$3.57	$321,300	$321,300
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	81,500	$9.87	$804,405	$804,405

DETAILED ESTIMATE - ALTERNATIVE 2B - UNPRESSURIZED PIPE - 40 & 50 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
48" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "48 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	45,800	$151.14	$6,922,212	$6,922,212
48" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0942: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 42" diameter ***Unit cost multiplied by 1.143 to approximately account for size increase of a 42" to a 48" pipe***	LF	45,800	$17.08	$782,330	$782,330
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$770,454	$770,454
Flume Work							
Repair, Removal, and/or Replacement of Existing Wooden Flumes for Elevated Pipe Crossings	*Not Applicable*	*Approximated average overall cost regarding the existing wooden flumes per linear foot based on Gannett Fleming's historical engineering consultant experience with full-scale wooden flume projects.*	LF	750	$3,712.00	$2,784,000	$2,784,000
						Construction Subtotal	*$15,922,520*
						Site Best Management Practices (BMPs) (3%)	$477,676
						Subtotal	$16,400,196
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,520,741
						Construction Subtotal	*$17,920,937*
Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading						Bonds & Taxes (8.25%)	$1,478,477
						Contractor Overhead, Mobilization, and Demobilization (20%)	$3,584,187
						Engineering Construction/Post-Design Support (15%)	$2,688,141
						Subtotal	$25,671,742
						Contingency (50%)	$12,835,871
						Total Cost	**$38,507,613**

NYWD Forbestown Ditch Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

DETAILED ESTIMATE - ALTERNATIVE 3 - CANAL SHOTCRETE LINER

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts (as needed)	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	170	$41.00	$6,970	$6,970
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	270	$253.00	$68,310	$68,310
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	140	$100.00	$14,000	$14,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	-	$5.16	$0	$0
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites***	LCY	1,600	$20.50	$32,800	$32,800
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth	LCY	1,600	$7.85	$12,560	$12,560
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes	BCY	1,600	$3.57	$5,712	$5,712

DETAILED ESTIMATE - ALTERNATIVE 3 - CANAL SHOTCRETE LINER

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Shotcrete/Gunite							
Shotcrete/Gunite (Material)	Dees-Hennessey 2024	Preliminary cost estimate per square foot of shotcrete/gunite liner with fiber reinforecment provided on 10/30/2024 by Jason Meyers of Dees-Hennessey	SF	527,400	$13.00	$6,856,200	$6,856,200
Shotcrete/Gunite (Labor)	RS Means 2024	Section 03 37 13 60 1040: Shotcrete (Wet-Mix) for fiber reinforced, 4" thick	SF	527,400	$7.03	$3,706,872	$3,706,872
Installation - Culverts							
New Precast Concrete Box Culverts	RS Means 2024	Section 33 42 11 60 0020 & 0100: Sewage/Drainage Collection, Concrete Pipe for box culvert, precast, base price, 8' long, 6' x 3' (not including excavation or backfill)	LF	176	$425.00	$74,800	$74,800
Flume Work							
Repair, Removal, and/or Replacement of Existing Wooden Flumes	*Not Applicable*	*Approximated average overall cost regarding the existing wooden flumes per linear foot based on Gannett Fleming's historical engineering consultant experience with full-scale wooden flume projects.*	LF	620	$3,712.00	$2,301,440	$2,301,440
						Construction Subtotal	*$13,079,664*
						Site Best Management Practices (BMPs) (3%)	$392,390
						Subtotal	$13,472,054
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,249,223
						Construction Subtotal	*$14,721,277*
Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading						Bonds & Taxes (8.25%)	$1,214,505
						Contractor Overhead, Mobilization, and Demobilization (20%)	$2,944,255
						Engineering Construction/Post-Design Support (15%)	$2,208,192
						Subtotal	$21,088,230
						Contingency (50%)	$10,544,115
						Total Cost	**$31,632,345**

NYWD DOHC Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

SUMMARY ESTIMATE

Alternative	Description	Cost
Alternative 1 - Pressurized Pipe (15 & 20 CFS)	Buried pressurized HDPE pipe system comprised of 12", 18", 24", 26", 28", 30", & 36" pipe sizes for 15-CFS & 20-CFS flow capacities	$75,825,355
Alternative 2A - Unpressurized Pipe (15 CFS)	Buried unpressurized HDPE pipe system comprised of 12", 18", & 30" pipe sizes for 15-CFS flow capacity	$47,520,635
Alternative 2B - Unpressurized Pipe (20 CFS)	Buried unpressurized HDPE pipe system comprised of 12", 24", & 36" pipe size for 20-CFS flow capacity	$51,805,674
Alternative 3 - Canal Gunite Liner (15 & 20 CFS)	Open canal system comprised of fiber-reinforced shotcrete/gunite liner	$45,553,082

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December 10, 2024
Reviewed by: J. Allen (GF)

GANNETT FLEMING

DETAILED ESTIMATE - ALTERNATIVE 1 - PRESSURIZED PIPE - 15 & 20 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	5,000	$41.00	$205,000	$205,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	27,900	$21.50	$599,850	$599,850
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	4,800	$253.00	$1,214,400	$1,214,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	7,100	$100.00	$710,000	$710,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	11,400	$5.16	$58,864	$58,864
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	200,800	$20.50	$4,116,400	$4,116,400
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	189,400	$7.85	$1,486,790	$1,486,790
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	11,400	$59.00	$672,600	$672,600
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	200,800	$3.57	$716,856	$716,856
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	182,000	$9.87	$1,796,340	$1,796,340

DETAILED ESTIMATE - ALTERNATIVE 1 - PRESSURIZED PIPE - 15 & 20 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
12" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "12 IPS DR13.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	10,600	$26.26	$278,356	$278,356
12" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0500: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 12" diameter	LF	10,600	$18.59	$197,054	$197,054
18" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "18 IPS DR11 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	5,700	$60.19	$343,083	$343,083
18" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0800: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 18" diameter	LF	5,700	$39.44	$224,794	$224,794
24" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "24 IPS DR13.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	1,900	$86.73	$164,787	$164,787
24" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0900: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 24" diameter	LF	1,900	$54.64	$103,816	$103,816
26" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "26 IPS DR17 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	6,500	$83.50	$542,750	$542,750
26" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0900: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 24" diameter ***Unit cost multiplied by 1.083 to approximately account for size increase of a 24" to a 26" pipe***	LF	6,500	$59.19	$384,755	$384,755

DETAILED ESTIMATE - ALTERNATIVE 1 - PRESSURIZED PIPE - 15 & 20 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
28" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "28 IPS DR11 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	75,000	$140.16	$10,512,000	$10,512,000
28" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0900: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 24" diameter ***Unit cost multiplied by 1.167 to approximately account for size increase of a 24" to a 28" pipe***	LF	75,000	$63.75	$4,780,984	$4,780,984
30" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "30 IPS DR11 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	2,500	$158.76	$396,900	$396,900
30" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter	LF	2,500	$13.34	$33,341	$33,341
36" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "36 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	120	$113.23	$13,588	$13,588
36" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter ***Unit cost multiplied by 1.2 to approximately account for size increase of a 30" to a 36" pipe***	LF	120	$16.00	$1,920	$1,920
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$1,797,813	$1,797,813
						Construction Subtotal	*$31,353,040*
						Site Best Management Practices (BMPs) (3%)	$940,591
						Subtotal	$32,293,632
						Inflation for Construction from 2025 to 2027 (9.3%)	$2,994,492
						Construction Subtotal	*$35,288,123*
						Bonds & Taxes (8.25%)	$2,911,270
						Contractor Overhead, Mobilization, and Demobilization (20%)	$7,057,625
						Engineering Construction/Post-Design Support (15%)	$5,293,218
						Subtotal	$50,550,236
						Contingency (50%)	$25,275,118
						Total Cost	**$75,825,355**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD DOHC Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

DETAILED ESTIMATE - ALTERNATIVE 2A - UNPRESSURIZED PIPE - 15 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	5,000	$41.00	$205,000	$205,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	27,900	$21.50	$599,850	$599,850
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	4,800	$253.00	$1,214,400	$1,214,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	7,100	$100.00	$710,000	$710,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	11,400	$5.16	$58,864	$58,864
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	200,800	$20.50	$4,116,400	$4,116,400
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	189,400	$7.85	$1,486,790	$1,486,790
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	11,400	$59.00	$672,600	$672,600
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	200,800	$3.57	$716,856	$716,856
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	182,000	$9.87	$1,796,340	$1,796,340

DETAILED ESTIMATE - ALTERNATIVE 2A - UNPRESSURIZED PIPE - 15 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
12" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "12 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	120	$47.78	$5,734	$5,734
12" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0500: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 12" diameter	LF	120	$18.59	$2,231	$2,231
18" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "18 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	15,200	$22.78	$346,256	$346,256
18" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0800: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 18" diameter	LF	15,200	$39.44	$599,451	$599,451
30" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "30 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	86,800	$60.22	$5,227,096	$5,227,096
30" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter	LF	86,800	$13.34	$1,157,612	$1,157,612
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$733,838	$733,838
						Construction Subtotal	*$19,649,317*
						Site Best Management Practices (BMPs) (3%)	$589,479
						Subtotal	$20,238,796
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,876,683
						Construction Subtotal	*$22,115,479*
						Bonds & Taxes (8.25%)	$1,824,527
						Contractor Overhead, Mobilization, and Demobilization (20%)	$4,423,096
						Engineering Construction/Post-Design Support (15%)	$3,317,322
						Subtotal	$31,680,424
						Contingency (50%)	$15,840,212
						Total Cost	**$47,520,635**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD DOHC Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

GANNETT FLEMING

DETAILED ESTIMATE - ALTERNATIVE 2B - UNPRESSURIZED PIPE - 20 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	5,000	$41.00	$205,000	$205,000
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	27,900	$21.50	$599,850	$599,850
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	4,800	$253.00	$1,214,400	$1,214,400
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	7,100	$100.00	$710,000	$710,000
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	11,400	$5.16	$58,864	$58,864
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites; quantity includes bedding materials for pipe installation***	LCY	200,800	$20.50	$4,116,400	$4,116,400
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth ***Includes pipe backfill and cover***	LCY	189,400	$7.85	$1,486,790	$1,486,790
Pipe Bedding	RS Means 2024	Section 31 23 23 16 0100: Fill by Borrow and Utility Bedding for utility bedding, for pipe & conduit, not incl. compaction for crushed stone 3/4" to 1/2"	LCY / BCY	11,400	$59.00	$672,600	$672,600
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes ***Includes pipe bedding compaction***	BCY	200,800	$3.57	$716,856	$716,856
Grading	RS Means 2024	Section 31 22 16 10 0012 & 3310: Finish Grading for finish grading area to be paved with grader, small area; finish grading slopes, steep slopes	SY	182,000	$9.87	$1,796,340	$1,796,340

DETAILED ESTIMATE - ALTERNATIVE 2B - UNPRESSURIZED PIPE - 20 CFS

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Pipe							
12" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a "12 IPS DR32.5 HDPE Pipe" provided on 11/19/2024 by Reggie Leipsic of Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	80	$47.78	$3,822	$3,822
12" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0500: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 12" diameter	LF	80	$18.59	$1,487	$1,487
24" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a 24" HDPE pipe based on general values interpreted from Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	16,900	$40.00	$676,000	$676,000
24" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0900: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 24" diameter	LF	16,900	$54.64	$923,416	$923,416
36" O.D. HDPE Pipe (Material)	Core & Main 2024	Preliminary scope/cost estimate for a cost per linear foot of a 36" HDPE pipe based on general values interpreted from Core & Main ***Only includes cost of actual pipe per linear foot, including unit costs, shipping, and fusion. Does not include any pipe fittings, attachments, or other features, and is assumed to not include installation labor***	LF	85,400	$70.00	$5,978,000	$5,978,000
36" O.D. HDPE Pipe (Labor)	RS Means 2024	Section 33 14 13 35 0930: Water Supply, HDPE for butt fusion joints, SDR 21, 40' lengths not including excavation or backfill for 30" diameter ***Unit cost multiplied by 1.2 to approximately account for size increase of a 30" to a 36" pipe***	LF	85,400	$16.00	$1,366,400	$1,366,400
Pipe Fittings/Attachments/Features	*Not Applicable*	*Assumed percentage of total pipe costs for all pipe fittings, attachments, and other features to be included as a preliminary comparative estimate*	%	10	0.10	$894,913	$894,913
						Construction Subtotal	*$21,421,138*
						Site Best Management Practices (BMPs) (3%)	$642,634
						Subtotal	$22,063,772
						Inflation for Construction from 2025 to 2027 (9.3%)	$2,045,907
						Construction Subtotal	*$24,109,680*
						Bonds & Taxes (8.25%)	$1,989,049
						Contractor Overhead, Mobilization, and Demobilization (20%)	$4,821,936
						Engineering Construction/Post-Design Support (15%)	$3,616,452
						Subtotal	$34,537,116
						Contingency (50%)	$17,268,558
						Total Cost	**$51,805,674**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

NYWD DOHC Analysis of Alternatives (AoA)
Rough Order of Magnitude (ROM) - DRAFT Cost Estimate

GF Project No. 075666
Prepared by: R. Conrad & J. Prettyman (GF)
December 10, 2024
Reviewed by: J. Allen (GF)

DETAILED ESTIMATE - ALTERNATIVE 3 - CANAL SHOTCRETE LINER

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Demolition and Removal							
Existing Culverts (as needed)	RS Means 2024	Section 02 41 13 40 0015 & 0180: Selective Demolition, Metal Drainage Piping for CMP pipe, steel, 30"-36" diam. (excludes excavation)	LF	1,100	$41.00	$45,100	$45,100
Existing Concrete Canal Liner (as needed)	RS Means 2024	Section 02 41 13 30 4100: Minor Site Demolition for concrete, plain, 4" ***Assumed demolition of existing canal liner is to be minor and as needed***	SY	-	$21.50	$0	$0
Loading And Hauling Fees	RS Means 2024	Section 02 41 19 19 3080 & 5000: Selective Demolition, Rubbish Handling for loading & trucking, machine loading truck with haul, per mile, up to 8 C.Y. truck ***Approximating up to a 100-mile cycle between project sites and city of Chico***	CY	370	$253.00	$93,610	$93,610
Dump Charges	RS Means 2024	Section 02 41 19 20 0100: Selective Demolition, Dump Charges for dump charges, typical urban city, tipping fees only for building construction materials	TON	185	$100.00	$18,500	$18,500
Installation - Earthwork							
Excavation	RS Means 2024	Section 31 23 16 42 0011, 0020, & 0200: Excavating, Bulk Bank Measure for common earth piled, excavator, hydraulic, crawler mtd., 1 C.Y. cap. = 100 C.Y./hr., including loading onto trucks	BCY	-	$5.16	$0	$0
Spoils Hauling and/or Fill Hauling	RS Means 2024	Section 31 23 23 20 0224: Excavated or borrow, loose cubic yards, no loading equipment, including hauling, waiting, loading/dumping time per cycle (wait, load, travel, unload or dump & return) for hauling for 8 C.Y. truck, 15 MPH avg., cycle 8 miles, 20 min. wait/ld./uld. ***Assumed location for spoils and fill materials are within 4 miles of the project sites***	LCY	100	$20.50	$2,050	$2,050
Soil Backfill (Fill)	RS Means 2024	Section 31 23 23 14 2420: Backfill, Structural for 80 HP wheeled dozer or F.E. loader, 300' haul, common earth	LCY	100	$7.85	$785	$785
Soil Backfill (Compaction)	RS Means 2024	Section 31 23 23 23 6220: Compaction for vibrating roller, 6" lifts, 4 passes	BCY	100	$3.57	$357	$357

DETAILED ESTIMATE - ALTERNATIVE 3 - CANAL SHOTCRETE LINER

Description *(includes labor and material, unless otherwise stated)*	Reference	Notes	Unit	Quantity	Unit Cost	Cost	Adjusted Cost (e.g., CCI)
Installation - Retaining Walls							
Berm-Side Retaining Walls - Timber (as needed)	RS Means 2024	Section 32 32 29 10 0100: Landscape Timber Retaining Walls for treated timbers, 6" x 6"	LF	-	$7.15	$0	$0
Berm-Side Retaining Walls - Fabric (as needed)	RS Means 2024	Section 32 32 29 10 0160: Landscape Timber Retaining Walls for reinforcing fabric	SY	-	$3.25	$0	$0
Berm-Side Retaining Walls - Gravel Backfill (as needed)	RS Means 2024	Section 32 32 29 10 0170: Landscape Timber Retaining Walls for gravel backfill	CY	-	$67.50	$0	$0
Installation - Shotcrete/Gunite							
Shotcrete/Gunite (Material)	Dees-Hennessey 2024	Preliminary cost estimate per square foot of shotcrete/gunite liner provided on 10/30/2024 by Jason Meyers of Dees-Hennessey	SF	916,800	$13.00	$11,918,400	$11,918,400
Shotcrete/Gunite (Labor)	RS Means 2024	Section 03 37 13 60 1040: Shotcrete (Wet-Mix) for fiber reinforced, 4" thick	SF	916,800	$7.03	$6,443,801	$6,443,801
Installation - Culverts							
New Precast Concrete Box Culverts	RS Means 2024	Section 33 42 11 60 0020 & 0100: Sewage/Drainage Collection, Concrete Pipe for box culvert, precast, base price, 8' long, 6' x 3' (not including excavation or backfill)	LF	650	$425.00	$276,250	$276,250
New HDPE Culverts	RS Means 2024	Section 33 42 11 50 0020 & 1090: Piping, Drainage & Sewage, Corrugated HDPE Type S with gaskets, 36" diameter (not including excavation & backfill, bell & spigot)	LF	450	$82.00	$36,900	$36,900
						Construction Subtotal	*$18,835,753*
						Site Best Management Practices (BMPs) (3%)	$565,073
						Subtotal	$19,400,825
						Inflation for Construction from 2025 to 2027 (9.3%)	$1,798,980
						Construction Subtotal	*$21,199,805*
						Bonds & Taxes (8.25%)	$1,748,984
						Contractor Overhead, Mobilization, and Demobilization (20%)	$4,239,961
						Engineering Construction/Post-Design Support (15%)	$3,179,971
						Subtotal	$30,368,721
						Contingency (50%)	$15,184,361
						Total Cost	**$45,553,082**

Unit Key: BCY = bank cubic yard; cap. = capacity; CF = cubic foot; CY = cubic yard; DR = dimension ratio; EA = each; FE = front end; HP = horsepower; incl. = include; LB = pound; LCY = loose cubic yard; ld. = loading; LF = linear foot; MPH = miles per hour; mtd. = mounted; OD = outer diameter; SDR = standard dimension ratio; SF = square foot; SFCA = square foot contact area; SY = square yard; uld. = unloading

DRAFT

Bid Proposal for Budget Quote - N. Yuba Water Dist. NYWD

CUSTOMER

North Yuba Water District
8691 La Porte Rd.
Brownsville, CA 95919

Job
Budget Quote - N. Yuba Water Dist. NYWD
Brownsville, CA
Yuba County
Bid Date: 11/02/2024
Bid #: 3847036

CONTACT

Sales Representative
Reginald Leipsic
(M) 408-748-6082
(T) 408-885-1467
Reggie.Leipsic@coreandmain.com

Core & Main
1160 N. 13th Street
San Jose, CA 95112
(T) 4088851467

NOTES

**** Quote is for Budgetary Purposes ****

DRAFT

Bid Proposal for Budget Quote - N. Yuba Water Dist. NYWD

North Yuba Water District
Job Location: Brownsville, CA
Bid Date: 11/02/2024
Core & Main Bid #: 3847036

Core & Main
1160 N. 13th Street
San Jose, CA 95112
Phone: 4088851467
Fax: 4088851495

Seq#	Qty	Description	Units	Price	Ext Price
20		**THIS QUOTE IS FOR BUDGETARY PURPOSES**			
50		**PRICING AND MATERIALS SUBJECT**			
60		**TO CHANGE DUE TO SUPPLY CHAIN AVAILABILITY**			
70		**AND MARKET CONDITIONS.**			
90		**PIPE IS ALL IN 40FT LENGTHS**			
100		**TO MAXIMIZE EASABILITY OF**			
110		**SHIPPING AND FUSING MATERIALS**			
120		**IN THE PROJECTS TERRAIN**			
150		**FORBSTOWN**			
170		**PRESSURIZED OPTION 1**			
180	1400	32 IPS DR11 HDPE PIPE BLK	FT	180.67	252,938.00
190	30900	36 IPS DR11 HDPE PIPE BLK	FT	231.70	7,159,530.00
200	13600	42 IPS DR13.5 HDPE PIPE BLK	FT	257.38	3,500,368.00
220		**PRESSURIZED OPTION 2 & 3**			
230	45800	42 IPS DR13.5 HDPE PIPE BLK	EA	257.32	11,785,256.00
250		**UNPRESSURIZED OPTION 1**			
260	45800	42 IPS DR32.5 HDPE PIPE BLK	FT	117.78	5,394,324.00
280		**UNPRESSURIZED OPTION 2 & 3**			
290	45800	48 IPS 32.5 HDPE PIPE BLK	FT	151.14	6,922,212.00
320		**DOHC**			
340		**PRESSURIZED OPTION 1**			
350	10600	12" DR13.5 IPS HDPE PIPE	FT	26.26	278,356.00
360	5700	18" DR11 IPS HDPE PIPE	FT	60.19	343,083.00
370	1900	24 IPS DR13.5 HDPE PIPE BLACK	FT	86.73	164,787.00
380	6500	26 IPS DR17 HDPE BLACK	FT	83.50	542,750.00
390	75000	28 IPS DR11 HDPE PIPE BLACK	FT	140.16	10,512,000.00
400	2500	30" DR11 IPS HDPE PIPE	FT	158.76	396,900.00
410	120	36" DR32.5 IPS HDPE PIPE	FT	113.23	13,587.60
430		**UNPRESSURIZED OPTION 1**			
440	120	12" DR32.5 IPS HDPE PIPE	FT	47.78	5,733.60

Thankyou for the opportunity!
Actual taxes may vary

Bid Proposal for Budget Quote - N. Yuba Water Dist. NYWD

Bid #: 3847036

Seq#	Qty	Description	Units	Price	Ext Price
450	15200	18" DR32.5 IPS HDPE PIPE	FT	22.78	346,256.00
460	86800	30" DR32.5 IPS HDPE PIPE	FT	60.22	5,227,096.00
490		**********			
500	1	12" SDR17 IPS PE FLG ADAPTER	EA	89.46	89.46
510	1	18" SDR17 IPS PE FLG ADAPTER	EA	260.00	260.00
520	1	24" SDR17 IPS PE FLG ADAPTER	EA	463.29	463.29
530	1	26 IPS DR17 HDPE FLG ADPT	EA	1,100.25	1,100.25
540	1	28 IPS DR17 HDPE FLG ADPT	EA	1,398.60	1,398.60
550	1	30 DR17 IPS FLG ADPT BUTT	EA	1,003.45	1,003.45
560	1	32 IPS DR17 HDPE FLG ADPT	EA	1,223.32	1,223.32
570	1	36 IPS DR17 HDPE FLG ADPT	EA	1,290.83	1,290.83
580	1	42 SDR 11 MOLDED FLG ADAPTER	EA	2,482.06	2,482.06
590	1	48" SDR17 IPS FLANGE ADAPTER	EA	3,282.06	3,282.06
600		**********			
610	1	12" SDR11 DI IPS BACKING RING	EA	60.08	60.08
620	1	18" SDR11 DI IPS BACKING RING	EA	137.05	137.05
630	1	24" SDR11 DI IPS BACKING RING	EA	230.26	230.26
640	1	26" SDR11 DI IPS BACKING RING	EA	681.79	681.79
650	1	28" SDR11 DI IPS BACKING RING	EA	831.59	831.59
660	1	30" IPS DI BACK UP RING	EA	854.30	854.30
670	1	32" SDR11 DI IPS BACKING RING	EA	1,180.08	1,180.08
680	1	36" SDR11 DI IPS BACKING RING	EA	1,187.66	1,187.66
690	1	42" SDR11 DI IPS BACKING RING	EA	3,899.08	3,899.08
700	1	48" SDR11 DI IPS BACKING RING	EA	50,196.68	50,196.68
710		**********			
720	1	12X1/8 FLG FF NEOPRENE GASKET	EA	12.38	12.38
730	1	18X1/8 FLG FF NEOPRENE GASKET	EA	20.54	20.54
740	1	24X1/8 FLG FF NEOPRENE GASKET	EA	35.08	35.08
750	1	26X1/8 FLG FF NEOPRENE GASKET	EA	55.08	55.08
760	1	28X1/8 FLG FF NEOPRENE GASKET	EA	66.10	66.10
770	1	30X1/8 FLG FF NEOPRENE GASKET	EA	50.08	50.08
780	1	32X1/8 FLG FF NEOPRENE GASKET	EA	62.60	62.60
790	1	36X1/8 FLG FF NEOPRENE GASKET	EA	69.48	69.48
800	1	42X1/8 FLG FF NEOPRENE GASKET	EA	134.18	134.18
810	1	48X1/8 FLG FF NEOPRENE GASKET	EA	211.44	211.44
820		**********			
830	1	10-12 HDPE STUD KIT 316SS	EA	129.75	129.75
840	1	18 HDPE STUD KIT 316SS	EA	268.34	268.34
850	1	24 HDPE STUD KIT 316SS	EA	453.34	453.34
860	1	26 HDPE STUD KIT 316SS	EA	483.34	483.34
870	1	28 HDPE STUD KIT 316SS	EA	600.00	600.00
880	1	30 HDPE STUD KIT 316SS	EA	721.67	721.67
890	1	32 HDPE STUD KIT 316SS	EA	833.34	833.34
900	1	36 HDPE STUD KIT 316SS	EA	1,151.67	1,151.67
910	1	42 HDPE STUD KIT 316SS	EA	2,063.34	2,063.34
920	1	48 HDPE STUD KIT 316SS	EA	2,523.34	2,523.34
940		**********			

Bid Proposal for Budget Quote - N. Yuba Water Dist. NYWD

Bid #: 3847036

Seq#	Qty	Description	Units	Price	Ext Price
950	1	12" SDR17 HDPE MOLDED 45	EA	337.70	337.70
960	1	18" SDR17 HDPE 45 DEG ELBOW	EA	406.28	406.28
970	1	24" SDR17 HDPE 45 DEG ELBOW	EA	1,125.29	1,125.29
980	1	26" SDR17 HDPE 45 DEG ELBOW	EA	1,655.92	1,655.92
990	1	28" SDR17 HDPE 45 DEG ELBOW	EA	2,116.05	2,116.05
1000	1	30" SDR17 HDPE 45 DEG ELBOW	EA	2,268.83	2,268.83
1010	1	32" SDR17 HDPE 45 DEG ELBOW	EA	2,656.62	2,656.62
1020	1	36" SDR17 HDPE 45 DEG ELBOW	EA	3,680.29	3,680.29
1030	1	42" SDR17 HDPE 45 DEG ELBOW	EA	4,586.48	4,586.48
1040	1	48" SDR17 HDPE 45 DEG ELBOW	EA	6,533.38	6,533.38
1050		**********			
1060	1	12 DR17 HDPE 22 1/2 DEG ELBOW	EA	321.75	321.75
1070	1	18 DR17 HDPE 22 1/2 DEG ELBOW	EA	391.83	391.83
1080	1	24 DR17 HDPE 22 1/2 DEG ELBOW	EA	1,019.95	1,019.95
1090	1	26 DR17 HDPE 22 1/2 DEG ELBOW	EA	1,509.08	1,509.08
1100	1	28 DR17 HDPE 22 1/2 DEG ELBOW	EA	1,983.79	1,983.79
1110	1	30 DR17 HDPE 22 1/2 DEG ELBOW	EA	2,028.70	2,028.70
1120	1	32 DR17 HDPE 22 1/2 DEG ELBOW	EA	2,364.39	2,364.39
1130	1	36 DR17 HDPE 22 1/2 DEG ELBOW	EA	3,272.19	3,272.19
1140	1	42 DR17 HDPE 22 1/2 DEG ELBOW	EA	4,378.00	4,378.00
1150	1	48 DR17 HDPE 22 1/2 DEG ELBOW	EA	6,236.40	6,236.40
1160		**********			
1170	1	12 DR17 HDPE 90 DEG ELBOW	EA	538.52	538.52
1180	1	18 DR17 HDPE 90 DEG ELBOW	EA	607.09	607.09
1190	1	24 DR17 HDPE 90 DEG ELBOW	EA	1,793.88	1,793.88
1200	1	26 DR17 HDPE 90 DEG ELBOW	EA	2,600.79	2,600.79
1210	1	28 DR17 HDPE 90 DEG ELBOW	EA	4,298.22	4,298.22
1220	1	30 DR17 HDPE 90 DEG ELBOW	EA	3,803.00	3,803.00
1230	1	32 DR17 HDPE 90 DEG ELBOW	EA	4,400.95	4,400.95
1240	1	36 DR17 HDPE 90 DEG ELBOW	EA	5,925.60	5,925.60
1250	1	42 DR17 HDPE 90 DEG ELBOW	EA	8,339.05	8,339.05
1260	1	48 DR17 HDPE 90 DEG ELBOW	EA	12,472.80	12,472.80
1270		**********			
1280	1	12 IPS DR17 HDPE TEE MOLD	EA	713.78	713.78
1290	1	18 IPS DR11/17 FAB TEE PC120	EA	1,323.03	1,323.03
1300	1	24 IPS DR11/17 FAB TEE PC120	EA	2,546.50	2,546.50
1310	1	26" IPS DR17 TEE	EA	3,802.55	3,802.55
1320	1	28" IPS DR17 TEE	EA	5,819.12	5,819.12
1330	1	30" IPS DR17 TEE	EA	4,687.05	4,687.05
1340	1	32" IPS DR17 TEE	EA	5,571.71	5,571.71
1350	1	36" IPS DR17 TEE	EA	6,823.89	6,823.89
1360	1	42" IPS DR17 TEE	EA	10,114.86	10,114.86
1370	1	48" IPS DR17 TEE	EA	18,412.23	18,412.23
1380		**********			
1390	1	48X36 DR17 HDPE REDUCER	EA	9,390.19	9,390.19
1400	1	36X32 DR17 HDPE REDUCER	EA	3,088.12	3,088.12
1410	1	32X26 DR17 HDPE REDUCER	EA	3,088.12	3,088.12
1420	1	26X18 DR17 HDPE REDUCER	EA	2,251.60	2,251.60
1430	1	18X 12DR17 HDPE REDUCER	EA	448.96	448.96
1440		**********			

DRAFT

Bid Proposal for Budget Quote - N. Yuba Water Dist. NYWD

Bid #: 3847036

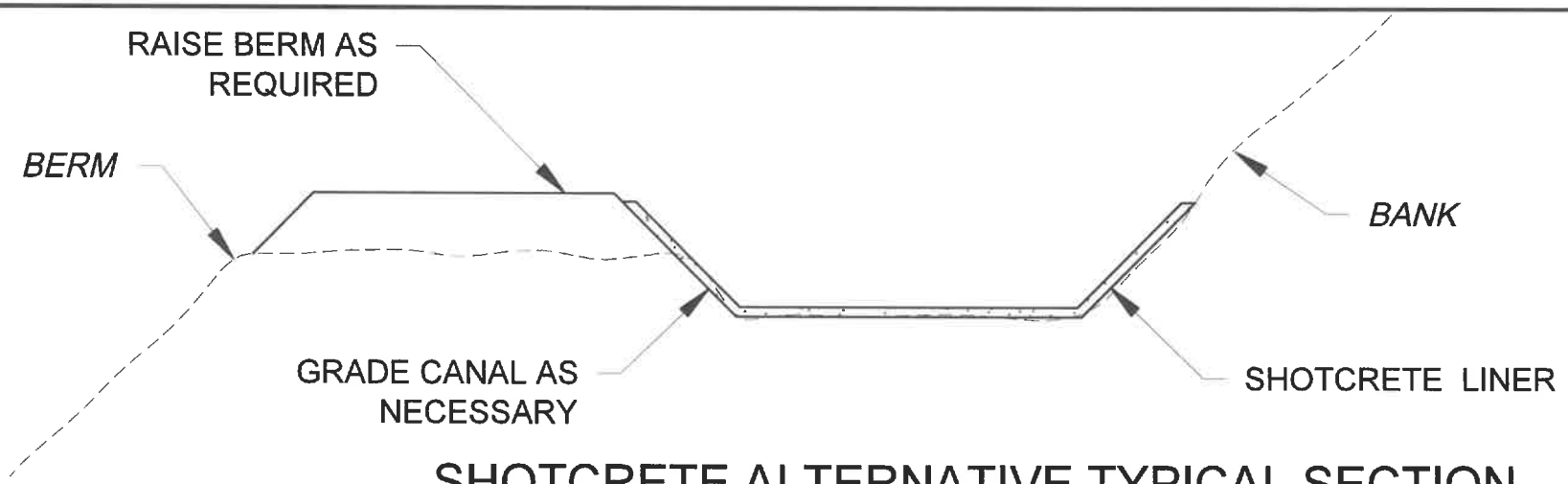
Seq#	Qty	Description	Units	Price	Ext Price
1450	6	12" DR17 ELOFIT RESTRAINT	EA	41.43	248.58
1460	14	28" DR17 ELOFIT RESTRAINT	EA	41.43	580.02
1470	15	30" DR17 ELOFIT RESTRAINT	EA	41.43	621.45
1480	16	32" DR17 ELOFIT RESTRAINT	EA	41.43	662.88
1490	18	36" DR17 ELOFIT RESTRAINT	EA	41.43	745.74
1500	21	42" DR17 ELOFIT RESTRAINT	EA	41.43	870.03
1510	25	48" DR17 ELOFIT RESTRAINT	EA	41.43	1,035.75
1520		**********			
1530		**AIR VENTS**			
1540	1	4" FIP WATERMAN CR-101 AIR/VAC	EA	125.00	125.00
1550	1	4 GATE VLV THREADED BRASS NL	EA	10,111.67	10,111.67
1560	1	4"X48" GALV NIPPLE	EA	205.00	205.00
1570	1	2" FIP WATERMAN AV-150 VENT	EA	101.67	101.67
1580	1	2X4 PVC S80 THRD NIP 887-040	EA	9.69	9.69
1590	1	2 BRS THRD GATE VALVE NO LEAD	EA	62.05	62.05
1600	1	2 PVC SCH40 UNION TXT 458-020	EA	23.54	23.54

UNLESS OTHERWISE SPECIFIED HEREIN, PRICES QUOTED ARE VALID IF ACCEPTED BY CUSTOMER AND PRODUCTS ARE RELEASED BY CUSTOMER FOR MANUFACTURE WITHIN THIRTY (30) CALENDAR DAYS FROM THE DATE OF THIS QUOTATION. CORE & MAIN LP RESERVES THE RIGHT TO INCREASE PRICES TO ADDRESS FACTORS, INCLUDING BUT NOT LIMITED TO, GOVERNMENT REGULATIONS, TARIFFS, TRANSPORTATION, FUEL AND RAW MATERIAL COSTS. DELIVERY WILL COMMENCE BASED UPON MANUFACTURER LEAD TIMES. ANY MATERIAL DELIVERIES DELAYED BEYOND MANUFACTURER LEAD TIMES MAY BE SUBJECT TO PRICE INCREASES AND/OR APPLICABLE STORAGE FEES. THIS BID PROPOSAL IS CONTINGENT UPON BUYER'S ACCEPTANCE OF SELLER'S TERMS AND CONDITIONS OF SALE, AS MODIFIED FROM TIME TO TIME, WHICH CAN BE FOUND AT: https://coreandmain.com/TandC/

APPENDIX C

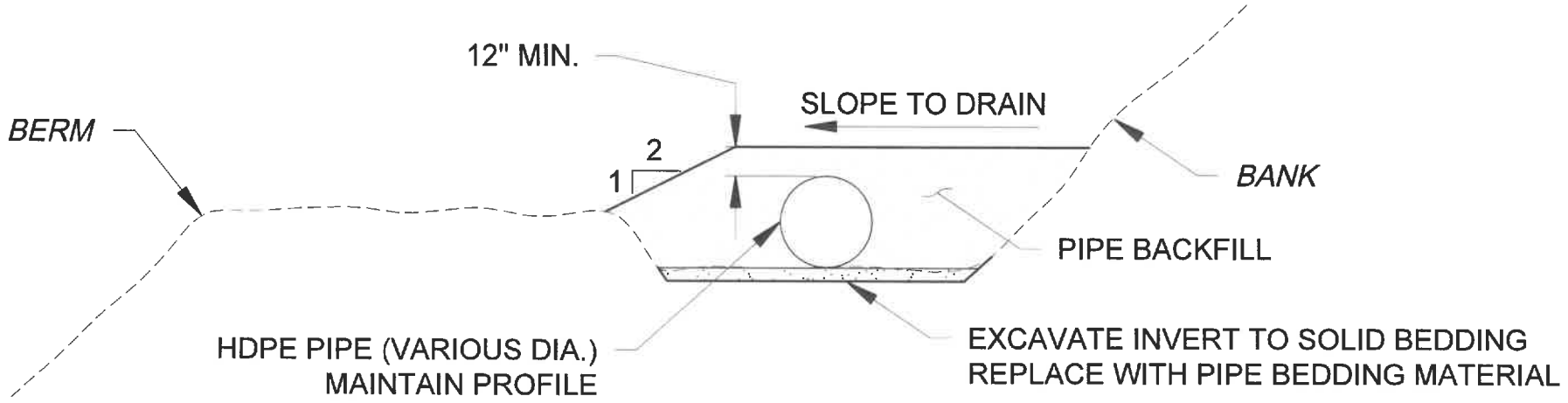
Typical Cross Section Sketches

GANNETT FLEMING



SHOTCRETE ALTERNATIVE TYPICAL SECTION

NOT TO SCALE



PIPE ALTERNATIVES TYPICAL SECTION

NOT TO SCALE

CONCEPTUAL SKETCHES

DRAFT

GANNETT FLEMING

NORTH YUBA WATER DISTRICT
YUBA COUNTY, CA

FORBESTOWN AND DOHC ALTERNATIVES ANALYSIS

ALTERANTIVES TYPICAL SECTIONS

JOB NO. 75666

DATE DEC 2024

SHEET NO.

DRAWING NO. 1

NORTH YUBA WATER DISTRICT

Memorandum

Date: January 24th, 2025

To: Leona Harris

From: Operations

Subject: Monthly work production/ Schedule of Maintenance review

The following is an overview of the work performed this month by operations staff.

Transmission:

1. Forbestown ditch is now in its winter cycle delivering water to the treatment plant every 7 to 10 days.

Distribution:

1. Domestic meter reads for Forbestown and Challenge were completed on time.
2. There was 1 service line leak for the last month. Job # 778
3. There were 0 main line leaks for the last month.
4. All blow offs were inspected, no problems were found.
5. All air releases were inspected, no problems were found.
6. All dead-end main were flushed.
7. There were 3 new hydrants installed. One located at the intersection of seven springs trail and Frenchtown Rd, Job # 776. One located at the intersection of La Port Rd and North loop Rd, Job # 777. One located at the intersection of La Porte Rd and New York Flat Rd, Job # 779. At this time 5 out of 10 new hydrants have been installed.

Water Treatment Plant:

1. With the new upgrades mentioned in previous reports, the treatment plant is functioning normal at this time with no issues. The aerators in the reservoir at the treatment plant are in use and operating normally.

Backflow:

1. All backflows are current, there were 0 backflow tests required within the last 4 weeks.

Regulators:

1. All CDPH (Cal. Dept. of Public Health) and NPDES (Nat. Pollution Discharge Elimination System) tests and samples were taken and performed on time. These include 3 bacteriological distribution samples for the CDPH, which came back as non-detect.

DOH Canal:

1. At this time district staff is patrolling the ditch, cleaning trash racks, and removing falling trees.

Schedule of Maintenance:

1. The SOM (schedule of maintenance) for the treatment plant, regulators (local, state and federal) and UFC were completed for the previous month. All regulatory (local, state and federal) reports for the current month were completed or are in process.

Safety Meetings:

1. Safety meetings are held weekly, all field employees are required to attend. The following is a list of completed safety meetings in the last 4 weeks.
2. #1 Texting and working.
3. #2 Lighting safety.
4. #3 Traffic zone safety.
5. #4 Personal protective equipment.

Before

After

Before

After

Before

After