OAK LODGE WATER SERVICES

BOARD OF DIRECTORS

REGULAR MEETING

OAK LODGE

WATER SERVICES

October 20, 2020

“Enhancing Our Community’s Water Environment”

OAK LODGE
WATER SERVICES

REMOTE MEETING
Board Attendance by Zoom Video/Telephone
Public Attendance by Telephone Only
October 20, 2020 at 6:00 p.m.

1. Call to Order and Meeting Facilitation Protocols

2. Call for Public Comment

   Members of the public are welcome to testify for a maximum of three minutes on each agenda item.

3. Consent Agenda

   a. September 2020 Financial Report
   b. Approval of September 10, 2020 Board Special Meeting Minutes
   c. Approval of September 15, 2020 Board Regular Meeting Minutes
   d. Approval of October 2, 2020 Board Special Meeting Minutes
   e. Extension of the March 17, 2020 Declaration of State of Emergency
   f. Approval of Contract for Emergency Water Intertie Preliminary Design

4. Update from Scott Archer, Director of North Clackamas Parks and Recreation District

5. Consideration of Resolution No. 2020-15 Approval of the Water Master Plan

6. PERS Side Account Update

7. Call for Public Comment

   Members of the public are welcome to testify for a maximum of three minutes on each agenda item.

8. Community Briefing Materials Update

9. Recess to Executive Session

   Convene executive session under ORS 192.660(2)(f) to consider information or records that are exempt by law from public inspection and 192.660(2)(h) to consult with counsel concerning the legal rights and duties of a public body with regard to current litigation or litigation likely to be filed.

10. Adjourn Executive Session

    If necessary, Board may take action on items discussed in Executive Session.

11. Department Reports

    a. Human Resources/Payroll
    b. Finance
    c. Technical Services
    d. Field Operations
    e. Plant Operations

12. Business from the Board

13. Adjourn Regular Meeting

OAK LODGE
WATER SERVICES

AGENDA ITEM

Title	Call for Public Comment
Item No.	2
Date	October 20, 2020

Summary

The Board of Directors welcomes comment from members of the public.

Written comments may not be read out loud or addressed during the meeting, but all public comments will be entered into the record.

The Board of Directors may elect to limit the total time available for public comment or for any single speaker depending on meeting length.

OAK LODGE
WATER SERVICES

CONSENT AGENDA

To	Board of Directors
From	Sarah Jo Chaplen, General Manager
Title	Consent Agenda
Item No.	3
Date	October 20, 2020

Summary

The Board of Directors has a standing item on the regular monthly meeting agenda called "Consent Agenda." This subset of the regular agenda provides for the Board to relegate routine business functions not requiring discussion to a consent agenda where all included items can be acted upon by a single act.

The Consent Agenda includes:

a. **September 2020 Financial Report**
b. **Approval of the September 10, 2020 Board Special Meeting Minutes**
c. **Approval of the September 15, 2020 Board Regular Meeting Minutes**
d. **Approval of the October 2, 2020 Board Special Meeting Minutes**
e. **Extension of the March 17, 2020 Declaration of State of Emergency**
f. **Approval of Contract for Emergency Water Intertie Preliminary Design**

Options for Consideration

1. Approve the Consent Agenda as listed on the meeting agenda.

2. Request one or more items listed on the Consent Agenda be pulled from the Consent Agenda for discussion.

Recommendation

Staff requests that the Board approve the items listed under the Consent Agenda.

Suggested Board Motion

"I move to approve the Consent Agenda."

Approved By ________________________ Date ________________________

MONTHLY FINANCIAL REPORT

To	Board of Directors
From	Gail Stevens, Finance Director
Title	September 2020 Financial Reports
Item No.	3a
Date	October 20, 2020

Reports

- September 2020 Monthly Overview
- September 2020 Monthly Cash and Investment Balances Report
- September 2020 Budget to Actual Report
- September 2020 Budget Account Roll Up Report

Oak Lodge Water Services
Monthly Overview
September 2020

This report summarizes the revenues and expenditures for September 2020. Also incorporated in this report are account balances, including all cash and investment activity as well as checks and withdrawals.

The District's liquid cash and investment assets equal $14.87 million as of the end of September 2020; consisting of $1.59 million in checking, and $13.28 million in the State Local Government Investment Pool (LGIP).

The District's checks, electronic withdrawals, and bank drafts total $0.92 million for September 2020.

Below is a table identifying the District's three principal sources of service charges in each fund with a comparison between annual budget estimates and year-to-date service charge fees.

GL Account	Service Charge	Budget Estimate	Period Amount	Year-to-Date Amount	Percentage of Budget
10-00-4210	Water sales-CRW	$ 32,000	$ 7,454	$ 7,454	23.29%
10-00-4211	Water sales	4,038,000	428,770	1,201,341	29.75%
20-00-4212	Wastewater charges	8,270,000	637,334	2,000,820	24.19%
30-00-4213	Watershed protection	1,548,000	127,864	386,853	24.99%
	Subtotal	$ 13,888,000	$ 1,201,422	$ 3,596,468	25.90%

The percentage of budget is calculated by dividing the ending balance by the budget. With respect to revenues, the percentage of budget is affected by seasonal variations. The expectation is that the District would recognize a greater percentage of revenue in the first half of the fiscal year than in the second half.

Review of revenue lines that are above 30% of budget:

1. **4220 System development charges** is at 132.57% of budget. In September, the District received payment of SDC charges for the Lennar NW single-family homes and Black Forest project on SE Hugh Ave.
2. **4290 Other Charges for Services** is at 191.30% of budget. This revenue is from inspection and plan review fees. There are several active building developments throughout the District.
3. **4320 State Grant** for CARES Act funds of $13,884 received for reimbursement for payroll cost related to Emergency FMLA.
4. **4630 Miscellaneous Revenue** is at 48.77% of budget. This revenue is from title companies.

With respect to expenditures, at the end of September expenditures are overall 13.08% of budget. When excluding Contingencies, expenditures are 17.72% of budget, with 25% of the fiscal year completed.

Review of expenditure lines that are above 30% of budget:

1. **5270 Workers Compensation** is at 99.59% of budget. This expense is paid in one lump sump in July.
2. **6120 Accounting & Audit Services** is at 60.37% of budget. This expense occurs in the first half of the fiscal year.

3. **6180 Dues & Subscriptions** is at 36.71% of budget. Consortium annual dues are paid in July.
4. **6320 Buildings and Grounds** is at 40.10% of budget. This is due to improvements completed to the HVAC Systems of all buildings to include UV treatment to reduce the potential of COVID-19 outbreaks in OLWSD facilities.
5. **6550 Operational Supplies** is at 47.22% of budget. New equipment item was incorrectly expensed. Will be moved to capital outlay in October reports.
6. **6560 Uniforms** is at 37.72% of budget. Uniforms budget line was reduced from prior years. This line may need to be reviewed in a later Supplemental Budget adjustment.
7. **6715 Water Quality Program** is at 63.64% of budget. This is due to required lead and copper testing every three years.
8. **6770 Bank Charges** is at 34.11% of budget. This is due to the collection of SDC charges via credit card payments resulting in additional banking fees. SDC Revenues are currently at 132.57% of budget.
9. **6780 Taxes and Fees** is at 64.56% of budget. Expenditures recorded in this account are typically annual, instead of monthly or quarterly so the percentage to budget will fluctuate throughout the fiscal year.

Low Income Rate Relief Program Overview

The District allows eligible customers to obtain a discounted rate on a portion of their bill. The District budgets resources to fund the revenue losses due to the program at the rate of 0.50% of budgeted service charge revenue. The budgeted amount serves as a cap to the program's cost which can only be exceed with approval from the District's Board of Directors.

Below is a table identifying the number of accounts in the program and an estimated monthly discount and year-to-date value based on a single-family residential account with a standard 20 GPM Water Meter and 6 CCF of water consumption per month.

Total Number of Accounts	Discount	Cap per Policy	Estimated Monthly Discount	Estimated Year-to-Date Discount	Estimated Percentage of Budget
142	Low Income Rate Relief	$ 69,440	$ 5,599	$ 17,123	24.66%

Customer Time Payment Agreements (TPA)

The District extends TPA's to customers with delinquent balances to bring accounts current over time. Negotiation of a TPA is often the first step in working with a customer who may have trouble paying their utility bills.

The table below summarizes TPA activity for September 2020.

Beginning of month	TPA Issued	TPA Completed	TPA Expired	End of month
56	2	(1)	(5)	52

Of the total TPAs outstanding at September 31, 2020, 22 are current in their arrangements and 30 are delinquent. One TPA completed with full payments received. Five TPAs expired in delinquent status. The District has mailed notices to delinquent TPA holders urging them to contact the District to make further arrangements.

Emergency Customer Assistance Program (ECAP)

The District's budget line item for the Emergency Customer Assistance Program (ECAP) is $97 thousand through June 30, 2021. These monies are earmarked as direct assistance to District customers experiencing acute financial troubles related to COVID-19 and that do not necessarily qualify for the District's Low-Income Rate Relief Program. Staff will provide monthly information going forward on the use of these monies to benefit District customers.

Beginning of month	Expended	End of month
$97,000	$2,614	$94,386

The above expenditures represent assistance to nineteen (19) residential accounts totaling $1,001 and four (4) commercial accounts.

Oak Lodge Water Services District

Account Balances As of:			
September 30, 2020	**Interest Rate**		**Balance**
Account			
Wells Fargo Bank Checking-3552	0.25%	$	1,589,858.00
LGIP	1.00%	$	13,281,465.48
Total		$	14,871,323.48

General Ledger
Budget to Actual

User: jeff
Printed: 10/12/2020 4:33:32 PM
Period 03 - 03
Fiscal Year 2021

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
05	**Administrative Services**					
	NonDivisional					
	Beginning Fund Balance					
05-00-3500	Fund balance	335,000.00	0.00	598,700.78	0.00	178.72
	Beginning Fund Balance	*335,000.00*	*0.00*	*598,700.78*	*0.00*	*178.72*
	NonDivisional	**335,000.00**	**0.00**	**598,700.78**	**0.00**	**178.72**
	Fund Balance	335,000.00	0.00	598,700.78	0.00	178.72
	NonDivisional					
	Revenue					
05-00-4320	State Grant Revenue	0.00	13,884.60	15,927.77	0.00	0.00
05-00-4610	Investment revenue	0.00	248.12	863.61	0.00	0.00
05-00-4630	Miscellaneous revenues	1,000.00	0.00	2,825.00	0.00	282.50
	Revenue	*1,000.00*	*14,132.72*	*19,616.38*	*0.00*	*1,961.64*
	NonDivisional	**1,000.00**	**14,132.72**	**19,616.38**	**0.00**	**1,961.64**
	Transfers & Contingencies					
	Revenue					
05-29-4910	Transfer in from Fund 10	1,908,000.00	159,000.00	477,000.00	0.00	25.00
05-29-4920	Transfer in from Fund 20	2,026,000.00	168,833.33	506,499.99	0.00	25.00
05-29-4930	Transfer in from Fund 30	635,000.00	52,916.67	158,750.01	0.00	25.00
	Revenue	*4,569,000.00*	*380,750.00*	*1,142,250.00*	*0.00*	*25.00*
	Transfers & Contingencies	**4,569,000.00**	**380,750.00**	**1,142,250.00**	**0.00**	**25.00**
	Revenue	4,570,000.00	394,882.72	1,161,866.38	0.00	25.42
	AdminFinance					
	Personnel Services					
05-01-5110	Regular employees	563,000.00	45,953.27	130,280.91	0.00	23.14
05-01-5120	Temporaryseasonal employees	5,000.00	0.00	0.00	0.00	0.00
05-01-5130	Overtime	5,000.00	492.72	1,767.13	0.00	35.34
05-01-5210	Healthdental insurance	115,000.00	8,354.10	22,616.04	0.00	19.67
05-01-5230	Social security	43,000.00	3,459.54	9,837.87	0.00	22.88
05-01-5240	Retirement	124,000.00	8,635.37	24,606.28	0.00	19.84
05-01-5250	TrimetWBF	4,000.00	358.67	1,021.31	0.00	25.53
05-01-5260	Unemployment	5,000.00	5,832.00	5,832.00	0.00	116.64
05-01-5270	Workers compensation	8,000.00	0.00	671.10	0.00	8.39
05-01-5290	Other employee benefits	5,000.00	3,240.00	3,303.95	0.00	66.08
	Personnel Services	*877,000.00*	*76,325.67*	*199,936.59*	*0.00*	*22.80*
	Materials & Services					
05-01-6110	Legal services	375,000.00	1,839.00	7,738.50	0.00	2.06
05-01-6120	Accounting and audit services	45,000.00	14,431.81	27,167.45	11,431.73	60.37
05-01-6155	Contracted services	248,000.00	20,007.55	27,561.10	0.00	11.11
05-01-6180	Dues and subscriptions	35,000.00	0.00	19,087.00	160.00	54.53
05-01-6220	Electricity	9,000.00	1,124.60	2,130.32	0.00	23.67
05-01-6240	Natural gas	1,000.00	103.62	197.84	0.00	19.78

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
05-01-6290	Other utilities	20,000.00	2,394.06	5,929.57	0.00	29.65
05-01-6310	Janitorial services	25,000.00	1,190.40	2,530.80	0.00	10.12
05-01-6320	Buildings and grounds maint	18,000.00	1,484.70	8,588.59	0.00	47.71
05-01-6410	Mileage	1,000.00	0.00	0.00	0.00	0.00
05-01-6420	Staff training	12,000.00	0.00	0.00	0.00	0.00
05-01-6510	Office supplies	25,000.00	97.94	5,400.51	1,678.75	21.60
05-01-6530	Small tools and equipment	2,000.00	0.00	0.00	0.00	0.00
05-01-6560	Uniforms	500.00	0.00	0.00	0.00	0.00
05-01-6730	Communications	2,000.00	189.60	395.01	0.00	19.75
05-01-6740	Advertising	1,000.00	0.00	0.00	0.00	0.00
05-01-6750	Other Purchased Services	0.00	0.00	1,000.00	0.00	0.00
05-01-6760	Equipment rental	1,000.00	222.20	230.65	1,776.15	23.07
05-01-6770	Bank charges	125,000.00	15,019.24	42,641.82	84,710.84	34.11
05-01-6780	Taxes, fees, and other charges	1,000.00	0.00	18.50	0.00	1.85
05-01-6785	ECAP Payments	97,000.00	1,113.77	2,614.28	0.00	2.70
05-01-6900	Miscellaneous expense	1,000.00	0.00	0.00	0.00	0.00
	Materials & Services	*1,044,500.00*	*59,218.49*	*153,231.94*	*99,757.47*	*14.67*
	AdminFinance	**1,921,500.00**	**135,544.16**	**353,168.53**	**99,757.47**	**18.38**
	Human Resources					
	Personnel Services					
05-02-5110	Regular employees	152,000.00	12,562.40	36,011.86	0.00	23.69
05-02-5130	Overtime	5,000.00	93.52	185.02	0.00	3.70
05-02-5210	Healthdental insurance	26,000.00	1,720.66	5,162.54	0.00	19.86
05-02-5230	Social security	12,000.00	950.91	2,717.24	0.00	22.64
05-02-5240	Retirement	27,000.00	2,142.65	6,127.93	0.00	22.70
05-02-5250	TrimetWBF	1,000.00	-7.68	176.71	0.00	17.67
05-02-5270	Workers compensation	2,000.00	0.00	174.96	0.00	8.75
05-02-5290	Other employee benefits	2,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*227,000.00*	*17,462.46*	*50,556.26*	*0.00*	*22.27*
	Materials & Services					
05-02-6180	Dues and subscriptions	1,000.00	0.00	0.00	0.00	0.00
05-02-6230	Telephone	57,000.00	3,950.74	9,916.44	0.00	17.40
05-02-6410	Mileage	1,000.00	0.00	0.00	0.00	0.00
05-02-6420	Staff training	22,000.00	0.00	0.00	0.00	0.00
05-02-6440	Board Travel and Training	7,000.00	22.00	22.00	0.00	0.31
05-02-6510	Office supplies	1,000.00	0.00	0.00	0.00	0.00
05-02-6540	Safety Supplies	1,000.00	0.00	0.00	0.00	0.00
05-02-6610	Board Compensation	2,500.00	0.00	0.00	0.00	0.00
05-02-6720	Insurance-General	240,000.00	-210.00	-210.00	0.00	-0.09
05-02-6730	Communications	6,000.00	0.00	0.00	0.00	0.00
05-02-6740	Advertising	5,000.00	0.00	0.00	0.00	0.00
05-02-6785	ECAP Payments	0.00	0.00	0.00	0.00	0.00
	Materials & Services	*343,500.00*	*3,762.74*	*9,728.44*	*0.00*	*2.83*
	Human Resources	**570,500.00**	**21,225.20**	**60,284.70**	**0.00**	**10.57**
	Technical Services					
	Personnel Services					
05-03-5110	Regular employees	577,000.00	39,074.93	111,551.20	0.00	19.33
05-03-5130	Overtime	5,000.00	66.50	133.00	0.00	2.66
05-03-5210	Healthdental Insurance	112,000.00	8,063.99	24,193.37	0.00	21.60
05-03-5230	Social security	44,000.00	2,945.29	8,396.76	0.00	19.08
05-03-5240	Retirement	112,000.00	7,031.97	20,056.58	0.00	17.91
05-03-5250	TrimetWBF	4,000.00	305.99	872.39	0.00	21.81
05-03-5260	Unemployment	5,000.00	0.00	0.00	0.00	0.00
05-03-5270	Workers compensation	9,000.00	0.00	664.16	0.00	7.38
05-03-5290	Other employee benefits	5,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*873,000.00*	*57,488.67*	*165,867.46*	*0.00*	*19.00*

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Materials & Services					
05-03-6155	Contracted services	291,000.00	25,161.39	26,332.49	47,493.08	9.05
05-03-6180	Dues and subscriptions	10,000.00	0.00	0.00	0.00	0.00
05-03-6350	Computer maintenance	237,000.00	15,205.90	60,833.31	13,925.00	25.67
05-03-6410	Mileage	3,000.00	0.00	0.00	0.00	0.00
05-03-6420	Staff training	16,000.00	0.00	0.00	0.00	0.00
05-03-6430	Certifications	1,000.00	0.00	0.00	0.00	0.00
05-03-6510	Office supplies	3,000.00	0.00	17.99	0.00	0.60
05-03-6540	Safety supplies	8,000.00	0.00	160.00	0.00	2.00
05-03-6730	Communications	149,000.00	2,230.16	2,320.16	0.00	1.56
	Materials & Services	*718,000.00*	*42,597.45*	*89,663.95*	*61,418.08*	*12.49*
	Technical Services	**1,591,000.00**	**100,086.12**	**255,531.41**	**61,418.08**	**16.06**
	Vehicle Services					
	Materials & Services					
05-04-6330	Vehicleequipment maintenance	50,000.00	34.16	3,546.48	0.00	7.09
05-04-6520	Fuels and oils	71,000.00	2,025.67	3,953.18	0.00	5.57
	Materials & Services	*121,000.00*	*2,059.83*	*7,499.66*	*0.00*	*6.20*
	Vehicle Services	**121,000.00**	**2,059.83**	**7,499.66**	**0.00**	**6.20**
	Special Payments					
	Special Payments					
05-25-6990	Special Payments - PERS	552,000.00	0.00	0.00	0.00	0.00
	Special Payments	*552,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Special Payments	**552,000.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Transfers & Contingencies					
	Transfers & Contingencies					
05-29-9000	Contingency	139,000.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*139,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Transfers & Contingencies	**139,000.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Expense	4,895,000.00	258,915.31	676,484.30	161,175.55	13.82
05	**Administrative Services**	**10,000.00**	**135,967.41**	**1,084,082.86**	**-161,175.55**	**10,840.83**
10	**Drinking Water**					
	NonDivisional					
	Beginning Fund Balance					
10-00-3500	Fund balance	1,527,000.00	0.00	1,508,128.42	0.00	98.76
	Beginning Fund Balance	*1,527,000.00*	*0.00*	*1,508,128.42*	*0.00*	*98.76*
	NonDivisional	**1,527,000.00**	**0.00**	**1,508,128.42**	**0.00**	**98.76**
	Fund Balance	1,527,000.00	0.00	1,508,128.42	0.00	98.76
	NonDivisional					
	Revenue					
10-00-4210	Water Sales - CRW	32,000.00	7,453.98	7,453.98	0.00	23.29
10-00-4211	Water sales	4,038,000.00	428,770.36	1,201,341.13	0.00	29.75
10-00-4215	Penalties and late charges	20,000.00	0.00	-127.79	0.00	-0.64
10-00-4220	System development charges	100,000.00	30,542.40	138,848.00	0.00	138.85
10-00-4230	Contract services	40,000.00	0.00	9,400.00	0.00	23.50
10-00-4240	Service installations	10,000.00	5,098.00	12,947.82	0.00	129.48
10-00-4280	Rents & leases	200,000.00	0.00	27,379.57	0.00	13.69

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
10-00-4290	Other charges for services	10,000.00	1,940.00	6,403.65	0.00	64.04
10-00-4610	Investment revenue	10,000.00	577.54	2,074.31	0.00	20.74
10-00-4630	Miscellaneous revenues	26,000.00	9,606.20	13,226.10	0.00	50.87
	Revenue	*4,486,000.00*	*483,988.48*	*1,418,946.77*	*0.00*	*31.63*
	NonDivisional	**4,486,000.00**	**483,988.48**	**1,418,946.77**	**0.00**	**31.63**
	Revenue	4,486,000.00	483,988.48	1,418,946.77	0.00	31.63
	Drinking Water					
	Personnel Services					
10-20-5110	Regular employees	607,000.00	49,419.36	145,966.91	0.00	24.05
10-20-5130	Overtime	35,000.00	3,143.97	9,062.00	0.00	25.89
10-20-5210	Healthdental insurance	140,000.00	11,428.79	34,288.57	0.00	24.49
10-20-5230	Social Security	47,000.00	3,930.68	11,587.96	0.00	24.66
10-20-5240	Retirement	132,000.00	10,717.17	31,473.62	0.00	23.84
10-20-5250	TrimetWBF	5,000.00	409.01	1,204.44	0.00	24.09
10-20-5260	Unemployment	8,000.00	0.00	0.00	0.00	0.00
10-20-5270	Workers compensation	9,000.00	0.00	16,936.29	0.00	188.18
10-20-5290	Other employee benefits	6,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*989,000.00*	*79,048.98*	*250,519.79*	*0.00*	*25.33*
	Materials & Services					
10-20-6155	Contracted Services	20,000.00	0.00	0.00	0.00	0.00
10-20-6220	Electricity	27,000.00	3,426.41	6,403.61	0.00	23.72
10-20-6240	Natural gas	3,000.00	198.65	397.30	0.00	13.24
10-20-6310	Janitorial services	0.00	-99.23	-99.23	0.00	0.00
10-20-6320	Buildings & grounds	5,000.00	7,880.00	8,073.17	0.00	161.46
10-20-6340	Distribution system maint	200,000.00	11,117.78	19,311.82	87,848.23	9.66
10-20-6390	Other repairs & maintenance	35,000.00	7,595.40	10,788.35	0.00	30.82
10-20-6420	Staff training	10,000.00	90.00	235.00	0.00	2.35
10-20-6430	Certifications	2,000.00	158.00	158.00	0.00	7.90
10-20-6530	Small tools & equipment	9,000.00	0.00	1,336.45	0.00	14.85
10-20-6540	Safety supplies	15,000.00	501.27	1,910.69	0.00	12.74
10-20-6550	Operational Supplies	2,000.00	772.49	1,962.79	0.00	98.14
10-20-6560	Uniforms	2,000.00	0.00	0.00	0.00	0.00
10-20-6710	Purchased water	1,084,000.00	0.00	265,216.06	0.00	24.47
10-20-6715	Water quality program	5,000.00	2,640.00	3,182.00	0.00	63.64
10-20-6760	Equipment Rental	3,500.00	0.00	0.00	0.00	0.00
10-20-6780	Taxes & fees	20,000.00	541.62	541.62	0.00	2.71
10-20-6900	Miscellaneous expense	1,000.00	0.00	0.00	0.00	0.00
	Materials & Services	*1,443,500.00*	*34,822.39*	*319,417.63*	*87,848.23*	*22.13*
	Drinking Water	**2,432,500.00**	**113,871.37**	**569,937.42**	**87,848.23**	**23.43**
	Debt Service					
	Materials & Services					
10-24-6815	Zions Bank loan-principal	179,000.00	0.00	0.00	0.00	0.00
10-24-6825	Zions Bank loan-interest	30,801.00	0.00	15,400.25	0.00	50.00
	Materials & Services	*209,801.00*	*0.00*	*15,400.25*	*0.00*	*7.34*
	Debt Service	**209,801.00**	**0.00**	**15,400.25**	**0.00**	**7.34**
	Transfers & Contingencies					
	Transfers & Contingencies					
10-29-8105	Transfer out - Fund 05	1,908,000.00	159,000.00	477,000.00	0.00	25.00
10-29-8171	Transfers out to Fund 71	500,000.00	41,666.67	125,000.01	0.00	25.00
10-29-9000	Contingency	962,699.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*3,370,699.00*	*200,666.67*	*602,000.01*	*0.00*	*17.86*

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Transfers & Contingencies	**3,370,699.00**	**200,666.67**	**602,000.01**	**0.00**	**17.86**
	Expense	6,013,000.00	314,538.04	1,187,337.68	87,848.23	19.75
10	**Drinking Water**	**0.00**	**169,450.44**	**1,739,737.51**	**-87,848.23**	**0.00**
20	**Wastewater Reclam.**					
	NonDivisional					
	Beginning Fund Balance					
20-00-3500	Fund balance	1,842,000.00	0.00	1,815,853.46	0.00	98.58
	Beginning Fund Balance	*1,842,000.00*	*0.00*	*1,815,853.46*	*0.00*	*98.58*
	NonDivisional	**1,842,000.00**	**0.00**	**1,815,853.46**	**0.00**	**98.58**
	Fund Balance	1,842,000.00	0.00	1,815,853.46	0.00	98.58
	NonDivisional					
	Revenue					
20-00-4212	Wastewater charges	8,270,000.00	637,334.06	2,000,820.16	0.00	24.19
20-00-4215	Penalties & late charges	10,000.00	0.00	0.00	0.00	0.00
20-00-4220	System development charges	125,000.00	36,155.00	185,940.00	0.00	148.75
20-00-4240	Service installations	10,000.00	0.00	0.00	0.00	0.00
20-00-4290	Other charges for services	10,000.00	3,185.00	14,239.69	0.00	142.40
20-00-4320	State grants	0.00	0.00	908.00	0.00	0.00
20-00-4610	Investment revenue	5,000.00	211.84	662.78	0.00	13.26
20-00-4630	Miscellaneous revenues	5,000.00	-263.07	43.30	0.00	0.87
	Revenue	*8,435,000.00*	*676,622.83*	*2,202,613.93*	*0.00*	*26.11*
	NonDivisional	**8,435,000.00**	**676,622.83**	**2,202,613.93**	**0.00**	**26.11**
	Revenue	8,435,000.00	676,622.83	2,202,613.93	0.00	26.11
	Wastewater-Plant					
	Personnel Services					
20-21-5110	Regular employees	608,000.00	46,221.65	134,827.22	0.00	22.18
20-21-5120	Temporaryseasonal employees	35,000.00	0.00	0.00	0.00	0.00
20-21-5130	Overtime	45,000.00	7,869.49	12,750.02	0.00	28.33
20-21-5210	Healthdental insurance	179,000.00	12,269.25	36,809.76	0.00	20.56
20-21-5230	Social security	55,000.00	4,054.30	11,036.68	0.00	20.07
20-21-5240	Retirement	131,000.00	9,157.63	24,984.82	0.00	19.07
20-21-5250	TrimetWBF	5,000.00	421.46	1,147.71	0.00	22.95
20-21-5260	Unemployment	5,000.00	0.00	0.00	0.00	0.00
20-21-5270	Workers compensation	9,000.00	0.00	15,600.79	0.00	173.34
20-21-5290	Other employee benefits	6,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*1,078,000.00*	*79,993.78*	*237,157.00*	*0.00*	*22.00*
	Materials & Services					
20-21-6155	Contracted services	133,000.00	12,978.00	20,225.35	2,654.13	15.21
20-21-6180	Dues & subscriptions	6,000.00	0.00	0.00	0.00	0.00
20-21-6220	Electricity	260,000.00	21,839.18	43,479.55	0.00	16.72
20-21-6240	Natural gas	1,000.00	21.39	43.66	0.00	4.37
20-21-6250	Solid waste disposal	81,000.00	3,139.59	17,819.82	0.00	22.00
20-21-6290	Other utilities	1,000.00	262.42	300.13	0.00	30.01
20-21-6310	Janitorial services	10,000.00	373.90	1,172.78	0.00	11.73
20-21-6320	Buildings & grounds	57,000.00	4,812.70	15,821.68	1,419.00	27.76
20-21-6342	WRF system maintenance	270,000.00	33,014.24	68,491.24	15,840.20	25.37
20-21-6410	Mileage	1,000.00	0.00	0.00	0.00	0.00
20-21-6420	Staff training	9,000.00	0.00	0.00	0.00	0.00
20-21-6430	Certifications	2,000.00	0.00	270.00	0.00	13.50
20-21-6525	Chemicals	26,000.00	1,553.75	6,853.85	20,000.00	26.36
20-21-6530	Small tools & equipment	10,000.00	89.99	89.99	0.00	0.90
20-21-6540	Safety supplies	20,000.00	703.96	1,634.64	0.00	8.17
20-21-6550	Operational supplies	14,000.00	7,677.74	7,677.74	0.00	54.84
20-21-6560	Uniforms	9,000.00	3,189.30	7,979.05	0.00	88.66

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
20-21-6590	Other supplies	10,000.00	206.68	242.67	0.00	2.43
20-21-6740	Advertising	0.00	0.00	496.30	0.00	0.00
20-21-6750	Other purchased services	15,000.00	0.00	0.00	0.00	0.00
20-21-6780	Taxes & fees	0.00	4,073.90	4,913.90	0.00	0.00
20-21-6900	Miscellaneous expense	1,000.00	0.00	0.00	0.00	0.00
	Materials & Services	*936,000.00*	*93,936.74*	*197,512.35*	*39,913.33*	*21.10*
	Wastewater-Plant	**2,014,000.00**	**173,930.52**	**434,669.35**	**39,913.33**	**21.58**
	Wastewater-Collections					
	Personnel Services					
20-22-5110	Regular employees	401,000.00	39,976.39	118,530.94	0.00	29.56
20-22-5130	Overtime	11,000.00	1,600.94	2,745.46	0.00	24.96
20-22-5210	Healthdental insurance	110,000.00	7,942.54	23,829.56	0.00	21.66
20-22-5230	Social security	32,000.00	3,172.57	9,253.20	0.00	28.92
20-22-5240	Retirement	70,000.00	7,711.08	22,515.47	0.00	32.16
20-22-5250	TrimetWBF	3,000.00	331.18	965.12	0.00	32.17
20-22-5260	Unemployment	5,000.00	0.00	0.00	0.00	0.00
20-22-5270	Workers compensation	7,000.00	0.00	9,149.34	0.00	130.70
20-22-5290	Other employee benefits	4,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*643,000.00*	*60,734.70*	*186,989.09*	*0.00*	*29.08*
	Materials & Services					
20-22-6310	Janitorial services	0.00	-43.83	-43.83	0.00	0.00
20-22-6320	Buildings & grounds	1,000.00	0.00	0.00	0.00	0.00
20-22-6342	Collection system maint.	50,000.00	0.00	3,576.25	1.25	7.15
20-22-6390	Other repairs & maintenance	5,000.00	0.00	194.16	0.00	3.88
20-22-6420	Staff training	8,000.00	0.00	0.00	0.00	0.00
20-22-6430	Certifications	2,000.00	0.00	0.00	0.00	0.00
20-22-6530	Small tools & equipment	25,000.00	0.00	11.98	0.00	0.05
20-22-6540	Safety supplies	4,000.00	235.84	540.19	0.00	13.50
20-22-6550	Operational supplies	5,000.00	154.10	276.13	0.00	5.52
20-22-6560	Uniforms	9,000.00	319.43	319.43	0.00	3.55
20-22-6780	Taxes & fees	0.00	863.61	8,082.67	0.00	0.00
20-22-6900	Miscellaneous expense	1,000.00	0.00	0.00	0.00	0.00
	Materials & Services	*110,000.00*	*1,529.15*	*12,956.98*	*1.25*	*11.78*
	Wastewater-Collections	**753,000.00**	**62,263.85**	**199,946.07**	**1.25**	**26.55**
	Transfers & Contingencies					
	Transfers & Contingencies					
20-29-8105	Transfers out to Fund 05	2,026,000.00	168,833.33	506,499.99	0.00	25.00
20-29-8140	Transfers out to Fund 40	812,000.00	0.00	0.00	0.00	0.00
20-29-8150	Transfers out to Fund 50	2,871,000.00	0.00	586,998.00	0.00	20.45
20-29-8172	Transfers out to Fund 72	1,000,000.00	83,333.33	249,999.99	0.00	25.00
20-29-9000	Contingency	801,000.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*7,510,000.00*	*252,166.66*	*1,343,497.98*	*0.00*	*17.89*
	Transfers & Contingencies	**7,510,000.00**	**252,166.66**	**1,343,497.98**	**0.00**	**17.89**
	Expense	10,277,000.00	488,361.03	1,978,113.40	39,914.58	19.25
20	**Wastewater Reclam.**	**0.00**	**188,261.80**	**2,040,353.99**	**-39,914.58**	**0.00**
30	**Watershed Protection**					
	NonDivisional					
	Beginning Fund Balance					
30-00-3500	Fund balance	410,000.00	0.00	438,142.50	0.00	106.86
	Beginning Fund Balance	*410,000.00*	*0.00*	*438,142.50*	*0.00*	*106.86*
	NonDivisional	**410,000.00**	**0.00**	**438,142.50**	**0.00**	**106.86**

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Fund Balance	410,000.00	0.00	438,142.50	0.00	106.86
	NonDivisional					
	Revenue					
30-00-4213	Watershed protection fees	1,548,000.00	127,863.71	386,853.12	0.00	24.99
30-00-4215	Penalties & late charges	2,000.00	0.00	0.00	0.00	0.00
30-00-4220	System development charges	20,000.00	0.00	0.00	0.00	0.00
30-00-4290	Other charges for services	5,000.00	5,578.30	27,182.55	0.00	543.65
30-00-4610	Investment revenue	0.00	202.57	448.07	0.00	0.00
30-00-4630	Miscellaneous revenues	1,000.00	0.00	0.00	0.00	0.00
	Revenue	*1,576,000.00*	*133,644.58*	*414,483.74*	*0.00*	*26.30*
	NonDivisional	**1,576,000.00**	**133,644.58**	**414,483.74**	**0.00**	**26.30**
	Revenue	1,576,000.00	133,644.58	414,483.74	0.00	26.30
	Watershed Protection					
	Personnel Services					
30-23-5110	Regular employees	92,000.00	1,801.41	5,436.69	0.00	5.91
30-23-5120	Temporaryseasonal employees	2,000.00	0.00	0.00	0.00	0.00
30-23-5130	Overtime	1,000.00	0.00	0.00	0.00	0.00
30-23-5210	Healthdental insurance	8,000.00	292.99	878.98	0.00	10.99
30-23-5230	Social Security	7,000.00	133.01	400.96	0.00	5.73
30-23-5240	Retirement	20,000.00	304.98	920.43	0.00	4.60
30-23-5250	TrimetWBF	1,000.00	13.95	42.02	0.00	4.20
30-23-5260	Unemployment	1,000.00	0.00	0.00	0.00	0.00
30-23-5270	Workers compensation	1,000.00	0.00	1,618.73	0.00	161.87
30-23-5290	Other employee benefits	1,000.00	0.00	0.00	0.00	0.00
	Personnel Services	*134,000.00*	*2,546.34*	*9,297.81*	*0.00*	*6.94*
	Materials & Services					
30-23-6155	Contracted Services	40,000.00	0.00	0.00	0.00	0.00
30-23-6310	Janitorial services	0.00	-66.78	-66.78	0.00	0.00
30-23-6340	System maintenance	50,000.00	0.00	0.00	0.00	0.00
30-23-6420	Staff training	3,000.00	0.00	0.00	0.00	0.00
30-23-6540	Safety supplies	500.00	0.00	0.00	0.00	0.00
30-23-6560	Uniforms	1,500.00	0.00	0.00	0.00	0.00
30-23-6730	Communications	10,000.00	0.00	0.00	0.00	0.00
	Materials & Services	*105,000.00*	*-66.78*	*-66.78*	*0.00*	*-0.06*
	Watershed Protection	**239,000.00**	**2,479.56**	**9,231.03**	**0.00**	**3.86**
	Debt Service					
	Materials & Services					
30-24-6814	Principal Payment-KS Statebank	54,233.00	54,233.33	54,233.33	0.00	100.00
30-24-6824	Interest Paid-KS Statebank	8,325.00	8,324.28	8,324.28	0.00	99.99
	Materials & Services	*62,558.00*	*62,557.61*	*62,557.61*	*0.00*	*100.00*
	Debt Service	**62,558.00**	**62,557.61**	**62,557.61**	**0.00**	**100.00**
	Transfers & Contingencies					
	Transfers & Contingencies					
30-29-8105	Transfers out to Fund 05	635,000.00	52,916.67	158,750.01	0.00	25.00
30-29-8173	Transfers out to Fund 73	500,000.00	41,666.67	125,000.01	0.00	25.00
30-29-9000	Contingency	549,442.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*1,684,442.00*	*94,583.34*	*283,750.02*	*0.00*	*16.85*
	Transfers & Contingencies	**1,684,442.00**	**94,583.34**	**283,750.02**	**0.00**	**16.85**

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Expense	1,986,000.00	159,620.51	355,538.66	0.00	17.90
30	**Watershed Protection**	**0.00**	**-25,975.93**	**497,087.58**	**0.00**	**0.00**
40	**WW GO Debt Service**					
	NonDivisional					
	Beginning Fund Balance					
40-00-3500	Fund balance	333,000.00	0.00	333,918.79	0.00	100.28
	Beginning Fund Balance	*333,000.00*	*0.00*	*333,918.79*	*0.00*	*100.28*
	NonDivisional	**333,000.00**	**0.00**	**333,918.79**	**0.00**	**100.28**
	Fund Balance	333,000.00	0.00	333,918.79	0.00	100.28
	NonDivisional					
	Revenue					
40-00-4610	Investment revenue	7,000.00	274.22	901.16	0.00	12.87
40-00-4701	Interest Subsidy	111,000.00	0.00	0.00	0.00	0.00
	Revenue	*118,000.00*	*274.22*	*901.16*	*0.00*	*0.76*
	NonDivisional	**118,000.00**	**274.22**	**901.16**	**0.00**	**0.76**
	Transfers & Contingencies					
	Revenue					
40-29-4920	Transfers in from Fund 20	812,000.00	0.00	0.00	0.00	0.00
	Revenue	*812,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Transfers & Contingencies	**812,000.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Revenue	930,000.00	274.22	901.16	0.00	0.10
	Debt Service					
	Materials & Services					
40-24-6811	2010 IFA Loan Principal	375,273.00	0.00	0.00	0.00	0.00
40-24-6822	2010 IFA Loan Interest	262,828.00	0.00	0.00	0.00	0.00
	Materials & Services	*638,101.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Debt Service	**638,101.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Expense	638,101.00	0.00	0.00	0.00	0.00
40	**WW GO Debt Service**	**624,899.00**	**274.22**	**334,819.95**	**0.00**	**53.58**
50	**WW Revenue Bond Debt Service**					
	NonDivisional					
	Beginning Fund Balance					
50-00-3500	Fund balance	682,000.00	0.00	678,562.56	0.00	99.50
	Beginning Fund Balance	*682,000.00*	*0.00*	*678,562.56*	*0.00*	*99.50*
	NonDivisional	**682,000.00**	**0.00**	**678,562.56**	**0.00**	**99.50**
	Fund Balance	682,000.00	0.00	678,562.56	0.00	99.50
	NonDivisional					
	Revenue					
50-00-4610	Investment revenue	16,084.00	557.07	1,799.04	0.00	11.19
	Revenue	*16,084.00*	*557.07*	*1,799.04*	*0.00*	*11.19*
	NonDivisional	**16,084.00**	**557.07**	**1,799.04**	**0.00**	**11.19**
	Transfers & Contingencies					
	Revenue					
50-29-4920	Transfer in from Fund 20	2,871,000.00	0.00	586,998.00	0.00	20.45
	Revenue	*2,871,000.00*	*0.00*	*586,998.00*	*0.00*	*20.45*

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Transfers & Contingencies	**2,871,000.00**	**0.00**	**586,998.00**	**0.00**	**20.45**
	Revenue	2,887,084.00	557.07	588,797.04	0.00	20.39
	Debt Service					
	Materials & Services					
50-24-6810	2010 SRF Loan Principal	910,550.00	0.00	453,101.00	0.00	49.76
50-24-6813	JPM Bank Loan Principal	1,356,000.00	0.00	0.00	0.00	0.00
50-24-6820	2010 SRF Loan Interest	327,958.00	0.00	133,897.00	0.00	40.83
50-24-6823	JPM Bank Loan Interest	374,576.00	0.00	0.00	0.00	0.00
	Materials & Services	*2,969,084.00*	*0.00*	*586,998.00*	*0.00*	*19.77*
	Debt Service	**2,969,084.00**	**0.00**	**586,998.00**	**0.00**	**19.77**
	Expense	2,969,084.00	0.00	586,998.00	0.00	19.77
50	**WW Revenue Bond Debt Service**	**600,000.00**	**557.07**	**680,361.60**	**0.00**	**113.39**
71	**Drinking Water Capital**					
	NonDivisional					
	Beginning Fund Balance					
71-00-3500	Fund balance	3,942,000.00	0.00	4,229,831.51	0.00	107.30
	Beginning Fund Balance	*3,942,000.00*	*0.00*	*4,229,831.51*	*0.00*	*107.30*
	NonDivisional	**3,942,000.00**	**0.00**	**4,229,831.51**	**0.00**	**107.30**
	Fund Balance	3,942,000.00	0.00	4,229,831.51	0.00	107.30
	NonDivisional					
	Revenue					
71-00-4610	Investment revenue	50,000.00	3,430.34	11,549.39	0.00	23.10
	Revenue	*50,000.00*	*3,430.34*	*11,549.39*	*0.00*	*23.10*
	NonDivisional	**50,000.00**	**3,430.34**	**11,549.39**	**0.00**	**23.10**
	Transfers & Contingencies					
	Revenue					
71-29-4910	Transfer in from Fund 10	500,000.00	41,666.67	125,000.01	0.00	25.00
	Revenue	*500,000.00*	*41,666.67*	*125,000.01*	*0.00*	*25.00*
	Transfers & Contingencies	**500,000.00**	**41,666.67**	**125,000.01**	**0.00**	**25.00**
	Revenue	550,000.00	45,097.01	136,549.40	0.00	24.83
	Drinking Water					
	Capital Outlay					
71-20-7540	Vehicles	35,000.00	0.00	0.00	0.00	0.00
71-20-7600	Capital Improvement Projects	1,480,000.00	11,126.86	147,553.01	98,080.00	9.97
	Capital Outlay	*1,515,000.00*	*11,126.86*	*147,553.01*	*98,080.00*	*9.74*
	Drinking Water	**1,515,000.00**	**11,126.86**	**147,553.01**	**98,080.00**	**9.74**
	Transfers & Contingencies					
	Transfers & Contingencies					
71-29-9000	Contingency	2,977,000.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*2,977,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Transfers & Contingencies	**2,977,000.00**	**0.00**	**0.00**	**0.00**	**0.00**

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Expense	4,492,000.00	11,126.86	147,553.01	98,080.00	3.28
71	**Drinking Water Capital**	**0.00**	**33,970.15**	**4,218,827.90**	**-98,080.00**	**0.00**
72	**Wastewater Reclamation Capital**					
	NonDivisional					
	Beginning Fund Balance					
72-00-3500	Fund balance	4,605,000.00	0.00	5,252,624.14	0.00	114.06
	Beginning Fund Balance	*4,605,000.00*	*0.00*	*5,252,624.14*	*0.00*	*114.06*
	NonDivisional	**4,605,000.00**	**0.00**	**5,252,624.14**	**0.00**	**114.06**
	Fund Balance	4,605,000.00	0.00	5,252,624.14	0.00	114.06
	NonDivisional					
	Revenue					
72-00-4610	Investment revenue	75,000.00	4,340.72	13,992.91	0.00	18.66
	Revenue	*75,000.00*	*4,340.72*	*13,992.91*	*0.00*	*18.66*
	NonDivisional	**75,000.00**	**4,340.72**	**13,992.91**	**0.00**	**18.66**
	Transfers & Contingencies					
	Revenue					
72-29-4920	Transfer in from Fund 20	1,000,000.00	83,333.33	249,999.99	0.00	25.00
	Revenue	*1,000,000.00*	*83,333.33*	*249,999.99*	*0.00*	*25.00*
	Transfers & Contingencies	**1,000,000.00**	**83,333.33**	**249,999.99**	**0.00**	**25.00**
	Revenue	1,075,000.00	87,674.05	263,992.90	0.00	24.56
	Wastewater-Plant					
	Capital Outlay					
72-21-7520	Equipment	100,000.00	0.00	15,900.01	0.00	15.90
72-21-7540	Vehicles	20,000.00	0.00	0.00	19,706.90	0.00
72-21-7600	Capital Improvement Projects	2,330,000.00	38,827.39	147,434.49	429,468.06	6.33
	Capital Outlay	*2,450,000.00*	*38,827.39*	*163,334.50*	*449,174.96*	*6.67*
	Wastewater-Plant	**2,450,000.00**	**38,827.39**	**163,334.50**	**449,174.96**	**6.67**
	Transfers & Contingencies					
	Transfers & Contingencies					
72-29-9000	Contingency	3,230,000.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*3,230,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Transfers & Contingencies	**3,230,000.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Expense	5,680,000.00	38,827.39	163,334.50	449,174.96	2.88
72	**Wastewater Reclamation Capital**	**0.00**	**48,846.66**	**5,353,282.54**	**-449,174.96**	**0.00**
73	**Watershed Protection Capital**					
	NonDivisional					
	Beginning Fund Balance					
73-00-3500	Fund balance	1,481,000.00	0.00	1,177,314.89	0.00	79.49
	Beginning Fund Balance	*1,481,000.00*	*0.00*	*1,177,314.89*	*0.00*	*79.49*
	NonDivisional	**1,481,000.00**	**0.00**	**1,177,314.89**	**0.00**	**79.49**

Account Number	Description	Budget	Period Amt	End Bal	Encumbered	% of Budget
	Fund Balance	1,481,000.00	0.00	1,177,314.89	0.00	79.49
	NonDivisional					
	Revenue					
73-00-4610	Investment revenue	40,000.00	1,034.86	3,732.53	0.00	9.33
	Revenue	*40,000.00*	*1,034.86*	*3,732.53*	*0.00*	*9.33*
	NonDivisional	**40,000.00**	**1,034.86**	**3,732.53**	**0.00**	**9.33**
	Transfers & Contingencies					
	Revenue					
73-29-4930	Transfer in from Fund 30	500,000.00	41,666.67	125,000.01	0.00	25.00
	Revenue	*500,000.00*	*41,666.67*	*125,000.01*	*0.00*	*25.00*
	Transfers & Contingencies	**500,000.00**	**41,666.67**	**125,000.01**	**0.00**	**25.00**
	Revenue	540,000.00	42,701.53	128,732.54	0.00	23.84
	Watershed Protection					
	Capital Outlay					
73-23-7600	Capital Improvement Projects	465,000.00	0.00	513.00	0.00	0.11
	Capital Outlay	*465,000.00*	*0.00*	*513.00*	*0.00*	*0.11*
	Watershed Protection	**465,000.00**	**0.00**	**513.00**	**0.00**	**0.11**
	Transfers & Contingencies					
	Transfers & Contingencies					
73-29-9000	Contingency	1,556,000.00	0.00	0.00	0.00	0.00
	Transfers & Contingencies	*1,556,000.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Transfers & Contingencies	**1,556,000.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Expense	2,021,000.00	0.00	513.00	0.00	0.03
73	**Watershed Protection Capital**	**0.00**	**42,701.53**	**1,305,534.43**	**0.00**	**0.00**
Revenue Total		**25,049,084.00**	**1,865,442.49**	**6,316,883.86**	**0.00**	**0.2522**
Expense Total		**38,971,185.00**	**1,271,389.14**	**5,095,872.55**	**836,193.32**	**0.1308**

General Ledger
Account Roll up

User: jeff
Printed: 10/12/2020 4:33:48 PM
Period 03 - 03
Fiscal Year 2021

Sort Level	Description	Budget	Period Amt	End Bal	% ExpendCollect
Revenue	Revenue				
4210	Water Sales - CRW	32,000.00	7,453.98	7,453.98	23.29
4211	Water sales	4,038,000.00	428,770.36	1,201,341.13	29.75
4212	Wastewater Charges	8,270,000.00	637,334.06	2,000,820.16	24.19
4213	Watershed protection fees	1,548,000.00	127,863.71	386,853.12	24.99
4215	Penalties & late charges	32,000.00	0.00	-127.79	-0.40
4220	System development charges	245,000.00	66,697.40	324,788.00	132.57
4230	Contract services	40,000.00	0.00	9,400.00	23.50
4240	Service installations	20,000.00	5,098.00	12,947.82	64.74
4280	Rents & leases	200,000.00	0.00	27,379.57	13.69
4290	Other charges for services	25,000.00	10,703.30	47,825.89	191.30
4320	State grants	0.00	13,884.60	16,835.77	0.00
4610	Investment revenue	203,084.00	10,877.28	36,023.80	17.74
4630	Miscellaneous revenues	33,000.00	9,343.13	16,094.40	48.77
4701	Interest Subsidy	111,000.00	0.00	0.00	0.00
4910	Transfer in from Fund 10	2,408,000.00	200,666.67	602,000.01	25.00
4920	Transfer in from Fund 20	6,709,000.00	252,166.66	1,343,497.98	20.03
4930	Transfer in from Fund 30	1,135,000.00	94,583.34	283,750.02	25.00
Revenue	Revenue	25,049,084.00	1,865,442.49	6,316,883.86	25.22
Expense	Expense				
5110	Regular employees	3,000,000.00	235,009.41	682,605.73	22.75
5120	TemporarySeasonal employees	42,000.00	0.00	0.00	0.00
5130	Overtime	107,000.00	13,267.14	26,642.63	24.90
5210	Employee Ins	690,000.00	50,072.32	147,778.82	21.42
5230	Social Security	240,000.00	18,646.30	53,230.67	22.18
5240	Retirement	616,000.00	45,700.85	130,685.13	21.22
5250	Trimet	23,000.00	1,832.58	5,429.70	23.61
5260	Unemployment	29,000.00	5,832.00	5,832.00	20.11
5270	Workers compensation	45,000.00	0.00	44,815.37	99.59
5290	Other employee benefits	29,000.00	3,240.00	3,303.95	11.39
6110	Legal services	375,000.00	1,839.00	7,738.50	2.06
6120	Accounting & audit services	45,000.00	14,431.81	27,167.45	60.37
6155	Contracted Services	732,000.00	58,146.94	74,118.94	10.13
6175	Records Management	5,000.00	364.50	1,117.78	22.36
6180	Dues & subscriptions	52,000.00	0.00	19,087.00	36.71
6220	Electricity	296,000.00	26,390.19	52,013.48	17.57
6230	Telephone	57,000.00	3,950.74	9,916.44	17.40
6240	Natual gas	5,000.00	323.66	638.80	12.78
6250	Solid waste disposal	81,000.00	3,139.59	17,819.82	22.00
6290	Other utilities	21,000.00	2,656.48	6,229.70	29.67
6310	Janitorial services	35,000.00	1,354.46	3,493.74	9.98
6320	Buildings & grounds	81,000.00	14,177.40	32,483.44	40.10
6330	Vehicle & equipment maint.	50,000.00	34.16	3,546.48	7.09
6340	Distribution system maint	250,000.00	11,117.78	19,311.82	7.72
6342	Collection system maint.	320,000.00	33,014.24	72,067.49	22.52
6350	Computer maintenance	237,000.00	15,205.90	60,833.31	25.67
6390	Other repairs & maintenance	40,000.00	7,595.40	10,982.51	27.46
6410	Mileage	6,000.00	0.00	0.00	0.00
6420	Staff training	80,000.00	90.00	235.00	0.29
6430	Certifications	7,000.00	158.00	428.00	6.11
6440	Board travel & training	7,000.00	22.00	22.00	0.31
6510	Office supplies	29,000.00	97.94	5,418.50	18.68

Sort Level	Description	Budget	Period Amt	End Bal	% ExpendCollect
6520	Fuel & oils	71,000.00	2,025.67	3,953.18	5.57
6525	Chemicals	26,000.00	1,553.75	6,853.85	26.36
6530	Small tools & equipment	46,000.00	89.99	1,438.42	3.13
6540	Safety supplies	48,500.00	1,441.07	4,245.52	8.75
6550	Operational Supplies	21,000.00	8,604.33	9,916.66	47.22
6560	Uniforms	22,000.00	3,508.73	8,298.48	37.72
6590	Other supplies	10,000.00	206.68	242.67	2.43
6610	Board compensation	2,500.00	0.00	0.00	0.00
6620	Election Costs	5,000.00	0.00	0.00	0.00
6710	Purchased water	1,084,000.00	0.00	265,216.06	24.47
6715	Water quality program	5,000.00	2,640.00	3,182.00	63.64
6720	Insurance	240,000.00	-210.00	-210.00	-0.09
6730	Communications	167,000.00	2,419.76	2,715.17	1.63
6740	Advertising	6,000.00	0.00	496.30	8.27
6750	Other purchased services	15,000.00	0.00	1,000.00	6.67
6760	Equipment Rental	4,500.00	222.20	230.65	5.13
6770	Bank charges	125,000.00	15,019.24	42,641.82	34.11
6780	Taxes & fees	21,000.00	5,479.13	13,556.69	64.56
6785	ECAP Payments	97,000.00	1,113.77	2,614.28	2.70
6810	2010 SRF Loan Principal	910,550.00	0.00	453,101.00	49.76
6811	2010 IFA Loan Principal	375,273.00	0.00	0.00	0.00
6813	JPM Bank Loan Principal	1,356,000.00	0.00	0.00	0.00
6814	Principal Payment-KS Statebank	54,233.00	54,233.33	54,233.33	100.00
6815	Zions Bank loan-principal	179,000.00	0.00	0.00	0.00
6820	2010 SRF Loan Interest	327,958.00	0.00	133,897.00	40.83
6822	2010 IFA Loan Interest	262,828.00	0.00	0.00	0.00
6823	JPM Bank Loan Interest	374,576.00	0.00	0.00	0.00
6824	Interest Paid-KS Statebank	8,325.00	8,324.28	8,324.28	99.99
6825	Zions Bank loan-interest	30,801.00	0.00	15,400.25	50.00
6900	Miscellaneous expense	4,000.00	0.00	0.00	0.00
6990	Special Payments	552,000.00	0.00	0.00	0.00
7520	Equipment	100,000.00	0.00	15,900.01	15.90
7540	Vehicles	55,000.00	0.00	0.00	0.00
7600	Capital Improvement Projects	4,275,000.00	49,954.25	295,500.50	6.91
8105	Transfers out to Fund 05	4,569,000.00	380,750.00	1,142,250.00	25.00
8140	Transfers out - Fund 40	812,000.00	0.00	0.00	0.00
8150	Transfers out - Fund 50	2,871,000.00	0.00	586,998.00	20.45
8171	Transfers out - Fund 71	500,000.00	41,666.67	125,000.01	25.00
8172	Transfers out - Fund 72	1,000,000.00	83,333.33	249,999.99	25.00
8173	Transfers out - Fund 73	500,000.00	41,666.67	125,000.01	25.00
9000	Contingency	10,215,141.00	0.00	0.00	0.00
Expense	Expense	38,981,185.00	1,271,753.64	5,096,990.33	13.08
Grand Total		**-13,932,101.00**	**593,688.85**	**1,219,893.53**	**-0.0876**
Fund Balance Total		**0.00**	**0.00**	**0.00**	**0**
Revenue Total		**25,049,084.00**	**1,865,442.49**	**6,316,883.86**	**0.2522**
Expense Total		**38,981,185.00**	**1,271,753.64**	**5,096,990.33**	**0.1308**

BOARD OF DIRECTORS
[REMOTE] SPECIAL MEETING MINUTES – 1:00 P.M.
SEPTEMBER 10, 2020

<u>Board of Directors – Members Present via Zoom</u>:

Kevin Williams	President
Paul Gornick	Secretary/Vice President
Mark Knudson	Treasurer
Susan Keil	Director
Ginny Van Loo	Director

<u>Oak Lodge Water Services Staff – Present via Zoom</u>:

Sarah Jo Chaplen	General Manager
Gail Stevens	Finance Director
Aleah Binkowski-Burk	Human Resources/Payroll Manager
David Mendenhall	Plant Operations Manager
Laural Casey	District Recorder
Lara Christensen	Water Quality Coordinator

<u>Consultants & Presenters – Present via Zoom</u>:

Laura Westmeyer	Cable Huston, LLP
Libby Barg Bakke	Barney & Worth
Aubrie Koenig	Barney & Worth
Pat McCormick	AM:PM PR
Rob Moody	Merina + Company

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1. Call to Order & Meeting Facilitation Protocols

President Williams called the meeting to order at 1:00 p.m.

General Manager Chaplen welcomed everyone and asked District Recorder Casey to facilitate a roll call. District Recorder Casey facilitated the roll call of Board members, staff, and consultants.

General Manager Chaplen introduced guest Sherry French, President of the Clackamas River Water Board of Commissioners, visiting in an official capacity

General Manager Chaplen overviewed the general protocols of a virtual meeting due to the COVID-19 pandemic.

2. Call for Public Comment

President Williams asked District Recorder Casey if any written comments had been submitted. District Recorder Casey stated there were none.

President Williams asked District Recorder Casey if there were any members of the public in attendance. District Recorder Casey stated there were none.

3. Community Briefing Materials and Communications Workshop

Consultant Barg Bakke detailed the workshop agenda and the purpose of the PowerPoint presentation. Consultant McCormick introduced himself and his role in providing materials for the District's communication plan. He overviewed the District's demographics.

Secretary/Vice President Gornick asked if the District's lower education level demographic could present a challenge when communicating with customers about complex financial issues. Consultant McCormick stated lower education level would not present a significant challenge but would be something to consider when communicating and creating materials.

President Williams expressed surprise regarding the District being home to more renters than the County's demographic. Consultant McCormick believed the residents of Willamette View and Rose Villa may have skewed the data towards apartment dwellers. Director Keil expressed interest in knowing where mobile homes were included in the demographics. Treasurer Knudson explained that the County's data may also be skewed by communities like Happy Valley comprised largely by single family homes. Director Van Loo asked if the data was compiled using just the Oak Lodge community or if it was reflective of the entire District. Consultant McCormick confirmed the data was compiled using the District's boundaries.

Consultant McCormick overviewed the generational differences related to the mediums in which the public receives news and current trends in how news is accessed. Director Van Loo observed the data reflected the larger Portland area and asked how it affected the District's twenty-seven thousand customers. Consultant McCormick explained the District is part of the Portland area, but a very small fraction of it. He stated the Portland data should be analyzed and used only as a general guide for the District.

Consultant McCormick continued to outline other trends affecting the state of current news media and explained how the District could use the data to develop a communications strategy.

Director Keil stated it was hard to believe that the public getting their news from social media would want news or information from the District. Consultant McCormick explained that developing a connection with the community through social media is just one way the District could reach the public. Consultant Barg Bakke added the importance for the public to understand what their role is in the District's services and how social media algorithms could aid in connecting interested parties with the District.

Consultant McCormick discussed the mechanics of building a communications plan by building the organization's priorities, situation analysis, messaging, identifying audiences, and outline strategies.

General Manager Chaplen asked if the high retirement age and increasing home values in the District indicated a trend that would result in an influx of younger and higher-educated residents in the District. Consultant McCormick confirmed the validity of the statement reflected the data.

Secretary/Vice President Gornick commented on the striking slide regarding age demographics in the United States, particularly the population of Generation Z. Consultant McCormick agreed and highlighted the fact that people from the younger generations are driving communication technology changes.

Plant Operations Manager Mendenhall asked what geographical areas the Portland media market consisted of. Consultant McCormick stated the market was comprised of parts of southwest Washington, the Tri-County area, and parts of Yamhill and Marion Counties. He reiterated the data of the predominance of newsrooms being on the east coast.

Treasurer Knudson stated the COVID-19 pandemic may only further accelerate and perpetuate the limiting of the media's direct access and local interviews. Consultant McCormick highlighted the book Ghosting the News, which explores those views in depth. Water Quality Coordinator Christensen explained the District's area is unique due to the communication coalitions like Pamplin Media and Oregon Public Broadcasting who are focused on local communities. She stated the District is fortunate to have a strong relationship with the Clackamas Review as well. Director Keil understood the need to publish "feel good" messages about pollution prevention or other District work but believed the more important messaging was on how the District was spending the customer's money. Directors Keil and Van Loo discussed the importance of staying on message and what types of messages were important for District customers to receive.

Consultant Barg Bakke overviewed the sample PowerPoint and addressed the written comments received from various Board members.

Financial Consultant Moody mentioned advertising the District's decision to temporarily suspend water shut offs may not be the best business decision. Treasurer Knudson agreed and offered a refinement of the message. Director Keil thought the slide might not be in the correct place and could be saved for the Q&A section. General Manager Chaplen explained the balancing of water provider messaging and what is enough for the District. Director Van Loo suggested a new order to the bullet points on the page. Consultant Barg Bakke agreed to make the changes discussed.

Consultant Barg Bakke continued her presentation highlighting the PowerPoint slide regarding District partnerships. Director Van Loo asked for Rex Putnum High School's name to be added to the list of partnerships the District maintains. Treasurer Knudson added the Regional Coalition for Clean Rivers and Streams. Director Keil asked if the public would care about the District's partnerships. Consultant Barg Bakke explained the versatility of the PowerPoint and the ability to modify it as needed. Treasurer Knudson noted the approach to present the slide in a way to highlight the strengths the partnerships afford the District and the consistency in messaging.

Consultant Barg Bakke discussed the messaging regarding the reliability of District services.

Director Van Loo asked for clarification of the message about the Water Master Plan as many people would not know the importance of the plan being approved.

Director Van Loo, Consultant Barg Bakke, and General Manager Chaplen discussed reframing the water audit message to include cost savings language.

Director Van Loo thought adding the fact the District was required to make seismic improvements for the reservoirs was important to note given that it did cost the District money. Director Keil discussed prioritization and identification of deficiencies. Treasurer Knudson noted the messaging should focus on the benefits or outcomes of the improvements. Director Van Loo noted the similar need to focus on the benefits or outcomes regarding leaking water pipes. President Williams agreed and reframed the bullet point to highlight the District's leak detection program and make the emphasis related to asset management.

Consultant Barg Bakke overviewed the slides pertaining to the District's "hot topics," explaining that the PowerPoint could be updated to include new information as future master plans were adopted.

Director Van Loo commented on the Surface Water Management slide that stated additional services would require more resources. She specifically asked when the resources would be needed. General Manager Chaplen stated she had received concerned messages from the public worried about quantity of services, not just quality. She noted that additional resources would be determined by the level of services the public requested. Director Keil noted the importance of highlighting the conversations the District is having with customers, so it is known that the public is driving the District's decision making. Treasurer Knudson asked if this is the slide to discuss the relationship between the County and the District regarding stormwater responsibilities. There was discussion on how to have conversations with the public about the cost of requested services. Consultant Barg Bakke stated she could supply an informational graphic that could help the conversations as well. There was further discussion related to explaining the shared responsibility of stormwater with the County.

Consultant Barg Bakke presented the slide highlighting operational efficiencies due to the District consolidation.

Director Keil asked what "identify lead for asset management" meant. Consultant Barg Bakke described the lead as the person in charge of the program. Director Keil stated the line should be removed from the slide and focus on the consolidation of the asset management systems. Secretary/Vice President Gornick offered *developed a more robust asset management system* as a reframe of the idea.

Director Keil stated the building consolidation and development was not on hold because of COVID-19, noting it was because the District does not have the money. Consultant Barg Bakke asked if a separate slide about building consolidation would be preferable. Treasurer Knudson confirmed the topic would be better served with a separate slide and to focus on the District's efforts to find efficient and affordable solutions. There was discussion about the urgent infrastructure issues that were identified as more of a priority than building consolidation, which has put the project on hold. Director Van Loo and President Williams noted the presence of staff in both buildings and the inability to sell the buildings while they are in use. Director Keil stated the original building consolidation estimates were vastly understated. President Williams agreed.

Consultant Barg Bakke moved on to the next slide regarding rate increases. Director Van Loo stated the messaging was never that there would not be rate increases after consolidation, but that consolidation would save money. Director Keil noted that the message was rates would be less due to cost savings. Secretary/Vice President Gornick offered to replace the word *steady* with *smaller*. General Manager Chaplen stated the amount of yearly rate increase is not known. Director Van Loo proposed taking the line out altogether. President Williams asked if the other Board members remembered the historical rate increase projections of twenty percent a year stating the rate increases since consolidation have not been that high. Director Keil noted the high sensitivity to rate increases due to the demographics of the District. General Manager Chaplen noted the difference between rate increases and rate spikes stating there needs to be customer education regarding the District's aging infrastructure and the inevitability that service rates will continue to increase. She also highlighted the public comments given during the last budget adoption process were from a self-selected group of people and not necessarily a representation of the entire District's customers. Consultant Barg Bakke and Director Keil discussed reframing the question and focusing on cost drivers like new regulations and increased costs for materials and services. Director Keil added that using the term *employee benefits* is better than *providing medical and retirement benefits*. She also thought that the fact that the District is taking care of problems not addressed previously needed to be interwoven into the PowerPoint because if the problems did not need to be fixed now, the costs would be lower.

Consultant Barg Bakke overviewed the slide regarding the process of the District becoming an authority. President Williams wanted to make clear that the process for becoming an authority was not driven by the District and needed to come from the community. Consultant Barg Bakke asked if the community could advocate for becoming an authority even if the District did not want to become an authority. President Williams and Director Van Loo stated it was probable. Director Keil stated the Board was able to educate the public on the process and the fact that the cost of service would be the same for an authority as a district. we are out in the community to raise this issue to give pros and cons. There was discussion regarding the cost of service and the status of the process to become an authority. Director Van Loo suggested to remove the slide from the current presentation and create an entire presentation on becoming an authority. Director Keil stated the slide could remain in the presentation and a separate presentation on the issue could still be created. Director Keil asked for clarification on when the District may engage in public discourse regarding becoming an authority. General Manager Chaplen stated District legal counsel would need to review the slide and give a legal guidance on how the District was able to proceed. Treasurer Knudson asked for District legal counsel to review the forthcoming standalone presentation on the issue.

Consultant Barg Bakke and General Manager Chaplen discussed the creation of a general customer service address to include on the last slide of the presentation. Consultant Barg Bakke thanked the Board for their input and discussed next steps.

4. Consideration of Personal Services Contract for a Utility Rate Study

Consultant Moody summarized the proposed resolution and the purpose of a comprehensive rate study. He outlined the scope, costs, and timeline of the study.

Director Keil asked what the urgency was to complete a rate study. Consultant Moody answered and General Manager Chaplen clarified the rate study would provide a consolidated approach to the financial forecasting model used in the upcoming budget season. General Manager Chaplen explained the rate study to be the next step in consolidating the District as has been done with asset management and master plans. Director Keil stated the rate study felt out of sync with the District’s trajectory given the uncompleted Sanitary Master Plan and the unknown conditions of the water system. Director Van Loo agreed and was not pleased with the increase in cost of conducting the study. Consultant Moody explained he was at fault for the perceived increase and that the placeholder of fifty thousand dollars was just a best guess when creating the budget.

Director Van Loo noted the scope of the study was not consistent when referring to the District’s services. General Manager Chaplen clarified the difference between service levels and the service rates. She explained the best practice for a rate study to inform the budget and confirmed the Board’s consensus that the issue was whether now was the correct time to conduct a rate study.

Director Keil asked if this was the number one priority for the District. General Manager Chaplen explained the importance of the rate study. She stated a one-year delay would be acceptable, but that a five-year delay while the District’s stormwater program is established would be too long. President Williams emphasized the District’s need for a long-term plan using the best information possible to inform long-term rate planning. Director Keil stated the study would need real data, which the District does not yet have. Treasurer Knudson outlined the fundamental problem of good input and the inability to have a clear picture of rates without a completed rate study. He emphasized the rate study as a tool and suggested moving forward while understanding the limitations.

Treasurer Knudson stated his unease with sole sourcing the project to Galardi Rothstein. Director Keil agreed. Treasurer Knudson stated the process should be transparent and the District should be clear on the scope and deliverables when soliciting proposals.

General Manager Chaplen outlined the Board’s input regarding delaying the rate study and conducting a selection process of candidates. President Williams noted preference to wait a year to conduct a rate study at which time a selection process could be performed. Director Keil clarified that if the product of the rate study was only the model and would not be used to inform the budget process, that the study could be delayed. President Williams stated delaying the study should not constrain the upcoming budget/rate process. Treasurer Knudson agreed to delay the rate study stating preference to conduct a selection process for the consultant. General Manager Chaplen restated her commitment to iterative improvement of the financial forecasting model. Secretary/Vice President Gornick stated his concern with sole sourcing and agreed to table the rate study.

5. Public Records Policy Workshop

District Recorder Casey overviewed the proposed Public Records Policy highlighting the type of records included in the policy and associated fees.

Secretary/Vice President Gornick asked if the policy was model language from the State or the Special Districts Association of Oregon. District Recorder Casey stated it was a blend of samples from cities and special districts in the area and had been carefully edited by District legal counsel Westmeyer.

Director Van Loo asked how the fees were determined. District Recorder Casey detailed her research of fees used by local special districts and the Cities of Milwaukie, Gladstone, and Oregon City.

Director Keil clarified the type of records included in the policy and subject to fees. District Recorder Casey explained the type of records mandated by state law to be provided to the public and the situations in which the public would be asked to pay fees. General Manager Chaplen explained the type of public records requests that have been received by the District. District legal counsel Westmeyer explained District Recorder Casey's discretionary decision to include thirty minutes of complimentary research time for every public records request in the proposed policy, noting the District's legal right to charge fees for every minute spent.

Treasurer Knudson and Secretary/Vice President Gornick approved of the policy.

6. Call for Public Comment

President Williams asked District Recorder Casey if there were any members of the public still in attendance. District Recorder Casey confirmed there were none.

7. Adjourn Meeting

President Williams adjourned the meeting at 4:01 p.m.

Respectfully submitted,

______________________________	______________________________
Kevin Williams President, Board of Directors	Paul Gornick Secretary/Vice President, Board of Directors
Date:__________________________	Date: __________________________

BOARD OF DIRECTORS
[REMOTE] REGULAR MEETING MINUTES – 6:00 P.M.
SEPTEMBER 15, 2020

Board of Directors – Members Present via Zoom:

Kevin Williams	President
Paul Gornick	Secretary/Vice President
Mark Knudson	Treasurer
Susan Keil	Director
Ginny Van Loo	Director

Oak Lodge Water Services Staff – Present via Zoom:

Sarah Jo Chaplen	General Manager
Jason Rice	District Engineer
Aleah Binkowski-Burk	Human Resources/Payroll Manager
David Mendenhall	Plant Operations Manager
Todd Knapp	Field Operations Manager
Gail Stevens	Finance Director
Brad Lyon	Field Operations Supervisor
Laural Casey	District Recorder
Haakon Ogbeide	Water Services Engineer

Consultants & Presenters – Present via Zoom:

Laura Westmeyer	Cable Huston, LLP

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1. Call to Order & Meeting Facilitation Protocols

President Williams called the meeting to order at 6:04 p.m.

General Manager Chaplen welcomed everyone and asked District Recorder Casey to facilitate a roll call. District Recorder Casey facilitated the roll call of Board members, staff, and consultants.

General Manager Chaplen introduced guests visiting in an official capacity: Chris Hawes, Chair of the Sunrise Water Authority Board of Commissioners, and Sherry French, President of the Clackamas River Water Board of Commissioners.

General Manager Chaplen overviewed the general protocols of a virtual meeting due to the COVID-19 pandemic.

2. Call for Public Comment

President Williams asked District Recorder Casey if any written comments had been submitted. District Recorder Casey stated there were none.

President Williams asked District Recorder Casey if there were any members of the public in attendance. District Recorder Casey stated there was one.

The member of the public remained muted.

3. Consent Agenda

Secretary/Vice President Gornick asked what Budget line the Biosolids Hauling Contract was budgeted in. Plant Operations Manager Mendenhall clarified the Solid Waste Disposal line was for Madison Farms and that the Contracted Services line is for the current contract.

Treasurer Knudson asked about the nine expired Time-Payment Agreements (TPAs) and what the plan was moving forward. Finance Director Stevens stated the Billing team will be following up with every TPA each month, including phone calls to customers who are delinquent. Treasurer Knudson noted the need for a plan of how to approach non-responsive delinquent customers.

Treasurer Knudson asked what special powers the State of Emergency allowed the District to exercise and if there was a point at which the continued extensions would not be necessary. General Manager Chaplen explained the State of Emergency enabled the District to conduct emergency procurement of goods and services, as well as allowed the District to remain eligible for future federal and state grants related to the pandemic. Director Van Loo asked if the declaration could be extended until the end of the year. Director Keil stated she was more comfortable approving the extension month by month.

In regard to the short-term storage of biosolids at the Plant, Treasurer Knudson asked what the duration of storage would be. Plant Operations Manager Mendenhall explained the biosolids would be hauled away twice a week meaning there would be storage of biosolid materials for three to four days at a time. Secretary/Vice President Gornick remembered winter closures of Interstate 84 had caused problems when hauling the biosolids to Madison Farms. Plant Operations Manager Mendenhall stated there is room at the plant to accommodate seasonal anomalies. Treasurer Knudson asked if odors would be an issue. Plant Operations Manager Mendenhall stated odor suppression was part of the District's agreement with the Department of Environmental Quality and explained the various ways staff would be ensuring odors did not cause problems for the surrounding residents. Secretary/Vice President Gornick asked if the temporary storage facility was different than the decant facility. Plant Operations Manager Mendenhall confirmed they were different facilities with the biggest difference being the temporary storage facility was covered.

Director Keil complimented Finance Director Stevens on the Monthly Financial Report including the highlight of revenue and expenditure lines.

Director Keil asked if the District's water purchase was higher due to customer demand. Finance Director Stevens confirmed customer consumption was high, even higher than 2019, but that it was common for the time of year.

Director Keil noted the workers' compensation percentage of budget were high. Finance

Director Stevens explained workers’ compensation insurance is paid once a year.

Director Keil asked why the solids piping project winning bid was so low in comparison to the engineer’s estimate. Water Services Engineer Ogbeide explained he had the same question and speculated that the large contracting firm was simply looking for a small filler project.

Director Keil asked why the biosolids hauling contract was not awarded to the lowest bidder. Plant Operations Manager Mendenhall explained the scoring structure used and that the approach and equipment used by the lowest bidder were not acceptable for the District’s standards.

Director Keil asked when the failing ductile iron pipe had been installed on Partridge Circle. Field Operations Manager Knapp answered with approximately the mid-1970s, which means the pipe had only lasted fifty of the anticipated one hundred years. He explained it was an electrolysis issue. Secretary/Vice President Gornick asked if there were underground utilities in the neighborhood. Field Operations Manager Knapp confirmed.

Finance Director Stevens pointed out the grant money received through the CARES Act as outlined in the Monthly Financial Report. Treasurer Knudson noted he had seen more opportunities for reimbursement money and encouraged staff to continue to apply.

Secretary/Vice President Gornick moved to adopt the Consent Agenda. Treasurer Knudson seconded. President Williams asked District Recorder Casey to conduct a roll call vote. Voting Aye: President Williams; Secretary/Vice President Gornick; Treasurer Knudson; Directors Keil and Van Loo.

MOTION CARRIED

There was discussion on what types of items should be included on the Consent Agenda. It was confirmed that any item included could be removed from the Consent Agenda for further discussion and modification.

4. Consideration of Resolution No. 2020-14 Approving a Budget Transfer for the FY 2021 Adopted Budget

Finance Director Stevens explained the purpose and actions of the proposed transfer resolution.

Treasurer Knudson asked if the workers’ compensation allocations discussed during the August 18, 2020 meeting had been addressed. Finance Director Stevens stated that item was missed in the creation of the proposed transfer resolution and would be included in the next budgetary true-up.

President Williams called for a motion. Director Keil moved to approve Resolution No. 2020-14 Approving a Budget Transfer for the FY 2021 Adopted Budget. Secretary/Vice President Gornick seconded. President Williams asked District Recorder Casey to conduct a roll call vote. Voting Aye: President Williams; Secretary/Vice President Gornick; Treasurer Knudson; Directors Keil and Van Loo.

MOTION CARRIED

5. Protective Footwear Policy Workshop

Human Resources/Payroll Manager Binkowski-Burk reviewed the proposed Protective Footwear Policy related to the current Collective Bargaining Agreement.

Treasurer Knudson acknowledged some of his most difficult employee conversations in his own work had been regarding boots. He expressed support of the proposed policy.

President Williams stated three hundred dollars was a generous boot allowance.

Secretary/Vice President Gornick noted the policy did not address boot height. Human Resources/Payroll Manager Binkowski-Burk stated boot height is addressed in the national standards that are part of the policy requirements.

6. Departments Reports

- **Human Resources/Payroll Report**

Human Resources/Payroll Manager Binkowski-Burk highlighted changes to the payroll process that have improved efficiency and accuracy. She noted the District would now be able to move towards electronic timekeeping using the District's financial software. Human Resources/Payroll Manager Binkowski-Burk overviewed the District's temporary mask policy, upgrades made to the HVAC systems, and the open Outreach and Education Coordinator employment position.

Secretary/Vice President Gornick asked if the District had any difficulty sourcing the masks provided to staff during the pandemic. Human Resources/Payroll Manager Binkowski-Burk summarized early difficulty finding personal protective equipment for staff and the partnerships the District had entered to obtain adequate masks and disinfecting supplies. She reported that Field Operations Supervisor Lyon had acquired extra N95 masks for use during the wildfires when air quality was poor. General Manager Chaplen commended staff for their dedication during the rapid succession of disasters; the pandemic, windstorms, electrical outages, and wildfire evacuations.

Treasurer Knudson asked how well the upgraded HVAC system filtered wildfire smoke. Human Resources/Payroll Manager Binkowski-Burk stated the office air was pretty good.

- **Finance Report**

Finance Director Stevens overviewed revenue, which was slightly down compared to the previous year, and the 2019-2020 fiscal year audit, which was almost complete. She reported on the work orders that have been entered into the Lucity software and the upcoming work on workflows and reporting. Finance Director Stevens gave an update on the purchase order project being completed by consultants from Merina + Co. She also discussed water meter testing and verification work with Field Operations Supervisor Lyon.

Finance Director Stevens detailed the recent Finance Sub-Committee Meeting regarding accounts receivable tracking and verified the Board's commitment to District Code regarding owner-tenant financial responsibility. President Williams stated he favored the District's Code and property owner responsibility model. Secretary/Vice President Gornick agreed. Director Van Loo worried it would only cause owners to raise rent and asked what services the owners would be responsible for. Finance Director Stevens stated they would be responsible for all three: drinking water, wastewater, and watershed protection. Director Van Loo asked why the District would allow any account to be delinquent for three years. Finance Director Stevens replied that she would not. Director Keil and Treasurer Knudson stated the issue had been previously unchecked, noting the best way to fix the issue was to move forward. Finance Director Stevens confirmed following District Code would make the collection process easier.

Director Keil asked if the capital asset inventory to be completed in September include surface water assets and what size assets would be counted. Finance Director Stevens stated she needed to clarify the level at which the auditors had suggested an annual inventory. She speculated that large, fixed assets such as vehicles would be counted. There was discussion on the size of assets most commonly accounted for and the use of District asset management software.

Secretary/Vice President Gornick asked whether the sixty-day delinquent accounts with larger balances were commercial or residential accounts. Finance Director Stevens explained the delinquent accounts were a mix and that most had not made payments in a long time. She discussed the need for express policies regarding managing delinquent accounts.

- **Technical Services Report**

District Engineer Rice reported the MS4 permit issuance has been delayed. He highlighted staff work on copper and lead sampling and inspections. District Engineer Rice gave an update on the Risk and Resiliency Analysis and the Water System Development Charge notification process for feedback. He thanked the Board for supporting the projects approved earlier in the meeting.

Director Van Loo asked if storm water work would resume. District Engineer Rice confirmed work on a request for proposals (RFP). Director Van Loo expressed concern about not having a plan and asked when the Storm Water Committee would meet again. District Engineer Rice stated the RFP needed to be finalized first and summarized the unique needs that would need to be analyzed by a consultant. There was discussion regarding if the Storm Water Committee should focus on the identified levels of storm water service as the framework for the consultant's study. District Engineer Rice discussed the relation of fees to increased services. There was discussion on how to calculate the rate impacts of a storm water program. Director Keil stated customers would need to decide if the cost of providing storm water service was worth it. Director Van Loo believed many customers did not know what they are currently paying for. President Williams reported on the time it has taken to educate the leadership of the Jennings Lodge Community Planning Organization that the District is responsible for the quality of water, not the quantity. He asked for clarification on the RFP. District Engineer Rice stated it would be for some level of financial analysis and a plan for the cost of various levels of service. He asked if rate increases due to increased services would be considered by the Board. Director Van Loo stated customers would want to know what services they would be provided and how much it would cost. District Engineer Rice discussed the swale construction and maintenance agreement underway with Clackamas County. General Manager Chaplen spoke to the difficulty of establishing new assets with no rate increase to fund maintenance. Director Keil stated the entire Board would need to meet with the Storm Water Committee to address the issues. There was discussion regarding the most recent Storm Water Committee meeting and plans to move forward.

- **Field Operations Report**

Field Operations Manager Knapp highlighted the second annual source meter testing results and reservoir maintenance needs. He reported Field Operations Supervisor Lyon had removed several large meters and test results were expected back soon. Field Operations Manager Knapp detailed the work of the water and collections teams.

President Williams asked about the work by Brix Paving. Field Operations Supervisor Lyon stated the completed work was temporary and would be replaced according to the new County standards. General Manager Chaplen added a discussion regarding costs to meet new standards would be needed during the next fiscal year budget. District Engineer Rice stated he had discussions regarding the new County standards with other water partners noting the feedback had been concern regarding the removal of old assets. President Williams asked why the standards had been changed. Field Operations Manager Knapp stated the County had adopted Oregon Department of Transportation standards.

- **Plant Operations Report**

Plant Operations Manager Mendenhall reported on the new biosolids storage. He highlighted two electrical outages: one in August and one in September. In August two aeration basins lost power possibly due to a crushed conduit under the aeration basins and faulty breakers. He spoke to the September electrical outage at Pump Station 2 that would be covered in more detail during the next regular meeting.

Treasurer Knudson asked if there was a structural issue in or under the basin that had been missed. Plant Operations Manager Mendenhall speculated there could have been settling. Treasurer Knudson agreed the issue would need to be investigated to avoid future structural impacts. There was discussion regarding the identified structural and electrical issues.

Plant Operations Manager Mendenhall reported the coliform violation from March 2020 had been resolved. He detailed the pump station spill that had resulted from the electrical outage and Department of Environmental Quality notification.

7. Call for Public Comment

President Williams asked District Recorder Casey if there were any members of the public still in attendance. District Recorder Casey confirmed there was one that remained muted.

8. Business from the Board

Secretary/Vice President Gornick reported on the Sunrise Water Authority meeting highlighting property and reservoir purchases. He attended the C4 meeting that covered HB 2001 draft ORS rules and an Executive Committee letter regarding the Interstate tolling.

Treasurer Knudson reported on a Water Research Foundation presentation regarding a utility data maturity model. He attended the Oak Grove Community Council meeting that provided an update on the County's response to COVID-19, a proposed children's safety levy, and a Clackamas County resolution condemning racism. Treasurer Knudson reported on the Regional Water Providers Consortium meeting highlighting how reduced Consortium spending will reduce membership rates. He summarized a conversation with Joseph Edge regarding the METRO/incorporation study and River Forest Lake. Treasurer Knudson stated he had been approached to participate on a Clackamas County Business Alliance panel and asked for Board support which he received.

President Williams noted the Clackamas Review newspaper article written by Director Keil.

Director Van Loo reported North Clackamas Chamber of Commerce meeting that covered the METRO bond. Directors Van Loo and Keil discussed the bond lobbyists and changing nature of the bond messaging.

President Williams reported on the Jennings Lodge Community Planning Organization meeting where Jennings Avenue improvement plans were reviewed, and MAP-IT conducted a 20-year vision exercise for the McLoughlin Boulevard area.

9. Adjourn Meeting

President Williams adjourned the meeting at 8:44 p.m.

Respectfully submitted,

______________________________	______________________________
Kevin Williams President, Board of Directors	Paul Gornick Secretary/Vice President, Board of Directors
Date:__________________________	Date: __________________________

BOARD OF DIRECTORS
[REMOTE] SPECIAL MEETING MINUTES – 2:30 P.M.
OCTOBER 2, 2020

Board of Directors – Members Present via Zoom:

Kevin Williams	President
Paul Gornick	Secretary/Vice President
Mark Knudson	Treasurer
Susan Keil	Director
Ginny Van Loo	Director

Oak Lodge Water Services Staff – Present via Zoom:

Sarah Jo Chaplen	General Manager
Jason Rice	District Engineer
Gail Stevens	Finance Director
Aleah Binkowski-Burk	Human Resources/Payroll Manager
David Mendenhall	Plant Operations Manager
Todd Knapp	Field Operations Manager
Laural Casey	District Recorder

Consultants & Presenters – Present via Zoom:

Tommy Brooks	Cable Huston, LLP

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1. Call to Order & Meeting Facilitation Protocols

President Williams called the meeting to order at 2:33 p.m.

General Manager Chaplen welcomed everyone and asked District Recorder Casey to facilitate a roll call. District Recorder Casey facilitated the roll call of Board members, staff, and consultants.

General Manager Chaplen overviewed the general protocols of a virtual meeting due to the COVID-19 pandemic.

2. Call for Public Comment

President Williams asked District Recorder Casey if any written comments had been submitted. District Recorder Casey stated there were none.

President Williams asked District Recorder Casey if there were any members of the public in attendance. District Recorder Casey stated there was one.

Lynn Fisher stated he was listening in.

3. Consideration of Notary Services Policy

Human Resources/Payroll Manager Binkowski-Burk reported the proposed Notary Services Policy had been approved by the Union.

President Williams called for a motion. Director Keil moved to approve the Notary Services Policy. Treasurer Knudson seconded. President Williams asked District Recorder Casey to conduct a roll call vote. Voting Aye: President Williams; Secretary/Vice President Gornick; Treasurer Knudson; Directors Keil and Van Loo.

MOTION CARRIED

4. Consideration of Public Records Policy

District Recorder Casey reported the proposed Public Records Policy had been approved by the Union as presented.

President Williams called for a motion. Secretary/Vice President Gornick moved to approve the Public Records Policy as presented. Directors Keil and Van Loo seconded. President Williams asked District Recorder Casey to conduct a roll call vote. Voting Aye: President Williams; Secretary/Vice President Gornick; Treasurer Knudson; Directors Keil and Van Loo.

MOTION CARRIED

5. Water System Development Charges and Accessory Dwelling Unit Fees Workshop

District Engineer Rice overviewed the purpose of the workshop, defined system development charges (SDCs), and detailed how the District's SDCs are currently calculated.

Secretary/Vice President Gornick asked if the "minor changes" which do not trigger SDCs were currently outlined. District Engineer Rice confirmed they are included in the District's Rules and Regulations.

Director Van Loo asked if the SDC was based on how many people live in a single residence. District Engineer Rice stated the District does not track the number of people per residence, noting that each residence accounted for one unit at the Treatment Plant.

District Engineer Rice overviewed the methodology used in calculating SDCs including reimbursements, improvements, and administrative fees.

Director Keil asked if the administration fee amount was spread across all SDCs. District Engineer Rice stated the calculations for the Water Master Plan is purely for the water program but would verify with the District's financial consultant. Director Keil and District Engineer Rice agreed the rationale was not to overcharge.

District Engineer Rice gave examples of SDC calculation variables by comparing other service providers with the District.

District Engineer Rice detailed the eligibility requirements for SDC reimbursement fees. Director

Keil asked if the current funds received as SDC fees were being sequestered. Finance Director Stevens stated they were accounted for in compliance with State regulations. She explained that SDC revenue has not covered ongoing capital projects and is currently being supplemented by the General Fund. Secretary/Vice President Gornick asked if the District had a choice regarding how to use SDC revenue. Finance Director Stevens explained the revenue use was dependent on how it was classified. Treasurer Knudson noted the need for careful segregation of expenses and the teamwork between Finance and Engineering to identify eligible expenses. There was discussion regarding ensuring all eligible expenses are documented accurately.

President Williams asked what currently funded capital improvement projects if not the collection of SDC revenue. District Engineer Rice stated the rates were used to supplement ongoing growth of infrastructure. He explained the importance of maintaining updated master plans as a way of analyzing infrastructure needs.

District Engineer Rice detailed eligible improvement fees and summarized current District SDC calculations for sanitary sewer, drinking water, and watershed protection (storm water).

Treasurer Knudson asked if the County collected a storm water SDC. District Engineer Rice confirmed and noted there is currently no County capital improvement plan to grow storm water infrastructure within the District. Director Keil asked if the County's Gas Tax was used for road maintenance. District Engineer Rice stated the collected revenue could be used that way. District Engineer Rice and Director Keil discussed the County's progress towards a road maintenance plan. General Manager Chaplen clarified the overall plan was for road maintenance and that there was not an overall plan for storm water service. District Engineer Rice explained the County would need to revise their road maintenance plan to meet District storm water standards. There was discussion regarding the County and District relationship regarding surface/storm water.

Secretary/Vice President Gornick asked if Water Environmental Services (WES) charged a watershed protection fee. District Engineer Rice confirmed a watershed protection fee is collected by WES, but not within the District's boundaries.

District Engineer Rice overviewed Accessory Dwelling Units (ADUs) highlighting the various definitions used by service providers and governmental entities. Director Keil asked if the District could define what is considered an ADU within the District. District Engineer Rice stated District legal counsel would need to verify the District's authority to define an ADU. Director Keil asked if the SDC could be calculated based on a fixture count. District Engineer Rice summarized the various calculation models. District legal counsel Brooks stated he would review the District's Rules and Regulations to provide an answer to Director Keil's question. Director Keil stated a more direct definition was needed. There was discussion regarding calculating fees based on meter size and the possible issues with under sizing meters in new development.

Plant Operations Manager Mendenhall asked whether residences with two kitchens could be defined as a single living unit. District Engineer Rice stated two kitchens would likely result in two SDCs. There was discussion regarding fire flow requirements mandated by the fire department. General Manager Chaplen discussed how the owner responsibility model would factor into SDC calculations. District Engineer Rice noted the SDC covers capacity regardless of current use. There was discussion regarding SDC subsidization commonly found in entities collecting property tax revenue. President Williams asked if an ADU disconnected from the main structure could connect to the existing lateral. District Engineer Rice reviewed State and County regulations regarding what may be considered "party lines."

District Engineer summarized the District's current ADU application process and detailed the District's current sanitary and proposed water SDCs compared to other local service providers. Director Van Loo asked which providers had a similar population. District Engineer Rice explained the City of Milwaukie was a little smaller and the City of West Linn was a little bigger, stating the growth and future service are often what drives costs. He noted system management and maintenance are important factors as well.

Secretary/Vice President Gornick asked about the City of Milwaukie ADU fee calculation. District Engineer Rice explained how the City had reduced ADU fees to incentivize growth while still maintaining suitable SDCs.

Director Keil asked if there was sound business reasoning for decreasing ADU fees, noting the District would not be interested in social engineering in the way a city may be. District Engineer Rice explained dense population is beneficial for utility districts because more drinking water is produced, more sewer is treated, and consequently service rates are lower. General Manager Chaplen noted many customers did not understand how average use may change overtime while the District built infrastructure for forecasted long term use.

District Engineer Rice overviewed the layering of SDC types on a particular community. Treasurer Knudson asked what the breakdown of SDCs would be for a residence within the District. District Engineer Rice stated he would provide a chart for Board review during the Drinking Water SDC adoption. Director Keil agreed a chart specific to the District and Clackamas County would be helpful.

District Engineer Rice overviewed the difference between adopting fees and SDCs highlighting noticing, methodology calculation, public input, and adoption differences. He outlined the current Drinking Water SDC adoption timeline.

6. Call for Public Comment

President Williams asked District Recorder Casey if there were any members of the public still in attendance. District Recorder Casey confirmed Lynn Fisher was still listening in. He did not comment.

7. Business from the Board

Treasurer Knudson provided an update on conversations with Joseph Edge and Thelma Haggenmiller regarding the METRO/incorporation grant study group. Director Keil expressed concern regarding the implication of METRO driving the study group stating the vision was for local participation. President Williams discussed increasing Jennings Lodge support for incorporation.

Treasurer Knudson provided an update on a conversation with Joseph Edge regarding River Forest Lake. He noted Mr. Edge’s concern about contamination reporting and possible disincentives for doing so. There was discussion around the jurisdiction of the District on a private lake, specifically how contamination from the lake flowed to other bodies of water the District may be responsible for maintaining quality. General Manager Chaplen stated staff would work to address the possible reporting disincentive during the upcoming Rules and Regulations update. District Engineer Rice detailed pollution types and the responsibility versus stewardship of the waterways within the District. It was agreed to monitor the situation.

Secretary/Vice President Gornick thanked President Williams and Treasurer Knudson for attending the North Clackamas County Water Commission meeting. President Williams reported that the District was responsible for providing a Chair during the 2020-2021 fiscal year and he had accepted the nomination for the position.

8. Adjourn Meeting

President Williams adjourned the meeting at 4:30 p.m.

Respectfully submitted,

______________________________	______________________________
Kevin Williams President, Board of Directors	Paul Gornick Secretary/Vice President, Board of Directors
Date:__________________________	Date: __________________________

OAK LODGE WATER SERVICES

STAFF REPORT

To	Board of Directors
From	Sarah Jo Chaplen, General Manager
Title	Extension of the March 17, 2020 Declaration of State of Emergency
Item No.	3e
Date	October 20, 2020

Summary

The Board of Directors holds the authority to declare and extend states of emergency for the Oak Lodge Water Services District, and to delegate certain powers to the General Manager during such an emergency.

Background

In response to the global pandemic and regional outbreak of COVID-19, the Oak Lodge Water Services District Board of Directors declared a State of Emergency relating to COVID-19 on March 17, 2020, to ensure that the District could perform all of its obligations and continue operating its systems.

The District's Declaration, as extended by Addendum No. 1 on April 21, 2020, Addendum No. 2 on May 19, 2020, Addendum No. 3 on June 16, 2020, Addendum No. 4 on July 21, 2020, Addendum No. 5 on August 18, 2020, and Addendum No. 6 on September 15, 2020, currently ends the State of Emergency on October 20, 2020.

The Oregon Health Authority has been monitoring various indicators measuring the health burden of COVID-19 in each county, and the public health capacity to respond. Counties have applied to the Governor to enter various phases of reopening consistent with meeting those health indicators. As of the date of this staff report, Clackamas County is in Phase 1 of three phases of reopening.

To date, the Board has extended the State of Emergency for so long as the findings in the original Declaration continue to exist; namely, the Board has continued to find that social distancing and community mitigation measures within the District are in the best interests of the public health, safety, and welfare of the community, and that immediate action may be required to minimize, respond to, or recover from the emergency.

Past Board Actions

On March 17, 2020, the Board of Directors approved Resolution 2020-03 authorizing declarations of a state of emergency and certain actions during a state of emergency.

The Board of Directors subsequently declared a State of Emergency relating to COVID-19 with the intent to revisit the effective end date at the next regularly scheduled meeting on April 21, 2020.

On April 21, 2020, the Board of Directors approved Addendum No. 1 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to May 19, 2020.

On May 19, 2020, the Board of Directors approved Addendum No. 2 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to June 16, 2020.

On June 16, 2020, the Board of Directors approved Addendum No. 3 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to July 21, 2020.

On July 21, 2020, the Board of Directors approved Addendum No. 4 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to August 18, 2020.

On August 18, 2020, the Board of Directors approved Addendum No. 5 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to September 15, 2020.

On September 15, 2020, the Board of Directors approved Addendum No. 5 to the March 17, 2020 Declaration of State of Emergency extending the effective end date to October 20, 2020.

Concurrence

The General Manager and the District's legal counsel are prepared to explain the approach other entities have taken while declaring states of emergency and how the District would be affected by an extension of the Declaration.

Recommendation

Staff recommends the Board extend the Declaration of State of Emergency until the conclusion of the next Board meeting on November 16, 2020.

Alternatives to Recommendation

The Board can decline to extend the Declaration of State of Emergency.

Suggested Board Motion

"I move to approve Addendum No. 7 to the March 17, 2020 Declaration of State of Emergency and extend the effective end date to November 16, 2020."

Attachments

1. Addendum No. 7 to the March 17, 2020 Declaration of State of Emergency

OAK LODGE WATER SERVICES DISTRICT

ADDENDUM NO. 7 TO THE
MARCH 17, 2020 DECLARATION OF STATE OF EMERGENCY

WHEREAS, the Board of Directors (“Board”) of the Oak Lodge Water Services District (“District”) on March 17, 2020 declared a state of emergency due to the public health and financial threats posed by the highly infectious virus COVID-19 and authorized certain actions that may be taken during the emergency; and

WHEREAS, the March 17, 2020 *Declaration of State of Emergency* included an expiration date of April 21, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the April 21, 2020 *Addendum No. 1 to the Declaration of State of Emergency* extended the expiration date to May 19, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the May 19, 2020 *Addendum No. 2 to the Declaration of State of Emergency* extended the expiration date to June 16, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the June 16, 2020 *Addendum No. 3 to the Declaration of State of Emergency* extended the expiration date to July 21, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the July 21, 2020 *Addendum No. 4 to the Declaration of State of Emergency* extended the expiration date to August 18, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the August 18, 2020 *Addendum No. 5 to the Declaration of State of Emergency* extended the expiration date to September 15, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the September 15, 2020 *Addendum No. 6 to the Declaration of State of Emergency* extended the expiration date to October 20, 2020, upon which date the state of emergency would terminate; and

WHEREAS, the facts set forth in the March 17, 2020 declaration that gave rise to the state of emergency continue to exist and continue to constitute an emergency.

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE OAK LODGE WATER SERVICES DISTRICT DECLARES:

Section 1. Continued State of Emergency. The Board finds that the facts set forth in the March 17, 2020 *Declaration of State of Emergency* as modified by the April 21st

Addendum No. 1, the May 19th *Addendum No. 2,* the June 16th *Addendum No. 3*, the July 21st *Addendum No. 4*, the August 18th *Addendum No. 5*, the September 15th *Addendum No. 6* ("Emergency Declaration") continue to exist and continue to constitute an emergency and the Board hereby declares the District to be in a continued state of emergency.

Section 2. Effective Date. The expiration date of the Emergency Declaration is hereby extended to November 16, 2020, unless superseded or earlier terminated.

Section 3. Effect on Declaration. This Addendum No. 7 modifies Section 5 of the Emergency Declaration, replacing the date of April 21, 2020 with the date identified in Section 2 of this Addendum No. 7. All other terms of the Emergency Declaration remain the same.

INTRODUCED AND ADOPTED THIS 20th DAY OF OCTOBER 2020, EFFECTIVE AS OF THE DATE OF ADOPTION.

OAK LODGE WATER SERVICES DISTRICT

By ______________________________ By ______________________________
Kevin Williams, President Paul Gornick, Secretary/Vice President

STAFF REPORT

To	Board of Directors
From	Jason Rice, District Engineer
Title	Approval of Contract for Emergency Water Intertie Preliminary Design
Item No.	3f
Date	October 20, 2020

Summary

Staff seeks approval for the General Manager to sign a contract with Water Systems Consulting for the Preliminary Design of an Emergency Water Intertie in the amount of $98,338.

Background

In 2018, the Oregon Water Resources Department issued new requirements for Water System Master Plans to identify improvements necessary for a seismically resilient water system within 50 years. A review of the District's water system found that water supply is entirely dependent upon a single 24-inch supply pipeline and a single water source, the Clackamas River.

The single 24-inch diameter supply main that feeds the Valley View Reservoirs supplies treated water from the North Clackamas County Water Commission (NCCWC) water treatment plant which has a raw water intake on the Clackamas River. While the District has several interties with the adjacent City of Gladstone and Clackamas River Water (CRW) service areas, these existing interties only allow the District to export water delivery. The District's service pressure is significantly higher than the adjacent Gladstone and CRW service pressures, and there are no permanent pumps at the interties that could overcome the difference in hydraulic grade to supply water to the District. The NCCWC can obtain emergency water from other sources such as CRW and the South Fork Water Supply Board (SFWB), but conveyance of any emergency supply to the District requires the 24-inch diameter pipeline. The District has determined that a secondary means of supplying water is necessary to prevent supply outages if the 24-inch diameter pipeline is out of service.

The District also depends solely on the Clackamas River as a water source. Although the NCCWC maintains interties with CRW and SFWB, both water systems also use the Clackamas River as their source of supply. If any event caused the Clackamas River to be temporarily limited or unavailable as a supply source, the District does not have direct access to an alternative supply. The District has determined that gaining access to alternative water supply sources is key to improving resilience and reliability of water deliveries in the future.

Three potential scenarios were identified that could impact the ability of the District to supply water to customers:

- Supply Pipeline Outage. Damage to the pipeline could occur from a seismic event or adjacent underground construction, and the 50-year old pipe may require an outage for future maintenance or replacement.
- Clackamas River Contamination. Spills of hazardous materials into the river from tanker truck accidents on adjacent roads or cyanotoxins from algal blooms could limit the water availability due to treatment limitations.
- Clackamas River Curtailment. During the late summer and early fall, withdrawals from the river could be curtailed to provide minimum flows for fishery health and limit water availability.

New interties, or combinations of intertie options, are desired to provide the District with the ability to continue water delivery to customers under any of the above scenarios.

As a part of the proposed 2020 Water System master Plan, The District has investigated several possible interties with neighboring water agencies and determined that an intertie with CRW with mobile capabilities would not only meet the goals of an intertie to water from Portland system, but it also allow the District to intertie with the City of Milwaukie in the future. This is the most flexible, cost conscious alternative available to the District right now.

Based on this information, staff asked Water Systems consulting to estimate the cost to perform what will be the preliminary design of this alternative. Since the estimate was below $100,000, per District Purchasing Rules, the Board can Direct Appoint Water Systems Consulting as an engineering consultant. Staff feels this is the best consultant to perform this work since they are already intimately knowledgeable with the project. Having the design completed puts OLWS in a better position for potential grants.

Past Board Actions

June 2020	Board adopts FY21 Budget along with 2021-2026 Capital Improvement Plan which identifies this design project as a priority.

Concurrence

Based on the approved FY21 Budget and 2021-2026 Capital Improvement Plan, this project was concurred by both the Budget Committee and Board.

Staff believes the sooner the District can create interties with bordering jurisdictions, the more protection our rate payers will have from catastrophic events in which water becomes scarce or completely unavailable from current sources.

Suggested Board Motion

"I move to approve the General Manager to sign a contract with Water Systems Consulting for the Preliminary Design of an Emergency Water Intertie in the amount of $98,338."

Attachments

1. Proposed Scope of Work
2. Proposed Schedule of Work

9/16/2020

Mr. Jason Rice
Oak Lodge Water Services District
14611 SE River Road
Oak Grove, OR 97267

SUBJECT: PROPOSAL FOR PREPARATION OF INTERTIE PRELIMINARY DESIGN REPORT

Dear Mr. Rice,

Water Systems Consulting (WSC) would like to sincerely thank the Oak Lodge Water Services District (District) for this opportunity to further define emergency intertie connections between the District and Clackamas River Water (CRW) and the City of Milwaukie. Defining the preferred locations, size, and type of interties will allow the District to budget and procure design services in 2021 and potentially apply for funding assistance through the Federal Emergency Management Agency (FEMA). WSC is pleased to provide a proposal to build upon the resilience work in the Water System Master Plan.

Our proposal is based on discussions with the District, CRW, Milwaukie, and the North Clackamas County Water Commission. The following is a summary of our understanding of the project followed by a proposed Scope of Services.

Project Understanding

As part of the recently completed 2020 Water System Master Plan (WSMP), the District has identified the need for emergency interties with Milwaukie and CRW in the event of a water supply outage. The District currently relies on a single source of supply, provided by the North Clackamas County Water Commission through a sole 24-inch diameter transmission pipeline. The WSMP identified preferred general locations for the interties, and the District has programmed funding of the CRW intertie into the Fiscal Year 2022 capital improvement plan and with the Milwaukie intertie to be completed in the future. The WSMP established an emergency supply criteria of 2.7 million gallons per day (MGD).

A preliminary design is necessary to determine if the interties with CRW and Milwaukie will be permanent facilities, or if a portable trailer-mounted pump station could be used to serve either site. Exact locations of the interties must be determined before the detailed designed can commence and construction contracts can be bid. The WSMP also indicated a need for further investigation of any seismic retrofits to the portion of the 24-inch diameter supply line that would be necessary for the proposed CRW intertie location. Discussions with both CRW and Milwaukie are necessary to confirm the specifics of any emergency intertie agreement including the available capacity for emergency water, desired connections from the District, and any limitations, fees, and financial participation. The purpose of a preliminary design will be to better define the intertie projects to allow procurement of an engineering design contract and to potentially apply for available funding for the construction.

The attached items include a scope of work and WSC's estimated budget for the proposed scope of work. A budget of **$98,338** has been estimated for the proposed scope of work and is provided attached for your review. To provide the proposed scope of work, WSC has included two subconsultants on our team; Landis Consulting for electrical engineering preliminary design, and McMillen Jacobs (MJA) for geotechnical investigation of seismic hazards.

Thank you again for the opportunity to propose on this project. If you have any questions, please contact Scott Duren at sduren@wsc-inc.com and (503) 419-6336, ext. 400.

Sincerely,

Water Systems Consulting, Inc.

Scott Duren, PE
Principal in Charge & Vice President

1. Attachments: Scope of Services & Fee Estimate, Project Schedule

SCOPE OF WORK

TASK 0.0 PROJECT MANAGEMENT

0.1 Project Administration

- Provide project administration and management, including invoicing and preparation of monthly progress reports in a format that is acceptable to the District.
- Manage work, including subconsultants, to deliver project on schedule and within budget.

0.2 Project Updates and Coordination

- Conduct a kick-off meeting to review project plan, schedule, critical success factors, and develop risk register.
- Schedule and conduct biweekly project update meetings, to be held virtually either using video conferencing tools or by telephone, with the District Project Manager to provide regular updates on work performed to date, potential concerns for future work to be performed, review outstanding needs, and discuss action items.

0.3 QA/QC

- Perform comprehensive quality control reviews of all deliverables.

DELIVERABLES: *Work Plan, Project Schedule, Monthly Progress Reports.*

TASK 1.0 INTERGOVERNMENTAL AGREEMENT COORDINATION

1.1 Support Discussions with CRW & Milwaukie

- Attend meetings and provide technical support to determine and document the following criteria for the proposed emergency intertie(s):
  (1) Capacity for water delivery at location over next 20 years
  (2) Water pressure available at intertie connection location at desired flow rates
  (3) Purchase cost of water during emergency delivery
  (4) Constraints that may limit delivery capacity
  (5) Reliability of key infrastructure such as pipelines, wells, treatment facilities, interties with Portland Water Bureau, or other critical components of the supply backbone
- For CRW, determine if an intertie location at the proposed Oatfield Reservoir location is a feasible alternative an emergency intertie that could supply water from both CRW and Milwaukie.
- Prepare a brief written summary of key points of mutual agreement that will serve as design criteria for the intertie and will form the basis of a future IGA between both parties.
- For budgeting purposes, an allocation of 24 hours for the WSC PM has been provided to support discussions and to document key points of agreement. WSC assumes that District staff and legal counsel will participate in meetings with both CRW and Milwaukie to establish key criteria.

DELIVERABLES: *Summary of key points of mutual agreement*

TASK 2.0 CONCEPTUAL PUMP STATION LAYOUT AND SITING

2.1 Develop Conceptual Pump Station Layouts

- Using key points of agreement, size pumps and motors required for each intertie.
- Evaluate use of diesel driven pumps versus standby generator with a permanent electrical power connection for portable pump station option.
- Develop a conceptual pump station layout for both an aboveground and a below ground emergency intertie pump station at both locations to determine spatial requirements.
- Develop a conceptual portable trailer mounted station layout that could be used for both interties
- Develop a conceptual layout for storage and testing of portable trailer mounted station at the Valley View Reservoir and Pump Station facility.
- Conduct a review meeting with District staff to review and discuss conceptual station layouts
- Incorporate comments into conceptual pump station layouts.

2.2 Intertie Pump Station Siting Study

- Conduct a field site visit with District staff to identify feasible locations for pump stations locations within the vicinity of each intertie.
- Meet with Clackamas County Parks and Recreation to discuss feasibility for acquiring an easement or property within Heddie Notz Park for either a permanent station or a location that could be used for a portable station.
- Meet with Clackamas County Department of Transportation to discuss feasibility for a temporary placement of portable pump station or a buried permanent station within right-of-way but outside of road travel lanes.
- Landis Consulting will meet with Portland General Electric to determine available power in the vicinity of each intertie and determine design constraints and transformer requirements for power connections.
- Prepare a ranking of potentially feasible intertie pump station locations in order of preference, including an analysis of site safety, additional infrastructure required, and likelihood of procurement.
- Conduct a review meeting with District staff to review the results of the site investigations and determine the criteria to use for the site selection in Task 4.
- Document findings including comments from the District into an Intertie PS Siting TM.

DELIVERABLES: *Draft and Final Conceptual Intertie PS Siting TM*

TASK 3.0 ASSESS SEISMIC RESILIENCE OF EXISTING SUPPLY MAIN

3.1 Pipe Condition Assessment

- Prepare a plan to excavate and expose the existing 24-inch diameter supply main, potentially in multiple locations, to assess the condition of the pipe and the type of joints and gaskets used in the original construction.

- Review plan with District and revise as necessary, with the assumption that the District crews will provide equipment and labor and obtain all right-of-way permits required to expose the existing pipe.
- Conduct visual observation of existing pipe condition and materials to determine the type of pipe joints used, trench backfill materials, and extents of any visible external pipe corrosion.
- Prepare a Supply Pipe Condition TM to document findings, evaluate the ability of the existing pipe to withstand seismically induced ground deformation, and provide recommendations regarding the value of performing additional geotechnical investigations described in Task 3.2.

3.2 Geotechnical Investigation

- If the visual inspection of the existing pipe exterior indicates a likelihood for withstanding seismic ground deformation, localized geotechnical borings along the alignment will provide a better understanding of site-specific ground deformations to confirm seismic resilience of the pipeline.
- MJA will obtain road permits for drilling within the County right-of-way and will contact the utility notification center for utility locations.
- MJA will conduct two geotechnical borings to collect standard penetration test (SPT) samples up to a depth of 30 feet to assess soil parameters that affect seismic ground movement. Locations are assumed to be “clean” regarding contaminated and hazardous materials and no environmental assessment will be necessary.
- Findings will be used to update and revise seismic hazard mapping
- MJA will prepare a Seismic Hazard TM to summarize field explorations, findings, and anticipated peak ground velocities and deformation in the vicinity of the 24-inch diameter supply main

DELIVERABLES: *Draft and Final Supply Pipeline Condition and Seismic Hazard TMs*

TASK 4.0 PRELIMINARY CONCEPTUAL DESIGN REPORT

4.1 Draft Preliminary Design Report

- Analyze intertie pump station alternatives and provide a recommendation for a preferred intertie concept.
- Conduct a workshop with District staff to review preliminary analysis results to confirm agreement with recommendations.
- Develop an engineer’s estimate of probable construction cost for each intertie location for use in budgeting design and construction of necessary improvements.
- Prepare a schedule for anticipated design, bidding, and construction required for the work.
- Prepare a draft report summarizing findings and recommendations for review by the District.
- Conduct a review meeting to discuss District comments and concerns on the Draft PDR.

4.2 Final Preliminary Design Report

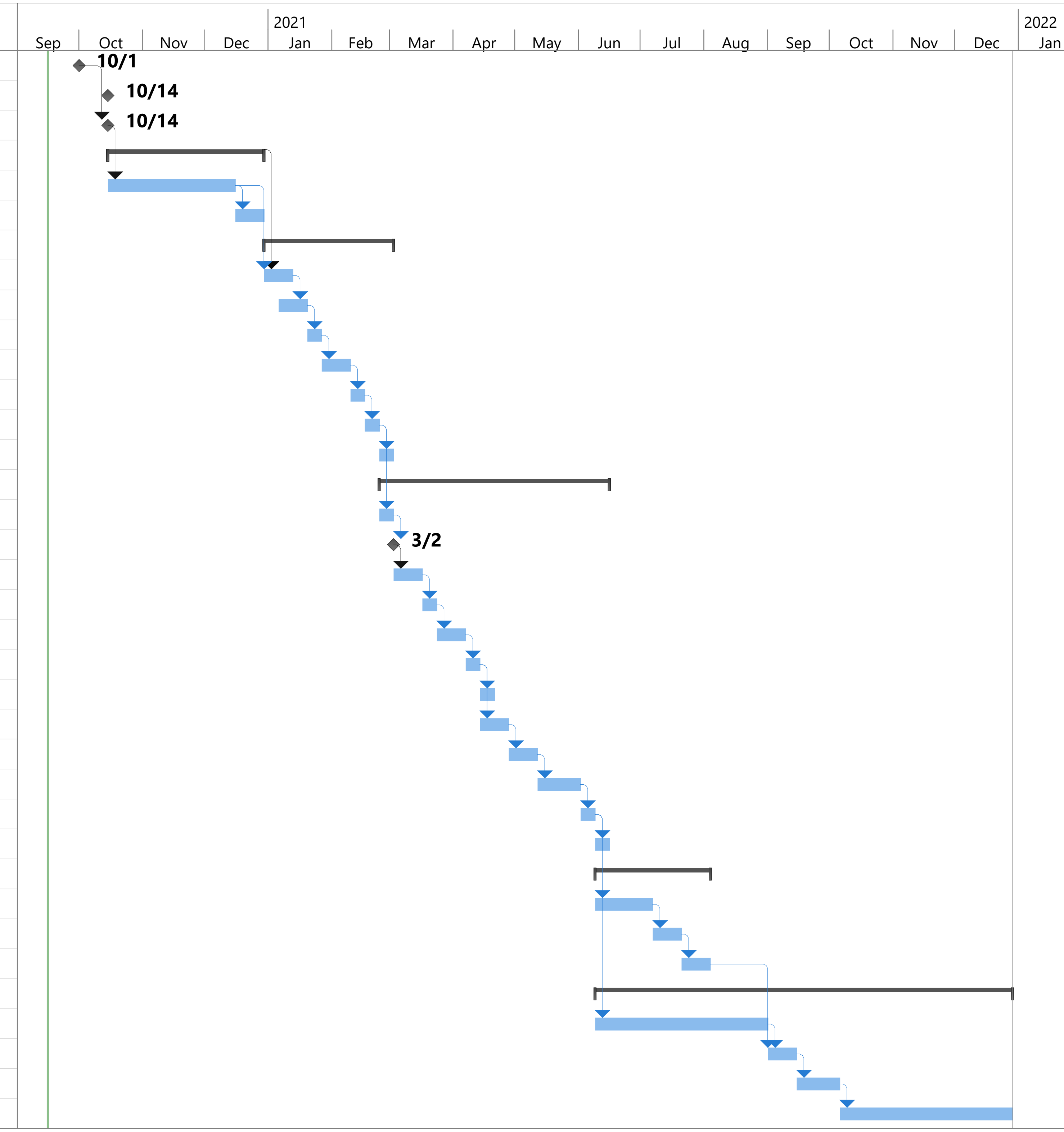
- Incorporate comments and revisions into a Final PDR document

DELIVERABLES: *Draft and Final Preliminary Conceptual Design Report*

Fee Estimate

Task No.	Task Description	WSC									Landis	McMillen	ALL FIRMS
		Project Manager	QA/QC	Project Engineer	CAD	Admin	WSC Labor Hours	WSC Labor Fee	Expenses	WSC Fee	Labor Fee	Labor Fee	Total Fee
		Scott Duren	Joshua Reynolds	Adam Donald	Paul D'Santi	Kay Merrill							
	Billing rates, $/hr	*$220*	*$225*	*$150*	*$130*	*$120*							
0	**Project Management**												
0.1	Project Administration	16				16	**32**	**$ 5,440**	**$ 200**	**$ 5,640**			**$ 5,640**
0.2	Project Updates and Coordination	14		4			**18**	**$ 3,680**	**$ 100**	**$ 3,780**			**$ 3,780**
0.3	QA/QC		14				**14**	**$ 3,150**	**$ 100**	**$ 3,250**			**$ 3,250**
	SUBTOTAL	**30**	**14**	**4**	**0**	**16**	**64**	**$ 12,270**	**$ 400**	**$ 12,670**	**$ -**	**$ -**	**$ 12,670**
1	**Intergoveermental Agreement Coordination**												
1.1	Support Discussions with CRW & Milwaukie	24					**24**	**$ 5,280**	**$ 200**	**$ 5,480**			**$ 5,480**
	SUBTOTAL	**24**	**0**	**0**	**0**	**0**	**24**	**$ 5,280**	**$ 200**	**$ 5,480**	**$ -**	**$ -**	**$ 5,480**
2	**Conceptual Pump Station Layout & Siting**												
2.1	Develop Conceptual Pump Station Layouts	12		24	24		**60**	**$ 9,360**	**$ 400**	**$ 9,760**	$ 4,851		**$ 14,611**
2.2	Intertie Pump Station Siting Study	18		14			**32**	**$ 6,060**	**$ 200**	**$ 6,260**	$ 4,851		**$ 11,111**
	SUBTOTAL	**30**	**0**	**38**	**24**	**0**	**92**	**$ 15,420**	**$ 600**	**$ 16,020**	**$ 9,702**	**$ -**	**$ 25,722**
3	**Assess Seismic Resilience of Existing Supply Main**												
3.1	Pipe Condition Assessment	8		24			**32**	**$ 5,360**	**$ 200**	**$ 5,560**			**$ 5,560**
3.2	Geotechnical Investigation	3					**3**	**$ 660**	**$ -**	**$ 660**		$ 13,404	**$ 14,064**
	SUBTOTAL	**11**	**0**	**24**	**0**	**0**	**35**	**$ 6,020**	**$ 200**	**$ 6,220**	**$ -**	**$ 13,404**	**$ 19,624**
4	**Preliminary Design Report**												
4.1	Draft Preliminary Design Report	24		72	24		**120**	**$ 19,200**	**$ 800**	**$ 20,000**	$ 7,762		**$ 27,762**
4.2	Final Preliminary Design Report	8		16	6		**30**	**$ 4,940**	**$ 200**	**$ 5,140**	$ 1,940		**$ 7,080**
	SUBTOTAL	**32**	**0**	**88**	**30**	**0**	**150**	**$ 24,140**	**$ 1,000**	**$ 25,140**	**$ 9,702**	**$ -**	**$ 34,842**
	COLUMN TOTALS	**127**	**14**	**154**	**54**	**16**	**365**	**$ 63,130**	**$ 2,400**	**$ 65,530**	**$ 19,404**	**$ 13,404**	**$ 98,338**

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors
1			Notice to Proceed	0 days	Thu 10/1/20	Thu 10/1/20	
2			**Project Management**	**0 days**	**Wed 10/14/2**	**Wed 10/14/2**	
3			Kick-off meeting	0 days	Wed 10/14/2	Wed 10/14/2	1FS+10 days
4			**IGA Support**	**54 days**	**Thu 10/15/2**	**Tue 12/29/2**	
5			Meetings w/ CRW & Milwaukie	44 days	Thu 10/15/2	Tue 12/15/2	3
6			Summarize MOU	10 days	Wed 12/16/2	Tue 12/29/2	5
7			**Conceptual PS Design**	**45 days**	**Wed 12/30/2**	**Tue 3/2/21**	
8			Permanent PS Layout	10 days	Wed 12/30/2	Tue 1/12/21	4,5
9			Portable PS Layout	10 days	Wed 1/6/21	Tue 1/19/21	8FS-5 days
10			Review Meeting & Site Visits w/ District	5 days	Wed 1/20/21	Tue 1/26/21	9
11			Meet w/ NCPRD, County DOT, PGE	10 days	Wed 1/27/21	Tue 2/9/21	10
12			Draft PS Siting TM	5 days	Wed 2/10/21	Tue 2/16/21	11
13			Review Meeting w/ District	5 days	Wed 2/17/21	Tue 2/23/21	12
14			Final PS Siting TM	5 days	Wed 2/24/21	Tue 3/2/21	13
15			**Assess Seismic Resilience of Supply Main**	**80 days**	**Wed 2/24/21**	**Tue 6/15/21**	
16			Field Exploration Plan	5 days	Wed 2/24/21	Tue 3/2/21	13
17			Review Meeting w/ District	0 days	Tue 3/2/21	Tue 3/2/21	16
18			ROW Permits and USA Notice	10 days	Wed 3/3/21	Tue 3/16/21	17
19			Field Explorations	5 days	Wed 3/17/21	Tue 3/23/21	18
20			Draft Pipe Condition TM	10 days	Wed 3/24/21	Tue 4/6/21	19
21			Review Meeting w/ District	5 days	Wed 4/7/21	Tue 4/13/21	20
22			Final Pipe Condition TM	5 days	Wed 4/14/21	Tue 4/20/21	21
23			ROW Permits and USA Notice	10 days	Wed 4/14/21	Tue 4/27/21	21
24			Geotechnical Investigation	10 days	Wed 4/28/21	Tue 5/11/21	23
25			Draft Seismic Hazard TM	15 days	Wed 5/12/21	Tue 6/1/21	24
26			Review Meeting w/ District	5 days	Wed 6/2/21	Tue 6/8/21	25
27			Final Seismic Hazard TM	5 days	Wed 6/9/21	Tue 6/15/21	26
28			**Draft Preliminary Design Report**	**40 days**	**Wed 6/9/21**	**Tue 8/3/21**	
29			Draft PDR	20 days	Wed 6/9/21	Tue 7/6/21	26
30			Review Meeting w/ District	10 days	Wed 7/7/21	Tue 7/20/21	29
31			Final PDR	10 days	Wed 7/21/21	Tue 8/3/21	30
32			**FEMA BRIC Funding Application**	**145 days**	**Wed 6/9/21**	**Tue 12/28/2**	
33			Prepare addendum to County NHMP	60 days	Wed 6/9/21	Tue 8/31/21	26
34			Notice of Intent Letter	10 days	Wed 9/1/21	Tue 9/14/21	33,31
35			Prepare Cost Benefit Analysis	15 days	Wed 9/15/21	Tue 10/5/21	34
36			Prepare application pacakage	60 days	Wed 10/6/21	Tue 12/28/21	35



Project: Emergency Intertie PDR
Date: Wed 9/16/20

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

OAK LODGE
WATER SERVICES

STAFF REPORT

To	Board of Directors
From	Jason Rice, District Engineer
Title	Update from Scott Archer, Director of North Clackamas Parks and Recreation District
Item No.	4
Date	October 20, 2020

Summary

Scott Archer, Director of the North Clackamas Parks and Recreation District (NCPRD), has requested time to address the Board regarding the Boardman Wetland Complex Project and our two districts' ongoing partnership.

No formal action will be requested.

STAFF REPORT

To	Board of Directors
From	Jason Rice, District Engineer
Title	Consideration of Resolution No. 2020-15 Approval of the Water Master Plan
Item No.	5
Date	October 20, 2020

Summary

Staff recommends approval of Resolution No. 2020-15, approving the District's 2020 Water System Master Plan.

Background

Oak Lodge Water Services District (OLWSD or District) owns and operates a potable water system that serves approximately 28,000 residents and commercial customers in unincorporated western Clackamas County. This Water System Master Plan (WSMP attachment #2 to this report) updates a previous plan developed in 2008 and assesses the ability of the system to meet the needs of current and future customers. The WSMP identifies a prioritized list of improvements to address fire flow deficiencies, repair or replace aging infrastructure, and mitigate the risk of a seismic event.

To assist staff in long-term planning and budgeting for improvement projects, a capital improvement program (CIP) has been developed. Based on this list of projects, a set of proposed System Development Charges (SDCs) has been calculated for each meter size and will be recommended to the Board at a future meeting.

By formally accepting this document, staff will be able to apply to the State for exemption of plan review, thus reducing total project time and budget.

Past Board Actions

June 2020	Board receives Presentation of Draft Water Master Plan prior to submission to Oregon Health Authority for concurrence.

June 2019	Board adopts Budget and Capital Improvement Plan that identifies a Water Master Plan as a project to be worked on in the upcoming fiscal year.
January 2019	Board receives update on Water Master Plan and has conversation around prioritization of projects. This conversation ultimately led to the budgeting of an Emergency Water Inter-tie Project to begin design as soon as budget allows.
June 2018	Board adopts Budget and Capital Improvement Plan that identifies a Water Master Plan as a project to be worked on in the upcoming fiscal year.
February 2018	Board approved contract with Water Systems Consulting for the creation of a Water System master Plan
June 2017	Board adopts Budget and Capital Improvement Plan that identifies a Water Master Plan as a project to be worked on in the upcoming fiscal year.

Concurrence

Both Technical Services and Field Operations Staff have worked alongside Water Systems Consulting during the creation of this Master Plan.

The Master Plan was reviewed by and has gained concurrence from the Oregon Health Authority (attachment 3 to this report).

Recommendation

Staff recommends approving Resolution No. 2020-15 approving the District 2020 Water System Master Plan.

Alternatives to Recommendation

If the Board wishes to make any substantial revisions, these changes would be evaluated by Staff and run past the Oregon Heath Authority to verify concurrence was kept. Then, later, staff would bring the document back before the Board for approval.

Suggested Board Motion

"I move to approve Resolution No. 2020-15 approving the District's 2020 Water System Master Plan."

Attachments

1. Resolution No. 2020-15
2. 2020 Water System Master Plan
3. OHA Concurrence Letter

OAK LODGE WATER SERVICES

RESOLUTION NO. 2020-15

A RESOLUTION APPROVING THE 2020 WATER SYSTEM MASTER PLAN.

WHEREAS, the Board approved a contract with Water Systems Consulting for the creation of the 2020 Water System Master Plan; and

WHEREAS, Water Systems Consulting along with District Staff has prepared the 2020 Water System Master Plan in accordance with OAR 333-061-0060; and

WHEREAS, the 2020 Water System Master Plan establishes projects for the water system that are necessary for the ongoing provision of adequate water service to the District; and

WHEREAS, it is necessary to document future projects necessary for the ongoing provision of adequate water service in order to determine the costs for maintaining the water system.

NOW, THEREFORE, BE IT RESOLVED BY THE OAK LODGE WATER SERVICES BOARD OF DIRECTORS:

Section 1. The Oak Lodge Water Services District approves the 2020 Water System Master Plan;

Section 2. This Resolution is and shall be effective from and after its passage by the Board.

INTRODUCED AND ADOPTED THIS 20th DAY OF OCTOBER 2020.

OAK LODGE WATER SERVICES DISTRICT

By ________________________________ By ________________________________

Kevin Williams, President Paul Gornick, Secretary/Vice President

2020 Water System Master Plan Update

Prepared for:

OAK LODGE
WATER SERVICES

Prepared Under the Responsible Charge of:

Scott Duren, PE

REGISTERED PROFESSIONAL ENGINEER
89922PE
OREGON
Jan. 15, 2015
SCOTT B. DUREN
EXPIRES: 12-31-2021

7/31/2020

WSC
WATER SYSTEMS CONSULTING, INC.

Acknowledgements

Water Systems Consulting, Inc. would like to acknowledge the significant contributions of Oak Lodge Water Services District, including the following staff and Board Members.

Kevin Williams, President

Paul Gornick, Secretary/Vice President

Mark Knudson, Treasurer

Susan Keil, Director

Ginny Van Loo, Director

Sarah Jo Chaplen, General Manager

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Todd Knapp, Field Superintendent

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The Oak Lodge Water Services District 2020 Water System Master Plan was prepared by Water Systems Consulting, Inc. The primary authors are listed below.

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Jeremy Fissel, P.E.

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Glossary of Terms

AACE	Association for the Advancement of Cost Engineering
AC	Asbestos Cement
ADA	American's with Disabilities Act
ADD	Average Day Demand
AF	Acre-Feet
AFY	Acre-Feet per Year
AL	Action level
ALA	American Lifelines Alliance
AWIA	America's Water Infrastructure Act
AWWA	American Water Works Association
BPS	Booster Pump Station
C-factor	Hazen Williams pipe roughness coefficient
CCI	Construction Cost Index
CCR	Consumer Confidence Report
CI	Cast iron
CIP	Capital Improvement Program
CMLC	Cement Mortar Lined & Coated Steel
CMMS	Computerized Maintenance Management Software
CRW	Clackamas River Water
CSZ	Cascadia Subduction Zone
DBP	Disinfectant Byproduct
DBPR	Disinfectant Byproduct Rule
DI	Ductile iron
DOGAMI	Department of Geology and Mineral Industries
DWS	Drinking Water Services
E. coli	Escherichia coli
ENR	Engineering News Record
EPA	Environmental Protection Agency
EPS	Extended Period Simulation
ERP	Emergency Response Plan
EUL	Estimated Useful Life
°F	Fahrenheit

FF	Fire Flow
fps	feet per second
ft	Feet
FY	Fiscal Year
GIS	Geographic Information Systems
GPCD	gallons per capita per day
gpm	gallons per minute
HAA5	Haloacetic acids
HDPE	High-density polyethylene
HGL	Hydraulic Grade Line
HP	Horsepower
IGA	Intergovernmental Agreement
in	inch
LCR	Lead and Copper Rule
MCE	Meter capacity equivalent
MCL	Maximum Contaminant Limit
MCLG	Maximum Contaminant Level Goal
MCMJ	McMillen Jacobs Associates
MDD	Maximum Day Demand
MG	Million Gallons
mg/L	milligrams per liter
MGD	Million Gallons per Day
MRDL	Maximum residual disinfectant level
MSL	Mean Sea Level
NCCWC	North Clackamas County Water Commission
NRW	Non-revenue water
NTU	Nephelometric Turbidity Units
OAR	Oregon Administrative Rule
OHA	Oregon Health Authority
OLWSD	Oak Lodge Water Services District
ORS	Oregon Revised Statutes
OSSPAC	Oregon Seismic Safety Policy Advisory Commission
PE	Polyethylene
PGA	Peak ground acceleration
PGV	Peak ground velocity
PGD	Peak ground deformation
PHD	Peak Hour Demand
PLC	Programmable logic controller
PNR	Public Notification Rule

ppb	parts per billion
ppm	parts per million
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
RRA	Risk and Resiliency Assessment
RTCR	Revised Total Coliform Rule
RUL	Remaining Useful Life
SCADA	Supervisory Control and Data Acquisition
SDC	System Development Charge
SFWB	South Fork Water Board
STL	Steel
SWA	Sunrise Water Authority
TAZ	Transportation analysis zone
TCR	Total Coliform Rule
TT	Treatment Technique
TTHM	Total trihalomethanes
UCMR	Unregulated Contaminant Monitoring Rule
U.S.	United States
VFD	Variable Frequency Drive
WMCP	Water Management and Conservation Plan
WSMP	Water System Master Plan
WSC	Water Systems Consulting
WTP	Water Treatment Plant

CHAPTER 1

Executive Summary

Oak Lodge Water Services District (OLWSD or District) owns and operates a potable water system that serves approximately 28,000 residents and commercial customers in unincorporated western Clackamas County. This Water System Master Plan (WSMP) updates the previous plan developed in 2008 and assesses the ability of the system to meet the needs of current and future customers. The WSMP identifies a prioritized list of improvements to address fire flow deficiencies, repair or replace aging infrastructure, and mitigate the risk of a seismic event. To assist in long-term planning and budgeting for improvement projects, a capital improvement program (CIP) has been developed.

1.1 System Description

The District service area is comprised mostly of the Oak Grove and Jennings Lodge County Planning Organizations (CPOs) and is located entirely within Metro's Urban Growth Boundary for the Portland regional area. Water supply is provided by the North Clackamas County Water Commission (NCCWC), a partnership between OLWSD, Sunrise Water Authority (Sunrise), and the City of Gladstone. Although the District turned over its water rights on the Clackamas River to the NCCWC, the Amended and Restated Intergovernmental Agreement (IGA) for the NCCWC states that OLWSD shall be allocated up to 42 percent of the NCCWC Water Treatment Plant (WTP) capacity. The NCCWC also maintains interconnections with Clackamas River Water (CRW) and the South Fork Water Board (SFWB). All District supply is conveyed through a 24-inch diameter supply pipeline that terminates at the Valley View Reservoirs. Prior to formation of the NCCWC, District water was supplied from the CRW Pump Station located at the CRW WTP. The District still owns the CRW Pump Station but currently leases operation to Sunrise. The District also maintains three

IN THIS SECTION

interconnections apiece with CRW and Gladstone, but due to the difference in hydraulic elevations of the systems, water is only available for export out from the District's distribution system.

The OLWSD distribution system is comprised of three pressure zones; lower, upper, and high-level. The lower zone is fed by gravity flow from the Valley View Reservoirs, twin 5.0 million gallon (MG) prestressed concrete cylinder tanks. The upper zone is fed by gravity flow from the View Acres Reservoirs, twin 2.8 MG welded steel tanks. The Valley View Booster Pump Station (BPS) conveys water from Valley View to the View Acres Reservoirs, and the View Acres BPS feeds the high-level zone. Three pressure reducing valves (PRVs) separate the upper and lower zone. A supervisory control and data acquisition (SCADA) system allows operations to monitor and control the pump stations and reservoirs. Overall there are approximately 105 miles of distribution and transmission piping in the system, with the majority in the 6- and 8-inch diameter sizes.

1.2 Evaluation Criteria

Water system criteria were developed for evaluating the performance of the OLWSD system using a variety of sources including Oregon Drinking Water Rules, District Standards and preferences, Clackamas County Fire Code and engineering judgement. A level of service workshop was conducted with District staff to discuss and confirm desired level of service during both normal operating conditions and in a theoretical emergency scenario. Criteria were organized into three categories; distribution system, storage volume, and booster pump stations. Actual system performance data and hydraulic modelling results were compared to the criteria to identify system deficiencies and recommend improvements.

1.3 Demand, Supply, and Storage

Based on historical billings for water meter readings between 2013 and 2017, the District's current consumption is 2,705 acre-feet per year (AFY). Production over the same period was measured at magnetic flow meters at the Valley View facility that monitor the volume of water entering the distribution system and indicates that 21 percent of water entering the distribution system is non-revenue water (NRW). This NRW percentage was a dramatic increase from the 8.9 percent NRW calculated in the previous 2008 WSMP. As this WSMP update was being prepared, the District has conducted a detailed water audit and is developing a multi-faceted strategy to optimize the amount of NRW in the system.

A spatial allocation of demands using District GIS data was scaled to expected population growth rates provided by Metro Transportation Analysis Zone (TAZ) data to determine the impacts of forecasted future demands on the existing water distribution system. Population within the OLWSD service area is anticipated to grow by approximately 6 percent above the 2017 estimate by the year 2037. The current and projected future demands for the District are provided in Table 1-1.

Table 1-1. Current and Future Projected Demands

Demand Condition	2017 Demand (MGD)	2037 Demand (MGD)
Average Day Demand (ADD)	3.07	3.25
Maximum Day Demand (MDD)	5.52	5.84
Peak Hour Demand (PHD)	9.32	9.87
MGD = million gallons per day		

Between 2014 and 2018, the average maximum daily production rate from the NCCWC WTP was 18.3 million gallons per day (MGD). Based on the District's allocation of NCCWC WTP production as described in the Amended and Restated IGA, the maximum supply available to the District has averaged 7.7 MGD, well above the projected 2037 maximum day demand (MDD) of 5.84 MGD.

Using the spatially distributed demands, each of the BPS was evaluated to determine if sufficient capacity exists to meet demands and fire flow requirements (for the high-level zone only). Both the Valley View and View Acres BPS were found to have excess firm capacity, the capacity with the largest pump out of service, beyond the projected future demands.

Existing storage was evaluated by calculating the necessary operational, fire flow, and emergency storage volumes for each of the zones served by each pair of reservoirs. Both the Valley View and View Acres tanks have excess storage in 2037, and the total existing storage volume of 15.60 MG exceeds the projected total required storage of 9.78 MG.

1.4 Hydraulic Analysis

The District's updated Geographic Information System (GIS) database of the water distribution system was used to construct a hydraulic model using InfoWater, Innovyze's® GIS-based hydraulic modeling software. District staff provided a review of the hydraulic model and several recently constructed improvements were incorporated. Five hydrant flow tests were conducted throughout the distribution system and were used to calibrate pipe friction factors based on pipe materials and age.

A system capacity analysis was conducted using the model and consisted of both a pressure and a fire flow analysis. No deficiencies were found for maintaining a minimum service pressure of 35 pounds per square inch (psi) under 2037 peak hour demands. Fire flow scenarios were created and run to evaluate the available fire flow at each fire hydrant while maintaining a residual pressure in the zone of 20 psi during both current and 2037 MDD. Fire flow improvement projects were identified to address individual hydrants with predicted flows less than the required minimum fire flow for the class of land-use served. A total of 37 fire flow projects, resulting in the upgrade of approximately 12 miles of distribution pipes, were identified. Each project was ranked based on operations and engineering staff input, estimated age of pipe, customer zoning classification, and number of fire flow deficient hydrants improved.

1.5 Asset Rehabilitation and Replacement

The District understands the importance of proactively rehabilitating and replacing aging assets to maintain a safe and reliable water system for its customers. Assets are divided into two categories; buried pipelines which are difficult to inspect for condition, and non-buried assets that can be visually inspected as needed to assess condition deterioration.

Pipeline rehabilitation and replacement needs were developed system-wide using pipe material and installation data within the GIS database. The District does not have detailed installation records prior to 1965 and assumes that pipes with no installation date were installed prior to 1965 and are most likely to be constructed of cast iron pipe. Available and assumed data on pipe age and material were compared against estimated useful lifetimes of various pipe materials to develop an estimate of remaining useful life (RUL) for each pipe. A recommended pipe rehabilitation and replacement rate of approximately one mile per year, or roughly $1.4M in capital replacement costs, is recommended. Expected useful life of water distribution pipes are anticipated to range between 60 to 110 years depending on material type, size, and installation methods. The recommended replacement rate of one mile per year represents one percent of the total system pipeline length and would result in a full replacement of the distribution system in 100 years. District operations staff also identified six pipeline replacement projects based on history of repairs and potential risk.

The District identified several rehabilitation and replacement projects anticipated over the next 20 years for addressing aging non-buried assets. An additional ten projects were identified that address condition deficiencies at the storage tanks, BPSs, PRVs, SCADA system, large customer meter vaults, and fire hydrants.

1.6 Seismic Analysis

Since the last WSMP Update for the District in 2008, new federal and state requirements have been adopted that require analysis of seismic risk. The Oregon Health Authority (OHA) updated the Oregon Administrative Rules (OARs) to require that WSMPs include a seismic risk assessment and mitigation plan for water systems located in high seismic risk areas, which includes the District service area. The risk assessment must identify critical facilities, evaluate the likelihood and consequences of seismic failure, and provide a mitigation plan that addresses deficiencies within the next 50 years for any capital improvements or additional studies. The seismic assessment will also help in compliance with the America's Water Infrastructure Act (AWIA) which requires Risk and Resiliency Assessments (RRAs) for both natural hazards and malevolent acts as well as preparation of an Emergency Response Plan (ERP).

The District's system was divided into primary backbone pipelines that provide water for fire suppression at the Valley View and View Acres facilities, and secondary backbone pipelines that serve potential community distribution centers, in accordance with the Oregon Resiliency Plan. Seismic hazard mapping was conducted by McMillen Jacobs Associates (MCMJ) to estimate the peak ground velocity (PGV) and peak ground deformation (PGD) within the District service resulting from a Cascadia Subduction Zone (CSZ) seismic event. A pipe fragility analysis was conducted to estimate the repair rates for each pipeline based on assumed pipe materials and estimated PGD. Pipes were then categorized in terms of the priority for seismic retrofits.

Recommendations were provided for both updates to the District Design Standards and for capital improvements. District Design Standards should be updated to require fully-restrained ductile iron pipe for all backbone pipelines, with the use of seismic joints evaluated for backbone pipelines in areas anticipated to experience over one foot of PGD. Non-backbone pipe in areas with PGD greater than 1 foot shall also be replaced with fully restrained ductile iron pipe. Recommended improvements included establishing emergency interties with CRW and the City of Milwaukie and extending the backbone system to the intertie locations, a seismic study of the existing 24-inch water supply pipeline, and replacement of all medium- and low-priority pipe over the next 50 years. Portions of the seismically fragile pipe overlap with pipes identified for either fire flow or condition-based improvements and will be replaced as part of the CIP.

1.7 Water Quality

Drinking water regulations established by the United States (U.S.) Environmental Protection Agency (EPA) and enforced in Oregon by OHA were reviewed to determine both the compliance levels and required sampling frequency. The District regularly complies with all necessary sampling and reporting. Sampling results, including the dates of each sampling event, are available to the public on the OHA website. OLWSD sampling results indicate compliance with all water quality regulations.

1.8 Capital Improvement Program

Projects identified to address level of service deficiencies, condition-based rehabilitation and replacement projects, and seismic risk mitigations are scheduled as part of a recommended CIP. Cost estimates were developed for individual projects in conformance with the Class 4 Conceptual Report Classification of Opinion of Probable Construction Costs as developed by the Association for the Advancement of Cost Engineering (AACE International). Opinions of probable construction costs for all eligible capacity increasing costs were used to calculate a recommendation for an updated system development charge (SDC). Projects were scheduled and prioritized based on District input, anticipated end of useful life, coordination with Clackamas County road projects, and other prioritization criteria. A summary of the recommend capital improvement projects, including the opinion of probable construction costs, is provided in Table 1-2.

To implement the CIP, the District will need to spend approximately $1.5M on average each year to fund capital improvement projects. In the fiscal year (FY) 2021 budget, the District adopted a capital improvement budget of $1.2M with a 0.55 percent increase to water rates. With a remaining balance of nearly $4M in the water capital improvement fund, it appears that the District may need to raise rates to generate enough revenue to meet the recommendations contained within this document over the next 20 years. The District will consider various rate and financing options to fund the recommended capital improvement program. Several grant programs exist to help water agencies with seismic resiliency projects and should be explored by the District. Based on an analysis by the FCS Group, the maximum defensible SDC per ¾-inch meter equivalent is $10,608.

Table 1-2. Capital Improvement Program Summary

Project ID	Description	Pipe Length (feet)	Diameter (Inches)	Project Total (2020 Dollars)
Engineering/Planning Studies (E)				***$900,000***
E-1	AWIA Risk and Resilience Assessment and Updates (every 5 years)	-	-	$300,000
E-2	Water System Master Plan Update (every 5 years)	-	-	$600,000
Fire Flow Improvement (F) Projects				***$20,464,000***
F-1	28th Avenue, Lakewood Drive, Kellogg Lake Apartments	4,015	8 & 12	$1,156,000
F-2	River Road	6,805	8 & 12	$3,297,000
F-3	Vista Sunrise Court	400	8	$122,000
F-4	Jennings, Colina Vista, Clayson Avenues, Emerald Drive, Colony Circle	4,415	8	$1,514,000
F-5	Alderway Avenue	1,070	8	$338,000
F-6	View Acres Road	2,130	8	$553,000
F7-F37	Increase pipeline diameters to meet fire flow criteria	42,475	8 & 12	$13,484,000
Condition (C) Projects				***$6,715,000***
C-1	Aldercrest Road	3,025	8	$925,000
C-2	Ranstad and Cinderella Courts	300	6	$79,000
C-3	Marcia Court	475	6	$128,000
C-4	Lisa Lane	760	6	$225,000
C-5	Oatfield Road	15,995	8	$3,278,000
C-6	Round Oaks Court	345	4	$58,000
C-7	Seal Coat Concrete Dome on Valley View Reservoirs	-	-	$70,000
C-8	Recoat Exterior of View Acres Tanks	-	-	$400,000
C-9	Replace Equipment and Refurbish Valley View Pump Station	-	-	$380,000
C-10	Replace Equipment and Refurbish View Acres Pump Station	-	-	$250,000
C-11	Upgrade SCADA System	-	-	$32,000
C-12	Radio Telemetry Activation Study	-	-	$24,000
C-13	Rebuild Pressure Reducing Valves (every 5 years)	-	-	$100,000
C-14	Large Meter Testing and Replacement	-	-	$337,000
C-15	Vault Meter Bypass Installations	-	-	$110,000
C-16	Replace All 4 ¼-inch Fire Hydrants	-	-	$319,000
Resiliency (R) Projects				***$3,250,000***
R-1	Intertie Pump Station with Clackamas River Water	-	-	$1,250,000
R-2	Intertie Pump Station with City of Milwaukie	-	-	$1,800,000
R-3	Seismic Study of 24-inch supply pipeline	-	-	$200,000
			CIP Total	**$31,329,000**

Notes: Project costs rounded up to nearest $1,000 and based on ENR 20-City Average CCI of 11392 for January 2020.

CHAPTER 2

Introduction

Oak Lodge Water Services District (OLWSD or District) provides water services to the Oak Grove and Jennings Lodge areas of unincorporated Clackamas County, as well as small areas within adjacent agency service areas. This Water System Master Plan (WSMP) Update guides planned capital project expenditures and asset management for its water system in an efficient and cost-effective manner.

2.1 Purpose

IN THIS SECTION

Purpose

Authorization

The following report is provided as an update to the OLWSD WSMP. The WSMP was last updated in 2008 and 2000, when the water system was managed by the Oak Lodge Water District. On January 1, 2017, OLWD and the Oak Lodge Sanitary District combined into one single agency to more efficiently and cost-effectively deliver water, sanitary sewer, and surface water utility services to its respective service areas.

The purpose of the 2020 WSMP Update is to refresh the previous plan for the District's capital project expenditures and asset management to meet anticipated capacity, water quality, and emergency supply goals in a financially sustainable manner. To achieve the stated purpose, the 2020 WSMP Update has been developed with the following goals:

- Satisfy the Oregon Health Authority (OHA) Drinking Water Services (DWS) water master plan requirements as outlined in Oregon Administrative Rule (OAR) 333-61-060,
- Define level of service goals for the water system,
- Determine population and demand projections through 2037,
- Develop an accurate hydraulic model of the distribution system,

- Identify existing and future system capacity deficiencies through 2037,
- Evaluate level of service and identify deficiencies,
- Identify a long-term renewal strategy for the aging assets within the water system,
- Conduct a seismic risk assessment on the existing water system,
- Prepare a seismic mitigation plan to be completed over the next 50 years,
- Develop a Capital Improvement Program (CIP) for pipelines, pump stations, and reservoirs through 2040,
- Identify financing strategy options for the District to fund the CIP through 2040.

2.2 Authorization

OLWSD has contracted Water Systems Consulting, Inc. (WSC) to complete the update to the Water System Master Plan, as described in the Engineering Services Agreement with OLWSD for the 2018 Water Master Plan, executed on March 23, 2018. WSC has partnered with Barney and Worth to assist in defining level of service goals, McMillen Jacobs to assist in preparing a seismic risk assessment and mitigation plan, and the FCS Group to assist in conducting a system development charge (SDC) analysis.

CHAPTER 3

Existing System

The OLWSD water system is comprised of 105 miles of distribution pipeline, three booster pump stations, and four storage reservoirs. The system contains three pressure zones, and water is supplied to the District through a 24-inch supply pipeline that connects to the North Clackamas County Water Commission transmission mains and water treatment plant.

3.1 Water System Area

The OLWSD provides water to approximately 28,000 residents and commercial customers in unincorporated western Clackamas County (Oregon Metro, 2018). The District service area covers more than 6.4 square miles, comprising the communities of Oak Grove and Jennings Lodge, and small portions of the City of Milwaukie, the City of Gladstone, and Clackamas River Water. The service area is located entirely within Metro's Urban Growth Boundary for the Portland regional area. OLWSD is bordered by the City of Milwaukie to the north, Clackamas River Water service area to the east, the City of Gladstone to the south, and the Willamette River to the west. The District service area and boundary are shown in Figure 3-1.

3.2 Existing Supply and Distribution Interconnections

Each of the normal and emergency supplies and interconnections are described in the sections below. The District has an agreement with partner agencies within the North Clackamas County Water Commission (NCCWC) for receiving normal and emergency supply. The District also has several agreements to supply water to neighboring agencies. Several interconnections provide the District with the ability to wheel water through its transmission and distribution infrastructure to more efficiently supply higher elevation customers in neighboring service areas.

IN THIS SECTION

Figure 3-1. OLWSD Service Area Boundary and Location Map

3.2.1 Water Supply

The OLWSD distribution system is primarily supplied by the NCCWC Water Treatment Plant (WTP). The District also periodically receives water from both Clackamas River Water (CRW) and the South Fork Water Board (SFWB), both of which operate WTPs on the Clackamas River, due to interconnections and agreements that rely on shared infrastructure. Each of the potential sources for water supply are described in detail below. An overview of the shared water supply infrastructure is provided in Figure 3-2.

3.2.1.1 North Clackamas County Water Commission

The NCCWC is a partnership of three water agencies; OLWSD, Sunrise Water Authority (Sunrise), and the City of Gladstone. Through the NCCWC partnership, the three agencies share ownership of the Allen F. Herr Water Treatment Facility (NCCWC WTP) which treats water from the Clackamas River. The facility began production in August 1999 with a 10 million gallon per day (MGD) capacity slow sand filtration plant. In July 2005, low pressure submerged membranes were added to increase peak hour design capacity by 10 MGD to a total of 20 MGD. The actual capacity of the NCCWC WTP varies based on operational conditions. As described in the Amended and Restated Intergovernmental Agreement for the NCCWC, the allocation of water treatment plant capacity is at any time: 42% to Oak Lodge, 48% to Sunrise, and 10% to City of Gladstone. The District and the City of Gladstone receive all of their normal supply from NCCWC, while Sunrise supplements their supply with other sources. As a condition for joining the NCCWC, the District turned over its water rights to Clackamas River surface supply to the NCCWC. The District no longer holds any water rights of its own and therefore has access to surface water supply through the water rights held by the NCCWC.

3.2.1.2 Clackamas River Water

CRW is a domestic water supply district that serves customers in Clackamas County. In addition to providing retail water service within its boundaries, CRW provides wholesale water to Sunrise, as well as the City of Milwaukie. The CRW treatment plant utilizes conventional coagulation, flocculation, and filtration to treat water from the Clackamas River.

The District received its primary water supply from CRW from 1966 until 1999 when the NCCWC WTP began production. The District still owns a water pump station at the CRW WTP that is connected to the NCCWC transmission main, which connects to the existing 24-inch diameter water transmission main from the NCCWC to the Valley View Reservoirs. Currently OLWSD leases the pump station to Sunrise. Sunrise has an intergovernmental agreement to purchase a minimum of 122 million cubic feet each calendar year (approximately 2.5 MGD) from CRW and uses the pump station to convey water to its distribution system at the Mather Road pump station (PS). Because the water from the CRW WTP is conveyed through a portion of the District's 24-inch diameter water transmission main, treated water from the CRW WTP could enter OLWSD's distribution system and thus CRW continues to be listed as a permanent water source under the State of Oregon's Drinking Water Program.

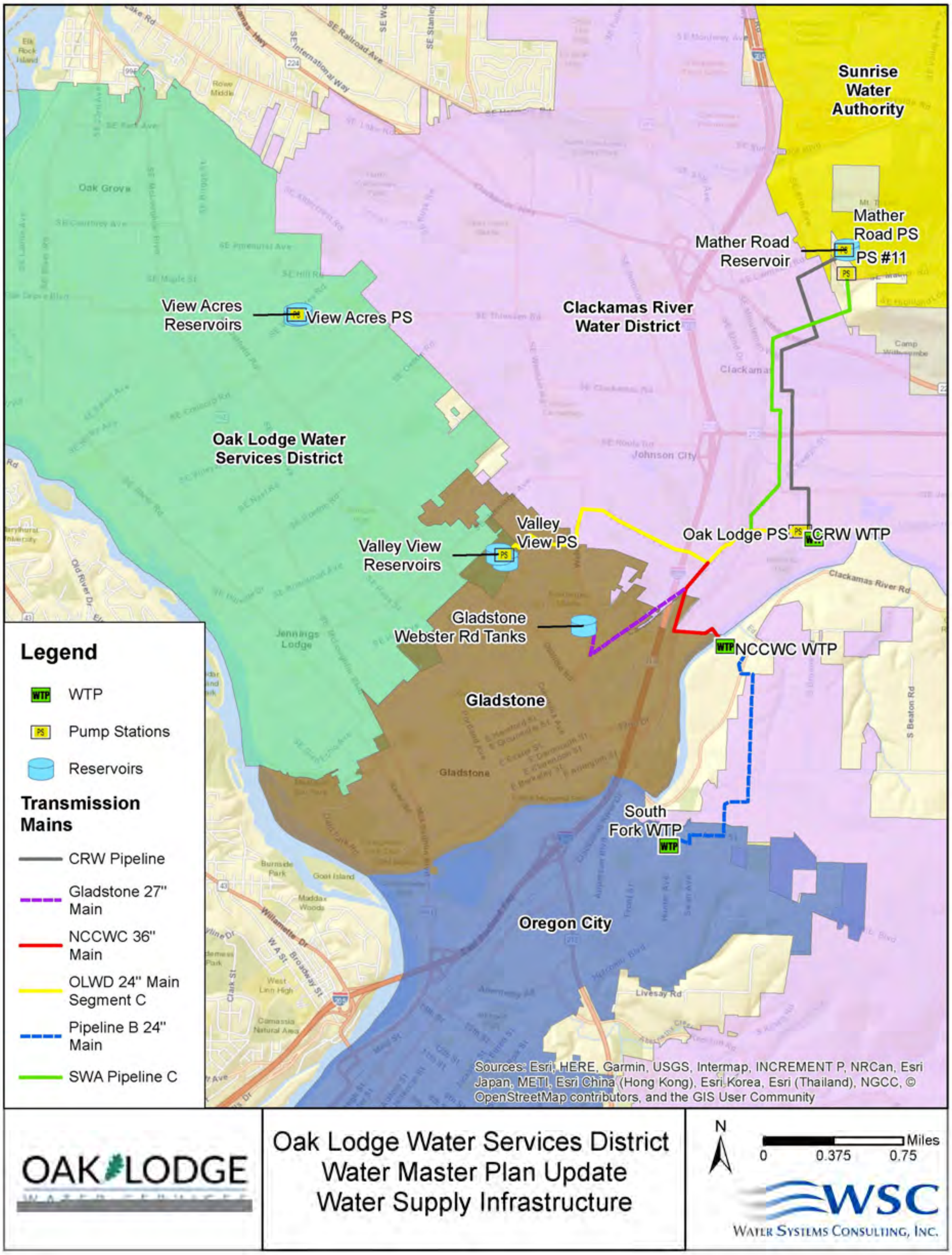


Figure 3-2. Water Supply Infrastructure

CRW is able to supply water to OLWSD during an emergency utilizing the existing OLWSD pump station. The capacity of the pump station is 10 MGD, but the ability to purchase that much water is dependent on CRW's supply availability at the time.

CRW also has an agreement with the NCCWC to provide service to customers that are connected directly to the 24-inch diameter water supply pipeline that delivers treated water to the Valley View Reservoirs.

3.2.1.3 South Fork Water Board

SFWB is a wholesale water provider to the cities of Oregon City and West Linn and to the CRW service area. The SFWB WTP is connected to the NCCWC WTP by a 24-inch pipeline designated Pipeline B, which was constructed in 2002. The SFWB WTP utilizes conventional flocculation, sedimentation, and filtration processes for treating water from the Clackamas River.

SFWB and NCCWC have a wholesale water agreement allowing NCCWC to purchase up to 12 MGD from SFWB during the wet weather months between October to April, when there is surplus capacity. During the remainder of the year, NCCWC may purchase SFWB surplus as available. SFWB may also purchase water from NCCWC. Water from the SFWB will enter the NCCWC transmission pipeline during periodic flushing of Pipeline B to prevent water age issues, and during any NCCWC plant shutdown for maintenance. SWA also regularly purchases supply from SFWB which is transferred through the shared NCCWC and District transmission lines.

3.2.2 Distribution Interconnections

The District maintains several distribution system interconnections that allow water to be transferred to neighboring service areas. The OLWSD distribution interconnections provide treated water to higher elevation areas within adjacent service areas that cannot be supplied as efficiently from within their own service area. CRW and the City of Gladstone purchase water from the District through several distribution interconnections to serve higher elevation customers. Due to the difference in hydraulic gradients, all distribution interconnections are only available to export water out of the District's distribution system. Pump stations, either temporary or permanent, would be necessary to use these interconnections to provide an emergency supply to the District from the CRW or Gladstone distribution systems. A map of the District's distribution system and locations of one-way interconnections is provided as Figure 3-3.

Clackamas River Water: The District maintains three separate interconnections with CRW along the eastern boundary of the service area to provide supply to CRW customers located above 190 feet in elevation. The three connections (at Valley View Road and Jennings Street, Hill Road and Thiessen Street, and Minerva Lane and Oetkin Street) provide service to approximately 237 CRW customers. Approximately 17 of these customers are physically located within the District's service area and could be switched over to the District. Additionally, there are approximately 78 District customers that are located within CRW service area and could be switched to CRW although they would continue to receive water from the District. Water delivery to customers within the CRW service area is tracked through individual customer billing meters and not through a master meter at the interconnection.

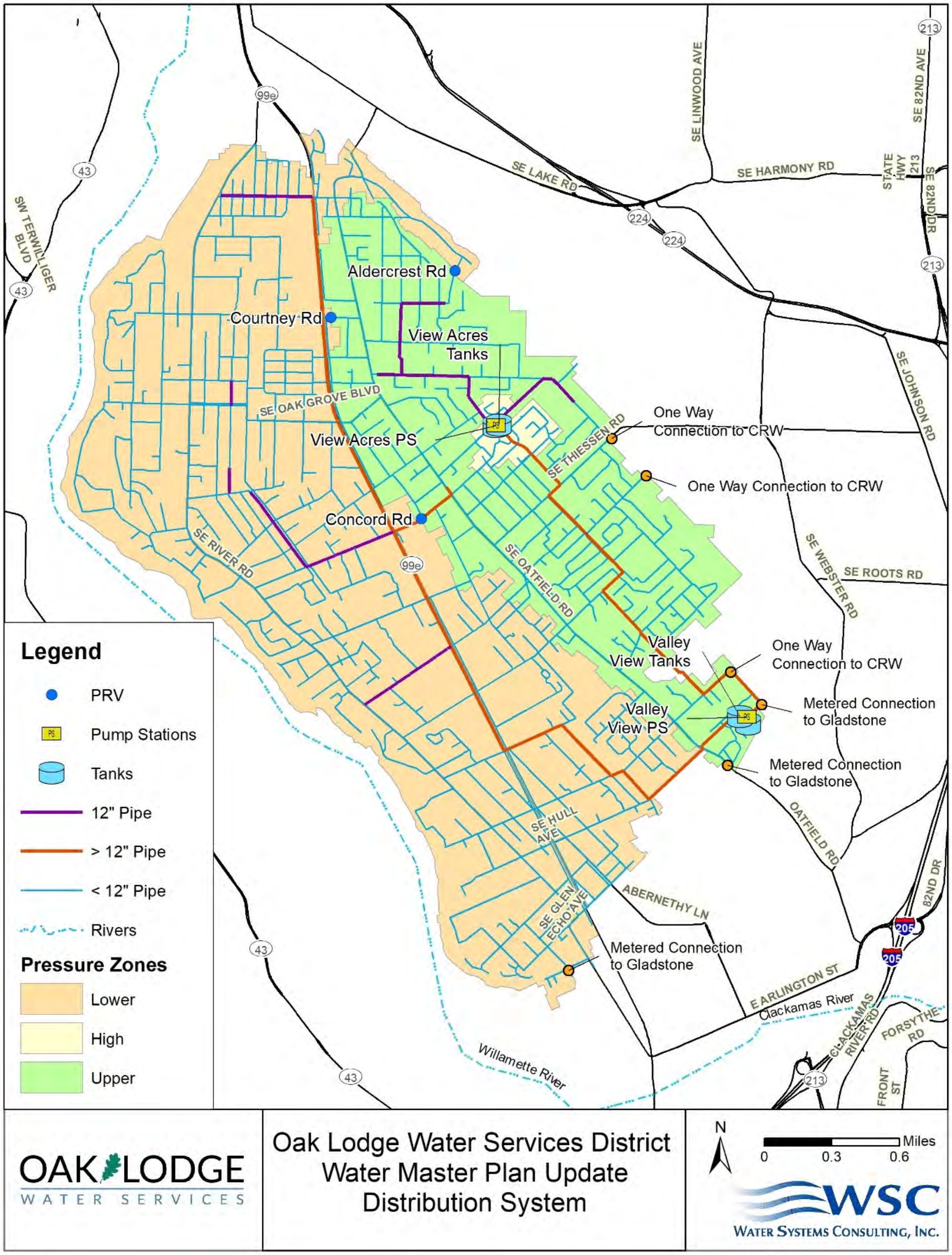


Figure 3-3. Oak Lodge Water Distribution System

***City of Gladstone**:* The District has three unidirectional interties that can be used to sell water to the City of Gladstone. Although Gladstone has a dedicated 27-inch diameter supply pipeline that connects the Webster Road Reservoir to the NCCWC's 36-inch diameter supply transmission line, there is no direct connection to the District's 24-inch diameter supply transmission line. The District occasionally provides peak and emergency supply to the City through the interconnections in the distribution system to supply the higher elevations portion of the City's system. Due to the hydraulic grade line, the City cannot provide water to the District unless portable pumps are used. The three interconnections include a 10-inch connection at the Valley View pump station site, a 6-inch connection at Caldwell Street and Oatfield Road, and a 6-inch connection at Rinearson Road.

***Sunrise Water Authority**:* There are no direct connections between the Sunrise and District distribution systems downstream of the master meters (located at Valley View Reservoirs) that record supply entering the District's distribution system. However, Sunrise does utilize a connection to the District's Valley View Reservoirs and transmission system to better serve portions of their distribution system.

3.3 Pressure Zones

The District water service area is comprised of three pressure zones, each of which is described below:

Lower Zone: The Lower Zone is the largest pressure zone in the distribution system and makes up most of the western portion of the service area. The Lower Zone is fed by gravity flow from the Valley View Reservoirs. A 24-inch magnetic flow meter measures the flow that enters the Lower Zone and serves as one of the two "master meters" that are used to record the water supply to the District. The lower zone can also be fed by three pressure reducing valve stations (PRVs) that are connected to the Upper Zone.

Upper Zone: The Upper Zone makes up most of the eastern portion of the service area and is fed by the Valley View Pump Station which pumps out of the Valley View Reservoirs. The Valley View Pump Station conveys treated water through a 16-inch diameter transmission main to the View Acres Reservoirs, which then feed the Upper Zone via gravity. A 16-inch diameter magnetic flow meter measures the discharge to the Upper Zone and serves as one of the two "master meters" that are used to record water supply to the District.

High-level Zone: The High-level Zone is the smallest pressure zone and is a closed-loop system fed by the View Acres pump station. This zone does not have gravity storage supply and is surrounded by the Upper Zone.

A hydraulic profile of the distribution system, including each of the reservoirs, pump stations, and PRVs is provided in Figure 3-4. The geographic delineations of each of the three pressure zones, pump stations, storage reservoirs, and PRVs are provided in Figure 3-5.

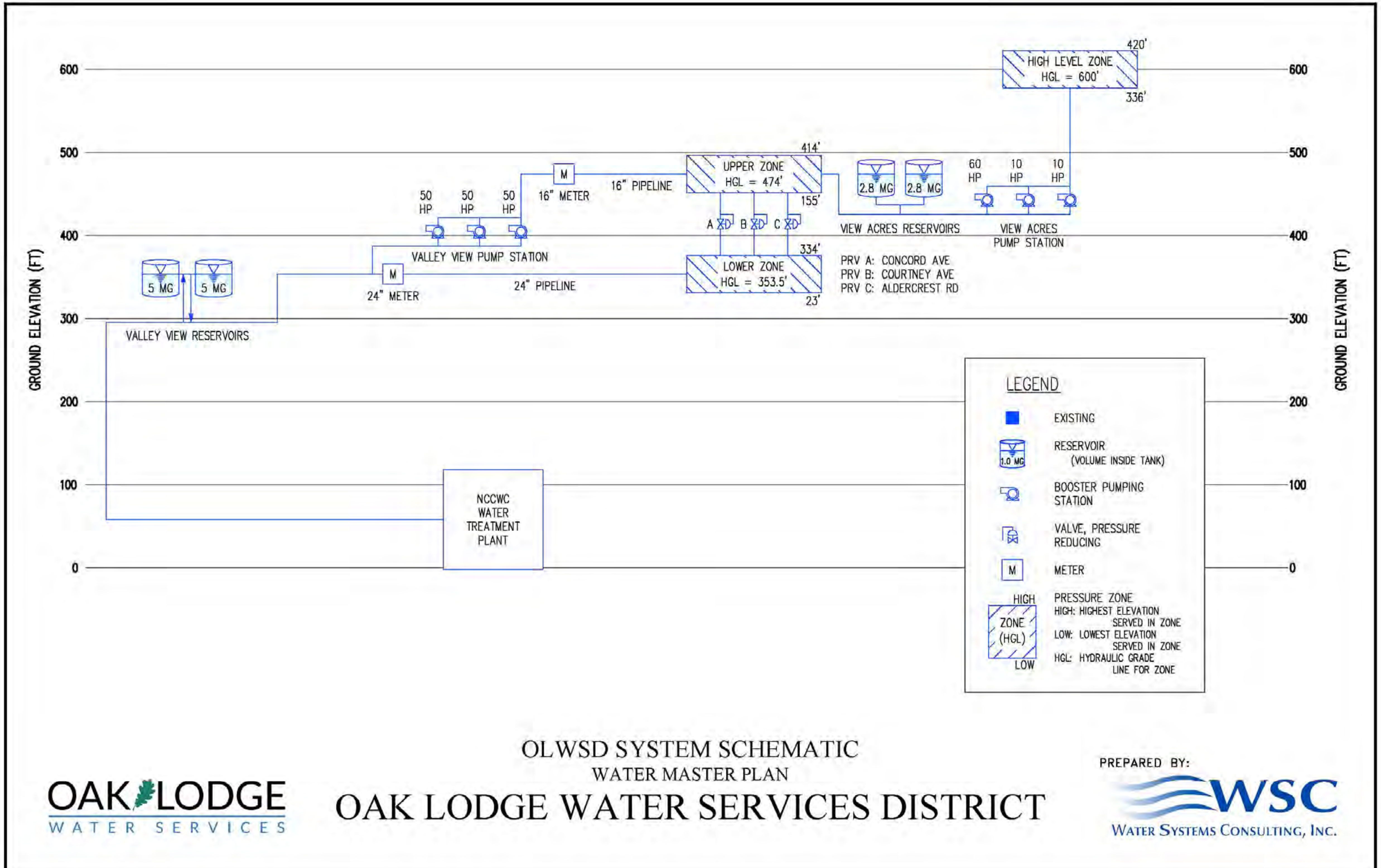


Figure 3-4. Oak Lodge System Schematic

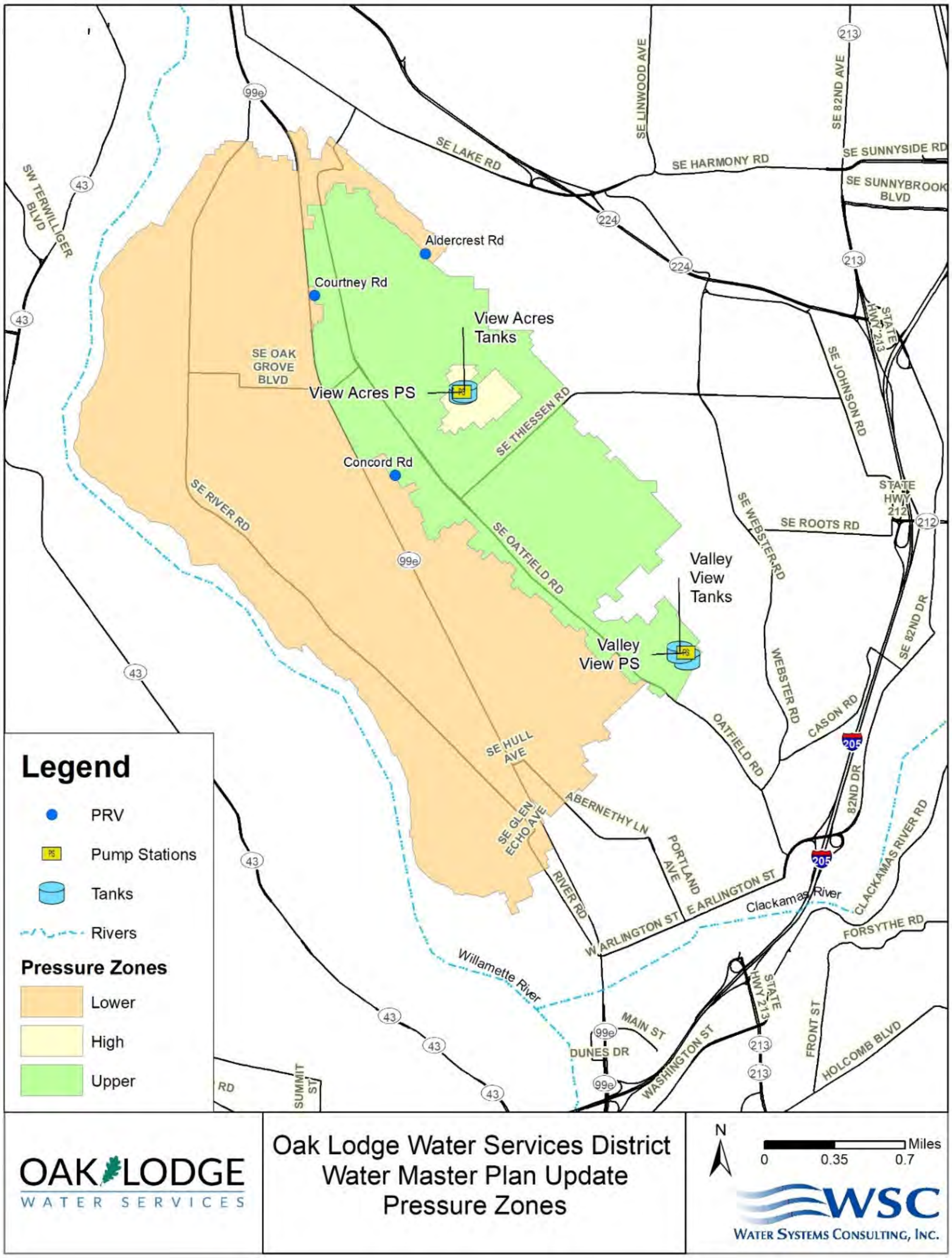


Figure 3-5. Oak Lodge System Pressure Zones

3.4 Storage

The District distribution system has four storage reservoirs at two sites that provide operational, emergency, and fire flow storage for the distribution system. The total storage capacity is 15.6 million gallons (MG). Each of the two reservoir locations include two identical reservoirs that provide gravity storage for each of the respective zones and are adjacent to pump stations that supply the higher elevation zones. Table 3-1 summarizes the storage reservoir characteristics based on the best available data including the 2008 WMP.

In April 2012, a Seismic Vulnerability Report was completed to assess the structural and mechanical integrity of the District's four reservoirs. Based on the findings and recommendations of the report, the View Acres Reservoirs underwent a seismic retrofit in 2013 as well as an upgrade to various site and mechanical components. Improvements were made to the Valley View Reservoirs in 2017 which included upgrades to the reservoirs exterior and interior access, mechanical fittings and valves, drainage and improvements to the valve vault (RH2, 2012). Both View Acres Reservoirs are circular steel tanks and have cathodic protection, while the Valley View Reservoirs are circular prestressed concrete.

Each reservoir is visually inspected every six to eight months. Due to the redundant tanks at each reservoir site, the District is able to drain one tank at a time to allow for detailed inspections and recoating of the tank interior approximately every ten years.

Table 3-1. Storage Summary

Reservoir Name	Zone Served by Gravity	Zone Served by Pump Station	Type	Year Built	Ground Elevation (feet)	Overflow Elevation (feet)	Diameter (feet)	Height (feet)	Capacity (MG)
View Acres 1	Upper	High-level	Circular Steel	1965	400	474	80.5	74	2.8
View Acres 2	Upper	High-level	Circular Steel	1989	400	474	80.5	74	2.8
Valley View 1	Lower	View Acres Reservoirs	Circular Prestressed Concrete	1966	320	353.5	161	33.5	5.0
Valley View 2	Lower	View Acres Reservoirs	Circular Prestressed Concrete	1989	320	353.5	161	33.5	5.0

MG = million gallons

3.5 Booster Pump Stations

The District distribution system contains two booster pump stations (BPS). The Valley View BPS pumps water from the Lower Zone to the View Acres Reservoirs in the Upper Zone. The View Acres BPS supplies water from the View Acres Reservoirs to the High-level Zone around the reservoirs. The High-level Zone does not contain storage and relies solely on the View Acres BPS for adequate supply and pressure. The View Acres BPS includes a fire pump for emergency supply since reservoir storage is not available in the High-level Zone.

Both booster pump stations have been upgraded and are equipped with emergency generators with sufficient capacities to operate the pumps, including the fire pump at View Acres BPS. Each BPS is inspected one to two times every month and maintenance is performed as needed.

The Valley View BPS operates based on the View Acres reservoir levels. The View Acres BPS operates on pressure settings for the High-level zone. The settings are used to maintain adequate supply and pressure in the system. Table 3-2 provides a summary of the booster station information, pump specifications, and respective associated infrastructure. Table 3-2 also includes the finished water pump station at the NCCWC WTP, which is owned and operated by the NCCWC, due to its impact on operation of the OLWSD system. The CRW WTP pump station is included because it is owned by OLWSD, although it is leased and operated by Sunrise.

Table 3-2. Booster Pump Station Summary

Booster Pump Station	Number & Type of Pumps	Design Capacity[1] (gpm)	Design Total Dynamic Head[1] (feet)	Motor Size (HP)	Firm Capacity	Year Built or Latest Rehab.	Zone Pumping From/To	Associated Infrastructure
Valley View	3 Vertical Turbine Pumps	1,100	155 ft	3 x 50	2,200 gpm	Built in 1966. Rehabilitated in 2008 including replacement of pumps	Lower Zone/ Upper Zone	Valley View Reservoirs
View Acres	2 VFD Pumps 1 Fire Pump	200 gpm 1,650 gpm	110 ft 100 ft	2 x 10 (VFD) 1 x 60	200 gpm	Built in 1965 Rehabilitated in 2005 including replacement of pumps	Upper Zone/ High-level Zone	View Acres Reservoirs
NCCWC Finished Water[2]	5 Pumps			3 x 500 1 x 200 1 x 400	20 MGD	Built in 1998	NCCWC WTP/ Lower Zone	Valley View Reservoirs
CRW Pump Station[3]	3 Pumps	3,100 gpm 5,200 gpm 6,600 gpm		2 x 100 1 x 150	5,200 gpm	Rehabilitated in 1985	CRW WTP/ Valley View Reservoirs (SWA)	Valley View Reservoirs

gpm = gallons per minute; HP = horsepower; VFD = variable frequency drive; MGD = million gallons per day

[1] Design capacity and total dynamic head vary based on pump configuration that is being utilized. Some stations do not provide operational variability.

[2] NCCWC finished water pumps are owned and operated by NCCWC and provide water to the OLWSD distribution system via the 24-inch transmission main.

[3] CRW Pump Station is owned by OLWSD but leased and operated by Sunrise. This pump station pumps water from the CRW WTP to the Sunrise distribution system. The Sunrise distribution system includes usage of some of OLWSDs transmission system, including the Valley View Reservoirs for operational storage.

3.6 Distribution and Transmission Mains

The District distribution system consists of about 105 miles of distribution and transmission mains. Transmission mains are generally mains that are 12-inches or greater and transport larger amounts of flow through the system, while distribution mains are pipes 8-inches or less in diameter that deliver flow to service connections. The District's geographic information system (GIS) database is updated by the District on an on-going basis and includes information on pipe material, diameter, and installation year, although this information is not complete for the entire distribution system. The system is predominately located within public rights-of-way, giving OLWSD access for repairs and maintenance. The District has been in the process of upgrading all 2-inch diameter lines in the system to 6-inch or greater and there are few 2-inch lines remaining. The District has also been in the process of upsizing 4-inch hydrant laterals. Blow offs were added to all dead-end mains in 2008.

The distribution system is maintained with an annual unidirectional flushing program, alternating zones each year. Leak detection is performed annually on portions of the distribution system.

A summary of lengths of water main diameters in the District's system is presented in Table 3-3. Additional information on pipeline materials and age is provided in Chapter 7.

Table 3-3. Distribution System Main Diameter Summary

Diameter	Total[1] (miles)
2"	1.1
3"	0.1
4"	5.2
6"	67.5
8"	17.6
10"	1.0
12"	3.6
16"	4.2
18"	0.1
24"	4.4
Total (miles)	104.8

[1] Data is based on the District geographic information system data as of October 2018

3.7 Pressure Reducing Valve Stations

The District has three PRV stations that connect the Upper Zone to the Lower Zone. PRVs are used to regulate system pressures and to augment the lower level system in a fire flow demand event. PRV stations are tested and rebuilt every five years. PRV settings are currently maintained by a District contractor and provided in Table 3-4.

Table 3-4. Pressure Reducing Valve Station Summary

Service Level	PRV Location	Size (inches)	Downstream Setting[1] (psi)
Upper to Lower Zone	SE Fernridge & Willamette (Aldercrest PRV)	8	55
	SE Concord Ave	6	50
	SE Courtney Ave	6	50

PRV = pressure reducing valve; psi = pounds per square inch

[1] Downstream pressure settings provided by District contractor.

3.8 Supervisory Control and Data Acquisition

The OLWSD system is monitored and controlled by a central SCADA system. The SCADA system allows OLWSD to monitor and control its reservoirs, pump stations, and supply meters. NCCWC is able to monitor the OLWSD system to regulate the NCCWC WTP production. Further discussion of the condition and status of the existing SCADA system is provided in Chapter 7. The SCADA system for the District's water facilities was installed prior to the District merger and is not integrated with the wastewater collection and treatment plant SCADA system.

CHAPTER 4

Evaluation Criteria

This section summarizes the desired performance criteria for the water distribution system that was used to analyze the system and identify recommended improvements. Performance criteria were developed from Oregon Drinking Water Rules, District Standards, Clackamas County Fire Code, the District's preferences and engineering judgement. A Level of Service workshop was conducted with OLWSD staff to discuss desired goals and criteria under normal and emergency operational scenarios. The evaluation criteria are organized into three categories; distribution, storage, and booster pump stations. The specific criteria included in each category are described in the following sections.

4.1 Distribution System

Pipeline capacity within the distribution system is typically evaluated based on system pressures during various demand scenarios. Most commonly, the adequacy of distribution piping sizes will be determined during fire flow scenarios, which vary for different types of construction. The pressure criteria that will be used to evaluate the distribution pipeline, which were the same criteria used in the 2008 WSMP, are summarized in Table 4-1.

IN THIS SECTION

Table 4-1. Water System Planning and Evaluation Criteria: Distribution

Purpose	Regulation or Reference	Engineering and Planning Criteria	
System Pressure	District Preference	35 psi minimum at Peak Hour Demand	
	Oregon Health Authority	20 psi minimum residual at MDD plus FF	
Fire Flows	Oregon Fire Code (Appendix B) and Clackamas Fire District #1	Residential[1]	1,500 gpm for 2 hours
		Commercial, Mixed-Use, Offices, Schools	3,500 gpm for 3 hours
		Industrial	5,000 gpm for 4 hours
		The distribution system analysis assumes only one fire will occur within the system at a time.	
New Distribution Mains	District Preference	All new water mains must be 8-inch or greater[2]	

MDD = maximum day demand; FF = fire flow; gpm = gallons per minutes; psi = pounds per square inch

[1] For single-family residential areas that are at the end of a dead-end main with a single hydrant, the fire flow criteria was evaluated at 1,000 gpm for 1 hour.

[2] Unless otherwise approved by District Engineer for special cases including dead-end mains beyond the hydrant where no expansion is anticipated.

4.2 Storage Facilities

A distribution system's storage facilities provide operational, fire flow and emergency storage. This section describes the criteria used to evaluate the District's storage facilities. Evaluation criteria for water storage within the OLWSD distribution system are provided in Table 4-2.

4.2.1 Operational Storage

Operational storage is the volume of water needed to equalize the daily supply and demand. Operational storage is used to meet diurnal peaks that occur in excess of the maximum day demands (MDD) and allows pumps to cycle off during the day and fill reservoirs during the night. Operational storage should be sized appropriately to allow adequate turnover that limits water age and maintains disinfectant residuals.

4.2.2 Fire Storage

Fire storage is the volume in the reservoir used in a fire event. The required fire storage is determined by multiplying the required maximum fire flow (FF) rate in gallons per minute for the service area by the required duration. It is assumed that only one fire will occur in a pressure zone at a time. The fire flow rates and duration requirements are set by the Clackamas Fire District #1 in accordance with Oregon Fire Code Appendix B.

4.2.3 Emergency Storage

Emergency storage is water that is available for use by water system customers in the event of a long-term disruption of water supply. Emergency scenarios may include pipeline failures, equipment failures, power outages, pumping system failures, water treatment plant failures, raw water contamination, or natural disasters. The quantity of emergency storage is determined based on the required water system dependability, risk acceptance, and water quality in storage reservoirs. Oversized reservoirs can potentially have a negative impact on stored water quality.

Table 4-2. Water System Planning and Evaluation Criteria: Storage

Purpose	Regulation or Reference	Engineering and Planning Criteria
Operational Storage[1]	District's Preference	0.25 x MDD of the area served by each reservoir
Fire Flow Storage	Oregon Fire Code (Appendix B) and Clackamas Fire District #1	Sufficient storage is required to provide the fire flows for each zone listed in Table 3-1
Emergency Storage[2]	District's Preference	2 x ADD of the area served by each reservoir
MDD = maximum day demand; ADD = average day demand		

[1] Operational Storage does not consider storage requirements in the Valley View Reservoirs to meet the operational requirements of the District's shared transmission system.
[2] Emergency Storage is in addition to fire flow storage to provide water in case of a pipeline failure, equipment failure, source contamination, power outage, or natural disaster.

4.3 Booster Pump Stations

Boosted zones with storage reservoirs capable of supplying fire flow and peak hour demands, must include booster station facilities with firm capacity to supply maximum day demand. For zones without gravity storage, booster stations should have a firm capacity to supply maximum day demand plus fire flow or peak hour demands, whichever is greater. Firm capacity is defined as the booster pump station capacity with the largest pump turned off. Dedicated emergency supply pumps, such as the View Acres fire pump are included in evaluating sufficient capacity. Evaluation criteria for pump stations within the District's distribution system are provided in Table 4-3.

Table 4-3. Water System Planning and Evaluation Criteria: Booster Pumps

Purpose	Regulation or Reference	Engineering and Planning Criteria
Capacity for Zone with Storage	Accepted Engineering Practices	Firm capacity must supply MDD to service zone Firm capacity of lower elevation pressure zone pumps must also deliver the MDD of all higher elevation pressure zones they supply.
Capacity for Zone without Storage	Accepted Engineering Practices	Firm capacity, including dedicated fire pumps, must supply MDD plus FF or PHD, whichever is greater, to service zone.
Emergency Power	Recommended Standards for Water Works[1] and District's Preference	Emergency power must be sufficient to meet system ADD or fire flow demands, whichever is greater.
MDD = maximum day demand; FF = fire flow; PHD = peak hour demand; ADD = average day demand		

[1] Recommended Standards for Water Works (Ten State Standards). Water Supply Committee of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. Albany: Health Research, Inc., 2007.

CHAPTER 5

Demand, Supply and Storage Analysis

To evaluate the sufficiency of the District's water supply and existing system storage over the planning period, the historic and current demand must be determined and used as the basis for projections of future demand. This section provides a description of both current demands and future projections and uses the calculated demands to analyze the District's existing supply and storage capacity to determine if any current of future deficiencies exist.

5.1 Definitions

For the purposes of this WSMP, the following defined terms are used:

- **Consumption:** The amount of billed metered water consumed by customers. OLWSD provided annual deliveries data by customer for 2013-2017.
- **Production:** The amount of water produced from OLWSD's supply sources and put into the distribution system based on metered flows entering the District's distribution system. OLWSD provided monthly production data from 2014-2017 by supply source and daily production data from 2013-2017.
- **Non-revenue Water (NRW):** The amount of water losses making up the difference between production and consumption.
- **Demand:** The amount of water distributed through the water system calculated based on consumption and production. Demand takes into account NRW.

IN THIS SECTION

5.2 Historic and Projected Water Demands

To evaluate the District's water distribution system, the location and quantities of water demands must be known and modeled. Water consumption records only include billed metered water consumption and do not include any NRW. NRW can also be referred to as water loss, either physically from leaking pipes, pipe flushing, overflows at facilities, or as apparent losses resulting from meter inaccuracies. To account for consumption and NRW, water demand is calculated based on water consumption and water production data. The production of all water was divided by the consumption to create a scaling factor. The scaling factor was then applied to consumption data to normalize the water consumption records to better model the total demand distributed through the District's water system.

Historical consumption, production, NRW, population and per capita demand in gallons per capita per day (GPCD) were analyzed to determine baseline and projected demands as shown in Table 5-1 and Figure 5-1. A baseline demand is representative of recent historic demand patterns that could be used to base future demand projections on. Baseline demand NRW was assumed to equal the average percentage from 2015-2017 and the baseline GPCD was assumed to equal the average from 2014-2017. Projected population was estimated using data within GIS software based on Oregon Metro Transportation Analysis Zone (TAZ) data. The District provided additional input on planned developments within the service area, but the resulting population increases were lower than those created from the Oregon Metro projections, so the TAZ data was used for projecting future demands. The projected population was applied to the baseline GPCD to yield estimated demands from 2022-2037. The Oregon Metro TAZ data predicts slow growth in the system over the next 20 years, thus projected water demands are also not expected to increase significantly through 2037.

Table 5-1. Historical and Projected Water Use

Year	Production (AFY)	Total Billed Consumption (AFY)	NRW (%)	Population	GPCD
2014	3,210	2,677	17%	27,401	105
2015	3,498	2,836	19%	27,505	114
2016	3,530	2,661	25%	27,610	114
2017	3,424	2,764	19%	27,715	110
Baseline Demand	3,435	2,705	21%	27,715	111
2022	3,501	2,757	21%	28,246	111
2027	3,568	2,810	21%	28,787	111
2032	3,602	2,837	21%	29,065	111
2037	3,637	2,864	21%	29,345	111

AFY = acre-feet per year; GPCD = gallons per capita per day

Several limitations to the demand projections merit further discussion. Although a constant GPCD is used and is based on the best and most recently available data, the future GPCD will likely vary over time due to conservation programs, climate change, reductions in NRW, and modifications to land use. Future updates to the demand forecast should also update the GPCD with the best available data. As with future variations in GPCD, the effects on population growth and densification due to House Bill 2001 (HB2001) are also difficult to predict for the District. The effects of HB2001, which allows multi-family and auxiliary housing within areas currently zoned for single-family residential housing, are not yet clear and observed trends in development should be used to inform updated population projections within future WSMP updates.

The average NRW from 2015-2017 was 21 percent, a dramatic increase from the average of 8.9 percent calculated in the 2008 WSMP. Oregon Water Resources Department sets a goal for municipal water suppliers to keep NRW below ten percent. Operations has not observed or recorded substantial leaking pipes across the system during routine maintenance work, and the NRW percentage is alarming. Although the following sections of this chapter demonstrate that existing storage and pumping facilities provide adequate capacity to accommodate the increased NRW, the District understands the need to reduce the amount of NRW as soon as possible.

District staff are actively working to troubleshoot and diagnose a variety of possible causes for the high rate of NRW. District operations staff are checking pipelines and valves for potential leaks. Control valves at interconnections with adjacent agencies are being checked for proper functioning. The District is reviewing the billing process to ensure accurate billing records, which were used to calculate NRW. In 2019, the District replaced all residential meters which reduced meter inaccuracy, another potential source of NRW. Finally, the District is tracking and logging all maintenance activities and water loss events to account for water loss, so that the sources of NRW can be better understood. As sources of NRW are identified and mitigated, the percentage of NRW should be recalculated as data becomes available and used to reduce the projected future water demands across the District.

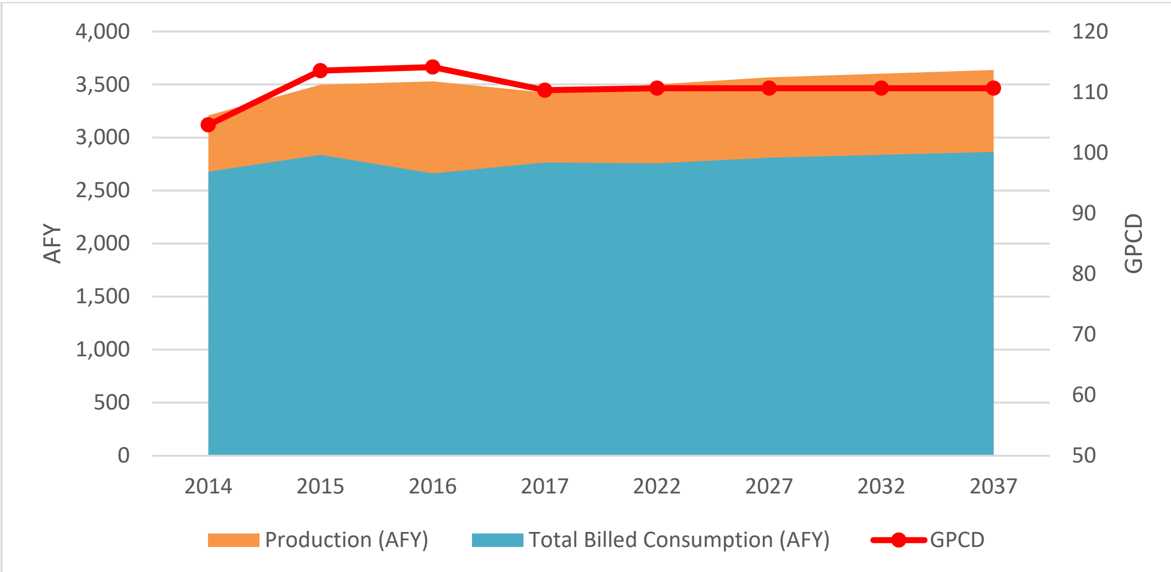


Figure 5-1. Historical and Projected Water Use

Spatially allocated demands were established based on District GIS data including historical annual water customer consumption and production records. The GIS data provided locations of small and large meters which were linked with customer billing records using account numbers, and addresses in some cases, to spatially allocate customers' water use. The spatial distribution of existing demands was then scaled to expected population growth rates. Projected demands in five-year increments from 2022-2037 were assigned to each existing customer location based on each customer's percentage of total water demand in 2017. An example of spatially allocated customer demand sized by water demand volume is shown in Figure 5-2 below.

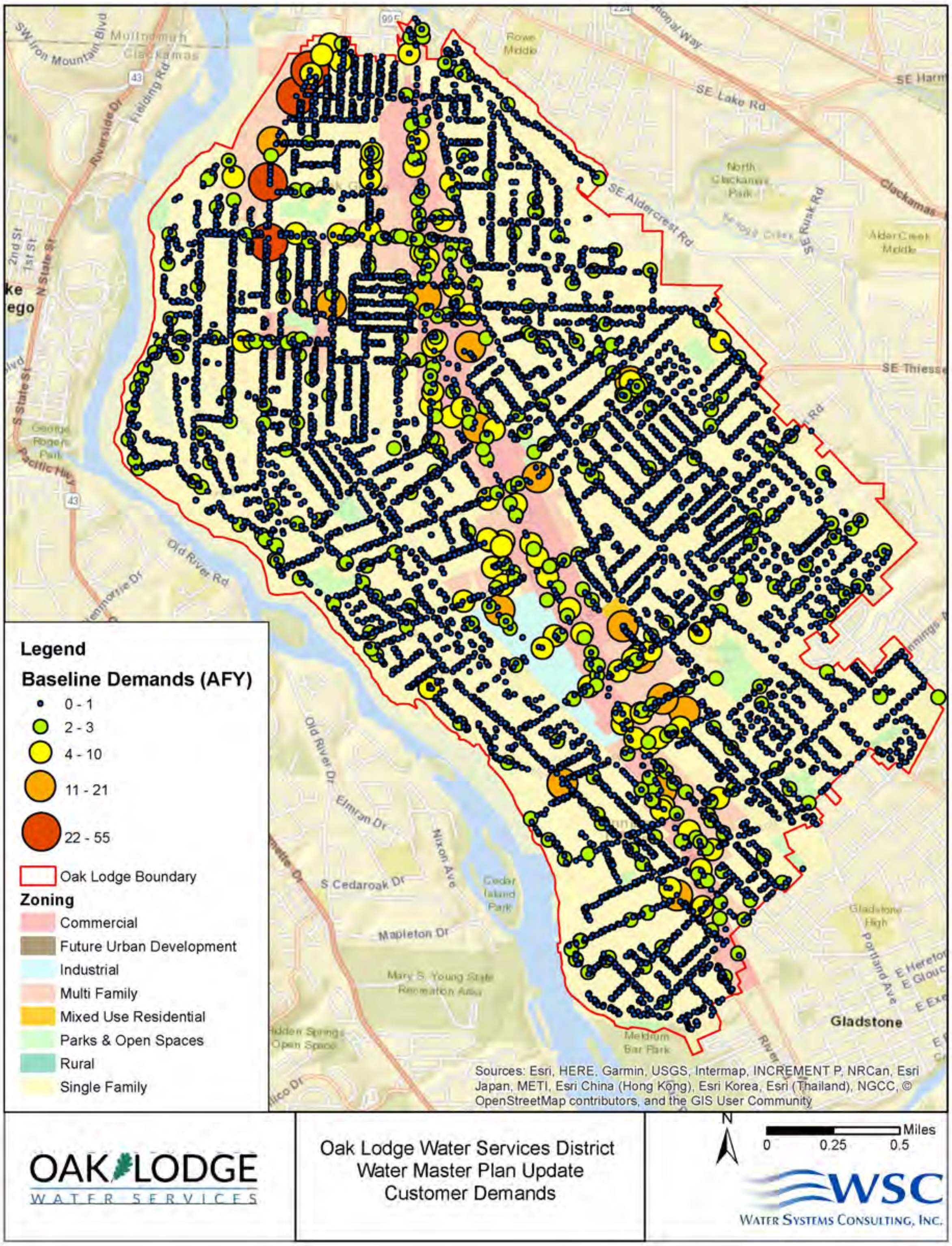


Figure 5-2. Spatially Allocated Demands

5.3 Peaking Factors

Monthly production data from 2014-2017 provided by the District was used to develop average monthly peaking factors, included in Table 5-2. Figure 5-3 depicts the monthly production from 2014 through 2017, with peak production occurring between July and August and significantly lower demands from November through April.

Table 5-2. Monthly Peaking Factors Developed from 2014-2017 Production Data

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
0.84	0.81	0.79	0.81	0.92	1.21	1.49	1.50	1.15	0.87	0.80	0.81

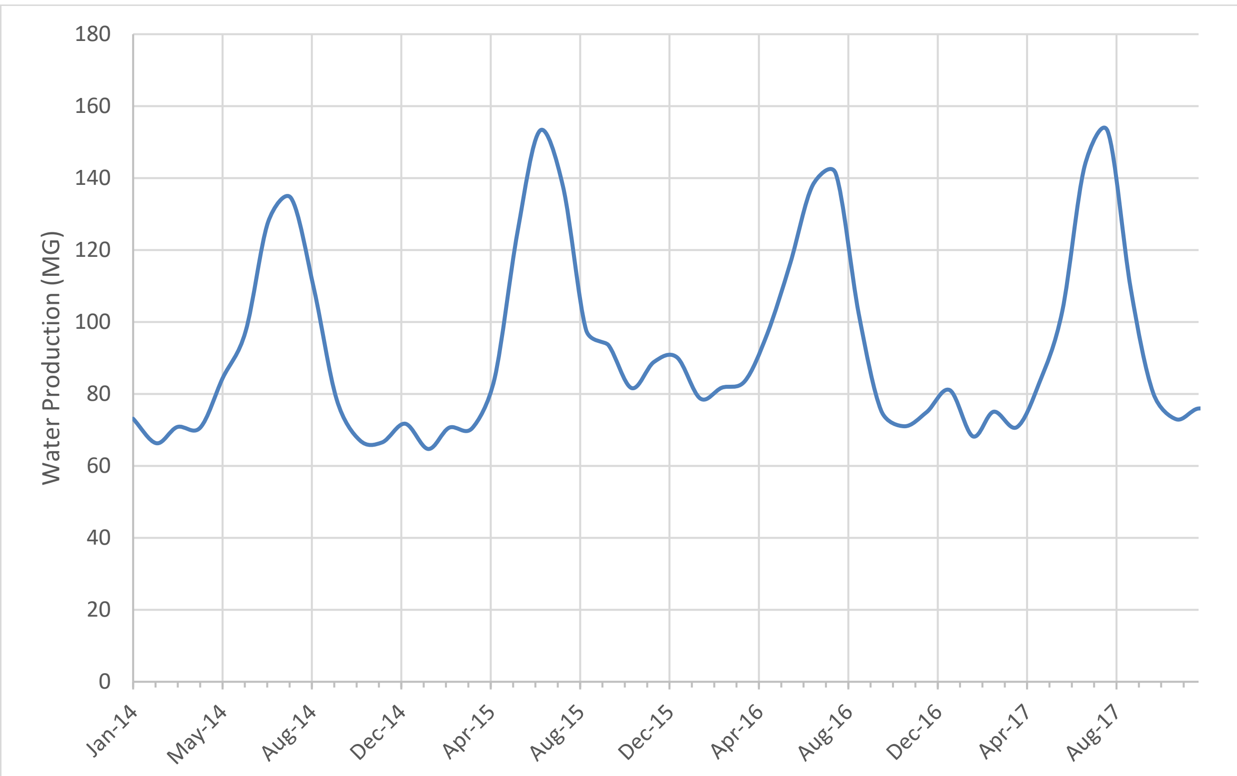


Figure 5-3. Historic Montly Water Production

Historic daily production data was also reviewed to develop daily and hourly peaking factors. The peaking factors were calculated using the 2014-2017 average daily production and peak productions. The MDD peaking factor was calculated using the maximum day production recorded from 2014-2017. Peak hour production was recorded during summer 2018 and used to develop a peak hour demand (PHD) peaking factor. Table 5-3 includes the historical average and peak productions used to develop the MDD and PHD peaking factors. Table 5-4 includes current and future demand values for each five-year planning period.

Table 5-3. Daily and Hourly Peaking Factors

Demand Condition	Demand[1] (MGD)	Calculated Peaking Factor[2]
Maximum Day Demand (MDD)	5.36	1.8 x ADD
Peak Hour Demand (PHD)	9.32	3.04 x ADD
MGD = million gallons per day; MDD = maximum day demand; ADD = average day demand; PHD = peak hour demand		

[1] Peak daily production from 2014-2017 was used for MDD and peak hourly production recorded during summer 2018 was used for PHD.

[2] The 2014-2017 Average Day Demand = 3.01 MGD was used to calculate both peaking factors.

Table 5-4. Baseline and Future Demand

Demand Condition	2017 Demand (MGD)	2022 Demand (MGD)	2027 Demand (MGD)	2032 Demand (MGD)	2037 Demand (MGD)
Average Day Demand (ADD)	3.07	3.13	3.19	3.22	3.25
Maximum Day Demand (MDD)	5.52	5.63	5.73	5.79	5.84
Peak Hour Demand (PHD)	9.32	9.50	9.68	9.78	9.87
MGD = million gallons per day; MDD = maximum day demand; ADD = average day demand; PHD = peak hour demand					

5.4 Supply Analysis

5.4.1 Water Supply

The District water supply is provided from the NCCWC WTP. The NCCWC WTP supplies water from the Clackamas River to the District, Sunrise, and the City of Gladstone through a shared transmission main. The NCCWC WTP is rated to produce up to 20 MGD and operates based on system demands. The actual production of the NCCWC WTP varies based on operational conditions. As described in the Amended and Restated Intergovernmental Agreement (IGA) for the NCCWC, the District is currently allocated 42 percent of the water treatment plant capacity at any time. Although the treatment plant has a design production capacity of 20 MGD, the actual available capacity may be limited by operational constraints including river turbidity and flow, water temperature, intake conditions, cleaning cycles and other factors. The IGA states that the NCCWC will develop a supply strategy to meet the 5-year projections of future demands, both in terms of annual volume and maximum day demand for the NCCWC members. The supply strategy shall optimize the most cost-effective use of the treatment plant and provide the overall least cost of water to each member from all available sources, including conservation and management of unaccounted water loss. If for any reason the availability of water at the river intake or overall production capacity of the treatment plant is curtailed or diminished at any time, the maximum available supply from the NCCWC WTP would be up to 42 percent of the available production capacity. The NCCWC has the authority to purchase or obtain water from any other sources to meet the immediate needs of the members. The District can also receive emergency water from SFWB and CRW through the shared transmission main. A more detailed description of the District's existing water supply is included in Chapter 3.

5.4.2 System Supply Capacity Analysis

Accepted engineering practices require that the water system supply must be able to meet the MDD. The sole source of supply for the District is the Clackamas River. Historically, this supply source has been able to meet District demands and appears to be an adequate supply source for normal operations. Table 5-5 compares the District's supply allocation from the NCCWC WTP between 2014 and 2018 to the current and future system MDD. It is assumed for this analysis that the District is allocated 42 percent of the historical maximum daily production from NCCWC WTP. Based on this assumption, the existing supply allocation from the NCCWC WTP will be sufficient to meet current demands and future demands through year 2037.

Table 5-5. System Supply Analysis

Demand Condition	Historically Available Supply from the NCCWC WTP[1] (MGD)	System MDD (MGD)
Current Demands	7.7	5.5
2037 Demands	7.7	5.8

MGD = million gallons per day; MDD = maximum day demand; NCCWC WTP = North Clackamas County Water Commission

[1] The 2014-2018 maximum daily production from the NCCWC WTP is 18.3 MGD. The maximum supply available to the District is assumed to be 42% of NCCWC WTP capacity.

It should be noted however, that the IGA also dictates that in the event of a curtailment order from Oregon Water Resources Department or an emergency that impacted the capacity of the treatment plant, the maximum allowable capacity to each NCCWC member shall be reduced on a pro rata basis (equal percentages). This supply analysis does not consider emergency supply situations when water may not be available through the shared transmission main or from the Clackamas River. Interconnections through nearby water purveyors will improve supply redundancy and reduce system risks. Emergency supply connections are further described in Chapter 7.

5.5 Booster Pump Station Capacity Analysis

Adequate BPS capacity is additionally important in maintaining reliable supply. The supply analysis above focuses on system-wide supply, but BPS capacity is important to effectively distribute water to the Upper and High Level zones. Based on accepted engineering practices, the Valley View BPS firm capacity must be able to meet the Upper Zone MDD and High-level Zone MDD. The View Acres BPS firm capacity must be able to supply the High-Level Zone MDD plus fire flow or PHD, whichever is larger, since the High-Level Zone does not contain gravity storage. Firm capacity is defined as the BPS capacity with the largest pump out of service. Dedicated emergency supply pumps, such as the View Acres fire pump are included in evaluating sufficient capacity. Table 5-6 and Table 5-7 evaluate the BPS supply capacity under current and future demands, respectively.

Table 5-6. Pump Station Capacity Analysis under Current Demands

Pump Station	Zone Served	Zone ADD (gpm)	Zone MDD (gpm)	Zone FF (gpm)	Zone PHD (gpm)	Required pump Capacity (gpm)	BPS Total Capacity (gpm)	BPS Firm Capacity (gpm)	Excess BPS Capacity (gpm)
Valley View	Upper	596	1,154	---	---	1,154	3,300	2,200	1,046
View Acres	High Level	45	82	1,500	137.8	1,582	2,050	1,850	268
gpm = gallons per minute; MDD = maximum day demand; ADD = average day demand; PHD = peak hour demand; FF = fire flow; BPS = booster pump station									

Table 5-7. Pump Station Capacity Analysis under 2037 Demands

Pump Station	Zone Served	Zone ADD (gpm)	Zone MDD (gpm)	Zone FF (gpm)	Zone PHD (gpm)	Required pump Capacity (gpm)	BPS Total Capacity (gpm)	BPS Firm Capacity (gpm)	Excess BPS Capacity (gpm)
Valley View	Upper	631	1,222	---	---	1,222	3,300	2,200	978
View Acres	High Level	48	86	1,500	145.9	1,586	2,050	1,850	264
gpm = gallons per minute; MDD = maximum day demand; ADD = average day demand; PHD = peak hour demand; FF = fire flow; BPS = booster pump station									

Based on the current and projected demands, the District's booster pump stations are equipped with adequately sized pumps and will have sufficient capacity through year 2037.

Additionally, emergency power for each BPS shall be sufficient to meet system ADD or fire flows for zones without gravity storage. Both the Valley View BPS and View Acres BPS are equipped with backup generators for emergency power. The Valley View BPS generator is sufficient to provide power to supply current and projected future ADD for the Upper Zone and the backup generator for the View Acres BPS is sufficient to provide power to supply the fire flow requirements of the High Level zone. Based on system demands, the existing emergency power is adequately sized through year 2037.

5.6 Storage Analysis

Supply sources do not need to be sized for peak hour demands (operational storage), to provide water for firefighting (fire flow storage), and to meet demands during an emergency such as disruption of a major supply source (emergency storage) if sufficient storage volumes are provided. The storage criteria are described in Chapter 4 and include specific criterion for each of these three types of storage.

5.6.1 Operational Storage

Operational storage is the volume of water needed to equalize the daily supply and demand. Without operational storage, water supply facilities would need to be sized to meet the instantaneous peak demands throughout the day. Historically the District has sized operational storage requirements based on 25% of the MDD of the area served by each storage reservoir for one day. The operational storage criterion is considered adequate and is used in this WSMP to evaluate storage requirements. Table 5-8 includes the operational storage requirements to meet current and future demands.

Table 5-8. Operational Storage Requirements

Zone	Current Demands			2037 Demands		
	ADD (gpm)	MDD (gpm)	Operational Storage (gallons)	ADD (gpm)	MDD (gpm)	Operational Storage (gallons)
Lower	1,534	2,761	993,857	1,624	2,923	1,052,327
Upper	550	991	356,650	583	1,049	377,632
High Level	45	82	29,365	48	86	31,092
Total	2,129	3,833	1,379,871	2,225	4,058	1,461,051
gpm = gallons per minute; MDD = maximum day demand; ADD = average day demand						

5.6.2 Fire Storage

The fire flow requirements are set by Clackamas County Fire District # 1 and the Oregon Fire Code. When assessing the fire flow in the distribution system the supply sources are assumed to be off, and the storage reservoirs are required to hold the volume of water required for firefighting. The fire storage requirements are based on the largest fire flow requirements for the development within the service area and assume that only one fire will occur at a time within the system. The Upper and High Level zones share storage in the View Acre Reservoirs, and since only one fire is assumed to occur at a time, the fire storage is combined for these two zones, using the largest fire flow requirement of the two zones. Table 5-9 lists the fire storage requirement for the system.

Table 5-9. Fire Storage Requirements

Zone	Flow (gpm)	Time (hour)	Fire Flow Volume (gallons)
Lower	5,000	4	1,200,000
Upper/ High Level	3,500	3	630,000
gpm = gallons per minute			

5.6.3 Emergency Storage

According to the American Water Works Association (AWWA) Manual M19 Emergency Planning for Water Utilities, emergency storage is water that is available for use by water system customers in the event of a longer-term disruption of water supply. "Emergency storage provides water during events such as pipeline failures, equipment failures, power outages, pumping system failures, water treatment plant failures, raw water contamination, or natural disasters" (American Water Works Association, 2001). The quantity of emergency storage is determined by the agency and based on the required water system dependability, risk acceptance, and water quality in storage reservoirs. Oversized reservoirs can potentially have a negative impact on stored water quality because of increased difficultly in maintaining the chlorine residual and a higher risk of exceeding disinfection byproduct limits. The District has historically used twice the ADD for 24 hours as the emergency storage requirement, and the same criteria is used in this WSMP to evaluate emergency storage in the District's system. Table 5-10 includes the emergency storage requirements by zone under current and future demands.

Table 5-10. Emergency Storage Requirements

Zone	Current Demands		2037 Demands	
	ADD (gpm)	Emergency Storage (gallons)	ADD (gpm)	Emergency Storage (gallons)
Lower	1,534	4,417,141	1,624	4,677,009
Upper	550	1,585,111	583	1,678,365
High Level	45	130,510	48	138,188
Total	**2,129**	**6,132,762**	**2,255**	**6,493,562**
gpm = gallons per minute				

5.6.4 Total Storage Requirements

The total required storage is the sum of the operational, fire flow, and emergency storage. Table 5-11 and Table 5-12 summarize the storage requirements for the Valley View and View Acres Reservoirs under current and future demands, respectively. The Valley View Reservoirs include the storage requirement for the Lower Zone and the View Acres Reservoirs include the storage requirements for the Upper and High-Level Zones.

Based on the storage criteria and the projected water demands, the District is expected to have sufficient storage volume now and through the next 20 years. In 2037, the system is expected to have an excess storage volume of 5.82 MG. As all tanks can be completely emptied using the adjacent pump stations, there does not appear to be any effectively unusable or "dead storage" volume in the tanks. Although excess capacity is available, the District strives to operate the tanks as close to the full volume as possible to avoid dropping pressure in the distribution system below the minimum level in areas at higher elevation.

Table 5-11. Total Storage Requirements under Current Demands

Reservoirs	Operational Storage (MG)	Fire Storage (MG)	Emergency Storage (MG)	Total Required Storage (MG)	Total Existing Storage (MG)	Excess Storage (MG)
Valley View	0.99	1.20	4.42	6.61	10	3.39
View Acres	0.39	0.63	1.72	2.73	5.6	2.87
Total	1.38	1.83	6.13	9.34	15.60	6.26
MG = million gallons						

**Note: The View Acres Reservoirs contain storage for the Upper and High-Level Zones*

Table 5-12. Total Storage Requirements under 2037 Demands

Reservoirs	Operational Storage (MG)	Fire Storage (MG)	Emergency Storage (MG)	Total Required Storage (MG)	Total Existing Storage (MG)	Excess Storage (MG)
Valley View	1.05	1.20	4.68	6.93	10	3.07
View Acres	0.41	0.63	1.82	2.86	5.6	2.74
Total	1.46	1.83	6.49	9.78	15.60	5.82
MG = million gallons						

**Note: The View Acres Reservoirs contain storage for the Upper and High-Level Zones*

5.7 Supply and Storage Recommendations

The District's current supply sources are sufficient to meet current and future projected demands. The District's normal and emergency supplies are all from the Clackamas River and conveyed through the shared transmission main. It is recommended to evaluate additional emergency intertie options to improve the District's resiliency in response to an outage of the current supply source. Alternative emergency supply sources are discussed in greater detail in Chapter 7.

The District's Valley View BPS and View Acres BPS were both found to have more than sufficient capacity now and through year 2037. The existing storage volume in the water system is also more than sufficient and will have a projected surplus storage volume of 5.82 MG in 2037.

Chapter 6

Hydraulic Analysis

The objective of the hydraulic model is to create a calibrated, representative model of the District's distribution system to simulate and predict the performance under a variety of demand and operational scenarios. The hydraulic model is also used for evaluating alternative configurations to address performance deficiencies in support of capital improvement recommendations.

6.1 Model Development

The District maintains an updated GIS database of the water distribution system, which allowed the model structure to be digitized within InfoWater, Innovyze's® GIS-based hydraulic modeling software. Major facilities such as tanks, pump stations, and valves were also manually added to the model. The modeling software was used to check the connectivity of the piping network, and pipe segments were added to build a fully functioning model. District staff provided a review of the model and identified several recently constructed improvements that had not yet been included within the GIS database, and these modifications were incorporated into the model pipe network. Spatially allocated demands were applied based on the historical and projected demands developed in Chapter 5 and applied to existing customer meter locations.

IN THIS SECTION

The model was then calibrated based on five hydrant tests throughout the distribution system. During calibration the pipe friction-factors were adjusted based on pipe material and age to better reflect the hydrant testing results. Detailed information on the model development and calibration is included in Appendix A, Hydraulic Model Development Technical Memorandum.

6.2 System Capacity Analysis

This section analyzes the District's water distribution system pressure and available fire flow. Evaluation criteria are described in Chapter 4. Areas that do not meet the pipeline evaluation criteria are identified and recommendations to improve the system are included in Section 6.3.

6.2.1 Pressure Analysis

An important part of a water distribution system is the pressure supplied to consumers. Pressures should be adequate to supply services, but not too high to cause damage to appliances or pipelines. The District's water distribution system was evaluated based on maintaining a minimum pressure of 35 psi under PHD conditions.

The system pressure was evaluated under PHD for current (2017) and future (2037) demand scenarios. Because the demands over the next 20 years are not expected to increase significantly, the pressure across the distribution system is also not expected to change significantly in that timeframe. Pressure in the system is dependent on the water level in the storage tanks and pump station operations. To best characterize system pressures, the model used the same typical operating status for facilities under both current and future demand scenarios. Table 6-1 includes the operational assumptions that reflect typical daily operational settings provided by the District's SCADA System.

Table 6-1. Operational Assumptions for Pressure Analysis

Facility	Operational Condition
Valley View BPS	No Pumps Operating
View Acres BPS	1 Pump Operating
Tank Volume	All Tanks 75% Full

Significant demand changes are not expected within the planning period, which is reflected when comparing the results of the current (2017) demand scenario to the future (2037) demand scenario. The location of pressure deficiencies under PHD was identical for both scenarios. The greatest variation in modeled pressure between the two scenarios was approximately 5-10 psi at any location which is not significant. Because the results were largely the same, only the deficiencies associated with the future (2037) PHD scenario are provided, as this is the more conservative analysis.

Figure 6-1 includes a map of the pressures experienced across the water distribution system under future PHD demands. There are no pressure deficiencies below the minimum pressure requirement of 35 psi at service connections within the District's service area. There are locations just downstream of the tanks and pump stations that show pressures below 35 psi, however low pressures at these locations are typical for these facilities and do not impact customers' service connections.

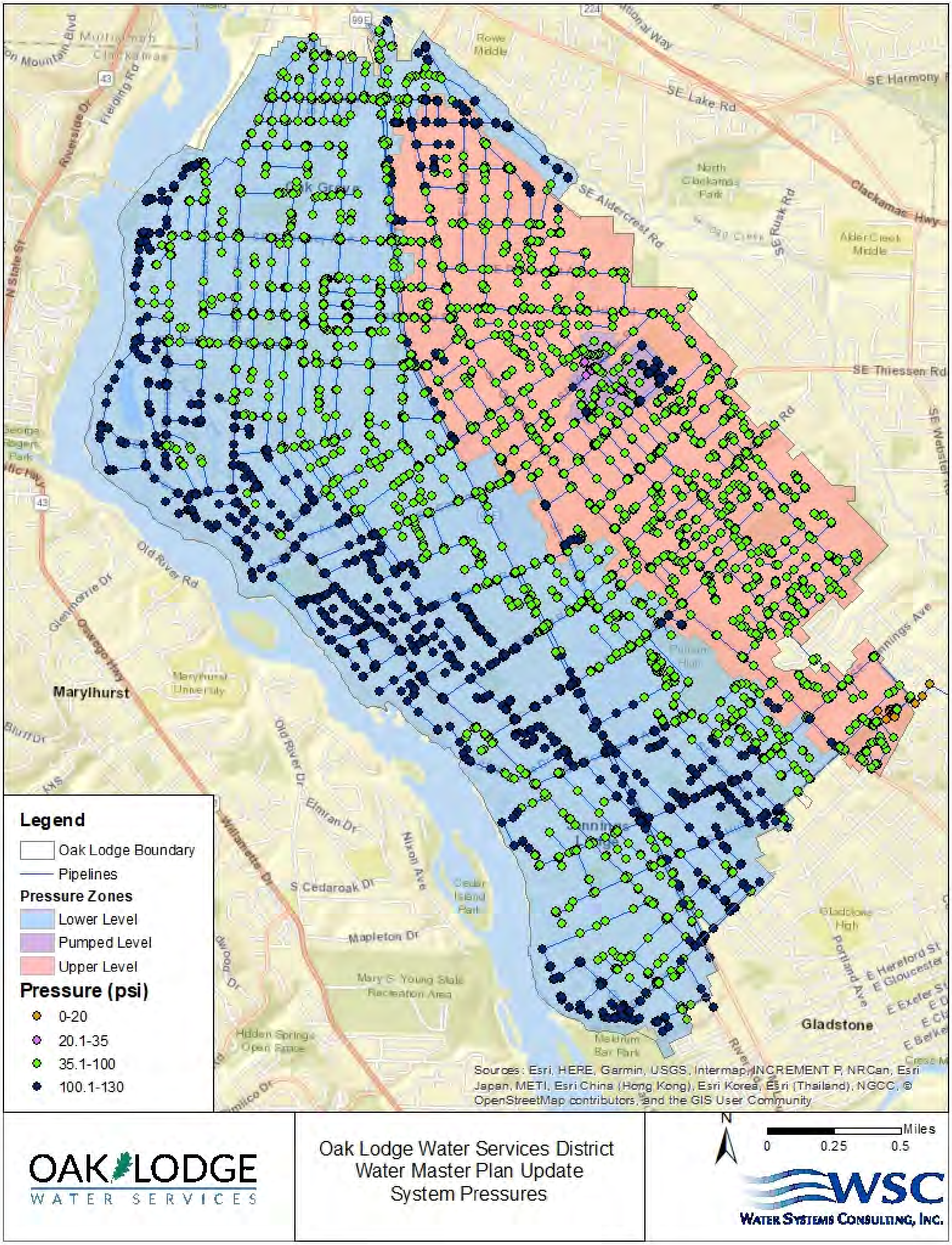


Figure 6-1. System Pressure Analysis

6.2.2 Fire Flow Analysis

Water distribution systems must provide adequate protection during a fire. The District's fire flow requirements at each hydrant location are based on the zoning category of the parcels served by the hydrant. A fire flow of 5,000 gpm is required for industrial zones, 3,500 gpm for commercial zones, mixed-use and schools, 1,500 gpm of flow in residential zones, and 1,000 gpm of flow in single-family residential zones with houses less than 3,600 square feet. Most of OLWSD is zoned as residential with some commercial, mixed use, and industrial zones.

The current available fire flow in the system was modeled using the calibrated hydraulic model. A fire flow scenario was created and run to evaluate the available fire flow at each fire hydrant while maintaining a residual pressure in the zone of 20 psi. For a conservative fire flow analysis, MDD was assumed, the reservoirs were set to 75 percent full, and all the pumps were turned off except for the View Acres fire pump.

The available fire flow was modeled under current (2017) MDD and future (2037) MDD and assumes no significant changes in land use. Since demands are not expected to increase significantly, the available fire flow under current demands is similar to the expected fire flow under future demands. Fire flow improvement projects were modeled under 2037 MDD to recommend pipe sizing that will accommodate future fire flow within the planning horizon. Any future changes in land use that increase densification are not anticipated to require additional upsizing unless an area were to move from residential to commercial or industrial land use. The fire flow requirement is based on the type of land use served and is several orders of magnitude greater than the demand created by additional users, so any upsizing to address fire flow requirements should also be sufficient to accommodate future growth beyond 2037. Figure 6-2 displays the available fire flow throughout the distribution system under the conservative settings and the required fire flow based on zoning.

Figure 6-3 shows the system fire hydrants and indicates the hydrants that cannot provide the required fire flow for their zoning. The available fire flow is highly dependent on pipeline size and available looping in the distribution system. Thus, many of the hydrant deficiencies occur on small-diameter dead-end pipelines.

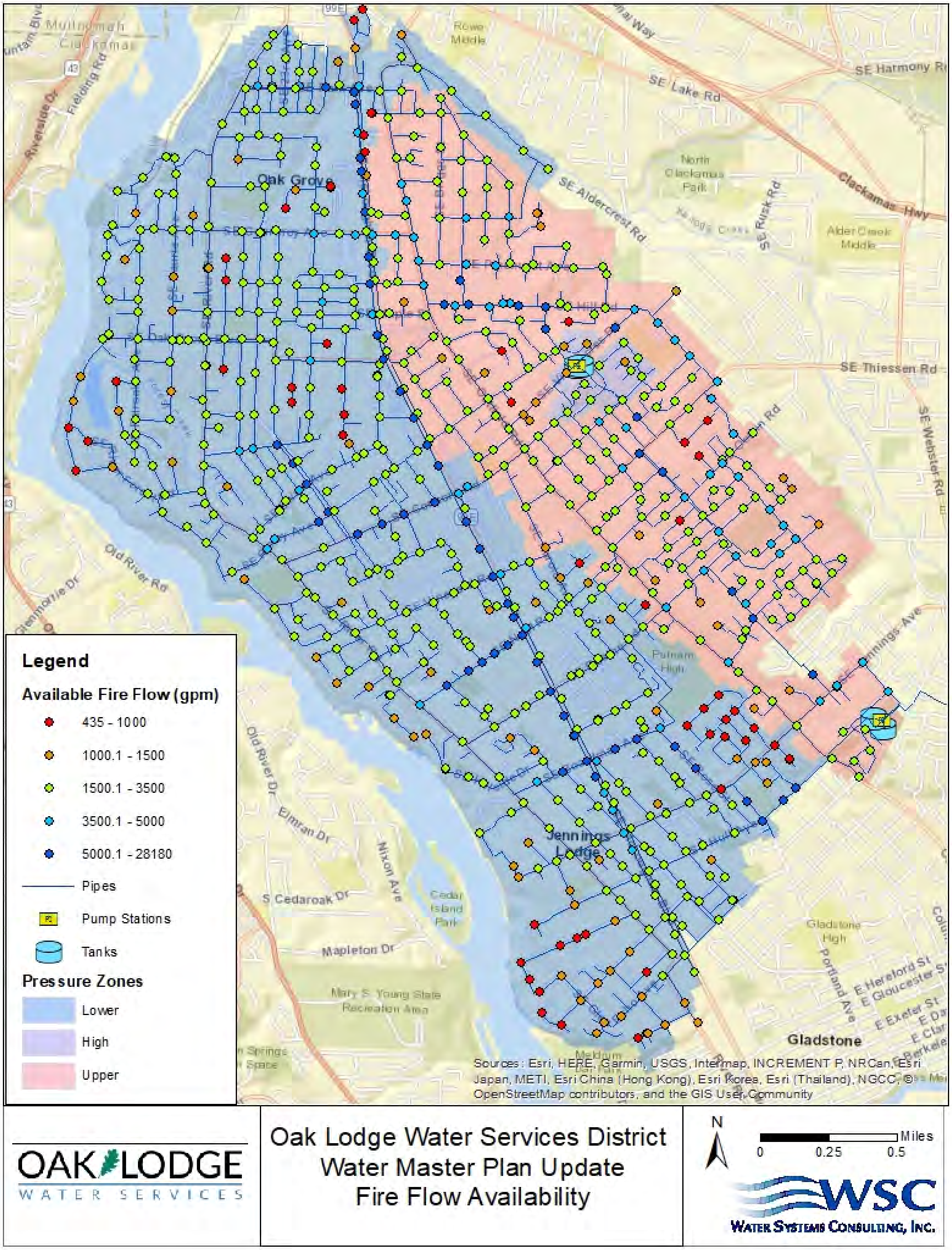


Figure 6-2. Available Fire Flow Under Future Maximum Day Demand

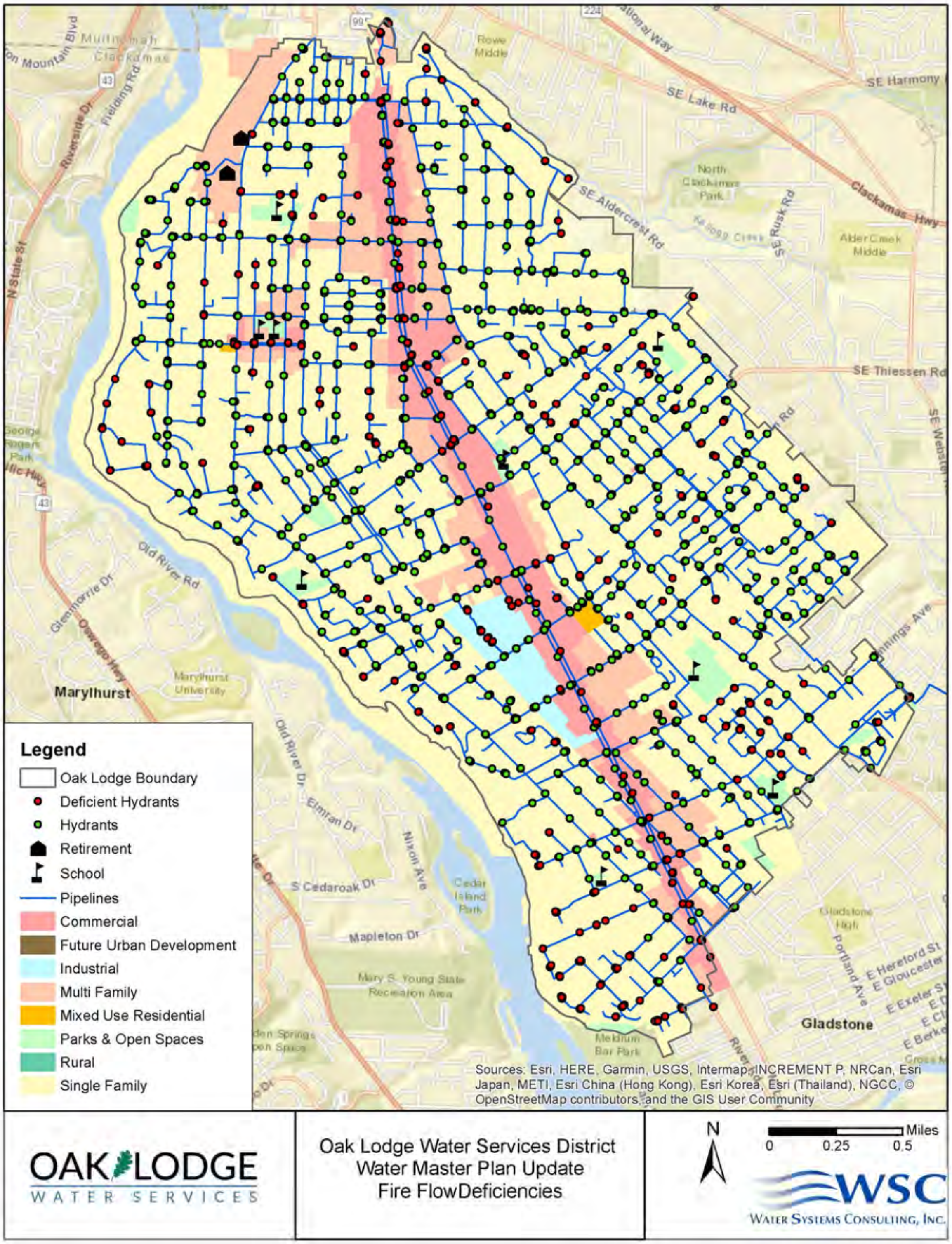


Figure 6-3. Fire Flow Deficiencies Under Future MDD

6.3 Recommended Capacity Projects

Projects to improve fire flow were developed by upsizing pipelines that restrict fire flow and adding new pipelines to create additional looping in the system where possible, and then rerunning the model to see if the modifications addressed the performance deficiency. Projects were iterated until the fire flow requirement was met with the minimum amount of upsizing or new pipe construction. For example, a deficient hydrant would not require an upsizing of pipe if there is a nearby hydrant that could also be used to meet the required fire flow. Upsizing of dead-end mains in residential zones was only recommended if the hydrant at the end of the main could not supply 1,000 gpm.

The resulting projects were then reviewed with District staff and modified further to incorporate staff preferences and opportunities to address condition deficiencies. Most of the recommended projects include upsizing aging 4-inch and 6-inch cast iron mains on dead-end mains that restrict fire flow. Overall, WSC recommends upgrading about 12.1 miles of small diameter pipelines with 8-inch or 12-inch diameter pipe to improve fire flow through the OLWSD distribution system.

Table 6-2 lists the recommended fire flow improvement projects in order of priority. The projects have been ranked based on operations and engineering staff input, installation of existing pipe, number of hydrant deficiencies corrected by the project, and the customer zoning. Prioritization and timing of projects was also coordinated with the Clackamas County Department of Transportation planned paving projects to allow pipes to be installed prior to, or in coordination with road paving projects to reduce restoration costs. Figure 6-4 includes a map of the recommended fire flow projects in the system and corresponds to the project list.

Table 6-2. Fire Flow Projects

Project Number	Project Type	Zone	Location	Existing Size and Material	Total New Pipe Length	Recommended Size and Material	Recommended Project (Segments)
F-1	Pipeline	Lower	SE 28th Avenue, SE Lakewood Drive, Kellogg Lake Apartments	6”	4,015 feet	8” and 12” DI	Replace 60 feet of 8” pipe and 270 feet of 6” pipe with 12” DI pipe along SE 28th Avenue north of SE Park Avenue. Replace 1,255 feet of 6” pipe with 8” DI pipe along SE McLoughlin Boulevard and SE Lakewood Drive. Replace 800 feet of 6” pipe with 8” DI pipe along SE Lark Street and SE Whitcomb Drive from SE Lakewood Drive to Kellogg Lake Apartments Road. Install 975 feet of 8” DI pipe to connect loop from SE Oatfield Road through Kellogg Lake Apartments to existing main on SE Whitcomb Drive. Replace 655 feet of 6” pipe with 8” DI pipe along SE Oatfield Road to Aldercrest Road.
F-2	Pipeline	Lower	SE River Road	4", 6”, and 8"	6,805 feet	8" and 12” DI	Replace 5,105 feet of 6” pipe with 12” DI pipe along SE River Road from Park Avenue to Oak Grove Boulevard. Replace 1,035 feet of 8” pipe with 12” DI pipe along SE Torbank Road from SE River Road to Oak Grove Elementary. Replace 665 feet of 4” pipe with 8” DI pipe along SE Maple Street between Laurie Avenue and River Road.
F-3	Pipeline	Upper	SE Vista Sunrise Court	6”	400 feet	8” DI	Replace 400 feet of 6” pipe with 8” DI pipe along SE Vista Sunrise Court north of SE Oetkin Road.
F-4	Pipeline	Lower	Jennings Avenue, Emerald Drive, Colina Vista Avenue, Clayson Avenue, Colony Circle	6”	4,415 feet	8” DI	Replace 1,010 feet of 6” pipe with 8” DI pipe along SE Jennings Avenue between SE Portland Avenue and SE Colina Vista Avenue and connect the new 8” pipe to the existing 24” DI pipe at corner of SE Portland Avenue and SE Jennings Avenue. Replace 1,055 feet of 6” pipe with 8” DI pipe along SE Emerald Drive between SE Jennings Avenue and SE Clayson Avenue. Replace 735 feet of 6” pipe with 8” DI pipe along SE Clayson Avenue between SE Emerald Drive and SE Colony Circle. Replace 600 feet of 6” pipe with 8” DI pipe along SE Colony Circle between SE Clayson Avenue and the existing hydrant. Replace 1,015 feet of 6” pipe with 8” DI pipe along SE Colina Vista Avenue between SE Clayson Avenue and SE Jennings Avenue.
F-5	Pipeline	Upper	Alderway Avenue	4”	1,070 feet	8” DI	Replace 1,070 feet of 4” pipe with 8” DI pipe along Alderway Avenue between Wallace Road and Hillwood Avenue.
F-6	Pipeline	Upper and High-level	View Acres Road	6”	2,130 feet	8” DI	Replace 1,675 feet of 6” pipe with 8” DI pipe along SE View Acres Road between View Acres tanks and SE Oatfield Road. Replace 455 feet of 6” pipe with 8” DI pipe along SE View Acres Road from the View Acres Pump Station to SE Danica Court.
F-7	Pipeline	Lower	Old Orchard Court, SE Meldrum Avenue	4” and 6”	1,850 feet	8” DI	Replace 540 feet of 4” pipe with 8” DI pipe along Old Orchard Court southwest of SE Glen Echo Avenue. Replace 710 feet of 6” pipe with 8” DI pipe along SE Meldrum Avenue between SE Glen Echo Avenue and SE Cottonwood Street. Replace 600 feet of 6” pipe with 8” DI pipe along SE Glen Echo Avenue between SE Old Orchard Court and SE Meldrum Avenue.
F-8	Pipeline	Lower	SE Hull Avenue	6”	3,565 feet	8” and 12” DI	Replace 2,645 feet of 6” pipe with 8” DI pipe along SE Hull Avenue between northbound SE McLoughlin Boulevard and SE Water Edge Way. Replace 920 feet of 6” pipe with 12” DI pipe along SE Wilmot Street between SE Hull Avenue and SE Jennings Avenue.
F-9	Pipeline	Upper	McLoughlin Boulevard	4” and 6”	5,455 feet	8” DI	Replace 2,675 feet of 6” pipe with 8” DI pipe along SE McLoughlin Boulevard between SE Maple Street and SE Risley Avenue. Replace 1,005 feet of 6” pipe with 8” DI pipe along SE Maple Street from SE McLoughlin Boulevard and SE Oatfield Road. Replace 500 feet of 6” pipe with 8” DI pipe along SE Oak Grove Boulevard from SE McLoughlin Boulevard and SE Oatfield Road. Replace 1,275 feet of 4” and 6” pipe with 8” DI pipe along SE Risley Avenue from SE McLoughlin Boulevard and SE Oatfield
F-10	Pipeline	Lower	McLoughlin Boulevard	6” CI and Unknown	4,810 feet	8” DI	Replace 2,730 feet of 6” with 8” DI pipe along northbound SE McLoughlin Boulevard from SE Boardman Avenue to south of SE Hull Avenue. End replacement at existing 8” DI pipe section between Hull Avenue and Meldrum Avenue. Replace 1,120 feet of 6” pipe with 8” DI pipe along SE McLoughlin Boulevard starting at end of existing 8” DI pipe between SE Hull Avenue and SE Meldrum Avenue and ending at SE Glen Echo Avenue. Replace 75 feet of 6” pipe with 8” DI pipe along SE Boardman Avenue between SE McLoughlin Boulevard and SE Addie Street connecting new 8” pipe along McLoughlin Boulevard to existing 24” pipe along Boardman Avenue. Replace 85 feet of 6” pipe with 8” DI pipe along SE Hull Avenue crossing SE McLoughlin Boulevard. Replace 305 feet of 6” pipe with 8” DI pipe along southbound SE McLoughlin Boulevard north of SE Hull Avenue. Replace 105 feet of 6” pipe with 8” DI pipe along SE Glen Echo Avenue crossing McLoughlin Boulevard. Replace 390 feet of 6” pipe with 8” DI pipe along SE McLoughlin Boulevard south of SE Glen Echo Avenue to end of main.

Project Number	Project Type	Zone	Location	Existing Size and Material	Total New Pipe Length	Recommended Size and Material	Recommended Project (Segments)
F-11	Pipeline	Lower	River Road	6”	780 feet	8” DI	Replace 780 feet of 6” pipe with 8” DI pipe along SE River Road between SE Risley Avenue and SE Tarbell Avenue.
F-12	Pipeline	Lower and Upper	Harold Avenue, Derry Lane, and Gordon Street	6”	1,210 feet	8” DI	Replace 435 feet of 6” pipe with 8” DI pipe along Harold Avenue between Naef Road and Derry Lane. Replace 500 feet of 6” pipe with 8” DI pipe along Derry Lane between Harold Avenue and Rayna Court. Replace 275 feet of 6” pipe with 8” DI pipe along SE Gordon Street between SE Whipple Avenue and SE Naef Road.
F-13	Pipeline	Lower	McLoughlin Boulevard	6”	170 feet	8” DI	Install 90 feet of 8” DI pipe along SE Courtney Avenue connecting the parallel 16” and 8” mains along McLoughlin Avenue. Connect existing Hydrant 5-8 located along northbound McLoughlin Boulevard to the 16” main along southbound Mcloughlin Boulevard by abandoning the existing hydrant lateral and installing 80 feet of new 8” DI hydrant lateral across McLoughlin Boulevard.
F-14	Pipeline	Lower	McLoughlin Boulevard	6”	450 feet	6” and 8” DI	Connect four existing hydrants (Hydrant 6-11, Hydrant 6-10, Hydrant 6-8, and Hydrant 6-7) located along northbound McLoughlin Boulevard between SE Vineyard Road and SE Ina Avenue to the 24” main along southbound Mcloughlin Boulevard by abandoning the existing hydrant laterals and installing a total of 360 feet (90 feet per hydrant lateral) of new 6” DI hydrant lateral across McLoughlin Boulevard. Install 90 feet of 8” pipe across McLoughlin Boulevard connecting the existing 6” pipe along northbound McLoughlin Boulevard to the existing 24” pipe along McLoughlin Boulevard at the corner of SE Ina Avenue.
F-15	Pipeline	Lower	McLoughlin Boulevard, Glen Echo Avenue, River Road	6”	1570 feet	8” DI	Replace 520 feet of 6” pipe with 8” DI pipe along SE Glen Echo Avenue between SE McLoughlin Boulevard and SE River Road. Replace 160 feet of 6” pipe with 8” DI pipe along SE River Road between SE Glen Echo Avenue and SE Britton Avenue. Replace 890 feet of 6” pipe with 8” DI pipe along SE River Road between SE Glen Echo Avenue and SE Rinearson Road.
F-16	Pipeline	Lower	Vineyard Road, Vineyard Lane, commercial parking lot, Kens Court	6”	2,830 feet	8” and 12” DI	Replace 395 feet of 6” pipe with 12” DI pipe along SE Vineyard Road between McLoughlin Boulevard and SE Vineyard Lane. Replace 585 feet of 6” pipe with 8” DI pipe along Vineyard Lane south of Vineyard Road. Replace 285 feet of 6” pipe with 8” DI along the parking lot road behind Protech Autoworks building from McLoughlin Boulevard to the existing hydrant. Replace 1,565 feet of 6” pipe with 12” DI pipe along Kens Court and the industrial parking lot between SE Vineyard Road and SE Naef Road.
F-17	Pipeline	Lower and Upper	Austin Street and Sandra Avenue and Roethe Road	6”	1,450 feet	8” DI	Replace 550 feet of 6” with 8” DI pipe along SE Austin Street northwest of SE Roethe Road. Replace 350 feet of 6” pipe with 8” DI pipe along SE Sandra Avenue northeast of SE Gordon Street. Replace 550 feet of 6” pipe with 8” DI pipe along SE Roethe Road between SE Oatfield Road and SE Gordon Street (up to pressure zone isolation valve).
F-18	Pipeline	Lower	SE Roethe Road	6”	850 feet	8” DI	Replace 850 feet of 6” pipe with 8” DI pipe along SE Roethe Road between SE McLoughlin Boulevard and SE Blanton Street.
F-19	Hydrant Laterals	Lower	River Road, Oak Grove Boulevard	6”	110 feet	6” and 8” DI	Connect existing Hydrant 3-91, located at SE Oak Grove Boulevard and SE Arista Drive, to the 8” pipeline across Oak Grove Boulevard by installing 60 feet of new 6” hydrant lateral across the street. Replace 50 feet of 6” hydrant lateral with 8” DI pipe for Hydrant 1-32, located at Oak Grove Boulevard and SE River Road, and connect to the existing 8” main.
F-20	Pipeline	Lower	SE Maple Street	6”	300 feet	8” DI	Replace 300 feet of 6” pipe with 8” DI pipe along SE Maple Street from SE Lee Avenue to SE Arista Drive.
F-21	Pipeline	Lower	Vineyard Road	6”	350 feet	8” DI	Replace 350 feet of 6” pipe with 8” DI pipe along SE Vineyard Road between McLoughlin Boulevard and SE Sun Avenue.
F-22	Pipeline	Lower	SE River Drive	6”	980 feet	8” DI	Replace 980 feet of 6” pipe with 8” DI pipe along SE River Drive between SE River Road and SE River Cress Lane.
F-23	Pipeline	Lower	Poplar Place	4” and 6”	2,695 feet	8” DI	Replace 325 feet of 4” pipe with 8” DI along SE Poplar Place east of SE Linden Lane. Replace 935 feet of 6” pipe with 8” DI pipe along Marian Street south of Oak Grove Boulevard. Replace 1,435 feet of 6” pipe with 8” DI pipe along Woodland Way south of Oak Grove Boulevard.
F-24	Pipeline	Lower	River Forest Road, River Forest Drive, River Forest Court (loop)	4” and 6”	3,035 feet	8” and 12” DI	Replace 3,035 feet of 4” and 6” pipe with 8” and 12” DI pipe looping along River Forest Road, River Forest Drive and River Forest Court.

Project Number	Project Type	Zone	Location	Existing Size and Material	Total New Pipe Length	Recommended Size and Material	Recommended Project (Segments)
F-25	Pipeline	Upper	Cottonwood Court	6”	965 feet	8” DI	Replace 965 feet of 6” pipe with 8” DI pipe along SE Cottonwood Court from SE Hill Road
F-26	Pipeline	Lower	Cedar Avenue	6”	1140 feet	8” DI	Replace 1,140 feet of 6” pipe with 8” DI pipe along SE Cedar Avenue north of SE Maple Street.
F-27	Pipeline	Lower	Thornton Drive	4”	1,000 feet	8” DI	Replace 1,000 feet of 4” pipe with 8” DI pipe along Thornton Drive between Fairbanks Avenue and the existing 6” pipe along Thornton Drive.
F-28	Pipeline	Upper	SE Diamond Lane	4”	310 feet	8” DI	Replace 310 feet of 4” pipe with 8” DI pipe along SE Diamond Lane south from SE Risley Avenue.
F-29	Pipeline	Upper	SE Sierra Vista Drive	6”	1,500 feet	8” DI	Replace 1,500 feet of 6” pipe with 8” DI pipe along SE Sierra Vista Drive from SE Thiessen Road to SE Mt Royale Court.
F-30	Pipeline	Lower	SE Britton Avenue	4” and 6”	440 feet	8” DI	Replace 440 feet of 4” and 6” pipe with 8” DI pipe along SE Britton Avenue between SE Kay Street and SE River Road.
F-31	Pipeline	Upper	Raintree Court	6”	540 feet	8” DI	Replace 540 feet of 6” pipe with 8” DI pipe along SE Raintree Court from SE Hager Lane.
F-32	Pipeline	Lower	Walta Vista Drive	6”	535 feet	8” DI	Replace 535 feet of 6” pipe with 8” DI pipe along SE Walta Vista Drive southwest of SE River Road.
F-33	Pipeline	Lower	SE Torbank Road and SE Lindenbrook Court	6”	1,190 feet	8” DI	Replace 320 feet of 6” pipe with 8” DI pipe along SE Torbank Road east of SE Linden Lane. Replace 870 feet of 6” pipe with 8” DI pipe along SE Lindenbrook Court west of SE Linden Lane.
F-34	Pipeline	Lower	McLoughlin Boulevard	6”	110 feet	8” DI	Replace 110 feet of the remaining 6” pipe segment along McLoughlin Boulevard south of SE Concord Road with 8” DI pipe.
F-35	Pipeline	Upper	SE Evergreen Street	4”	240 feet	8” DI	Replace 240 feet of 4” pipe with 8” DI pipe along SE Evergreen Street between SE Oatfield Road to SE 29th Avenue.
F-36	Pipeline	Lower	SE McLoughlin Blvd	NA	80 feet	8” DI	Connect the existing 6” main located along northbound McLaughlin Boulevard to the 16” main along southbound Mcloughlin Boulevard by installing 80 feet of new 8” DI pipe across McLoughlin Boulevard.
F-37	Pipeline	Upper	SE McLoughlin Blvd and Holly Ave	6”	1,965 feet	8” DI	Replace 735 feet of 6” pipe with 8” DI pipe along Holly Avenue from SE Oatfield Road to McLoughlin Boulevard. Replace 1,230 feet of 6” pipe with 8” DI pipe along McLoughlin Boulevard from Holly Avenue to end of main.

DI = ductile iron; SE = southeast; Blvd = Boulevard; Ave = Avenue; NA = not available; CI = cast iron

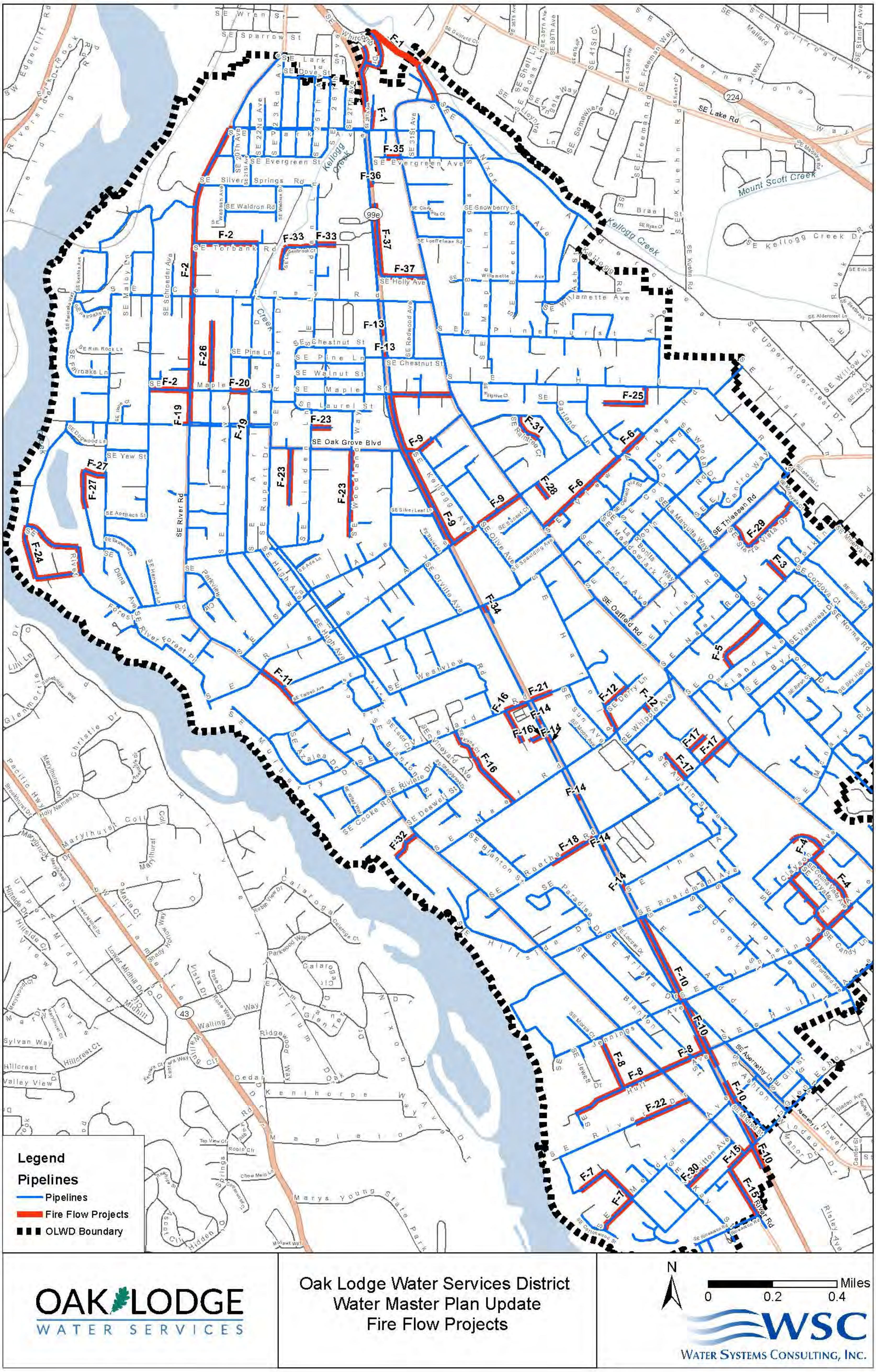


Figure 6-4. Fire Flow Projects

CHAPTER 7

Asset Rehabilitation and Replacement

The purpose of this chapter is to identify the District's asset rehabilitation and replacement needs within the 20-year CIP. OLWSD has the challenge of proactively maintaining a safe and reliable water distribution system while rehabilitating and replacing aging assets in a cost-effective manner.

7.1 Pipeline Replacement

IN THIS SECTION

Pipeline Replacement

Non-Buried Assets

Most of the distribution system is underground and not able to be visually inspected. Water purveyors must manage these assets based on regular leak detection surveys, review of installation and maintenance records, and proactive replacement of aging infrastructure based on industry standard expected useful life.

7.1.1 Available Pipeline Data

The District's current GIS database is missing a significant amount of pipe material and installation year data, which is necessary to estimate when pipelines should be replaced. The District did not maintain records prior to 1965. Although the material and installation years are not recorded in the GIS database for these pipes, the District assumes that pipes missing this information were installed prior to 1965 and were cast iron material. The District does not have pipe material recorded in the District's database for about 77 percent of the system's pipes. Assuming pipes with unknown material are cast iron, about 80 percent of the distribution system is comprised of cast iron pipe and 19 percent is ductile iron pipe. The percentage of each type of pipe material that currently comprises the District distribution system is provided in Figure 7-1.

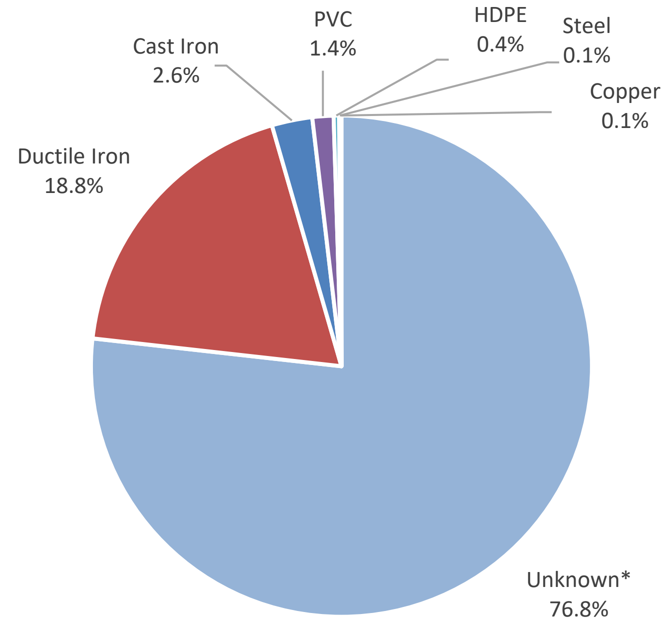
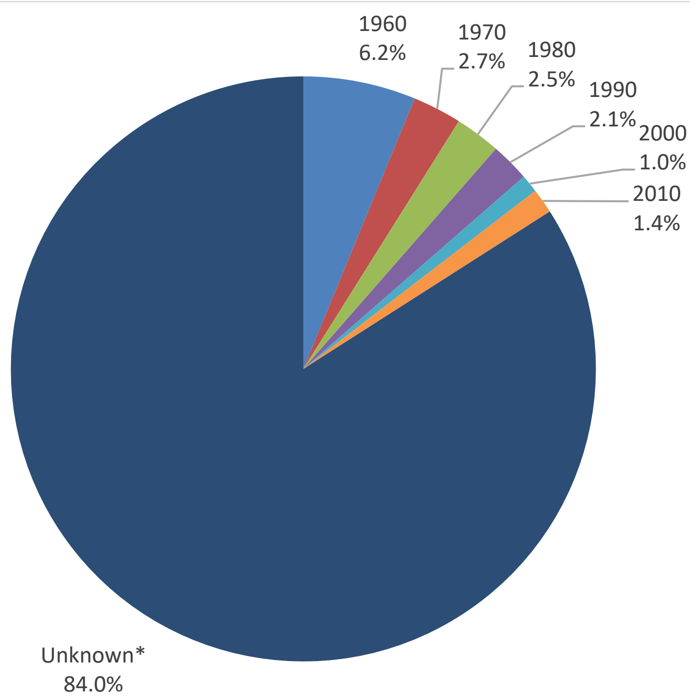


Figure 7-1. Percentage of Pipeline Materials within the Distribution System



*The District assumes pipes missing installation date are installed in year 1965.

Figure 7-2. Percentage of Pipeline Installed Each Decade within the Distribution System

The District has identified the need to improve their asset management database system. Historically, the District has stored asset information for the water system in a georeferenced database in GIS. Currently the District is undergoing the process to implement a Computerized Maintenance Management System (CMMS). The CMMS system will allow the District to better store, track and mange asset data related to the water system.

Figure 7-2 shows the number of miles of pipe installed each decade. For pipes missing installation dates, the District assumes installation was prior to 1965. Using this assumption, about 90% of the District's pipes were installed prior to 1969.

7.1.2 Remaining Useful Life Evaluation

Pipeline condition data, leak detection results, or histories of repairs are not available for evaluating the current condition of the District's water distribution system. Although this data is not available, the District's underground assets can be evaluated based on remaining useful life (RUL). The RUL of an asset is the amount of time that asset is expected to be functional without major failures. While the actual service life of a pipeline will vary, the RULs are commonly accepted as estimates for long term planning and a starting point to identify pipelines that need replacement. The RUL is not intended to suggest that the District will experience an immediate simultaneous failure of these pipes once the RUL reaches zero, but rather that they will have an increased likelihood of breakage or leakage. The likelihood of failure will increase as a pipe continues to remain in place beyond its RUL. Actual failure patterns can be variable and depend on construction quality, manufacturer, pressure, water quality, soil type and condition, proximity to other utilities and many other attributes.

Using available information documenting pipeline material and the year of installation, the RUL can be estimated by subtracting the age of the pipe from the typical industry standard expected useful life for the given pipe material. Other underground assets, including valves, services, and hydrant laterals are assumed to have a similar RUL as the water main that serves them, as they were likely installed at the same time. The RUL can be used to determine the year in which each pipeline and its associated services, valves, and hydrants should be replaced.

For this analysis, industry accepted pipeline service lifetimes, shown in Table 7-1, were used to estimate the decade each pipe is expected to fail. This analysis is focused on identifying a system-wide strategy for quantifying and funding pipeline replacements. Detailed condition assessments and/or leak detection survey results are not available to identify and prioritize individual pipes for replacement. Prioritization of pipeline replacements should be reviewed and adjusted annually based on updated condition and leak testing data, coordination with planned road improvement projects, and new developments. The timing of individual pipe replacement projects may also require adjustment to align with annual District financial budgeting processes, short- and long-term rate strategies, and financing opportunities.

Table 7-1. Pipeline Estimated Useful Life Based on Material

Pipe Material	Estimated Useful Lifetime (years)[1]
Cast Iron	75
Ductile Iron	100
PVC	100
Steel	90
Copper	90
HDPE	110

PVC = polyvinyl chloride; HDPE = high-density polyethylene

[1] Estimated useful life is adapted from Deb, Arun, Herz, Raimund, et al; "Quantifying Future Rehabilitation and Replacement Needs of Water Mains"; WRF 1998

Interviews with District operations staff were also used to identify and prioritize condition-based replacement projects. Operators leveraged their knowledge of the frequency of past pipeline breaks and repairs to identify pipeline segments that may be at the end of their useful life. Operators also helped prioritize condition-based replacements by identifying segments with high consequence of failure.

7.1.3 Pipeline Renewal Strategy

The District should plan to replace pipe in a proactive manner to avoid pipeline failures and costly emergency repairs. In the absence of condition data, the anticipated need for renewal each year is estimated based on the total length of pipe reaching the end of its remaining useful life within that year.

To account for the uncertainty associated with the number of pipes that are missing data for the year of installation, a normal distribution was applied to distribute the installation years for these pipes across the 20-year period from 1945 to 1965. Otherwise, 84 percent of all pipe with unknown installation year would be estimated to fail simultaneously in 2040. Figure 7-3 shows cumulative miles of pipeline reaching expected end of useful life, both with and without the normal distribution applied.

Figure 7-3 also shows a straight-line rate of replacement of one percent of the system per year, representing a full replacement of the entire distribution system over the next 100 years. A constant one percent rate of renewal requires replacing about one mile of pipeline per year at an estimated cost of $1.4 million in 2018 dollars. The figure shows that the one mile per year rate of replacement falls largely under the curve of when pipelines are expected to reach the end of service life. Because the actual installation dates and materials are unknown for the majority of the system, there is not sufficient data to justify accelerating the pipeline replacement rate at this time to keep up with the RUL curve. Given the potential that there may be a significant amount of distribution piping that is at or beyond its RUL, WSC recommends a minimum replacement rate of one mile per year across the system.

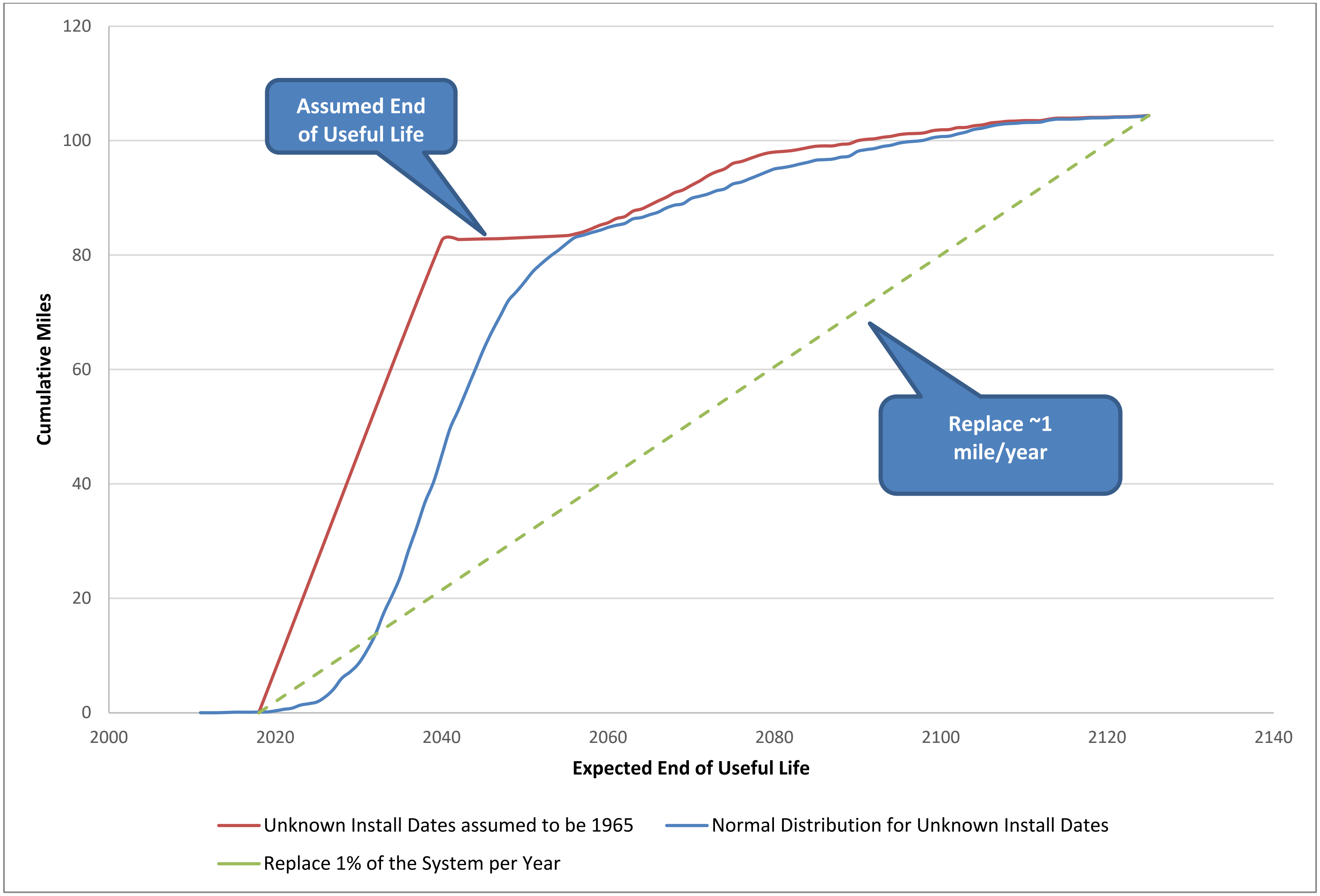


Figure 7-3. Cumulative Pipeline Reaching End of Expected Useful Life and Renewal Strategy

The District should continue to monitor pipeline condition, leaks and repairs on a regular basis as an indicator of assets reaching the end of useful life and proactively identify and replace individual pipeline assets. As installation and material data continue to be captured, the accuracy of the RUL curve can be improved and budgeting for pipeline replacement projects can be refined. Additional field studies, such as leak detection surveys and coupon analysis, would provide data necessary to adjustment the RUL to reflect field conditions.

The RUL analysis includes all of the District's pipes, including those identified for capacity projects as described in Chapter 6. The total footage of capacity-based projects recommended for the 20-year CIP is approximately 12 miles. Addressing the recommended capacity projects along with the operator-identified condition projects over the 20-year CIP will roughly match the recommended minimum renewal rate of one mile per year. The capacity upgrade projects were also prioritized to replace older pipelines over newer pipelines. Operator identified projects are provided in the following section.

7.1.4 Pipeline Rehabilitation & Replacement Projects

The District operations staff identified and prioritized six pipeline projects based on age and condition to be upgraded in the CIP, presented in Table 7-2. The condition-based projects total about four miles of pipeline. The locations for each of the operator identified condition replacement projects within the District are shown in Figure 7-4.

Table 7-2. Pipeline Condition Projects

Project	Location	Existing Size and Material	Total New Pipe Length	Recommended Size and Material
C-1	Aldercrest Road (Oatfield to Kellogg Rd)	6" and 8"	3,025 feet	8" DI
C-2	Lisa Lane (North of Swain Ave)	2"	300 feet	6" DI
C-3	Marcia Court (North of Glen Echo Ave)	4" CI	475 feet	6" DI
C-4	Ranstad and Cinderella Courts	4" CI	760 feet	6" DI
C-5	Oatfield (Jennings to Park Ave)	6" and 8"	15,995 feet	8" DI
C-6	Round Oaks Court (East of Harold Ave)	3" PVC	345 feet	4" DI
DI = ductile iron; CI = cast iron; PVC = polyvinyl chloride; Rd = road; Ave = avenue				

7.2 Non-Buried Assets

Many of the District's major facilities are above ground and able to be visually inspected and proactively maintained, such as tanks and pump stations. The District's above ground assets and recent upgrades are described in Chapter 3. There are also assets within the distribution system that are located above ground or within underground vaults that can also be inspected and proactively maintained, such as large commercial meters, pressure reducing valves, and fire hydrants. The District Operations team has identified significant rehabilitation and replacement projects that are anticipated over the next 20-years for these non-buried assets as described in the following sections.

7.2.1 Storage Tanks

The Valley View and View Acres storage reservoirs are both anticipated to require coating repairs to extend the remaining useful life of these assets. Coating repairs are anticipated to require specialty contractors with the necessary equipment to prepare surfaces and apply new coatings to meet the necessary performance requirements and to achieve the desired longevity for the coating.

The Valley View tanks are prestressed concrete tanks and require a seal coat on the domed roofs of the two tanks to protect small surface cracks in the concrete from further deterioration. Timing of a seal coat will depend on continued monitoring of the tank roof condition through periodic inspections. Application of a seal coat is anticipated to be necessary within the next 5 to 10 years unless observed crack propagation indicates a more immediate need.

View Acres Tanks are steel and require periodic recoating to protect against corrosion on both the interior and exterior of the tanks. The two tanks were coated in 2002 and again in 2013. Periodic tank inspections are conducted to monitor the condition of the interior and exterior coating. Touch up coating can be applied to local areas of coating failure as needed but based on the frequency of past coating applications and industry standard coating recommendations the tanks should be completely recoated every 10 to 15 years. Tank coatings can be achieved with an application of a new top-coat or can require a full stripping of existing coating down to bare metal followed by the application of primer and subsequent coating layers to provide the desired protection. Interior coatings can often last longer than exterior coatings and may not require replacement as frequently. Previous coatings for the tanks have been successfully applied as a new top-coat over existing coating. Based on discussions with operations staff, the interiors of the View Acres tanks were inspected during the installation of seismic retrofit measures in 2013 with touch-up coating applied where necessary. For planning purposes, the District should assume that a full external top-coating will be required for both tanks between 2023 and 2028. Completing the coating for one tank at a time would allow the District to continuously provide the required storage for the upper and high pressure zones if draining the tank is determined to be necessary to obtain the adhesion performance required for the exterior coatings.

7.2.2 Booster Pump Stations

The Valley View and View Acres pump stations were last upgraded in 2017 and 2005 respectively. The pump stations are anticipated to require pump and motor replacements every 20 years. The pipe galleries are also anticipated to require a new coating every 20 years, including removing the old coating by sand blasting to bare steel. Based on the timing of the previous upgrades, the View Acres pump station is scheduled for pump and motor replacements as well as pipe gallery maintenance in 2025. The Valley View pump station would not require pump and motor replacements or pipe gallery recoating until approximately 2037, although periodic inspections may indicate a modification to the timing of proposed upgrades.

7.2.3 Pressure Reducing Valves

The District has three PRVs that regulate pressure throughout the system. The District has indicated that each of the PRVs should be rebuilt every five years. Typically this work is performed by an outside contractor and includes a tear-down of each valve to inspect the diaphragm, seats, and other parts subject to wear, and the replacement of any components that have outlived their useful service life. In addition to rebuilding the valve, the PRV vault should also be assessed to determine if additional improvements to address drainage, safe access and egress, and ventilation.

7.2.4 SCADA System

The technological advancement of SCADA and communications components requires periodic upgrades to take advantage of instrumentation and automation that can improve operational efficiency and response to emergencies. In 2013 the District upgraded all communications from radio to cellular modems, and in 2019 the District replaced the programmable logic controllers (PLCs) at the two booster pump stations. The District has indicated that SCADA and PLC upgrades are desirable every 10 to 12 years. In addition to upgrading the SCADA system, the District has identified a benefit to reactivating radio telemetry communications to serve as a backup communications system to the cellular modems. Radio telemetry units would be necessary at four District facilities including Valley View, View Acres, the central operations shop, and the NCCWC WTP. To allow integration of any new SCADA system upgrades and the backup radio telemetry system, both upgrades are recommended to occur in the same year and would between 2023 and 2025. An evaluation of the benefits of standardizing the SCADA system with the wastewater and stormwater systems should also be considered by the District prior to the next round of replacements.

7.2.5 Large Billing Meters

All commercial, industrial, and multi-family billing meters on services of 3-inch diameter or greater are located within vaults that may also include backflow prevention devices that protect the water within the District system from contamination that could originate within the premise plumbing on private property. The revenue generated from these meters can be substantial and testing is recommended on a 3-year frequency. The large meters should also be replaced once the tested accuracy drops below acceptable standards. Meter technology continues to improve and meters should be replaced as they become technologically obsolete, which can be estimated to occur between 10 to 20 years after initial purchase. District billing records currently indicate 82 meters for services ranging from 3-inch to 10-inch diameter. For planning purposes, a representative sample of meters should be tested every 3-years and older meters or those that cannot meet the desired accuracy should be replaced.

7.2.6 Fire Hydrants

The District's current potable water system standards require each fire hydrant to use a 5 ¼-inch valve. Older hydrants exist throughout the distribution system that have a 4 ½-inch valve. Over the next 20-years the District plans to replace all 4 ½-inch hydrants to meet the current standard. Replacements are likely to occur in conjunction with condition based replacements as described in the previous section and with fire flow projects described in the previous chapter. There will still be a remaining number of hydrants outside of the scope of the condition and fire flow projects that will also need to be replaced within the next 20 years.

7.2.7 Non-Buried Asset Rehabilitation & Replacement Projects

The District operations staff identified and prioritized ten projects on non-buried assets at major facility installations and throughout the distribution system. The project timeless are based on age of assets or timing of the most recent upgrades and are and presented in Table 7-3.

Table 7-3. Non-Buried Asset Condition Projects

Project	Facility	Recommended Improvement
C-7	Valley View Reservoirs	Seal coat concrete dome roof of each reservoir within 5-10 years
C-8	View Acres Reservoirs	Recoat interior and exterior of steel tank between 2023 and 2028
C-9	View Acres Pump Station	Replace pumps and motors and recoat pipes by 2037
C-10	Valley View Pump Station	Replace pumps and motors and recoat pipes by 2025
C-11	SCADA	Upgrade SCADA system between 2023 and 2025
C-12	SCADA	Radio telemetry activation study in conjunction with SCADA upgrades
C-13	PRVs	Rebuild PRVs every 5 years
C-14	Large Meters	Meter testing and replacements every 3 years
C-15	Large Meters	Vault meter bypass installation within 5-10 years
C-16	Hydrants	Replace all 4 ¼” hydrants by 2040

SCADA = supervisory control and data acquisition; PRV = pressure reducing valve

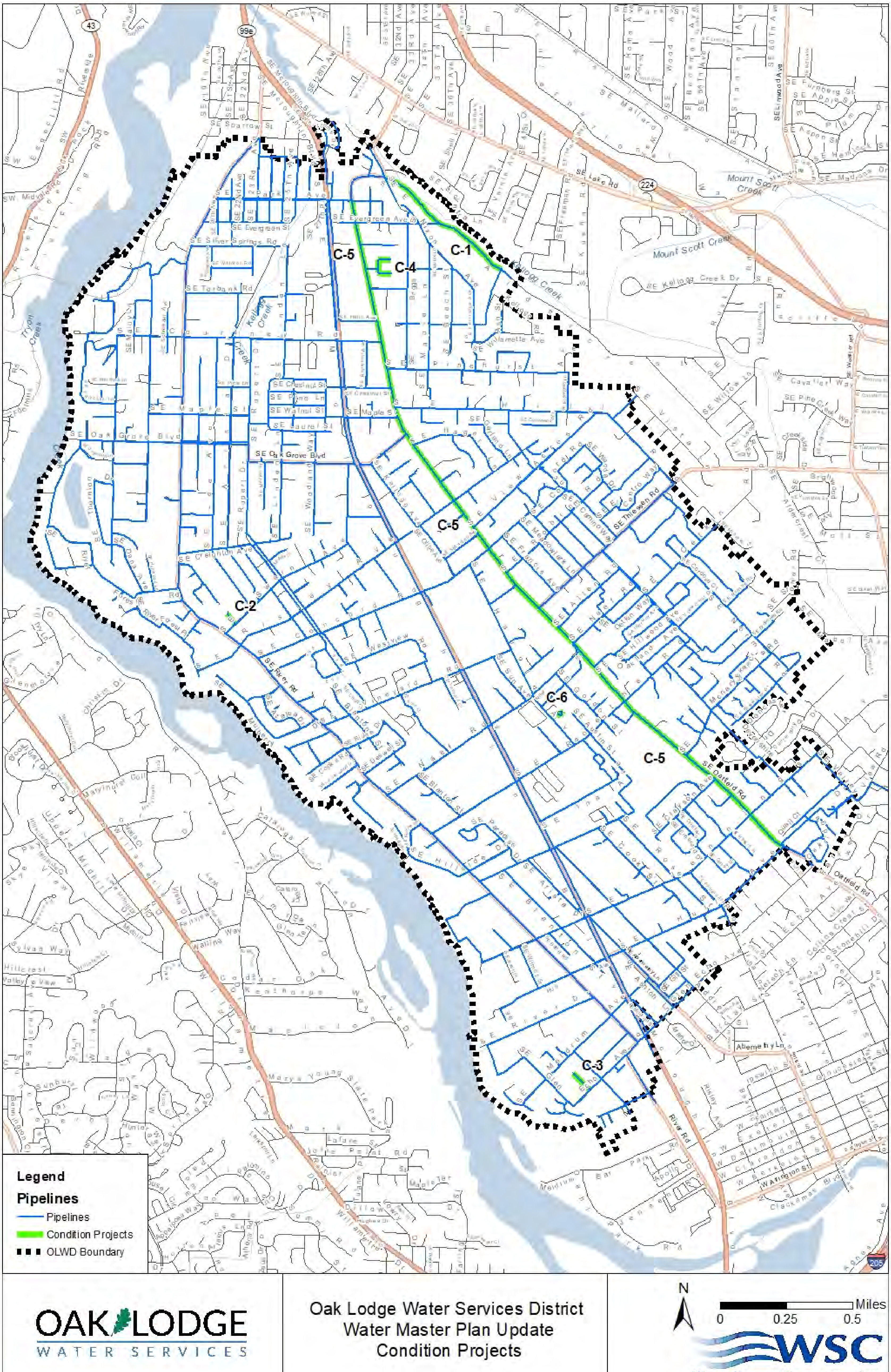


Figure 7-4. Pipeline Rehabilitation and Replacement Projects

CHAPTER 8

Seismic Analysis

In 2018 the Oregon Health Authority updated the requirements for WSMPs to include a seismic analysis with mitigation over the next 50 years. The requirement aligns with recommendations provided in the 2013 Oregon Resiliency Plan which addresses the state's vulnerability to a subduction zone seismic event. This section provides the results of a seismic hazard mapping and fragility analysis along with recommendations to mitigate the risk and improve the resiliency of the District water distribution system following an earthquake.

8.1 Background

In the 1980s, well after a majority of the OLWSD distribution system was installed, the Cascadia subduction zone (CSZ) was recognized as an active fault that poses a major geological hazard to Oregon (OSSPAC, 2013). Recent studies of the CSZ indicate a potential to generate a large earthquake with a magnitude ranging from 8.0 to 9.2. Analysis of the historical recurrence intervals estimates the probability of a high magnitude earthquake originating in the CSZ is approximately 16 to 22 percent over the next 50 years. In the decades since the discovery of the risk associated with the CSZ, Oregon building code has been updated to account for seismic forces in structures and in 2013 the Oregon Seismic Safety Policy Advisory Commission (OSSPAC) developed the Oregon Resilience Plan. The plan provides recommendations for improving the resilience of communities to a CSZ seismic event, including prioritizing the phased restoration of water services.

IN THIS SECTION

In response to the risk presented by a CSZ seismic event, the District has performed seismic retrofits on the critical water storage facilities at Valley View and View Acres. In 2013 the foundations and anchorage of the View Acres Reservoirs were improved and seismic valves were installed to retain water in the tanks following a CSZ magnitude seismic event. In 2017 mechanical piping improvements were made at the Valley View Reservoirs to add flexibility at tank connections and a seismic valve was installed to retain stored water in the tank immediately following a seismic event.

8.2 Resiliency Planning Requirements

Since the last Water Master Plan Update for the District in 2008, new federal and state requirements have been adopted that require analysis of seismic risk. A brief description of each requirement is provided in the subsequent sections.

8.2.1 Oregon Health Authority

In January 2018, the Oregon Health Authority updated Chapter 333 Division 61 of the OARs which covers Public Water Systems. The update included a new requirement in OAR 333-061-0060.5.J for water system master plans to include a seismic risk assessment and mitigation plan for water systems located in high seismic risk areas, including Oak Lodge. The risk assessment must identify critical facilities, evaluate the likelihood and consequences of seismic failure, and provide a mitigation plan that addresses deficiencies within the next 50 years for any capital improvements or additional studies.

8.2.2 America's Water Infrastructure Act

On October 23, 2018, America's Water Infrastructure Act (AWIA) was passed, tasking the United States Environmental Protection Agency (EPA) with enforcing community water systems serving more than 3,300 people to conduct Risk and Resiliency Assessments and to develop an Emergency Response Plan.

The AWIA Risk and Resiliency Assessments are meant to help the District characterize critical assets and the threats from both natural hazards and malevolent acts. Outcomes from the assessments can then be used to develop appropriate emergency response procedures and planning as part of the District's Emergency Response Plan. The District's compliance deadline for completing the AWIA Risk and Resilience Assessment is June 30, 2021. Preparation of the assessment and planning documents will commence following the completion of this Water Master Plan Update and findings from the seismic analysis will be incorporated.

8.3 Identification of Critical Facilities

As described in the Oregon Resilience Plan, a phased approach to providing water following a seismic event requires having a hardened "backbone" to the water system. The backbone system consists of key supply, treatment, transmission and distribution elements that would help meet community needs, including fire suppression, health and emergency response, and community drinking water distribution points, while damage to the larger, non-backbone system is being addressed. (Oregon Seismic Safety Policy Advisory Commission, 2013)

In accordance with the Oregon Resiliency Plan, the District's water facilities have been separated into three distinct categories representing a descending level of priority for returning the water system to service following a CSZ seismic event:

- **Primary Backbone**. Includes essential components of the water supply and transmission system, including the transmission main from the NCCWC and the Valley View and View Acres pump stations and reservoirs. These facilities will also provide water for fire suppression at key supply points.
- **Secondary Backbone**. Includes distribution pipes which supply potential community distribution centers. For the District, these facilities are assumed to include fire stations and schools, which may serve as emergency shelters.
- **Non-backbone**. The remainder of the distribution system will be necessary to provide potable water to individual residences and businesses and provide fire suppression using existing fire hydrants.

For the District's water distribution system, the primary and secondary backbone systems, as shown in Figure 8-1, consist of pipelines with nominal diameter greater than or equal to 12-inches. The backbone also includes the pipelines necessary to serve critical facilities located within the District's service area, such as public schools and Clackamas Fire District Stations. Although additional facilities are considered critical, such as hospitals, Sheriff's Office Stations, or other public safety facilities (e.g. emergency operations centers), there are none currently identified within the District's service area that would indicate additional backbone pipeline locations.

Water treatment and supply facilities should also be considered part of the Primary Backbone system. The District does not own the shared transmission mains that water from the NCCWC, CRW and SFWB WTPs so these facilities are not considered within the scope of this WSMP. OLWSD will need to work with the partners in the Clackamas River Water Providers group to develop appropriate mitigation measures for these shared facilities. Similarly, any new emergency interconnections within the District's distribution system will require the expansion of the backbone piping system to connect to these intertie locations.

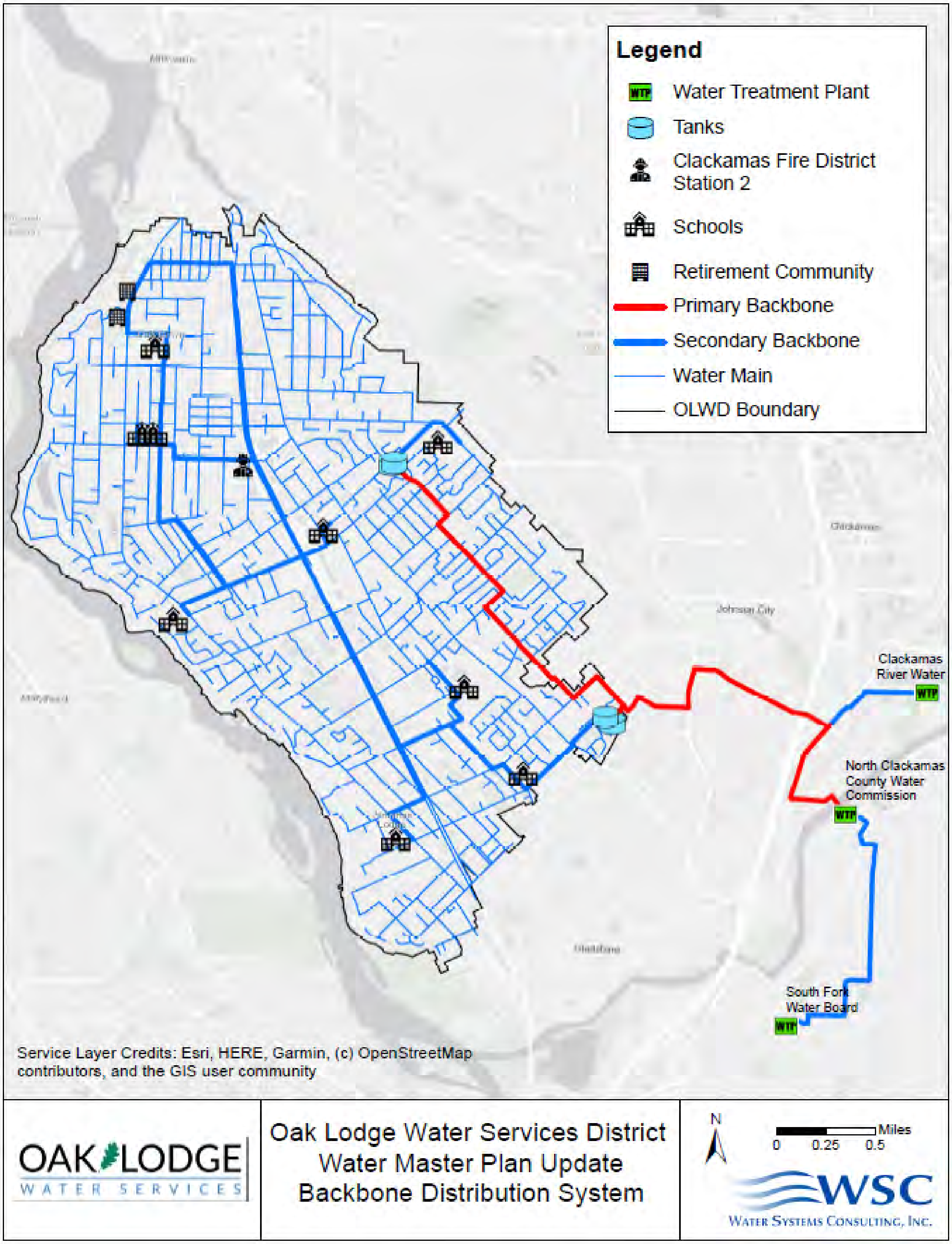


Figure 8-1. OLWSD Water System Backbone Pipelines

8.4 Seismic Hazard Mapping

Subsurface conditions influence the nature of both shallow and surface level responses associated with a seismic event and these conditions are not consistent across the District. To better understand the potential risk of damage to the water system, a seismic hazard map is helpful to compare the expected seismic responses based on existing subsurface conditions with the locations of critical water facilities.

McMillan Jacobs Associates (MCMJ) prepared a geotechnical seismic hazards evaluation for the District's service area by reviewing Oregon's Department of Geology and Mineral Industries (DOGAMI) seismic hazard maps for a magnitude 9.0 CSZ earthquake, reviewing available geological and geotechnical information, and performing site reconnaissance to confirm key assumptions and verify published maps. Based on the field data and site reconnaissance, MCMJ refined the DOGAMI seismic hazard maps to provide best estimates for strong ground shaking, liquefaction-induced settlement, lateral spreading permanent ground deformation, and seismic landslide instability within the District's service area. An overview of these seismic hazard parameters is provided below:

- Peak Ground Velocity (PGV) – the ground shaking near the surface, which is amplified by thick soil units, and varies based on the subsurface materials. It serves as a measure for the amount of ground shaking a buried pipeline experiences. For the District's service area, the PGV ranged from 7 to 16 inches per second.
- Peak Ground Acceleration (PGA) – the measure for ground shaking used for above ground components. A PGA of 0.20 g was used to represent the effects of a magnitude 9.0 CSZ seismic event within the District's service area.
- Liquefaction-Induced Settlement – settlement within saturated, granular soils caused by rapid shearing from an earthquake that results in the soil losing its shear strength and becoming a viscous fluid mass. Much of the District's service area is located within non-liquefiable soils but there are sections where liquefaction is expected to be as high as 4 inches.
- Lateral Spreading – the lateral movement of liquefied soils that occurs when the ground acceleration from a seismic event causes liquified soil to move laterally and break the non-liquefied soil crust into blocks, that then move downslope. During a magnitude 9.0 CSZ event, the southwestern third of the District's service area is expected to experience lateral spreading, with permanent ground deformation of up to 2 feet.
- Seismic Landslide Instability – landslides that occur on slopes when an earthquake adds additional loading to the slope.

The results of the MCMJ study, including seismic hazard mapping, is provided in a Technical Memorandum included as Appendix B. The areas of elevated hazards associated with peak ground velocity, liquefaction-induced settlement, lateral spreading, and seismic induced landslides in relation to the Primary and Secondary backbone systems are provided in Figure 8-2 through Figure 8-5.

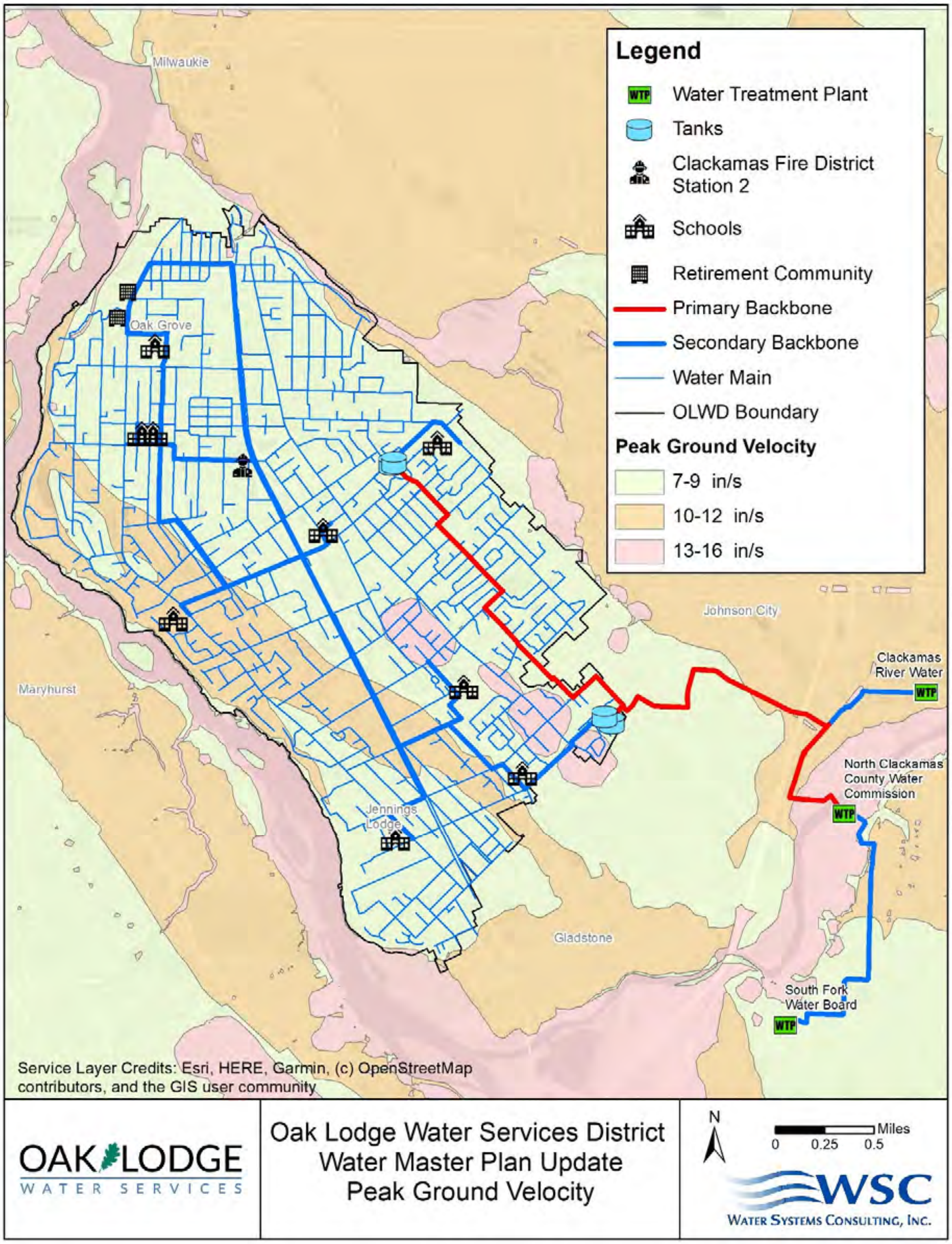


Figure 8-2. District Mapping of Peak Ground Velocity

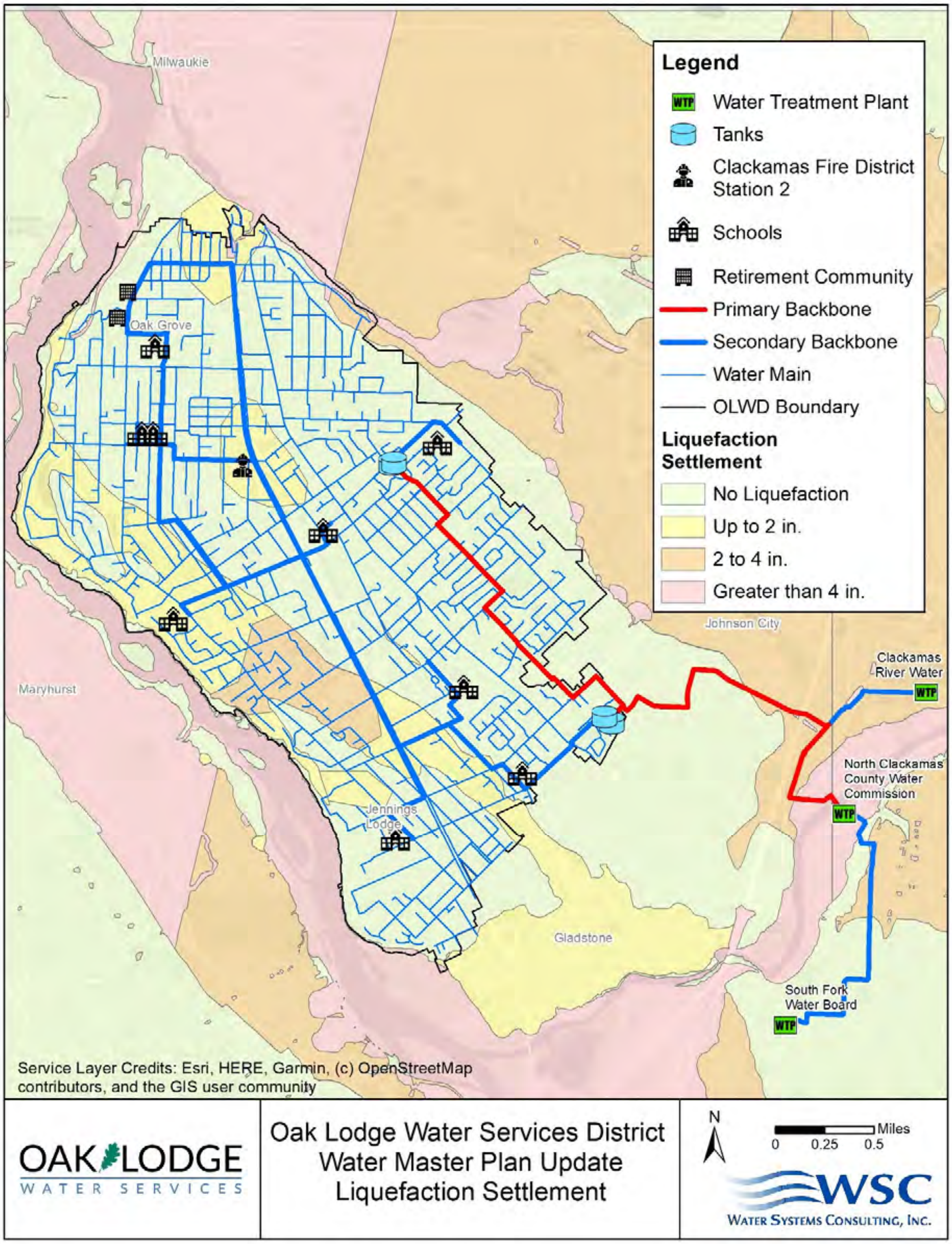


Figure 8-3. District Mapping of Seismically Induced Liquefaction Settlement

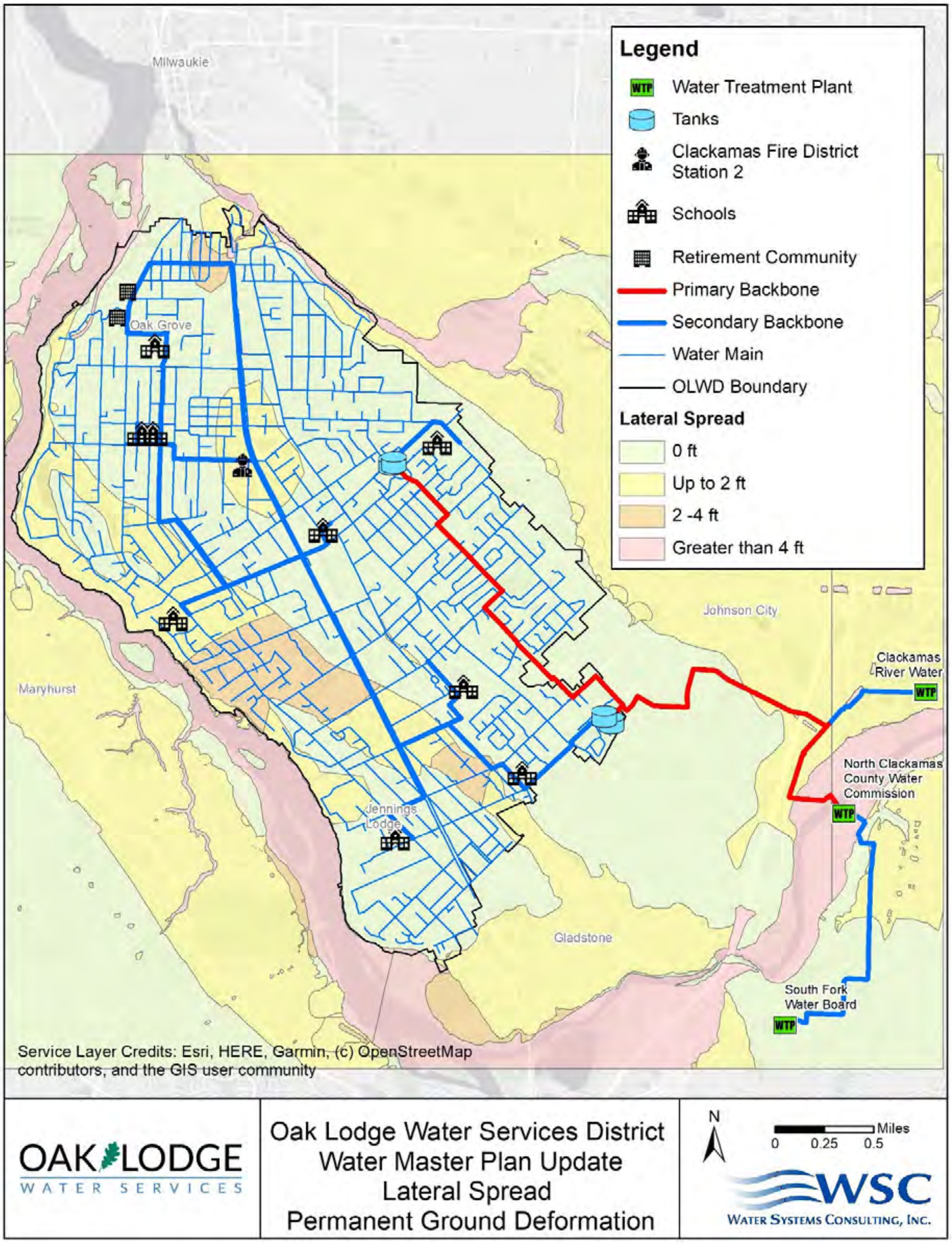


Figure 8-4. District Mapping of Lateral Spreading Peak Ground Deformation

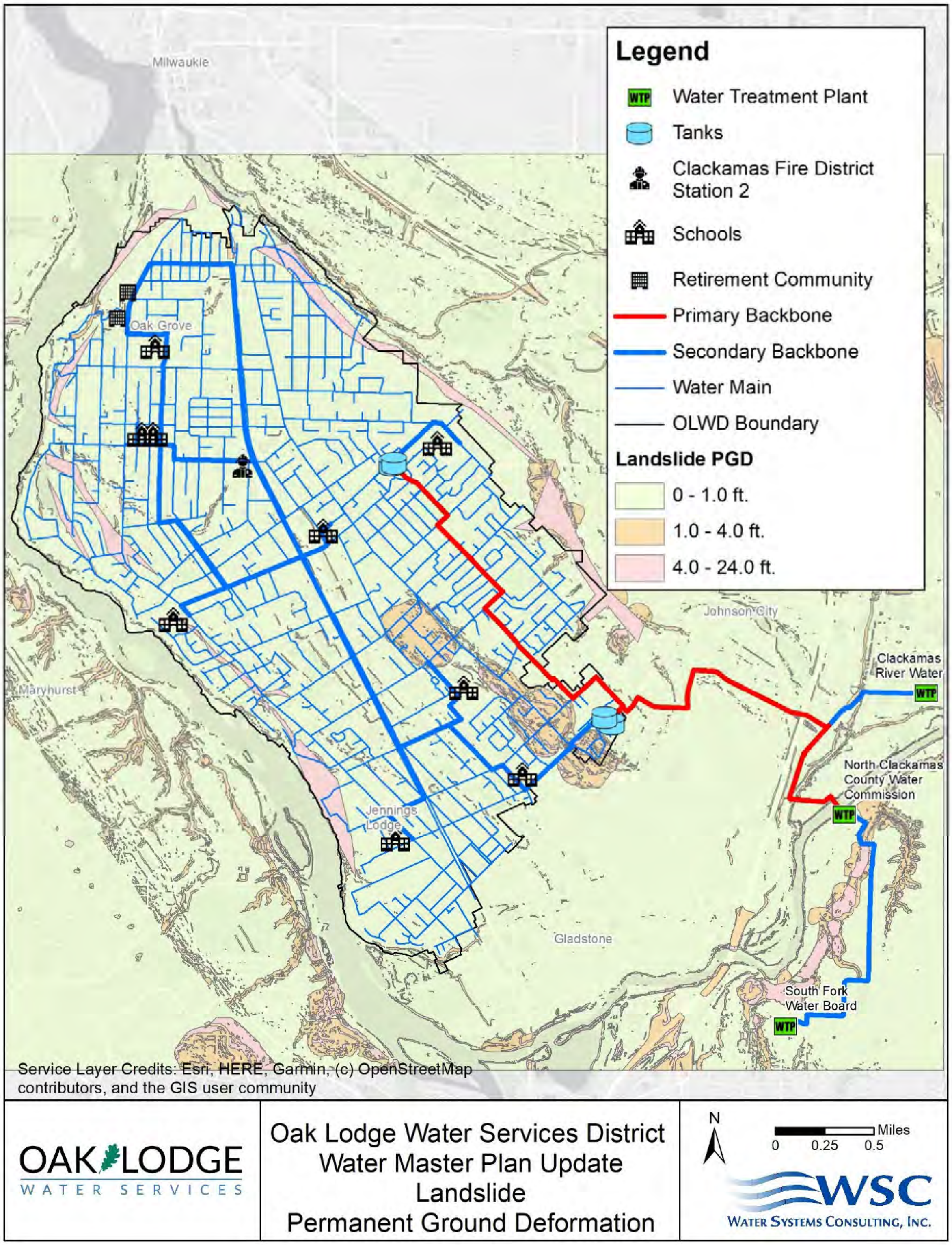


Figure 8-5. District Mapping of Seismic Landslide Peak Ground Deformation

8.5 Pipe Fragility Analysis

In 2012 the District performed a seismic vulnerability assessment of the reservoirs at the View Acres and Valley View facilities that resulted in seismic retrofits in 2013 and 2017, respectively. A review of the seismic vulnerability assessment does not indicate that a seismic assessment of the pump stations was performed. Since the District's storage facilities have been recently addressed and an assessment of the pumping station structures is not available, the piping system will be the focus of seismic analysis.

The guidelines and methodology provided in the American Lifelines Alliance's (ALA) *Seismic Fragility Formulations for Water Systems,* in combination with the seismic hazards evaluation, was used to evaluate the District's water distribution system. The ALA developed empirical algorithms to predict the repair rate (repairs per 1,000 feet of pipe) based on data collected from major past seismic events, including, but not limited to, the 1994 Northridge Earthquake, 1989 Loma Prieta Earthquake, and the 1971 San Fernando Earthquake. The key data used to predict repair rates include the following data:

- **Pipeline material**. Findings from past earthquakes have indicated that ductile pipe materials such as ductile iron, steel, and plastic exhibit less breaks compared to rigid and brittle materials such as cast iron. Each pipe material correlates to a fragility curve modification factor, K_1 and K_2, that represents the ability of the pipe and joints to withstand ground movement and deformation.
- **PGV.** The magnitude of the ground velocity, as measured in inches per second (in/s), exhibits a linear relationship with the amount of pipe breaks.
- **Permanent ground deformation (PGD)**. The ground deformation measured in inches, whether caused by liquefaction induced settlement, a seismically induced landslide, or lateral spreading, exhibits a power, or exponential, relationship with the amount of pipe breaks.

Some assumptions are required to select K factors for the pipeline material. The ranges of observed fragility curve modifications by pipe type are provided in Table 8-1 below along with the values assumed for the District's distribution system.

Table 8-1. Fragility Curve Modification Factors by Pipe Type

Pipe Material	K_1 Typical Range	K_1 Assumed Value	K_2 Typical Range	K_2 Assumed Value	Supporting assumptions
Cast Iron	0.7-1.4	0.8	0.7-1.0	0.8	Assume rubber gasket joints
Ductile Iron	0.5	0.5	0.5	0.5	Assume rubber gasket joints
Steel	0.15-1.3	0.7	0.15-0.7	0.7	Assume rubber gasket joints
Copper	NA	0.3	NA	0.15	Equivalent to welded steel
PVC	0.5	0.5	0.8	0.8	Assume rubber gasket joints
HDPE	NA	0.3	NA	0.15	Equivalent to welded steel

Equation 1: $\boldsymbol{RR = K_1 * 0.00187 * PGV}$ **Equation 2:** $RR = K_2 * 1.06 * PGD^{0.319}$

NA = not available RR = rate of repairs per 1,000 feet of pipe K_1 = fragility curve modification factor for ground shaking
K_2 = fragility curve modification factor for permanent ground deformation PGV = peak ground velocity in inches per second
PGD = peak ground deformation in inches
Values for typical range of K_1 and K_2 take from American Lifelines Alliance Seismic Fragility Formulations for Water Systems

Using the seismic hazard mapping and the ALA fragility calculations, estimated repair rates per 1,000 feet of pipe were calculated for the primary, secondary, and non-backbone pipelines within the District's water system. A graphic representation of the repair rates for the backbone system and the water distribution system as a whole are shown in Figure 8-6 and Figure 8-7, respectively.

Based on the analysis, the District's primary backbone system shows vulnerability to breakages during a CSZ seismic event within the District owned 24-inch water supply pipeline and within the NCCWC combined pipeline near the WTP. A break in the 24-inch water supply pipeline carries a particularly high risk to the District as there is currently no other infrastructure that can be used to supply emergency demand.

Sections of the secondary backbone system also predict breakage rates that exceed 1.0 breaks per 1,000 feet and thus are likely to require repairs immediately following an earthquake. Assuming that these breaks can be isolated, the District's looped system may still allow water service to schools and fire stations to provide emergency access, so retrofitting the secondary backbone to withstand a seismic event has a lower priority than the primary system.

Smaller pipes in the distribution system are predicted to break at a frequency of 2.0 breaks per 1,000 feet or greater in the areas of the lower pressure zone near the Willamette, and within areas of higher risk to ground deformation due to liquefaction induced settlement, lateral spreading, or landslides. Although retrofitting these pipes to improve the performance following an earthquake is desired, the priority for implementing these repairs should be considered lower than that of the primary and secondary backbone pipelines. A summary of the anticipated linear footage of pipe requiring repairs as well as the estimated replacement costs is provided in Table 8-2.

Table 8-2. Prioritization for Addressing Pipe Fragility within District system

Priority Level	Criteria	Total Length (feet)	Pipe Diameter (inches)	Total Replacement Cost
High	Primary Backbone pipelines with 0.5 or greater repairs per 1,000 feet	7,246	24 to 36	$3.4M
Medium	Secondary backbone pipeline with 1.0 or greater repairs per 1,000 feet	14,184	6 to 24	$4.8M
Low	Secondary backbone pipeline with greater than 0.5 but less than 1.0 repairs per 1,000 feet	23,033	6 to 24	$5.3M
Low	Non-backbone pipelines with 1.0 or greater repairs per 1,000 feet	124,575	6 to 8	$20.8M

The replacement costs provided in the table reflect recommendations for seismically resilient pipe standards discussed in the following section.

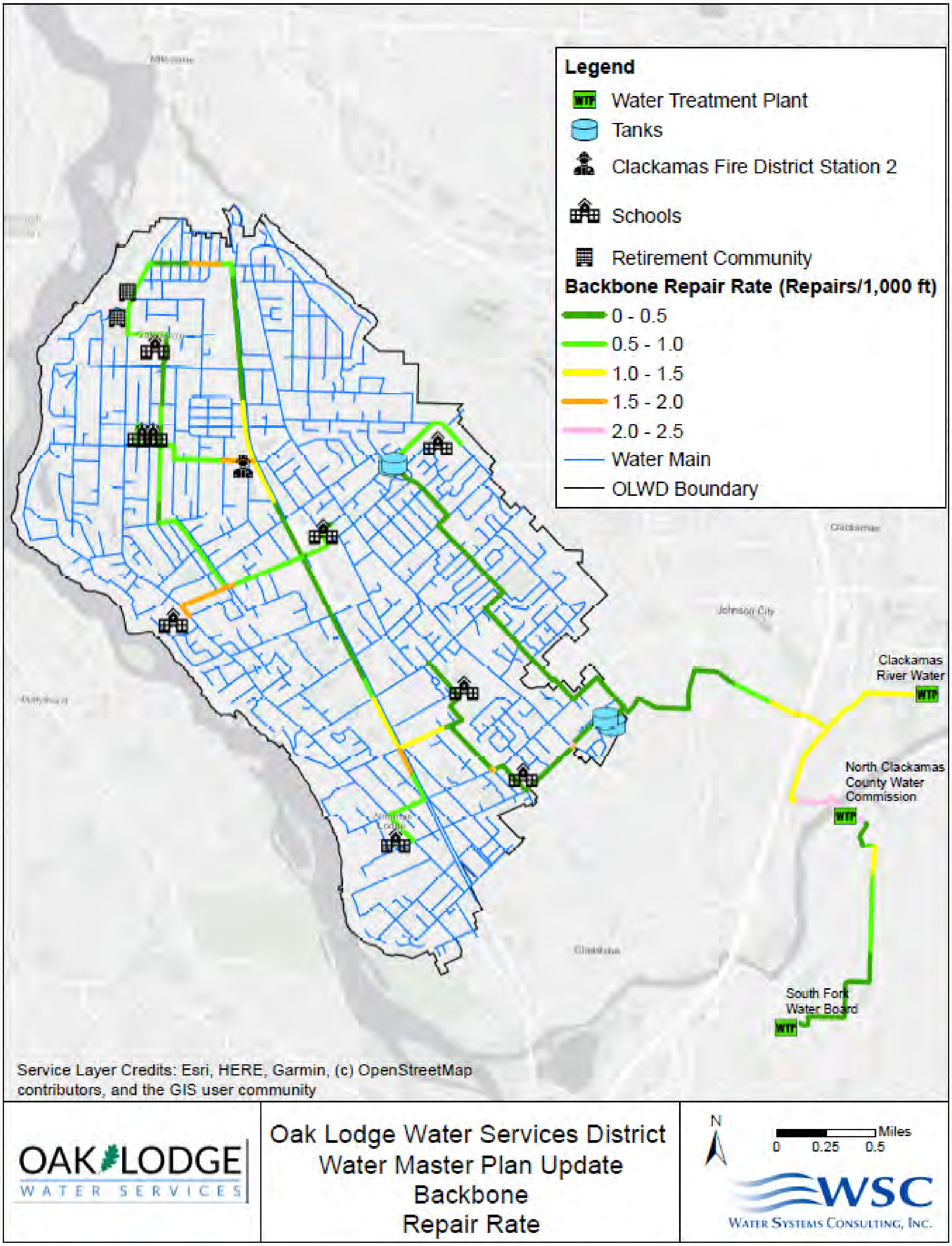


Figure 8-6. OLWSD Backbone Distribution System Repair Rates

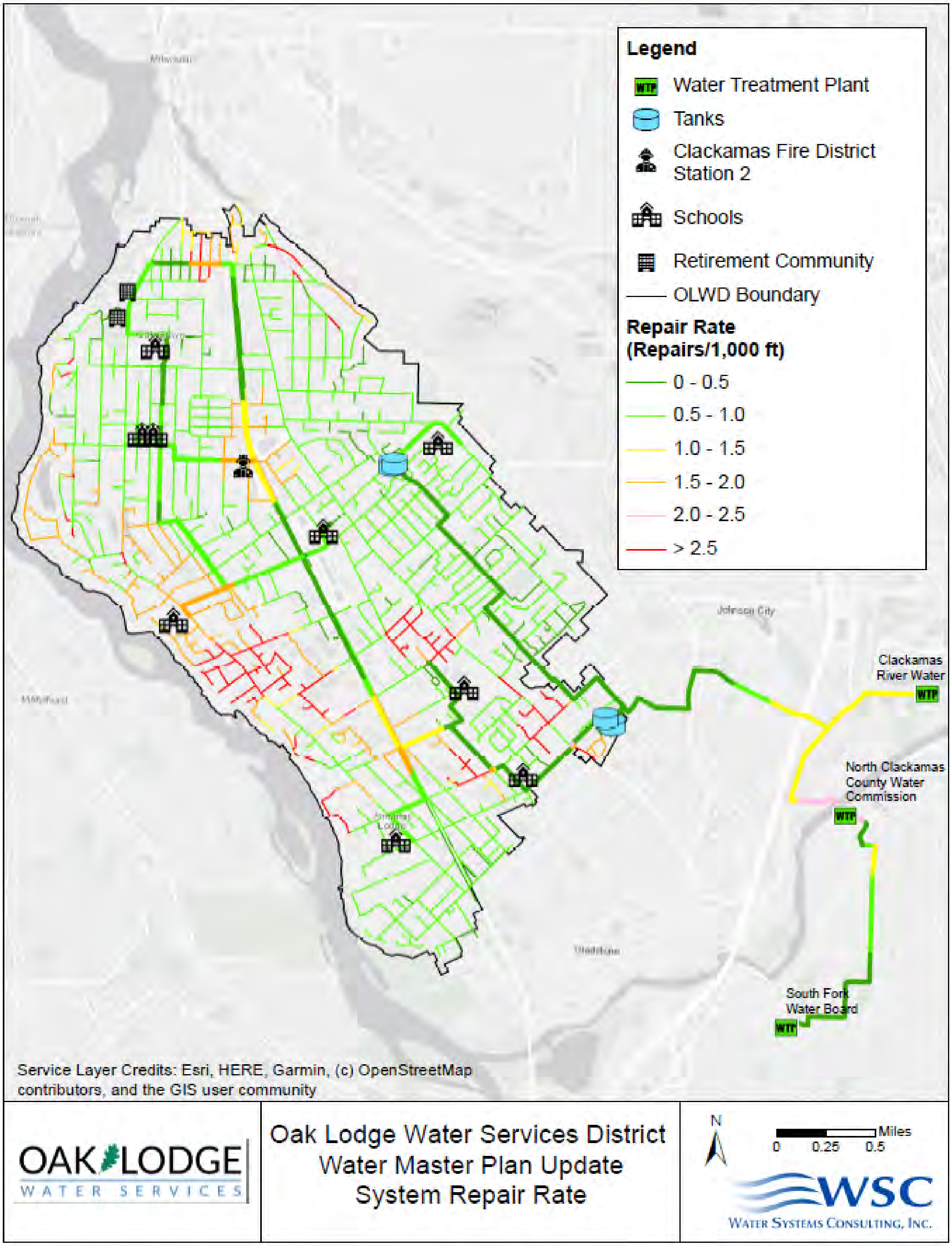


Figure 8-7. OLWSD Water Distribution System Repair Rates

8.6 Recommended Design Standards

The District's 2019 Design and Construction Standards require all new water distribution piping to be ductile iron cement mortar-lined pipe with push-on or mechanical joints. All bell and spigot joints must be restrained using Field LOK (or equivalent) gaskets. Pipelines and fittings should be encased with 8 mil polyethylene tubing meeting manufacturer and AWWA standards in areas with corrosive conditions. All fittings must be restrained by joint restraint glands and thrust blocks or "rodding" are not permitted. The District's standards allow alternative pipeline materials to be used in locations where there is an active cathodic protection system protecting other systems near the pipe.

The District does not currently have any seismic design standards for water pipelines. Seismically resistant pipeline design varies on a site by site basis due to the important role subsurface conditions play within the design of these systems. As such, there is no industry standard seismic pipeline design document at this time. District Design Standards should be updated to require fully restrained ductile iron pipe and appropriate pipe connections to accommodate anticipated PGD for all backbone pipelines. HDPE pipe with fused joints and steel pipe with double welded joints are suitable alternatives for seismic design and may be recommended on a case-by-case basis by the design engineer.

Seismically resilient pipe material must be sufficiently ductile to accommodate deformations without failing and must use joints that are sufficiently restrained such that slight deformation of the pipe will occur before the joint fails. In areas where PGD is anticipated to be relatively minor, ductile iron pipe with restrained joints should allow some deformation in response to ground movement without pulling joints apart or breaking pipes. In areas where significant PGD is anticipated, ductile iron pipe with seismic joints that allow rotation, deflection of up to 15 degrees, and expansion/contraction of up 1 percent of pipe segment length may be necessary to accommodate the ground movement without the pipe or joint failing. A description of recommended pipe replacement materials for both backbone and non-backbone pipe is provided in Table 8-3.

Table 8-3. Recommended Design Standards for Pipe Replacement

Pipe Type	Corresponding Seismic Hazard Zones	Replacement Pipe Material
Backbone	Lateral spreading with PGD up to 2 feet or greater Seismic landslide with PGD 1 foot or greater	Ductile Iron Pipe w/ Seismic Joints
Backbone	No lateral spreading risk Seismic landslide with PGD less than 1 foot	Restrained Ductile Iron Pipe
Non-backbone	Lateral spreading with PGD up to 2 feet or greater Seismic landslide with PGD 1 foot or greater	Restrained Ductile Iron Pipe
Non-backbone	No lateral spreading risk Seismic landslide with PGD less than 1 foot	Current Design Standards
PGD = peak ground deformation		

Although some of the backbone pipe was not included within the high, medium, or low priority groupings provided in Table 8-2, the recommended design standards would still require that all backbone pipe is replaced with restrained ductile iron pipe as it reaches the end of its useful life.

8.7 Recommended Improvements

Based on the results of the pipeline fragility analysis, recommendations are provided for installation of new emergency interties, a seismic study of the 24-inch diameter supply line, and replacement of selected segments of the backbone and non-backbone pipelines.

8.7.1 Emergency Interties

With a single source of supply through the 24-inch pipeline from the NCCWC, the District is vulnerable to an outage caused by an unplanned pipe break. Portions of the pipeline closer to the Clackamas River are expected to have an increased risk of breakage due to lateral spreading and liquefaction induced settlement. As shown in Figure 8-6, the NCCWC WTP is also located in an area of elevated seismic risk, as are the interconnecting pipelines that allow the NCCWC to purchase emergency supply from CRW or the SFWB. Furthermore, all of these water sources rely on the Clackamas River as the primary source of supply.

To increase the ability to reliably deliver water under potential adverse conditions such as curtailment due to drought conditions, toxic algae blooms, seismic events, or other natural hazards, the District conducted a study to determine the feasibility and preferred alternatives for construction of new emergency interties to neighboring water agencies. After a thorough review, two emergency intertie connections were identified that could each deliver the emergency level of service demand of 2.7 MGD:

- **Clackamas River Water Intertie at the Intersection of Strawberry Lane and Webster Road**. The 24-inch diameter water supply pipeline is located immediately adjacent to a 12-inch diameter CRW transmission main. A booster pump station could be used to pump water from the CRW system into the Valley View tanks at an estimated cost of $1,248,000.
- **City of Milwaukie Intertie at River Road and Lark Street**. An existing 10-inch diameter main in the Milwaukie system is located adjacent to existing 8-inch diameter District main along River Road. A booster pump station could be used to pump water from Milwaukie’s lower zone to the District’s lower zone to fill the Valley View tanks. Upsizing of 2,000 feet of pipe along River Road to 12-inch diameter would be required at an estimated cost of $1,789,000.

A full description of all alternatives that were considered and ranked is provided in Appendix C. Based on hydraulic modeling of the alternatives, a similarly sized 35 horsepower pump would be sufficient at each location. A single trailer-mounted portable pump station could be used to provide flexibility to use either intertie in an emergency. The estimated combined cost for a portable pump station is approximately $3M which is similar in cost to constructing two separate emergency pump stations. A preliminary design is recommended to refine the locations, costs, agreements, and permits required for construction of the proposed emergency interties.

Due to the current vulnerability without any redundant supply options in an emergency, the construction of an emergency intertie is recommended as a high priority improvement. Conversations with both CRW and the City of Milwaukie have indicated there is mutual interest, although the City of Milwaukie indicated that they may not be able to complete the necessary modeling to confirm pipe sizing until the next biennial budget cycle in 2023. Thus, proceeding with an intertie with CRW is recommended first, to be followed with an intertie with Milwaukie.

8.7.2 Seismic Study of 24-inch Supply Pipeline

The District's 24-inch supply line was constructed in the late 1960s. Record drawings indicate the pipe is class 175 ductile iron, but there is no indication of the joints used. Replacement of the pipeline will be technically challenging and costly, as the alignment is located within easements through private property, crosses underneath I-205, and would require temporary bypassing of supply flows to the District.

A seismic vulnerability study is recommended for the pipeline to better determine the anticipated magnitude of PGD at locations along the alignment where landslides or lateral spreading are anticipated for comparison against the ability of the aged pipe materials and joints to respond to the ground movement. The scope of such a study should include in-situ condition assessment of the pipeline, including carrier and casing pipe at the I-205 crossing, documentation of pipe material condition and joint type, site-specific geotechnical data along the alignment, and specific recommendations for improvements. The cost of such a study is estimated to be $200,000. The study is recommended as a high priority for the District and should be performed as soon as possible. The study should also include a structural seismic assessment of the Valley View and View Acres pump stations. The pump stations are also considered part of the primary backbone system and it is not clear if these facilities have undergone a seismic assessment.

8.7.3 Replacement of Medium Priority Pipelines

As described in Table 8-2, approximately 14,200 linear feet of the secondary backbone piping will need to be updated to meet the proposed seismically resilient design standards at an estimated cost of $4.4M. In accordance with the Oregon Resiliency Plan, the priority for restraining the secondary backbone piping is considered to be secondary in priority to the primary backbone piping. Much of the secondary piping identified for restraining overlaps with projects identified to address fire flow or condition deficiencies within previous chapters. Thus, it is recommended that only those pipes that also present fire flow or condition deficiencies are included within the 20-year CIP. To avoid excessive burden to customers, restraining of medium priority pipelines should occur as pipes reach the end of their useful life or are identified for capacity deficiencies.

8.7.4 Replacement of Non-Backbone Pipelines

Replacement of backbone pipelines that are predicted to experience greater than 0.5 but less than 1 repair per 1,000 feet of pipe, and those non-backbone pipelines that are predicted to experience greater than 1 repair per 1,000 feet, should be improved over the next 50 years as defined in OAR 333-061 but are considered to be the lowest priority. There is approximately 150,000 feet of pipe in this category that represents a total replacement cost estimated at $26.1M. Some of the pipe identified for replacement overlaps with projects previously identified to alleviate fire flow capacity or condition deficiencies and is recommended for replacement in the 20-year CIP.

The remaining low-priority pipe should be prioritized for replacement between 2040 and 2070 to mitigate the seismic risk throughout the distribution system. The average rate of spending of $870,000 per year would be less than the recommended replacement rate of $1.4M (or 1 mile of pipe) per year recommended for addressing condition deficiencies. Assuming that sufficient funding will be provided to achieve the minimum replacement rate over the 20-year CIP, there would be enough capital budget each year to prioritize the medium and low priority seismic pipe replacements over the next 50 years. Thus, specific identification of seismic mitigation projects for medium and low-priority pipelines are not included within the CIP.

CHAPTER 9

Water Quality

The purpose of this chapter is to review the District's water quality compliance with current drinking water regulations provided by OAR 333-061 and the U.S. EPA. The regulatory review includes a brief description of current and proposed water quality regulations that apply to the OLWSD water system, a description of water quality monitoring and sampling practices, and a summary of the water quality results and compliance.

9.1 Regulatory Review

Drinking water regulations are established by the U.S. EPA to protect drinking water quality. State health departments typically assume the role of primacy agency and are responsible for enforcing drinking water regulations at the state level. Any drinking water regulations that are promulgated by the state are required to be at least as strict as the U.S. EPA regulation and in some cases may be more stringent than the U.S. EPA regulation. In Oregon, the OHA Drinking Water Program is the responsible agency for drinking water regulations. The regulations are detailed in OAR 333-061. This review includes OHA Drinking Water Program rules that are relevant to the District's distribution system.

9.1.1 Current Regulations

The rules described in this section address distribution system water quality and are the responsibility of the District. The description under each rule only includes aspects of the rule that are relevant to the District.

9.1.1.1 Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR)

The Stage 1 DBPR established maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for total trihalomethanes (TTHMs) and haloacetic acids (HAA5s). The MCL for TTHM is 0.080 milligrams per liter (mg/L) and HAA5 is 0.060 mg/L. The maximum residual disinfectant limit (MRDL) was set to 4.0 mg/L as an annual average.

The Stage 2 DBPR requires monitoring sites to reflect areas of the system that exhibit highest disinfection byproduct (DBP) concentrations and at least one quarterly monitoring period that reflects peak monthly DBP concentrations. Stage 2 DBPR also requires that each MCL be met by a running average at each of the monitoring locations rather than a system total average for all locations. The District collects samples from four (4) compliance locations within the distribution system.

9.1.1.2 Lead and Copper Rule (LCR) – Promulgated in 1991

The LCR requires systems to monitor drinking water for lead and copper at customer taps every 6 months. The sample size is based on the size of the water system. If lead concentrations exceed an action level (AL) of 15 parts per billion (ppb) or copper concentrations exceed an AL of 1.3 parts per million (ppm) in more than 10 percent of the customer taps sampled, additional actions are required that may include water quality parameter monitoring, corrosion control, source water monitoring or treatment, public notification and education, and lead service line replacement programs. Water systems may qualify for reduced monitoring schedules if the water system meets the appropriate criteria.

The LCR has undergone various revisions since inception with the most recent being in 2007. The following revisions were made:

1. An additional requirement that prevents water systems that exceed the action limit to be able to remain on a reduced monitoring schedule.
2. Water systems must provide advanced notification and gain approval of the primacy agency before changing treatment or source water that could impact corrosion.
3. Notification of water monitoring results at customer taps must be provided to those customers.

Adjustments were made to the lead service line replacement requirements.

9.1.1.3 Revised Total Coliform Rule (RTCR) – Promulgated in 2013

The Total Coliform Rule (TCR) was established in 1989 and required that total coliform samples be collected at sites representative of water quality throughout the distribution system. The total number of samples required was based on the population served. A monthly MCL violation is triggered if greater than five percent of monthly samples are positive for total coliforms. Directly following violations, the state and the public must be informed of the violation and a repeat sample must occur.

The RTCR, promulgated in 2013, established an MCL for Escherichia coli (E. coli) as a reliable indicator of fecal contamination. The E. coli MCL is exceeded if the sample tests positive and is confirmed by a repeat positive sample. The MCL also qualifies as exceeded if the repeat sample is not taken or when a sample tests positive for total coliform and is confirmed with a second sample of Escherichia coli (E. coli). The RTCR also sets a total coliform treatment technique (TT) requirement that triggers differing levels of assessment following an MCL violation. Requirements for monitoring locations and schedules are established according to the specific water system.

9.1.1.4 Unregulated Contaminant Monitoring Rule 4 (UCMR4) – Promulgated in 2016

The fourth UCMR requires monitoring for 30 unregulated chemical contaminants between 2018 and 2020. This monitoring data is used by the USEPA to inform future regulatory actions. Water systems are required to monitor for cyanotoxins, metals, pesticides, alcohols, semivolatile chemicals, indicators, and three brominated haloacetic acid groups. The District monitors the haloacetic acid groups for the UCMR4 at the entry point to the distribution system and at the same four monitoring locations identified for compliance with the Stage 2 DBPR in the distribution system. Samples at the surface water intake to the NCCWC WTP are collected by the NCCWC.

9.1.1.5 Public Notification Rule (PNR) – Promulgated in 2000

The PNR requires the public water system to notify their customers when the water system violates USEPA regulations, State regulations or monitoring requirements. The PNR establishes notification levels based on violations.

9.1.1.6 Consumer Confidence Report (CCR) – Promulgated in 1996

The CCR rule requires that public water systems with more than 500 customers prepare an annual CCR to inform customers about water quality data. The report is required to contain a specific list of information.

9.1.2 Future Regulations

The rules described in this section are only those relevant to distribution systems that will likely impact the District and are pending review by U.S. EPA.

9.1.2.1 Lead and Copper Long Term Revisions

The U.S. EPA has discussed and is working to establish long-term revisions that will replace the short-term revisions made to the LCR in 2007. Revision items include lead service line replacements, sample site selection, tap sampling, corrosion control, and public education about copper.

9.1.2.2 Use of Lead-Free Materials for Drinking Water

The USEPA is currently reviewing a proposed regulation for the use of lead free pipes, fittings, fixtures, solder, and flux for drinking water systems. The regulation would modify the definition for lead free plumbing and prohibit a lead level above 25 percent.

9.2 Regulatory Schedule

The District complies with the regulatory schedules in

Table 9-1 to meet all regulatory rule requirements. The District is currently on a reduced monitoring schedule for the LCR.

Table 9-1. Regulatory Schedules

Regulation	Regulatory Schedule
Stage 2 Disinfectant and Disinfection Byproduct Rule	The District is required to test four (4) samples for TTHM and HAA5 on a quarterly schedule during the months of October, January, April, and July.
Lead and Copper Rule	The District is required to take 30 samples every three (3) years between June 1 and September 30. Customer notice of sample results is required. The last sample occurred in 2017.
Revised Total Coliform Rule	The District is required to take 30 routine samples on a monthly schedule.
Public Notification	The District is required to notify customers of any violations or issues with drinking water.
Consumer Confidence Reports	The District is required to provide an annual report to inform users of the water quality in the District.

TTHM = total trihalomethanes; HAA5 = haloacetic acids

9.3 Water Quality Compliance

The District is responsible for water quality sampling at the entry point to the distribution system and within the distribution system. This includes conducting water quality tests for coliform bacteria, DBPs, lead, copper and unregulated contaminants. The District also maintains one online sampling station at the View Acres Pump Station which monitors chlorine residual. This monitoring station is connected to the District's SCADA system. NCCWC performs water quality testing at the surface water intake and water treatment plant. All water quality sampling results are publicly available on the OHA website at https://yourwater.oregon.gov.

9.3.1 Disinfection Byproducts

The District is required to collect four samples per quarter to determine compliance with the Stage 2 DBPR. District average total TTHM and HAA5 levels have been well below their respective MCLs in 2018.

9.3.2 Lead and Copper Rule

The District monitors lead and copper on a reduced schedule. The District collects 30 samples every three years between June 1 and September 30. The NCCWC WTP installed a corrosion control unit in 2005 that raises pH to prevent metal leaching from plumbing fixtures. The last monitoring cycle occurred in 2017 and lead and copper samples were well below action levels at all the monitoring locations. Results were provided to customers.

9.3.3 Total Coliform Rule

The District collects 30 total coliform samples each month in compliance with the TCR. The District has never exceeded the maximum monthly five percent positive samples allowed under the TCR. In 2018 the District did not detect any positive samples.

9.3.4 Consumer Confidence Report

The most recent (2018) CCR is provided in Appendix D. In addition to water quality data within the District's distribution system, the CCR includes raw and treated water quality data for the NCCWC WTP, which is provided by NCCWC.

CHAPTER 10

Capital Improvement Program

The previous chapters have identified improvement projects that address level of service deficiencies, rehabilitation and replacement of aging infrastructure, and mitigation of seismic risk. The purpose of this chapter is to recommend a water system CIP to be completed over the next 20 years that includes a schedule for implementation. Options to be explored for funding and financing the recommended improvements over the planning period, including an analysis of system development charges, are also included.

10.1 Methodology

IN THIS SECTION

The following sections describe the basis and assumptions used to develop cost estimates for recommended projects, a brief summary of the calculations used to identify SDC eligible costs, and the criteria used to prioritize individual projects within the CIP.

10.1.1 Cost Estimating Basis and Assumptions

Engineering opinions of probable construction costs (estimates) have been developed for each of the projects identified in previous chapters. The design concepts and associated costs presented in this CIP are conceptual in nature due to the limited design information that is available at this stage of project planning. For pipeline replacement projects, District GIS data was used to estimate quantities for pipeline length, depth, fittings, valves, hydrants, services, and pavement restoration. The scope of work for non-pipeline projects and studies were approximated based on equipment and/or facility size and comparison with similar replacement projects. As each project progresses into design and construction, the associated costs may vary as project-specific requirements are identified.

All estimates provided in this chapter were prepared in conformance with the Class 4 Conceptual Report Classification of Opinion of Probable Construction Costs as developed by the Association for the Advancement of Cost Engineering (AACE International). The purpose of a Class 4 Estimate is to provide a conceptual level of effort that is expected to range in accuracy from -30 percent to +50 percent. A Class 4 Estimate also includes an appropriate level of contingency so that it can be used in future planning and feasibility studies. These cost estimates are based on unit costs developed using a combination of data from RS Means CostWorks® and recent bids, experience with similar projects, and foreseeable regulatory requirements. Costs are tied to an Engineering News Record (ENR) Construction Cost Index (CCI) of 11392. The ENR CCI can be used to adjust projected future costs based on monthly updates to the CCI.

For budgeting purposes, the construction cost estimates were adjusted to account for contingency to capture unknown aspects of the work at the planning stage and for the “soft costs” required to plan, design, and manage each project through construction. Adjustments to each project estimate were made using the following markups:

- A 10 percent markup of the itemized construction sub-total was added to account for unknown items not included in the opinion of cost
- A 20 percent markup of the itemized construction sub-total was added to account for construction contingency
- A 15 percent markup of the total construction cost including unknown items and contingency was added to account for design phase services including project administration, planning, alternatives analysis, engineering design, surveying, permitting, etc.
- A 10 percent markup of the total construction cost including unknown items and contingency was added to account for construction phase support services, including administration, inspection, materials testing, office engineering, construction administration, etc.

Detailed cost estimates are included in Appendix E.

10.1.2 System Development Charges

Oregon Revised Statutes (ORS) 223.297 to 223.314 authorize the District to establish SDCs to recover a fair share of the cost of existing and planned facilities that provide capacity to serve future growth. The SDC is a one-time fee on new development that is paid prior to connection to the water system.

To calculate an SDC for the District's water system, improvement, administrative, and reimbursement costs can be considered. Improvement costs include those portions of future costs that will provide increased capacity that could serve new connections. Reimbursement costs include the eligible costs for existing facilities associated with the unused capacity that could benefit new connections. Administrative costs include salary and benefits for Oak Lodge staff or consulting fees associated with tracking, managing, and reporting on the SDC funds to meet regulatory requirements. The eligible costs are divided by the number of meter capacity equivalents (MCE) of anticipated growth in the District through 2037. One MCE equals the capacity of a 5/8-inch by 3/4-inch water meter. A detailed description of the SDC methodology can be found in a Memorandum prepared by FCS Group and included as Appendix F. The most current version of the memorandum included with this Draft WSMP calculates a recommended SDC using only the incremental cost for increasing the capacity of the system, but current analysis is underway to modify the calculation to include administrative and reimbursement costs in addition to the improvement costs.

10.1.3 Project Scheduling and Prioritization

In addition to developing a cost estimate for each project and determining the SDC eligible costs, the timing of each project was considered. Timing was determined using one of four possible criteria:

- **District Determined Frequency**. Where applicable, the District has provided a desired frequency for upgrades, replacements, or updates and the timing of projects was set accordingly.
- **End of Useful Life**. Refurbishment or replacement of assets is timed to occur as close as possible to the anticipated end of useful service life based on the typical expected life of an asset or type of refurbishment (i.e. external coating, internal lining, etc.) and the date of original installation or last refurbishment.
- **Coordination with Clackamas County Road Projects.** The District requested the Clackamas County 10-year paving plan to determine if any water system improvements are located within roads that are planned for future pavement. The County imposes a 5-year moratorium on trenching or excavation within newly constructed roads, and water main replacement projects were prioritized to occur ahead of any planned paving. Only one road improvement project was identified that corresponds with water system improvements, and that is the County's Oatfield Road project which includes American's with Disabilities Act (ADA) compliance improvements along with road paving. The ADA improvements are anticipated to occur in fiscal year 2025 (FY25), with paving planned for FY27 and FY28.
- **Prioritization Criteria**. Those projects that do not fit the first two categories, were prioritized based on risk, as determined by the consequence and the likelihood of failure. Consequence of failure was determined by the magnitude of customers whose service would be disrupted with a higher priority given to those customers (i.e. schools, care facilities) that provide a critical community function. Likelihood of failure was determined by the age of the facility, seismic risk, and input from operations and maintenance staff on the current condition.

10.2 Recommended Capital Improvement Program

Using the scheduling, prioritization and cost estimating methodology described in the previous sections, a plan was developed to determine the annual capital spending required to address deficiencies within the water system over the next 20 years. Project timing was adjusted to keep the annual capital costs as consistent as possible to allow the District to execute projects with the current level of staff. A detailed description of the initial 10 years through fiscal year 2030 is provided, with the remainder of the capital spending summed for future allocation in fiscal years 2031 through 2040. Assignment of projects to individual fiscal years beyond 2030 was not performed. Future changes in prioritization and identification of additional projects is expected to modify timing and will be reflected in future master plan updates. The recommended CIP plan is provided in Table 10-1.

A total of approximately $30M in capital improvements were identified for the water system. Costs are tied to an ENR CCI of 11392 associated with the 20-City Average for January of 2020. The ENR CCI can be used to adjust projected future costs based on monthly updates to the CCI. Annual budgeting should use the most recently published CCI to adjust costs for future years.

In current dollars, the average annual capital spending should be approximately $1.5M per year. Annual spending was kept as consistent as possible to allow the District to fund projects through reserves in the drinking water capital fund, incremental rate increases, and SDC's whenever possible. The recommended year for implementing each improvement was established using the methodology described in Section 10.1.3 above. Projects with estimates exceeding $1.5M were separated into multiple phases across two or more fiscal years to keep the annual average capital spending as close as possible to $1.5M. Projects with probable construction costs exceeding $800,000 were assumed to require design costs that would be incurred in the fiscal year preceding the project construction. All projects scheduled for FY31 through FY40 were not assigned to individual years as the prioritization and coordination with paving projects is likely to change over the next ten years. The average spending between 2031 and 2040 is also approximately $1.5M in current dollars.

10.3 Capital Improvement Projects

The following sections provide a brief description of each of the prioritized CIP projects including engineering and planning studies, fire flow improvements, resiliency, and condition driven projects. All CIP projects are also identified on a system map provided as a plate in Appendix G.

Table 10-1. Capital Improvement Program Implementation

Recommended 20-Year CIP For Oak Lodge Water Services District Water System																
Project ID	**Project Category**	**Description**	**Pipe Length, feet**	**Diameter, Inches/ Capacity**	**Project Total (2020 Dollars)**	**CIP Value in Current 2020 Dollars**										
						FY21 1	**FY22 2**	**FY23 3**	**FY24 4**	**FY25 5**	**FY26 6**	**FY27 7**	**FY28 8**	**FY29 9**	**FY30 10**	**FY31-40 11-20**
Engineering/Planning Studies (E)					***$900,000***	***$100,000***	***$0***	***$0***	***$0***	***$0***	***$200,000***	***$0***	***$0***	***$0***	***$0***	***$600,000***
E-1	Planning Study	AWIA Risk and Resilience Assessment and Updates (every 5 yr)	-	-	$300,000	$100,000					$50,000					$150,000
E-2	Planning Study	Water System Master Plan Update (every 5 yr)	-	-	$600,000						$150,000					$450,000
Fire Flow Improvement (F) Projects					***$20,464,000***	***$0***	***$115,600***	***$1,040,400***	***$0***	***$0***	***$0***	***$329,700***	***$1,483,650***	***$1,483,650***	***$1,636,000***	***$14,375,000***
F-1	Fire Flow	28th Avenue, Lakewood Drive, Kellogg Lake Apartments	4,015	8 & 12	$1,156,000		$115,600	$1,040,400								
F-2	Fire Flow	River Road	6,805	8 & 12	$3,297,000							$329,700	$1,483,650	$1,483,650		
F-3	Fire Flow	Vista Sunrise Court	400	8	$122,000										$122,000	
F-4	Fire Flow	Jennings, Colina Vista, Clayson Avenues, Emerald Drive, Colony Circle	4,415	8	$1,514,000										$1,514,000	
F-5	Fire Flow	Alderway Avenue	1,070	8	$338,000											$338,000
F-6	Fire Flow	View Acres Road	2,130	8	$553,000											$553,000
F7 - F37	Fire Flow	Increase pipeline diameters to meet fire flow criteria	42,475	8 & 12	$13,484,000											$13,484,000
Condition (C) Projects					***$6,715,000***	***$92,500***	***$832,500***	***$50,550***	***$534,800***	***$1,552,400***	***$1,353,950***	***$1,149,400***	***$200,000***	***$250,550***	***$25,000***	***$673,350***
C-1	Pipeline	Aldercrest Road	3,025	8	$925,000	$92,500	$832,500									
C-2	Pipeline	Ranstad and Cinderella Courts	300	6	$79,000				$79,000							
C-3	Pipeline	Marcia Court	475	6	$128,000				$128,000							
C-4	Pipeline	Lisa Lane	760	6	$225,000					$225,000						
C-5	Pipeline	Oatfield Road	15,995	8	$3,278,000				$327,800	$983,400	$983,400	$983,400				
C-6	Pipeline	Round Oaks Court	345	4	$58,000											$58,000
C-7	Non-buried Asset	Seal Coat Concrete Dome on Valley View Reservoirs	-	-	$70,000						$70,000					
C-8	Non-buried Asset	Recoat Exterior of View Acres Tanks	-	-	$400,000								$200,000	$200,000		
C-9	Non-buried Asset	Replace Equipment and Refurbish Valley View Pump Station	-	-	$380,000											$380,000
C-10	Non-buried Asset	Replace Equipment and Refurbish View Acres Pump Station	-	-	$250,000						$250,000					
C-11	Non-buried Asset	Upgrade SCADA System	-	-	$32,000							$32,000				
C-12	Non-buried Asset	Radio Telemetry Activation Study	-	-	$24,000							$24,000				
C-13	Non-buried Asset	Rebuild Pressure Reducing Valves (every 5 years)	-	-	$100,000					$25,000					$25,000	$50,000
C-14	Non-buried Asset	Large Meter Testing and Replacement	-	-	$337,000			$50,550			$50,550			$50,550		$185,350
C-15	Non-buried Asset	Vault Meter Bypass Installations	-	-	$110,000							$110,000				
C-16	Non-buried Asset	Replace All 4 ¼-inch Fire Hydrants	-	-	$319,000					$319,000						
Resiliency (R) Projects					***$3,250,000***	***$1,450,000***	***$180,000***	***$810,000***	***$810,000***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***
R-1	Emergency Supply	Intertie Pump Station with Clackamas River Water	-	-	$1,250,000	$1,250,000										
R-2	Emergency Supply	Intertie Pump Station with City of Milwaukie	-	-	$1,800,000		$180,000	$810,000	$810,000							
R-3	Seismic Resiliency	Seismic Study of 24-inch supply pipeline	-	-	$200,000	$200,000										
				CIP Total	**$31,329,000**	**$1,642,500**	**$1,128,100**	**$1,900,950**	**$1,344,800**	**$1,552,400**	**$1,553,950**	**$1,479,100**	**$1,683,650**	**$1,734,200**	**$1,661,000**	**$15,648,350**

Notes: Project costs rounded up to nearest $1,000. All costs are based on an Engineering News and Review 20-City Average Construction Cost Index of 11392 for January of 2020.

10.3.1 Engineering and Planning Studies

State and federal rules and regulations require periodic engineering and planning studies for water systems. These studies have been included within the CIP and include the following projects:

- **E-1 America's Water Infrastructure Act (AWIA) Risk and Resilience Assessment and Updates**. In 2018 the AWIA was signed into law and requires the District to conduct a risk and resilience assessment (RRA) and a subsequent development of an emergency response plan (ERP) prior to June 30, 2021. The law also mandates that the that the RRA and ERP are updated every 5 years.
- **E-2 Water System Master Plan (WSMP) Update.** Planning capital improvements beyond 5 years can be a challenge for water utilities, and a targeted update to the master plan on a 5-year cycle can dramatically improve the utility of the WSMP.

Although a Water Management and Conservation Plan (WMCP) is also required for nearly all municipal water suppliers and must be periodically updated, the District's requirement is met through the WMCP prepared by the NCCWC.

10.3.2 Fire Flow Improvements

A total of 37 fire flow capacity improvement projects were identified and described in Chapter 5 of this WSMP. Table 5-2 provides a description of the extents of each project, including the existing and recommended pipe size and materials. Locations of each project are provided on the CIP map included in Appendix G. The projects were numbered based on prioritization criteria, with the first four projects (F-1 through F-4) scheduled for implementation between FY21 and FY30. The next highest priority projects, F-5 Alderway Avenue and F-6 View Acres Road, are also included as separate CIP projects in Table 10-1. Both projects could be implemented earlier than FY30 if annual capital budget capacity becomes available if other projects are delayed or suspended.

10.3.3 Rehabilitation and Replacement Projects

A total of 16 condition driven improvement projects were identified and described in Chapter 6 of this WSMP. Projects were divided into two categories; pipelines and non-buried assets. The first six projects (C-1 through C-6) are pipeline replacements identified by the District based on current condition and history of repairs. The remaining projects (C-7 through C-16) represent various repairs, refurbishments, or replacements to pumps, motors, meters, pressure reducing valves, hydrants, coatings, and communications infrastructure.

In addition to the specific projects identified by District operations and maintenance staff, a minimum pipeline replacement rate of approximately one mile per year was identified in Chapter 7 to provide a full system replacement over the next 100 years. The approximate spending rate required to achieve this pipeline replacement rate is $1.4M per year in current dollars. After removing all costs for engineering studies and non-buried assets, the proposed pipeline replacement costs over the next 20 years approximately equals $1.4M per year so no additional condition based projects were identified within the CIP.

10.3.4 Seismic Resiliency Improvements

A detailed analysis of the seismic vulnerability of the District's water system is provided in Chapter 8 of this WSMP. Three recommended improvements were identified for high priority implementation and include the following projects:

- **R-1 Intertie Pump Station with Clackamas River Water.** To provide a redundant supply that could be used during an outage of the 24-inch water supply pipeline to the District, an intertie with Clackamas River Water is recommended. A pumping station will be necessary to overcome the difference in pressure between the two systems.
- **R-2 Intertie Pump Station with City of Milwaukie.** To provide access to an alternative supply source than the Clackamas River, and to provide additional redundant supply that could be used during an outage of the 24-inch water supply pipeline to the District, an intertie with the City of Milwaukie is recommended. A pumping station will be necessary to overcome the difference in pressure between the two systems. The City of Milwaukie has indicated a preference to defer the design and construction of this intertie until the next biennial budget cycle in FY23.
- **R-3 Seismic Study of 24-inch Supply Pipeline.** To improve the reliability of the District's 24-inch water supply pipeline, a seismic study is recommended to assess the current condition and the potential site-specific ground deformations anticipated along the alignment based on geotechnical explorations. Identification of any excessive seismic risk and appropriate mitigation measures is a high priority for improving the overall system resilience.

As described in Chapter 8, additional medium- and low-priority improvements are recommended over the next 50 years for both backbone and non-backbone pipelines. A summary of the total estimated pipeline replacement costs for mitigation of medium and low-priority seismic risks comes to approximately $26.1M. Many of the fire flow and condition improvements for distribution pipelines identified in the CIP will also address replacement of pipelines with medium and low-priority seismic risk. These pipes are recommended to be replaced per the seismic standards recommended in Chapter 8. At the recommended replacement rate of one mile of pipe per year identified in Chapter 7, and assuming medium- and low-priority seismic risk pipelines are prioritized for replacement, the recommendations for mitigating seismic risk can be accomplished well within the 50-year target established in the Oregon Resiliency Plan.

10.4 Funding and Financing

The District has several options to fund the CIP including user fees, short- and long-term borrowing, grants from outside agencies, and SDCs. The following sections will describe the potential for funding the recommended capital improvements through user fees and SDCs, borrowings, or grants from outside agencies.

10.4.1 Rates and SDCs

The District maintains a specific Drinking Water Capital Fund that is used to fund capital improvement projects for the drinking water system. The Drinking Water Capital Fund receives transfers from the Drinking Water Fund, which is primarily funded through water sales. Over the past three years, SDCs have contributed between 6 to 9 percent of revenue. A summary of the Drinking Water Capital Fund activity since the formation of the OLWSD is provided in Table 10-2.

Table 10-2. Drinking Water Capital Fund from 2019 to 2021

Item	FY19 (Actual)	FY20 (Estimate)	FY21 (Budget)
Beginning Fund Balance	$0	$3,236,048	$3,942,090
Transfer from Drinking Water Fund	$2,700,000	$1,675,000	$500,000
Interest Revenue or Borrowing Proceeds	$1,394,267	$85,000	$50,000
Total Resources Available	$4,094,267	$4,996,048	$4,492,090
Capital Improvement Projects	$133,715	$777,000	$1,480,000
Other Capital Spending	$724,504	$276,958	$35,000
Total Capital Outlay	$858,220	$1,053,958	$1,515,000
Remaining Balance	$3,236,048	$3,942,090	$2,977,090

In May of 2020, the District budget committee approved a budget for FY21 to be adopted by the District Board at the May 19, 2020 meeting. The adopted budget includes $1.2M for capital improvement projects as part of the Drinking Water Capital Fund and incorporated a 0.55 percent increase to water rates. If the projected capital improvement budget is fully spent, the fund will still retain a reserve of approximately $3M.

Based on the past transfers from the Drinking Water Fund and historical rate increases it appears that an annual average capital spending rate of $1.5M per year can be funded initially through rate increases that keep up with inflation, but it is likely that substantial rate increases will be required in future years to fund the recommended capital plan. The District financial budgeting tool could be used to estimate the potential impacts on rate increases under various spending scenarios to confirm that a more drastic increase in rates is not required.

FCS Group analyzed the SDC eligible and calculated their opinion of the District's maximum defensible SDC for the water utility to be $10,608 per MCE, where one MCE is a 5/8" x ¾" meter. The maximum defensible SDC includes a reimbursement fee for available capacity within the existing District supply, storage, and BPS facilities, an improvement fee for planned capacity-increasing projects included in the CIP of this WSMP, and administrative costs to the District for developing the SDC methodology and providing annual accounting of SDC expenditures. A full description of the SDC calculation based on improvement costs is provided in Appendix F.

10.4.2 Long-term Borrowing

Several options for long-term borrowing are available to the District to finance the CIP, including the issuance of revenue-backed bonds and obtaining through various state and federally administered low-interest loan programs specifically for water utilities. Debt financing of capital improvements through issuance of revenue bonds is common practice, but typically will incur a higher interest rate than may be available through state and federal low-interest financing programs. The District does not currently have any outstanding debt for water system capital improvements. If expediting the implementation of the CIP is desired, the District could use revenue bonds, and/or low-interest state and federal loan programs to finance water system improvements.

There are several state and federal programs that offer low-interest financing that may be available to the District. Applicants and/or projects meeting certain criteria may also qualify for principal forgiveness or grant funding. Several potential programs are listed below and could be considered for funding specific capital improvements:

- **Safe Drinking Water Revolving Loan Fund.** The Safe Drinking Water Revolving Loan Fund is managed through the OHA drinking water program with loans managed by the Oregon Infrastructure Finance Authority. Loans can be used for system improvements, including design and planning costs, up to $6,000,000 per project.
- **Water and Wastewater Financing and Special Project Works Fund Programs**. These programs, both managed by the Oregon Infrastructure Finance Authority, offer low-interest loans for up to $10,000,000 per project through a combination of direct and/or bond funded loans.
- **Oregon Water Resources Water Project Grants and Loans**. The Water Project Grants and Loans provide funding for implementation ready projects that help meet Oregon's instream and out-of-stream water supply needs and could be applied to the proposed emergency intertie projects.
- **Federal Emergency Management Agency Pre-Disaster Mitigation Loans**. Projects for mitigating seismic risk can be eligible for this program but must be consistent with the goals and objectives identified within the County's Natural Hazard Mitigation Plan.
- **Water Infrastructure Finance and Innovation Act Program**. Offers low-interest supplemental loans for regionally and nationally significant projects with construction value of $20,000,000 or more, likely requiring the District to bundle projects into a single application package to achieve eligibility.

At the time of preparation of this WSMP update, the District is planning to develop a comprehensive funding and financing plan for the water, wastewater, and stormwater utilities and will consider all available options for funding each respective utilities CIP.

10.5 Summary

The recommended CIP identifies approximately $30M in projects, with roughly half of the work to be completed within the next 10 years. An implementation schedule that provides for an average capital improvement budget of $1.5M per year appears feasible and may be accomplished with moderate rate increases similar to those implemented by the District over previous years. Risk of insufficient fire flows, unplanned failure due to poor condition, or outages following a major seismic event are the primary drivers of individual projects and do not include specific timelines, however if there is a desire to accelerate the improvement schedules, bond or government low-interest financing can be pursued.

CHAPTER 11

References

1. **Oregon Metro.** *Regional Transportation Plan- Population, Employment, Households, and 2040 Design Type by Transportation Analysis Zone (TAZ).* 2018.

2. **RH2.** *Oak Lodge Water District Seismic Vulnerability Report.* 2012.

3. **American Water Works Association.** *AWWA Manual M19, Fourth Edition. Emergency Planning for Water Utilities.* 2001.

4. **Oregon Seismic Safety Policy Advisory Commission.** *The Oregon Resilience Plan.* Salem : s.n., 2013.

Appendix A. Hydraulic Model Development TM

Date: [Publish Date]

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Project: Oak Lodge Water Services District Water Master Plan Update

SUBJECT: **DRAFT HYDRAULIC MODEL DEVELOPMENT TM**

Oak Lodge Water Services District (OLWSD) has appointed Water Systems Consulting, Inc. (WSC) with the task of updating their Water Master Plan (WMP). Part of updating the WMP includes building and calibrating a new hydraulic model in Innovyze's InfoWater® hydraulic modeling software based on OLWSD's current system mapping. A calibrated hydraulic model is a valuable tool that OLWSD can use to evaluate the distribution system, determine system deficiencies, and predict the system response due to operational changes.

This technical memorandum (TM) describes how the model was built and calibrated, including assumptions made for unknown data. This TM will be included as an appendix to the final WMP update. WSC requests that the District review the draft provided in this TM and provide comments within 2 weeks. The District's review comments will be incorporated into revised final draft TM.

For reference, a list of terms is provided below:

ADD	Average Day Demand
AWWA	American Water Works Association
GIS	Geographical Information Systems
gpm	Gallons per Minute
HDPE	High Density Polyethylene
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
NRW	Non-Revenue Water
OLWSD	Oak Lodge Water Services District
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PVC	Polyvinyl Chloride
SCADA	Supervisory Control and Data Acquisition
TAZ	Transportation Analysis Zone

1 BACKGROUND

An updated and calibrated model is an important tool for evaluating the water system. Having a model that accurately represents the water system helps make the tool more robust. The District maintains a Geographic Information System (GIS) database as the most up to date record of the water system assets. Consistency between the GIS database is important for the District's ability to track assets, maintain an accurate model as changes to the system occur, and to support decision making. The District is in the process of expanding use of their asset management software system. Part of this process includes a plan to establish asset ID numbering that is consistent between the asset management software, GIS database, and the model.

2 MODEL STRUCTURE AND CONNECTIVITY

The first steps in model development are to build the model structure, confirm the pipe and facility connectivity, and populate basic facility physical information. The model structure was built using OLWSD's Geographic Information System (GIS) database that contains a map of the distribution system's assets and information on the system's water mains, laterals, reservoirs, pump stations, hydrants, valves, meters, pipe fittings, and other assets. There is a significant amount of information contained in the GIS database, such as billing account information, addresses, and location coordinates, that is not required in the hydraulic model and was excluded to decrease the model complexity and keep model run times low. The GIS data was carefully reviewed for pertinent information that would affect the system hydraulics and was prepared for transfer to the hydraulic model. Some GIS data, such as zone, valve type, and descriptions, are useful for reference and were imported to the model when available.

The GIS Gateway Tool in Innovyze's InfoWater® software was used to easily transfer GIS data and attributes into the hydraulic model. InfoWater's GIS Gateway Tool transfers GIS shapefiles into InfoWater model features. The District continuously maintains the GIS database as the most accurate representation of the distribution system. To allow for as much consistency as possible between the GIS dataset and the InfoWater model dataset, changes to pipes and junctions were avoided where possible. The InfoWater GIS Gateway Tool allows GIS Data Fields to be mapped to the Model Network Data Fields. This allowed information in the GIS data fields to be preserved in the model. Table 1 lists the water distribution system facilities and assets transferred into the hydraulic model from the GIS database as well as the relevant properties transferred for each asset.

Table 1. Attributes transferred into the Model from OLWSD's Geodatabase

InfoWater Facility	GIS Shapefile Data Source	Attributes Transferred from GIS database	Notes
Pipes	**Water Mains**	FID	The GIS database contained an ID number labeled FID for each pipe that was used to populate the unique ObjectID field in the model.
		Pipe Diameter	The GIS database contained diameter in inches for all pipes.
		Pipe Length	The pipe length was 0 inches for 2 of the pipes. Pipe length calculation is discussed below.
		Pipe Material	The material was listed for 25% of the transferred water mains as cast iron, ductile iron, HDPE, steel, or PVC. The District assumes the remaining 75% of pipes are cast iron material.
		Year Installed	The year installed was listed for 16% of the transferred water mains as years ranging from 1965 to 2018. The District assumes the additional 84% were installed before 1965.
		Zone	The pressure zone was not listed for 431 feet of pipe length. The majority of pipe zones were included as either Lower, Upper or Pumped. The Pumped Zone is also referred to as the High-Level Zone.
	Hydrant Laterals	FID	The GIS database contained an ID number labeled FID for each hydrant line that was preserved as the Description. The ObjectID field in the model was populated by the GIS Gateway Tool with a unique ID to avoid conflict with the Water Main ObjectIDs.
		Pipe Diameter	The diameter was listed as 6 inches for 1% of the hydrant laterals. The remaining 99% were blank. It was assumed that the remaining laterals have a diameter of 6 inches and assigned a diameter of 5.99 inches to distinguish it as an assumed diameter.
		Pipe Length	The pipe segment length was listed for 8 of the hydrant laterals. The remaining were blank. Pipe length calculation is discussed below.
		Pipe Material	The material was listed as Ductile for 1% of the hydrant laterals. The remaining 99% were blank.
		Year Installed	Date installed was listed as 2014 or 2015 for 5 of the hydrant laterals. The remaining were blank.
Junctions	**Hydrants**	HYD-ID	The GIS database contained a unique Hydrant ID labeled HYD-ID for each hydrant that was transferred to the description to differentiate hydrants from junctions transferred from other GIS shapefiles.
		Year Installed	The year installed was not listed for 10% of the hydrants. The remaining 90% were listed as years ranging from 1946 to 2014.
		Zone	The pressure zone was listed for all hydrants.

	Hydrant Valves	Valve Type	Valve type was listed for all hydrant valves and preserved as the Description.
	Valves	Valve Type	Valve type was listed for all valves and preserved as the Description.
		Zone	The zone was listed for all valves as either Lower, Upper, or Pumped/Pressure. Pumped and pressure both refer to the High-Level Zone. Zone was listed as "Hi_Lo" to indicate isolation valves between zones.
	Blow Off Valves	FID	The GIS database contained an ID number labeled FID for each blow off valve that was preserved as the Description.
	Fittings	Blockname	The GIS database contained a field labeled Blockname that indicates the type of fitting. This field was transferred to the description.
		Zone	The zone was listed for fittings as either Lower, Upper, or Pumped. Pumped refers to the High-Level Zone. Zone was listed as "Hi/Lo" to indicate fittings near isolation valves between zones. Less than 1% of fittings did not have a zone listed.

Assumptions were made for elements with unknown GIS attribute data when necessary. 7,050 feet of hydrant lateral pipe were transferred into the model with a diameter of zero inches. Because OLWSD's standard hydrant lateral diameter is 6 inches, these pipes were all assigned a diameter of 5.99 inches. Hydraulically, the pipe still operates similar enough to a 6 inch pipe in the model, but is different from all other pipe diameters to indicate it is an assumed diameter. As more detailed information is available, these pipe diameters can easily be updated.

When importing pipes, scaled lengths are automatically calculated based on the geographic location data. The scaled lengths are sometimes different than the length value imported from the GIS dataset and in these cases the scaled length was used because it is based on the pipe location. There were three locations of pipes with a scaled length of zero feet. These pipes were found to be duplicate pipes and were made inactive.

Once the GIS Gateway Tool was executed and the structure built, the system's connectivity needed to be confirmed. Some of the junctions and pipes created from the GIS Gateway Tool were not necessary for the function of the model. To maintain consistency with the District's GIS Database, these unnecessary elements were made inactive rather than deleting them from the model. A field "Exist_Mod" was created as an indicator used to query all active elements by assigning 1 to active elements and 0 to inactive elements.

The InfoWater Fill Pipe Connectivity Tool assigns a "to" and "from" nodes to the ends of each pipe based on graphic overlap of pipes and junctions. The Fill Pipe Connectivity Tool was applied to the entire model with a pipe tolerance of 0.001 foot. A small tolerance was used to avoid errors in connecting pipes and nodes where multiple nodes may fall within the searching distance.

InfoWater Connectivity tools can use queries such as "nodes in close proximity", "orphaned nodes", "crossing pipes", and more to review the connectivity and troubleshoot problems. After review of the distribution system's connectivity using the Network Navigator tools, orphan nodes not connected to nearby pipes were located. These orphan nodes not required for connectivity were made inactive.

The InfoWater Domain Manager was used to select Disconnected Nodes to identify remaining nodes disconnected from the system, that are not orphaned nodes. These areas, along with a few other manually identified areas, were adjusted by adding small pipes to connect two nodes or by making overlapping nodes or pipes inactive. In some cases where a node is in close proximity to a pipe but not connected, the pipe was manually split at the node location and the nearby node was merged to the split pipe as shown in Figure 1. When pipes were added or modified for connectivity, an indicator "EDIT_WSC" was used to differentiate changes made to the pipe network in the model. A number 1 indicates that WSC modified or added a pipe.

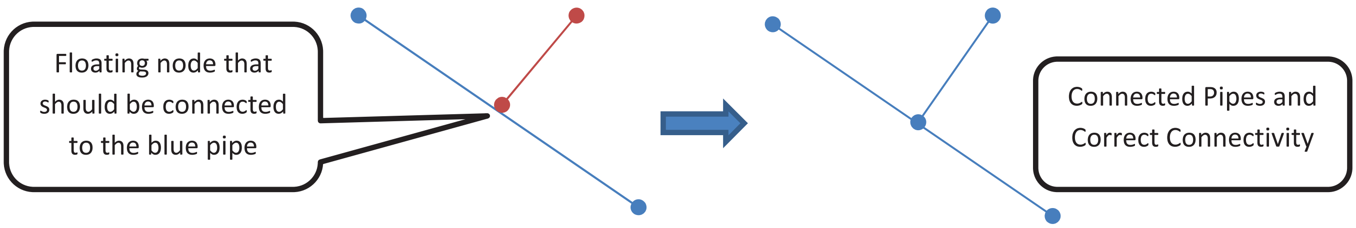

Figure 1. Joining pipes in the model to fix connectivity issues

Tanks, pumps, and pressure reducing valves (PRVs) were manually added to the model with necessary piping for connectivity. Additionally, isolation valves were closed at zone boundaries where necessary. The model was then manually reviewed a last time for other connectivity issues, focusing at zone boundaries and tank and pump station connections.

The last step in building the model structure is populating basic physical and operating information for the model and facilities. This information includes elevation data at the junctions and facilities, tank operating elevations, pump operating points or pump curves, and PRV settings. OLWSD's 2008 Water Master Plan was the basis of much of the information in the water model, along with record drawings, supervisory control and data acquisition (SCADA) information, pressure reducing valve calibration and setting information from vendors, and workshop input from the District.

Table 2 lists the sources used to populate facilities.

Table 2. Sources of Manually added Physical and Operating Data

Hydraulic Model Elements	Source
Pipe Connectivity	GIS Database, Pipeline As-Builts, and input from OLWSD
Elevation	10 foot elevation contours provided by OLWSD
Pump Dimensions and Definitions	Pump curves provided by OLWSD, Pump Station Upgrade As-Builts, 2008 Water Master Plan
Tank Elevations and Dimensions	2008 Water Master Plan, Reservoir Upgrade As-Builts
Tank Operating Levels	SCADA provided by OLWSD
PRV Location and Direction	2008 Water Master Plan
PRV Settings and Dimensions	Settings provided by GC Systems
Zone Boundary	GIS Database

3 SYSTEM DEMANDS

To evaluate OLWSD's water distribution system, the location and quantities of water demands must be known and modeled. Spatially allocated demands were established based on historical annual water customer consumption and production data from District. Future demands were projected in 5-year increments from 2022-2037 using the current consumption per capita and expected population forecasts by the Oregon Metro Transportation Analysis Zone (TAZ) data.

The GIS attributes and demand data provided for small and large meters were linked using account numbers, and addresses in some cases, to spatially allocate customers' water use. The spatial distribution of existing demands scaled to expected population growth rates is assumed to be sufficient for modeling purposes because the District is at buildout. Therefore, projected demands from for each 5-year period from 2022-2037 were assigned to each existing customer location based on each customer's percentage of total water demand in 2017. To address the gap between the production rates and demand, the assigned customer demands were increased to account for non-revenue water (NRW) to normalize the total consumption distributed across the system.

A spatially allocated demand shapefile was loaded into the model with the InfoWater Demand Allocation Manager. The Demand Allocation Manager assigns each customer meter demand to the nearest pipe. The tool automatically identifies the closest pipe to each meter and distributes the meter's demand to the junctions at either end of the pipe.

The maximum daily demands (MDD) were determined by evaluating historic daily production data. The average maximum production days from 2014-2017 were compared to the average daily production data in 2014-2017 to determine the peaking factors. The historical maximum production data included some anomalous high values that were confirmed by the District to be maintenance activities and were removed from the demand analysis. OLWSD does not store historical hourly production data, so the highest peak production was recorded during summer 2018 and used to calculate a peaking factor that could be used to develop future peak hourly demand (PHD).

Table 3 summarizes the modeled demands and peaking factors.

Table 3. Summary of Modeled Demands

System Demand	Current (MGD)	Current (gpm)	Future[1] (MGD)	Future[1] (gpm)	Peaking Factor
Average Daily Demand (ADD)	3.07	2129	3.25	2255	N/A
Maximum Daily Demand (MDD)	5.52	3834	5.84	4058	1.80 x ADD
Peak Hourly Demand (PHD)	9.32	6474	9.87	6854	3.04 x ADD

[1]Future demand is evaluated at the 20-year planning period in year 2037.

For more information on demand spatial allocation and demand projections, see Chapter 4 Demand, Supply, and Storage.

4 MODEL CALIBRATION

After the model was developed and demands allocated, the model needed to be calibrated for accuracy. WSC and OLWSD Staff worked together to select five (5) fire hydrant flow test locations throughout the water distribution system. The testing locations were selected based on pressure zone, pipe size, material, and number of available hydrants in the area. The OLWSD water distribution system is comprised of three pressure zones: the Lower Zone, Upper Zone, and High Level pumped Zone. The five testing locations were in the Lower and Upper Zones because the data from the small pumped zone would not have yielded useful data for model calibration. In this zone the pumps will maintain constant pressure when a hydrant is opened preventing an accurate pressure drop reading.

On May 7, 2018, WSC and OLWSD staff performed the five selected hydrant flow tests, shown in Figure 2. The fire hydrant flow tests were performed by using at least two hydrants. One hydrant, known as the flow hydrant (FH), is open and the flowrate is measured with a pitot gage, and the pressure drop from a nearby hydrant, known as the residual hydrant (RH), is measured with a pressure gage. The pressure taken when the hydrant is closed is known as the static pressure, and the pressure taken when the hydrant is open is the residual pressure. In addition to the static and residual pressure at the flow and residual hydrant, three data loggers (DL) were also placed on nearby hydrants to monitor pressures during the fire hydrant flow test and provide additional data points. The static and residual pressures recorded at all hydrants were used to calibrate the model. The fire hydrant flow testing results compared to the calibrated model results are provided in Table 6.

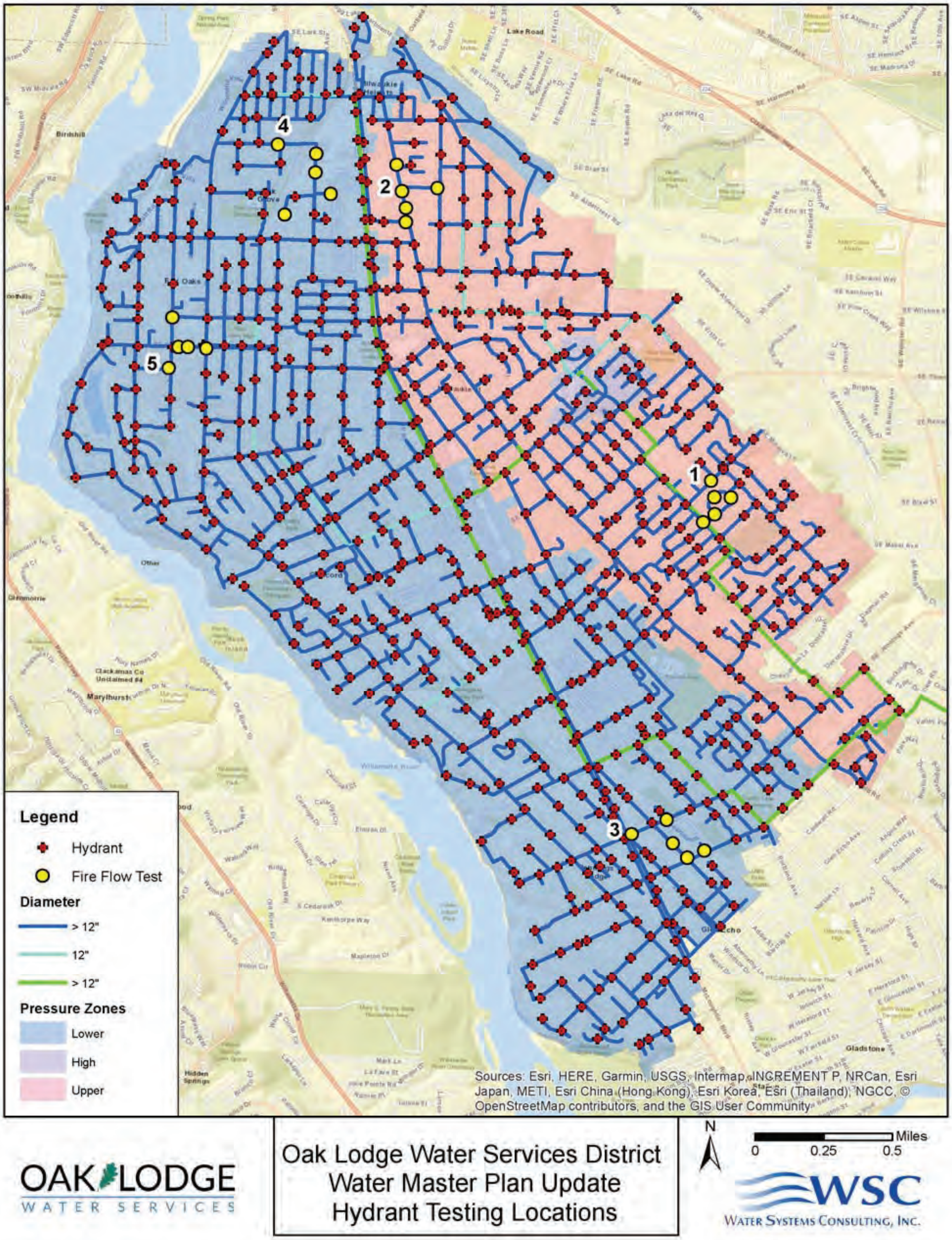

Figure 2. Location of Hydrant Flow Tests

To accurately calibrate the model with the hydrant flow testing data, the system conditions during testing are also required. These conditions, usually referred to as boundary conditions, include tank levels, pump status, and PRV settings. Average day demands were loaded into the model, which is typical of a May weekday. The critical steady state boundary conditions for each hydrant flow test are shown in Table 4. PRV settings were provided by GC systems and were constant during all hydrant flow tests.

Table 4. Model Calibration Boundary Conditions

Hydrant Flow Test	Facility	Boundary Condition
1	Valley View Tank Levels View Acres Tank Levels Valley View Pump Station	27.2 feet 61.8 feet All Pumps Off
2	Valley View Tank Levels View Acres Tank Levels Valley View Pump Station	27.2 feet 61.4 feet All Pumps Off
3	Valley View Tank Levels View Acres Tank Levels Valley View Pump Station	27.0 feet 61.7 feet Pump turned On
4	Valley View Tank Levels View Acres Tank Levels Valley View Pump Station	27.2 feet 60.8 feet Pump turned On
5	Valley View Tank Levels View Acres Tank Levels Valley View Pump Station	27.2 feet 60.8 feet Pump turned On

Ten new scenarios were developed in the model, one static and one dynamic scenario for each fire flow test. Each scenario was loaded with the allocated ADD and the boundary conditions recorded for each test. The flowing and residual hydrants were identified in the model, and the flowrate measured during the test was applied to the flowing hydrant in the model. The model was run under both static and dynamic conditions, and the modeled pressures were compared to the observed field data. Once results were tabulated, the model was adjusted to reflect observed pressures, including:

- The pipe C-factors were adjusted broadly throughout the system to account for variations in head loss based on location in the system. C-factors are determined by pipe material and age. The District does not have records for all pipes installed prior to 1965. These pipes are assumed by the District to be cast iron but the exact age is unknown. The C-factor ranges used are listed in Table 5 are within the accepted range for the material and age of the pipes.
- In the area around Test 3, C-factors were lowered from 85 to 70-75 to account for head loss in the model.
- In the area around Tests 4 and 5, C-factors were lowered from 85 to 60-70 to account for head loss in the model.

Table 5. Adjusted C-Factors

Material	C-Factor
Ductile Iron	100-130
PVC	130
Cast Iron	60-85
All hydrant laterals (PVC, Copper, and unknown material)	130

Over time the inside of pipes become rougher, either from sand or grit in the system wearing down the pipes or metal corrosion. Roughened pipes are generally in worse condition than smooth pipes, and can lead to increased head loss in the distribution and lower the available fire flow. Rough pipes are characterized with a lower C-factor. Pipe materials known to have a significant increase in pipe roughness over time are cast iron, steel, and galvanized iron pipes. The OLWSD distribution system was originally built with a significant amount of cast iron pipes.

Following each adjustment to the C-factors, a batch of model runs was completed again and the adjustments to C-factors continued as an iterative process until the difference between modeled and observed pressures was less than or equal to ±10 pounds per square inch (psi). Table 6 includes the observed and modeled results.

Table 6. May 2018 Hydrant Flow Testing Results Compared to Modeled Pressures

					Observed Pressures			Modeled Pressures			Difference between Observed and Modeled Pressures (Goal is within ±10 psi)		
Test	**Location**	**Fire Flow ID**	**Hydrant Model ID**	**Measured Flow (gpm)**	**Static Pressure (psi)**	**Residual Pressure (psi)**	**Pressure Drop (psi)**	**Static Pressure (psi)**	**Residual Pressure (psi)**	**Pressure Drop (psi)**	**Δ Static Pressure (psi)**	**Δ Residual Pressure (psi)**	**Δ of the Pressure Drop (psi)**
1	Hillwood Circle	FH 1	8-92	1400				50.9	36.3	14.7			
		RH 1	8-91		58	53	5	52.2	46.9	5.3	5.8	6.1	-0.3
		DL 1-1	8-93		48	46	3	50.0	48.7	1.4	-2.0	-3.2	1.2
		DL 1-2	8-71		54	48	6	53.2	51.8	1.4	0.9	-3.4	4.2
		DL 2-3	8-90		59	53	6	58.3	53.8	4.5	0.7	-0.6	1.3
2	Oatfield Road	FH 2	7-9	1875				101.7	79.2	22.5			
		RH 2	7-10		108	86	22	105.4	85.7	19.7	2.6	0.3	2.3
		DL 2-1	5-22		101	76	25	100.4	81.0	19.4	0.6	-5.2	5.8
		DL 2-2	7-30		94	81	13	95.9	78.6	17.3	-1.8	2.4	-4.3
		DL 2-3	7-15		111	95	16	110.7	91.9	18.9	0.3	3.5	-3.3
3	Addie Street	FH 3	6-100	1675				112.6	60.5	52.1			
		RH 3	6-99		108	90	18	108.7	87.3	21.4	-0.7	2.7	-3.4
		DL 3-1	6-98		114	102	12	116.0	102.3	13.7	-2.0	-0.3	-1.7
		DL 3-2	6-83		114	97	17	113.9	102.1	11.7	0.1	-4.8	5.0
		DL 3-3	6-82		108	94	14	108.7	99.3	9.4	-0.7	-5.3	4.6
4	Linden Lane	FH 4	3-60	1600				85.9	44.6	41.3			
		RH 4	3-146		78	40	38	78.0	44.6	33.4	0.0	-4.6	4.6
		DL 4-1	3-61		80	53	27	81.5	56.7	24.9	-1.5	-3.7	2.1
		DL 4-2	3-47		73	49	24	76.1	58.3	17.8	-3.1	-9.0	5.9
		DL 4-3	3-63		66	40	26	66.6	41.0	25.6	-0.6	-1.0	0.4
5	Oak Grove Boulevard	FH 5	1-33	1700				86.6	63.0	23.6			
		RH 5	1-31		80	66	14	81.7	61.7	20.0	-1.7	4.3	-6.0
		DL 5-1	1-34		92	66	26	95.4	75.8	19.6	-3.4	-9.8	6.4
		DL 5-2	1-19		81	56	25	82.4	65.1	17.4	-1.4	-8.8	7.4
		DL 5-3	3-5		71	52	19	74.1	59.9	14.1	-3.1	-7.6	4.6

FH= flow hydrant; RH= residual hydrant; DL= data logger hydrant

Figure 3 includes a graphical representation between the modeled and observed pressures at the flowing hydrant as well as the residual hydrant and other data logger locations.

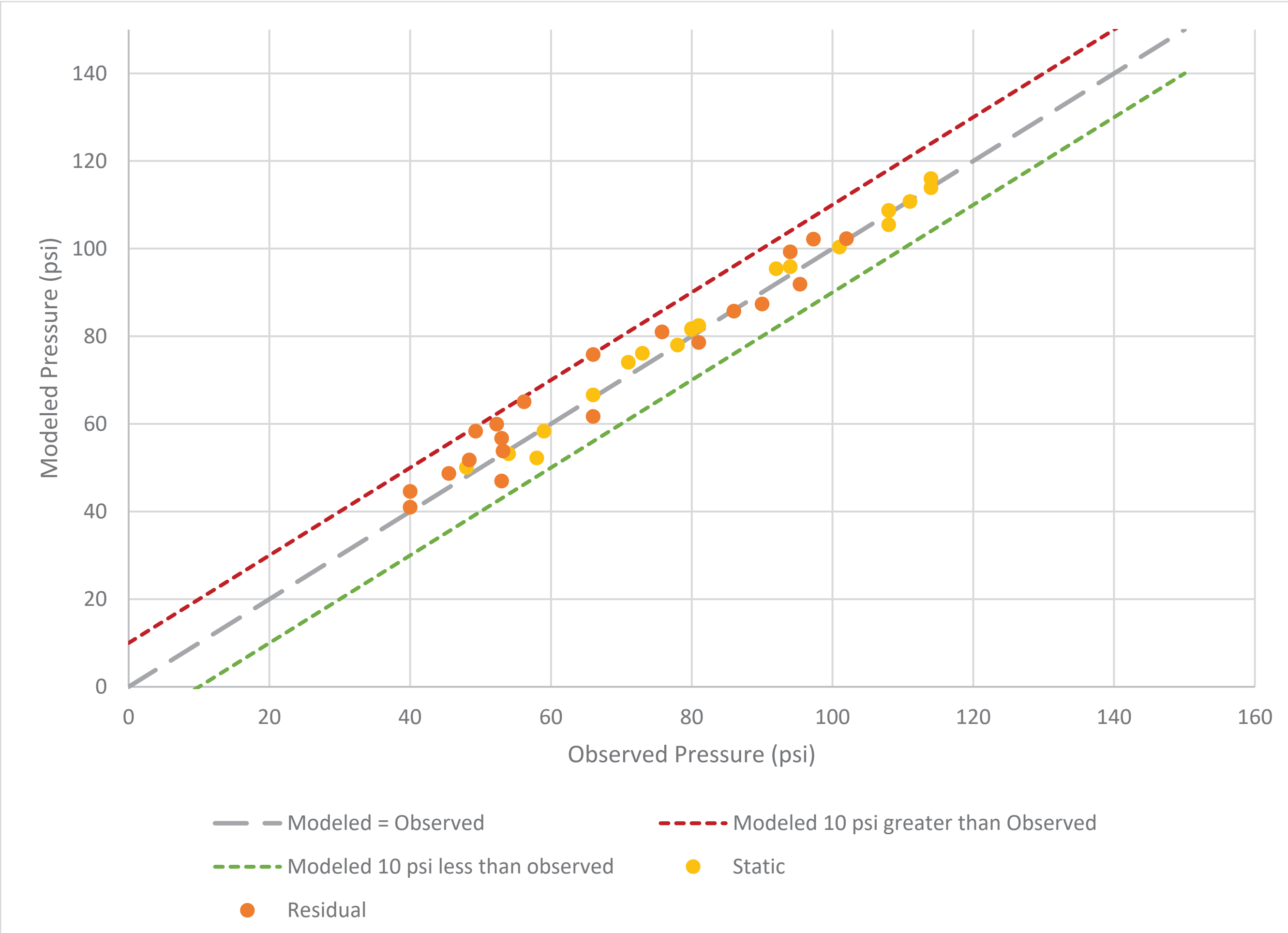

Figure 3. Linear Regression Relationship between Observed and Modeled Pressures for both Static and Residual Pressure Data from Fire Flow Test Simulations

As mentioned, a well-calibrated hydraulic model will have a maximum difference between modeled and observed pressures of ±10 psi (indicated on the graph as the green and red lines). All modeled pressures were within this range when compared to observed pressures, and the majority were within less than 4 psi difference.

Based on the calibration results, the model developed by WSC can be used effectively for evaluating steady state simulations within the OLWSD water system under for the intended purposed of updating the Water Master Plan.

Appendix B. Geotechnical Seismic Hazards Evaluation TM

Technical Memorandum

To:	Scott Duren, Water Systems Consulting	Project:	Oak Lodge Water Service District – 2018 Master Plan Update, Task #1.3
From:	Wolfe Lang, PE, GE	cc:	
Prepared by:	Jeremy Fissel, PE	Job No.:	5815.0
Date:	June 08, 2020		
Subject:	Geotechnical Seismic Hazards Evaluation		

1.0 Introduction

Oak Lodge Water Service District (OLWSD) is conducting an update to its Water Master Plan and this seismic resiliency study is part of the update. OLWSD has contracted Water Systems Consulting (WSC) to provide professional engineering services for the Water Master Plan update. McMillen Jacobs Associates has been retained by WSC to provide geotechnical engineering services.

This memorandum presents the results of our evaluation. The following tasks were completed in accordance with the scope of work for Task 1.3 – Identification of Seismic Geohazards for the 2018 Water Master Plan Update Subconsultant Agreement:

1. Review of available geological and geotechnical information;
2. Review of The Department of Geology and Mineral Industries (DOGAMI) seismic hazard maps for a magnitude 9.0 Cascadia Subduction Zone (CSZ) event in the OLWSD's service area;
3. Site reconnaissance to address key geological and geotechnical assumptions and to verify published maps with our analyses and field observations, as well as examine areas that are potentially prone to failures from lateral spreading and seismic landslide hazards;
4. Develop estimates of strong ground shaking, liquefaction-induced settlement, lateral spreading permanent ground displacement, seismic landslide slope instability, and develop maps illustrating these hazards in relation to the OLWSD service area; and
5. Develop this memorandum summarizing the results of our evaluations and including updated hazard maps.

In the following sections, we present the results of the data review, seismic hazards evaluation, and a summary of geotechnical hazards at the facilities and along the backbone system.

2.0 Data Review

We reviewed previous geotechnical reports and subsurface data for various projects in the area conducted between the years of 2004 and 2017. A list of reviewed documents is provided below:

- Report of Geotechnical Services, Task 1, Landslide Investigation and Reconnaissance, Oak Lodge Water Main Alignment, Gladstone, Oregon, July 9, 2004, GeoDesign, Inc.**
- Report of Geotechnical Services, Task 1, Storm Sewer Video Analysis, Oak Lodge Water Main Alignment, Gladstone, Oregon, January 19, 2005, GeoDesign, Inc.
- Report of Geotechnical Services, Strain Gauge Installation, Oak Lodge Water Main Alignment, Gladstone, Oregon, April 27, 2005, GeoDesign, Inc.
- Report of Geotechnical Services, Strain Gauge and Inclinometer Monitoring, Oak Lodge Water Main Alignment, Gladstone, Oregon, January 10, 2006, GeoDesign, Inc.**
- Report of Geotechnical Services, Inclinometer Monitoring, Oak Lodge Water Main Alignment, Clackamas County, Oregon, January 15, 2007, GeoDesign, Inc.
- Report of Geotechnical Services, Inclinometer and Groundwater Monitoring, Oak Lodge Water Main Alignment, Clackamas County, Oregon, June 2, 2008, GeoDesign, Inc.
- Report of Geotechnical Services, Inclinometer and Groundwater Monitoring, Oak Lodge Water Main Alignment, Clackamas County, Oregon, May 11, 2009, GeoDesign, Inc.
- Report of Geotechnical Services, Inclinometer and Groundwater Monitoring, Oak Lodge Water Main Alignment, Clackamas County, Oregon, May 2, 2012, GeoDesign, Inc.
- Seismic Vulnerability Report – Valley View and View Acres Reservoir Seismic Improvements, Oak Lodge Water District, April 2012, RH2 Engineering, Inc.
- Construction Drawings, View Acres Reservoirs Seismic Retrofit, Oak Lodge Water District, Clackamas County, Oregon, May 7, 2013, RH2 Engineering, Inc.
- Construction Drawings, Valley View Reservoir Improvements, Oak Lodge Water District, Clackamas County, Oregon, Winter 2016/2017, RH2 Engineering, Inc.
- Preliminary Geotechnical Report, Boardman Wetland Complex, Oak Lodge Sanitary District, Clackamas County, Oregon, November 9, 2016, Shannon and Wilson, Inc.*
- Report of Geotechnical Engineering Services, Northpoint – Willamette View, Southeast River Road, Portland, Oregon, December 29, 2017, GeoDesign, Inc.*
- Subsurface Exploration and Preliminary Geotechnical Engineering Report, Proposed Lot Partition, 5212 and 5314 Southeast Jennings Avenue, Portland, Oregon, November 19, 2007, Chinook GeoServices, Inc.
- Preliminary Geotechnical Engineering Report for Private Roadway Grading, Portland, Oregon, June 3, 2009, Chinook GeoServices, Inc.
- Geotechnical Investigation, Sarah Estate Subdivision, Portland, Oregon, January 22, 2010, Rapid Soil Solutions, LLC.*
- Engineering Geologic Hazard Report for Proposed Residence, 17264 SE Oatfield Road, Milwaukie, Oregon, August 18, 2006, Hydro-GeoEngineering, Inc.
- Geotechnical Site Assessment for Proposed New Garage/Loft Building, Clackamas County, Oregon, March 2, 2010, Strata Design, LLC.
- Geotechnical Report, Ken's Court Commercial Development, Clackamas County, Oregon, March 9, 2005, West Coast Geotech, Inc.*
- Report of Geotechnical Engineering Services, Proposed Pacific Northwest Storage Facility, 3260 SE Oak Grove Blvd., Portland, Oregon, January 27, 2017, Geotech Solutions, Inc.*
- Geotechnical Engineering Services, Proposed Walgreens Site, Oak Grove, Milwaukie, Oregon, August 16, 2012, Geotech Solutions, Inc.*
- Geotechnical Engineering Report, Jennings Lodge Estates, 18121 SE River Road, Clackamas County, Oregon, June 17, 2015, GeoPacific Engineering, Inc. **

- Geotechnical Engineering Report, Jennings Lodge Estates, 18121 SE River Road, Clackamas County, Oregon, January 21, 2016, GeoPacific Engineering, Inc.**
- Geotechnical Review, Stormwater Outfall – Energy Dissipation System, Jennings Lodge Estates, 18121 SE River Road, Clackamas County, Oregon, September 14, 2016.

Collectively, the provided documents include limited subsurface information, such as deep soil borings. A single asterisk (*) after the citation indicates soil borings and Penetration Testing (SPT) were included up to a depth of 20 feet below ground surface (bgs). A double asterisk (**) after the citation indicates those documents that include soil borings and SPT sampling to a depth of 50 feet bgs or greater.

In addition to the above documents, we reviewed our internal soil borings and SPT sampling for previously completed projects located within the OLWSD's service area. We also reviewed maps and publications by Oregon's Department of Geology and Mineral Industries (DOGAMI), the United States Geological Survey (USGS), and various publicly available well logs provided by the Oregon Water Resources Department.

Subsurface information included with the provided documents listed above and that of other previously completed explorations is discussed in greater detail below by general locations within the OLWSD.

2.1 View Acres Reservoirs

The Seismic Vulnerability Report for the Valley View and View Acres Reservoirs by RH2 Engineering RH2) dated April 2012 refers to a geotechnical engineering report by Shannon & Wilson dated May 2, 1988. The report by RH2 cites that this Shannon & Wilson geotechnical report was used for the construction of one of the two reservoirs at the View Acres site in 1989. This geotechnical investigation report for the construction of this reservoir was not provided. In addition, RH2 cited that the ringwall foundation of the 1989 reservoir was too small to distribute the bearing loads to the soil. RH2 recommended structurally expanding the existing ringwall foundation of the 1989 reservoir by a 10-foot diameter. The provided as-built drawings for the project show that the diameter of the existing ringwall foundation was expanded by 9 feet.

2.2 Valley View Reservoirs

The Landslide Investigation Report by Geodesign (July 2004) included a 105-foot deep soil boring, B-1, with SPT sampling and rock coring, located approximately 400 feet west of the intersection of SE Oatfield Road and SE Oakridge Drive. A slope inclinometer was installed in this boring. The inclinometer extends the full distance of B-1. It is noted that one page was missing from the B-1 boring log in the provided report; this missing page should include subsurface information from depths from 40 to 80 feet bgs.

A slope stability analysis was performed for the site as part of GeoDesign's investigation. However, the analyses appear to be only under static conditions.

GeoDesign's January 10, 2006 Strain Gauge and Inclinometer Monitoring Report cites that a second soil boring, B-2, was drilled uphill and to the east of SE Oatfield Road on July 29, 2005. A slope inclinometer was also installed at B-2 and extends to a depth of 40 feet bgs. B-2 is located within the "homeowners park". The boring log, included in their January 10, 2006 report, cites B-2 was drilled to a depth of 130-feet bgs. Subsurface soils in B-2 are cited to be 7 feet of gravel at the surface, overlying 115 feet of stiff to very stiff silty clay, and terminating in a soft to medium hard basalt at 130 feet.

The information provided for this site indicates that inclinometer readings were periodically taken up to May 2012. GeoDesign reports that their inclinometer readings between January 2006 through May 2012 result in ales than 0.02-inch cumulative movement in B-1 and less than 0.1-inch cumulative movement in B-2. GeoDesign concludes that this movement is minor and that shallow soil creep may be occurring in B-1.

Periodic piezometer readings by GeoDesign report general flat trends increasing toward the month of April, from March 2004 through May 2012. At B-1, a groundwater elevation between 200 and 210 feet (MSL) is reported. At B-2, water level elevations are reported to be between about 230 to 235 feet (MSL). A 2.5-foot of groundwater elevation was gained between from October 2011 to April 2012.

GeoDesign monitored strain gauges installed on portions of the existing water main. The locations of those areas of strain gauge installation are identified as along SE Hull Avenue and within "the Oak Ridge homeowner's park." Depth of the water main at these locations are cited to be between 5 and 8 feet below the surface. GeoDesign concluded that changes reflected in the periodic readings of the installed gauges are primarily due to temperature changes on the water, which can be attributed to the seasonal temperature fluctuation of the Clackamas River, the source for the water service area.

GeoDesign performed a Storm Sewer Video Analysis for the Oak Lodge Water Main Alignment project, which is summarized in their report dated January 19, 2005. This report includes additional background information for the Valley View site and associated infrastructure. GeoDesign reports a 12-inch diameter concrete storm sewer line was installed adjacent to the water main in 1965, one year after the installation of the subject water main. The two utilities are located within the same trench for a 300-foot long section of their alignment from SE Oatfield Road, extending upslope along SE Oakridge Road to the northeast. GeoDesign cites that severe cracking of the concrete sewer pipe was not observed, but several minor cracks and fissures are present in the alignment of the storm sewer pipe scoped. Increases in water depths were also observed within the vicinity of the alignment where it enters "the homeowner's park." GeoDesign concludes that there has been no large-scale movement of the water main and storm sewer since installation in 1964 and 1965, respectively. However, they also consider the video survey to be an inconclusive indicator with respect to small to moderate movement or distresses within the two utilities.

GeoDesign provided several options for mitigating the effects of continued subsurface soil movement at the Valley View site. These options included installation of horizontal drains, installation of flexible couplings, realigning problematic sections of the waterline alignment, and replacing or de-stressing over-stressed portion of the pipeline.

2.3 Jennings Lodge - Boardman Wetland Complex

The November 9, 2016 Preliminary Geotechnical Report for Boardman Wetland Complex by Shannon & Wilson includes advancing SPT soil borings to depths of 20 and 21 feet bgs, as well as various test pit explorations. The location of B-1 is northeast of the intersection of SE Boardman Avenue and SE McLoughlin Boulevard. B-2 is located near the southcentral region of the wetland that extends from SE Boardman to SE Jennings. The soils boring logs report a layer of loose or soft fine-grained flood deposits or marsh deposits overlying medium dense coarse-grained flood deposits. Shannon & Wilson estimates groundwater elevations to range from 6 inches above to 12 inches below the existing ground surface.

Similar surficial conditions were documented in the Geotechnical Investigation Report by Rapid Soil Solutions dated January 22, 2010 for a property at SE Jennings Avenue and SE Cook Street. Site photos in the report show that surficial water is ponding at the site. In addition, three drilled borings up to 18 feet deep with SPT sampling were performed for this investigation and laboratory testing resulted in wet conditions. The soils described are very soft clay from the surface to 12 feet, followed by a 3-foot thick stratum of medium stiff sandy silt, and hard gravel as the final stratum encountered.

2.4 Jennings Lodge - SE River Road and SE Faith Avenue

The January 21, 2016 and June 17, 2015 Geotechnical Engineering Reports by GeoPacific for Jennings Lodge Estates was prepared for the proposed residential development of a region of the OLWSD located at the referenced intersection between the Boardman Wetland Complex and the Willamette River. This engineering report includes one drilled soil boring to a depth of 50 feet bgs. The subsurface soil strata are described as a surficial layer of silt to 15 feet bgs, followed by medium dense transitioning to dense sands and gravel. A groundwater depth is not reported for this project. However, mud rotary methods were used to advance the soil boring. GeoPacific cites that the USGS reports the depth to groundwater at the site to be approximately 57 feet bgs.

A quantitative slope stability analysis is included with this report. This analysis was performed along a 170-foot long cross section that includes the subsurface information from the 50-foot soil boring. The cross section extends downslope to the west to SE Willamette Drive. The analyses were performed assuming for the proposed residential structures would be set back a minimum of 15 feet from the top of the native soil slopes. The stable analyses resulted in a Factor of Safety of 1.59 and 1.15 for static and seismic conditions, respectively.

2.5 SE McLoughlin Boulevard and SE Vineyard Road

The March 9, 2005 Geotechnical Report by West Coast Geotech, Inc (WCG) is for the construction of new commercial/industrial buildings located southeast of the intersection of SE Vineyard Road and SE Vineyard Ave. This report includes eleven SPT soil borings logs ranging from 11 to 30 feet in depth. Boring logs indicate that the site is underlain by fill soils comprised of soft silts and clays followed by loose to medium dense mixtures of sand and silt. Groundwater is reported to be 6 to 12 feet bgs and groundwater seepage is reported in each boring. WCG cites that historic fill was placed in a region of the area evaluated in order to fill a swale. Fill placement had begun at the site around 1975, based WCG's review of historic imagery.

2.6 SE McLoughlin Boulevard and SE Oak Grove Boulevard

Two reports provided by Geotech Solutions, Inc. dated August 6, 2012 and January 27, 2017, are for two separate properties located near the intersection of SE McLoughlin Boulevard and SE Oak Grove Boulevard. SPT soil borings up to 25 feet were used to develop geotechnical design recommendations for the construction of two commercial properties near the referenced intersection. Up to 6 feet of fine-grained fill is reported and overlays a native gravel stratum. The borings terminate in a stratum of medium stiff to stiff silt with varying amounts of sand. Perched groundwater is encountered in these investigations at a depth of approximately 10 feet bgs.

2.7 SE River Road and SE Park Avenue

GeoDesign's December 29, 2017 Report of Geotechnical Engineering Services includes three SPT soil borings. The locations of these borings are along the northwest limits of the OLWSD. These borings range in depth from 18 to 20 feet below ground surface. Medium hard basalt is encountered at 5 and 10 feet below the surface in the borings. Generally, the basalt stratum is overlain by gravelly soils. A piezometer is installed in B-2 and extends to a depth of 19 feet bgs. Piezometer readings are not included with this report. Additional reports of groundwater monitoring of this piezometer are not provided. GeoDesign estimates that groundwater is likely present along to the surface of the basalt stratum.

2.8 SE McLoughlin Boulevard from SE Lark Avenue to SE Park Avenue

McMillen Jacobs Associates was previously provided (by others) a Geotechnical Data Report for a previously completed project within the north portion of the OLWSD. Primarily, the information in this Data Report includes drilled soils borings along SE McLoughlin Boulevard, between SE Lark Street and SE Park Avenue. Subsurface strata differ significantly in this region. Generally, the north portion of the OLWSD along SE McLoughlin Boulevard includes fine and coarse-grained Missoula Flood Deposits, underlain by basalt bedrock. The fine-grained soils were medium stiff to stiff apparent consistency, while coarse-grained soils were medium dense to dense. Standard Penetration Test sampler refusal was generally encountered within the basalt bedrock stratum.

2.9 SE River Road and SE Hull Avenue

McMillen Jacobs Associates was previously provided (by others) two subsurface soil borings performed along the east banks of the Willamette River. The two borings are located along SE Hull Avenue in Milwaukie, OR and are advanced to a depth of 161 and 260 feet bgs. The soils are reported to be generally loose to medium dense silty sand to a depth of 15 feet which overlays dense gravels and very stiff fine-grained soils. Basalt bedrock is encountered at 120 feet bgs in one of these two borings.

3.0 Site Reconnaissance

On May 18 and June 17, 2018, Wolfe Lang, PE, GE, and Jeremy Fissel, PE, respectively, performed geotechnical reconnaissance of the following sites within the OLWSD service area:

- Two 5 million-gallon reservoirs and associated pumps along SE Valley View Road;
- Two 2.8 million-gallon reservoirs and associated pumps along SE View Acres Road;
- The Water Main which traverses primarily along SE McLoughlin Boulevard;

- Oak Lodge Pump Station located southeast of the intersection of SE Mangan Drive and SE Water Avenue in Gladstone, OR; and,
- North Clackamas County Water Commission Water Treatment Plant located at 14275 Clackamas River Drive, Oregon City, OR.

During the reconnaissance, we noted site conditions, surface or exposed soil conditions, site topography, proximity to bodies of water, and features (i.e. culverts, retaining walls, etc.).

The two locations of the reservoirs are within the general OLWSD service area. Each of these sites are within a residentially developed community. The reservoirs are generally located at the top of a gentle to moderately sloping hillside. Slopes are approximately 5:1 to 3:1 with occasional isolated areas up to 1:1 (H:V).

The North Clackamas County Water Treatment Plant and Oak Lodge Pump Station are located outside the general service area near the flood plains of the Clackamas River. The pump station and water treatment plant include in-ground, open-air water treatment vessels (clarifiers, aerators, filtration vessels, etc.). Generally, the existing structures are located on nearly level terrain, however adjacent very steep slopes are present. The water treatment plant facility includes a concrete retaining wall about 10 feet in height next to the access road and existing in-ground vessels. That retaining wall decreases in height as it traverses to the north. It is noted that at the time of our visits the Oak Lodge Pump Station and the North Clackamas County Water Commission Treatment Plant were closed, surrounded by chain link fencing; our visual reconnaissance of these two facilities was limited to the immediate surrounding areas.

Our evaluation results from our site observations and review of available data for these facilities are further discussed in Section 6.

4.0 Geology

4.1 Geologic Setting

The Portland basin is a structural depression created by complex folding and faulting of the basement rocks, a sequence of middle Miocene age, about 17 to 6 Ma (“Mega annum” or million years ago), lava flows of the Columbia River Basalt Group (CRBG). An extensive sedimentary fill has then accumulated in the basin and overlies the CRBG basement (Trimble, 1963; Tolan and Beeson, 1984). The Tertiary sedimentary units include up to 1,300 feet of the Sandy River Mudstone, which directly overlies the CRBG, and 100 to 350 feet of sandstone and conglomerate of the Troutdale Formation, which overlies the Sandy River Mudstone (Pratt et al., 2001).

Unconsolidated sediments at the top of the basin fill sequence consist primarily of catastrophic flood sediment deposited near the end of the last ice age, between 15,300 and 12,800 radiocarbon years ago (Mullineaux et. al., 1978; Waitt, 1987; Allen et al., 2009). Forty or more catastrophic floods occurred at intervals of several decades on the Columbia River system. The flood waters swept across the Portland basin and deposited tremendous loads of sediment. Boulders, cobbles, and gravels were deposited near the mouth of the Columbia River Gorge and along the main channel of the Columbia River, while great cobble and gravel bars stretched westward across the Portland basin, grading to thick blankets of micaceous sand. Within the Portland basin, the flood deposits mantle the Troutdale Formation at elevations below about 350 feet above mean sea level. The flood deposits generally consist of unconsolidated gravel topped by fine sand and silt and range from a few feet to more than 200 feet thick.

During the late Pliocene epoch, fluvial conglomerate, volcaniclastic sandstone, siltstone and debris flow deposits, originating in the Cascade Range, were deposited in a broad fan in the Boring Hills area at the southern margin of the Portland Basin (Tolan and Beeson, 1984). These deposits, the Springwater Formation, interfingered with the late Troutdale Formation sediments. Deposition of the Springwater Formation continued into the Pleistocene (Madin, 1994).

During the middle to late Pleistocene (after about 2 Ma), Boring Lava was erupted from several local vents in the Portland basin and in the Boring Hills south of Gresham, intruding the Sandy River Mudstone, Troutdale Formation, and Springwater Formation sediments (Trimble, 1963; Madin, 1994). The lava flows were relatively thin and apparently of small volume, because they do not appear to have flowed far from their source. Both the Springwater Formation and the Boring Lavas are very deeply weathered and decomposed.

During the Holocene epoch (the last 10,000 years), minor alluvial deposits have accumulated along the several creeks and streams that drain the area. These young alluvial sediments are largely reworked from older materials in the Boring Hills and from the catastrophic flood deposits on the basin floor. Other active geologic processes include soil creep and land sliding.

4.2 Seismic Setting

The Pacific Northwest is located near an active tectonic plate boundary. Off the coast, the Juan de Fuca oceanic plate is subducting beneath the North American crustal plate. This tectonic regime has resulted in seismicity in the Pacific Northwest occurring from three primary sources:

- Shallow crustal faults within the North American plate;
- CSZ intraplate faults within the subducting Juan de Fuca plate; and,
- CSZ megathrust events generated along the boundary between the subducting Juan de Fuca plate and the overriding North American plate.

Among these three sources, CSZ megathrust events are considered as having the most hazard potential due to the anticipated magnitude and duration of associated ground shaking. Recent studies indicate that the CSZ can potentially generate large earthquakes, with magnitudes ranging from 8.0 to 9.2 depending on rupture length. The recurrence intervals for CSZ events are estimated at approximately 500 years for the mega-magnitude full rupture events (magnitude 9.0 to 9.2) and 200 to 300 years for the large-magnitude partial rupture events (magnitude 8.0 to 8.5). Additionally, current research indicates a probability of future occurrence because the region is “past due” based on historic and prehistoric recurrence intervals documented in ocean sediments. For example, over the next 50 years, the CSZ earthquake has an estimated probability of occurrence off the Oregon Coast on the order of 16 to 22 percent (Goldfinger et. al., 2016).

In 2013, the State of Oregon developed the Oregon Resilience Plan (ORP, 2013) to prepare for a magnitude 9.0 CSZ event. We understand that this earthquake scenario is selected as the seismic source in the OLWSD service area seismic hazards study.

Locally, the service is mapped to include 2 Class A faults – the Oatfield and Portland Hills faults. Class A faults have geologic evidence that demonstrate the existence of Quaternary origin. Class A faults can be exposed for mapping or inferred from liquefaction or other permanent ground deformation features.

The Oatfield Fault bisects the service area. The Oatfield Fault is about 29 km (18 mi) in length located on the western flank of the West Hills. The strike of the Oatfield Fault is paralleled by the Portland Hills Fault at the east and the trend of the West Hills. The Oatfield Fault was observed offsetting Boring Lava in Portland's light rail tunnel, but no offset of Quaternary units was observed (Walsh et al., 2011). The USGS Fault database (USGS, 2006) lists the age of the Oatfield Fault up to 1.6 million years old. (Personius, 2002).

The service area is bordered to the east by the Portland Hills Fault. The Portland Hills Fault is a Class A fault and about 49 km (30 mi) in length and marks the western boundary of the Portland basin. There are surface features on the east face of the West Hills that suggest the presence of this fault, and a trench excavation has exposed disturbed Missoula Flood sediments, but no offset. The disturbed sediments might suggest liquefaction during a prehistoric earthquake. However, the limited historical earthquake records do not place any known earthquake on the Portland Hills Fault. Many small magnitude historic earthquakes have been recorded and located near the Portland Hills Fault suggesting that there are active structures nearby; "the presence of small earthquakes, more often than not, delineates areas where larger earthquakes are likely to occur" (Wong et al., 2001). The USGS Fault database (USGS, 2006) lists the age of last activity on this fault as less than 15 thousand years ago (Personius and Haller, 2017). The Oatfield Fault might be structurally connected to the Portland Hills Fault (Wong, et al., 2001).

The USGS maps the Portland Hills Fault to extend about 300 feet from the North Clackamas County Water Commission Water Treatment Plant. The Oatfield Fault is mapped to cross SE McLoughlin Boulevard, the alignment of the existing water main, at approximately SE Oak Grove Boulevard.

5.0 Subsurface Conditions

Minimal deep subsurface information was provided to McMillen Jacobs Associates. Three deep soil borings (greater than 50 feet bgs) were provided and located within the service area. Geologic maps, publications, and subsurface information previously provided to McMillen Jacobs Associates by others were used to further identify the subsurface conditions at the site. Based on this information, the subsurface within the project area is predominantly the following geologic units:

- Alluvial Deposits: Generally consist of soft fine grained material near existing surface water locations and low lying areas. This material is highly variable in its susceptibility to seismic liquefaction and lateral spreading hazards. DOGAMI mapping shows these soils along the banks of the Willamette River and Kellogg Creek at the north portion of the service area as well as along the banks of the Clackamas River at the North Clackamas County Water Treatment Plant and Oak Lodge Pump Station.

- Missoula Flood Deposits: Fine-grained deposits generally consist of very soft to stiff silt with varying concentrations of clay and sand. When saturated, the fine-grained material is generally prone to seismic liquefaction and lateral spreading hazards. Coarse-grained flood deposits generally consist of medium dense to very dense sand and gravel with varying concentrations of silt. The coarse-grained deposits are generally seismically stable and not susceptible to liquefaction and lateral spreading permanent ground deformations. These deposits are shown to be scattered throughout most of the west portion of the service area.
- Troutdale Formation: Generally, consists of very dense silty or clayey sand and gravel mixtures. This material is seismically stable and not susceptible to liquefaction and lateral spreading permanent ground deformations. This formation is shown in the southeast vicinity of the service area near the Valley View Pump and Reservoirs.
- Basalt: Although only encountered in a few explorations provided, this bedrock stratum was in varying states of weathering. This material is seismically stable and not susceptible to liquefaction, lateral spreading, or permanent ground deformations. This material is mapped sparsely at locations in the northwest quadrant of the service area and predominantly along the northeast quadrant of the service area.

DOGAMI shows similar geology in their mapping of the service area (Bauer et. al., 2018). Figure 1 shows the distribution of the geologic units across the general service area per DOGAMI.

6.0 Geotechnical Seismic Hazards

Seismic hazards including very strong ground shaking, liquefaction potential, lateral spreading, and seismic-induced landslide were analyzed. These hazards have the potential to damage facilities (i.e., pipelines, reservoirs, pump stations, treatment plants) through either permanent ground deformation (PGD) or intense shaking. Our analysis of these seismic hazards is based on information provided from existing geotechnical explorations, DOGAMI hazard maps, and our knowledge of the geotechnical conditions of the area. In our seismic analyses, we assumed a magnitude 9.0 earthquake and a peak ground acceleration (PGA) of 0.20 g to represent the effects of a M9 CSZ seismic event in the project area.

6.1 Present Landslides Identified within or adjacent to the OLWSD Service Area

DOGAMI's Statewide Landslide Information Database for Oregon (SLIDO) (Burns and Watzig, 2014) shows that the OLWSD service area includes several landslides. Figure 2 shows the locations of these landslides. These mapped landslide features are predominantly in the southeastern limits of the service area. The slides are reported to be deep-seated with a failure depth up to 45 feet. There are two slide masses downslope from the two existing reservoirs along SE Valley View Road. These slides are cited to have occurred within the last 150 years. GeoDesign (GeoDesign, July 2004) previously performed a landslide investigation and reconnaissance for a portion of the OLWSD waterline alignment fed by these two reservoirs. A summary of the information provided to us regarding GeoDesign's investigation is included in Section 2.0.

SLIDO also maps a series of pre-historic (greater than 150 years old) landslides and debris flows located just outside the northeastern limits of the service area. These mapped landslides and debris flows are located on steep slopes that trend downward to Kellogg Creek. Figure 2 shows the locations of these slides and flows. It is noted that Figure 2 displays landslide deposits and debris flows or fans as a single unit and does not differentiate between the two slide mass types.

A series of deep-seated, prehistoric landslides as well as a historic debris slide are shown along the east and south banks of the Clackamas River next to the North Clackamas County Water Treatment Plant. Additionally, a localized slide is shown along Clackamas River Drive, just east of the entrance to the water treatment facility. Finally, a deep-seated, historic landslide (less than 150 years old) is shown adjacent to the southeast corner of the Oak Lodge Pump Station.

Finally, SLIDO also shows the presence of small localized slides along the east banks of the Willamette River within the OLWSD.

6.2 Ground Shaking

6.2.1 Seismic Ground Shaking Parameters for CSZ Earthquake

To assess the hazard potential of ground shaking in the project area, we reviewed the peak ground velocity (PGV) map published by DOGAMI in their Open File Report for Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon in the event of a M9 CSZ earthquake (Bauer et. al., 2018).

The estimated ground shaking intensity (PGV) depends on the subsurface materials. The ground shaking near the surface will be amplified by thick soil units. Generally, the average PGV is estimated to range between 7 and 16 inches per second. The PGV map is shown in Figure 3.

6.2.2 Seismic Ground Shaking Parameters for Maximum Considered Earthquake

DOGAMI cites a peak ground acceleration of 0.15 to 0.20 g for the general service area in Plate 4 of its Earthquake Regional Impact Analysis for Clackamas, Multnomah, and Washington Counties, Oregon (Bauer et. al., 2018).

Since detailed, deep subsurface information was provided for most of the OLWSD's above-ground structures, we assessed the code-based seismic ground motion parameters for the structural evaluations of the two reservoirs and associated pump located at Valley View Road. The seismic ground motion parameters were developed based on the current building code (2015 NEHRP) requirements for Site Class D (stiff soil). The seismic parameters are provided in Table 1. These parameters are for the maximum considered earthquake (MCE) with a 2,475-year recurrence interval.

Table 1. 2015 NEHRP Seismic Ground Acceleration Parameters for a 2,475-Year MCE for Structures at SE Valley View Road

Seismic Parameter	Site Class D
MCE Peak Bedrock Acceleration (PBA)	0.39 g
MCE Bedrock Spectral Acceleration, 0.2 second period (S_s)	0.87 g
MCE Bedrock Spectral Acceleration, 1.0 second period (S_1)	0.39 g
Site Coefficient (F_{PGA})	1.20
Short-Period Site Factor, F_a	1.15
Long-Period Site Factor, F_v	1.91
Soil MCE Peak Ground Acceleration (MCE PGA_M)	0.47 g
Soil MCE Spectral Acceleration, 0.2 second period (S_{MS})	1.04 g
Soil MCE Spectral Acceleration, 1.0 second period (S_{M1})	0.74 g

It is noted that the above parameters are based on deep subsurface information, B-1 and B-2, which were part of the 2004 Landslide Investigation and subsequent reporting by GeoDesign. The design parameters in Table 1 should not be used for other structures within OLWSD unless additional deep subsurface information confirms these values.

6.3 Liquefaction

Liquefaction is a phenomenon affecting saturated, granular soils in which cyclic, rapid shearing from an earthquake results in a drastic loss of shear strength and a transformation from a granular solid mass to a viscous, heavy fluid mass. The results of soil liquefaction include loss of shear strength, loss of soil materials through sand boils, flotation of buried chambers/pipes, and post liquefaction settlement.

To evaluate the hazard potential of soil liquefaction in the service area, we reviewed liquefaction hazard maps published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer, et. al., 2018). Where geotechnical data was available or provided, we conducted site specific analyses based on the subsurface conditions using SPT-based liquefaction susceptibility and settlement assessment procedures (Boulanger and Idriss, 2014; Idriss and Boulanger, 2008). Based on our calculated post-liquefaction settlement results using the provided subsurface information discussed in Section 2.0, we slightly revised DOGAMI's liquefaction probability map and developed a liquefaction induced settlement map included in Figure 4.

In general, we mostly concur with DOGAMI's mapping for the risks of liquefaction settlement. We considered most of the northeast section of the service area (northeast of McLoughlin Boulevard) to be non-liquefiable. We consider the region of the Valley View pump and reservoirs to be non-liquefiable based on the extensive geotechnical work performed at the site and the significant depth to groundwater shown by the USGS (Snyder, 2008). Finally, we concur with DOGAMI's mapping of the southwest quadrant of the service district to be non-liquefiable based on our review of deep explorations for previously completed projects performed by others.

However, some of the provided subsurface information indicates that there is a potential for a dynamic settlement due to liquefiable soils along SE McLoughlin Boulevard at SE Oak Grove Boulevard and SE Park Avenue. In addition, we revised a region of DOGAMI's mapping for a generally low risk area near south of SE McLoughlin Boulevard between SE Concord Road and SE Roethe Road based on provided geotechnical information. Shallow groundwater was reported and is generally confirmed by the USGS mapping of groundwater (Snyder, 2008). DOGAMI estimated settlement to be up to 2 inches while we estimated the settlement due to liquefiable soils to be around 4 inches based on the available subsurface information.

Outside the general service area, alluvial deposits along the Clackamas River are susceptible to liquefaction, which can impact the Oak Lodge Pump Station and the North Clackamas County Water Treatment Plant. No subsurface information was provided for either of these facilities. DOGAMI estimates a moderate to high risk of liquefaction at the North Clackamas County Water Commission Water Treatment Plant and a moderate risk for the Oak Lodge Pump Station. A subsurface investigation should be performed at each site to better evaluate the seismic hazards at these locations.

To refine or revise our opinions regarding the locations of potentially liquefiable soils, additional subsurface information will need to be provided or additional explorations should be performed.

6.4 Lateral Spreading

Liquefaction can result in progressive deformation of the ground known as lateral spreading. The lateral movement of liquefied soil breaks the non-liquefied soil crust into blocks that progressively move downslope or toward a free face in response to the earthquake generated ground accelerations. Seismic movement incrementally pushes these blocks downslope as seismic accelerations overcome the strength of the liquefied soil column. The potential for and magnitude of lateral spreading depends on the liquefaction potential of the soil, the magnitude and duration of earthquake ground accelerations, the site topography, and the post-liquefaction strength of the soil.

To assess the hazard potential of lateral spreading in the project area, we reviewed a lateral spreading hazard map published by DOGAMI for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer et. al., 2018). The primary zones of lateral spreading hazard areas are at a region within the southwestern one-third of the service area. Similarly, shallow groundwater is also mapped in this region. DOGAMI reports that permanent ground deformation will be up to 2 feet in the southwest portion of the immediate service area, while most of the service area is showing negligible lateral spread.

To verify and refine the DOGAMI mapping, we used pseudo-static slope stability analyses for areas with gentle slope with no free face and used lateral displacement index (LDI) method (Zhang et. al., 2004) for areas with free face (gentle slope and flat ground). The pseudo-static slope stability analyses were completed using the computer software SLIDE by RocScience (version 7.0) to calculate the minimal slope degree at which lateral spreading may occur. In our analyses we used an average residual shear strength of 250 psf for the liquified soil, under a block-type failure. The residual shear strength was estimated for Missoula Flood Deposits and Alluvial soils assuming soft or loose consistency. A pseudo-static coefficient of 0.1g was applied, which is one-half of DOGAMI’s estimated Peak Ground Acceleration for a simulated Cascadia Subduction Zone Magnitude 9.0 earthquake, (Bauer et. al., 2018). When back-calculating to seismically stable conditions (a stability factor of safety slightly less than less than 1.10), the results of the analyses indicate that lateral spreading may occur for slopes steeper than 12 percent (7 degrees) and located within areas susceptible to liquefaction.

Where geotechnical data was available, we conducted site specific analyses for LDI based on the subsurface conditions and SPT N-values shown in previous geotechnical explorations listed in Section 2. The available subsurface information for these analyses include the community of Jennings Lodge (located between SE River Road and Oatfield Road, and SE Roethe Avenue and SE Hull Avenue), the Valley View site, several locations along SE McLoughlin Boulevard, and a few scattered locations within the general service area.

A portion of the Jennings Lodge community is reported to be a wetland in Shannon & Wilson’s Preliminary Geotechnical Report dated November 9, 2016. Similar surficial conditions were documented in the Geotechnical Investigation Report by Rapid Soil Solutions dated January 22, 2010 for a nearby property. Based on the limited subsurface information provided to us our site-specific analyses of LDI results in expected PGD within this region to be on the order of 2 to 3 feet.

In addition, we considered risks of lateral displacement due to liquefaction at two isolated regions located along SE McLoughlin Boulevard. These regions are in areas where we consider settlement due to liquefaction to be more of a risk than DOGAMI’s mapping (also discussed in Section 6.3). Based on the provided subsurface information as well as internal subsurface information for previously completed projects, we estimate the lateral spreading displacement to be up to 4 feet in isolated regions within the northeast portion of the service area near SE McLoughlin and SE Park Avenue. We estimate that up to 2 feet of lateral displacement due to potentially liquefiable soils could occur in the vicinity of the intersection of SE McLoughlin and SE Oak Grove Boulevards.

DOGAMI mapping shows the North Clackamas County Water Treatment Plant and the Oak Lodge Pump Station to include risks of lateral spreading. The water treatment plant is shown to be in a “very high” risk zone, with PGD between 39 and 173 inches. The Oak Lodge Pump Station is shown to be of a “moderate” risk, with 4 to 12 inches of lateral spread. Without subsurface information for these two facilities, we generally concur with the risk levels denoted by DOGAMI. An investigation should be performed at these sites to further evaluate the risks of potentially liquefiable subsurface conditions.

Based on DOGAMI mapping and provided subsurface information, we identified those areas where we consider risks present for lateral displacement due to liquefiable soils. See Figure 5.

6.5 Seismic Landslides

Earthquake induced landslides can occur on slopes due to the inertial force from an earthquake adding load to a slope. The ground movement due to landslides can be extremely large and damaging to pipelines and other structures.

To assess the hazard potential of seismic landslides in the project area, we reviewed several publicly available documents from DOGAMI: the landslide deformation map for the Portland Metro Area in the event of a M9 CSZ earthquake (Bauer et. al., 2018), the Statewide Landslide Information Database for Oregon (SLIDO), and the topography of the project area in conjunction with visual assessment of slopes during our site visit.

We also evaluated the stability of the area using SLIDE software by RocScience Version 7.0 to quantitatively evaluate the degree of the slope where a soil mass would become unstable. We assumed subsurface soil parameters based on the geotechnical information provided to us. In our analyses we used a 5-foot thick crustal layer with a unit weight of 125 pounds per cubic foot (pcf), no cohesion, and an internal angle of friction of 30 degrees, overlying a 125 pcf stratum of soil with an internal angle of friction of 30 degrees, and 50 psf of cohesion. The final stratum in our analyses included soil parameters of 130 pcf, cohesion of 50 psf, and an internal angle of friction of 32 degrees. We back-calculated the minimal slope angle of the soil strata that would become unstable with circular failures under a seismic condition using a peak ground acceleration of 0.1 g. We concluded that inclinations of 22 degrees and great (40 percent and greater) would become unstable (an analysis resulting with a stability factor of safety slightly less than 1.10) for a depth of 1-foot over a lateral distance of 300 feet.

The service area is generally located on relatively flat to gently sloping ground. There are, however, many isolated regions that include moderate to steeply sloping terrain. One is located near the southeastern extent of the service area downslope from the two existing reservoirs along SE Valley View Road. The site slopes are overall about 5:1 to 2:1 (Horizontal:Vertical), but there are isolated slopes up to approximately 1:1 present along the northeast side of SE Oatfield Road. These steeper slopes are generally down to the southwest and located within previously discussed landslide masses.

The two reservoirs along SE Valley View Road sit above the mapped slide scarps to the northeast. DOGAMI's SLIDO shows a series of four landslides which cross SE Oatfield Road in this area near the southeast limits of the service area (Burns and Watzig, 2014). The GeoDesign 2004 Landslide Investigation Report reports the presence of smaller secondary landslides within the slide masses along SE Oatfield Road.

GeoDesign's monitoring of the two slope inclinometers between January 2004 and May 2012, showed nearly negligible soil movement and concluded shallow soil creep movement was present at the site. The greatest cumulative displacement, about 0.02 inches, is shown in the piezometer installed along SE Oatfield Road. The depth of this maximum movement is shown to be approximately 4 to 6 feet below the top of the inclinometer. Although that monitoring was observed during seismically dormant periods and showed nearly negligible movement, we have concern about potential soil instabilities within the mapped landslide at the Valley View site. We consider these risks moderate. Because potential soil movement could damage the existing water system, which in turn could introduce subsurface water into the region, we recommend that OLWSD continue to have the previously installed inclinometers and piezometers periodically monitored. Introduction of subsurface water into the existing landslide mass could create and/or expedite instabilities. Routine inspections should be performed on the subsurface pipe system to identify potential leaks or breaks to limit the amount of subsurface water introduced into the surrounding soils. Excessive lateral deformation of the inclinometer or excessive rise in groundwater levels should be evaluated to determine if mitigation efforts will be necessary.

Similar slopes are present at the View Acres site. However, known landslides documented by DOGAMI are not shown in this area. Generally, the existing reservoirs site on top of a gentle hill that slopes downward in each direction. The steepest slopes, up to approximately 1:1 (H:V), are located about 120 feet northeast of the tanks. The underlying geology in this steeply sloping region is shown to include Columbia River Basalt (see Figure 1). The RH2 April 2012 Seismic Vulnerability Report for Valley View and View Acres refers to a geotechnical engineering report by Shannon & Wilson dated May 2, 1988. This report has not been provided to us for review. However, considering the general stable geologic formation within the vicinity of the area (Columbia River Basalt Group) and the overall gentle terrain, the risks of potential instabilities due to a CSZ seismic event at the View Acres site are expected to be low. We recommend additional review of the geotechnical information to verify this expectation.

The northeast border of the service area also contains sloping terrain, generally down to Kellogg Creek located to the northeast. Similarly, steep slopes are present along the service areas west border along the Willamette River. Generally, these slopes are on the order of 20 to 45 percent, but also include isolated regions that are nearly vertical. Finally, the north portion of the western extent of the service area, along the banks of the Willamette River, contain regions of near vertical slopes that extend nearly 2,500 lateral feet. SLIDO shows that there are small, localized landslides along this portion adjacent to the banks of the Willamette River (Burns and Watzig, 2014). Larger pre-historic landslide and debris flows are mapped near the northeast border of the general service area. We consider the risk of seismically induced landslides along Kellogg Creek and the southwest border of the service area adjacent to the Willamette River to be moderate to high. In our opinion the higher risk regions are located on or adjacent to steep slopes, such as those properties and areas near the perimeter of the service area. If needed, a detailed subsurface investigation and stability analyses should be performed to further evaluate these areas.

The Oak Lodge Pump Station and North Clackamas County Water Treatment Plan, each located outside the general service area along the Clackamas River, are situated adjacent to steeply sloping terrain. As discussed in Section 6.1, DOGAMI's SLIDO maps pre-historic, historic, as well as recent localized landslides and debris fans near each of these facilities.

We consider North Clackamas County Water Treatment Plant to have a high risk associated with ground instabilities during a Cascadia event. In addition to potential structural damages associated with soil movement, potential landslide debris could encroach the existing in-ground vessels of this water treatment plant. To provide a detailed stability analysis of the area, a subsurface investigation will need to be performed.

We consider the Oak Lodge Pump Station to have moderate to high risks for potential soil instabilities due to a Cascadia event. The primary areas of concern are those structures located near steep slopes, such as the open-air aeration, clarification, or filtration vessels located on the river flood plains. Upslope instable soils could migrate to these vessels. There are steeper slopes adjacent to the property to the east that are at higher risk for potential instabilities. A subsurface investigation will need to be performed or provided so that detailed stability analyses can be performed.

Figure 6 shows the regions of the OLWSD where we consider the various levels of risks of landslides occurring under design-level seismic events. Generally, we consider those areas at risk to be located on sloping terrain greater than 22 degrees and within mapped landslide masses per DOGAMI (Burns and Watzig, 2014). In Figure 6, we incorporate DOGAMI's report for the Portland Metro Area (Bauer et. al., 2018) to include lateral displacement amounts in three increments: 0 to 1; 1 to 4; and 4 to 24 feet.

7.0 Seismic Hazard Assessment and Recommendations for Critical Facilities

As discussed in Section 6, we have concerns regarding the sites of the reservoirs, the water treatment plant, and the pump station. These location have various risk levels for potential seismic hazards. Table 2 summarizes the results of the site visits, document review, as well as our opinions regarding the seismic hazards and geotechnical concerns at these locations. Our recommendations for future studies are also included in Table 2.

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Table 2. Preliminary Seismic Hazard Assessment Summary for Critical Facilities

Structure Name	Available or Nearby Geotechnical Information	Mapped Seismic Hazards and Levels	Anticipated Subsurface Conditions and Site Topography	Preliminary Geotechnical Seismic Concerns & Issues	Recommendations/Notes
Two Reservoirs and Pump Station along SE View Acres Road	A site-specific study for these reservoirs have already been performed by RH2 in 2012. RH2's conclusions were based on a 1988 Geotechnical Investigation Report by Shannon & Wilson. This report was **not** provided for our review. Seismic upgrades of the two reservoirs were performed in 2013.	Liquefaction and landslide hazards are anticipated to be low at this site.	Located at the top of a moderately sloping hill with isolated steep slopes. The hillside slope ranges from about 3:1 and includes slopes up to 1:1 (H:V). Geology is mapped as Columbia River Basalt Group.	Isolated steep slopes along hillside. Lack of subsurface information.	Obtain and perform a detailed review of the May 2, 1988 Shannon & Wilson Geotechnical Engineering Report which was used during the design and construction of the 1989 reservoir and the recent RH2 seismic retrofit design.
Two Reservoirs and Pump Station along SE Valley View Road	Landslide Investigation performed by GeoDesign in 2004. Two soil borings, B-1 and B-2, were drilled to 105 and 130 feet, respectively. Very stiff silt and clay to a depth of 57 and 124 feet, underlain by basalt. Slope inclinometers were installed in each borehole installed – B-1 to 100 feet, B-2 to 40 feet. Inclinometer readings provided between 2004 and 2012 show no significant movement but possible soil creep. Piezometer readings do not indicate large fluctuations in groundwater levels.	Site sits above the headscarp of a mapped historic landslide. Surrounding area includes moderate landslide hazards due to steep slopes and nearby existing slide mass. Liquefaction hazards are not anticipated at this site.	Located on level ground at the top of a hill, behind the headscarp of a landslide. Slide mass slopes up to about 1:1 (H:V) degrees and crosses SE Oatfield Road. Geology is mapped as Troutdale Formation.	Isolated steep slopes located adjacent to existing structures. Located in a region of a known landslide about 300 feet downslope of the facility. Adjacent ground movement within the slide mass observed during that last 20 years along SE Oatfield Road and surrounding neighborhood. Repairs to a few single-family homes were needed (as cited by GeoDesign in 2004). Lack of global subsubsurface information.	Continue monitoring slope inclinometers and piezometers previously installed by GeoDesign. Should ground movement be observed through continued monitoring, follow recommendations provided in GeoDesign's 2004 report. Potential ground movement may negatively impact surrounding private properties. Should excessive ground movement be observed during the continued inclinometer monitoring, a global stability investigation and analysis of the slide area may need to be performed. Develop a pipeline inspection program to quickly identify potential subsurface leaks or breakages.
North Clackamas County Water Commission Water Treatment Plant	No geotechnical data available.	High liquefaction susceptibility rating. Liquefaction settlement estimated to be greater than 4 inches. Liquefaction lateral spread displacement estimated to be greater than 4 feet. Historic landslide and debris slide mapped adjacent to facility. High landslide hazard area upslope from site based on existing site slopes. Location mapped along the Portland Hills Fault.	The site is located within the flood plains of the Clackamas River. There is an approximately 180-foot tall very steep slope directly to the east of Clackamas River Drive. Site is about 200 feet east of the Clackamas River. The geologic map indicates the site is near the border of present day alluvial deposits and continental sedimentary rocks.	Very steep slope adjacent to site. Historic landslides and debris slides located near property. Lack of subsurface information.	Perform subsurface investigation, site-specific stability, and liquefaction analyses.
Oak Lodge Pump Station	No geotechnical data available.	Moderate liquefaction susceptibility rating. Liquefaction settlement estimated to be 2 to 4 inches. Liquefaction lateral spread estimated to be up to 2 feet. Moderate to high landslide hazard based on existing site slopes. Historic landslide located at the east corner of property.	The site is located within the flood plains of the Clackamas River. There is approximately 30 to 40 feet of vertical relief between the pump facility and the lower nearby flood plains. The Clackamas River is located about 700 feet south of the main facility and about 400 feet south of the existing in-ground, open-air water treatment vessels that are situated on a lower terrace adjacent to steep slopes. The geologic map indicates subsurface soils are present day alluvial deposits.	Very steep slopes located adjacent to site. Historic landslides located adjacent to property. Lack of subsurface information.	Perform subsurface investigation, site-specific stability, and liquefaction analyses.

8.0 References

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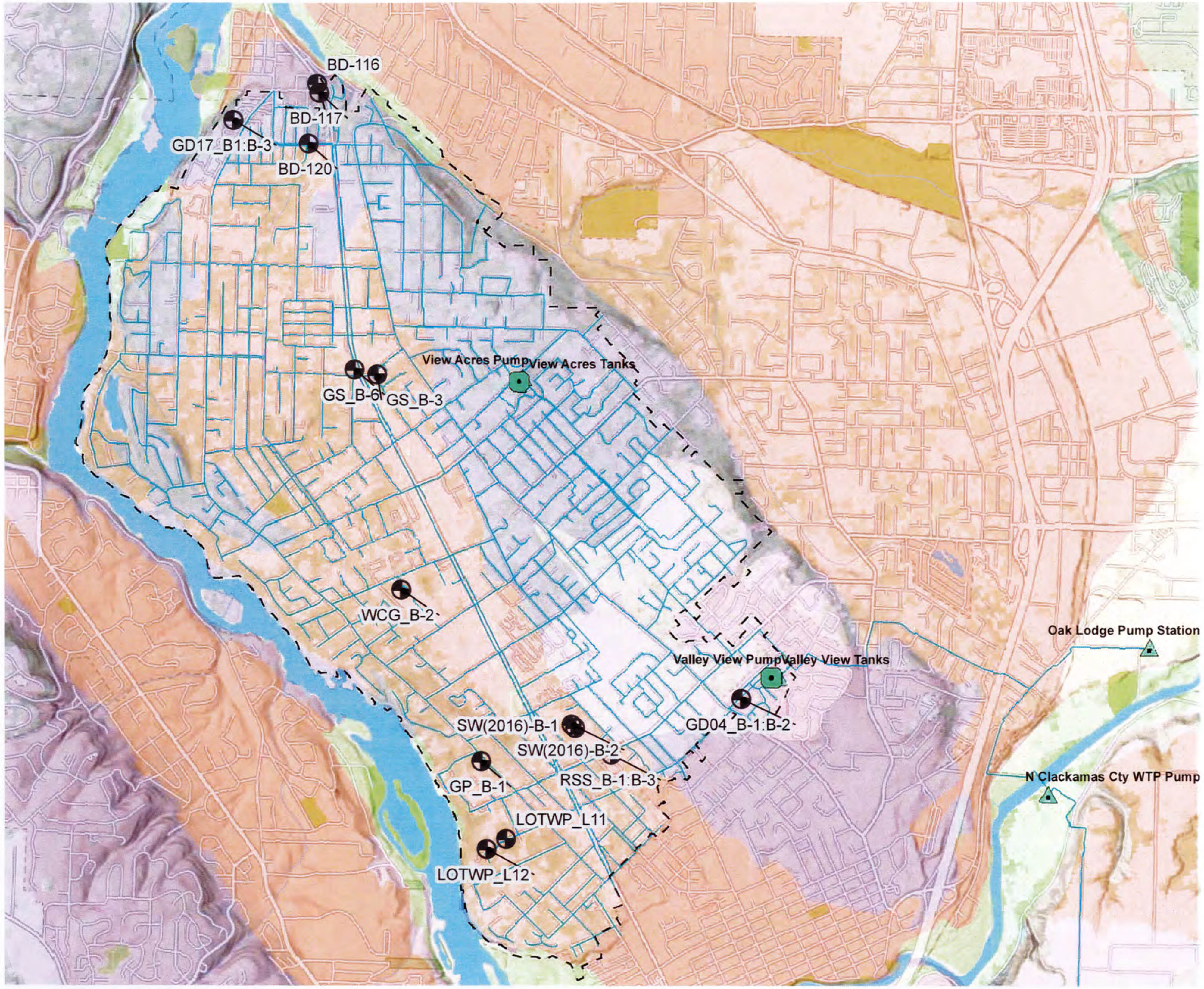
Figures



LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main

GEOLOGY

- Alluvial Deposits
- Columbia River Basalt Group
- Landslide Deposits
- Missoula Flood Deposits
- Portland Basin Volcanoes
- Terrace Deposits
- Troutdale Formation

NOTES:

1. ESTIMATES SHOWN ARE BASED ON HAZARD DATA FROM DOGAMI OPEN-FILE REPORT O-18-02 AND DATA FROM EXISTING BORINGS. AREAS OUTSIDE OF EXISTING BORING LOCATIONS HAVE NOT BEEN VERIFIED.
2. DATA SOURCE: DOGAMI O-18-02, SLIDO 3-4, OGDC-6
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors
3. THIS MAP IS INTENDED ONLY FOR THE OLWSD SERVICE AREA. OUTSIDE OF THE SERVICE AREA, THE DOGAMI MAPPING WAS NOT REVIEWED AND SHOWN FOR INFORMATION ONLY.

0 0.25 0.5 1 Miles

Coordinate System: NAD 1983 HARN Oregon Statewide Lambert Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

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McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT

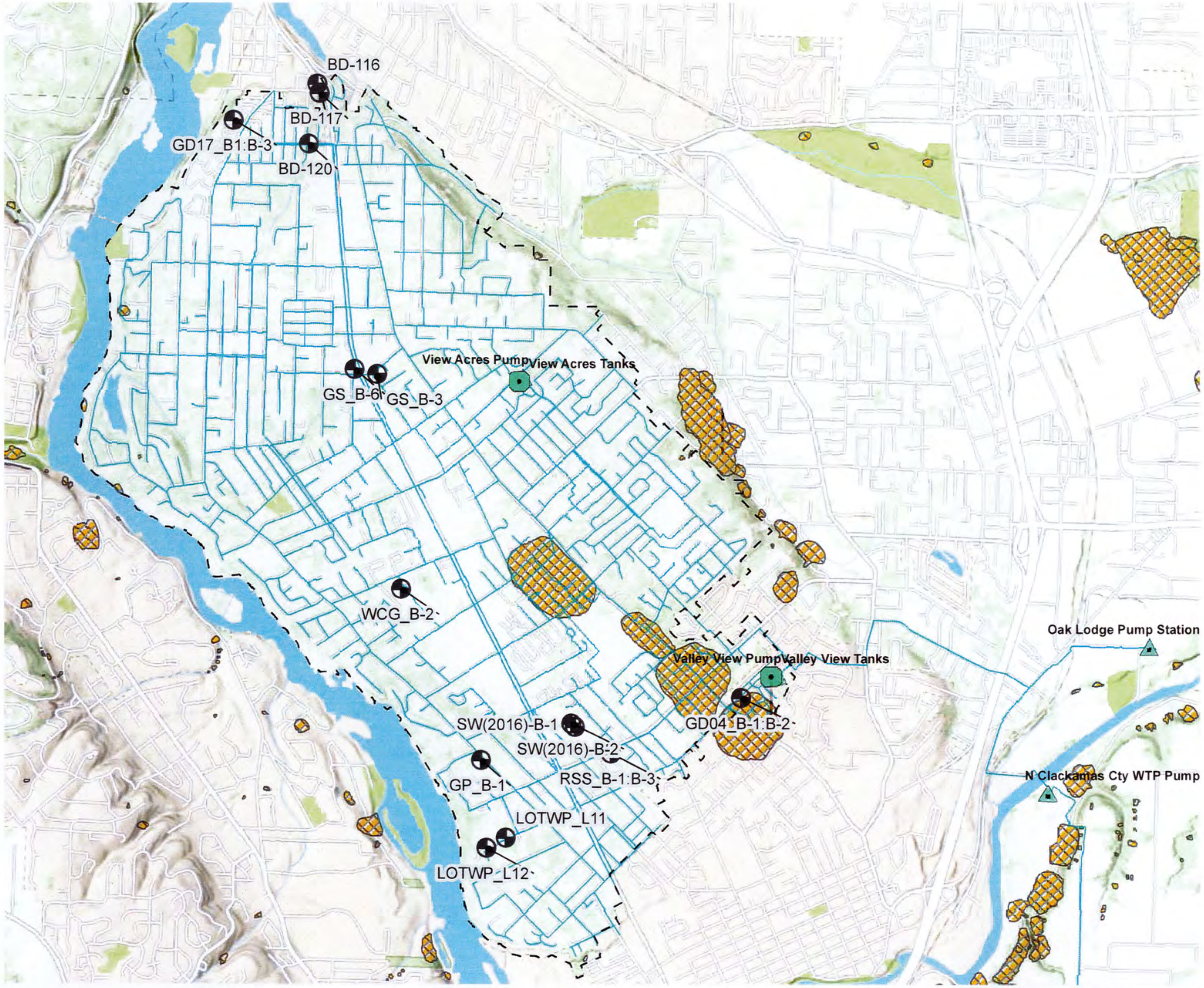
SEISMIC HAZARDS EVALULATION

TECHNICAL MEMORANDUM
SEISMIC HAZARDS
GEOLOGIC MAP

FIG. 1

June 2018

Document Path: C:\Users\roth\Box\Jobs\5815.0 Oak Lodge Water Dist Sys Seismic Study\Project Work\GIS\5815.0 Oak Lodge.mxd



LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main
- Landslide Deposits

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2. DATA SOURCE: DOGAMI O-18-02, SLIDO 3-4, OGDC-6
Topographic Map 3D - Portland, OR USA: Esri, Esri Community Maps Contributors
3. THIS MAP IS INTENDED ONLY FOR THE OLWSD SERVICE AREA. OUTSIDE OF THE SERVICE AREA, THE DOGAMI MAPPING WAS NOT REVIEWED AND SHOWN FOR INFORMATION ONLY.

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Coordinate System: NAD 1983 HARN Oregon Statewide Lambert Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT	FIG. 2
SEISMIC HAZARDS EVALULATION	
TECHNICAL MEMORANDUM SEISMIC HAZARDS LANDSLIDE DEPOSITS	June 2018

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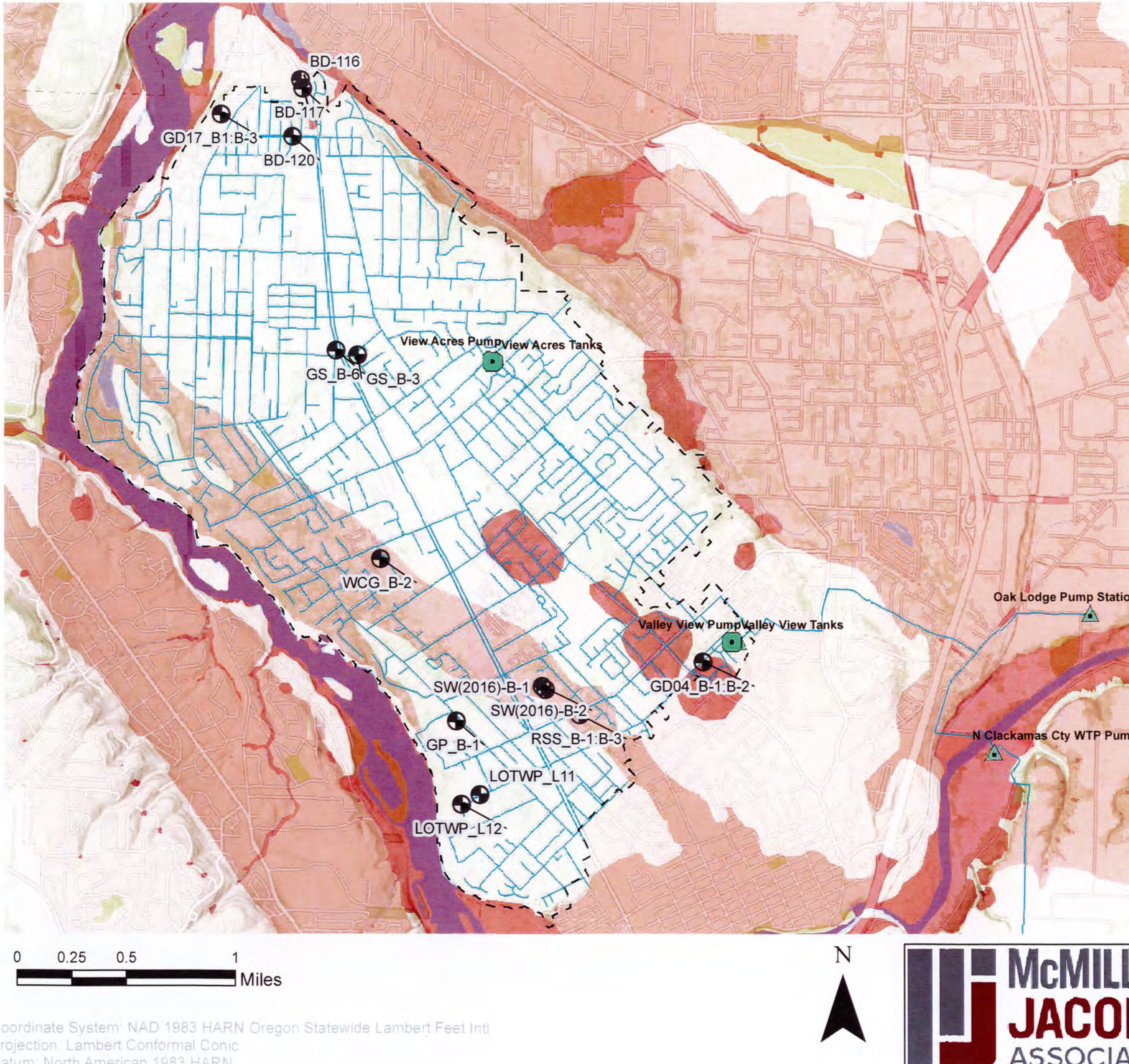

LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main

PEAK GROUND VELOCITY

- 7 - 9 in/s
- 10 -12 in/s
- 13 -16 in/s

NOTES:

1. ESTIMATES SHOWN ARE BASED ON HAZARD DATA FROM DOGAMI OPEN-FILE REPORT O-18-02 AND DATA FROM EXISTING BORINGS. AREAS OUTSIDE OF EXISTING BORING LOCATIONS HAVE NOT BEEN VERIFIED.
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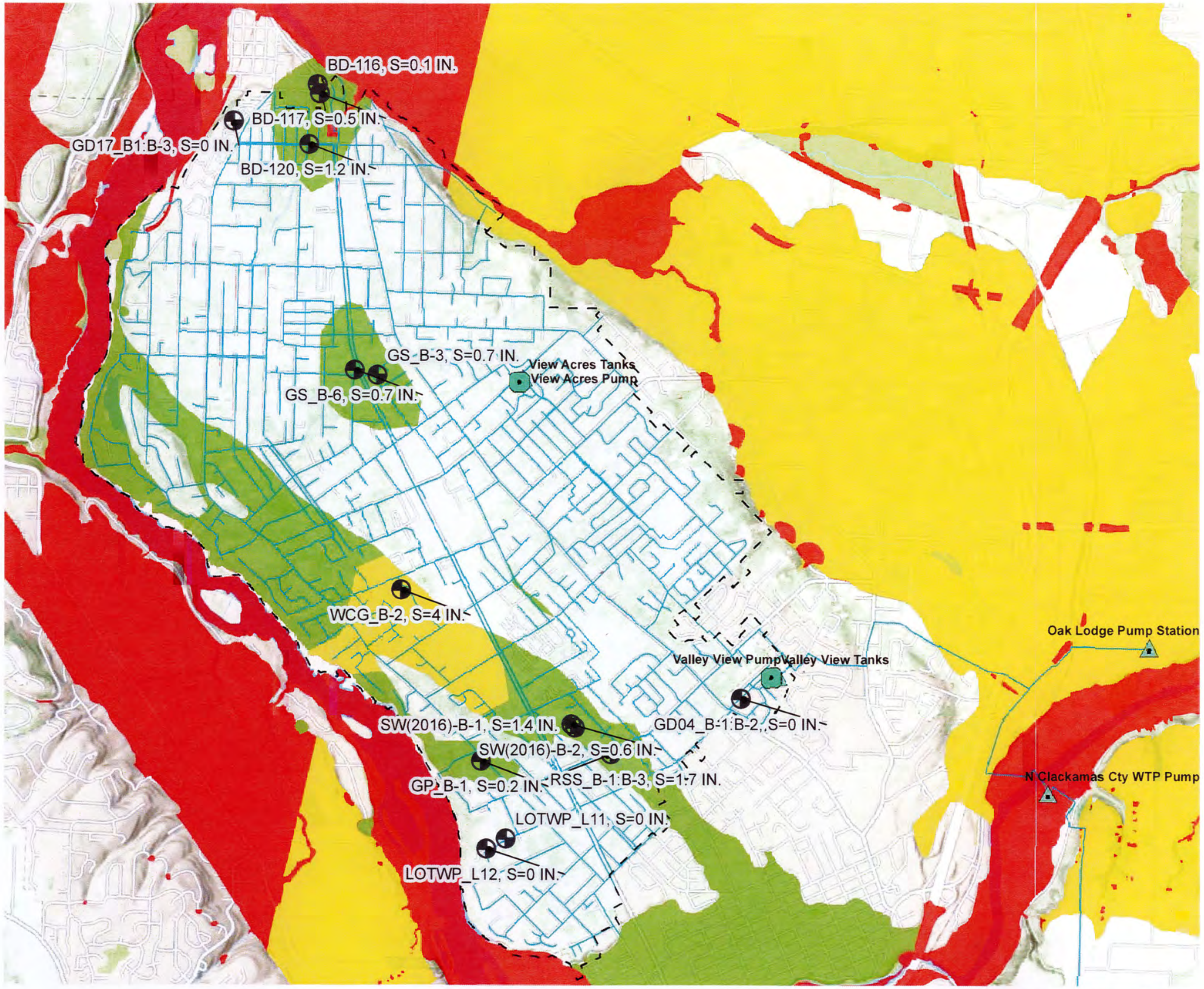
McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT
SEISMIC HAZARDS EVALULATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
PEAK GROUND VELOCITY

FIG. 3

June 2018

Document Path: C:\Users\troth\Box\Jobs\5815.0 Oak Lodge Water Dist Sys Seismic Study\Project Work\GIS\5815.0 Oak Lodge.mxd



LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main

LIQUEFACTION SETTLEMENT, S

- Up to 2 in.
- 2 to 4 in.
- Greater than 4 in.

NOTES:

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Coordinate System: NAD 1983 HARN Oregon Statewide Lambert Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT

SEISMIC HAZARDS EVALULATION

TECHNICAL MEMORANDUM
SEISMIC HAZARDS
LIQUEFACTION-INDUCED SETTLEMENT

FIG. 4

June 2018

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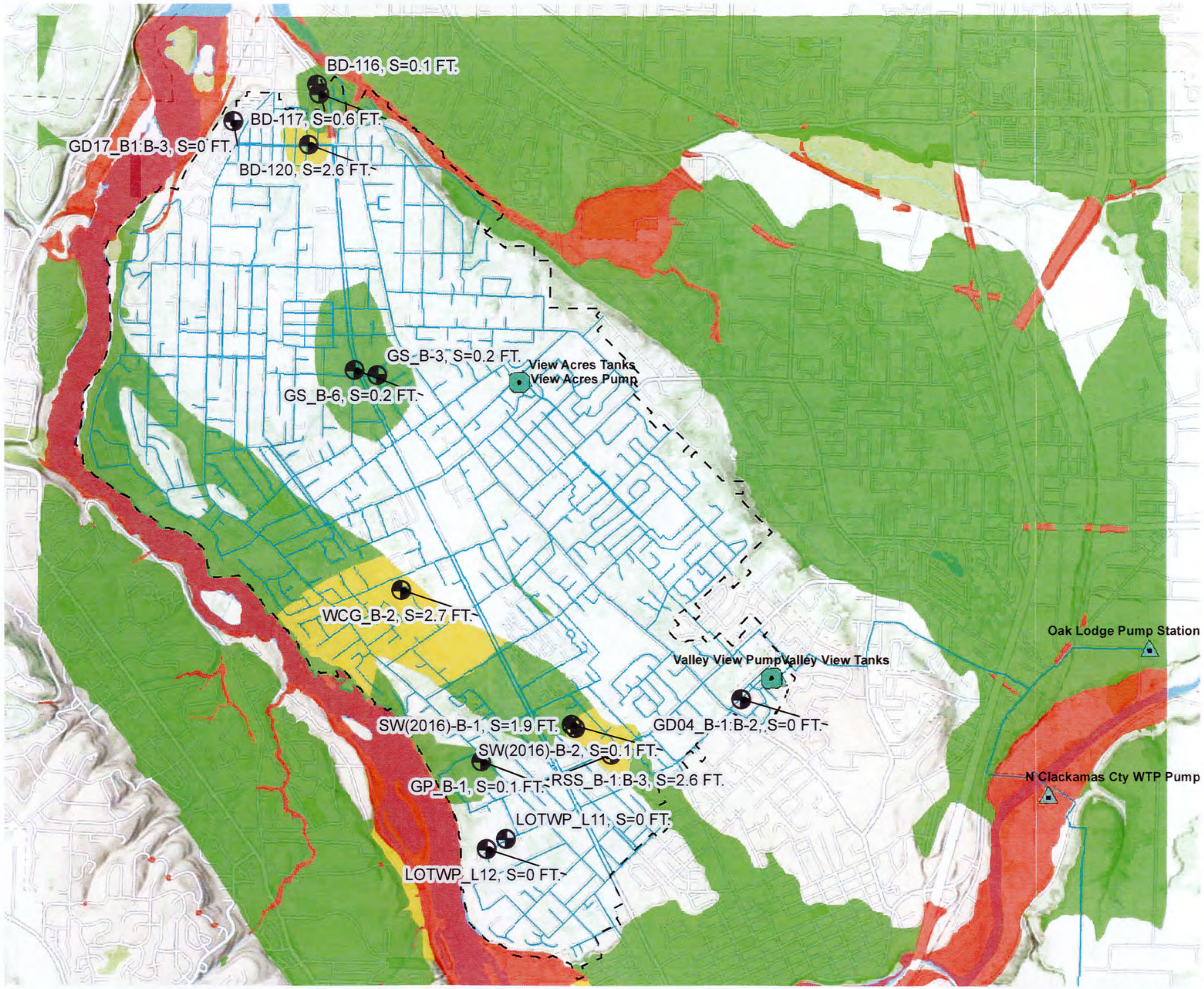

0 0.25 0.5 1 Miles

N

Coordinate System: NAD 1983 HARN Oregon Statewide Lambert Feet Intl
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main

LATERAL SPREADING, D

- Up to 2 feet
- 2 - 4 feet
- Greater than 4 feet

NOTES:

1. ESTIMATES SHOWN ARE BASED ON HAZARD DATA FROM DOGAMI OPEN-FILE REPORT O-18-02 AND DATA FROM EXISTING BORINGS. AREAS OUTSIDE OF EXISTING BORING LOCATIONS HAVE NOT BEEN VERIFIED.
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McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT
SEISMIC HAZARDS EVALULATION
TECHNICAL MEMORANDUM
SEISMIC HAZARDS
LIQUEFACTION LATERAL SPREADING

FIG. 5

June 2018

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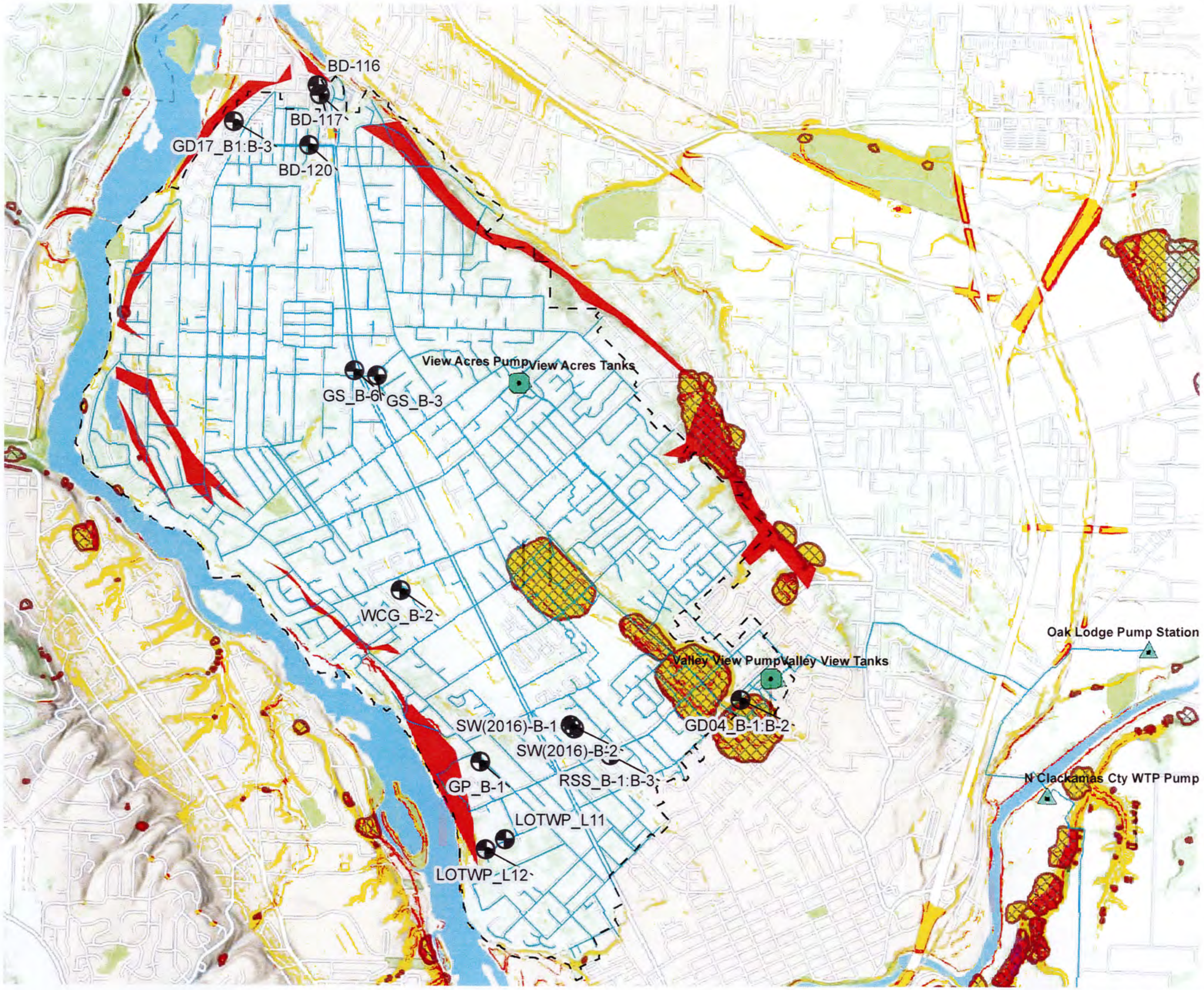

LEGEND

- Analyzed Borings
- Oak Lodge District Boundary
- Tanks
- Pumps
- Water Main
- Landslide Deposits

SEISMIC LANDSLIDE DISPLACEMENT

- Up to 1 ft.
- 1 to 4 ft.
- Greater than 4 ft.

NOTES:

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McMILLEN JACOBS ASSOCIATES

OAK LODGE WATER SERVICE DISTRICT

SEISMIC HAZARDS EVALULATION

TECHNICAL MEMORANDUM
SEISMIC HAZARDS
SEISMIC LANDSLIDE

FIG. 6

June 2018

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Appendix C. Emergency Supply Study TM

Date: 6/8/2020

To: Jason Rice
District Engineer
14611 SE River Road
Oak Grove, Oregon 97267

Phone: (503) 353-4202

Prepared by: Scott Duren

Reviewed by: Kirsten Plonka

Project: Oak Lodge Water Services District Water System Master Plan Update

SUBJECT: **EMERGENCY SUPPLY STUDY TECHNICAL MEMORANDUM**

Oak Lodge Water Services District (District) has appointed Water Systems Consulting, Inc. (WSC) with the task of updating their Water System Master Plan (WSMP). During the process of evaluating the District's water supply sources, WSC identified a major vulnerability for the District's emergency supplies. As part of the WSMP effort, the District would like to include a Capital Improvement Plan (CIP) project and budget for a project to improve the District's emergency supply options. WSC completed an emergency supply study to evaluate alternatives for emergency supplies for the District.

This technical memorandum (TM) describes the District's criteria for evaluating emergency supply alternatives, the initial screening of eight supply alternatives, and the final alternative evaluation and recommendation. This TM will be included as an appendix to the final WSMP update. WSC requests that the District review the draft provided in this TM and provide comments within 2 weeks. The District's review comments will be incorporated into revised final draft TM.

For reference, a list of terms is provided below:

ADD	Average Day Demand
ASR	Aquifer storage and recovery
AWWA	American Water Works Association
CRW	Clackamas River Water
GIS	Geographical Information Systems
gpm	Gallons per Minute
HDPE	High Density Polyethylene
IGA	Intergovernmental agreement
LOTWP	Lake Oswego-Tigard Water Partnership
MDD	Maximum Day Demand
MG	Million Gallons
MGD	Million Gallons per Day
NCCWC	North Clackamas County Water Commission
NRW	Non-Revenue Water
O&M	Operations and maintenance
OLWSD	Oak Lodge Water Services District
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PVC	Polyvinyl Chloride
PWB	Portland Water Bureau
SCADA	Supervisory Control and Data Acquisition
SFWB	South Fork Water Board
TAZ	Transportation Analysis Zone
TVWD	Tualatin Valley Water district

1 WATER SUPPLY VULNERABILITIES

In 2018, the Oregon Water Resources Department issued new requirements for Water System Master Plans to identify improvements necessary for a seismically resilient water system within 50 years. A review of the District's water system found that water supply is entirely dependent upon a single 24-inch water supply pipeline and a single water source, the Clackamas River.

The single 24-inch diameter supply main that feeds the Valley View Reservoirs supplies treated water from the North Clackamas County Water Commission (NCCWC) water treatment plant which has a raw water intake on the Clackamas River. While the District has several interties with the adjacent City of Gladstone and Clackamas River Water (CRW) service areas, these existing interties only allow the District to export water delivery. The District's service pressure is significantly higher than the adjacent Gladstone and CRW service pressures, and there are no permanent pumps at the interties that could overcome the difference in hydraulic grade to supply water to the District. The NCCWC can obtain emergency water from other sources such as CRW and the South Fork Water Supply Board (SFWB), but conveyance of any emergency supply to the District requires the 24-inch diameter pipeline. The District has determined that a secondary means of supplying water is necessary to prevent supply outages if the 24-inch diameter pipeline is out of service.

The District also depends solely on the Clackamas River as a water source. Although the NCCWC maintains interties with CRW and SFWB, both water systems also use the Clackamas River as their source of supply. If any event caused the Clackamas River to be temporarily limited or unavailable as a supply source, the District does not have direct access to an alternative supply. The District has determined that gaining access to alternative water supply sources is key to improving resilience and reliability of water deliveries in the future.

Three potential scenarios were identified that could impact the ability of the District to supply water to customers:

- Supply Pipeline Outage. Damage to the pipeline could occur from a seismic event or adjacent underground construction, and the 50-year old District-owned pipe may require an outage for future maintenance or replacement.
- Clackamas River Contamination. Spills of hazardous materials into the river from tanker trucks, accidents on adjacent roads, or cyanotoxins from algal blooms could limit the water availability due to treatment limitations.
- Clackamas River Curtailment. During the late summer and early fall, withdrawals from the river could be curtailed provide minimum flows for fishery health and limit water availability.

New interties, or combinations of intertie options, are desired to provide the District with the ability to continue water delivery to customers under any of the above scenarios. The District has investigated several possible interties with neighboring water agencies that could reduce the risk associated with any of these events.

2 PREVIOUS EMERGENCY INTERTIES AND SUPPLY STUDIES

The need to access alternative water supply sources to the Clackamas River is not new for the District. Several past studies have evaluated different concepts, both regionally with other Clackamas River Providers, and for the District alone. Returning previously existing interties to service and modifying current interties are also options that were identified. A brief description of each concept is provided below:

- **City of Milwaukie Intertie**. Although the District has never had an intertie with the City of Milwaukie, an abandoned intertie with the Portland Water Bureau (PWB) included an alignment through the City and connected with the District at SE Aldercrest Road. An emergency pump station located within the Milwaukie service area was available to pump water from PWB into the District's system. The pump station is no longer operable but the building still exists and the intertie piping is believed to be intact. In discussions with District staff, temporary piping and pumping could allow some water to be transferred from the City of Milwaukie directly into the District's system but no formal agreement or infrastructure exists for emergency supply.
- **Clackamas River Water.** As mentioned above, the District currently maintains three interties with CRW distribution system, however due to pressure differential between the service zones, these can only be used to supply CRW with water from the District. A fourth interconnection is the District owned pump station at the CRW water treatment plant that is currently used by Sunrise, which can transfer water through the 24-inch supply pipeline to Valley View. In discussions with District staff, temporary piping and pumping could allow some water to be transferred directly between CRW and the District's distribution system but no formal agreement exists.
- **City of Portland Water Bureau Intertie**. The intertie with the City of Milwaukie, mentioned above, included a steel transmission pipeline along Linwood Road that connected to the PWB distribution system near the intersection of SE Flavel and SE Harney Drives. The majority of the pipeline was abandoned in place, but a portion was removed during construction of Highway 224.
- **City of Portland Water Bureau Regional Intertie**. Additional studies for a regional interconnection between PWB and Sunrise Water Authority were conducted by the Clackamas River Water Providers. The study investigated several options for construction of a transmission pipeline to convey water from PWB Bull Run Conduits to storage tanks at either the SE 92nd Ave and Otty Road or the SE 97th and Mather Road facilities owned and operated by Sunrise Water Authority. From these locations water could be conveyed to the District through the existing 24-inch diameter supply pipeline.
- **City of Gladstone**. Similar to CRW, the District currently maintains three interties with Gladstone, but due to pressure differential they can only be used to supply water to Gladstone from the District. In discussions with District staff, temporary piping and pumping could allow some water to be transferred into the District's system but no formal agreement exists.
- **Oak Lodge Groundwater Well**. In 2010 the District commissioned a Groundwater Feasibility Report to investigate the potential for a groundwater supply well. The study concluded that a capacity of up to 1 million gallons per day could be possible from a single well, and a minimum of two wells would be necessary at an estimated cost of $1.92M per well (in 2010 dollars) to meet District demands. The study did not include any test drilling or pumping and recommended further exploratory drilling to confirm assumptions related to yield and interference from other wells. The District does not currently maintain any groundwater rights, but the study indicated there were no obvious impediments to obtaining a groundwater right.
- **Sunrise Water Authority Aquifer Storage and Recover Wells.** The Sunrise Water Authority plans to further develop the capacity of an aquifer storage and recovery (ASR) system that could be used to store surplus water during wet years and augment water supply during periods of drought. Water from the ASR system cannot be feasibly routed to the District during normal operating conditions but could be used to offset Sunrise's water supply from the NCCWC to deliver a higher percentage of the NCCWC WTP's capacity to the District and Gladstone. This solution would require the use of the 24-inch diameter District supply pipeline.

- **Willamette River Intake**. A study commissioned by the Clackamas River Water Providers included an option to construct a new surface water intake on the Willamette River south of the confluence with the Clackamas River. The intake would include a 500-600 hp raw water pump station, a 12,500 foot long 30- to 36-inch diameter pipeline and would terminate at the South Fork WTP intake. Water could then be conveyed to the District through existing intertie pipelines between the SFWB and the NCCWC and then via the 24-inch water supply line.
- **Lake Oswego-Tigard Water Partnership**. A study commissioned by the North Clackamas County Water Commission (NCCWC) investigated the feasibility of repurposing the abandoned raw water supply pipeline to the Lake Oswego-Tigard Water Partnership (LOTWP) for supply of emergency potable water to Gladstone. Additional piping would be required to connect the existing pipeline to an abandoned 24-inch Gladstone Ranney Collector supply line and to Gladstone's Webster Tanks. An intertie pump station would be required to supply water to the District directly or emergency water could be routed through the NCCWC system and the 24-inch water supply pipeline to Valley View.

3 INITIAL SCREENING CRITERIA

To screen the list of potential emergency intertie options, the District established level of service requirements for an emergency intertie and criteria for use in ranking options.

3.1 Level of Service

During an emergency event that would require the use of an intertie, the District anticipates the ability to reduce demands through public outreach and water use restrictions such as discouraging outdoor irrigation. A minimum level of service during an emergency would provide sufficient supply to meet the average winter demands across the system. To account for projected future demands over the 20-year planning horizon, a minimum supply of 2.7 MGD would allow customers to receive continuous water service with some conservation requirements. The emergency supply must also meet the District's level of service for pressure above 40 psi at all service connections and provide fire flow with a residual pressure of 20 psi.

3.2 Initial Screening Criteria

The District developed criteria to screen potential emergency supply options as described below.

Table 3-1**Error! Reference source not found.** describes each screening category and the factors used to designate a ranking score. Each criterion results in a ranking score on a scale of 1 (lowest score) to 3 (highest score) that are summed for the purpose of ranking the alternatives. The alternatives with the highest sum of criteria scoring are preferable and will be further analyzed. A brief description of each criterion is provided below:

- **Water Sources** – The alternative's ability to provide a source of water that is not a Clackamas River source is an important ranking criterion. Alternatives that can provide access to a non-Clackamas River source, either by wheeling water from a third-party intertie or via direct connection, were given higher scores to account for the additional resilience in diversifying the District's access to water supply sources.
- **Partner Agencies** – The number of partner agencies that are required to supply the District with a non-Clackamas River water source will add complexity to an emergency situation and may impact the District's ability to access water. For example, an intertie with CRW would provide access to water from the Bull Run watershed through an interconnection with PWB, but this requires CRW to introduce non-Clackamas River water into their distribution system which may cause water quality concerns for their customers. Higher scores were awarded for alternatives that require less partner agencies.
- **Cost Estimates** – The anticipated cost of an intertie is an important factor for ranking alternatives. Preliminary cost estimates for initial capital costs were developed for each alternative or estimates from previous studies were used when available. Cost estimates prepared for this analysis conform to Class 5 Planning Level Classification of Opinions of Probable Construction Costs as developed by the Association for the Advancement of Cost Engineering. A Class 5 Estimate is typically used for concept screening purposes and has an expected accuracy ranging from -50% to +100%. Higher scores were awarded for alternatives with relatively lower estimated capital costs.
- **Operations and Maintenance (O&M)** – The anticipated O&M required is important to consider, as complex infrastructure will incur annual costs for maintaining equipment, functionality testing, and training of operations staff. For example, an intertie requiring a permanent pumping station and a long emergency pipeline will add to the annual O&M requirements for District staff compared to an intertie that only requires a few valves and a flow meter. Interties that will require reconfiguring existing District flow patterns, reservoir settings, and pump station operations are also considered to have a higher O&M burden than an intertie that mimics the existing supply and does not require specialized emergency controls or valve closures. It should be noted that additional ongoing charges that might be required by partner agencies for connecting to their system have not been determined and are not included in this study. Higher scores were given to alternatives that require less O&M.
- **Uncertainty/Risks** – Some intertie alternatives are less defined than others, and the rankings need to account for uncertainty and the risk of potential feasibility issues and hidden risk costs. For example, an alternative that depends on the unknown condition of currently abandoned pipelines or which requires the District to obtain new water rights would be ranked lower than those projects that are better defined. Alternatives that require a long pipeline alignment will have additional uncertainty related to potential water way or environmental wetland crossings, freeway crossings, or construction limitations due to land use or zoning that could increase construction costs.

Each of the criteria is presented in Table 3-1 below along with the specific parameters used to assign the individual ranking scores associated with the criteria.

Table 3-1. Initial Screening Criteria Descriptions and Scoring

Screening Criteria	Description	1	2	3
Water Sources	Ability to provide a non-Clackamas River water source	No access to non-Clackamas River Sources	Connection to a Clackamas user that can wheel non-Clackamas River water	Direct Connection to Non-Clackamas River Source
Partner Agencies	Number of partner agencies required to supply non-Clackamas River water	3+	2	0-1
Cost Estimates	Preliminary capital cost estimates	>$10M	$5M-$10M	<$5M
O&M	Modifications to current operations and increased asset maintenance	Major operational modifications And/or 2+ mechanical facilities	Minor operational modifications And/or 1 pump and over 1 mile of pipeline	No operational modifications And/or 1 pump and less than 1 mile of pipeline
Uncertainty /Risks	Potential to impact costs or project feasibility	Alignment poorly defined and >0.5 miles, water rights required, use of abandoned pipe in uncertain condition, capacity uncertainty	Alignments well defined but >0.5 miles, no new water right, all new infrastructure, minor capacity uncertainty	Alignments well defined and <0.5 miles, no new water rights, all new infrastructure, capacity can be defined

4 INITIAL ALTERNATIVE SCREENING

An overview of the alternatives that were investigated, a description of the criteria scoring for each alternative, and a summary and recommendation for more detailed analysis are provided in this section. Alternative screening was conducted in an interactive workshop with District staff to gain consensus on the recommendations for further evaluation.

4.1 Overview

To conduct an initial screening of each of the alternative emergency intertie options described in Section 2 of this TM, a conceptual description of each alternative was developed. In cases where previous studies had developed detailed descriptions of the potential emergency intertie, only the cost estimates were modified to reflect escalation and inflation to current pricing using the Engineering News Report's Construction Cost Index. Other alternatives unique to the District were developed to a conceptual level for the purpose of comparison. All the concepts were reviewed with District staff during an interactive workshop to confirm the feasibility and potential benefits or concerns with each alternative.

4.2 Alternative Screening

The following sections provide a brief description of each alternative emergency intertie and the justification behind the scoring provided for each of the screening criteria described in Section 3. As described in Section 3, the higher the score, the more preferred each alternative is for providing emergency supply to the District.

4.2.1 City of Milwaukie

The City of Milwaukie's distribution system borders the north end of the District's service area. Milwaukie receives its water supply from groundwater wells and has emergency intertie connections with CRW and PWB. A pump and upsized pipelines will be required to distribute the supply to the District's customers. Five distinct connection locations were identified and considered. Scoring for each criterion is provided below along with a brief description to explain each score.

- ***Water Sources: 3.*** The City's primary water source is groundwater which provides direct access to a non-Clackamas River source. The City also can access water from PWB (an additional non-Clackamas River source) and CRW through emergency interties.
- ***Partner Agencies: 3.*** Coordination with a single partner agency, Milwaukie, is required to obtain non-Clackamas River supply from the City's groundwater wells.
- ***Cost: 3.*** Estimated costs were developed between $1.6M and $2.5M depending on the location of the intertie. Costs include a pumping station to boost pressure from the City's operating pressure to match the District's lower pressure zone and to fill the Valley View reservoirs. Each location also requires upsizing of existing District pipelines to convey flow to Valley View.
- ***O&M: 2.*** Infrastructure maintenance includes a pump station and upsizing existing pipelines but does not add new pipelines. Upsizing existing pipelines is not considered to increase the amount of maintenance for any intertie alternative. An intertie with Milwaukie requires reversing flow through the system to pump into the north end and reach the Valley View tanks. This operational modification may increase pressures in the north end of the system and impact water quality in the distribution system.
- ***Uncertainty/Risks: 3.*** The project appears to be feasible, does not rely on abandoned infrastructure, and does not require any new water rights. The City has indicated a mutual desire for an emergency intertie.
- **Total Score: 14**

4.2.2 Clackamas River Water

The District's service area is bordered by the CRW service area to the east. To supply water from CRW to the District along the eastern service boundary, a pump station will be required to overcome the difference in service pressures. Four distinct connection locations were identified and considered. Scoring for each criterion is provided below along with a brief description to explain each score.

- ***Water Sources: 2.*** The primary water source is from the Clackamas River. Access to Bull Run watershed source water and groundwater is possible through CRW's existing 18-inch diameter intertie connection to PWB at SE 99th Avenue and Foster Road. PWB water cannot be directly accessed and must be wheeled through the CRW distribution system.
- ***Partner Agencies: 2.*** Two partner agencies, CRW and PWB, are required for the District to obtain access to a non-Clackamas River supply.
- ***Cost: 3.*** An estimated cost of $1.3M was developed for a connection between an existing 12-inch CRW water main and the District's 24-inch diameter supply line at the intersection of Strawberry Lane and Webster Road (location CRW D). The infrastructure includes a pump station and valve insertion on the District's 24-inch supply line.
- ***O&M: 3.*** Although maintenance will be required for the pump station, no modifications are needed within the District system as emergency supply would be provided to Valley View similar to normal conditions.
- ***Uncertainty/Risks: 3.*** The project appears to be feasible, does not rely on abandoned infrastructure, and does not require any new water rights. CRW has indicated an emergency intertie appears to be feasible

for supplying water from the CRW water treatment plant, but the capacity to wheel PWB water through the CRW system is unknown at this time.

- **Total Score: 13**

4.2.3 Portland Water Bureau

The PWB receives surface water supply from the Bull Run watershed and groundwater from the Columbia Shore Wellfield. A direct connection to PWB would provide the District with access to two non-Clackamas River water sources. District staff indicated that a 16-inch diameter steel pipeline along Linnwood Ave provided a connection to a PWB transmission main located along Harney and Clatsop Roads. The 16-inch diameter intertie pipe was abandoned, and sections were removed to provide for construction of Highway 224. Due to the unknown condition of the existing pipeline, a new direct connection is assumed to require 3.4 miles of pipeline to deliver water to the District at Aldercrest Road, where a pump station and pipe alignment underneath Kellogg Creek previously existed. Upsizing of existing District 8-inch diameter pipe on Aldercrest to 12-inch diameter pipe would be required.

- ***Water Sources: 3.*** PWB's primary water source is from the Bull Run watershed. Their secondary water source is groundwater from the Columbia Shore Wellfield.
- ***Partner Agencies: 3.*** With a direct connection to PWB, only one partner agency is anticipated.
- ***Cost: 2.*** An estimated cost of $8.4M would be required to construct a new pump station, 3.4 miles of new pipeline, and 1 mile of upsized pipeline within the District's system.
- ***O&M: 2.*** The pipeline will require periodic maintenance and flushing. The connection location will require reversing flow within the District from the north end of the system to fill the Valley View tanks, which has the potential to impact customer pressures in the north end of the District and could impact water quality due to reversing flow from the current operating conditions.
- ***Uncertainty/Risks: 2.*** The pipeline alignment may change based on easement acquisition, creek crossings, and highway crossings and presents the potential for unforeseen cost increases.
- **Total Score: 12**

4.2.4 City of Gladstone

The City of Gladstone borders the south end of the District's service area. The District has three existing interconnections that supply water from the District to Gladstone. A pump station would be required to supply water to the District from Gladstone's system.

- ***Water Sources: 1.*** The primary water source for Gladstone is the NCCWC which is the same source water and treatment plant that provides District water. Secondary sources for Gladstone are from the SFWB or CRW through the NCCWC. This alternative does not provide access to a non-Clackamas River water source.
- ***Partner Agencies: 1.*** Non-Clackamas River water could be obtained from PWB through interconnections with CRW and the NCCWC and then Gladstone but would require three partner agencies.
- ***Cost: 3.*** An estimated project cost of $0.5M would be required for adding a pump station at the largest diameter intertie located at Valley View.
- ***O&M: 3.*** No operational modifications are expected because the intertie location is close to the Valley View Tanks so regular operations can occur. Maintenance would be required for the pump station.
- ***Uncertainty/Risks: 3.*** The project appears to be feasible, does not rely on abandoned infrastructure, and does not require any new water rights. The emergency intertie with Gladstone already exists.
- **Total Score: 11**

4.2.5 Oak Lodge Groundwater

In 2010, the District evaluated the feasibility of drilling groundwater wells within the District service boundary to provide emergency supply. The Groundwater Feasibility Report was used to provide background information about groundwater within the District's service boundary. The report provided two locations for wells, one at the Valley View facility and one near Candy Lane Elementary School. The report was based on limited well information in the vicinity and there is uncertainty regarding the actual production of the wells. The District does not currently have groundwater rights and would need to apply for them.

- ***Water Sources: 3.*** The well would supply groundwater directly to the District.
- ***Partner Agencies: 3.*** No partners required.
- ***Cost: 2.*** Based on cost estimates provided for a single well in the previous report, an estimate of $5M was developed for two well sites. The cost estimate included exploratory well drilling, well equipping, standby power generator, chlorination system, and a treatment system should treatment be necessary.
- ***O&M: 1.*** The groundwater wells will require two additional mechanical facilities along with chlorination and controls, and possibly treatment equipment.
- ***Uncertainty/Risks: 1.*** Construction of new wells has a relatively higher uncertainty compared to other alternatives. The actual well yield and water quality is uncertain. Additional exploratory drilling and geochemical analysis is necessary to confirm the stratigraphy and thickness of the aquifer. Additional field studies and modeling to determine drawdown impacts on or by other users will also be required. A new well will also require the District to obtain a groundwater right, which presents uncertainty in permitting, zoning, and land use requirements.
- **Total Score: 10**

4.2.6 Sunrise Water Authority ASR Wells

Sunrise Water Authority owns a permit to maintain and operate up to five aquifer storage and recovery (ASR) wells. Currently, one of the five wells is installed and operational. Expanding the ASR system could reduce demand on the Clackamas River during low flow events. This alternative would offset the demand on NCCWC water by Sunrise Water Authority to allow the District to receive a greater percentage allocation.

- ***Water Sources: 1.*** The ASR wells would not provide groundwater directly to the District and would be used to offset Sunrise Water Authority's allocation of NCCWC supply. This alternative does not provide access to a non-Clackamas River water source.
- ***Partner Agencies: 1.*** Non-Clackamas River water could be obtained from PWB through interconnections with CRW and the NCCWC and would require three partner agencies.
- ***Cost: 2.*** Sunrise Water Authority has indicated a cost of $3.4M is required to fully develop the ASR water right.
- ***O&M: 3.*** No new pump stations or pipelines would be required for District maintenance and flow would enter the system through the existing 24-inch diameter supply pipeline as in normal conditions.
- ***Uncertainty/Risks: 1.*** There is a great degree of uncertainty as the capacity of individual ASR wells depends on the underlying geology which can be unpredictable. The individual yield and storage capacity of individual wells can vary, and capacity cannot be established until a bore hole is completed and pump testing can be conducted.
- **Total Score: 8**

4.2.7 Willamette River Intake

The Clackamas River Water Providers evaluated developing a new raw water intake on the Willamette River as an additional water source for the region's water suppliers. The intake and pump station would be constructed upstream of the confluence with the Clackamas River, over 2 miles of 30-inch diameter pipeline would be required to connect to the existing SFWB intake, and a new surface water right would be required.

- ***Water Sources: 3.*** The alternative would provide access to Willamette River water.
- ***Partner Agencies: 2.*** At least two partner agencies would be required, SFWB and the NCCWC.
- ***Cost: 1.*** An estimated cost of $32M-$39M was developed by escalating the estimate provided in the 2015 Alternate Water Supply Study prepared by Clackamas River Water Providers.
- ***O&M: 1.*** The intake, pump station, and pipeline will require substantial maintenance.
- ***Uncertainty/Risks: 1.*** The ability to obtain water rights is unclear and hidden costs may be present in alignment selection, intake siting, and permitting.
- **Total Score: 8**

4.2.8 Lake Oswego-Tigard Water Partnership

The Lake Oswego-Tigard Water Partnership (LOTWP) owns an abandoned raw water 27-inch main that crosses under the Willamette River. The LOTWP supplies water from the Clackamas River but is also connected to City of Portland and with the Joint Water Commission through the City of Beaverton. The NCCWC provided funding to install the necessary fittings for a future connection to the treated water from the LOTWP. With some improvements the abandoned pipeline under the Willamette River could deliver treated water to the City of Gladstone or wheel water from City of Portland from an existing intertie with the city of Tigard (Providers, 2015). Water could be delivered to Gladstone's Webster Road Reservoir by connecting to an abandoned 24-inch Ranney collector supply line within the City of Gladstone and modifying piping at existing pressure reducing valves (PRVs) and at the reservoir site. A pump station at the Webster Reservoir or at the interconnection with the District system would be required to convey flow from the lower pressure Gladstone system into the Valley View tanks. The abandoned pipelines have not been used for potable water and would likely need to be flushed before water could be conveyed to the District and it is unclear if the lines could be adequately disinfected or if the water quality would require issuance of boil water notifications within the District. The condition of the existing abandoned pipeline is not known however a study indicated the pipe should be sufficiently rated to convey flow based on initial thickness, past operating conditions, and estimated condition.

- ***Water Sources: 1.*** LOTWP primarily receives water from the Clackamas River, but does have the ability to provide Bull Run watershed source water through an intertie with PWB. The PWB connection is in the northwest end of the Tigard water system however, and the ability to wheel PWB water to the District is likely to be limited.
- ***Partner Agencies: 1.*** Access to non-Clackamas River source water would require at least three partner agencies.
- ***Cost: 2.*** A project cost estimate of $1.1M was developed assuming investigations into the existing pipe condition, new piping connections, modifications to the Gladstone Hereford PRVs and reservoir piping, and booster pump station.
- ***O&M: 2.*** The abandoned pipelines will require periodic flushing and the pump station will require maintenance. The pipeline will also require periodic inspection to verify condition and is over one mile in length.

- ***Uncertainty/Risks: 1.*** The pipeline is approximately 50 years old and current condition is unknown. The pipeline is not likely to be seismically retrofitted and may fail in a seismic event. Hidden costs may arise to provide OHA required pipeline separation and cross-connection prevention and to provide modifications to the Webster Storage Tank and Hereford PRV piping.
- **Total Score: 7**

4.3 Screening Evaluation Summary

Based on the results of the initial screening, the top three alternatives appear to be construction of new interties with Milwaukie, CRW, or PWB. A summary of the scoring for all of the alternatives including the anticipated benefits and limitations of each are provided in Table 4-1 below.

Table 4-1. Initial Screening Criteria Descriptions and Scoring

Alternatives	Rating	Water Source(s)	Partner Agencies	Estimated Capital Costs	Operational Modifications	Uncertainty/ Risks	Summary
Milwaukie	**14**	3	3	3	2	3	Provides direct access to groundwater source with minimal infrastructure improvements.
CRW	**13**	2	2	3	3	3	Minimal operational changes and infrastructure improvements.
PWB	**12**	3	3	2	2	2	Provides direct access to non-Clackamas River water supply but high costs.
Gladstone	**11**	1	1	3	3	3	Minimal infrastructure improvements but provides no new source
OLWSD Wells	**10**	3	3	2	1	1	Direct access to groundwater supply but high level of uncertainty
Sunrise	**8**	1	1	2	3	1	Minimal infrastructure improvements but provides no new source
Willamette River intake	**8**	3	2	1	1	1	Provides access to non-Clackamas River water supply but high costs.
LOTWP	**7**	1	1	2	2	1	Provides access to non-NCCWC water supply but high uncertainty.

5 ALTERNATIVES ANALYSIS

This section provides a more detailed analysis and cost estimates for each of the top three alternatives identified during the screening evaluation.

5.1 Overview of Top 3 Alternatives

The initial screening identified CRW, Milwaukie and PWB as the top three potential intertie partners. Each of these alternatives have multiple connection options. Figure 5-1 shows each of the intertie locations that were considered during the initial screening and subsequent alternatives analysis.

The top three alternatives were discussed with each of the partner agencies to confirm supply availability and impacts on their distribution systems. WSC evaluated multiple locations for the interties by modeling the additional supply in the District's distribution system. Four intertie locations for a connection with Milwaukie, four locations for CRW, and one location for PWB were evaluated based on cost, proximity to larger diameter pipelines in the respective partner agency system, and design feasibility considerations, including land availability, constructability, creek and highway crossings, and security measures.

5.2 CRW Alternative

Four intertie locations (CRW A, B, C, and D) were identified for the CRW alternative. The District and CRW have three existing intertie locations that are used to serve small areas of customers (CRW A, B, and C). The existing interties are connected to 8-inch diameter mains that would require upsizing to convey the desired emergency flow. A fourth location (CRW D) was considered due to the proximity of the District's 24-inch diameter supply pipeline and a 12-inch diameter CRW main. CRW D would require a new intertie along the District's 24-inch main that uses a 35 horsepower pump station to fill the Valley View Tanks from the CRW transmission main. An intertie at this location would allow CRW to supply the District without any major modifications to the two systems. There does not appear to be any vacant lots along the alignment, however the pump station could be located within Heddie Notz Park. North Clackamas Parks and Recreation District owns the park and further discussion would be required to determine if an intergovernmental agreement or easement could be obtained to allow placing a pump station within the park. Other locations may be available through purchase of an easement or a portion of existing private property, or through construction of a below-grade prefabricated booster pump station within the right-of-way. A proposed layout is provided in Figure 5-2.

To allow the pump station to convey water from CRW into the Valley View tanks, an isolation valve will be required on the 24-inch diameter water supply pipeline that could be closed when the emergency supply is required. Because this alternative requires conveyance through a portion of the existing supply pipeline, a seismic study is recommended and included within the costs for the project. The study could potentially be paired with a larger study of the entire 24-inch diameter supply pipeline recommended as a result of the seismic risk analysis in the WSMP. The pipeline alignment is located in close proximity to mapped areas of landslide risk located south of the Valley View facility A study to confirm the anticipated ground deformations directly under and over the pipe can confirm that the existing pipe material and joints are anticipated to remain operational following a major earthquake. An itemized cost estimate for the intertie, including land acquisition, studies, and engineering fees is provided in Table 5-1.

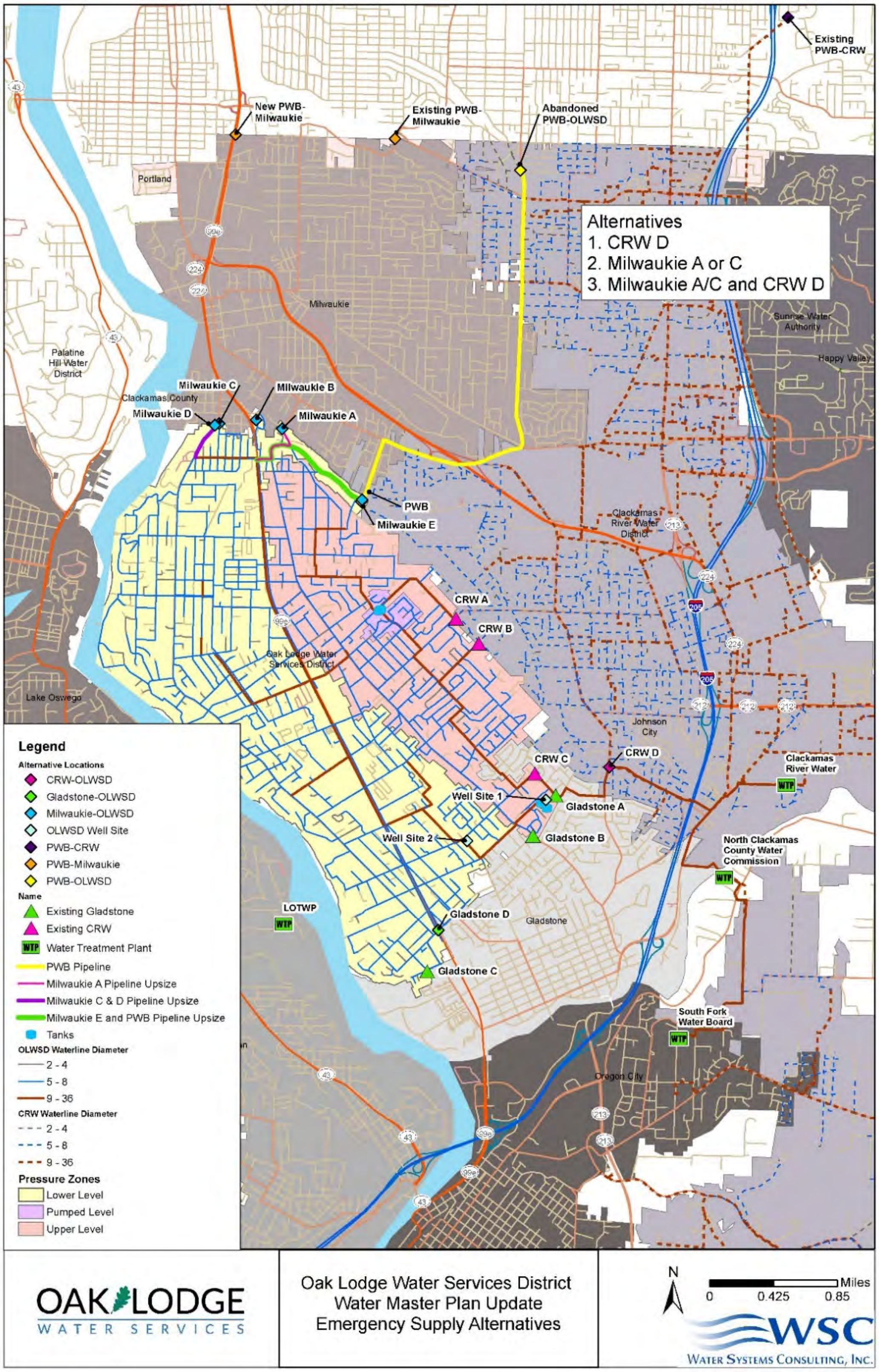

Figure 5-1. Potential Emergency Intertie Locations and Pipelines

The District engaged CRW and provided the concept for the intertie to initiate discussions of a potential emergency connection. CRW indicated that both pumping and treatment capacity are sufficient under current maximum day demand to provide the desired 2.7 MGD to the District, but by 2038 there will not be sufficient pumping and treatment capacity to deliver this much flow based on assumed growth within CRW's service area. The available pumping capacity in 2038 appears to be closer to 2.4 MGD. CRW expressed interest in further discussions to confirm capacity commitments, metering requirements, and other provisions that could be included into an intergovernmental agreement (IGA) for emergency water supply between the two providers. WSC recommends that CRW and the District discuss establishing an IGA.

Table 5-1. Itemized Cost Estimate for Emergency Intertie with CRW

Item	Unit Cost	Unit	Qty	Cost
Prefabricated Pump Station - 35 hp	$ 500,000	EA	1	$ 500,000
Isolation Valve - 24"	$ 100,000	EA	1	$ 100,000
Construction Subtotal				**$ 600,000**
Construction Contingency	20%			$ 120,000
Unaccounted for Items	10%			$ 60,000
Mobilization	3%			$ 18,000
Insurance and Bonds	1%			$ 6,000
SWPPP	1%			$ 6,000
Subtotal				**$ 810,000**
Land Acquisition	$ 25	/sqft	2000	$ 50,000
Seismic Study	$ 100,000		1	$ 100,000
Subtotal				$ **960,000**
Design/CM/Administration	30%			$ 288,000
Total				**$ 1,248,000**

Figure 5-2. Proposed Concept for Emergency Intertie with CRW

5.3 Milwaukie Alternative

Five locations (Milwaukie A, B, C, D, and E) were identified for a potential intertie connection with the City of Milwaukie. Each location was evaluated in terms of estimated cost, feasibility, land availability, and design considerations. Locations A and C were found to have the lowest capital and life-cycle costs; however, location A has limited land availability and is located along a tight curve on Oatfield Road that presents a significant safety risk. Thus, location C was chosen as the preferred Milwaukie intertie due to its proximity to a larger 10-inch diameter main on the City side and the potential for viable options for siting a relatively small booster pump station within the right-of-way or through acquisition of an easement through partial purchase of vacant private property. Location C will require the District to upsize their existing 8-inch diameter piping along River Road to 12-inch diameter to convey emergency water into the larger diameter transmission system to fill the Valley View reservoirs. A proposed conceptual location for the intertie, including the extents of upsizing required within the District system, is provided in Figure 5-3. An itemized cost estimate is provided in Table 5-2.

The District engaged the City of Milwaukie in November 2019 to discuss the potential intertie location and to gauge the interest in forming an IGA for emergency supply. The City is also interested in an intertie that could supply NCCWC water in an emergency and is willing in concept to share some of the construction costs. The City of Milwaukie agrees that the proposed location is preferable, however recent efforts are underway to update the City's water hydraulic model as part of a Water System Master Plan update. Initial review of the City's 2010 Water System Master Plan appears to indicate there is adequate supply to provide the desired 2.7 MGD based on combined well capacity and City-wide storage. The City would like to confirm that the location is preferred and that the desired emergency demand capacity can be provided once an updated and calibrated hydraulic model is available. Milwaukie indicated that with their current biennial budget cycle already finalized, they would like to continue to explore an intertie within the next 2 to 5 years.

Table 5-2. Itemized Cost Estimate for Emergency Intertie with Milwaukie

Item	Unit Cost	Unit	Qty	Cost
Prefabricated Pump Station - 35 hp	$ 500,000	EA	1	$ 500,000
OLWSD Pipe Upsize (non-CIP) - 12" pipe	$ 240	/LF	2,010	$ 482,400
Construction Subtotal				**$ 982,400**
Construction Contingency	20%			$ 196,480
Unaccounted for Items	10%			$ 98,240
Mobilization	3%			$ 29,472
Insurance and Bonds	1%			$ 9,824
SWPPP	1%			$ 9,824
Subtotal				$ **1,326,240**
Land Acquisition	$ 25	/sqft	2,000	$ 50,000
Subtotal				$ **1,376,240**
Engineering, Design, CM Services	30%			$ 412,872
TOTAL				**$ 1,789,112**

Figure 5-3. Proposed Concept for Emergency Intertie with the City of Milwaukie

5.4 Portland Water Bureau

The analysis of an emergency intertie with PWB was limited to a single alternative that matches the general description of a previously existing connection that was abandoned. Although the previous 16-inch diameter steel pipe is still in existence, the condition and ability to reuse the pipeline is unknown. A portion of the old pipeline was removed during the construction of Highway 224. The proposed emergency intertie would include a 12-inch diameter pipeline along Linnwood Road to connect to an existing PWB transmission main in Harvey and Clatsop Roads. The interconnecting pipeline would cross under Kellogg Creek near an abandoned pump station within the City of Milwaukie at the intersection of Where Else Lane and Bowman Street. The connection to the District's system would be located along Aldercrest Road. A new 35 horsepower pump station will be needed to boost the pressure before entering the District's Lower Zone. Trenchless pipeline construction is anticipated to be required for the crossing of Highway 224 and for Kellogg Creek. Upsizing of the existing 6-inch and 8-inch diameter water main on Aldercrest to a 12-inch diameter pipeline will be required to convey water to Valley View. A conceptual description of the intertie locations, including the required piping alignment, is provided in Figure 5-4. An itemized cost estimate is provided in Table 5-3.

PWB indicated that there is sufficient capacity within their system to provide the desired 2.7 MGD during maximum day demand conditions. Due to the significantly higher capital cost for the PWB intertie alternative as compared to Milwaukie and CRW, further discussions with the PWB were not pursued by the District.

Table 5-3. Itemized Cost Estimate for Emergency Intertie with the Portland Water Bureau

Item	Unit Cost	Unit	Qty	Cost
Prefabricated Pump Station - 35 hp	$ 500,000	EA	1	$ 500,000
New Pipe - 10" pipe	$ 200	/LF	18000	$ 3,600,000
OLWSD Pipe Upsize (non-CIP) - 12" pipe	$ 240	/LF	2200	$ 528,000
OLWSD Pipe Upsize (CIP) - 8" pipe to 12" pipe	$ 40	/LF	3290	$ 131,600
Construction Subtotal				**$ 4,759,600**
Construction Contingency	20%			$ 951,920
Unaccounted for Items	10%			$ 475,960
Mobilization	3%			$ 142,788
Insurance and Bonds	1%			$ 47,596
SWPPP	1%			$ 47,596
Subtotal				**$ 6,425,460**
Land Acquisition	$ 25	/sq ft	0	$ -
Subtotal				**$ 6,425,460**
Engineering Services	30%			$ 1,927,638
TOTAL				**$ 8,353,098**

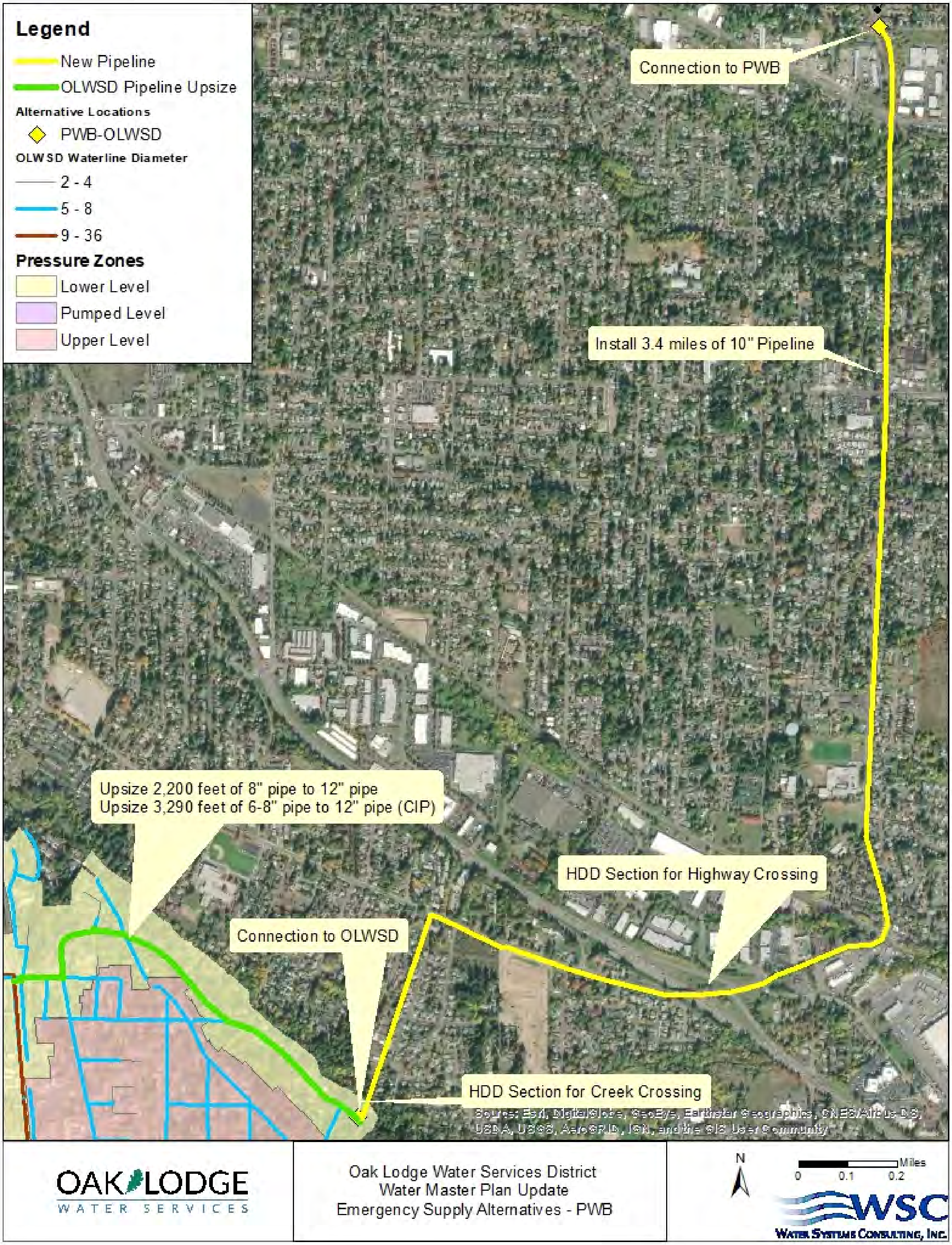

Figure 5-4. Proposed Concept for Emergency Intertie with the Portland Water Bureau

5.5 Portable Pump Station Hybrid Option

The top two alternatives, CRW and Milwaukie, may be combined into a hybrid alternative using a portable pump station. The CRW and Milwaukie alternatives require nearly identical pump sizes which lends the possibility of a single trailer mounted pumping station that could be mobilized to either of the locations in an emergency. Although a portable pump station is anticipated to be slightly more expensive than a prepackaged booster pump station due the customized design and fabrication required, there are the following significant savings:

- No building is required at either site
- Only one set of pumps is required for purchase and to maintain
- Diesel driven pumps can be used to eliminate permanent power supply or standby generator
- Property acquisition can be minimized if not eliminated

To allow rapid mobilization during an emergency, site improvements would include hard piping for pump suction and discharge, valve modifications to existing buried pipelines, and sufficient space and surfacing to allow the trailer mounted station to be placed into position. A single pump and connective piping can likely be transported on a large trailer with dimensions of approximately 8 feet in width and 25 to 30 feet in length. The exact spatial requirements will be influenced by the piping configurations at each of the potential sites and could require 40 to 50 feet in length and 20 to 30 feet in width at a minimum. Additional space may be required to account for maneuvering trailers into position, piping assembly, and flow metering. Installation could likely be completed in 1 day, excluding any extensive cleaning, disinfection, or testing requirements.

The District would need to consider where a unit could be stored securely and protected from excessive exposure, and annual training and trial installations are recommended to keep operations staff familiar with the installation and to test equipment functionality. Additional capital improvements could be performed at the Valley View facility to create a permanent testing and training installation site with similar configuration to field locations. It may also be possible to configure the testing location so that the portable pump station could also serve as a backup to the Valley View Booster Pump Station.

An example of a portable pump station designed for emergency deployment by the Tualatin Valley Water District (TVWD) is provided in Figure 5-4. The TVWD portable station includes two 5 MGD capacity pumps, each mounted on a separate 8-foot wide by 30-foot long trailer. Each trailer is also equipped to store and convey the connection fittings required for a hard-piped suction and discharge manifold to connect to the distribution system. The photo provided below is taken at a testing facility constructed by the District at a reservoir site that allows the installation to be setup and tested once a year for several days to check functionality and to train operators in installation procedures.

Figure 5-5. Example of Portable Trailer-Mounted Pump Station from TVWD

A hybrid estimate was developed to compare the cost of constructing two permanent emergency intertie pump stations as compared to a single trailer-mounted portable pump station that could be deployed at either location. Given the level of accuracy expected for a conceptual level design, the estimated costs for a portable pump station is effectively equal to the construction of a permanent station for each of the Milwaukie and CRW interties. An itemized estimate of the cost of the hybrid alternative is provided in Table 5-4.

Table 5-4. Itemized Cost Estimate for Portable Emergency Intertie Pump Station at CRW and Milwaukie

Item	Unit Cost	Unit	Qty	Cost
Trailer Mounted Pump Station - 35 hp	$ 600,000	EA	1	$ 600,000
Plumb Sites for Trailer Mounted Station	$ 150,000	EA	2	$ 300,000
Plumb Test Site at Valley View	$ 100,000	EA	1	$ 100,000
OLWSD Pipe Upsize (non-CIP) - 12" pipe	$ 240	/LF	2010	$ 482,400
Isolation Valve – 24-inch Supply Pipe	$ 100,000	EA	1	$ 100,000
Construction Subtotal				**$ 1,582,400**
Construction Contingency	20%			$ 316,480
Unaccounted for Items	10%			$ 158,240
Mobilization	3%			$ 47,472
Insurance and Bonds	1%			$ 15,824
SWPPP	1%			$ 15,824
Subtotal				**$ 2,136,240**
Land Acquisition	$ 25	/sq ft	2000	$ 50,000
Seismic Study	$ 100,000	EA	1	$ 100,000
Subtotal				**$ 2,286,240**
Engineering Services	30%			$ 685,872
TOTAL				**$ 2,972,112**

6 RECOMMENDATIONS AND NEXT STEPS

Based on the screening evaluation and analysis of alternatives for emergency interties that could provide water service to the District, connections with both Milwaukie and CRW appear to be preferred and would give the District multiple options in an emergency. The cost of constructing both interties would be approximately $3.0M. A portable trailer-mounted pump station that could provide emergency supply from either CRW or the City of Milwaukie also appears to be a viable alternative and would cost approximately $3.0M. The true costs of each alternative could vary based on siting, permitting, and other factors that are not known at this time.

WSC recommends proceeding with a preliminary design for both permanent intertie pump stations at each location and a portable pump station that could be deployed to either intertie location to determine more accurate cost estimates for each alternative. The preliminary design would include the following activities:

- Confirmation of available capacity from Milwaukie, CRW, and PWB wheeled through the CRW system
- Development of term sheets with each agency partner to determine costs for water supply during emergencies, standby charges (if any), and any cost sharing for operations and maintenance or capital costs for construction and installation
- Identification of feasible sites and the necessary property acquisition required for pump stations and connection points
- Identification of any permitting requirements
- Seismic design criteria and plans for mitigating risks in existing infrastructure required to convey emergency water to the District

WSC recommends that work commence as soon as possible to commence preliminary design of the alternatives so that a preferred project can be recommended. Upon approval of the preferred project, detailed design should commence so that construction bid documents can be developed for the construction of the much needed emergency interties.

Another step that should be considered is to evaluate and apply for grant funding that could be used to finance the project. Programs such as the Federal Emergency Management Agency Pre-Disaster Mitigation Fund provide funding for projects that improve the resilience of water systems and communities in the aftermath of a seismic event.

Appendix D. Annual Water Quality Report (2018)

ANNUAL WATER QUALITY REPORT

WATER TESTING PERFORMED IN 2018

Presented By

OAK LODGE
WATER SERVICES

PWS ID#: 4101512

Our Mission Continues

Oak Lodge Water Services is pleased to present our annual water quality report covering all testing performed between January 1 and December 31, 2018. Over the years, Oak Lodge has dedicated ourselves to producing drinking water that meets all state and federal standards. We continually strive to adopt new methods for delivering the best-quality drinking water to you. As new challenges to drinking water safety emerge, we remain vigilant in meeting the goals of source water protection, water conservation, community outreach and education, while continuing to serve the needs of all our water users.

Please remember that we are always available should you ever have any questions or concerns about your water. For more information about this report, or for any questions relating to your drinking water, please call Marty Guenther, Pollution Prevention Specialist, at (503) 753-9689.

Source Water Assessment

A Source Water Assessment Plan (SWAP) is now available at our office. This plan is an assessment of the delineated area around our listed sources through which contaminants, if present, could migrate and reach our source water. It also includes an inventory of potential sources of contamination within the delineated area, and a determination of the water supply's susceptibility to contamination by the identified potential sources.

According to the Source Water Assessment Plan, potential contaminants to our water system were identified and ranked by risks, which range from low to high depending on the category. If you would like to review the Source Water Assessment Plan, please feel free to contact our office during regular office hours.

"We remain vigilant in delivering the best-quality drinking water"

Important Health Information

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The U.S. EPA/CDC (Centers for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791 or http://water.epa.gov/drink/hotline.

Substances That Could Be in Water

To ensure that tap water is safe to drink, the U.S. EPA prescribes regulations limiting the amount of certain contaminants in water provided by public water systems. U.S. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of these contaminants does not necessarily indicate that the water poses a health risk.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals, in some cases, radioactive material, and substances resulting from the presence of animals or from human activity. Substances that may be present in source water include: Microbial Contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, or wildlife; Inorganic Contaminants, such as salts and metals, which can be naturally occurring or may result from urban storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming; Pesticides and Herbicides, which may come from a variety of sources such as agriculture, urban storm-water runoff, and residential uses; Organic Chemical Contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production and may also come from gas stations, urban storm-water runoff, and septic systems; Radioactive Contaminants, which can be naturally occurring or may be the result of oil and gas production and mining activities.

For more information about contaminants and potential health effects, call the U.S. EPA's Safe Drinking Water Hotline at (800) 426-4791.

Community Participation

You are invited to participate in our public forum and voice your concerns about your drinking water. The Board of Directors holds regular public meetings on the third Tuesday of each month, beginning at 6 p.m. at the Oak Lodge Water Services office, 14496 SE River Road, Oak Grove. Interested members of the public are encouraged to attend. Please call (503) 654-7765 or visit our website, www.oaklodgewaterservices.org, for further information.

How is My Water Treated and Purified?

Oak Lodge Water Services customers receive their water from the North Clackamas County Water Commission (NCCWC). The South Fork Water Board, with its conventional water treatment, also serves as a backup supply to the NCCWC. The NCCWC began using slow sand filtration in August 1999 and added membrane filtration processes in 2005.

The slow sand filtration process operates as follows: Untreated water is pumped onto four half-acre beds. As the water is passed down through the filter media, the top six inches of sand at the surface provide an area where pathogenic organisms are trapped or ingested by nonpathogenic organisms. This treatment zone is known as the zoogleal mass that filters out particles and helps break down organic matter. Chlorine is added to the filtered water as a follow-up treatment measure to disinfect any pathogenic organisms that may have passed through the filter media. An adequate amount of chlorine is added to provide a detectable residual throughout the distribution system.

Membrane filtration processes operate as follows: Raw water flows from the river into a cell where the filters are submerged. Each filter cell has 288 membrane modules, and each module has 9,500 individual hollow fibers. The flow is drawn through the walls of the membrane fibers by vacuum to the inside of the fiber by a pump. After the membranes have filtered a predetermined flow, the water goes through a backwash procedure for cleaning. The backwash procedure is a process where water and air is used to scour the particles that have accumulated on the fibers. This water is then chlorinated and combined, at most times, with the water from the slow sand filters.

The water from South Fork Water Board is treated in the following conventional fashion: Water is pumped to a basin where alum and polymer are added to the raw water as coagulants. The water then enters hydraulic flocculators and goes to a sedimentation basin where the floc settles. The supernatant water is collected in weirs and sent to rapid filters. The filtered water is then chlorinated and provided to the NCCWC on an as-needed basis.

Information on the Internet

The U.S. EPA (https://goo.gl/TFAMKc) and the Centers for Disease Control and Prevention (www.cdc.gov) websites provide a substantial amount of information on many issues relating to water resources, water conservation, and public health. Also, the Oregon Health Authority has a website (https://goo.gl/EQPb3C) that provides complete and current information on water issues in Oregon, including valuable information about our watershed.

Where Does My Water Come From?

Oak Lodge Water Services withdraws water from the Clackamas River. The Clackamas River is an extremely high-quality raw water source. The Clackamas River watershed covers almost 1,000 square miles, mostly located in Clackamas County, Oregon. Timothy Lake and Ollalie Lake make up the headwaters of the Clackamas River, and many tributary streams contribute to the flow of the river. Drinking water for Oak Lodge Water Services is produced by three treatment techniques: slow sand filtration, conventional filtration, and membrane filtration. The Allen F. Herr Water Treatment Facility began production in August 1999. Oak Lodge Water Services, Sunrise Water Authority, and the City of Gladstone --- known as the North Clackamas County Water Commission (NCCWC) --- jointly own the slow sand and membrane filtration systems. Water is occasionally received from the South Fork Water Board's conventional treatment plant facility. The South Fork Water Board's treatment facility was constructed in 1958 and started providing water to Oak Lodge customers in 2002. The South Fork Water Board's plant is used primarily as a backup supply.

The Commission added membrane filtration in 2005. Membrane filtration is a state-of-the-art treatment technique that filters water through a series of small tubes with openings one micron in size. This ultra-filtered water allows for a continuous supply of water, even when the turbidity of raw water rises in the winter months.

Approximately 100 miles of water mains make up the distribution system that carries water to Oak Lodge customers. The district has four reservoirs with a combined storage of 15.6 million gallons.

Testing for *Cryptosporidium*

Cryptosporidium is a microbial parasite found in surface water throughout the U.S. Although filtration removes *Cryptosporidium*, the most commonly used filtration methods cannot guarantee 100 percent removal. Monitoring of source water and/or finished water indicates the presence of these organisms. Current test methods do not allow us to determine if the organisms are dead or if they are capable of causing disease. Symptoms of infection include nausea, diarrhea, and abdominal cramps. Most healthy individuals can overcome the disease within a few weeks. However, immunocompromised people are at greater risk of developing life-threatening illness. We encourage immunocompromised individuals to consult their doctor regarding appropriate precautions to take to avoid infection. *Cryptosporidium* must be ingested to cause disease, and it may be spread through means other than drinking water.

Lead in Home Plumbing

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. We are responsible for providing high-quality drinking water, but we cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at (800) 426-4791 or at www.epa.gov/safewater/lead.

How Long Can I Store Drinking Water?

The disinfectant in drinking water will eventually dissipate, even in a closed container. If that container housed bacteria prior to filling up with the tap water, the bacteria may continue to grow once the disinfectant has dissipated. Some experts believe that water could be stored up to six months before needing to be replaced. Refrigeration will help slow the bacterial growth.

What's a Cross-connection?

Cross-connections that contaminate drinking water distribution lines are a major concern. A cross-connection is formed at any point where a drinking water line connects to equipment (boilers), systems containing chemicals (air conditioning systems, fire sprinkler systems, irrigation systems), or water sources of questionable quality. Cross-connection contamination can occur when the pressure in the equipment or system is greater than the pressure inside the drinking water line (back-pressure). Contamination can also occur when the pressure in the drinking water line drops due to fairly routine occurrences (main breaks, heavy water demand), causing contaminants to be sucked out from the equipment and into the drinking water line (back-siphonage).

Outside water taps and garden hoses tend to be the most common sources of cross-connection contamination at home. The garden hose creates a hazard when submerged in a swimming pool or when attached to a chemical sprayer for weed killing. Garden hoses that are left lying on the ground may be contaminated by fertilizers, cesspools, or garden chemicals. Improperly installed valves in your toilet could also be a source of cross-connection contamination.

Community water supplies are continuously jeopardized by cross-connections unless appropriate valves, known as backflow prevention devices, are installed and maintained. We have surveyed industrial, commercial, and institutional facilities in the service area to make sure that potential cross-connections are identified and eliminated or protected by a backflow preventer. We also inspect and test backflow preventers to make sure that they provide maximum protection.

For more information on backflow prevention contact the Safe Drinking Water Hotline at (800) 426-4791.

Test Results

The water we deliver must meet specific health standards, so our water is monitored for many different kinds of substances on a very strict sampling schedule. Here, we only show those substances that were detected in our water between January 1 and December 31, 2018 (a complete list of all our analytical results is available upon request). Remember that detecting a substance does not mean the water is unsafe to drink; our goal is to keep all detects below their respective maximum allowed levels.

The State recommends monitoring for certain substances less than once per year because the concentrations of these substances do not change frequently. In these cases, the most recent sample data are included, along with the year in which the sample was taken.

REGULATED SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	MCL [MRDL]	MCLG [MRDLG]	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Barium (ppm)	2018	2	2	0.002	0.002-0.002 -	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Chlorine (ppm)	2018	[4]	[4]	1.11	0.21–1.11	No	Water additive used to control microbes
Fecal coliform and *E. coli* (# positive samples)	2018	A routine sample and a repeat sample are total coliform positive, and one is also fecal coliform or *E. coli* positive	0	0	NA	No	Human and animal fecal waste
Haloacetic Acids [HAAs] (ppb)	2018	60	NA	44	12–44	No	By-product of drinking water disinfection
Nitrate [as Nitrogen] (ppm)	2018	10	10	0.190	0.190-0.190 -	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
TTHMs [Total Trihalomethanes] (ppb)	2018	80	NA	50	19–50	No	By-product of drinking water disinfection
Total Coliform Bacteria (Positive samples)	2018	TT	NA	0	NA	No	Naturally present in the environment

Tap Water Samples Collected for Copper and Lead Analyses from Sample Sites throughout the Community

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AL	MCLG	AMOUNT DETECTED (90TH %ILE)	SITES ABOVE AL/TOTAL SITES	VIOLATION	TYPICAL SOURCE
Copper (ppm)	2017	1.3	1.3	0.006	0/60	No	Corrosion of household plumbing systems; Erosion of natural deposits
Lead (ppb)	2017	15	0	None Detected	0/60	No	Lead services lines; Corrosion of household plumbing systems, including fittings and fixtures; Erosion of natural deposits

SECONDARY SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	SMCL	MCLG	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Chloride (ppm)	2018	250	NA	2.4	2.4–2.4	No	Runoff/leaching from natural deposits

UNREGULATED SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AMOUNT DETECTED	RANGE LOW-HIGH	TYPICAL SOURCE
Sodium (ppm)	2018	6.0	6.0–6.0	Naturally occurring

Definitions

90th %ile: The levels reported for lead and copper represent the 90th percentile of the total number of sites tested. The 90th percentile is equal to or greater than 90% of our lead and copper detections.

AL (Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

MCL (Maximum Contaminant Level): The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

MCLG (Maximum Contaminant Level Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG (Maximum Residual Disinfectant Level Goal): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

NA: Not applicable.

ppb (parts per billion): One part substance per billion parts water (or micrograms per liter).

ppm (parts per million): One part substance per million parts water (or milligrams per liter).

SMCL (Secondary Maximum Contaminant Level): These standards are developed to protect aesthetic qualities of drinking water and are not health based.

TT (Treatment Technique): A required process intended to reduce the level of a contaminant in drinking water.

Appendix E. Capital Improvement Project Cost Estimates

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

Opinion of Probable Construction Cost

Mobilization

SWPPP (per LF)

Traffic Control (per Day)

Subtotal

Construction Contingency

Construction Total

Project Development

Project Cost

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

C- 1

Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1400	S.Y.	$9.74	$13,636
Hauling Pavement	194	L.C.Y.	$6.62	$1,284
Pavement Repair	189	Ton	$250.00	$47,250
Shoring	24200	SF Wall	$0.76	$18,392
Excavation-Trench	971	B.C.Y.	$8.10	$7,865
Pipe Bedding (sand import)	439	L.C.Y.	$34.67	$15,220
Bedding Compaction	439	E.C.Y.	$3.90	$1,712
Native Backfill & Compaction	532	E.C.Y.	$4.32	$2,298
Water Compaction	532	E.C.Y.	$2.55	$1,357
Hauling Excavation	1165	B.C.Y.	$5.31	$6,186
8" Ductile Iron Piping	3025	L.F.	$96.13	$290,793
8" Gate Valve	4	Ea.	$1,300.00	$5,200
8" Tee	1	Ea.	$1,481.77	$1,482
8" 90 Bend	1	Ea.	$872.69	$873
Air Release Valve	3	Ea.	$6,000.00	$18,000
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	3025	L.F.	$1.50	$4,538
Saddle & Tap for Service	48	Ea.	$1,700.00	$81,600

Segment Label	Laterals	Diam in	Depth ft
Aldercrest	48	8	4.0

Mobilization	6%	$32,681
SWPPP (per LF)	$2	$6,050
Traffic Control (per Day)	$500	$6,000
Subtotal		$616,651
Construction Contingency	20%	$123,330
Construction Total		**$739,982**
Project Development	25%	$184,995
Project Cost		**$924,977**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	133	S.Y.	$9.74	$1,295
Hauling Pavement	18	L.C.Y.	$6.62	$119
Pavement Repair	19	Ton	$250.00	$4,750
Shoring	2400	SF Wall	$0.76	$1,824
Excavation-Trench	89	B.C.Y.	$8.10	$721
Pipe Bedding (sand import)	37	L.C.Y.	$34.67	$1,283
Bedding Compaction	37	E.C.Y.	$3.90	$144
Native Backfill & Compaction	52	E.C.Y.	$4.32	$225
Water Compaction	52	E.C.Y.	$2.55	$133
Hauling Excavation	107	B.C.Y.	$5.31	$568
6" Gate Valve	1	Ea.	$3,384.95	$3,385
6" Ductile Iron Piping	300	L.F.	$88.02	$26,406
Pipeline Testing and Disinfection	300	L.F.	$1.50	$450
Saddle & Tap for Service	3	Ea.	$1,700.00	$5,100

Segment Label	Laterals	Diam in	Depth ft
Lisa Lane	3	6	4.0

Mobilization	6%	$2,784
SWPPP (per LF)	$2	$600
Traffic Control (per Day)	$500	$500
Subtotal		$52,607
Construction Contingency	20%	$10,521
Construction Total		**$63,129**
Project Development	25%	$15,782
Project Cost		**$78,911**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	211	S.Y.	$9.74	$2,055
Hauling Pavement	29	L.C.Y.	$6.62	$192
Pavement Repair	30	Ton	$250.00	$7,500
Shoring	3800	SF Wall	$0.76	$2,888
Excavation-Trench	141	B.C.Y.	$8.10	$1,142
Pipe Bedding (sand import)	59	L.C.Y.	$34.67	$2,046
Bedding Compaction	59	E.C.Y.	$3.90	$230
Native Backfill & Compaction	82	E.C.Y.	$4.32	$354
Water Compaction	82	E.C.Y.	$2.55	$209
Hauling Excavation	169	B.C.Y.	$5.31	$897
6" Gate Valve	1	Ea.	$3,384.95	$3,385
6" Ductile Iron Piping	475	L.F.	$88.02	$41,810
Pipeline Testing and Disinfection	475	L.F.	$1.50	$713
Saddle & Tap for Service	7	Ea.	$1,700.00	$11,900

Segment Label	Laterals	Diam in	Depth ft
Marcia Court	7	6	4.0

Mobilization	6%	$4,519
SWPPP (per LF)	$2	$950
Traffic Control (per Day)	$500	$500
Subtotal		$85,056
Construction Contingency	20%	$17,011
Construction Total		**$102,067**
Project Development	25%	$25,517
Project Cost		**$127,584**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	338	S.Y.	$9.74	$3,292
Hauling Pavement	47	L.C.Y.	$6.62	$311
Pavement Repair	48	Ton	$250.00	$12,000
Shoring	6080	SF Wall	$0.76	$4,621
Excavation-Trench	225	B.C.Y.	$8.10	$1,823
Pipe Bedding (sand import)	95	L.C.Y.	$34.67	$3,294
Bedding Compaction	95	E.C.Y.	$3.90	$371
Native Backfill & Compaction	130	E.C.Y.	$4.32	$562
Water Compaction	130	E.C.Y.	$2.55	$332
Hauling Excavation	270	B.C.Y.	$5.31	$1,434
6" Gate Valve	2	Ea.	$3,384.95	$6,770
6" Ductile Iron Piping	760	L.F.	$88.02	$66,895
6" 90 Bend	1	Ea.	$523.40	$523
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	760	L.F.	$1.50	$1,140
Saddle & Tap for Service	12	Ea.	$1,700.00	$20,400

Segment Label	Laterals	Diam in	Depth ft
Ranstad Court	12	6	4.0

Mobilization	6%	$7,966
SWPPP (per LF)	$2	$1,520
Traffic Control (per Day)	$500	$500
Subtotal		$149,390
Construction Contingency	20%	$29,878
Construction Total		**$179,268**
Project Development	25%	$44,817
Project Cost		**$224,085**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	7405	S.Y.	$9.74	$72,125
Hauling Pavement	1029	L.C.Y.	$6.62	$6,812
Pavement Repair	1000	Ton	$250.00	$250,000
Shoring	127960	SF Wall	$0.76	$97,250
Excavation-Trench	5135	B.C.Y.	$8.10	$41,594
Pipe Bedding (sand import)	2319	L.C.Y.	$34.67	$80,400
Bedding Compaction	2319	E.C.Y.	$3.90	$9,044
Native Backfill & Compaction	2816	E.C.Y.	$4.32	$12,165
Water Compaction	2816	E.C.Y.	$2.55	$7,181
Hauling Excavation	6162	B.C.Y.	$5.31	$32,720
8" Ductile Iron Piping	15995	L.F.	$96.13	$1,537,599
8" Gate Valve	57	Ea.	$1,300.00	$74,100
Air Release Valve	8	Ea.	$6,000.00	$48,000
Fire Hydrant Assembly (Furnish and Install)	26	Ea.	$8,500.00	$221,000
Removal of Existing Fire Hydrant	26	Ea.	$500.00	$13,000
Pipeline Testing and Disinfection	15995	L.F.	$1.50	$23,993
Saddle & Tap for Service	279	Ea.	$1,700.00	$474,300

Segment Label	Laterals	Diam in	Depth ft
Oatfield_2	265	8	4.0
Oatfield_3		8	4.0
Oatfield_4	14	8	4.0

Mobilization	6%	$180,077
SWPPP (per LF)	$2	$31,990
Traffic Control (per Day)	$500	$16,500

Subtotal		$2,184,806
Construction Contingency	20%	$436,961
Construction Total		**$2,621,767**
Project Development	25%	$655,442
Project Cost		**$3,277,209**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	147	S.Y.	$9.74	$1,432
Hauling Pavement	20	L.C.Y.	$6.62	$132
Pavement Repair	22	Ton	$250.00	$5,500
Shoring	2760	SF Wall	$0.76	$2,098
Excavation-Trench	94	B.C.Y.	$8.10	$761
Pipe Bedding (sand import)	36	L.C.Y.	$34.67	$1,248
Bedding Compaction	36	E.C.Y.	$3.90	$140
Native Backfill & Compaction	58	E.C.Y.	$4.32	$251
Water Compaction	58	E.C.Y.	$2.55	$148
Hauling Excavation	113	B.C.Y.	$5.31	$600
4" PVC Pressure Pipe AWWA C900	345	L.F.	$10.54	$3,636
4" Gate Valve	1	Ea.	$2,865.20	$2,865
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	345	L.F.	$1.50	$518
Saddle & Tap for Service	3	Ea.	$1,700.00	$5,100

Segment Label	Laterals	Diam in	Depth ft
Round Oaks Court	3	4	4.0

Mobilization	6%	$2,006
SWPPP (per LF)	$2	$690
Traffic Control (per Day)	$500	$500
Subtotal		$38,296
Construction Contingency	20%	$7,659
Construction Total		**$45,956**
Project Development	25%	$11,489
Project Cost		**$57,445**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

F- 1

Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1870	S.Y.	$9.74	$18,214
Hauling Pavement	260	L.C.Y.	$6.62	$1,721
Pavement Repair	252	Ton	$250.00	$63,000
Shoring	32120	SF Wall	$0.76	$24,411
Excavation-Trench	1305	B.C.Y.	$8.10	$10,571
Pipe Bedding (sand import)	596	L.C.Y.	$34.67	$20,663
Bedding Compaction	596	E.C.Y.	$3.90	$2,324
Native Backfill & Compaction	709	E.C.Y.	$4.32	$3,063
Water Compaction	709	E.C.Y.	$2.55	$1,808
Hauling Excavation	1566	B.C.Y.	$5.31	$8,315
12" Ductile Iron Piping	330	L.F.	$150.62	$49,705
8" Ductile Iron Piping	3685	L.F.	$96.13	$354,239
8" Gate Valve	3	Ea.	$1,300.00	$3,900
12" Gate Valve	4	Ea.	$1,800.00	$7,200
12" Tee	2	Ea.	$3,042.18	$6,084
8" 90 Bend	2	Ea.	$872.69	$1,745
12" 90 Bend	1	Ea.	$1,567.84	$1,568
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	5	Ea.	$8,500.00	$42,500
Removal of Existing Fire Hydrant	5	Ea.	$500.00	$2,500
Pipeline Testing and Disinfection	4015	L.F.	$1.50	$6,023
Saddle & Tap for Service	26	Ea.	$1,700.00	$44,200

Segment Label	Laterals	Diam in	Depth ft
Lakewood Drive	5	8	4.0
Lark St and Whitcomb Dr	10	8	4.0
Kellog Lake Apartments	0	8	4.0
Oatfield	8	8	4.0
28th Ave	3	12	4.0

Mobilization	6%	$40,785
SWPPP (per LF)	$2	$8,030
Traffic Control (per Day)	$500	$8,000

Subtotal		$770,557
Construction Contingency	20%	$154,111
Construction Total		**$924,669**
Project Development	25%	$231,167
Project Cost		**$1,155,836**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

F- 2

Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	3378	S.Y.	$9.74	$32,902
Hauling Pavement	469	L.C.Y.	$6.62	$3,105
Pavement Repair	426	Ton	$250.00	$106,500
Shoring	54440	SF Wall	$0.76	$41,374
Excavation-Trench	2487	B.C.Y.	$8.10	$20,145
Pipe Bedding (sand import)	1246	L.C.Y.	$34.67	$43,199
Bedding Compaction	1246	E.C.Y.	$3.90	$4,859
Native Backfill & Compaction	1241	E.C.Y.	$4.32	$5,361
Water Compaction	1241	E.C.Y.	$2.55	$3,165
Hauling Excavation	2985	B.C.Y.	$5.31	$15,850
12" Ductile Iron Piping	6140	L.F.	$150.62	$924,807
8" Ductile Iron Piping	665	L.F.	$96.13	$63,926
8" Gate Valve	2	Ea.	$1,300.00	$2,600
12" Gate Valve	15	Ea.	$1,800.00	$27,000
12" Tee	4	Ea.	$3,042.18	$12,169
12" 90 Bend	2	Ea.	$1,567.84	$3,136
Fire Hydrant Assembly (Furnish and Install)	64	Ea.	$8,500.00	$544,000
Removal of Existing Fire Hydrant	64	Ea.	$500.00	$32,000
Pipeline Testing and Disinfection	6805	L.F.	$1.50	$10,208
12" Cross	2	Ea.	$3,279.94	$6,560
Saddle & Tap for Service	34	Ea.	$1,700.00	$57,800

Mobilization	6%	$117,640
SWPPP (per LF)	$2	$13,610
Traffic Control (per Day)	$500	$7,500

Segment Label	Laterals	Diam in	Depth ft
Torbank Road	15	12	4.0
SE Maple St	5	8	4.0
SE River Road (north-north)	14	12	4.0

Subtotal		$2,197,448
Construction Contingency	20%	$439,490
Construction Total		**$2,636,938**
Project Development	25%	$659,234
Project Cost		**$3,296,172**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

F- 3

Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	185	S.Y.	$9.74	$1,802
Hauling Pavement	26	L.C.Y.	$6.62	$172
Pavement Repair	25	Ton	$250.00	$6,250
Shoring	3200	SF Wall	$0.76	$2,432
Excavation-Trench	128	B.C.Y.	$8.10	$1,037
Pipe Bedding (sand import)	58	L.C.Y.	$34.67	$2,011
Bedding Compaction	58	E.C.Y.	$3.90	$226
Native Backfill & Compaction	70	E.C.Y.	$4.32	$302
Water Compaction	70	E.C.Y.	$2.55	$179
Hauling Excavation	154	B.C.Y.	$5.31	$818
8" Ductile Iron Piping	400	L.F.	$96.13	$38,452
8" Gate Valve	1	Ea.	$1,300.00	$1,300
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	400	L.F.	$1.50	$600
Saddle & Tap for Service	4	Ea.	$1,700.00	$6,800

Segment Label	Laterals	Diam in	Depth ft
SE Vista Sunrise Ct	4	8	4.0

Mobilization	6%	$4,283
SWPPP (per LF)	$2	$800
Traffic Control (per Day)	$500	$1,000
Subtotal		$81,032
Construction Contingency	20%	$16,206
Construction Total		**$97,239**
Project Development	25%	$24,310
Project Cost		**$121,549**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	2044	S.Y.	$9.74	$19,909
Hauling Pavement	284	L.C.Y.	$6.62	$1,880
Pavement Repair	277	Ton	$250.00	$69,250
Shoring	35320	SF Wall	$0.76	$26,843
Excavation-Trench	1418	B.C.Y.	$8.10	$11,486
Pipe Bedding (sand import)	640	L.C.Y.	$34.67	$22,189
Bedding Compaction	640	E.C.Y.	$3.90	$2,496
Native Backfill & Compaction	778	E.C.Y.	$4.32	$3,361
Water Compaction	778	E.C.Y.	$2.55	$1,984
Hauling Excavation	1702	B.C.Y.	$5.31	$9,038
8" Ductile Iron Piping	4415	L.F.	$96.13	$424,414
8" Gate Valve	21	Ea.	$1,300.00	$27,300
8" Tee	13	Ea.	$1,481.77	$19,263
Air Release Valve	10	Ea.	$6,000.00	$60,000
Fire Hydrant Assembly (Furnish and Install)	4	Ea.	$8,500.00	$34,000
Removal of Existing Fire Hydrant	4	Ea.	$500.00	$2,000
Pipeline Testing and Disinfection	4415	L.F.	$1.50	$6,623
Saddle & Tap for Service	82	Ea.	$1,700.00	$139,400

Segment Label	Laterals	Diam in	Depth ft
SE Colina Vista Ave	25	8	4.0
SE Emerald Dr	20	8	4.0
SE Colony Cir	15	8	4.0
SE Clayson Ave	4	8	4.0
SE Jennings	18	8	4.0

Mobilization	6%	$52,886
SWPPP (per LF)	$2	$8,830
Traffic Control (per Day)	$500	$21,500

Subtotal		$1,008,722
Construction Contingency	20%	$201,744
Construction Total		**$1,210,467**
Project Development	25%	$302,617
Project Cost		**$1,513,083**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	495	S.Y.	$9.74	$4,821
Hauling Pavement	69	L.C.Y.	$6.62	$457
Pavement Repair	67	Ton	$250.00	$16,750
Shoring	8560	SF Wall	$0.76	$6,506
Excavation-Trench	343	B.C.Y.	$8.10	$2,778
Pipe Bedding (sand import)	155	L.C.Y.	$34.67	$5,374
Bedding Compaction	155	E.C.Y.	$3.90	$605
Native Backfill & Compaction	188	E.C.Y.	$4.32	$812
Water Compaction	188	E.C.Y.	$2.55	$479
Hauling Excavation	412	B.C.Y.	$5.31	$2,188
8" Ductile Iron Piping	1070	L.F.	$96.13	$102,859
8" Gate Valve	3	Ea.	$1,300.00	$3,900
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	1070	L.F.	$1.50	$1,605
Saddle & Tap for Service	20	Ea.	$1,700.00	$34,000

Segment Label	Laterals	Diam in	Depth ft
Alderway Drive	20	8	4.0

Mobilization	6%	$11,888
SWPPP (per LF)	$2	$2,140
Traffic Control (per Day)	$500	$3,000
Subtotal		$225,068
Construction Contingency	20%	$45,014
Construction Total		**$270,082**
Project Development	25%	$67,521
Project Cost		**$337,603**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	986	S.Y.	$9.74	$9,604
Hauling Pavement	137	L.C.Y.	$6.62	$907
Pavement Repair	134	Ton	$250.00	$33,500
Shoring	17040	SF Wall	$0.76	$12,950
Excavation-Trench	684	B.C.Y.	$8.10	$5,540
Pipe Bedding (sand import)	309	L.C.Y.	$34.67	$10,713
Bedding Compaction	309	E.C.Y.	$3.90	$1,205
Native Backfill & Compaction	375	E.C.Y.	$4.32	$1,620
Water Compaction	375	E.C.Y.	$2.55	$956
Hauling Excavation	821	B.C.Y.	$5.31	$4,360
8" Ductile Iron Piping	2130	L.F.	$96.13	$204,757
8" Gate Valve	9	Ea.	$1,300.00	$11,700
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	2130	L.F.	$1.50	$3,195
Saddle & Tap for Service	42	Ea.	$1,700.00	$71,400

Segment Label	Laterals	Diam in	Depth ft
SE View Acres	38	8	4.0
View Acres	4	8	4.0

Mobilization	6%	$23,964
SWPPP (per LF)	$2	$4,260
Traffic Control (per Day)	$500	$3,500
Subtotal		$368,172
Construction Contingency	20%	$73,634
Construction Total		**$441,806**
Project Development	25%	$110,451
Project Cost		**$552,257**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	857	S.Y.	$9.74	$8,347
Hauling Pavement	120	L.C.Y.	$6.62	$794
Pavement Repair	117	Ton	$250.00	$29,250
Shoring	14800	SF Wall	$0.76	$11,248
Excavation-Trench	594	B.C.Y.	$8.10	$4,811
Pipe Bedding (sand import)	268	L.C.Y.	$34.67	$9,292
Bedding Compaction	268	E.C.Y.	$3.90	$1,045
Native Backfill & Compaction	326	E.C.Y.	$4.32	$1,408
Water Compaction	326	E.C.Y.	$2.55	$831
Hauling Excavation	714	B.C.Y.	$5.31	$3,791
8" Ductile Iron Piping	1850	L.F.	$96.13	$177,841
8" Gate Valve	6	Ea.	$1,300.00	$7,800
8" 90 Bend	1	Ea.	$872.69	$873
Fire Hydrant Assembly (Furnish and Install)	5	Ea.	$8,500.00	$42,500
Removal of Existing Fire Hydrant	5	Ea.	$500.00	$2,500
Pipeline Testing and Disinfection	1850	L.F.	$1.50	$2,775
Saddle & Tap for Service	35	Ea.	$1,700.00	$59,500

Segment Label	Laterals	Diam in	Depth ft
Old Orchard ct	16	8	4.0
SE Glen Echo Ave_2	9	8	4.0
SE Meldrum Ave	10	8	4.0

Mobilization	6%	$21,876
SWPPP (per LF)	$2	$3,700
Traffic Control (per Day)	$500	$3,500

Subtotal		$411,914
Construction Contingency	20%	$82,383
Construction Total		**$494,296**
Project Development	25%	$123,574
Project Cost		**$617,870**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1685	S.Y.	$9.74	$16,412
Hauling Pavement	234	L.C.Y.	$6.62	$1,549
Pavement Repair	223	Ton	$250.00	$55,750
Shoring	28520	SF Wall	$0.76	$21,675
Excavation-Trench	1190	B.C.Y.	$8.10	$9,639
Pipe Bedding (sand import)	555	L.C.Y.	$34.67	$19,242
Bedding Compaction	555	E.C.Y.	$3.90	$2,165
Native Backfill & Compaction	635	E.C.Y.	$4.32	$2,743
Water Compaction	635	E.C.Y.	$2.55	$1,619
Hauling Excavation	1428	B.C.Y.	$5.31	$7,583
12" Ductile Iron Piping	920	L.F.	$150.62	$138,570
8" Ductile Iron Piping	2645	L.F.	$96.13	$254,264
8" Gate Valve	8	Ea.	$1,300.00	$10,400
12" Gate Valve	2	Ea.	$1,800.00	$3,600
8" Tee	5	Ea.	$1,481.77	$7,409
Air Release Valve	2	Ea.	$6,000.00	$12,000
Fire Hydrant Assembly (Furnish and Install)	5	Ea.	$8,500.00	$42,500
Removal of Existing Fire Hydrant	5	Ea.	$500.00	$2,500
Pipeline Testing and Disinfection	3565	L.F.	$1.50	$5,348
8" Cross	1	Ea.	$1,787.16	$1,787
Saddle & Tap for Service	64	Ea.	$1,700.00	$108,800

Segment Label	Laterals	Diam in	Depth ft
SE Hull Ave	48	8	4.0
SE Wilmont St	16	12	4.0

Mobilization	6%	$43,533
SWPPP (per LF)	$2	$7,130
Traffic Control (per Day)	$500	$7,500

Subtotal		$819,995
Construction Contingency	20%	$163,999
Construction Total		**$983,994**
Project Development	25%	$245,999
Project Cost		**$1,229,993**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	2524	S.Y.	$9.74	$24,584
Hauling Pavement	351	L.C.Y.	$6.62	$2,324
Pavement Repair	341	Ton	$250.00	$85,250
Shoring	43640	SF Wall	$0.76	$33,166
Excavation-Trench	1751	B.C.Y.	$8.10	$14,183
Pipe Bedding (sand import)	791	L.C.Y.	$34.67	$27,424
Bedding Compaction	791	E.C.Y.	$3.90	$3,085
Native Backfill & Compaction	960	E.C.Y.	$4.32	$4,147
Water Compaction	960	E.C.Y.	$2.55	$2,448
Hauling Excavation	2102	B.C.Y.	$5.31	$11,162
8" Ductile Iron Piping	5455	L.F.	$96.13	$524,389
8" Gate Valve	16	Ea.	$1,300.00	$20,800
8" Tee	9	Ea.	$1,481.77	$13,336
Air Release Valve	4	Ea.	$6,000.00	$24,000
Fire Hydrant Assembly (Furnish and Install)	8	Ea.	$8,500.00	$68,000
Removal of Existing Fire Hydrant	8	Ea.	$500.00	$4,000
Pipeline Testing and Disinfection	5455	L.F.	$1.50	$8,183
Saddle & Tap for Service	52	Ea.	$1,700.00	$88,400

Segment Label	Laterals	Diam in	Depth ft
SE Maple St_2	19	8	4.0
SE Oak Grove	1	8	4.0
SE Risley	15	8	4.0
SE McLoughlin Blvd	17	8	4.0

Mobilization	6%	$57,533
SWPPP (per LF)	$2	$10,910
Traffic Control (per Day)	$500	$11,000

Subtotal		$1,086,267
Construction Contingency	20%	$217,253
Construction Total		**$1,303,520**
Project Development	25%	$325,880
Project Cost		**$1,629,400**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	2228	S.Y.	$9.74	$21,701
Hauling Pavement	310	L.C.Y.	$6.62	$2,052
Pavement Repair	302	Ton	$250.00	$75,500
Shoring	38480	SF Wall	$0.76	$29,245
Excavation-Trench	1544	B.C.Y.	$8.10	$12,506
Pipe Bedding (sand import)	697	L.C.Y.	$34.67	$24,165
Bedding Compaction	697	E.C.Y.	$3.90	$2,718
Native Backfill & Compaction	847	E.C.Y.	$4.32	$3,659
Water Compaction	847	E.C.Y.	$2.55	$2,160
Hauling Excavation	1853	B.C.Y.	$5.31	$9,839
8" Ductile Iron Piping	4810	L.F.	$96.13	$462,385
8" Gate Valve	16	Ea.	$1,300.00	$20,800
8" Tee	4	Ea.	$1,481.77	$5,927
8" 90 Bend	2	Ea.	$872.69	$1,745
Air Release Valve	3	Ea.	$6,000.00	$18,000
Fire Hydrant Assembly (Furnish and Install)	5	Ea.	$8,500.00	$42,500
Removal of Existing Fire Hydrant	5	Ea.	$500.00	$2,500
Pipeline Testing and Disinfection	4810	L.F.	$1.50	$7,215
8" Cross	2	Ea.	$1,787.16	$3,574
Saddle & Tap for Service	10	Ea.	$1,700.00	$17,000

Mobilization	6%	$45,912
SWPPP (per LF)	$2	$9,620
Traffic Control (per Day)	$500	$7,500

Segment Label	Laterals	Diam in	Depth ft
SE McLoughlin Boulevard (so	9	8	4.0
McLoughlin (south of glen ec	0	8	4.0
Glen Echo (crossing)	0	8	4.0
SE Boardman Ave	0	8	4.0
Hull Ave (crossing)	0	8	4.0
SE McLoughlin Boulevard (so	1	8	4.0
McLoughlin (north of hull)	0	8	4.0

Subtotal		$715,448
Construction Contingency	20%	$143,090
Construction Total		**$858,538**
Project Development	25%	$214,634
Project Cost		**$1,073,172**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	361	S.Y.	$9.74	$3,516
Hauling Pavement	50	L.C.Y.	$6.62	$331
Pavement Repair	49	Ton	$250.00	$12,250
Shoring	6240	SF Wall	$0.76	$4,742
Excavation-Trench	250	B.C.Y.	$8.10	$2,025
Pipe Bedding (sand import)	113	L.C.Y.	$34.67	$3,918
Bedding Compaction	113	E.C.Y.	$3.90	$441
Native Backfill & Compaction	137	E.C.Y.	$4.32	$592
Water Compaction	137	E.C.Y.	$2.55	$349
Hauling Excavation	300	B.C.Y.	$5.31	$1,593
8" Ductile Iron Piping	780	L.F.	$96.13	$74,981
8" Gate Valve	4	Ea.	$1,300.00	$5,200
8" Tee	1	Ea.	$1,481.77	$1,482
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	780	L.F.	$1.50	$1,170
Saddle & Tap for Service	10	Ea.	$1,700.00	$17,000

Segment Label	Laterals	Diam in	Depth ft
SE River Road	10	8	4.0

Mobilization	6%	$8,855
SWPPP (per LF)	$2	$1,560
Traffic Control (per Day)	$500	$1,500
Subtotal		$166,885
Construction Contingency	20%	$33,377
Construction Total		**$200,262**
Project Development	25%	$50,066
Project Cost		**$250,328**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	559	S.Y.	$9.74	$5,445
Hauling Pavement	78	L.C.Y.	$6.62	$516
Pavement Repair	75	Ton	$250.00	$18,750
Shoring	9680	SF Wall	$0.76	$7,357
Excavation-Trench	388	B.C.Y.	$8.10	$3,143
Pipe Bedding (sand import)	175	L.C.Y.	$34.67	$6,067
Bedding Compaction	175	E.C.Y.	$3.90	$683
Native Backfill & Compaction	213	E.C.Y.	$4.32	$920
Water Compaction	213	E.C.Y.	$2.55	$543
Hauling Excavation	466	B.C.Y.	$5.31	$2,474
8" Ductile Iron Piping	1210	L.F.	$96.13	$116,317
8" Gate Valve	6	Ea.	$1,300.00	$7,800
8" 90 Bend	1	Ea.	$872.69	$873
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	1210	L.F.	$1.50	$1,815
Saddle & Tap for Service	24	Ea.	$1,700.00	$40,800

Segment Label	Laterals	Diam in	Depth ft
Harold Ave	6	8	4.0
SE Gordon Street	2	8	4.0
Derry Lane	16	8	4.0

Mobilization	6%	$14,430
SWPPP (per LF)	$2	$2,420
Traffic Control (per Day)	$500	$2,500

Subtotal		$271,879
Construction Contingency	20%	$54,376
Construction Total		**$326,254**
Project Development	25%	$81,564
Project Cost		**$407,818**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	79	S.Y.	$9.74	$769
Hauling Pavement	11	L.C.Y.	$6.62	$73
Pavement Repair	11	Ton	$250.00	$2,750
Shoring	1360	SF Wall	$0.76	$1,034
Excavation-Trench	55	B.C.Y.	$8.10	$446
Pipe Bedding (sand import)	25	L.C.Y.	$34.67	$867
Bedding Compaction	25	E.C.Y.	$3.90	$98
Native Backfill & Compaction	30	E.C.Y.	$4.32	$130
Water Compaction	30	E.C.Y.	$2.55	$77
Hauling Excavation	66	B.C.Y.	$5.31	$350
8" Ductile Iron Piping	170	L.F.	$96.13	$16,342
8" Gate Valve	1	Ea.	$1,300.00	$1,300
8" Tee	2	Ea.	$1,481.77	$2,964
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	170	L.F.	$1.50	$255

Segment Label	Laterals	Diam in	Depth ft
Mcloughlin (crossing at Chest	0	8	4.0
Hydrant 5-8	0	8	4.0

Mobilization	6%	$2,727
SWPPP (per LF)	$2	$340
Traffic Control (per Day)	$500	$0

Subtotal		$50,793
Construction Contingency	20%	$10,159
Construction Total		**$60,951**
Project Development	25%	$15,238
Project Cost		**$76,189**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	202	S.Y.	$9.74	$1,967
Hauling Pavement	28	L.C.Y.	$6.62	$185
Pavement Repair	29	Ton	$250.00	$7,250
Shoring	3600	SF Wall	$0.76	$2,736
Excavation-Trench	136	B.C.Y.	$8.10	$1,102
Pipe Bedding (sand import)	58	L.C.Y.	$34.67	$2,011
Bedding Compaction	58	E.C.Y.	$3.90	$226
Native Backfill & Compaction	78	E.C.Y.	$4.32	$337
Water Compaction	78	E.C.Y.	$2.55	$199
Hauling Excavation	163	B.C.Y.	$5.31	$866
8" Ductile Iron Piping	90	L.F.	$96.13	$8,652
6" Ductile Iron Piping	360	L.F.	$88.02	$31,687
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	450	L.F.	$1.50	$675

Segment Label	Laterals	Diam in	Depth ft
Hydrant 6-11, Hydrant 6-10,	0	6	4.0
McLoughlin Boulevard Crossi	0	8	4.0

Mobilization	6%	$4,170
SWPPP (per LF)	$2	$900
Traffic Control (per Day)	$500	$500
Subtotal		$78,537
Construction Contingency	20%	$15,707
Construction Total		**$94,244**
Project Development	25%	$23,561
Project Cost		**$117,806**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	727	S.Y.	$9.74	$7,081
Hauling Pavement	100	L.C.Y.	$6.62	$662
Pavement Repair	99	Ton	$250.00	$24,750
Shoring	12560	SF Wall	$0.76	$9,546
Excavation-Trench	504	B.C.Y.	$8.10	$4,082
Pipe Bedding (sand import)	227	L.C.Y.	$34.67	$7,870
Bedding Compaction	227	E.C.Y.	$3.90	$885
Native Backfill & Compaction	277	E.C.Y.	$4.32	$1,197
Water Compaction	277	E.C.Y.	$2.55	$706
Hauling Excavation	604	B.C.Y.	$5.31	$3,207
8" Ductile Iron Piping	1570	L.F.	$96.13	$150,924
8" Gate Valve	7	Ea.	$1,300.00	$9,100
8" Tee	3	Ea.	$1,481.77	$4,445
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	1570	L.F.	$1.50	$2,355
Saddle & Tap for Service	29	Ea.	$1,700.00	$49,300

Mobilization	6%	$18,187
SWPPP (per LF)	$2	$3,140
Traffic Control (per Day)	$500	$4,000

Segment Label	Laterals	Diam in	Depth ft
SE River Road (North)	2	8	4.0
SE River Road (south)	23	8	4.0
SE Glen Echo Ave	4	8	4.0

Subtotal		$343,593
Construction Contingency	20%	$68,719
Construction Total		**$412,312**
Project Development	25%	$103,078
Project Cost		**$515,390**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1383	S.Y.	$9.74	$13,470
Hauling Pavement	193	L.C.Y.	$6.62	$1,278
Pavement Repair	178	Ton	$250.00	$44,500
Shoring	22640	SF Wall	$0.76	$17,206
Excavation-Trench	1005	B.C.Y.	$8.10	$8,141
Pipe Bedding (sand import)	493	L.C.Y.	$34.67	$17,092
Bedding Compaction	493	E.C.Y.	$3.90	$1,923
Native Backfill & Compaction	512	E.C.Y.	$4.32	$2,212
Water Compaction	512	E.C.Y.	$2.55	$1,306
Hauling Excavation	1206	B.C.Y.	$5.31	$6,404
12" Ductile Iron Piping	1960	L.F.	$150.62	$295,215
8" Ductile Iron Piping	870	L.F.	$96.13	$83,633
8" Gate Valve	2	Ea.	$1,300.00	$2,600
12" Gate Valve	8	Ea.	$1,800.00	$14,400
8" 90 Bend	1	Ea.	$872.69	$873
12" 90 Bend	1	Ea.	$1,567.84	$1,568
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	9	Ea.	$8,500.00	$76,500
Removal of Existing Fire Hydrant	9	Ea.	$500.00	$4,500
Pipeline Testing and Disinfection	2830	L.F.	$1.50	$4,245
Saddle & Tap for Service	24	Ea.	$1,700.00	$40,800

Mobilization	6%	$38,632
SWPPP (per LF)	$2	$5,660
Traffic Control (per Day)	$500	$5,500

Segment Label	Laterals	Diam in	Depth ft
Kens Court	20	12	4.0
Vineyard Lane	0	8	4.0
SE Vineyard Road (East)	3	12	4.0
Protech Autoworks	1	8	4.0

Subtotal		$725,850
Construction Contingency	20%	$145,170
Construction Total		**$871,020**
Project Development	25%	$217,755
Project Cost		**$1,088,775**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	672	S.Y.	$9.74	$6,545
Hauling Pavement	92	L.C.Y.	$6.62	$609
Pavement Repair	92	Ton	$250.00	$23,000
Shoring	11600	SF Wall	$0.76	$8,816
Excavation-Trench	466	B.C.Y.	$8.10	$3,775
Pipe Bedding (sand import)	211	L.C.Y.	$34.67	$7,315
Bedding Compaction	211	E.C.Y.	$3.90	$823
Native Backfill & Compaction	255	E.C.Y.	$4.32	$1,102
Water Compaction	255	E.C.Y.	$2.55	$650
Hauling Excavation	558	B.C.Y.	$5.31	$2,963
8" Ductile Iron Piping	1450	L.F.	$96.13	$139,389
8" Gate Valve	5	Ea.	$1,300.00	$6,500
8" Tee	1	Ea.	$1,481.77	$1,482
Fire Hydrant Assembly (Furnish and Install)	4	Ea.	$8,500.00	$34,000
Removal of Existing Fire Hydrant	4	Ea.	$500.00	$2,000
Pipeline Testing and Disinfection	1450	L.F.	$1.50	$2,175
Saddle & Tap for Service	42	Ea.	$1,700.00	$71,400

Segment Label	Laterals	Diam in	Depth ft
SE Roethe Rd	7	8	4.0
SE Sandra Ave	9	8	4.0
SE Austin St	26	8	4.0

Mobilization	6%	$18,753
SWPPP (per LF)	$2	$2,900
Traffic Control (per Day)	$500	$2,500

Subtotal		$352,323
Construction Contingency	20%	$70,465
Construction Total		**$422,788**
Project Development	25%	$105,697
Project Cost		**$528,485**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	394	S.Y.	$9.74	$3,838
Hauling Pavement	55	L.C.Y.	$6.62	$364
Pavement Repair	53	Ton	$250.00	$13,250
Shoring	6800	SF Wall	$0.76	$5,168
Excavation-Trench	273	B.C.Y.	$8.10	$2,211
Pipe Bedding (sand import)	123	L.C.Y.	$34.67	$4,264
Bedding Compaction	123	E.C.Y.	$3.90	$480
Native Backfill & Compaction	150	E.C.Y.	$4.32	$648
Water Compaction	150	E.C.Y.	$2.55	$383
Hauling Excavation	328	B.C.Y.	$5.31	$1,742
8" Ductile Iron Piping	850	L.F.	$96.13	$81,711
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	850	L.F.	$1.50	$1,275
Saddle & Tap for Service	11	Ea.	$1,700.00	$18,700

Segment Label	Laterals	Diam in	Depth ft
SE Roethe Rd (west)	11	8	4.0

Mobilization	6%	$9,818
SWPPP (per LF)	$2	$1,700
Traffic Control (per Day)	$500	$1,500
Subtotal		$184,832
Construction Contingency	20%	$36,966
Construction Total		**$221,799**
Project Development	25%	$55,450
Project Cost		**$277,249**

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Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	50	S.Y.	$9.74	$487
Hauling Pavement	7	L.C.Y.	$6.62	$46
Pavement Repair	7	Ton	$250.00	$1,750
Shoring	880	SF Wall	$0.76	$669
Excavation-Trench	34	B.C.Y.	$8.10	$275
Pipe Bedding (sand import)	14	L.C.Y.	$34.67	$485
Bedding Compaction	14	E.C.Y.	$3.90	$55
Native Backfill & Compaction	20	E.C.Y.	$4.32	$86
Water Compaction	20	E.C.Y.	$2.55	$51
Hauling Excavation	41	B.C.Y.	$5.31	$218
8" Ductile Iron Piping	50	L.F.	$96.13	$4,807
6" Ductile Iron Piping	60	L.F.	$88.02	$5,281
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	110	L.F.	$1.50	$165

Segment Label	Laterals	Diam in	Depth ft
Hydrant 1-32	0	8	4.0
Hydrant 3-91	0	6	4.0

Mobilization	6%	$1,943
SWPPP (per LF)	$2	$220
Traffic Control (per Day)	$500	$0

Subtotal		$36,157
Construction Contingency	20%	$7,231
Construction Total		**$43,388**
Project Development	25%	$10,847
Project Cost		**$54,235**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	139	S.Y.	$9.74	$1,354
Hauling Pavement	19	L.C.Y.	$6.62	$126
Pavement Repair	19	Ton	$250.00	$4,750
Shoring	2400	SF Wall	$0.76	$1,824
Excavation-Trench	96	B.C.Y.	$8.10	$778
Pipe Bedding (sand import)	43	L.C.Y.	$34.67	$1,491
Bedding Compaction	43	E.C.Y.	$3.90	$168
Native Backfill & Compaction	53	E.C.Y.	$4.32	$229
Water Compaction	53	E.C.Y.	$2.55	$135
Hauling Excavation	115	B.C.Y.	$5.31	$611
8" Ductile Iron Piping	300	L.F.	$96.13	$28,839
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Pipeline Testing and Disinfection	300	L.F.	$1.50	$450
Saddle & Tap for Service	6	Ea.	$1,700.00	$10,200

Segment Label	Laterals	Diam in	Depth ft
Maple St_2	6	8	4.0

Mobilization	6%	$3,213
SWPPP (per LF)	$2	$600
Traffic Control (per Day)	$500	$500
Subtotal		$60,544
Construction Contingency	20%	$12,109
Construction Total		**$72,653**
Project Development	25%	$18,163
Project Cost		**$90,817**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	162	S.Y.	$9.74	$1,578
Hauling Pavement	22	L.C.Y.	$6.62	$146
Pavement Repair	22	Ton	$250.00	$5,500
Shoring	2800	SF Wall	$0.76	$2,128
Excavation-Trench	112	B.C.Y.	$8.10	$907
Pipe Bedding (sand import)	51	L.C.Y.	$34.67	$1,768
Bedding Compaction	51	E.C.Y.	$3.90	$199
Native Backfill & Compaction	61	E.C.Y.	$4.32	$264
Water Compaction	61	E.C.Y.	$2.55	$156
Hauling Excavation	134	B.C.Y.	$5.31	$712
8" Ductile Iron Piping	350	L.F.	$96.13	$33,646
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	350	L.F.	$1.50	$525
Saddle & Tap for Service	6	Ea.	$1,700.00	$10,200

Segment Label	Laterals	Diam in	Depth ft
SE Vineyard Road (West)	6	8	4.0

Mobilization	6%	$4,700
SWPPP (per LF)	$2	$700
Traffic Control (per Day)	$500	$500
Subtotal		$88,143
Construction Contingency	20%	$17,629
Construction Total		**$105,771**
Project Development	25%	$26,443
Project Cost		**$132,214**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	454	S.Y.	$9.74	$4,422
Hauling Pavement	63	L.C.Y.	$6.62	$417
Pavement Repair	61	Ton	$250.00	$15,250
Shoring	7840	SF Wall	$0.76	$5,958
Excavation-Trench	315	B.C.Y.	$8.10	$2,552
Pipe Bedding (sand import)	142	L.C.Y.	$34.67	$4,923
Bedding Compaction	142	E.C.Y.	$3.90	$554
Native Backfill & Compaction	173	E.C.Y.	$4.32	$747
Water Compaction	173	E.C.Y.	$2.55	$441
Hauling Excavation	378	B.C.Y.	$5.31	$2,007
8" Ductile Iron Piping	980	L.F.	$96.13	$94,207
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	980	L.F.	$1.50	$1,470
Saddle & Tap for Service	15	Ea.	$1,700.00	$25,500

Segment Label	Laterals	Diam in	Depth ft
SE River Drive	15	8	4.0

Mobilization	6%	$10,743
SWPPP (per LF)	$2	$1,960
Traffic Control (per Day)	$500	$2,000
Subtotal		$202,704
Construction Contingency	20%	$40,541
Construction Total		**$243,245**
Project Development	25%	$60,811
Project Cost		**$304,057**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1247	S.Y.	$9.74	$12,146
Hauling Pavement	173	L.C.Y.	$6.62	$1,145
Pavement Repair	169	Ton	$250.00	$42,250
Shoring	21560	SF Wall	$0.76	$16,386
Excavation-Trench	865	B.C.Y.	$8.10	$7,007
Pipe Bedding (sand import)	391	L.C.Y.	$34.67	$13,556
Bedding Compaction	391	E.C.Y.	$3.90	$1,525
Native Backfill & Compaction	474	E.C.Y.	$4.32	$2,048
Water Compaction	474	E.C.Y.	$2.55	$1,209
Hauling Excavation	1038	B.C.Y.	$5.31	$5,512
8" Ductile Iron Piping	2695	L.F.	$96.13	$259,070
8" Gate Valve	6	Ea.	$1,300.00	$7,800
8" Tee	1	Ea.	$1,481.77	$1,482
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	6	Ea.	$8,500.00	$51,000
Removal of Existing Fire Hydrant	6	Ea.	$500.00	$3,000
Pipeline Testing and Disinfection	2695	L.F.	$1.50	$4,043
Saddle & Tap for Service	63	Ea.	$1,700.00	$107,100

Segment Label	Laterals	Diam in	Depth ft
SE Poplar Place	11	8	4.0
Marian Street	31	8	4.0
Woodland Way	21	8	4.0

Mobilization	6%	$32,537
SWPPP (per LF)	$2	$5,390
Traffic Control (per Day)	$500	$5,500

Subtotal		$612,817
Construction Contingency	20%	$122,563
Construction Total		**$735,381**
Project Development	25%	$183,845
Project Cost		**$919,226**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	1405	S.Y.	$9.74	$13,685
Hauling Pavement	195	L.C.Y.	$6.62	$1,291
Pavement Repair	190	Ton	$250.00	$47,500
Shoring	24280	SF Wall	$0.76	$18,453
Excavation-Trench	974	B.C.Y.	$8.10	$7,889
Pipe Bedding (sand import)	440	L.C.Y.	$34.67	$15,255
Bedding Compaction	440	E.C.Y.	$3.90	$1,716
Native Backfill & Compaction	534	E.C.Y.	$4.32	$2,307
Water Compaction	534	E.C.Y.	$2.55	$1,362
Hauling Excavation	1169	B.C.Y.	$5.31	$6,207
8" Ductile Iron Piping	3035	L.F.	$96.13	$291,755
8" Gate Valve	6	Ea.	$1,300.00	$7,800
8" Tee	2	Ea.	$1,481.77	$2,964
8" 90 Bend	3	Ea.	$872.69	$2,618
Air Release Valve	3	Ea.	$6,000.00	$18,000
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	3035	L.F.	$1.50	$4,553
Saddle & Tap for Service	53	Ea.	$1,700.00	$90,100

Segment Label	Laterals	Diam in	Depth ft
River Forest Road Loop	53	8	4.0

Mobilization	6%	$33,627
SWPPP (per LF)	$2	$6,070
Traffic Control (per Day)	$500	$6,000
Subtotal		$634,173
Construction Contingency	20%	$126,835
Construction Total		**$761,008**
Project Development	25%	$190,252
Project Cost		**$951,260**

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Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	447	S.Y.	$9.74	$4,354
Hauling Pavement	62	L.C.Y.	$6.62	$410
Pavement Repair	60	Ton	$250.00	$15,000
Shoring	7720	SF Wall	$0.76	$5,867
Excavation-Trench	310	B.C.Y.	$8.10	$2,511
Pipe Bedding (sand import)	140	L.C.Y.	$34.67	$4,854
Bedding Compaction	140	E.C.Y.	$3.90	$546
Native Backfill & Compaction	170	E.C.Y.	$4.32	$734
Water Compaction	170	E.C.Y.	$2.55	$434
Hauling Excavation	372	B.C.Y.	$5.31	$1,975
8" Ductile Iron Piping	965	L.F.	$96.13	$92,765
8" Gate Valve	1	Ea.	$1,300.00	$1,300
8" 90 Bend	1	Ea.	$872.69	$873
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	965	L.F.	$1.50	$1,448
Saddle & Tap for Service	12	Ea.	$1,700.00	$20,400

Segment Label	Laterals	Diam in	Depth ft
SE Cottonwood	12	8	4.0

Mobilization	6%	$10,288
SWPPP (per LF)	$2	$1,930
Traffic Control (per Day)	$500	$2,000
Subtotal		$194,263
Construction Contingency	20%	$38,853
Construction Total		**$233,115**
Project Development	25%	$58,279
Project Cost		**$291,394**

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Client: Oak Lodge Water District
Project: 2020 Water Master Plan Update
Prepared By: SRS and HEF
Reviewed By: SBD and KLP
Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	528	S.Y.	$9.74	$5,143
Hauling Pavement	73	L.C.Y.	$6.62	$483
Pavement Repair	71	Ton	$250.00	$17,750
Shoring	9120	SF Wall	$0.76	$6,931
Excavation-Trench	366	B.C.Y.	$8.10	$2,965
Pipe Bedding (sand import)	165	L.C.Y.	$34.67	$5,721
Bedding Compaction	165	E.C.Y.	$3.90	$644
Native Backfill & Compaction	201	E.C.Y.	$4.32	$868
Water Compaction	201	E.C.Y.	$2.55	$513
Hauling Excavation	439	B.C.Y.	$5.31	$2,331
8" Ductile Iron Piping	1140	L.F.	$96.13	$109,588
8" Gate Valve	1	Ea.	$1,300.00	$1,300
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	1140	L.F.	$1.50	$1,710
Saddle & Tap for Service	25	Ea.	$1,700.00	$42,500

Segment Label	Laterals	Diam in	Depth ft
SE Cedar Ave	25	8	4.0

Mobilization	6%	$13,347
SWPPP (per LF)	$2	$2,280
Traffic Control (per Day)	$500	$2,500
Subtotal		$251,695
Construction Contingency	20%	$50,339
Construction Total		**$302,034**
Project Development	25%	$75,509
Project Cost		**$377,543**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	463	S.Y.	$9.74	$4,510
Hauling Pavement	64	L.C.Y.	$6.62	$424
Pavement Repair	63	Ton	$250.00	$15,750
Shoring	8000	SF Wall	$0.76	$6,080
Excavation-Trench	321	B.C.Y.	$8.10	$2,600
Pipe Bedding (sand import)	145	L.C.Y.	$34.67	$5,027
Bedding Compaction	145	E.C.Y.	$3.90	$566
Native Backfill & Compaction	176	E.C.Y.	$4.32	$760
Water Compaction	176	E.C.Y.	$2.55	$449
Hauling Excavation	385	B.C.Y.	$5.31	$2,044
8" Ductile Iron Piping	1000	L.F.	$96.13	$96,130
8" Gate Valve	2	Ea.	$1,300.00	$2,600
8" 90 Bend	1	Ea.	$872.69	$873
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	1000	L.F.	$1.50	$1,500
Saddle & Tap for Service	15	Ea.	$1,700.00	$25,500

Segment Label	Laterals	Diam in	Depth ft
Thornton Drive	15	8	4.0

Mobilization	6%	$11,329
SWPPP (per LF)	$2	$2,000
Traffic Control (per Day)	$500	$2,000
Subtotal		$213,582
Construction Contingency	20%	$42,716
Construction Total		**$256,298**
Project Development	25%	$64,074
Project Cost		**$320,372**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	144	S.Y.	$9.74	$1,403
Hauling Pavement	20	L.C.Y.	$6.62	$132
Pavement Repair	20	Ton	$250.00	$5,000
Shoring	2480	SF Wall	$0.76	$1,885
Excavation-Trench	100	B.C.Y.	$8.10	$810
Pipe Bedding (sand import)	45	L.C.Y.	$34.67	$1,560
Bedding Compaction	45	E.C.Y.	$3.90	$176
Native Backfill & Compaction	55	E.C.Y.	$4.32	$238
Water Compaction	55	E.C.Y.	$2.55	$140
Hauling Excavation	120	B.C.Y.	$5.31	$637
8" Ductile Iron Piping	310	L.F.	$96.13	$29,800
8" Gate Valve	1	Ea.	$1,300.00	$1,300
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	310	L.F.	$1.50	$465
Saddle & Tap for Service	5	Ea.	$1,700.00	$8,500

Segment Label	Laterals	Diam in	Depth ft
SE Diamond Lane	5	8	4.0

Mobilization	6%	$3,663
SWPPP (per LF)	$2	$620
Traffic Control (per Day)	$500	$500
Subtotal		$68,881
Construction Contingency	20%	$13,776
Construction Total		**$82,657**
Project Development	25%	$20,664
Project Cost		**$103,321**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	694	S.Y.	$9.74	$6,760
Hauling Pavement	96	L.C.Y.	$6.62	$636
Pavement Repair	94	Ton	$250.00	$23,500
Shoring	12000	SF Wall	$0.76	$9,120
Excavation-Trench	481	B.C.Y.	$8.10	$3,896
Pipe Bedding (sand import)	217	L.C.Y.	$34.67	$7,523
Bedding Compaction	217	E.C.Y.	$3.90	$846
Native Backfill & Compaction	264	E.C.Y.	$4.32	$1,140
Water Compaction	264	E.C.Y.	$2.55	$673
Hauling Excavation	577	B.C.Y.	$5.31	$3,064
8" Ductile Iron Piping	1500	L.F.	$96.13	$144,195
8" Gate Valve	4	Ea.	$1,300.00	$5,200
8" 90 Bend	2	Ea.	$872.69	$1,745
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	2	Ea.	$8,500.00	$17,000
Removal of Existing Fire Hydrant	2	Ea.	$500.00	$1,000
Pipeline Testing and Disinfection	1500	L.F.	$1.50	$2,250
Saddle & Tap for Service	26	Ea.	$1,700.00	$44,200

Segment Label	Laterals	Diam in	Depth ft
SE Sierra Vista Drive	26	8	4.0

Mobilization	6%	$16,725
SWPPP (per LF)	$2	$3,000
Traffic Control (per Day)	$500	$3,000
Subtotal		$315,411
Construction Contingency	20%	$63,082
Construction Total		**$378,493**
Project Development	25%	$94,623
Project Cost		**$473,117**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	204	S.Y.	$9.74	$1,987
Hauling Pavement	28	L.C.Y.	$6.62	$185
Pavement Repair	28	Ton	$250.00	$7,000
Shoring	3520	SF Wall	$0.76	$2,675
Excavation-Trench	141	B.C.Y.	$8.10	$1,142
Pipe Bedding (sand import)	64	L.C.Y.	$34.67	$2,219
Bedding Compaction	64	E.C.Y.	$3.90	$250
Native Backfill & Compaction	77	E.C.Y.	$4.32	$333
Water Compaction	77	E.C.Y.	$2.55	$196
Hauling Excavation	169	B.C.Y.	$5.31	$897
8" Ductile Iron Piping	440	L.F.	$96.13	$42,297
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	440	L.F.	$1.50	$660
Saddle & Tap for Service	11	Ea.	$1,700.00	$18,700

Segment Label	Laterals	Diam in	Depth ft
SE Britton Ave	11	8	4.0

Mobilization	6%	$5,409
SWPPP (per LF)	$2	$880
Traffic Control (per Day)	$500	$1,000
Subtotal		$101,937
Construction Contingency	20%	$20,387
Construction Total		**$122,325**
Project Development	25%	$30,581
Project Cost		**$152,906**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	250	S.Y.	$9.74	$2,435
Hauling Pavement	35	L.C.Y.	$6.62	$232
Pavement Repair	34	Ton	$250.00	$8,500
Shoring	4320	SF Wall	$0.76	$3,283
Excavation-Trench	173	B.C.Y.	$8.10	$1,401
Pipe Bedding (sand import)	78	L.C.Y.	$34.67	$2,704
Bedding Compaction	78	E.C.Y.	$3.90	$304
Native Backfill & Compaction	95	E.C.Y.	$4.32	$410
Water Compaction	95	E.C.Y.	$2.55	$242
Hauling Excavation	208	B.C.Y.	$5.31	$1,104
8" Ductile Iron Piping	540	L.F.	$96.13	$51,910
8" Gate Valve	1	Ea.	$1,300.00	$1,300
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	540	L.F.	$1.50	$810
Saddle & Tap for Service	7	Ea.	$1,700.00	$11,900

Segment Label	Laterals	Diam in	Depth ft
SE Raintree	7	8	4.0

Mobilization	6%	$5,732
SWPPP (per LF)	$2	$1,080
Traffic Control (per Day)	$500	$1,000
Subtotal		$108,126
Construction Contingency	20%	$21,625
Construction Total		**$129,751**
Project Development	25%	$32,438
Project Cost		**$162,189**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	248	S.Y.	$9.74	$2,416
Hauling Pavement	34	L.C.Y.	$6.62	$225
Pavement Repair	34	Ton	$250.00	$8,500
Shoring	4280	SF Wall	$0.76	$3,253
Excavation-Trench	172	B.C.Y.	$8.10	$1,393
Pipe Bedding (sand import)	78	L.C.Y.	$34.67	$2,704
Bedding Compaction	78	E.C.Y.	$3.90	$304
Native Backfill & Compaction	94	E.C.Y.	$4.32	$406
Water Compaction	94	E.C.Y.	$2.55	$240
Hauling Excavation	206	B.C.Y.	$5.31	$1,094
8" Ductile Iron Piping	535	L.F.	$96.13	$51,430
8" Gate Valve	3	Ea.	$1,300.00	$3,900
8" Tee	1	Ea.	$1,481.77	$1,482
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	535	L.F.	$1.50	$803
Saddle & Tap for Service	3	Ea.	$1,700.00	$5,100

Segment Label	Laterals	Diam in	Depth ft
SE Walta Vista Drive	3	8	4.0

Mobilization	6%	$5,535
SWPPP (per LF)	$2	$1,070
Traffic Control (per Day)	$500	$1,000
Subtotal		$104,466
Construction Contingency	20%	$20,893
Construction Total		**$125,359**
Project Development	25%	$31,340
Project Cost		**$156,699**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Client: Oak Lodge Water District

Project: 2020 Water Master Plan Update

Prepared By: SRS and HEF

Reviewed By: SBD and KLP

Date 5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	551	S.Y.	$9.74	$5,367
Hauling Pavement	77	L.C.Y.	$6.62	$510
Pavement Repair	75	Ton	$250.00	$18,750
Shoring	9520	SF Wall	$0.76	$7,235
Excavation-Trench	382	B.C.Y.	$8.10	$3,094
Pipe Bedding (sand import)	172	L.C.Y.	$34.67	$5,963
Bedding Compaction	172	E.C.Y.	$3.90	$671
Native Backfill & Compaction	210	E.C.Y.	$4.32	$907
Water Compaction	210	E.C.Y.	$2.55	$536
Hauling Excavation	459	B.C.Y.	$5.31	$2,437
8" Ductile Iron Piping	1190	L.F.	$96.13	$114,395
8" Gate Valve	3	Ea.	$1,300.00	$3,900
8" 90 Bend	1	Ea.	$872.69	$873
Fire Hydrant Assembly (Furnish and Install)	3	Ea.	$8,500.00	$25,500
Removal of Existing Fire Hydrant	3	Ea.	$500.00	$1,500
Pipeline Testing and Disinfection	1190	L.F.	$1.50	$1,785
Saddle & Tap for Service	34	Ea.	$1,700.00	$57,800

Segment Label	Laterals	Diam in	Depth ft
SE Torbank	4	8	4.0
SE Lindenbrook	30	8	4.0

Mobilization	6%	$15,073
SWPPP (per LF)	$2	$2,380
Traffic Control (per Day)	$500	$2,000

Subtotal		$283,237
Construction Contingency	20%	$56,647
Construction Total		**$339,884**
Project Development	25%	$84,971
Project Cost		**$424,855**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	51	S.Y.	$9.74	$497
Hauling Pavement	7	L.C.Y.	$6.62	$46
Pavement Repair	7	Ton	$250.00	$1,750
Shoring	880	SF Wall	$0.76	$669
Excavation-Trench	35	B.C.Y.	$8.10	$284
Pipe Bedding (sand import)	16	L.C.Y.	$34.67	$555
Bedding Compaction	16	E.C.Y.	$3.90	$62
Native Backfill & Compaction	19	E.C.Y.	$4.32	$82
Water Compaction	19	E.C.Y.	$2.55	$48
Hauling Excavation	42	B.C.Y.	$5.31	$223
8" Ductile Iron Piping	110	L.F.	$96.13	$10,574
8" Gate Valve	1	Ea.	$1,300.00	$1,300
8" 90 Bend	1	Ea.	$872.69	$873
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	110	L.F.	$1.50	$165

Segment Label	Laterals	Diam in	Depth ft
SE McLoughlin Blvd (dead en	0	8	4.0

Mobilization	6%	$1,568
SWPPP (per LF)	$2	$220
Traffic Control (per Day)	$500	$500
Subtotal		$29,722
Construction Contingency	20%	$5,944
Construction Total		**$35,667**
Project Development	25%	$8,917
Project Cost		**$44,583**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	111	S.Y.	$9.74	$1,081
Hauling Pavement	15	L.C.Y.	$6.62	$99
Pavement Repair	15	Ton	$250.00	$3,750
Shoring	1920	SF Wall	$0.76	$1,459
Excavation-Trench	77	B.C.Y.	$8.10	$624
Pipe Bedding (sand import)	35	L.C.Y.	$34.67	$1,213
Bedding Compaction	35	E.C.Y.	$3.90	$137
Native Backfill & Compaction	42	E.C.Y.	$4.32	$181
Water Compaction	42	E.C.Y.	$2.55	$107
Hauling Excavation	92	B.C.Y.	$5.31	$489
8" Ductile Iron Piping	240	L.F.	$96.13	$23,071
8" Gate Valve	2	Ea.	$1,300.00	$2,600
Pipeline Testing and Disinfection	240	L.F.	$1.50	$360

Segment Label	Laterals	Diam in	Depth ft
Evergreen Street	0	8	4.0

Mobilization	6%	$2,110
SWPPP (per LF)	$2	$480
Traffic Control (per Day)	$500	$500
Subtotal		$40,020
Construction Contingency	20%	$8,004
Construction Total		**$48,025**
Project Development	25%	$12,006
Project Cost		**$60,031**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
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Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	37	S.Y.	$9.74	$360
Hauling Pavement	5	L.C.Y.	$6.62	$33
Pavement Repair	5	Ton	$250.00	$1,250
Shoring	640	SF Wall	$0.76	$486
Excavation-Trench	26	B.C.Y.	$8.10	$211
Pipe Bedding (sand import)	12	L.C.Y.	$34.67	$416
Bedding Compaction	12	E.C.Y.	$3.90	$47
Native Backfill & Compaction	14	E.C.Y.	$4.32	$60
Water Compaction	14	E.C.Y.	$2.55	$36
Hauling Excavation	31	B.C.Y.	$5.31	$165
8" Ductile Iron Piping	80	L.F.	$96.13	$7,690
Fire Hydrant Assembly (Furnish and Install)	1	Ea.	$8,500.00	$8,500
Removal of Existing Fire Hydrant	1	Ea.	$500.00	$500
Pipeline Testing and Disinfection	80	L.F.	$1.50	$120

Segment Label	Laterals	Diam in	Depth ft
McLoughlin	0	8	4.0

Mobilization	6%	$1,192
SWPPP (per LF)	$2	$160
Traffic Control (per Day)	$500	$0
Subtotal		$22,221
Construction Contingency	20%	$4,444
Construction Total		**$26,665**
Project Development	25%	$6,666
Project Cost		**$33,331**

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Client:	Oak Lodge Water District
Project:	2020 Water Master Plan Update
Prepared By:	SRS and HEF
Reviewed By:	SBD and KLP
Date	5/20/2020

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Opinion of Probable Construction Cost

Item Description	Quantity	Units	Unit Cost	Total Item Cost
Sawcut & Remove	909	S.Y.	$9.74	$8,854
Hauling Pavement	126	L.C.Y.	$6.62	$834
Pavement Repair	123	Ton	$250.00	$30,750
Shoring	15720	SF Wall	$0.76	$11,947
Excavation-Trench	631	B.C.Y.	$8.10	$5,111
Pipe Bedding (sand import)	285	L.C.Y.	$34.67	$9,881
Bedding Compaction	285	E.C.Y.	$3.90	$1,112
Native Backfill & Compaction	346	E.C.Y.	$4.32	$1,495
Water Compaction	346	E.C.Y.	$2.55	$882
Hauling Excavation	757	B.C.Y.	$5.31	$4,020
8" Ductile Iron Piping	1965	L.F.	$96.13	$188,895
8" Gate Valve	3	Ea.	$1,300.00	$3,900
8" Tee	1	Ea.	$1,481.77	$1,482
8" 90 Bend	1	Ea.	$872.69	$873
Air Release Valve	1	Ea.	$6,000.00	$6,000
Fire Hydrant Assembly (Furnish and Install)	5	Ea.	$8,500.00	$42,500
Removal of Existing Fire Hydrant	5	Ea.	$500.00	$2,500
Pipeline Testing and Disinfection	1965	L.F.	$1.50	$2,948
Saddle & Tap for Service	24	Ea.	$1,700.00	$40,800

Segment Label	Laterals	Diam in	Depth ft
McLoughlin Blvd, north of Hol	7	8	4.0
Holly Avenue	17	8	4.0

Mobilization	6%	$21,887
SWPPP (per LF)	$2	$3,930
Traffic Control (per Day)	$500	$4,000
Subtotal		$412,839
Construction Contingency	20%	$82,568
Construction Total		**$495,406**
Project Development	25%	$123,852
Project Cost		**$619,258**

*Cost estimates are in 2020 dollars (ENR 20 City Average Construction Cost Index of 11392 for January 2020).

Project	Item	Description	Qty	Units	Price/Unit	Cost	Timing
C7 - Reseal Concrete Domes at Valley View Tanks							
C7	1	Mob/General Conditions	1	LS	$ 4,300.0	$ 5,000	Once every 10 years, not sure when last occurred
	2	Seal Coat Dome	42248	SF	$ 1.00	$ 43,000	
		Subtotal				$ 48,000	
		Contingency/CM/Admin			40%	$ 19,200	
		Total				$ 67,200	
C8 - Recoat Single Tank Exterior and Interior at Valley View							
C8	1	Mob/General Conditions	1	LS	$ 14,500	$ 15,000	Last coated in 2002 and 2013, so plan for 2023-2025, one tank/yr
	2	Coat Tank Exterior	24127.43	SF	$ 6.00	$ 145,000	
	3	Coat Tank Interior	24127.43	SF	$ -	$ -	
		Subtotal				$ 160,000	
		Contingency/CM/Admin			0%	$ -	
		Total				$ 160,000	
C9 - Replace Pump and Motors at Valley View							
C9	1	Mob/General Conditions	1	LS	$ 22,800	$ 23,000	Last replaced 2017; assume every 20 yr
	2	Replace 50 hp Pumps & Motors	3	EA	$ 75,000.00	$ 225,000	
	3	Recoat Pipes	419	SF	$ 6.00	$ 3,000	
		Subtotal				$ 251,000	
		Contingency/CM/Admin			50%	$ 125,500	
		Total				$ 376,500	
C10 - Replace Pump and Motors at View Acres							
C10	1	Mob/General Conditions	1	LS	$ 15,300	$ 16,000	Last replaced 2005; assume every 20 yr
	2	Replace 60 hp Pumps & Motors	1	EA	$ 90,000.00	$ 90,000	
	3	Replace 10 hp Pumps & Motor	2	EA	$ 30,000.00	$ 60,000	
	4	Recoat Pipes	419	SF	$ 6.00	$ 3,000	
		Subtotal				$ 169,000	
		Contingency/CM/Admin			50%	$ 84,500	
		Total				$ 253,500	
C11 - Upgrade SCADA system							
C11	1	Mob/General Conditions	1	LS	$ 1,900	$ 2,000	Cellular modems in 2013, PLC in 2019; assume every 10 yr
	2	Replace PLC	1	LS	$ 9,000.00	$ 9,000	
	3	Replace cellular modems	1	LS	$ 10,000.00	$ 10,000	
		Subtotal				$ 21,000	
		Contingency/CM/Admin			50%	$ 10,500	
		Total				$ 31,500	
C12 - Radio Telemetry							
C12	1	Mob/General Conditions	1	LS	$ 1,500	$ 2,000	Needed now.
	2	Upgrade Radios	4	EA	$ 2,500.00	$ 10,000	
	3	Programming	1	LS	$ 5,000.00	$ 5,000	
		Subtotal				$ 17,000	
		Contingency/CM/Admin			40%	$ 6,800	
		Total				$ 23,800	

Project	Item	Description	Qty	Units	Price/Unit	Cost	Timing
C13 - Rebuild PRVs							
C13	1	Mob/General Conditions	1	LS	$ 1,500	$ 2,000	Assume every 5 yr
	2	Rebuild PRVs	3	EA	$ 5,000.00	$ 15,000	
		Subtotal				$ 17,000	
		Contingency/CM/Admin			40%	$ 6,800	
		Total				$ 23,800	
C14 - Large Meter Testing and Replacement							
C14	1	Test 15% of all meters	20.5	EA	$ 500.00	$ 11,000	Assume 15% are tested/replaced every 3 years
	2	Replace 15% of 3" meters	1.65	EA	$ 1,000.00	$ 2,000	
	3	Replace 15% of 4" meters	3.45	EA	$ 1,500.00	$ 6,000	
	4	Replace 15% of 6" meters	5.1	EA	$ 2,000.00	$ 11,000	
	5	Replace 15% of 8" meters	1.65	EA	$ 3,000.00	$ 5,000	
	6	Replace 15% of 10" meters	0.45	EA	$ 4,000.00	$ 2,000	
		Subtotal				$ 37,000	
		Contingency/CM/Admin			30%	$ 11,100	
		Total				$ 48,100	
C15 - Large Meter Bypass							
C15	1	Add bypass to meters >4"	41	EA	$ 2,000.00	$ 82,000	Needed now.
		Contingency/CM/Admin			30%	$ 24,600	
		Total				$ 106,600	
C16 - Replace 4 1/2" Fire Hydrants							
C16	1	Replace 4 1/2" fire hydrants	49	EA	$ 5,000.00	$ 245,000	Needed now.
		Contingency/CM/Admin			30%	$ 73,500	
		Total				$ 318,500	

Appendix F. System Development Charge Analysis TM

FCS GROUP
Solutions-Oriented Consulting

| Memorandum

To: Scott Duren, PE **Date:** July 2, 2020

From: Wyatt Zimbelman, Senior Analyst
Doug Gabbard, Project Manager
John Ghilarducci, Principal

RE: Oak Lodge Water Services District Water SDC

INTRODUCTION

This section describes the policy context and project scope upon which this memorandum is based.

THE ENGAGEMENT

In 2018, the Oak Lodge Water Services District (District) hired Water Systems Consulting to develop the 2018 Water Master Plan (WMP), with FCS GROUP contracted to perform the financial portion of the greater master planning effort. This report summarizes our opinion of the District's maximum defensible system development charges for the water utility, based on the demand growth projections and capital improvement plan included in the WMP.

SYSTEM DEVELOPMENT CHARGE BACKGROUND

Oregon Revised Statutes (ORS) 223.297 to 223.314 authorize local governments to establish system development charges (SDCs), one-time fees on new development paid at the time of development. SDCs are intended to recover a fair share of the cost of existing and planned facilities that provide capacity to serve future growth.

ORS 223.299 defines two types of SDCs:

- A reimbursement fee designed to recover "costs associated with capital improvements already constructed, or under construction when the fee is established, for which the local government determines that capacity exists"
- An improvement fee designed to recover "costs associated with capital improvements to be constructed"

ORS 223.304(1) states, in part, that a reimbursement fee must be based on "the value of unused capacity available to future system users or the cost of existing facilities" and must account for prior contributions by existing users and any gifted or grant-funded facilities. The calculation must "promote the objective of future system users contributing no more than an equitable share to the cost of existing facilities." A reimbursement fee may be spent on any capital improvement related to the system for which it is being charged (whether cash-financed or debt-financed) and on the costs of compliance with Oregon's SDC law.

ORS 223.304(2) states, in part, that an improvement fee must be calculated to include only the cost of projected capital improvements needed to increase system capacity for future users. In other words, the cost of planned projects that correct existing deficiencies or do not otherwise increase capacity for future users may not be included in the improvement fee calculation. An improvement fee may be spent only on capital improvements (or portions thereof) that increase the capacity of the system for which it is being charged (whether cash-financed or debt-financed) and on the costs of compliance with Oregon's SDC law.

SDC Calculation

This section provides our detailed calculations of the maximum defensible water SDC.

CALCULATION OVERVIEW

In general, SDCs are calculated by adding a reimbursement fee component and an improvement fee component—both with potential adjustments. Each component is calculated by dividing the eligible cost by growth in units of demand. The unit of demand becomes the basis of the charge. **Exhibit 1** shows this calculation in equation format:

Exhibit 1: SDC Equation

$$\frac{\text{Eligible costs of available capacity in existing facilities}}{\text{Units of growth in demand}} + \frac{\text{Eligible costs of capacity-increasing capital improvements}}{\text{Units of growth in demand}} = \text{SDC per unit of growth in demand}$$

Reimbursement Fee

The reimbursement fee is the cost of available capacity per unit of growth that such available capacity will serve. In order for a reimbursement fee to be calculated, unused capacity must be available to serve future growth. For facility types that do not have available capacity, no reimbursement fee may be calculated.

Improvement Fee

The improvement fee is the cost of planned capacity-increasing capital projects per unit of growth that those projects will serve. In reality, the capacity added by many projects serves a dual purpose of both meeting existing demand and serving future growth. To compute a compliant improvement fee, growth-related costs must be isolated, and costs related to meeting current demand must be excluded.

We have used the incremental approach to allocate costs to the improvement fee basis, based on data provided by the District's consulting engineer.

Adjustments

Fund Balance

All accumulated SDC revenue currently available in fund balance is also deducted from its corresponding cost basis. This practice prevents a jurisdiction from double charging for projects that were in the previous methodology's improvement fee cost basis but have not yet been constructed.

The District's practice is to use SDC revenue as the first source of funding for capital projects, and capital expenditures exceeded SDC revenues in both 2018 and 2019. Therefore, the District believes there is no unspent water SDC revenue, and we have not calculated an adjustment.

Compliance Costs

ORS 223.307(5) authorizes the expenditure of SDCs for "the costs of complying with the provisions of ORS 223.297 to 223.314, including the costs of developing system development charge methodologies and providing an annual accounting of system development charge expenditures." To avoid spending monies for compliance that might otherwise have been spent on growth-related projects, this report includes an estimate of compliance costs in the SDC calculation.

GROWTH

The growth calculation is the basis by which an SDC is charged. Growth for each system is measured in units that most directly reflect the source of demand. For water SDCs, the most applicable and administratively feasible unit of growth is the meter capacity equivalent (MCE). For the District, one MCE equals the flow capacity of a 5/8" x 3/4" water meter.

Current Demand

According to the District's records, the water utility had 8,777 customer accounts in 2017. Table 4-1 of the WMP provides the District's projected population growth from 2017 to 2022, which was used to project customer accounts for 2020. Applying the MCE flow factors provided by the American Water Works Association (AWWA), the District has 8,877 customer accounts in 2020 with a combined flow capacity of 13,634 MCEs, as shown in **Exhibit 2**:

Exhibit 2: Estimated 2020 Customer Data

Meter Size	2020 Accounts	MCE Factors	2020 MCEs
5/8"	8,342	1.0	8,342
3/4"	21	1.5	31
1"	224	2.5	560
1 1/2"	123	5.0	613
2"	91	8.0	732
3"	10	16.0	163
4"	21	25.0	529
6"	33	50.0	1,669
8"	10	80.0	762
10"	2	115.0	233
Total	8,877		13,634

Future Demand

Table 4-1 of the District's WMP includes a population growth forecast for the utility through 2037. Assuming that the distribution of meter sizes remains unchanged, and therefore MCEs increase in proportion to population growth, the District will serve 14,272 MCEs in 2037. The growth from 13,634 MCEs in 2020 to 14,272 MCEs in 2037 (i.e., 638 MCEs) is the denominator in the SDC equation (**Exhibit 3**).

Exhibit 3: Customer Growth

Growth Unit	2020	2037	Growth (2020-2037)	Growth Share
Meter Capacity Equivalents	13,634	14,272	638	4.5%

Any estimate of future demand involves uncertainty. Fortunately, the accuracy of this estimate is less important than its derivation from the same process that produced the project list described later. In other words, the defensibility the SDC rests more on the consistency of the growth estimate with the project list than with the accuracy of the growth estimate.

REIMBURSEMENT FEE COST BASIS

The reimbursement fee is the eligible cost of available capacity per unit of growth that such available capacity will serve. Calculation of the reimbursement fee begins with the historical cost of assets or recently completed projects that have unused capacity to serve future users. For each asset or project, the eligible cost is the cost portion of the asset or project that is available to serve future users.

To avoid charging future development for facilities provided at no cost to the District or its ratepayers, the reimbursement fee cost basis must be reduced by any grants or contributions used to fund the assets or projects included in the cost basis. Furthermore, unless a reimbursement fee will be specifically used to pay debt service, the reimbursement fee cost basis should be reduced by any outstanding debt related to the assets or projects included in the cost basis to avoid double charging for assets paid for by debt service in the rates.

The District’s records list $17,586,255 in water fixed assets. We allocated these assets to six categories based on the function of each asset:

- Storage
- Pumping
- Water mains
- Meters and services
- Fire
- General plant

Of these six categories, storage, pumping, and water mains were determined to have available capacity for future users of the system.

Storage

The cost of unused capacity in storage facilities is $2,843,023. The detailed calculation of storage capacity is shown in **Exhibit 4**:

Exhibit 4: Storage Capacity

Storage Facility	Existing Storage	Required Storage	Excess Capacity	% Excess Capacity	Facility Cost	Eligible Cost
Valley View	10.0 MG	6.6 MG	3.4 MG	33.9%	$ 2,428,539	$ 823,275
View Acres	5.6 MG	2.7 MG	2.9 MG	51.3%	$ 3,940,973	$ 2,019,749
Total	15.6 MG	9.3 MG	6.3 MG	44.6%	$ 6,369,512	$ 2,843,023

Pumping

The cost of unused capacity in pumping facilities is $277,156. The detailed calculation of pumping capacity is shown in **Exhibit 5**:

Exhibit 5: Pumping Capacity

Pumping Facility	Firm Capacity	Required Capacity	Excess Capacity	% Excess Capacity	Facility Cost	Eligible Cost
Valley View	2,200 gpm	1,154 gpm	1,046 gpm	47.5%	$ 550,279	$ 261,633
View Acres	1,850 gpm	1,582 gpm	268 gpm	14.5%	$ 107,154	$ 15,523
Total	4,050 gpm	2,736 gpm	1,314 gpm	42.2%	$ 657,433	$ 277,156

Water Mains

Chapter 5.2.1 of the WMP indicates that the District's distribution system has no pressure deficiencies at service connections within the District's service area under future peak hour demands. Because the system is sufficient to serve future demands, the capacity share of the District's water mains is estimated to be equal to the District's growth share of 4.5 percent. By "growth share," we mean that portion of total future demand that will be new.

Reimbursement Fee Cost Calculation

The reimbursement fee cost basis is calculated by multiplying the capacity share of each asset category by the original cost asset value of that category. The detailed calculation is shown in **Exhibit 6:**

Exhibit 6: Reimbursement Fee Cost Basis

Asset Category	Original Cost	Less: Debt Principal	Net Asset Value	Available Capacity	Eligible Cost
Water Mains	$ 7,717,967	$ -	$ 7,717,967	4.5%	$ 345,227
Storage	6,369,512	-	6,369,512	44.6%	2,843,023
Pumping	657,434	-	657,434	42.2%	277,156
Meters & Services	461,838	(1,320,000)	-	0.0%	-
Fire	47,321	-	47,321	0.0%	-
General Plant	2,332,182	-	2,332,182	0.0%	-
Total	$ 17,586,255	$ (1,320,000)	$ 17,124,417	20.2%	$ 3,465,406

IMPROVEMENT FEE COST BASIS

An improvement fee is the eligible cost of planned projects per unit of growth that such projects will serve. The improvement fee cost basis is based on a specific list of planned capacity-increasing capital improvements. The portion of each project that can be included in the improvement fee cost basis is determined by the extent to which each new project creates capacity for future users. **Exhibit 7** shows how a total project cost of $24,050,600 reduces to an eligible cost of $3,219,594.

Exhibit 7: Improvement Fee Cost Basis

ID	Description	Project Cost	SDC Eligible	SDC Eligible Portion of Costs	Timing
C-1	SE Aldercrest Road	$ 885,500	9.7%	$ 85,919	Year 1-3
F-1	SE 28th Avenue, SE Lakewood Drive, Kellogg Lake Apartments	1,099,000	18.3%	201,650	Year 1-3
F-2	SE River Road	3,143,500	19.6%	614,781	Year 4-9
C-2	SE Lisa Lane	67,500	33.0%	22,291	Year 4-9
F-3	SE Vista Sunrise Court	116,400	9.8%	11,361	Year 4-9
C-3	SE Marcia Court	109,700	32.2%	35,295	Year 4-9
F-4	Jennings Avenue, Emerald Drive, Colina Vista Avenue, Clayson Ave	1,453,900	8.6%	125,399	Year 4-9
C-4	SE Ranstad Court and SE Cinderella Court	195,300	28.9%	56,472	Year 4-9
F-5	Alderway Avenue	323,800	33.9%	109,898	Year 10+
C-5	Oatfield	3,169,400	7.9%	249,947	Year 4-9
F-6	View Acres Road	530,600	11.4%	60,498	Year 10+
C-6	Round Oaks Court	56,900	6.4%	3,636	Year 10+
F-7	Old Orchard Court, SE Meldrum Avenue	593,800	15.6%	92,670	Year 10+
F-8	SE Hull Avenue	1,173,800	13.8%	161,414	Year 10+
F-9	McLoughlin Boulevard	1,557,400	9.9%	154,939	Year 10+
F-10	McLoughlin Boulevard	1,021,400	13.4%	136,619	Year 10+
F-11	River Road	240,100	9.2%	22,154	Year 10+
F-12	Harold Avenue, Derry Lane, and Gordon Street	392,000	8.8%	34,368	Year 10+
F-13	McLoughlin Boulevard	73,700	22.2%	16,342	Year 10+
F-14	McLoughlin Boulevard	103,500	39.0%	40,339	Year 10+
F-15	McLoughlin Boulevard, Glen Echo Avenue, River Road	494,600	9.0%	44,593	Year 10+
F-16	Vineyard Road, Vineyard Lane, commercial parking lot, Kens Cour	1,031,800	20.2%	208,541	Year 10+
F-17	Austin Street and Sandra Avenue and Roethe Road	509,600	8.1%	41,184	Year 10+
F-18	SE Roethe Road	266,300	9.1%	24,143	Year 10+
F-19	River Road, Oak Grove Boulevard	51,400	13.0%	6,701	Year 10+
F-20	SE Maple Street	86,900	9.8%	8,521	Year 10+
F-21	Vineyard Road	127,700	7.8%	9,941	Year 10+
F-22	SE River Drive	291,400	9.6%	27,835	Year 10+
F-23	Poplar Place	884,200	11.4%	100,695	Year 10+
F-24	River Forest Road, River Forest Drive, River Forest Court (loop)	911,100	9.5%	86,203	Year 10+
F-25	Cottonwood Court	278,700	9.8%	27,409	Year 10+
F-26	Cedar Avenue	362,800	8.9%	32,379	Year 10+
F-27	Thornton Drive	307,300	33.4%	102,708	Year 10+
F-28	SE Diamond Lane	99,300	32.1%	31,839	Year 10+
F-29	SE Sierra Vista Drive	453,300	9.4%	42,605	Year 10+
F-30	SE Britton Avenue	147,200	22.2%	32,694	Year 10+
F-31	Raintree Court	155,200	9.9%	15,338	Year 10+
F-32	Walta Vista Drive	149,600	10.2%	15,196	Year 10+
F-33	SE Torbank Road and SE Lindenbrook Court	409,300	8.3%	33,800	Year 10+
F-34	McLoughlin Boulevard	43,000	7.3%	3,124	Year 10+
F-35	SE Evergreen Street	56,900	43.3%	24,650	Year 10+
F-36	SE McLoughlin Blvd	32,300	23.8%	7,690	Year 10+
F-37	SE McLoughlin Blvd and Holly Ave	593,500	9.4%	55,812	Year 10+
	Total	*$ 24,050,600*		*$ 3,219,594*	

COMPLIANCE COSTS

Compliance costs are the sum of SDC methodology updates and annual administrative costs. In consultation with District staff, we estimate compliance costs at 1.3 percent of the combined reimbursement fee and improvement fee cost bases.

SDC FUND BALANCE

The District has advised us that it holds no unspent water SDC revenue. Had a fund balance existed, we would have deducted it from the SDC cost basis to avoid double-charging development.

CALCULATED SDC

Dividing the sum of the net cost bases by the projected growth results in the calculated SDC per MCE, as shown in **Exhibit 8**:

Exhibit 8: Water SDC per MCE

Reimbursement Fee Cost Basis	
Reimbursement Fee Cost Basis	$3,465,406
Growth to End of Planning Period	*638 MCEs*
Reimbursement Fee	$5,428
Improvement Fee Cost Basis	
Improvement Fee Cost Basis	$3,219,594
Growth to End of Planning Period	*638 MCEs*
Improvement Fee	$5,043
Total System Development Charge	
Reimbursement Fee	$5,428
Improvement Fee	$5,043
Compliance Fee (1.3%)	$137
Total System Development Charge per MCE	$10,608

SCHEDULE OF SDCS

In order to impose water SDCs on an individual property, the number of MCEs is determined by the size of the property's water meter. The MCE calculation used is based on AWWA flow factors as shown in **Exhibit 9** where one MCE is a 5/8" x 3/4" meter.

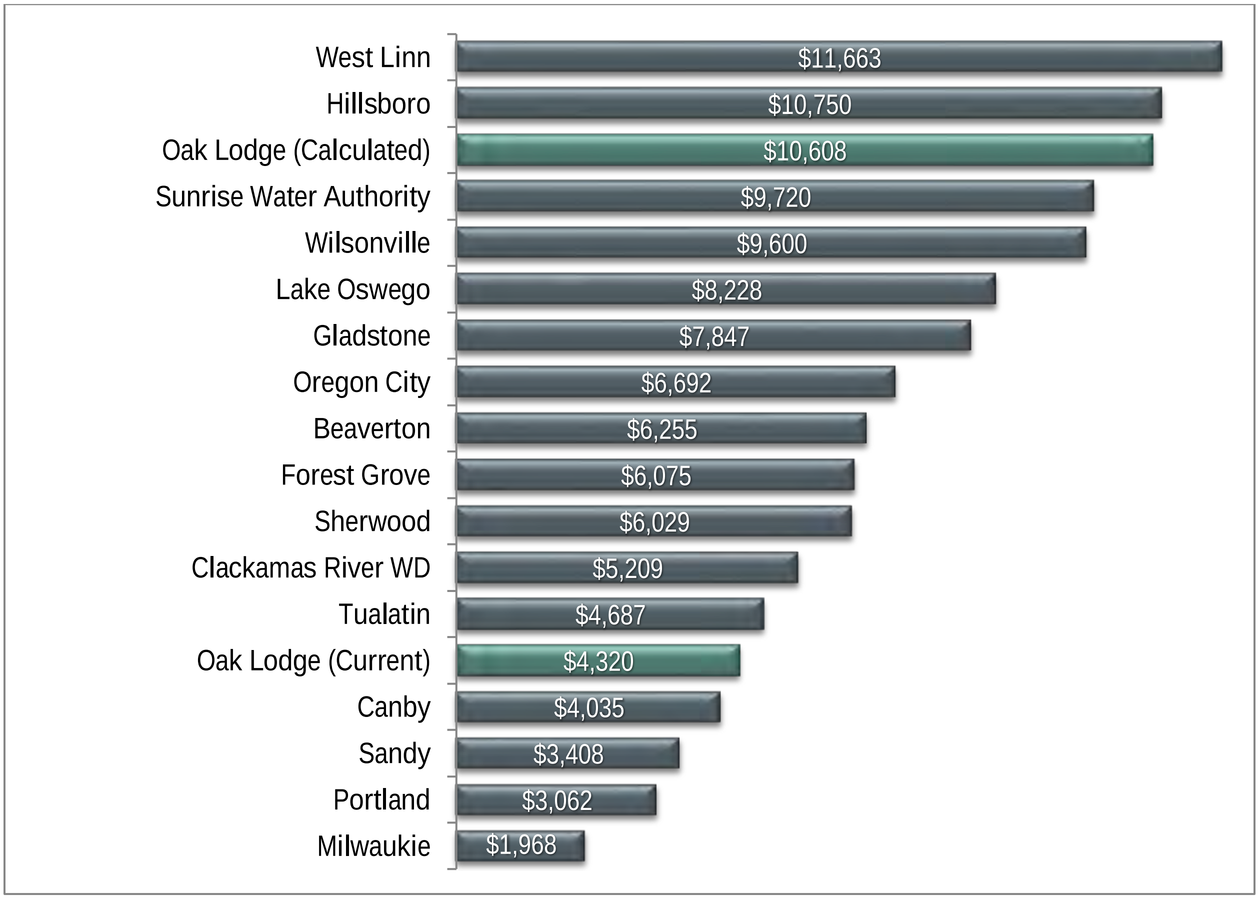
Exhibit 9: Water SDC Schedule

Meter Size	Flow Factor	Calculated SDC	Current SDC	Change
5/8" x 3/4"	1.0	$10,608	$4,320	+$6,288
3/4"	1.5	$15,912	$6,480	+$9,432
1"	2.5	$26,521	$10,800	+$15,721
1 1/2"	5.0	$53,042	$21,595	+$31,447
2"	8.0	$84,867	$34,555	+$50,312
3"	16.0	$169,733	$69,110	+$100,623
4"	25.0	$265,208	$107,985	+$157,223
6"	50.0	$530,416	$215,970	+$314,446
8"	80.0	$848,666	$345,550	+$503,116
10"	115.0	$1,219,958	$496,730	+$723,228

COMPARISONS

Exhibit 10 shows how the District's current and calculated 5/8" x 3/4" water SDCs compare with SDCs adopted by other water utilities.

Exhibit 10: Regional Comparison



SDC IMPLEMENTATION

FUNDING PLAN

The SDCs calculated in this report represent our opinion of the maximum water SDCs that the District can legally charge. However, even if the District imposes the full, calculated charge, the SDC will generate only 28 percent of the funds needed to complete the full project list, as shown in **Exhibit 11**.

Exhibit 11: Funding Plan

Capital Funding Plan	$	%
Requirements		
Capital Improvement Plan	$ 24,050,600	99.6%
Compliance Costs	87,406	0.4%
Total Requirements	$ 24,138,006	100.0%
Resources		
System Development Charges	$ 6,767,904	28.0%
Other District Resources	17,370,102	72.0%
Total Resources	$ 24,138,006	100.0%

The District is under no legal obligation to impose the full, calculated SDC. However, the District should be aware that any discounting or phase-in period that reduces SDC revenue will increase the funding requirement from other resources.

CREDITS

A credit is a reduction in the amount of the SDC for a specific development. ORS 223.304 requires that SDC credits be issued for the construction of a qualified public improvement which is: required as a condition of development approval; identified in the District's adopted SDC project list; and either "not located on or contiguous to property that is the subject of development approval," or located "on or contiguous to such property and is required to be built larger or with greater capacity than is necessary for the particular development project . . ."

Additionally, a credit must be granted "only for the cost of that portion of an improvement which exceeds the minimum standard facility size or capacity needed to serve" the particular project up to the amount of the improvement fee. For multi-phase projects, any "excess credit may be applied against SDCs that accrue in subsequent phases of the original development project."

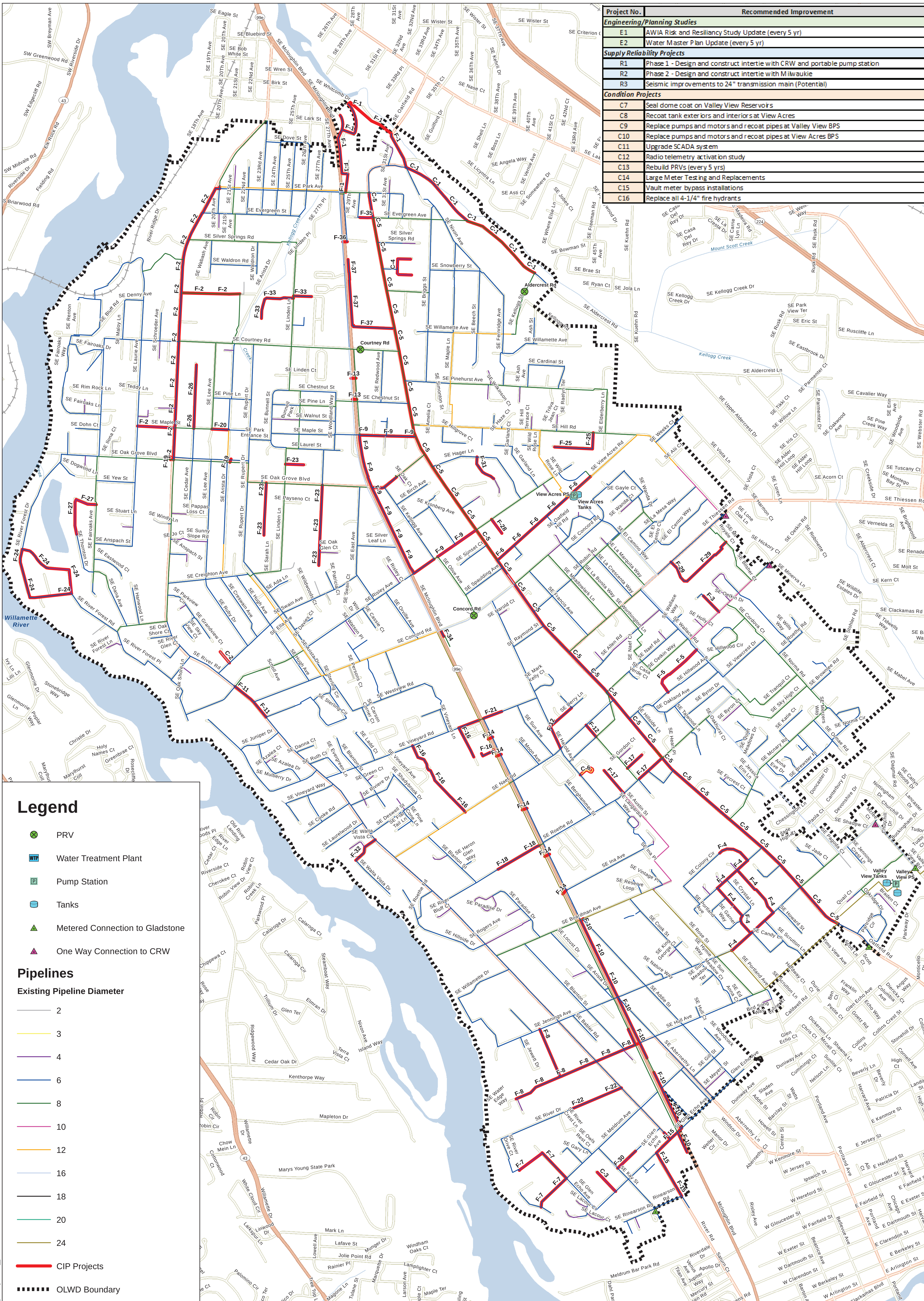
INDEXING

Oregon law (ORS 223.304) also allows for the periodic indexing of SDCs for inflation, as long as the index used is:

> (A) A relevant measurement of the average change in prices or costs over an identified time period for materials, labor, real property or a combination of the three;
> (B) Published by a recognized organization or agency that produces the index or data source for reasons that are independent of the system development charge methodology; and
> (C) Incorporated as part of the established methodology or identified and adopted in a separate ordinance, resolution or order.

We recommend that the District index its charges to the *Engineering News Record* Construction Cost Index for the City of Seattle and adjust its charges annually. There is no comparable Oregon-specific index.

Plate 1. Map of CIP Projects



Project No.	Recommended Improvement
Engineering/Planning Studies	
E1	AWIA Risk and Resiliancy Study Update (every 5 yr)
E2	Water Master Plan Update (every 5 yr)
Supply Reliability Projects	
R1	Phase 1 - Design and construct intertie with CRW and portable pump station
R2	Phase 2 - Design and construct intertie with Milwaukie
R3	Seismic improvements to 24" transmission main (Potential)
Condition Projects	
C7	Seal dome coat on Valley View Reservoirs
C8	Recoat tank exteriors and interiors at View Acres
C9	Replace pumps and motors and recoat pipes at Valley View BPS
C10	Replace pumps and motors and recoat pipes at View Acres BPS
C11	Upgrade SCADA system
C12	Radio telemetry activation study
C13	Rebuild PRVs (every 5 yrs)
C14	Large Meter Testing and Replacements
C15	Vault meter bypass installations
C16	Replace all 4-1/4" fire hydrants

Name: CIP_Projects_22x34

Date: 5/6/2019

OAK LODGE
WATER SERVICES

Oak Lodge Water Services District
Water Master Plan Update
CIP Projects

WSC
WATER SYSTEMS CONSULTING, INC.

PUBLIC HEALTH DIVISION
Center for Health Protection, Drinking Water Services
Kate Brown, Governor

Oregon Health Authority

800 NE Oregon Street, Suite #640
Portland, OR 97232-2162
(971) 673-0459
(971) 673-0694 – FAX
http://healthoregon.org/dwp

September 22, 2020

Scott Duren, P.E.
Water Systems Consulting, Inc.
Via email

Re: **Concurrence with Master Plan (PR#111-2020)**
Oak Lodge Water Services (PWS ID#01512)

Mr. Duren:

Thank you for your submittal to the Oregon Health Authority's Drinking Water Services (DWS) of plan review information for the Water System Master Plan for Oak Lodge Water Services. On August 20, 2020, our office received a copy of the master plan, along with a review fee of $4,125. The Master Plan represents a 20-year planning horizon to the year 2037. The plan includes system goals and description, future demand estimates, an engineering evaluation, evaluations of options to meet future demand, financing, and a list of recommended projects and cost estimates. A seismic risk assessment and mitigation plan is required and was included. **Upon review of the Master Plan, it appears the elements required in Oregon Administrative Rules (OAR) 333-061-0060(5) have been addressed.** Approximately $30 million is identified for the planning period to improve fire flow, resiliency, and to conduct engineering and planning studies as well as condition driven projects.

Please note that OAR 333-061-0060 contains plan submission and review requirements for all major water system additions or modifications. Construction plans and specifications must be submitted to and approved by DWS before construction begins. Also, Oak Lodge does not currently maintain a plan review exemption for waterline extensions, but it is eligible with this current master plan. See www.healthoregon.org/pwsplanreview for more information.

If you have any questions or concerns, please contact me at (971) 673-0459, or james.b.nusrala@dhsoha.state.or.us.

Sincerely,

James Nusrala

James Nusrala, P.E.
Regional Engineer
Drinking Water Services
ec:
Todd Knapp, Oak Lodge Water Services
Jason Rice, P.E., District Engineer, Oak Lodge WS

OAK LODGE
WATER SERVICES

STAFF REPORT

To	Board of Directors
From	Gail Stevens, Finance Director
Title	PERS Side Account Update
Item No.	6
Date	October 20, 2020

Background

PERS recalculates contribution rates on a biennial basis, or every two years, in October on the even numbered year. The report for Biennium 2021-2013, which begins on July 1, 2021, was released on Friday October 9, 2020. The District's unfunded actuarial liability (UAL) with PERS increased from $4.47 million as of December 31, 2017 to $5.69 million as of December 31, 2019, or 27.3%.

The initial contribution of $300,000 is a start to reducing the District's unfunded actuarial liability (UAL) with PERS. The UAL valuation is essentially the difference between a liability for future retirement benefits to employees and the portion of that liability that has been funded through employer contributions. The unfunded liability is a significant portion of the annual contribution rate for each District employee; currently 12.60% for Tier 1/Tier 2 UAL plus 1.69% for OPSRP UAL, for a combined 14.29%.

An actuarial calculation was requested at the time of the initial $300,000 contribution, so the District is already receiving a 0.72% reduction to the PERS contribution rate since January 1, 2020 as a result of the initial District side account contribution. Starting July 1, 2021, this increases to a 0.75% reduction for FY 2021-22 and FY 2022-23. The estimated savings for current FY 2020-21 is $21,000. Matching funds have not been received at this time due to being waitlisted.

PERS had anticipated additional EIF funding in 2021, however during the Second Legislative Special Session of 2020 on August 10, 2020, the Legislature voted to withdraw all current funds and remove future funding from EIF, effectively suspending the program. However, Governor Kate Brown vetoed parts of the legislation on September 20, 2020 and future funding for the EIF was preserved.

Side accounts are still an option for the District to reduce the unfunded liability. PERS provides an Employer Rate Projection Tool to estimate a Cumulative Contribution Reduction from a new side account. Per this tool, the rate offset is 1.29% for a contribution of the budgeted $552,000. With an actuarial calculation service request at the cost of $1,000, this rate offset can be implemented as early as December 1, 2020 with the submission of this payment. This is estimated to provide saving FY 2020-21 of

$21,883 in PERS Contributions. With the side account currently in place this makes a total annual savings next year of $59,160.

The following table is per October 2020 actuarial valuation report:

Employer Rates Effective July 1, 2021 for Oak Lodge Water Services District

	Payroll				
	Tier 1/Tier 2			OPSRP	
	Default	Optional Separate Rates			
	All T1/T2 Payroll	General Service	Police & Fire	General Service	Police & Fire
Pension					
Normal cost rate	14.36%	14.36%	20.28%	8.64%	13.00%
Tier 1/Tier 2 UAL rate[1]	12.60%	12.60%	12.60%	12.60%	12.60%
OPSRP UAL rate	1.69%	1.69%	1.69%	1.69%	1.69%
Pre-SLGRP pooled liability rate	0.00%	0.00%	0.00%	0.00%	0.00%
Transition liability/(surplus) rate[2]	(2.27%)	(2.27%)	(2.27%)	(2.27%)	(2.27%)
Side account rate relief [2]	(0.75%)	(0.75%)	(0.75%)	(0.75%)	(0.75%)
Member redirect offset [3]	(2.45%)	(2.45%)	(2.45%)	(0.70%)	(0.70%)
Net employer pension contribution rate	**23.18%**	**23.18%**	**29.10%**	**19.21%**	**23.57%**
Retiree Healthcare					
Normal cost rate	0.05%	0.05%	0.05%	0.00%	0.00%
UAL rate	0.00%	0.00%	0.00%	0.00%	0.00%
Net retiree healthcare rate	**0.05%**	**0.05%**	**0.05%**	**0.00%**	**0.00%**
Total net employer contribution rate	**23.23%**	**23.23%**	**29.15%**	**19.21%**	**23.57%**

In this report, the payroll of Tier 1 and Tier 2 members is referred to as Tier 1/Tier 2 valuation payroll. Combined valuation payroll refers to the payroll for Tier 1/Tier 2 members, OPSRP general service members, and OPSRP police and fire members.

[1] *Includes Multnomah Fire District #10 rate and any impact of rate collar developed on page 42 of the system-wide actuarial valuation report.*

[2] *The transition liability/(surplus) rate and side account rate relief shown may be reduced such that the net pension contribution rate does not go below 0.00%.*

[3] *Redirected member contributions under Senate Bill 1049 (2.50% of payroll for Tier 1/Tier 2 and 0.75% of payroll for OPSRP) will offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.*

SB 1049, signed into law in 2019, makes several adjustments to PERS to slow the increase in employer contribution rates. In the above table, "Member redirect offset" is the reduction the District will receive starting July 1, 2021. By redirecting the member contribution, this legislation provides the District with a 2.45% reduction for Tier 1 / Tier 2 rate and 0.70% for OPSRP rate for the actuarial period of July 1, 2021 through June 30, 2023.

With the reduction from SB 1049 included, the District's employer contribution rate increased for Tier 1 / Tier 2 from 23.22% to 23.23% and increased for OPSRP from 17.65% to 19.21%. The additional District contribution to the side account will offset against these new rates.

Past Board Actions

At the November 19, 2019 regular Board of Directors meeting, the Board authorized staff to contribute to PERS $300,000 and thus establish a side account. The motion that carried included a projection of an additional $900,000 contribution to be made before September 30, 2020. The FY 2020-21 adopted budget includes a contribution of $552,000, reduced from the original $900,000. The date for possible contribution was extended by PERS to December 1, 2020 to take advantage of the State Employer Incentive Fund (EIF) program.

The EIF program provides a 25% match up to a maximum of $300,000 on qualifying employer lump-sum payments. The District applied and is currently approved and, on the waitlist for matching funds.

Recommendation

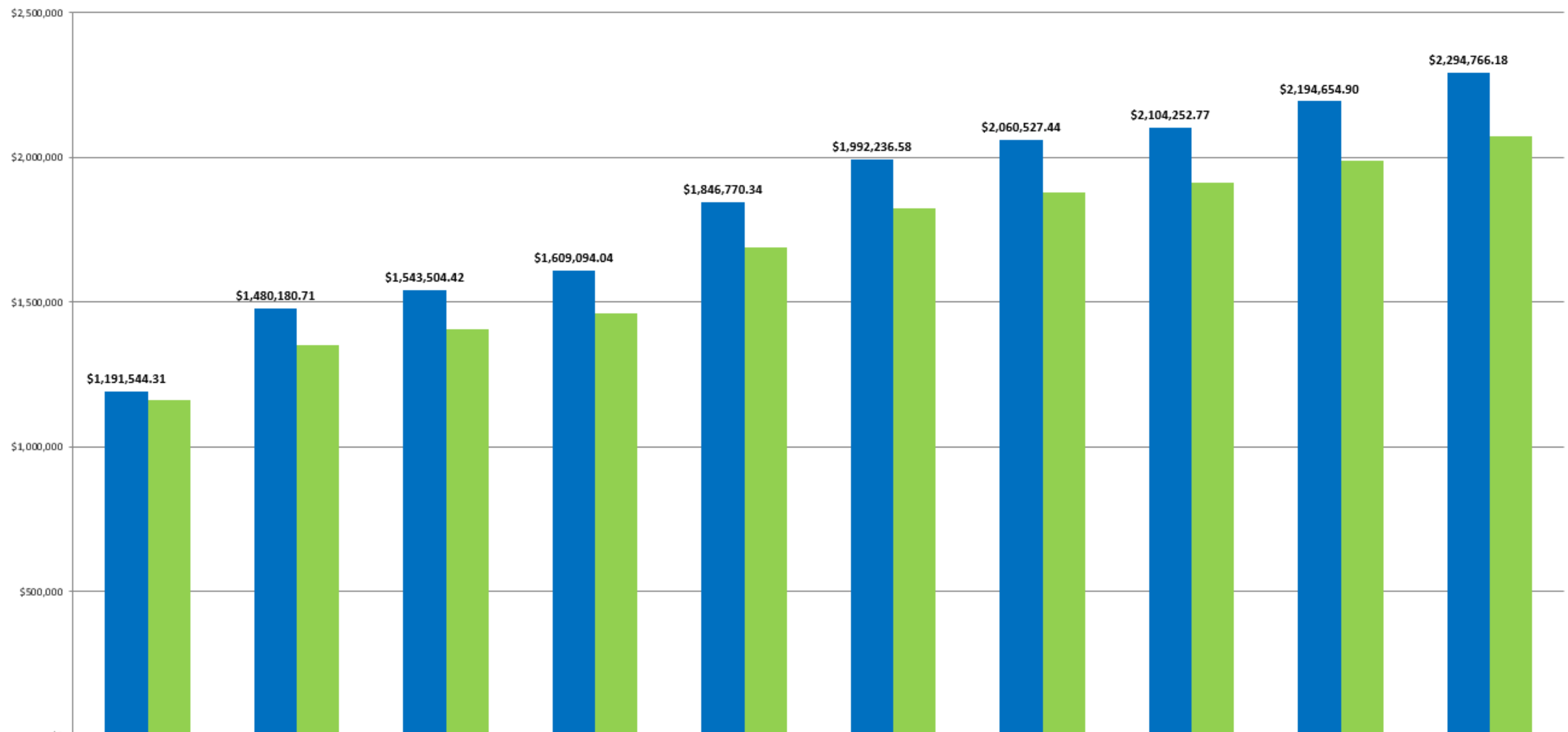
Staff recommends completion of the PERS contribution at the budgeted amount of $552,000.

Attachments

1. PERS Employer Rate Projection Tool Results

PERS Employer Rate Projection Tool Results

Projected Estimated Contributions Savings with Total Contribution of $852,000



	2019 - 2021	2021 - 2023	2023 - 2025	2025 - 2027	2027 - 2029	2029 - 2031	2031 - 2033	2033 - 2035	2035 - 2037	2037 - 2039
Total Projected Contributions (Without New Side Acct)	$1,191,544.31	$1,480,180.71	$1,543,504.42	$1,609,094.04	$1,846,770.34	$1,992,236.58	$2,060,527.44	$2,104,252.77	$2,194,654.90	$2,294,766.18
Projected Cntrb's (After New Side Acct.)	$1,160,944.09	$1,353,458.32	$1,407,756.23	$1,463,677.19	$1,690,996.17	$1,825,367.39	$1,881,773.00	$1,912,766.55	$1,989,530.07	$2,075,031.33

Biennium

AGENDA ITEM

Title	Call for Public Comment
Item No.	7
Date	October 20, 2020

Summary

The Board of Directors welcomes comment from members of the public.

Written comments may not be read out loud or addressed during the meeting, but all public comments will be entered into the record.

The Board of Directors may elect to limit the total time available for public comment or for any single speaker depending on meeting length.

STAFF REPORT

To	Board of Directors
From	Sarah Jo Chaplen, General Manager
Title	Community Briefing Materials Update
Item No.	8
Date	October 20, 2020

Summary

Oak Lodge Water Services District has engaged Barney & Worth to prepare community briefing materials and develop a multiple year strategic communications plan.

Background

Barney & Worth is developing a base PowerPoint to be used for community briefings. The base presentation was reviewed with the Board at their September 10 meeting and again the week of October 5 by email communications. The suggested edits to the base PowerPoint have been made and are included in the Board packet. Additional edits to the base PowerPoint will be made as Barney & Worth develops the District's strategic communications plan.

The longer base PowerPoint can be used in its entirety for longer presentations such as a special briefing for Willamette View. For shorter presentations, when the District only has 10-20 minutes on a community group's agenda, the PowerPoint can be shortened and customized. At the October 20 Board meeting, Barney & Worth is presenting a condensed version of the base PowerPoint that focuses on the District's "hot topics" to showcase the versatility of the presentation material.

The next step for the community briefing effort is to request time on agendas for upcoming community meetings: Jennings Lodge Community Planning Organization, North Clackamas Chamber of Commerce, Oak Grove Community Council, Willamette View, Rose Villa and others as directed by the Board. Board members and District staff can jointly attend the (currently virtual) meetings—with Board members presenting and staff available to help answer questions. Community briefings provide a great way to share information and hear directly from ratepayers.

Past Board Actions

On August 18, 2020, the Board of Directors approved a Communications Plan Framework.

On September 10, 2020, the Board of Directors provided input on the draft community briefing materials.

Recommendation

Staff requests Board of Directors discussion and consensus on the community briefing materials and next steps.

Suggested Board Motion

"I move to approve moving forward with the community briefing process and additional updates to the presentation as needed."

Attachments

1. Community Briefing Presentation (short version)
2. Base Community Briefing Presentation

OAK LODGE
WATER SERVICES

Frequently Asked Questions

October 2020

1

Providing essential water services to our community

Our Commitments

- Provide excellent customer service
- Protect public health
- Make smart investments and keep rates affordable
- Keep our streams and rivers clean

2

The District is committed to providing reliable water services today and in the future

Delivering safe, reliable drinking water

Collecting and treating wastewater

Protecting local streams and rivers

3

Did the consolidation make operations more efficient?

We've been diligently seeking efficiencies:

- ✓ Quicker response during emergencies
- ✓ Improved financial management
- ✓ Efficient maintenance plan
- ✓ Staff are using existing administrative buildings, while considering options for efficient and affordable operations space

What's Coming

- More financial improvements
- Continuing to focus on finding and fixing issues and inefficiencies

4

4

I thought the consolidation was going to save us money. Why did the rates go up?

- Consolidation has kept rates from increasing as quickly as they would have without the consolidation
- Investments in maintenance and replacement of District infrastructure are needed to maintain reliable and efficient services
- Cost drivers include new regulations, increasing costs for materials and services, and the cost of retaining high-quality staff

5

What services does the District provide for the watershed protection fee?

- In the District, Clackamas County owns and maintains the surface water system
- The District helps clean the County-owned system and is responsible for maintaining water quality
- Fees provide funding for creek monitoring, catch basin cleaning, school education programs, and stormwater infrastructure permitting
- Currently evaluating options for increased flood management services in coordination with the County

6

Questions?

(503) 654-7765
info@olwsd.org

14496 SE River Road
Oak Grove, OR 97267

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OAK LODGE
WATER SERVICES

7

OAK LODGE
WATER SERVICES

An Update for Our Community

October 2020

1

Providing essential water services to our community

Our Commitments

- Provide excellent customer service
- Protect public health
- Make smart investments and keep rates affordable
- Keep our streams and rivers clean

2

One District, three services – protecting public health and our water resources

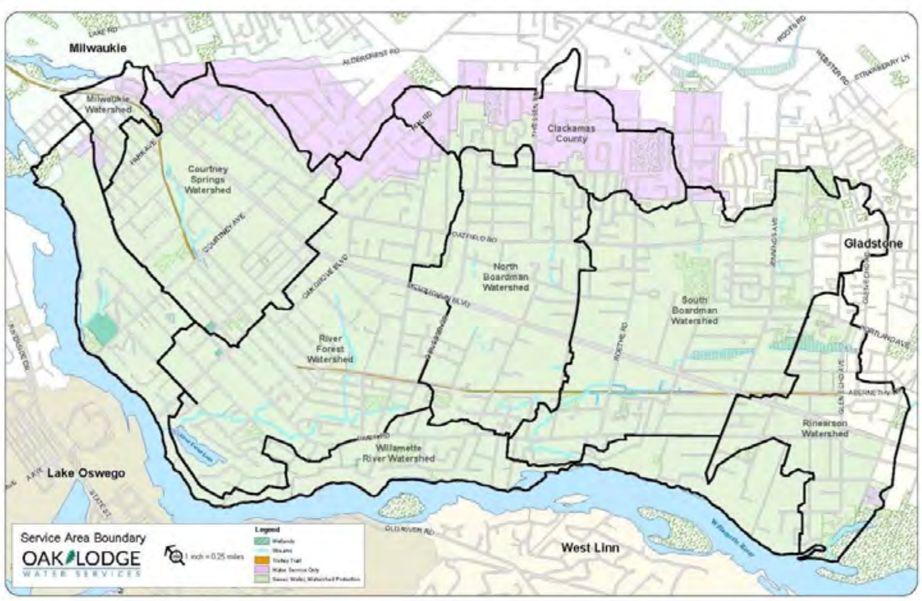
Safe and reliable drinking water from the Clackamas River delivered to customers

Wastewater collected from homes and businesses, treated and returned to the Willamette River

Water quality of local streams and rivers protected

3

The District serves homes and businesses, providing 24/7 reliable water services to nearly 29,000 people



4

An update on our services

5

5

Drinking Water: delivering safe & reliable water

- ✓ Reservoirs upgraded to current seismic standards to improve system resilience
- ✓ Water System Master Plan completed to determine future needs and priorities
- ✓ Water meters updated to provide more timely data to customers and improve billing accuracy
- ✓ Water audit completed to better manage water resources and control operating costs

What's Coming

- Upgrading critical facilities to improve earthquake resilience and increase capacity for fighting fires

6

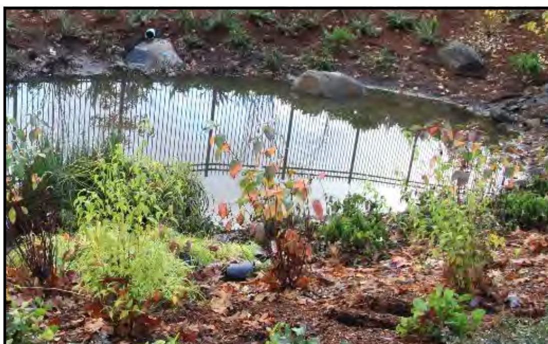
Sanitary Sewer: collecting & treating wastewater

- ✓ Improved and expanded treatment plant doing well; meeting water quality permit requirements
- ✓ Collection and treatment systems work effectively for current customers and new development
- ✓ Ongoing employee education to keep up with permitting changes

What's Coming

- Completing a Sanitary Sewer System Master Plan to identify future needs and priorities
- Ongoing repair and replacement of sewer pipes and pump stations to improve reliability

7



Watershed Protection: protecting streams & rivers

- ✓ Continue to meet water quality permit requirements set by Oregon Department of Environmental Quality
- ✓ Fees provide funding for creek monitoring, catch basin cleaning, school education programs, and stormwater infrastructure permitting
- ✓ Working with local businesses through our Stormwater Cleaning Assistance Program to keep storm drains clean

What's Coming

- Evaluating options for expanded watershed protection services using customer input and engineering analysis
- Designing and constructing improvements to help manage runoff

8

Frequently asked questions

FAQ: Did the consolidation make operations more efficient?

We've been diligently seeking efficiencies:

- ✓ Quicker response during emergencies
- ✓ Improved financial management
- ✓ Efficient maintenance plan
- ✓ Staff are using existing administrative buildings, while considering options for efficient and affordable operations space

What's Coming

- More financial improvements
- Continuing to focus on finding and fixing issues and inefficiencies

FAQ: I thought the consolidation was going to save us money. Why did the rates go up?

- Consolidation has kept rates from increasing as quickly as they would have without the consolidation
- Investments in maintenance and replacement of District infrastructure are needed to maintain reliable and efficient services
- Cost drivers include new regulations, increasing costs for materials and services, and the cost of retaining high-quality staff

Our Commitments

- Provide excellent customer service
- Protect public health
- Make smart investments and keep rates affordable
- Keep our streams and rivers clean

11

FAQ: What services does the District provide for the Watershed Protection fee? What is the County responsible for?

- In the District, Clackamas County owns and maintains the surface water system
- The District helps clean the County-owned system and is responsible for maintaining water quality
- Fees provide funding for creek monitoring, catch basin cleaning, school education programs, and stormwater infrastructure permitting
- Currently evaluating options for increased flood management services in coordination with the County

12

Hold for Authority FAQ

13

Questions?

(503) 654-7765
info@olwsd.org

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OAK LODGE
WATER SERVICES

14

AGENDA ITEM

Title	Recess to Executive Session
Item No.	9
Date	October 20, 2020

Summary

Convene Executive Session under ORS 192.660(2)(f) to consider information or records that are exempt by law from public inspection and 192.660(2)(h) to consult with counsel concerning the legal rights and duties of a public body with regard to current litigation or litigation likely to be filed.

OAK LODGE
WATER SERVICES

AGENDA ITEM

Title	Adjourn Executive Session
Item No.	10
Date	October 20, 2020

Summary

Adjourn Executive Session and make any necessary motions as a result of Executive Session discussions.

STAFF REPORT

To	Board of Directors
From	Aleah Binkowski-Burk, Human Resources Manager
Title	Human Resources Monthly Report
Item No.	11a
Date	October 20, 2020

Summary

The Board has requested updates at the Regular Meetings of the Board on the status of the District's operations.

Highlights of the Month

- Laural and Aleah both attended virtual conferences.
- Both the Wastewater Treatment Plant Operator position and the Outreach and Communications Specialist positions are active and receiving applications.
- Coronavirus Relief Fund (CRF) submission for additional $13,884.60 has been accepted.
- Massive records management project completed by Laural.

Human Resources/Payroll

I attended the 2020 Northwest Human Resources and Management conference. It was scheduled to be held in Spokane, but of course it was virtual this year. Highlights included sessions on diversity in the workplace, addressing workplace civility in polarized times, situational workplace scenarios and work in the age of COVID-19. Laural attended the Oregon Association of Municipal Recorders (OAMR) virtual conference. Highlights include two Athenian Leadership Dialogues and two seminars: one on writing policies/procedures and another on dealing with difficult people. Upon completion of the associated assessments, participation at the conference will provide Laural with twelve professional development credits towards her Certified Municipal Clerk (CMC) certification.

We are currently taking applications for both the Wastewater Treatment Plant Operator position and the Outreach and Communications Specialist positions. I am very excited by the applicants for the Outreach and Communications positions. We asked for applicants to provide some work samples and many of the submissions are very impressive. We have not received as many interested parties for the Wastewater position, but I reached out to a contact at Clackamas Community College who heads the WET (Water and Environmental Technology) Program and he passed it on to 119 alumni of the program he has on his listserv.

We submitted our third round of expenses to the Coronavirus Relief Fund (CRF) totaling $13,884.60. Most of these expenses were related to upgrading the HVAC systems in the buildings, payroll for staff who needed to take leave and PPE. We have now received a total of $47,342.27 in reimbursement through the CRF and will continue to track expenses.

Records Management

Finally, Laural went through the herculean effort of bringing down 68 boxes of paper documents from the attic in August. Laural had been both dreading and looking forward to this project since her very first day when she got the tour of our attic storage area. The dread mostly stemmed from the thought of hauling the heavy boxes down a single wide ladder. Needless to say, we will not be using this area for document storage from now on. Once she had transferred all the boxes to the Boardroom, she was able to gleefully approve 52 of the 68 boxes for destruction according to the State retention and destruction standards for special districts. Our shredding company came in September with a giant box truck to fit all the boxes of documents (see photo).

Attachments

1. Photo Page

Human Resources Photo Page

The boxes awaiting destruction.

OAK LODGE
WATER SERVICES

STAFF REPORT

To	Board of Directors
From	Gail Stevens, Finance Director
Title	Finance Department Monthly Report
Item No.	11a
Date	October 7, 2020 for October 20, 2020

Summary

The Board has requested updates at the Regular Meetings of the Board on the status of the District's Operations.

Highlights of the Month

- The District's final audit work occurred October 5 through October 16, 2020. The District is on time for financial reports from the auditors at the November 17^{th} Board Meeting.
- Staff continues to make progress in addressing the audit findings from the FY 2018-19 financial statement audit as noted below.
- Meter project verification of the District's billing system is nearly completed as noted below.
- The District has started to replace large meters. As of August 2020, 24 meters have been replaced, with an increase in consumption reads of 51%.
- The District has started to see a potential impact to collections due to the COVID State of Emergency.
- Accounts Receivables balance has increased even with a reduction in delinquent accounts.

FY2019 Audit Recommendations Status

As of this report 18 of the 24 recommendation are in place and complete, this is 75%. The following work been completed since the last status report:

- A physical inventory of capital assets has been completed and reconciled with Springbrook fixed assets general ledger accounts. Next step is recommendation number 7 of tracking and monitoring capital assets accounts during the year. The current plan is to start with quarterly reconciliations during FY 2020-21.
- Also, on recommendation number 7, work orders have been moved to Lucity. Reports of completed work orders will be developed as part of the quarterly capital assets review.

- Security access review has been completed on the access by groups. Individual users access review is underway. Completion is anticipated over the next 30-45 days, with Springbrook staff support and training.
- Purchase order workflow changes are in development with an assigned Springbrook training and project manager. Springbrook is a lineal system for approvals and follows the path by approval authority. Once the workflow is rebuilt, training will be developed and completed with implementation.

FY 2020 Audit

Moss Adams began on-site review on Monday, July 20, 2020. They are focusing on the District's internal controls and progress on recommendations from the prior audit. On October 5, 2020, Moss Adams began the final audit work, testing and reviewing sample documentation and verification. The audit is on target for final financial reports to be presented to the Board at the November 17, 2020 meeting.

Billing System and Non-Revenue Water

Final step of the Billing System Verification is recalculation for two billing cycles. This work is planned after the audit work is completed.

Data for replaced large meters is being collected to determine if there is a noted increase in billed consumption. As of August 2020, 24 meters, sizes 1" – 2", have been replaced with the following results:

- Consumption billed increased

Collections Rate

As the COVID State of Emergency continues, the District has kept a close eye on collections for Utility Billing. With the impacts from Oregon's Unemployment Department's delay of paying claims, and uncertainty in future CARES Act assistance, each District customer could be impacted in a variety of ways.

Collection Rates

	July 2020	August 2020	September 2020
Utility Billing Sales	$ 1,203,556	$ 1,117,848	$ 1,280,284
Cash Receipts	1.211.307	1,100,072	1,145,389
% Uncollected	(0.6%)	1.6%	10.5%

September is the first month that the collection rate dropped. This is the first month that the District collections may be showing the economic impact of COVID. This trend will be watched and reported as we move through the remainder of 2020 and into 2021.

Accounts Receivable Review

The Accounts Receivable balances as of September 30, 2020 compared to August 31, 2020. These were the findings:

1. A/R Balance owed to OLWSD has increased 3.28%

A/R Balance	8/31/2020	9/30/2020
Bi-Monthly Residential	$ 1,154,155	$1,198,425
Large Meters	522,439	534,755
Total	**1,676,594**	**1,733,180**
	Variance	**$56,586**
		3.38%

2. While the total number of delinquent accounts has decreased by 78, the average balance per delinquent account has increased by 23.3%.

Delinquent Accounts	8/31/2020	9/30/2020
Over 60 Days	$ 330,765	$ 363,202
Number of Accounts	713	635
Average Balance per Acct.	$ 464	$ 572
		23.3%

3. The number of accounts that are current, account paid in full within 30 days, has increased over prior month.

Account %	8/31/2020	9/30/2020
Current	83.74%	84.16%
30-60 Day Grace	3.40%	4.30%
Delinquent	7.68%	6.88%
Credit Balance	5.17%	4.67%

Part of these variances are due to the composition of accounts included in each of the Cycle 001 and Cycle 002 residential billing accounts. Utility Billings for Cycle 002 are 9% higher than Cycle 001. Additionally, the pattern of payments will also be different for the two cycles. While this initial uncollected amount is concerning, it has not become a trend.

While Governor Brown has extended the eviction moratorium for residential property until the end of 2020, the moratorium for commercial property was not. Property owners have begun to reach out to the District to advise of tenant changes. The District is taking this opportunity to covert these tenant accounts back to the property owner.

Attachments

1. Checks by Date Report for September 2020
2. Corrective Action Plan Matrix

Bank Reconciliation
Checks by Date
User: jeff
Printed: 10/06/2020 - 4:51PM
Cleared and Not Cleared Checks
Print Void Checks

Check No.	Check Date	Name	Comment	Module	Void	Clear Date	Amount
ACH Disbursement Activity							
0	9/2/2020	Check Commerce		AP		9/ 2/2020	170.50
0	9/7/2020	TSYS		AP		9/10/2020	3,111.45
0	9/7/2020	TSYS		AP		9/10/2020	7,951.78
0	9/11/2020	Nationwide Retirement Solutions		AP		9/14/2020	1,633.04
0	9/11/2020	OR Dept of Justice, Div of Child Support		AP		9/16/2020	937.30
0	9/11/2020	Public Employees		AP			29,744.32
0	9/11/2020	VALIC c/o JP Morgan Chase		AP		9/14/2020	3,691.45
0	9/11/2020	Oregon Department Of Revenue		AP		9/15/2020	8,432.01
0	9/11/2020	IRS Dept of The Treasury		AP		9/14/2020	30,429.24
0	9/11/2020	Oregon DOR - State Transit Tax		AP		9/15/2020	107.67
0	9/11/2020	Wells Fargo Bank		AP		9/11/2020	1,762.62
0	9/11/2020	Payroll Direct Deposit	DD 00001.09.2020	PR		9/11/2020	73,223.29
0	9/22/2020	KS Statebank		AP		9/21/2020	62,557.61
15400923	9/23/2020	Wells Fargo Remittance Center	Wells Fargo Credit (	BRX		9/23/2020	9,710.06
15400924	9/23/2020	Wells Fargo Remittance Center	Wells Fargo Credit (	BRX			-9,710.06
0	9/23/2020	Wells Fargo Remittance Center		AP			9,710.06
0	9/25/2020	IRS Dept of The Treasury		AP		9/28/2020	31,324.15
0	9/25/2020	Nationwide Retirement Solutions		AP			1,633.04
0	9/25/2020	Oregon Department Of Revenue		AP		9/29/2020	8,684.34
0	9/25/2020	Public Employees		AP			30,564.94
0	9/25/2020	OR Dept of Justice, Div of Child Support		AP		9/30/2020	937.30
0	9/25/2020	VALIC c/o JP Morgan Chase		AP		9/29/2020	3,634.79
0	9/25/2020	Oregon DOR - State Transit Tax		AP		9/29/2020	110.85
0	9/25/2020	Payroll Direct Deposit	DD 00002.09.2020	PR		9/25/2020	75,385.34
ACH Disbursement Activity Subtotal							385,737.09
Voided ACH Activity							0.00
Adjusted ACH Disbursement Activity Subtotal							385,737.09
Paper Check Disbursement Activity							
44456	9/1/2020	NCCWC		AP		9/ 2/2020	265,216.06
44457	9/3/2020	AFLAC		AP		9/15/2020	905.72
44458	9/3/2020	AFSCME Council 75		AP		9/15/2020	902.89
44459	9/3/2020	AnswerNet		AP		9/11/2020	266.92
44460	9/3/2020	Apex Labs		AP		9/11/2020	1,760.00
44461	9/3/2020	BendTel, Inc		AP		9/16/2020	169.74
44462	9/3/2020	Cascadia Backflow		AP		9/16/2020	3,192.95
44463	9/3/2020	Century Link		AP		9/14/2020	965.40
44464	9/3/2020	Cintas Corporation - 463		AP		9/15/2020	650.81
44465	9/3/2020	Clackamas County		AP		9/15/2020	842.01
44466	9/3/2020	Coastal Farm & Home Supply		AP		9/22/2020	277.95
44467	9/3/2020	Comcast		AP		9/14/2020	471.35
44468	9/3/2020	Consolidated Supply Co.		AP		9/11/2020	1,693.67
44469	9/3/2020	Craig Blackman Trucking		AP			1,478.33
44470	9/3/2020	D&H Flagging Inc.		AP		9/17/2020	561.10
44471	9/3/2020	Daily Journal Of Commerce		AP		9/14/2020	496.30
44472	9/3/2020	Detemple Company, Inc.		AP		9/ 8/2020	9,192.02
44473	9/3/2020	HealthEquity		AP		9/15/2020	57.05
44474	9/3/2020	J. Thayer Company		AP		9/11/2020	914.99

Bank Reconciliation
Checks by Date
User: jeff
Printed: 10/06/2020 - 4:51PM
Cleared and Not Cleared Checks
Print Void Checks

Check No.	Check Date	Name	Comment	Module	Void	Clear Date	Amount
44475	9/3/2020	Lord & Associates, Inc.		AP		9/15/2020	1,364.00
44476	9/3/2020	Madison Biosolids, Inc.		AP		9/17/2020	6,091.69
44477	9/3/2020	Maverick Welding Supplies Inc		AP		9/14/2020	62.02
44478	9/3/2020	Mission Communications, LLC		AP		9/16/2020	260.00
44479	9/3/2020	Moss Adams LLP		AP		9/14/2020	12,735.64
44480	9/3/2020	Multiquip, Inc.		AP		9/15/2020	15,900.01
44481	9/3/2020	Net Assets Corporation		AP		9/14/2020	606.00
44482	9/3/2020	One Call Concepts, Inc.		AP		9/15/2020	749.70
44483	9/3/2020	Oregon State Administrative Services		AP		9/16/2020	1,000.00
44484	9/3/2020	Polydyne, Inc.		AP		9/14/2020	4,258.10
44485	9/3/2020	Portland Road and Driveway Co., Inc		AP		9/15/2020	16.00
44486	9/3/2020	Quadient Leasing USA, Inc.		AP		9/14/2020	599.43
44487	9/3/2020	R & L Services Inc.		AP		9/21/2020	609.55
44488	9/3/2020	Red Wing Shoe Store		AP		9/14/2020	275.00
44489	9/3/2020	Seattle Ace Hardware		AP		9/17/2020	49.67
44490	9/3/2020	Traver's Cleaning Service Inc.		AP		9/14/2020	150.00
44491	9/3/2020	Unifirst Corporation		AP		9/16/2020	646.81
44492	9/3/2020	Verizon Wireless		AP		9/14/2020	1,791.96
44493	9/10/2020	Customer Refund		AP		9/14/2020	185.48
44494	9/10/2020	Customer Refund		AP		9/14/2020	156.80
44495	9/10/2020	Customer Refund		AP		9/17/2020	166.96
44496	9/10/2020	Customer Refund		AP		9/24/2020	49.92
44497	9/10/2020	Customer Refund		AP			73.32
44498	9/10/2020	Customer Refund		AP			2.54
44499	9/10/2020	Customer Refund		AP			80.75
44500	9/10/2020	Customer Refund		AP		9/16/2020	182.06
44501	9/10/2020	Customer Refund		AP		9/15/2020	8.04
44502	9/10/2020	Customer Refund		AP		9/21/2020	68.59
44503	9/10/2020	Customer Refund		AP			6.94
44504	9/10/2020	Customer Refund		AP		9/24/2020	14.56
44505	9/10/2020	Customer Refund		AP		9/28/2020	73.24
44506	9/10/2020	Customer Refund		AP		9/14/2020	25.00
44507	9/10/2020	Customer Refund		AP		9/16/2020	51.48
44508	9/10/2020	Customer Refund		AP			88.82
44509	9/10/2020	Customer Refund		AP			161.58
44510	9/10/2020	Customer Refund		AP		9/15/2020	110.19
44511	9/10/2020	Customer Refund		AP		9/22/2020	14.80
44512	9/10/2020	Customer Refund		AP		9/14/2020	3.81
44513	9/10/2020	Customer Refund		AP			2.99
44514	9/10/2020	Customer Refund		AP			48.96
44515	9/10/2020	Customer Refund		AP		9/29/2020	9.10
44516	9/10/2020	Customer Refund		AP			4.20
44517	9/10/2020	Customer Refund		AP			101.62
44518	9/10/2020	Customer Refund		AP			174.81
44521	9/11/2020	Customer Refund		PR		9/14/2020	1,306.37
44522	9/11/2020	Customer Refund		PR		9/14/2020	2,001.99
44523	9/18/2020	Customer Refund		AP			5.03
44524	9/18/2020	Customer Refund		AP			407.15
44525	9/18/2020	Customer Refund		AP			6.64
44526	9/18/2020	Customer Refund		AP			19.08
44527	9/18/2020	Customer Refund		AP		9/30/2020	19.42
44528	9/18/2020	Customer Refund		AP			193.63
44529	9/18/2020	Customer Refund		AP			552.89
44530	9/18/2020	Customer Refund		AP			11.13
44531	9/18/2020	Customer Refund		AP		9/25/2020	9.28
44532	9/18/2020	Customer Refund		AP			2.17

Bank Reconciliation
Checks by Date
User: jeff
Printed: 10/06/2020 - 4:51PM
Cleared and Not Cleared Checks
Print Void Checks

Check No.	Check Date	Name	Comment	Module	Void	Clear Date	Amount
44533	9/18/2020	Customer Refund		AP		9/28/2020	77.74
44534	9/18/2020	Customer Refund		AP		9/28/2020	136.35
44535	9/18/2020	Customer Refund		AP		9/28/2020	82.20
44536	9/18/2020	Customer Refund		AP		9/28/2020	45.98
44537	9/18/2020	Customer Refund		AP			505.07
44538	9/22/2020	AFSCME Council 75		AP			902.89
44539	9/22/2020	Alexin Analytical Laboratories, Inc.		AP		9/25/2020	2,644.00
44540	9/22/2020	Applied Industrial Technologies		AP		9/28/2020	135.26
44541	9/22/2020	Bend Mailing Services LLC		AP		9/28/2020	3,597.55
44542	9/22/2020	Brown And Caldwell		AP		9/28/2020	3,045.25
44543	9/22/2020	Bullard Law		AP			114.00
44544	9/22/2020	Cascadia Backflow		AP		9/29/2020	7,595.40
44545	9/22/2020	Cavanaugh & Associates. PA		AP			3,600.00
44546	9/22/2020	CDR Labor Law, LLC		AP		9/30/2020	1,725.00
44547	9/22/2020	City Of Gladstone		AP		9/30/2020	161.33
44548	9/22/2020	City Of Milwaukie		AP		9/30/2020	1,738.11
44549	9/22/2020	Clean-A-Duct		AP			1,419.00
44550	9/22/2020	Contractor Supply		AP		9/25/2020	334.64
44551	9/22/2020	Convergence Networks		AP			11,792.00
44552	9/22/2020	Daily Journal Of Commerce		AP		9/28/2020	319.80
44553	9/22/2020	FLO-Analytics		AP			3,187.50
44554	9/22/2020	Hach Company		AP		9/28/2020	7,853.00
44555	9/22/2020	HealthEquity		AP		9/29/2020	11,984.24
44556	9/22/2020	Merina & Company, LLP		AP		9/28/2020	9,360.00
44557	9/22/2020	Northstar Chemical, Inc.		AP		9/25/2020	1,051.25
44558	9/22/2020	Northwest Natural		AP		9/28/2020	323.66
44559	9/22/2020	OCD Automation, Inc.		AP		9/25/2020	11,151.00
44560	9/22/2020	Pamplin Media Group		AP		9/28/2020	131.68
44561	9/22/2020	Portland Engineering Inc		AP			120.00
44562	9/22/2020	Portland General Electric		AP		9/29/2020	26,390.19
44563	9/22/2020	SDIS		AP		9/25/2020	45,343.59
44564	9/22/2020	Technology Integration Group		AP		9/28/2020	1,513.40
44565	9/22/2020	Top Industrial Supply		AP		9/25/2020	320.00
44566	9/22/2020	TPR Industrial Inc		AP		9/28/2020	270.75
44567	9/22/2020	US Bank Equipment Finance		AP		9/28/2020	222.20
44568	9/22/2020	US Crane & Hoist, Inc		AP		9/29/2020	928.75
44569	9/22/2020	Waste Connections		AP		9/28/2020	115.48
44570	9/22/2020	Waste Management Of Oregon		AP			977.39
44571	9/22/2020	Water Systems Consulting, Inc.		AP		9/29/2020	8,141.86
44572	9/22/2020	Western Exterminator Company		AP		9/28/2020	282.65
44573	9/25/2020	Employee Paycheck		PR		9/24/2020	1,450.59
44574	9/25/2020	Employee Paycheck		PR			2,002.05
44575	9/25/2020	AFLAC		AP		9/29/2020	1,811.44
44576	9/25/2020	AFSCME Council 75		AP			902.49
44577	9/25/2020	Customer Refund		AP			12.81
44578	9/25/2020	City Of Gladstone		AP			75.42
44579	9/25/2020	Contractor Supply		AP		9/28/2020	76.00
44580	9/25/2020	Convergence Networks		AP		9/29/2020	1,300.00
44581	9/25/2020	Employee Business Expense Reimbursement		AP		9/30/2020	158.00
44582	9/25/2020	Customer Refund		AP		9/30/2020	29.52
44583	9/25/2020	Kaiser Permanente		AP		9/28/2020	15,258.68
44584	9/25/2020	Customer Refund		AP		9/28/2020	187.82
44585	9/25/2020	Customer Refund		AP			118.17
44586	9/25/2020	Customer Refund		AP		9/30/2020	4.79
44587	9/25/2020	Olson Bros. Service, Inc.		AP		9/30/2020	2,025.67
44588	9/25/2020	Customer Refund		AP			158.36

Check No.	Check Date	Name	Comment	Module	Void	Clear Date	Amount

Paper Check Disbursement Activity Subtotal	538,794.15
Voided Paper Check Disbursement Activity	0.00
Adjusted Paper Check Disbursement Activity Subtotal	538,794.15

Total Void Check Count:	0
Total Void Check Amount:	0.00
Total Valid Check Count:	154
Total Valid Check Amount:	924,531.24
Total Check Count:	154
Total Check Amount:	924,531.24

Oak Lodge Water Services District
Corrective Action Plan - 2019 Audit
2019 Audit recommendations

Report Date:
9-Oct-20

Identification							
Category	#	Audit Finding	Recommendation	Priority Level	Individual Responsible	Planned Action	Estimated Completion Date
Process	1	Review of new rates – During our current year control procedures over the revenue cycle, we noted no formal, documented process in place to evidence the review of rates input into the system. This is particularly important at the time of a Board-approved rate change to mitigate the risk that rates are input incorrectly or are not updated timely in accordance with the effective date of the new rates.	We recommend that a formal process be established to require someone other than the person responsible for making the rate changes to review those changes to verify the accuracy and timeliness.	B	Finance Director	Annually, when rates are entered to Springbrook, the Finance Director will print a report from the system, compare rates to the resolution adopted by the Board, and initial and date indicating their review and approval. The report will be retained until after audit.	Completed - July 2020. New rates added into the financial billing system were reviewed and verified by the Finance Director before publishing the first utility billing requiring the new rates. Verification file is electronically saved to support the audit trail.
Process	2	Recalculation of customer bills – During our control procedures we noted no evidence of a recalculation of a sample of customer bills to determine if the bills were calculated accurately using appropriate rates. This is a key control that helps to mitigate the risk that bills are being calculated incorrectly or with incorrect rates, prior to the bills being sent to the customers.	We recommend that management implement controls to require a re-calculation of a sample of customer bills each billing cycle, with a minimum of one bill from each rate class. This procedure should be documented to support which bills were re-calculated, who performed the procedures, and to date when the procedures were completed.	A	Jr Accounting Specialist	Monthly after the bills are generated, the Jr. Accountant will obtain a billing register and recalculate a sample of customer bills to ensure accuracy of the bills. Review will occur prior to mailing of customer bills. Jr. Accountant will maintain a log of customer bills verified and retained until after audit.	Completed - Placed in effect with April 2020 billing. Junior Accountant completes testing prior to billing being sent to the printers and reviewed by Finance Director.
Process	3	Manual adjustments to customer accounts – During our procedures we noted that the District often makes manual adjustments to customer bills and consumption amounts.	We recommend that manual adjustments are reviewed and approved by someone other than the person recording the adjustments prior to the bill being sent to the customer. This approval should be documented either electronically through the billing system or in writing. In addition, we recommend that the District run monthly reports to detail the adjustments made during the month, and such a report should be reviewed by someone other than those responsible for recording adjustments, to help identify any unauthorized adjustments.	A	Finance Director	Monthly the Finance Director will run a "Transactions by Date" report from the system for adjustments and review for anomalies. The Finance Director will initial and date evidencing approval, and the report will be retained until after audit.	Completed - Placed in effect in early April. Finance Director ran report and reviewed. Documented review with initials and data and filed for reference.
Process	4	Customer refund approvals – During our inquiries, we noted that the District has a policy in place that requires any customer refunds should be approved by the Finance Director prior to being issued to the customer. However, during our testing we noted instances where the refunds were not approved by the Finance Director and had been issued to customers. We also noted that individuals other than the Finance Director had access to approve refunds in the system.	We recommend that the Finance Director reviews and approves all refunds prior to being issued, and that electronic access to approve refunds be limited to the Finance Director.	A	Finance Director	The Finance Director receives documentation supporting a customer refund which requires signature and date of approval. Documentation is retained as support for AP. Refund batches are committed (posted) in the system by the Finance Director. Access to approve refund batches has been limited to the Finance Director or the General Manager.	Completed - Control is currently in place and operating effectively.
Process	5	New customer setup – During our inquiries, we noted that no formal review control is in place to verify the accuracy of the new customer information input into the billing system. This is particularly important for new services to validate that the proper rate class was entered into the billing system.	We recommend that management establish a control to routinely review reports of new customers added and to verify that the customers were setup correctly with accurate billing attributes.	A	Jr Accounting Specialist	Monthly the Jr Accounting Specialist will run an "Account Master List" report indicating all accounts setup during the month and review for completeness and accuracy of information. All exceptions will be addressed and resolved immediately. The report will be initialed and dated evidencing the review, and will be retained until after audit. Upon setup of a new customer account, a service order will be generated for an initial read. Initial read and meter information on each account will be verified to the respective service order for initial read.	Completed - Control placed in effect April 2020 with review of customer account changes for March 2020. Review performed by Jr. Accounting Specialist and any exceptions reported to Finance Director (Financial Consultant) for direction of resolution. All documentation retained for reference.
Process	6	Exceptions – During our inquiries over the exception reporting process, we noted that the exceptions report is a live screen that populates all the variances identified by the system and clears them out as exceptions are cleared by staff. However, no evidence of the exceptions is maintained on file to support the variances that were identified, and the manner with which those exceptions were cleared. This also creates challenges with verifying whether all exceptions were cleared prior to issuing all the bills to customers.	We recommend that the District establish procedures to review the exceptions report prior to issuing customer bills each billing cycle to ensure all exceptions were cleared appropriately and timely. This review should be documented to note who performed the review and when it was completed.	B	Finance Director	The Finance Director will work with Springbrook to identify a report from the system that can evidence exceptions identified, resolution, and approval. That report will be run each month prior to bills being sent to customers and retained until after audit.	Completed - Staff is retaining the "Xdata reports" as evidence of resolution of meter read exceptions. Reports are retained until after the audit.
Process	7	Asset tracking system – We noted that the District does not currently utilize an asset tracking system to track and monitor costs by project throughout the year, and to document when projects were placed into commercial operation and should be moved to assets in service for financial reporting purposes.	We recommend that the District consistently utilize an electronic project tracking system to capture all the costs by project each year and to utilize reports from the system to monitor the costs by project to identify any significant variances from budget or estimate. The information in this system should also be reconciled to the general ledger on a monthly basis and any projects placed into service should be closed to assets in service on the general ledger.	C	Management Team	The Finance Director will work directly with other members of the management team to identify the objectives and requirements of a project tracking system, then evaluate options to best meet those needs. An approach will be selected and implemented to ensure project cost information is complete and accurate on a go-forward basis.	In progress - The District has completed the merging of historical information into Lucity. In September 2020, water workorders are being generated by Lucity. Into October processes are being created to pass meter replacement information into Springbrook for billing. Reports are being reviewed for the recording of costs.
Process	8	Capital asset reconciliation to the general ledger – We noted that the District does not currently have a control in place to reconcile certain key, full-accrual accounts on a monthly basis, specifically capital assets.	To improve the accuracy of the monthly financial reports and to reduce the burden of the year end closing process, we recommend that the activity per the asset tracking system be routinely reconciled to the capital outlay accounts on a monthly basis. This reconciliation should be formally documented and reviewed by someone other than the person performing the reconciliation as part of the District's monthly close process.	C	Jr Accounting Specialist	The Jr Accounting Specialist will reconcile capital asset records to asset additions, and other changes in capital assets for fiscal year end June 30, 2020 in preparation for the annual audit. Reconciliations will be reviewed and approved by the Finance Director. Beginning with the 20-21 fiscal year, staff will reconcile capital assets activity quarterly.	Capital Assets and Construction in Progress has been reconciled to the GL for FY 2020. Next step is quarterly reconcilation and reporting starting in Q1 FY 2021.

Process	9	Labor and overhead costs – During our review of project costs, we noted that the District does not currently track and apply internal labor and overhead costs to projects.	With the implementation of an asset tracking system as noted in the previous comment, we recommend that the District begin to track these costs and apply them to the appropriate projects to help capture all costs that were incurred during the construction phase of each project.	C	Management Team	This will be a key component of the project as outlined in number 7 above	In progress - The District is merging the in-house water workorder system with Lucity. Once combined, workorders that capture labor and equipment usage support proper costing of capital projects.
Process	10	Physical inventory of capital assets – During the audit several assets were identified on the general ledger that were disposed of in previous periods, thus requiring a prior period adjustment for this error.	We recommend that the District establish controls to perform periodic physical inventories of capital assets to help identify assets that were disposed of, but have not been captured appropriately in the financial records of the District.	C	Jr Accounting Specialist	The Jr Accounting Specialist will develop and implement a plan for a physical inventory of the District's capital assets in accordance with best practices. That plan will include identification of all capital assets by location and incorporate property tagging as well as procedures for reporting acquisition, transfer and disposal of capital assets in support of accurate financial reporting.	Complete - Physical inventory of capital assets, with a focus on assets that are not part of the infrastructure or physical plant were located and counted. Process included clarification of asset description and locations.
Process	11	Useful lives of capital assets – As we were analyzing depreciation expense and useful lives assigned to assets, we noted that the ability to change useful lives is unrestricted and therefore unauthorized changes could occur and impact the calculation of depreciation expense.	We recommend that access to change useful lives be restricted to certain individuals.	C	Jr Accounting Specialist/Finance Director	System security will be updated to restrict edit authority for capital assets to the Jr Accounting Specialist, with review responsibilities by the Finance Director	Completed as of May 31, 2020. Access provided to Jr Accounting Specialist with review and reporting access (only) to Finance Director
Process	12	Journal entries – During our review of IT access, we noted that the Finance Director has the ability to both prepare and post journal entries without a secondary approval.	We recommend that any manual journal entry have a documented approval from someone other than the person responsible for posting the entry.	A	Sr Accountant /Finance Director	The District has a policy in place that journal entries be approved/committed by someone other than the initiator. The system captures information on who initiated the journal entry and who approved/committed it. Staff is currently working with Springbrook to identify a report/procedure for documenting review and approval of separation of duties re: journal entries.	Completed in May 2020. The Finance Director runs a report of journal entries committed/posted to the system monthly, reviews and retains the report as evidence of the control.
Process	13	Review of reconciliations – During our testing, we noted no evidence to support that reconciliations are reviewed and approved timely by someone other than the person preparing the reconciliations. This includes bank reconciliations, accounts payable reconciliations, the daily cash summaries, as well as other monthly reconciliations.	We recommend that each reconciliation be reviewed monthly and that the review be documented electronically or in writing.	A	Finance Director	The Finance Director currently reviews all staff prepared reconciliations in a timely manner, and evidences that review with initials and date. Reconciliations are retained in accordance with records retention requirements.	Currently in place and operating effectively.
Process	14	Physical inventory of wastewater inventory – During our inquiries we determined that the District had not recorded materials and supplies inventory previously, which resulted in an audit adjustment of approximately $116,000.	We recommend that the District record and track wastewater inventory consistently going forward and that physical inventories be performed on at least an annual basis to validate the accuracy of the amounts recorded.	B	Finance Director/Plant Superintendant/Collections Manager	The Finance Director will work directly with the Plant and Operations Managers to identify the required information in support of an effective and efficient materials inventory for Wastewater operations. That inventory will address quantities and costs in support of complete and accurate financial reporting.	Complete - these assets have been added to Lucity for tracking
Process	15	Inventory costs – We noted that the purchase of inventory items are not being input into the system timely, which has created instances where inventory items are identified during the year end physical inventory count and management may have to call the vendor to obtain the price.	We recommend that all inventory purchases be input into the inventory system on a timely basis to ensure the listing is updated, costs are accurate, and amounts charged to projects will be charged at accurate rates.	B	Finance Director/Plant Superintendant/Collections Manager	This will be a key component of the project as outlined in number 14 above	Completed - June 30 physical inventory has been added to Lucity.
Process	16	Approval of inventory charged to projects – We noted that the District did not have controls established to require formal approval of inventory to be charged to projects.	We recommend that controls be established to require a formal charge-out approval for any inventory items to be taken from the warehouse and utilized on a project. These approvals should be compared to the actual inventory charged to each project to ensure only authorized costs were captured on the project.	B	Finance Director/Plant Superintendant/Collections Manager	This will be a key component of the project as outlined in number 14 above	In progress - Approval processes and reporting are under development with the addition of inventory and workorders into Lucity.
Process	17	Obsolete inventory – We noted that the District did not have a process in place to regularly review its inventory listing to identify obsolete or unusable inventory items.	We recommend that as part of the physical inventory process, the District identify any obsolete items that should be expensed in the current year.	B	Finance Director/Plant Superintendant/Collections Manager	This will be a key component of the project as outlined in number 14 above	Completed with June 30 end of year counts.
Process	18	Cutoff of expenditures – During our testing, we noted amounts where the service period per the invoice spanned over both fiscal year 2018 and 2019, but the total amount of the invoice was expensed in fiscal year 2019. In addition, we noted an expenditure for which receiving documentation was not retained for materials that were invoiced in the prior fiscal year, but were recorded as expenditures in the current fiscal year.	We recommend that the District establish controls to review year end cutoff to ensure that costs are recorded in the period in which the service was provided or the materials were received. We also recommend that the District retain all documentation related to purchases including any receiving documentation.	A	Finance Director	The Finance team will intiate communications regarding cutoff to Destrict staff in advance of year end emphasizing cutoff issues. The Finance Director reviews all expenditure batches against supporting documentation prior to payment. One element of review is that expenditures are charged to the proper period. Review is documented with initials and date evidencing approval.	Completed - Control is currently in place and operating effectively.
Process	19	Duplicate payment – We noted one instance in our subsequent disbursement testing where an invoice was paid twice by the District and was not discovered during the District's approval process.	We recommend a formal review of all disbursements prior to issuing payment to ensure the amount to be paid matches the amount owed to the vendor for the products or services received and invoiced.	A	Finance Director	The Finance Director is currently working with the new Jr Accounting Specialist to tighten controls and processes over expenditures and utilize system functionality to reduce or eliminate the opportunity for duplicate payments.	Completed - Control is currently in place and operating effectively. The Finance Director reviews all expenditures prior to payment for accuracy.

Process	20	Review of NCCWC balance – During the audit of the North Clackamas County Water Commission (NCCWC), a prior period adjustment was identified and reported relating to the improper previous amortization of water rights. The restatement of the NCCWC's financial statements had a direct impact on the District's reporting of its investment in the NCCWC on the District's financial statements. The adjustment to the investment in NCCWC was not properly recorded as a restatement in the initial draft of the district's financial statements provided to us.	We recommend that the district provide for a review of the final, audited NCCWC financial statements prior to finalizing the District's financial statements to ensure proper reflection of the investment in NCCWC. The review should be documented as part of the District's year end closing process.	A	Finance Director	The Finance Director will perform a careful and detailed review of NCCWC accounting records and financial statements in conjunction with the audit of NCCWC. That review will translate to a timely update of relevant accounting records and financial statements of the District.	Completed - Control is currently in place and operating effectively.
Process	21	Listing of public procurement contracts – As part of our testing of compliance with state procurement requirements, we noted that the District does not maintain a centralized list of all contracts executed during the year.	We recommend that this process be centralized with one employee to help track all procurements and ensure all documentation required is maintained on file to support the District's compliance with the State's procurement requirements.	B	District Recorder	The District Recorder has assumed responsibility for centralizing the District's contracts and related information as well as compliance with State records requirements. The Finance Director will work directly with the District Recorder to ensure all information related to procurements is centralized in support of contracts with vendors.	In Progress - Contract centralization is currently in process. It is expected that records will be complete and available by December 31, 2020.
Process	22	IT user access – We noted that the District does not regularly perform and document its review of user access to the various systems supporting the financial reporting function.	We recommend that the District perform routine reviews of user access, at least annually, to determine whether access to the systems are appropriately updated, terminated users have been removed timely, and any segregation of duties conflicts are identified.	A	Finance Director	The Finance Director will review system access quarterly and work with the appropriate staff to maintain appropriate segregation of duties.	In Progress - Security reviewed. Recommendations are currently under review. Training is underway with Springbrook to strengthen internal knowledge and two in a box training.
Process	23	Pay rate and other employee master file changes – We noted during our payroll testing that once a pay rate is entered into the system, there is no formal review to verify that the rates were entered correctly.	We recommend that the District run reports of any changes made to the employee master file on a monthly basis to verify the accuracy and timeliness of the changes. Such review should be formally documented to evidence who performed the review and when it was completed.	A	Finance Director	System security will be updated to allow the Finance Director "view only" and "reporting" access to the HR module so that changes to employee master files can be reviewed for completeness and accuracy. All changes to employee master files will be supported by a personnel action form approved and dated by appropriate parties. The Finance Director will review these forms against the system as they are implemented.	Completed - Control is currently in place and operating effectively.
Process	24	Purchase orders – We noted that the District's current policy requires purchase orders to be utilized for any inventory items over $500. However, non-inventory items do not have a similar requirement.	We recommend that the District update its policy to require purchase orders on non-inventory items over $500 as well. The purchase orders should be reviewed and approved by someone other than the person requesting the purchase.	B	Finance Director	The District's procurement and related approval policy is currently in review. Once finalized and implemented the policy will allow for consistency across transactions and require training of appropriate District staff in the generation and approval of PO's, supporting documentation for payment, and records retention.	In Prcess - PO workflows have been mapped and currently working on system updates. Anticipating completion by end of November.

STAFF REPORT

To	Board of Directors
From	Jason Rice, District Engineer
Title	Technical Services Monthly Report
Item No.	11c
Date	October 20, 2020

Summary

The Board has requested updates at the Regular Meetings of the Board on the status of the District's operations.

Highlights of the Month

- MS4 Annual Report Preparation
- TMDL Annual Report Preparation
- Began Solids Piping Project at the Water Reclamation Facility
- Began Belt Filter Press Project at the Water Reclamation Facility
- Various Task Orders are in draft stage for FY21 Capital Work.
- Rollout of PACP Sewer Condition Rating system for Field Operations
- GIS Mapping layers continue to be updated
- Staff continues to work from home while still meeting the public expectations for our presence (such as inspections).

Education and Outreach

The fires through much of September created considerable messaging needs with regards to water conservation to support the needs of emergency service providers in Clackamas County. The main goal has been to keep water in the pipes, reservoirs, and river to support human lives, property, fish and wildlife. As the dry season continues, usually through the end of this month, we are hoping the fall rains begin without having to curtail water usage. We are, as you know, still in Oregon's fire season until the seasonal rains return.

During the crisis Oak Lodge relied on partnerships with the Clackamas River Water Providers and the Regional Water Providers Consortium. This emergency situation showed how important those relationships are to maintaining a cohesive level of information and service for our customers. Regular information briefings were held to inform and update partners, and common messaging throughout all of the water users of Clackamas River water allowed OLWS staff and customers to support the emergency efforts. OLWS did our part to update the website frequently and as well as email our interested parties and push out messaging to our social media partners like the local email newsletters, Jennings Lodge CPO, and the Oak Grove Community Council.

October messaging includes:

- Now that the immediate fire management response has been completed, seasonal water conservation messaging, continues with the Fish on the Run, Irrigation Done! Campaign. The Clackamas River Water Providers message encourages lower water use outdoors by reducing or shutting-off watering by the beginning of September to support the fall fish migration. This year customers may also recognize their water conservation efforts also support emergency services.
- Seasonal leaf cleanup messaging also has begun, in order to keep nutrients out of our waterways. OLWS encourages people to remove leaves from their gutters and not to let them enter the storm drains, ditches and local creeks. Visit our media partnership to learn more.
- Commercial or business customer? Remember that OLWS offers the Stormdrain Cleaning Assistance Program to customers. Click through on the link provided to find out more information about this cost-effective program.
- As the pandemic continues to be an ongoing challenge to our community, the District will continue to update communications relevant information to our customers regarding the situation.
- October 21, 2020 is the day devoted to Imagine a Day Without Water. Visit their site if you are curious to learn how OLWS participates in this effort.
- Just a reminder that important messages for the Board to be aware of can be found on our website here.

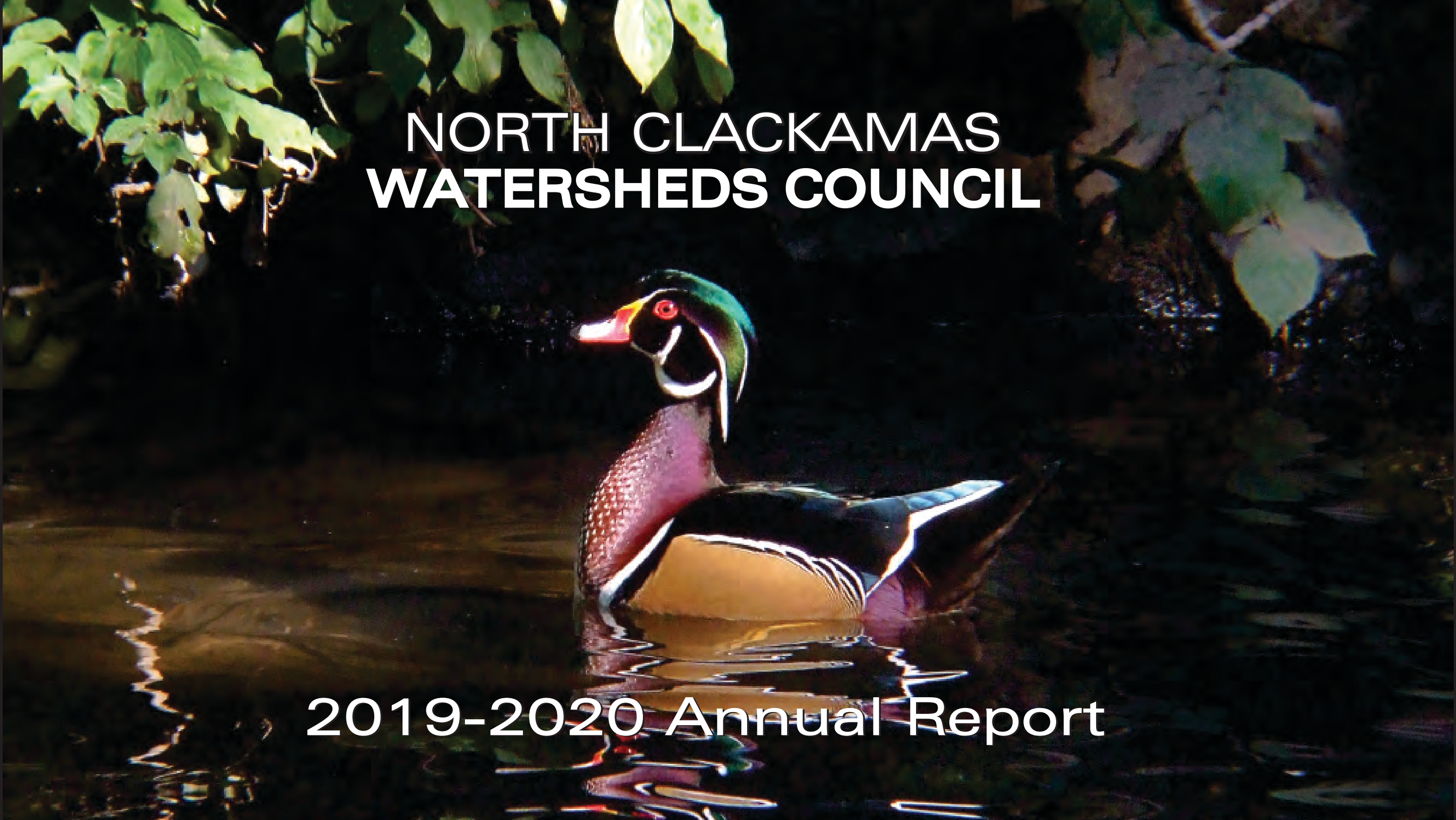
Finally, the North Clackamas Watersheds Council (NCWC) completed their annual report (attachment 1 to this report). This year staff and Board were able to pivot through the challenges of the pandemic as well as beginning to look more deeply at our watersheds with the help of an equity lens. The report features these topics as well as highlighting other challenges and successes this year, which have helped to strengthen NCWC's relationship with OLWS.

September 2020 Permit Activity

	This Month	Last Month	Fiscal Year-to-Date	This Month Last Year	Last Year-to-Date
Pre-applications Conferences	1	0	5	3	10
New Erosion Control Permits	4	8	22	-	76
New Development Permits	0	0	0	1	6
New Utility Permits	6	5	18	-	-
Wastewater Connections	7	8	15	20	56
Sanitary SDC Fees Received	$36,155	$103,300	$181,032	$92,831.75	$246,237.60
Water SDC Fees Received	$30,542	$67,058	$136,805	$69,120.00	$129,410.00
Plan Review Fees Received	$4,155	$12,873	$25,398	$9,730.00	$22,795.00
Inspection Fees Received	$7,058	$7,241	$22,838	$7,250.00	$14,769.80

Attachments

1. NCWC Annual Report
2. Development Tracker
3. Capital Project Tracker



NORTH CLACKAMAS
WATERSHEDS COUNCIL

2019-2020 Annual Report

What We Do, and Why

165,000 people live in the North Clackamas watersheds between the mouths of Johnson Creek in Milwaukie and of the Clackamas River in Gladstone. The Kellogg, Mt. Scott, Rinearson, River Forest, and Boardman Creek watersheds, and the east bank of the Willamette River, have the same population as Eugene, the fourth largest city in Oregon.

People, like salmon, river otters, beavers, hummingbirds, and kingfishers, need clean water, healthy natural areas, and rivers that function like rivers should: meandering through natural floodplains and wetlands with lots of different kinds of habitat. In the era of Covid-19, when we're all seeking nature closer to home, our mission of restoring healthy watersheds for fish, wildlife, and people has never been more critical.

The North Clackamas Watersheds Council does this in five major ways:

- Planting trees with willing landowners in the Streamside Stewards program
- Working toward removing Kellogg Dam, a now-functionless barrier to salmon and steelhead from before the Civil War
- Using cutting-edge watershed science to identify and prioritize projects and keep track of changing ecological conditions
- Working with local governments to adopt watershed-friendly policies
- Engaging people in stewardship of healthy watersheds through volunteer events, workshops, and more

Highlights from 2019-2020

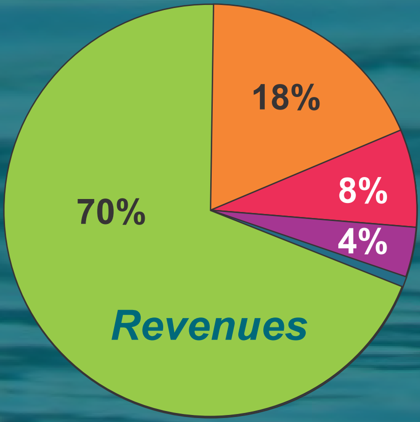
We have a lot to be proud of:

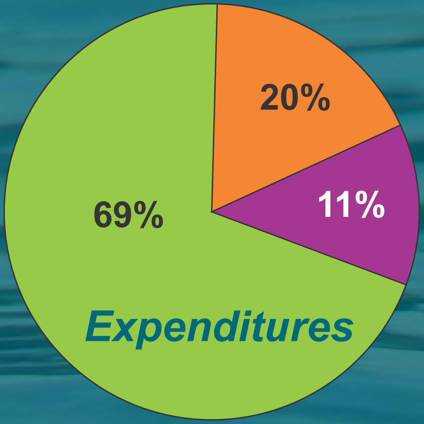
- Planted 4,777 trees on 163 Sites
- Raised funds and convened partners for the next phase of Kellogg Dam removal planning and design
- Completed our BioAssessment, the first phase of our Watershed Action Plan

(To read the Bio-Assessment Report, go to https://ncurbanwatershed.wordpress.com/watersheds/ and click on the Report download button.

- Worked with Northwest Housing Alternatives to restore Olson Wetlands in Gladstone, a critical natural area which provides outdoor access for nearby low income residents
- Replanted the headwaters of Mt. Scott Creek in Happy Valley
- Used aerial imagery to monitor growth of shade on creeks
- Helped the City of Milwaukie adopt a cutting-edge Comprehensive Plan that will help protect part of our watersheds for years to come
- Built our financial reserve

2019-2020 Revenues & Expenditures





Local & State Jurisdictions:	$146,557 -	70%
Foundations:	$ 37,640 -	18%
Program Service Revenues:	$ 17,066 -	8%
Individuals:	$ 7,443 -	4%
Other:	$ 37 -	<1%
Total Revenues:	$208,743 -	100%

Programs:	$ 111,500 -	69%
Management & Administration:	$ 32,380 -	20%
Fundraising:	$ 17,909 -	11%
Total Expenditures:	$161,789 -	100%

Disruption and Disparities

Two big changes came to our watersheds this spring.

The first was Coronavirus, which forced us to change how we operate. We had to reduce the size of restoration crews, cancel volunteer events, and shift to online gatherings. It also created a challenging funding environment, as many funders and partners were forced to scale back. At the same time, it drew attention to how important natural areas close to home are to all of us.

The second was growing awareness of longstanding racial inequities. Healthy natural areas haven't been equally distributed: people of color have historically lived in areas with fewer trees, fewer parks and natural areas, and more pollution. Even our own programming echoes this disparity: our tree planting projects, which have focused on streamside trees for ecological reasons, haven't benefitted low-income residents enough. We also recognize that our watersheds are the original homeland of the Clackamas People, from whom it was taken in the 1800s. In the coming year, the Council will be grappling with how we can both serve those watershed residents who have been excluded from the benefits of a healthy environment, and how our organization can engage with the full range of our watersheds' growing diversity. This is a long journey, and an important one. (To read our full statement, click the statement download button at https://ncurbanwatershed.wordpress.com/.)

Coming in 2020-2021

- The next step toward a free-flowing Kellogg Creek: designing what the restored river channel will look like
- Completing our 10-year Watershed Action Plan
- Helping residents learn to be good stewards of our watersheds, whether in-person or online
- Expanding the Streamside Stewards program along Mt. Scott Creek
- Developing our equity strategy
- Working with local government to help them enact cutting-edge watersheds protections
- Maintaining a fiscally-sound Council

How You Can Help

Restoring watersheds during a pandemic and an economic slowdown will take effort from all of us. We need your help in four specific ways:

1. Lend Us Your Voice: We'll need your voices to join ours in advocating for funding to remove Kellogg Dam and prioritize healthy watersheds amongst many competing issues. Email is our best way of letting you know about such opportunities: please go to https://ncurbanwatershed.wordpress.com/contact/, and click on "Get Email Alerts" at the bottom of the page, to get on our email list. (We never sell our email list.)

2. Contribute Financially: Planting trees and restoring watersheds takes money, and many funding sources have cut back during the pandemic. Please make a one-time or recurring contribution by going to https://ncurbanwatershed.wordpress.com/donate/ and clicking on the yellow "donate" button.

3. Lend Us Your Talents: The Council always needs volunteer help. It could be planting trees, graphic design, community outreach, or more. If you've got a skill or talent you'd like to offer, read more about opportunities and how to contact us here: https://ncurbanwatershed.wordpress.com/eve

4. Improve the Habitat in Your Own Yard: Planting more native plants will support pollinator and bird populations. And routing your downspouts into a small rain garden is also a great step. There are lots of great resources around to help you get started. Visit ncwatersheds.org or https://conservationdistrict.org/resources/yard for information on things you can do.

Supporters

Government
City of Milwaukie
Clackamas Soil & Water Conservation District
Clackamas Water Environment Services
North Clackamas Parks & Recreation District
Oak Lodge Water Services
Oregon Watershed Enhancement Board

Foundations
Bonneville Environmental Foundation
Johnny Leuthold Charitable Trust
Gray Family Foundation
One Tree Planted
PGE Samon Habitat Support Fund
William & Irene Finley Charitable Fund

Businesses
Bjorklund Business Relations
Dave's Killer Bread
Happy Valley Heights
 Homeowners' Association
Leatherman Tool Group
MacFarlane's Bark
Patagonia & Patagonia Action Works
Tech Soup

Partners
Altap Restoration
Alexis Barton
Cascade Environmental Group
Celebrate Milwauke
City of Gladstone
City of Happy Valley
Clackamas Community College
Clackamas Partnership
Clackamas River Basin Council
Clackamas River Water Providers
Depave
Friends of Trees
GeoEngineers
Greater Oregon City Watershed Council
Institute for Natural Resources
Inter-Fluve, Inc.
Johnson Creek Watershed Council
Lake Road Neighborhood Association
Lower Columbia Estuary Partnership
Metro
Milwaukie High School
Milwaukie Presbyterian Church
Mosaic Ecology
Network of Oregon Watershed Councils

Partners, continued
NOAA Fisheries
Northwest Housing Alternatives
OnPoint Community Credit Union
Oregon Dept. of Environmental Quality
Oregon Dept. of Fish & Wildlife
Oregon Dept. of Transportation
Portland Community College
Portland State University Dept. of
 Environmental Sciences & Resources
SOLVE
Tryon Creek Watershed Council
Urban Greenspaces Institute
Warn Industries
Willamette Partnership
The Wetlands Conservancy

NORTH CLACKAMAS **WATERSHEDS COUNCIL**

Content: Executive Director Neil Schulman
Layout & Design: Karen Bjorklund
Wood Duck & Hummingbird Photos: Steve Berliner
Other photos: NCWC Staff

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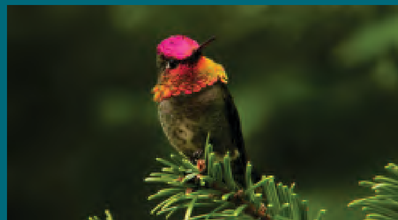
Board of Directors



- Joseph Edge, Chair
- Mark Fitzsimons, Vice Chair
- Cecilia Seiter, Treasurer
- Mona Thomason, Secretary
- Lisa Batey, City of Milwaukie
- Steve Berliner
- Bob Bohannon
- Lara Christensen, Oak Lodge Water Services
- Dale Guenther
- Rob Livingston, Clackamas Water Environment Services
- Chris Randall, City of Happy Valley
- Chris Runyard
- Dick Shook
- Randi Thomas
- Tonia Williamson, North Clackamas Parks & Recreation District

Project Status	Address	Type of Development	Notes	Last Updated
Under Construction	4410 SE Pinehurst	Residential Subdivision: 17 lots	Water utility only. Inspections Continuing	10/2/20
Under Construction	16518 SE River Rd.	Head Start School Additions	Oak Lodge permits expire March 2021	10/2/20
Under Construction	13505 SE River Rd	Rose Villa Phase 4 Medical Building	Oak Lodge permits expire July 2021	10/2/20
Under Construction	1901 SE Oak Grove Blvd	Alteration of a Nonconforming Use to replace a portion of existing New Urban School	Oak Lodge permits expire July 2021	10/2/20
Under Construction	View Acres Elementary School	Redevelopment: School	Oak Lodge permits expire July 2021	10/2/20
Under Construction	Riverside Elementary School	Redevelopment: School	Oak Lodge permits expire July 2021	10/2/20
Under Construction	New Urban High School "Annex"	Redevelopment: School	Oak Lodge permits expire July 2021	10/2/20
Under Construction	Candy Lane School	Redevelopment: School	Oak Lodge permits expire July 2021	10/2/20
Under Construction	Jennings Lodge School	Redevelopment: School	Oak Lodge permits expire July 2021	10/2/20
Plan Review	SE Kellogg @ SE Birch	Road Improvements: CC DTD CIP	Oak Lodge Site Development Permit current review	10/2/20
Plan Review	15099 SE McLoughlin Blvd	Tenant Improvement: Corporate Headquarters, Clackamas Credit Union	Oak Lodge Site Development Permit current review	10/2/20
Plan Review	15115 SE East Ave	Residential Subdivision	Application submitted to Oak Lodge. Oak Lodge permit expires January 2021	10/2/20
Plan Review	19315 SE River Rd	Residential 2-lot partition	Land Use comments sent to CCDTD. County land use expiration timeline.	10/2/20
Plan Review	14720 SE River Rd	Residential: Multifamily	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Plan Review	Jennings Ave. Oatfield to McLoughlin	CC DTD Jennings Ave Roadway expansion and regional stormwater treatment	Current OLWSD review	10/2/20
Plan Review	15603 SE Ruby Dr	Residential: 3-lot partition	Current OLWSD review	10/2/20
Plan Review	14928 SE Oatfield Rd	Residential: 4-lot partition	Current OLWSD review	10/2/20
Plan Review	6364 SE McNary Rd	Residential: 15-lot partition	Current OLWSD review: water utility only	10/2/20
Pre-Application	14733 SE Rupert Ave	Residential tri-plex; no demo	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	3110 SE Concord Rd and 16103 SE Southview Ave	Residential: 7-lot subdivision	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20

Project Status	***Address***	***Type of Development***	***Notes***	***Last Updated***
Pre-Application	Spaulding Ave., TL 3200	Residential: 1-lot partition	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	5212 SE Thiessen Rd	Residential: 5-Lot Short Subdivision	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	5200 SE Roethe Rd.	Residential: 4-lot subdivision	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	16305 SE Oatfield Rd	Residential: 12-lot subdivision	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	3870 SE Hillside Dr	Modification of previously approved 13 lot subdivision.	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	3421 SE Vineyard Rd	Zone Change To MR-1 and a three-parcel Partition for seven duplex and triplex units.	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	2316 SE Courtney Ave	Six Lot Subdivision w/ 14 rowhomes or 14	Pre-app Comments sent to CCDTD. County land use expiration timeline.	10/2/20
Pre-Application	3811 SE Concord	Renovations To Existing Use: School	Pre-app scheduled for Oct. 21	10/2/20

Wastewater Capital Projects

Project ID	Project Name and Description	Fiscal Year 2021 Budget	Fiscal Year 2021 Spent	Total Spent To-date	Project Status	Project Manager	Phase	Percent Complete
2018-SS03	Belt Filter Press #2 Retrofit	$ 340,000	$ 28,671	$ 131,771	Active	Ogbeide		
	This project creates redundancy for the District's single Belt Filter Press and will allow for Belt Filter Press #1 to be taken off-line for much needed maintenance without interruption to biosolids handling.						Planning	100%
							Design	100%
							Bid	100%
							Construction	15%
2020-SS01	Solids Piping Project	$ 420,000	$ 23,175	$ 135,611	Active	Ogbeide		
	Creates a new pipeline connection between four existing tanks that together process wasted sludge into biosolids. Increases smoothness of day-to-day operations and conserves energy.						Planning	100%
							Design	100%
							Bid	100%
							Construction	5%
2020-SS05	Hillside Sewer Line	$ 400,000	$ -		Active	Rice		
	Replacement of 638' of 12" diameter pipe that has settled and is collecting sediment, grease and fats.						Planning	90%
							Design	0%
							Bid	0%
							Construction	0%
2020-SS05	2A010-343 Line Replacement	$ 60,000	$ -		Active	Rice		
	Replacement of 160' of 8-inch main that has deteriorated due to a sag in the line that has collected grease and been cleaned too many times.						Planning	90%
							Design	0%
							Bid	0%
							Construction	0%
2020-SS06	Sanitary Sewer Master Plan	$ 400,000	$ -		Active	Rice		
	The District's first master Plan informed by an asset management database built from inspections. This document will look at both the field and the treatment plant to prioritize capital projects.						Planning	50%
							RFP	60%
							Creation	0%
							Adoption	0%
2020-SS07	Aeration Basin Baffle Wall	$ 150,000	$ -	$ -	Active	Ogbeide		
	Makes improvements to the first aeration basin train, allowing operational flexibility and enhanced performance of sewage treatment.						Planning	100%
							Design	45%
							Bid	0%
							Construction	0%
2020-SS04	WTP Blower Rehab	$ 150,000	$ -	$ -	Active	Ogbeide		
	Replace one faulty and oversized turbo blower with a smaller and more versatile screw blower						Planning	100%
							Design	45%
							Bid	0%
							Construction	0%
2020-SS05	Lateral Repair Program (FY2021)	$ 60,000	$ -	$ -	Active	Rice		
	A re-occurring repair and replacement program that aims to fix the worst lateral issues in the District's Asset Maintenance Software.						Planning	90%
							Design	0%
							Bid	0%
							Construction	0%
2020-SS04	Pump Station Rebuild Program	$ 350,000	$ -	$ -	Active	Ogbeide		
	Redesigns sewage Pump Station No 5 by altering its layout to allow for modern submersible pumps and upgrading its electrical and mechanical equipment						Planning	100%
							Design	40%
							Bid	0%
							Construction	0%
	Total	$ 2,755,000	$ 51,846	$ 299,381				

Water Capital Projects

Project ID	Project Name and Description	Fiscal Year 2021 Budget	Fiscal Year 2021 Spent	Total Spent To-date	Project Status		Phase	Percent Complete
2017-W01	Water Master Plan	$ 40,000	$ 20,607	$ 185,870	Active	Rice		
	The Water Master Plan will serve as an all-						Planning	100%
	inclusive guiding document for the District to						Adoption	50%
	forecast capital projects, rates and SDC's for							
	the Drinking Water Program.							
2020-W02	Intertie Project Design	$ 100,000	$ -	$ -	Active	Rice		
	Identified during the development of the						Planning	95%
	Water Master Plan, OLWSD is in need of an						Design	0%
	alternative water source in the event that						Bid	NA
	Clackamas River Water is unavailable.						Construction	NA
2020-W01	AWIA Water Resiliency Plan	$ 100,000	$ 10,370	$ -	Active	Rice		
	This study will look into the District's						Creation	30%
	vulnerabilities and ability to respond in the							
	event of an emergency. Gaps will be identified							
	and help drive future projects to better protect							
	the District.							
2020-W03	Partridge Circle Main Replace	$ 325,000	$ -	$ -	Active	Rice		
	Replacement of a ductile iron pipe due to						Planning	100%
	electrolysis and land movement with HDPE						Design	0%
	pipe.						Bid	0%
							Construction	0%
2020-W04	Capital Project Place Holder #1	$ 955,000	$ -	$ -	Active	Rice		
	Design and Replacement of 3025' on 8" pipe on						Planning	100%
	Aldercrest Road. If there is enough money left						Design	0%
	over, design for next years Construction						Bid	0%
	Projects will be started.						Construction	0%
	Total	$ 1,520,000	$ 30,977	$ 185,870				

Watershed Protection Capital Projects

Project ID	Project Name and Description	Fiscal Year 2021 Budget	Fiscal Year 2021 Spent	Total Spent To-date	Project Status		Phase	Percent Complete
2018-SW01	Stormwater Master Plan	$ 215,000	$ -	$ -	Active	Rice		
	This project will look into two alternative						Planning	80%
	Watershed Protection Program models and						RFP	0%
	how their costs would affect the District's						Creation	0%
	rates.						Outreach	0%
2020-SW01	Localized Enhancement Program (FY21)	$ 250,000	$ -	$ -	Active	Rice		
	This project aims to fix small to medium scale						Planning	15%
	localized stormwater issues throughout the						Design	0%
	District. This would likely include planted						Bid	0%
	facilities such as swales and ponds.						Construction	0%
	Total	$ 465,000	$ -	$ 3,609,000				

STAFF REPORT

To	Board of Directors
From	Todd Knapp, Field Operations Manager
Title	Field Operations Monthly Report
Item No.	11d
Date	October 20, 2020

Summary

The Board has requested updates at the Regular Meetings of the Board on the status of the District's Operations.

Highlights of the Month

- Meters replaced, new services added, and leaks repaired (See chart)
- Water consumption for **September: 120,624,000 Gallons** (**4.93%** Above the 10-year average of 114,951,300 and up **14.66%** compared to last year) (See metered monthly consumption chart)
- OLWSD Non-Revenue Water Tracker Graph update.

Water Operations

Staff was still in the process of cleaning the exterior of the two 5 MG reservoirs until wildfires put a halt to most outside activities.

Staff was told to limit their outside activities to emergencies and critical operations only during this time, this was an excellent opportunity for staff to take or retake their FEMA training, currently all utility staff has taken IC-100 and IC-700 with some taking the IC-200 as well.

The sampling results of meters that were taken out of service have been received (see attachment 11dv) you will notice two meters were at 0% due to the fact they were stuck meters so 0% was expected, most were in fairly acceptable ranges, Staff is in the process of trying to make estimates for the non-revenue water for these meters, but does illustrate the fact our older larger meters are showing signs of aging, staff has made a list of the top 100 consumers and will prioritize this list for future change outs.

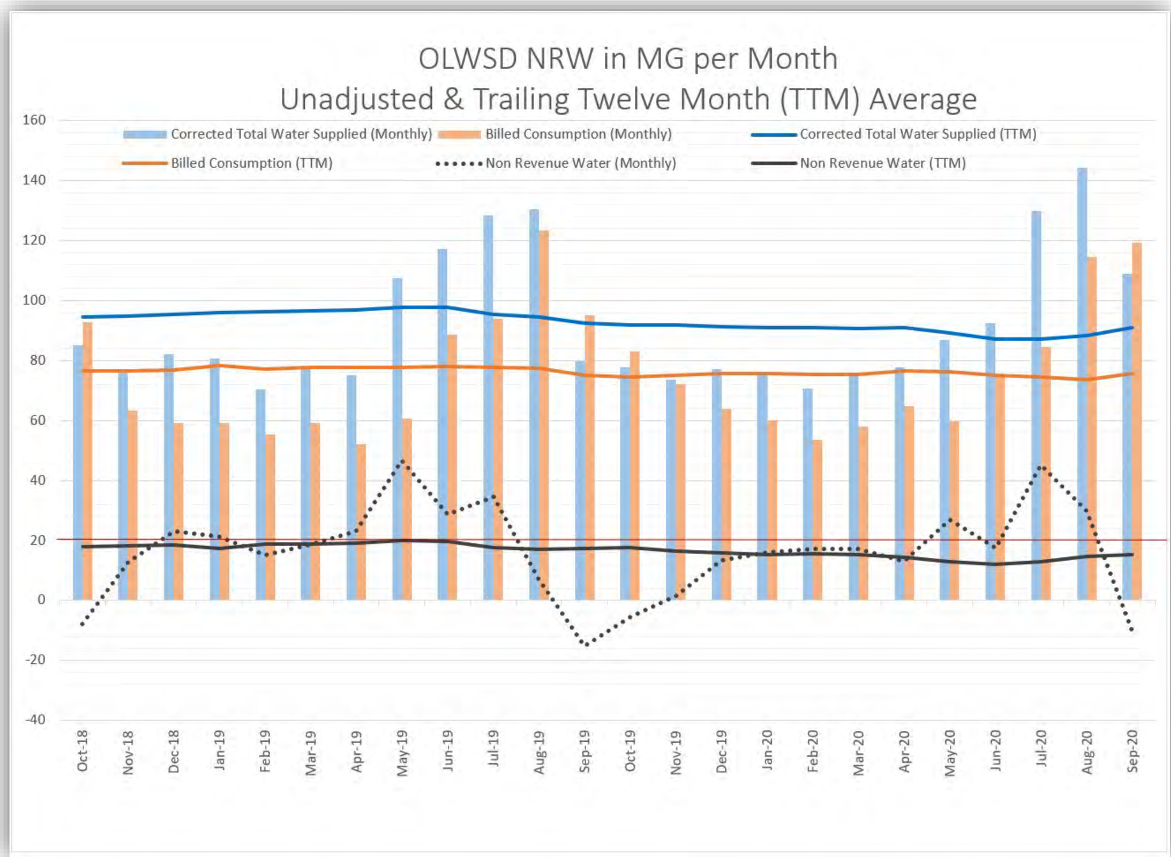
The Elks Lodge contacted the District with concerns of an unusually high-water bill, after investigating the cause, it was determined a sink faucet had accidentally been left on for approximately four weeks.

Non-Revenue Water Tracker

- The graph below is a new graph that illustrates a <u>per month</u> combined with a trailing 12-month (the trailing 12-month is to help smooth out that fact we bill every other month)

- Last year at this time our trailing 12-month non-revenue loss in million gallons was 17.332 compare that to this year's 12-month non-revenue loss of 15.142 a difference of 2.19 million gallons.

- The monthly billed consumption (what we billed our customers) this month was 119.355 MG the corrected total water supplied (what we received from NCCWC) was 108.984 MG a difference of (-10.371) MG. Again, this is because of the split billing.



Collections Operations

The collections team had to deal with multiple issues during the month of September. Staff completed critical monthly grease line cleaning, along with other TV and Hydro cleaning.

The District has a total of **523,392** feet of main, of that a small percentage (less than 5%) had no TV inspections that could be found, due to inaccessibility, data being lost or data corruption, The last several months staff have been diligently searching and with some success was able to find roughly another 3.79%, the remainder, to be TV'd again or placed on a CIP list to create accessibility.

Staff as of September 30th, have a remaining **6,338** feet or **1.21%** left to complete.

Collection crew has also been involved in debris removal and beaver dam removal (see Photo's page) Each beaver dam typically takes four people an average of (4) hours to remove. This has been an ongoing battle, as soon as the area is cleaned the beaver quickly moves back in to rebuild, luckily rainfall for the past several months has been minimal. Crews are monitoring several locations for beaver build ups. The beaver dams which have been removed are mostly on County property.

Attachments

1. Photos Page
2. Sewer Collection Report
3. Master Meter Report
4. Water Stats Report
5. Meter Audit results

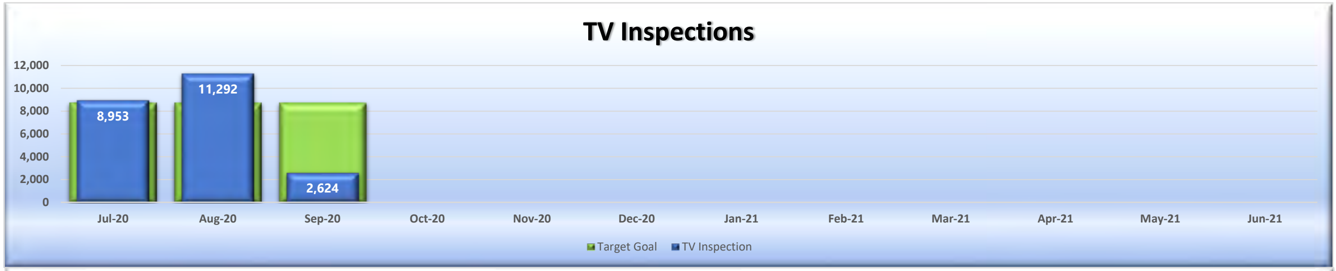
Photos Page

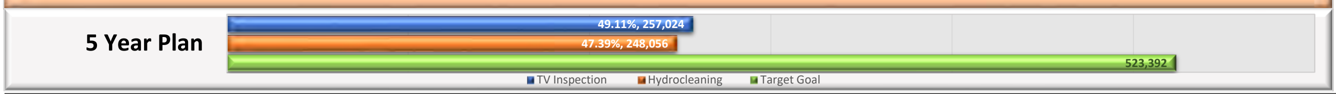
Beaver Dam Removal (9/23/20)

Debris Removal

Beaver Dam Removal (1/8/20)

Oak Lodge Water Services Collections Report





FY 2017-2018

Month	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Current Month %	To Date Totals	Year 1 % Complete	5 Year %	Total Feet Remaining
TV Inspection	2,512	11,906	13,532	8,961	4,566	4,987	5,092	1,548	1,942	9,212	7,875	6,239		78,372	74.87%	14.97%	445,020
Hydrocleaning	6,967	8,539	13,085	10,206	4,472	2,328	4,723	513	4,906	8,953	8,638	5,367		78,697	75.18%	15.04%	444,695
Target Goal	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723		104,678	100.00%	20.00%	418,714
Actual to Goal	**-3,984**	**1,499**	**4,585**	**860**	**-4,204**	**-5,066**	**-3,816**	**-7,693**	**-5,299**	**359**	**-467**	**-2,920**		**-26,144**			
Grease Line	3,625	5,105	3,276	3,625	10,227	3,859	3,625	4,757	3,625	3,276	11,061	4,225		60,286			

FY 2018-2019

Month	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Current Month %	To Date Totals	Year 2 % Complete	5 Year %	Total Feet Remaining
TV Inspection	4,308	10,281	10,488	3,388	5,886	13,480	3,283	8,993	4,635	1,657	4,923	15,854		87,176	83.28%	31.63%	357,844
Hydrocleaning	3,619	9,456	6,197	13,307	2,636	16,171	1,124	11,765	14,542	3,289	287	0		82,393	78.71%	30.78%	362,302
Target Goal	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723		104,678	100.00%	40.00%	314,035
Actual to Goal	**-4,760**	**1,145**	**-381**	**-376**	**-4,462**	**6,102**	**-6,520**	**1,656**	**865**	**-6,250**	**-6,118**	**-796**		**-19,894**			
Grease Line	3,276	4,757	3,625	3,625	3,625	2,192	5,105	3,625	2,963	10,872	4,006	3,276		50,947			

FY 2019-2020

Month	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Current Month %	To Date Totals	Year 3 % Complete	5 Year %	Total Feet Remaining
TV Inspection	16,502	768	0	7,139	5,272	8,798	11,449	8,537	7,246	0	249	2,647	30.34%	68,607	65.54%	44.74%	289,237
Hydrocleaning	21,557	0	0	7,709	9,405	9,493	11,164	0	9,414	0	0	0	0.00%	68,742	65.67%	43.91%	293,560
Target Goal	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	8,723	100.00%	104,678	100.00%	60.00%	209,357
Actual to Goal	10,306	-8,339	-8,723	-1,299	-1,385	422	2,583	-4,455	-393	-8,723	-8,599	-7,400		**-36,004**			
Grease Line	1,480	3,276	3,276	1,480	9,392	3,276	3,625	3,625	3,625	0	0	5,105		38,160			

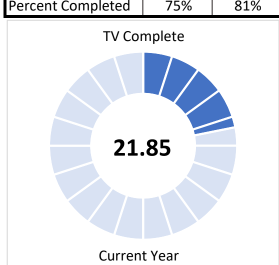
FY 2020-2021

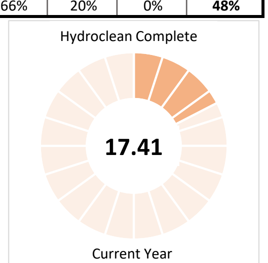
Month	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Current Month %	To Date Totals	Year 4 % Complete	5 Year %	Total Feet Remaining
TV Inspection	**8,953**	**11,292**	**2,624**										30.08%	22,869	22%	49.11%	266,368
Hydrocleaning	**4,205**	**11,108**	**2,911**										33.37%	18,224	17%	47.39%	275,336
Target Goal	8,723	8,723	8,723										100.00%	26,170	25%	65.00%	183,187
Actual to Goal	**-2,144**	**2,477**	**-5,956**											-5,623			
Grease Line	**2,169**	**9,084**	**2,963**											14,216			

FY 2021-2022

Month	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Current Month %	To Date Totals	Year 5 % Complete	5 Year %	Total Feet Remaining
TV Inspection																	0
Hydrocleaning																	0
Target Goal																	0
Grease Line																	

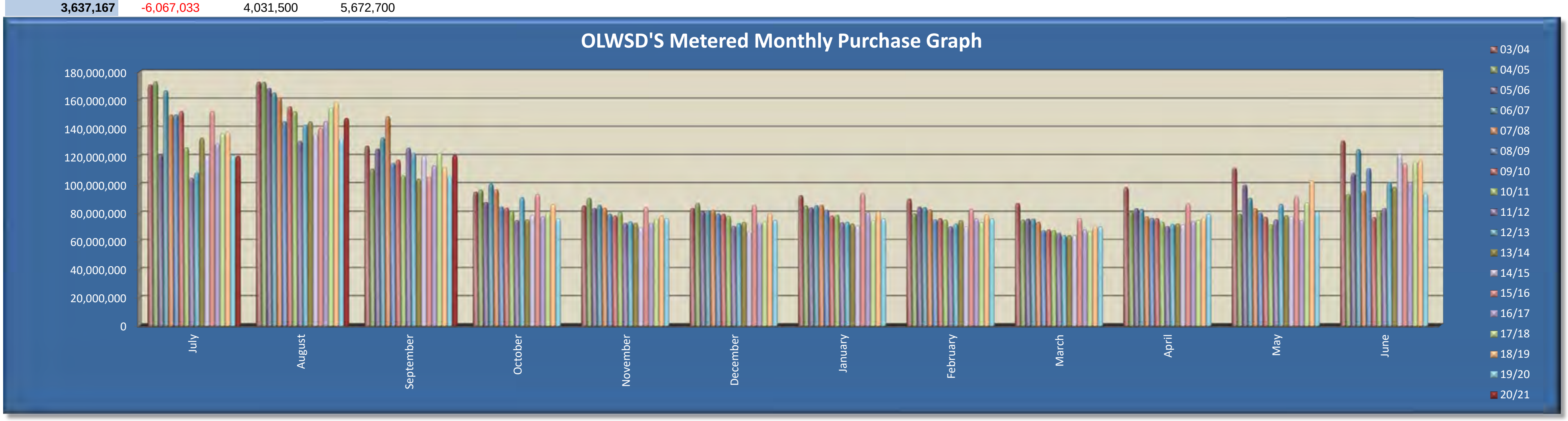
	Year 1	Year 2	Year 3	Year 4	Year 5	Remaining
Total Feet	523,392	523,392	523,392	523,392	523,392	
Target Per Year	104,678	104,678	104,678	104,678	104,678	
Target Per Month	8,723	8,723	8,723	8,723		
Actual Per Year TV	78,372	87,176	68,607	22,869		**266,368**
Actual Per Year Hyd	78,697	82,393	68,742	18,224		**275,336**
Make up	-26,144	-19,894	-36,004	-84,132		
Percent Completed	75%	81%	66%	20%	0%	**48%**



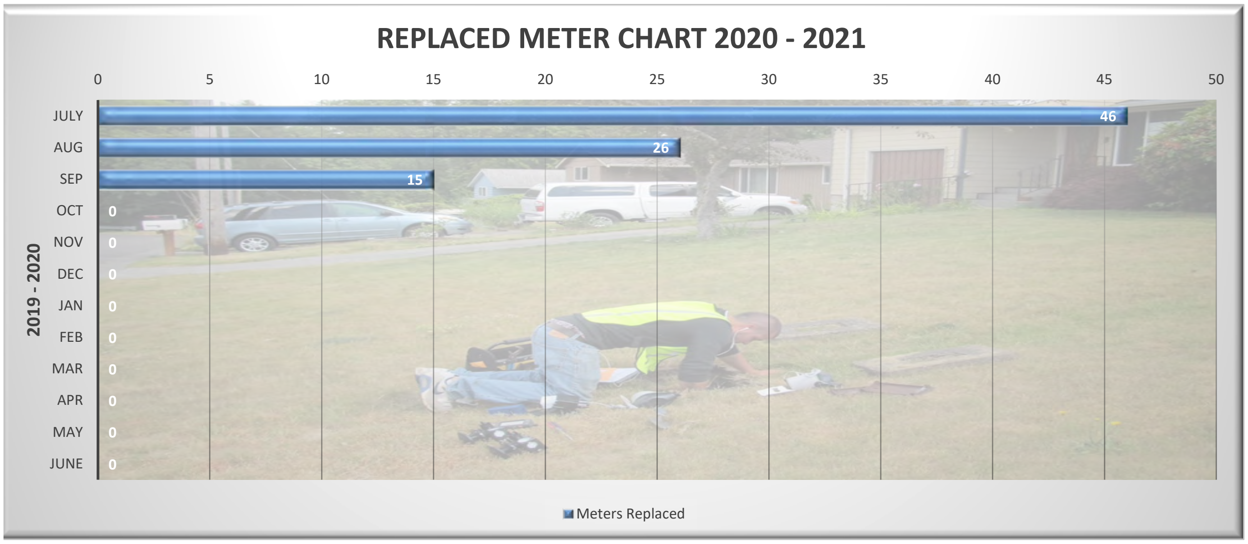


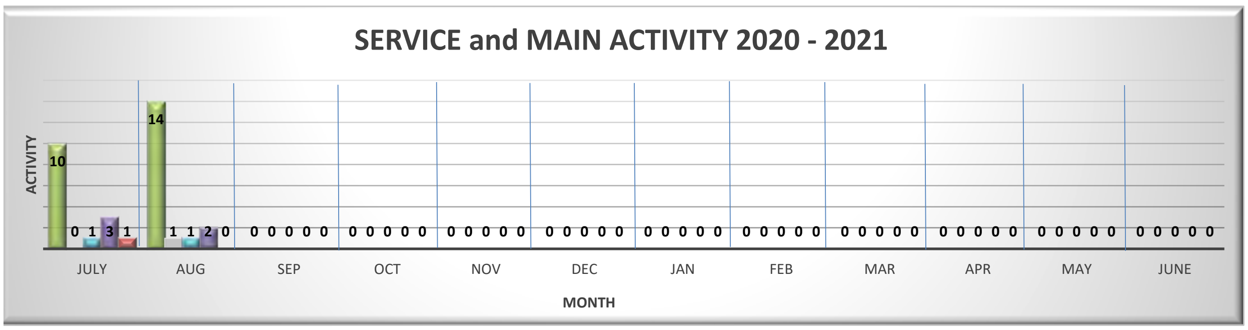
Water Purchased from NCCWC By Month and Year

Year	Fiscal 1st Half						Fiscal 2nd Half						Total	Average	10 Year
	July	August	September	October	November	December	January	February	March	April	May	June	Yearly Con	Daily Demand	% Ave
03/04	170,652,000	172,726,000	127,198,000	94,416,000	85,037,000	83,285,000	91,933,000	89,441,000	86,755,000	97,665,000	111,392,000	130,863,000	**1,341,363,000**	**3.67**	
04/05	172,883,000	172,499,000	110,696,000	95,973,000	90,079,000	86,823,000	84,976,000	79,415,000	74,996,000	80,616,000	79,088,000	92,885,000	**1,220,929,000**	**3.35**	
05/06	120,871,000	168,248,000	125,172,000	87,512,000	83,230,500	80,773,500	83,697,000	84,098,667	75,580,333	83,028,000	99,436,000	107,501,000	**1,199,148,000**	**3.29**	
06/07	166,449,000	164,957,000	132,989,000	100,180,000	85,350,000	81,587,000	85,179,000	83,766,000	75,622,455	82,508,545	90,129,000	124,696,000	**1,273,413,000**	**3.49**	
07/08	149,207,000	161,512,000	147,980,000	96,159,000	83,445,000	81,921,000	85,466,000	82,200,000	73,405,000	77,221,722	83,162,278	94,885,000	**1,216,564,000**	**3.33**	
08/09	149,422,000	144,592,000	114,830,000	84,307,000	79,094,000	79,319,000	82,042,000	75,196,000	67,364,000	76,238,000	79,968,000	111,127,286	**1,143,499,286**	**3.13**	
09/10	151,804,000	155,069,000	117,099,000	83,457,000	77,782,000	79,107,000	77,735,000	75,975,000	67,986,000	75,943,000	76,903,000	76,720,000	**1,115,580,000**	**3.06**	101.94%
10/11	125,996,000	151,590,000	105,880,000	81,052,000	80,389,000	77,515,000	78,266,000	74,983,000	67,462,000	73,285,000	71,613,000	81,189,000	**1,069,220,000**	**2.93**	97.70%
11/12	104,328,000	130,684,000	125,733,000	74,646,000	72,657,000	70,555,000	73,041,000	70,104,000	65,501,000	70,380,000	75,148,000	83,256,000	**1,016,033,000**	**2.78**	92.84%
12/13	108,236,000	142,023,000	121,981,000	90,545,000	73,672,000	72,454,000	73,277,000	72,051,000	63,866,000	71,906,000	86,085,000	101,278,000	**1,077,374,000**	**2.95**	98.45%
13/14	132,837,000	144,354,000	103,403,000	75,217,000	72,624,000	73,180,000	72,052,000	74,566,000	63,886,000	72,171,000	77,889,000	97,978,000	**1,060,157,000**	**2.90**	96.87%
14/15	120,411,000	135,271,000	120,008,000	78,257,000	69,534,000	66,200,143	70,840,857	70,318,000	63,972,000	71,515,000	77,173,000	121,185,000	**1,064,685,000**	**2.92**	97.29%
15/16	151,728,000	139,696,000	105,238,000	92,781,000	83,966,000	85,368,000	93,522,000	82,637,000	76,044,000	86,443,000	90,989,000	114,745,667	**1,203,157,667**	**3.30**	109.94%
16/17	128,722,333	144,599,000	113,212,000	77,196,000	72,766,000	72,839,000	80,205,000	75,867,000	68,040,000	73,822,000	74,515,000	101,310,000	**1,083,093,333**	**2.97**	98.97%
17/18	136,262,000	154,085,000	122,113,000	79,860,000	75,718,000	73,584,000	74,389,000	73,219,000	66,754,000	74,713,000	87,263,000	115,543,000	**1,133,503,000**	**3.11**	103.58%
18/19	136,887,000	158,433,000	112,001,000	86,062,000	77,769,000	79,690,000	81,040,000	78,594,000	70,790,000	76,199,000	102,519,000	116,626,000	**1,176,610,000**	**3.22**	107.51%
19/20	120,368,000	132,181,000	105,200,000	75,825,000	76,089,000	74,759,000	75,848,000	75,918,000	70,192,000	79,173,000	80,872,000	93,438,000	**1,059,863,000**	**2.90**	96.85%
20/21	119,901,000	146,849,000	**120,624,000**												
	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average	10 Year Average		10 Year ADD	Winter Ave
	125,968,033	142,817,500	114,951,300	81,144,100	75,518,400	74,614,414	77,248,086	74,825,700	67,650,700	74,960,700	82,406,600	100,983,067		**3.00**	75,562,733
Last Year Compare	**99.61%**	**111.10%**	**114.66%**												Summer Ave
10 year Average	95.18%	102.82%	104.93%												127,912,278
0.98%	-4.82%	2.82%	4.93%												
3,637,167	-6,067,033	4,031,500	5,672,700												



Oak Lodge Water Services Water Report





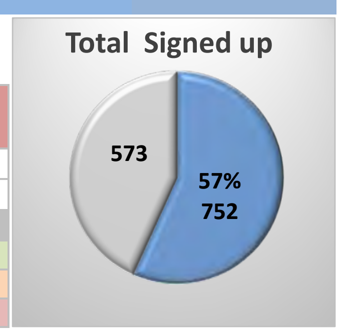
Fiscal Year 2020 - 2021	Month	Meters Replaced	New Services	Iron Services Renewed	Plastic Services Renewed	Service Leaks Repaired	Main Leaks Repaired
2020	July	46	10	0	1	3	1
2020	Aug	26	14	1	1	2	0
2020	Sep	15	0	0	0	0	0
2020	Oct	0	0	0	0	0	0
2020	Nov	0	0	0	0	0	0
2020	Dec	0	0	0	0	0	0
2021	Jan	0	0	0	0	0	0
2021	Feb	0	0	0	0	0	0
2021	Mar	0	0	0	0	0	0
2021	Apr	0	0	0	0	0	0
2021	May	0	0	0	0	0	0
2021	June	0	0	0	0	0	0
Yearly Total		87	24	1	2	5	1

Backflow Program Update for the Month of July

Total						
1,325						
Signed up to Date	Devices Repaired	New Installations	Notice of Non-Compliance	Notice of Violation	Notice of Termination	Force Test
752	3	2	0	0	0	42
57%						

List of Backflow Letters

Letter 1	Notice of Non-Compliance	District made aware (30 days to respond)
Letter 2	Notice of Violation	Customer has final 30 days to correct
Letter 3	Notice of Termination of water service	Customer has 5 days til water shut off



Oak Lodge meter audit 9.18.2020

Make, Model, SN	Flow Rate	Test Amount	Initial reading	Final Reading	Difference	Accuracy
2" Sensus SR S/N 62840741	2 gpm	10 cf	6083366.000	6083375.505	9.505	95.05%
	15 gpm	10 cf	6083375.505	6083385.52	10.015	100.15%
	100 gpm	10 cf	6083385.520	6083395.47	9.950	99.50%
2" Neptune T-10 S/N 31690695	2 gpm	10 cf	2020371.300	2020381.2	9.900	99.00%
	15 gpm	10 cf	2020381.200	2020391.3	10.100	101.00%
	100 gpm	10 cf	2020391.300	2020400.11	8.810	88.10%
2" Sensus SR S/N 67553927	2 gpm	10 cf	709854.305	709864.1	9.795	97.95%
	15 gpm	10 cf	709864.100	709874.095	9.995	99.95%
	100 gpm	10 cf	709874.095	709884.04	9.945	99.45%
1.5" Sensus SR S/N 58956450	1.5 gpm	10 cf	12244582.455	12244592.3	9.845	98.45%
	8 gpm	10 cf	1244592.300	1244602.19	9.890	98.90%
	50 gpm	10 cf	1244602.190	1244612.01	9.820	98.20%
1.5" Sensus SR S/N 59717695	1.5 gpm	10 cf	455800.115	455800.115	0.000	0.00%
	8 gpm	10 cf	455800.115	455800.115	0.000	0.00%
	50 gpm	10 cf	455800.115	455800.115	0.000	0.00%
1.5" Sensus SR S/N 60340839	1.5 gpm	10 cf	1346103.235	1346110.120	6.885	68.85%
	8 gpm	10 cf	1346110.120	1346119.790	9.670	96.70%
	50 gpm	10 cf	1346119.790	1346128.505	8.715	87.15%
						page 1
1" Sensus SRII S/N 60986754	3/4 gpm	1 cf	319763.6975	319764.7000	1.003	100.30%
	4 gpm	1 cf	319764.7000	319765.7045	1.004	100.40%
	40 gpm	10 cf	319765.7045	319775.7190	10.014	101.40%
1" Sensus SRII S/N 69877921	3/4 gpm	1cf	567296.0115	567296.0115	0.000	0.00%
	4 gpm	1 cf	567296.0115	567296.0115	0.000	0.00%
	40 gpm	10 cf	567296.0115	567296.0115	0.000	0.00%
1" Sensus SRII S/N 66535639	3/4 gpm	1 cf	515619.4130	515620.4150	1.002	100.20%
	4 gpm	1 cf	515620.4150	515621.4160	1.001	100.10%
	40 gpm	10 cf	515621.4160	515631.3770	9.961	99.61%
1" Sensus SRII S/N 35453226	3/4 gpm	1 cf	240353.0000	240354.0000	1.000	100.00%
	4 gpm	1 cf	240354.0000	240354.9900	0.990	99.00%
	40 gpm	10 cf	240354.9900	240365.0200	10.030	100.30%

STAFF REPORT

To	Board of Directors
From	David Mendenhall, Plant Superintendent
Title	Plant Operations Monthly Report
Item No.	11e
Date	October 20, 2020

Summary

The Board has requested updates at the Regular Meetings of the Board on the status of the District's Operations.

Highlights of the Month

- Wind, Fire, a little rain
- Plant smoke impacts
- Biosolids hauling

Water Reclamation Facility Operations

We had a Sanitary Sewer Overflow (SSO) at the constructed overflow immediately upstream of Pump Station (PS) #2 which discharged to the Willamette River. The overflow occurred from 7:25 pm to 7:40 pm on 9/7/2020. The total flow was estimated at 10,500 gals using the time of overflow alarm to the end of the alarm and used the flow before the outage of 700 gpm. The SSO came in the midst of a very strong windstorm which caused a power outage to the area including PS #2. The back-up generator at PS#2 came on but the electronic controls for the pump tripped out when the generator came on. The alarm generated an automatic call to our on-call personnel, and they responded within 20 minutes and reset the controls. But the SSO could not be avoided. The power was not restored until 9/9/2020 at about 2 pm. During that time there were three other incidents where the controls tripped out on an undervoltage alarm. We had staff either at the plant or at the station throughout this incident so the trips were noted and reset each time so there were no more SSOs. We also had several power bumps at the main plant on 9/7/2020 and overnight. One bump was enough to call on the main plant generator and that functioned well for about 15 minutes. We had one outage at pump station #3 but the generator kicked on without incident. Operations and maintenance crew really came through in the very long and stressful outage.

We were able to schedule our annual generator maintenance for 09/15/2020. PS #2 was the first stop, and the generator was inspected, serviced, and load tested. No problems were found directly with the generator but based on the problems we described adjustments were made to the governor. We did a power shutdown and switchover occurred without issue. The controls were inspected, and no problems were found. So, at this point we feel the problem was an intermittent low voltage output. The governor adjustment looks like it helped, and we will look at the limit set points on the controls. We will also do additional power disconnect tests to make sure the station comes on with the generator.

The generator at PS# 3 and the portable generator at PS #5 were services and load tested. Control programming was checked, and they are all ready to go.

We are still addressing the damage from the power short we had in August. We did receive and install replacement Programmable Logic Controls (PLC) and related parts. When trying to put it all back online, a few more boards came up with problems that were not apparent until current was restored. Those replacements have been ordered and installation is now scheduled for 10/14/2020.

On the power wiring side, we were unable to pull out all the failed wires. One wire that did come out was broken through and showed the damage from the voltage surge. We have decided to run conduit around the outside of the aeration basins to restore power to aeration basins # 3 and 4. We need to have those back online for the wet weather flows. We will run a separate conduit for control wiring and will leave room for future conduit replacement. We are currently getting quotes for just the conduit and wiring for # 3 and 4 actuators. Future work will have to be a project and budgeted.

All of the preliminaries for the Biosolids Hauling contract were finalized and Horner Enterprises will start hauling on 10/7/2020. (Photo 4) Once more I want to thank Justin Claxton, Dave Seifert, Doug Woods, and Marty Guenther for carrying us through for the last nine months while we sorted this all out. 166 cu yds of biosolids were hauled to Madison Farms in September.

We did our final test with Energy Partners on reducing load. They will be figuring out what our monthly stipend will be for participating in this program.

Our new influent sampler arrived, and it was installed. (Photo 1) We are testing it out side by side to make sure the controls are set up correctly and the sample is properly taken. Our old sampler has served for about 10 years before the refrigeration conked out.

The Mixed Liquor Return (MLR) pump #1 was reinstalled and test run and is ready for service after being rebuilt in house.

After the windstorm of 09/07/2020 came the smoke from the fires. It quickly had a major effect on our filters for blowers and air handling equipment all over the plant. On one of the blowers, the prefilter was clogged up after 4 days during the worst of the smoke event. (Photos 2 & 3) Blowers are especially vulnerable because of the volume they handle. Air filters for all air handling equipment were changed or washed several times during this event. We eagerly await the next challenge. In the meantime, work orders continued to be handled.

On the process side, clarity is very good, and most performance indicators are good. We had a drop in dissolved oxygen (DO) on the aeration basin and some weird trends from the air supply system. We had the pressure monitoring instrument checked and it was fine, but we were having to run the system at a higher pressure to get enough air to the basins. The blowers appeared to have enough volume and there was no back pressure as you would see if something were clogged and no pressure drop as you would see if there was a leak. Adjustments were made and the DO elevated. We lost ammonia treatment for a few days but that came back. This happened during the worst of the smoke and has since cleared up. We think it may have something to do with all the particulates in the air, but for now that is just speculation. We will explore some more.

Attachments

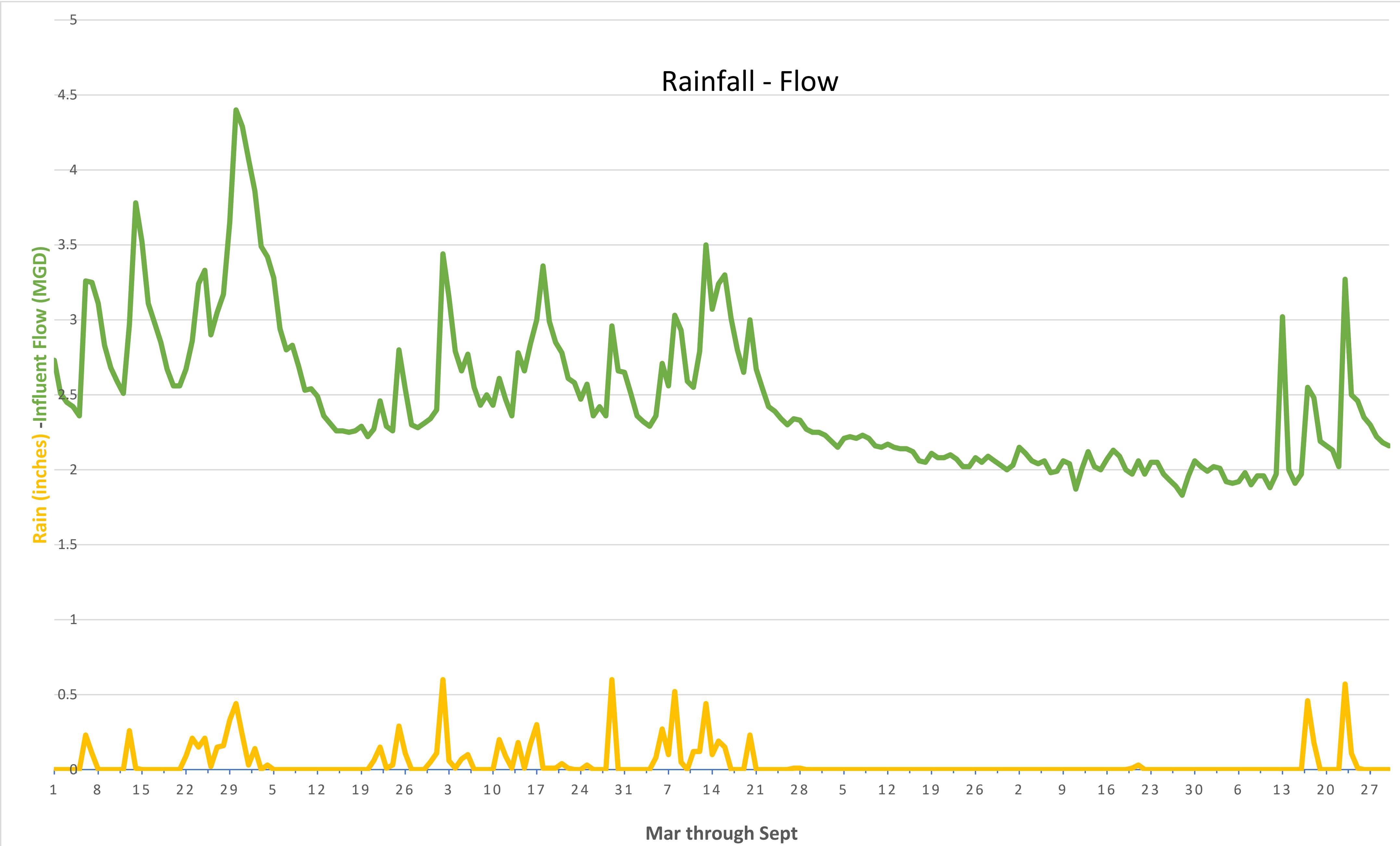
1. Photo Pages of September 2020 Work
2. Rainfall vs Flow Data Correlation for March 2020-September 2020
3. Plant Performance BOD-SS Graph for March 2020-September 2020
4. Work Order Summary Graph 2020

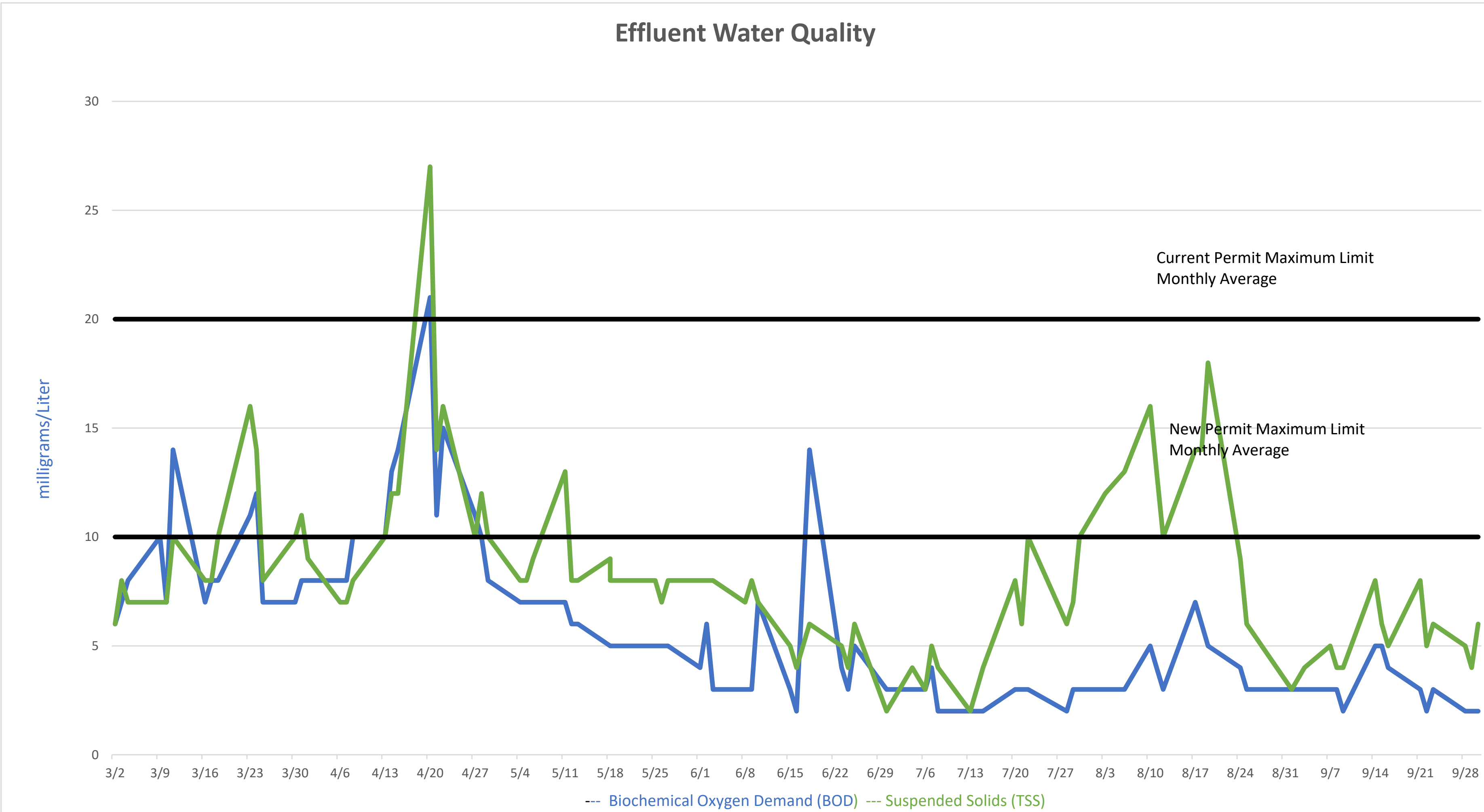
1) New Influent Sampler installed

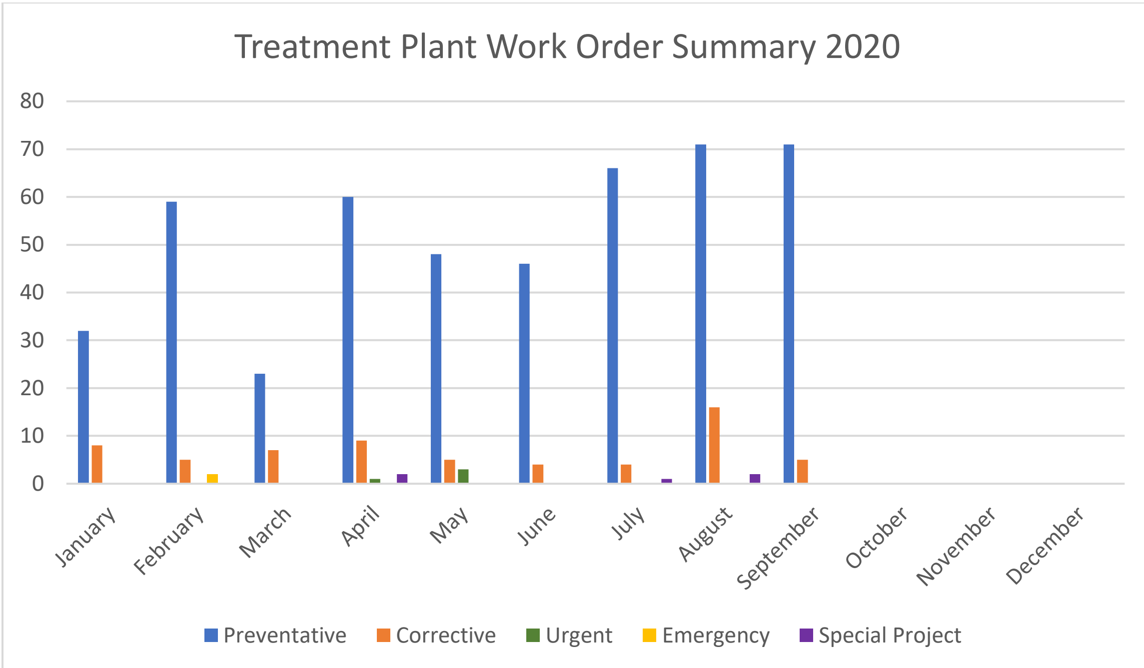
2) Air Handling pre-filters post smoke

3) HVAC filters new and old

4) Ready for contract hauling


Rainfall - Flow
Rain (inches) -Influent Flow (MGD)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28 5 12 19 26 2 9 16 23 30 6 13 20 27
Mar through Sept


Effluent Water Quality
milligrams/Liter
30
25
20
15
10
5
0
Current Permit Maximum Limit
Monthly Average
New Permit Maximum Limit
Monthly Average
3/2 3/9 3/16 3/23 3/30 4/6 4/13 4/20 4/27 5/4 5/11 5/18 5/25 6/1 6/8 6/15 6/22 6/29 7/6 7/13 7/20 7/27 8/3 8/10 8/17 8/24 8/31 9/7 9/14 9/21 9/28
--- Biochemical Oxygen Demand (BOD) --- Suspended Solids (TSS)


Treatment Plant Work Order Summary 2020
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December
Preventative
Corrective
Urgent
Emergency
Special Project

AGENDA ITEM

Title	Business from the Board
Item No.	12
Date	October 20, 2020

Summary

The Board of Directors appoints District representatives from time to time to serve as liaisons or representatives of the District to committees or community groups.

Directors assigned specific roles as representatives of the District are placed on the agenda to report to the Board on the activities, issues, and policy matters related to their assignment.

Business from The Board Items Include:

a. **Individual Board Member Reports**

b. **Parking Lot**

Date Added	Item	Work Update
8/13/2019	OLWSD/Gladstone IGA	OLWSD Staff is working to create the first full draft of the IGA for City of Gladstone review

Oak Lodge Water Services
2020 OLWS Board Member Liaison Assignments

Board/Committee	Current Primary	Current Alternate	Meeting Schedule
Clackamas River Water	Kevin Williams	Paul Gornick	Monthly - Second Thursday, 6 p.m.
Sunrise Water Authority	Paul Gornick	Kevin Williams	Monthly - Fourth Wednesday, 6 p.m.
C-4	Paul Gornick	Susan Keil	Monthly - First Thursday, 6:45 p.m.
Regional Water Providers Consortium	Mark Knudson	Paul Gornick	Triannually - First Wednesday, 6:30 p.m.
Oak Grove Community Council	Mark Knudson	Susan Keil	Monthly - Fourth Wednesday, 7:00 p.m.
SDAO	All		Varies
AWWA	All		Varies
Jennings Lodge CPO	Kevin Williams	Paul Gornick	Monthly - Fourth Tuesdays, 7:00 p.m.
North Clackamas County Water Commission (NCCWC)	Paul Gornick/Kevin Williams	Mark Knudson	Quarterly - Fourth Thursday in Jan/March/June/Sept, 5:30 p.m.
Chamber of Commerce	Ginny Van Loo	Susan Keil	Monthly - Third Wednesdays, 11:45 a.m.-1:15 p.m.
New Concord Task Force	Ginny Van Loo		Quarterly
Healthy Watersheds	Kevin Williams		
OGLO Bike-Ped Bridge Advisory Group	Lynn Fisher	None needed	Task Force will dissolve after project decision
Water Research Foundation	Mark Knudson	None needed	

<u>Meetings Attended During the Past Month</u>

1. September 15, 2020 – Oak Lodge Water Services Board meeting (virtual meeting)
2. September 23, 2020 – Oak Grove Community Council meeting (virtual meeting, agenda attached)
    a. Attendance: ~ 29 participants
    b. Clackamas County Transit Development Plan (Karen Buehrig, Clack Co Long-Range Planning)
        i. Underway since March 2020 – transit tax requires funded projects are within a plan
        ii. Objectives: connections, coordination & actions – in & out of TriMet service area
        iii. Seven transit providers in Clackamas Co (most in Oregon), large areas w/o providers
        iv. Needs identification: looked at corridors, connections, enhancements, efficiencies; identified new connections and lines in/to/through Oak Grove & Jennings Lodge (e.g., increased frequency, weekend service, coordination between providers, new service to Town Center/Happy Valley); survey at County website
        v. Commissioner Savas: transit service depends on payroll tax revenue - need strong employment base to fund future expansion of transit services
    c. Segregated by Design (Valerie Chapman, Vice Chair, OGCC)
        i. Video & community conversation – <u>The Color of Law</u> by Richard Rothstein
        ii. Segregation occurred by design: segregation was implemented throughout the country since mid-1930's based on federal, state and local policies that limited African-American access to suburban and up-scale housing and encouraged segregation. Polices resulted supply/demand imbalance that disproportionately increased costs for African-American housing market and resulted in overcrowding, poorer public services, and creation of slums/ghettos.
        iii. "All levels of government maintained segregation"
        iv. Changed by 1968 Fair Housing Act but damage had been done; segregation that was in place perpetuated economic disparity and limited economic opportunities
    d. LUART (Joseph Edge)
        i. BCC approved allowing bakeries and brewpubs … effective Oct 1, 2020
        ii. Housing strategies working group has been formed and continues to meet
        iii. OGCC soliciting ideas for BCC will have interactive session on ideas for long range planning projects for 2021-23
    e. Concord Property & Library Planning Task Force update (Jan Lindstrom & Mark Elliott)
        i. Last meeting rescheduled … Concord Task Force open house: https://openhouse.jla.us.com/concord-library
    f. Park Avenue Community Advisory Committee update: (Valery Chapman)
        i. In final stages; currently working on zoning and design standards based on community priorities (e.g., input from survey)
        ii. Website available through Clackamas County
        iii. Next meeting Oct 14 – virtual meeting
3. September 23, 2020 – Oregon Water Utility Council (virtual meeting)
    a. Water Loss National Perspective (Steve Cavanaugh)
    b. Wildfire Impacts (Oregon State Univ & Purdue Univ)
        i. OSU Forestry proposed monitoring study of fire impacts to water providers
        ii. EBMUD & Purdue studying leaching of contaminants from plastic pipe in fire zones
4. September 23, 2020 – NCCWC Board meeting (virtual meeting) – agenda attached
    a. Oak Lodge Director Kevin Williams elected as Chair of the NCCWC
    b. Sunrise Water Authority Director Chris Hawes elected as Vice-Chair of NCCWC

c. Collaboration with South Fork Water Board – John Collins
    i. Apprenticeship Program - goal is certified apprenticeship program for operators
        1. South Fork taking lead; application currently being reviewed by BOLI
        2. Submitted as South Fork Water Board & NCCWC Joint Apprentice Program
        3. 2-year program, \$17/hr; limited benefits; 2nd year wage = \$19-20/hr
        4. Working with Cal State Sacramento for classwork; hope to add CCC
    ii. Evolution of leadership and collaboration
        1. John Collins is retiring in June 2021
        2. Lee (finance manager from OC) to serve as GM for SFWB; 9-month overlap
        3. Need to find treatment manager for SFWB; opportunity to pool resources between NCCWC and SFWB by having shared leadership
        4. Would provide coverage, cross-training, efficiency, resiliency, reliability
d. Contracted services for engineering services and other key roles
    i. Approved to change allocation from 10% to 15% for SWA's engineering services
e. Draft Procurement Rules (LCRB)
    i. Anticipate adopting system-specific procurement rules based on OLWSD rules
f. Staff Reports
    i. Finance
    ii. Operations Report – production at/near plant capacity in Aug & Sept; need to begin discussions to plan future expansion
    iii. Managers' Report – impact of fires; much larger than previous fires in recent history (27x the size of 2014 fire) with significant potential impacts to water quality (turbidity and organic load) – no indication of extensive use of fire retardants

5. September 30, 2020 – Meeting with Joseph Edge, Sarah Jo Chaplen & Jason Rice
    a. District rules & regulations – perceived disincentive to reporting water contamination on private property
    b. River Forest Lake - long term planning; concerns, opportunities and environmental benefits
6. October 2, 2020 – Oregon Infrastructure Finance Authority Board meeting (virtual meeting)
    a. Funding requests from Mapleton Water District (\$1.4M) and City of John Day (\$2.5M)
    b. Administering over \$131M in Cares Act funding – CARES funds must be spent by 12/31/2020 – additional funding from HEROS Act anticipated yet this year
    c. "Don't expect additional funding (e.g., CARES2 or HEROS2/3/4) immediately after the election."
7. October 2, 2020 – OLWS special meeting (virtual meeting)
8. October 5 & 6 – Business Oregon Infrastructure Summit (virtual conference)
9. October 7, 2020 – Regional Water Providers Consortium Board meeting (virtual meeting, agenda attached)

<u>Meetings Scheduled for the Next Month</u>

1. October 20, 2020 – OLWS Board meeting
2. October 26, 2020 – Business Oregon Audit Committee meeting
3. October 28, 2020 – Oak Grove Community Council meeting

Oak Grove Community Council

Regular Council Business Meeting
September 23, 2020
Agenda

What: Regular Council Business Meeting - Oak Grove Community Council

When: Wednesday, September 23rd, 2020 - 7:00 p.m. to 8:15 p.m.

Where: Zoom – link and phone number emailed / posted on website one day prior

6:50 - 7:00 Connect to Zoom

7:00 Welcome, Introductions, and Officer reports

- August 26th Meeting minutes + membership update
- Treasurer's update
- Upcoming OGCC Board Elections

7:10 Program:

- Clackamas County Transit Development Plan
  - *Karen Buehrig, Long-Range Planning Manager*
- Segregated by Design: Video and Community Discussion
  - *Valerie Chapman, Vice Chair, OGCC*

7:55 Land Use Application Review Team (LUART):

- Updates on Long Range Planning projects 8:00 Committee updates
- CPO Summit
- Park Ave Community Project

8:10 Schedule review:

- Future OGCC Meetings - 7 pm at Zoom:

  Sep 23, Oct 28, Dec 2*, Jan 27

- Future OGCC Board Meetings - 6:45 pm at Zoom:

  Oct 5, Nov 2, Jan 4

8:15 Adjourn

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Water Commission

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Regular Meeting

North Clackamas County Water Commission
Board of Commissioners

Thursday, September 24, 2020

Virtual Meeting Online

https://us02web.zoom.us/j/82517630327

Call-In: 1-888-788-0099

Meeting ID: 825 1763 0327

AGENDA

Convene Regular Board Meeting

1. **Open Regular Meeting**

2. **Welcome Visitors – Public**

3. **Public Comment**

4. **Approval of Minutes**
    1. Approval of Minutes June 25, 2020 Budget Hearing & Regular Meeting

5. **Adoption of Consent Calendar**
    1. Authorization of Checks June, July and August 2020
    2. Re-Appoint Legal Counsel of Record
    3. Re-Appoint Insurance Agent of Record

6. **Board Discussion**
    1. Election of Officers for FY2020-21
    2. Update on Collaboration Efforts with South Fork Water Board
    3. Update Contracted Services for Engineering and other Key Roles
    4. Convene Local Contract Review Board – Review Draft Procurement Rules

7. **Monthly Items**
    1. Financial Reports
    2. Operations Report
    3. Manager's Report
    4. Business from the Board

8. **Adjourn Regular Meeting**

*POSTED PER REQUIREMENTS 9/18/2020

Consortium Board Meeting Agenda

DATE: October 7, 2020
6:30 p.m. – 8:30 p.m.

HOW: This meeting will be held remotely via Zoom/videoconference

Agenda

Introductions (3 minutes)

Approval of Consortium Board Meeting Summary for June 3, 2020 (2 minutes)

Public Comment* (5 minutes)

City of Wilsonville Membership (5 minutes)

- Approval of the City of Wilsonville's request to join the Regional Water Providers Consortium.

Oregon Water/Wastewater Agency Response Network (ORWARN) Membership (5 minutes)

- Approval of ORWARN membership.

Director Report – Rebecca Geisen, Managing Director (10 minutes)

- Update on on-going projects and year-end accomplishments.

Program Report – Bonny Cushman, Program Coordinator (10 minutes)

- Emergency Planning and Conservation Program ongoing projects and accomplishments.

FY 2021-22 Consortium Budget and Work Plan Concepts Discussion – Rebecca Geisen, Managing Director (30 minutes)

- Review FY 2021/22 budget and work plan concept recommendations from the EC and provide Consortium staff with further budget direction.

2021 Legislative Session – Rebecca Geisen, Managing Director (5 minutes)

- Consortium staff approach to upcoming session.

Wildfire and Water Provider Response – Consortium member staff and Board (45 minutes)

- Report out from regional water systems and discussion.

Next Meeting Date/Location:

February 3, 2021/TBD

*Agenda Item #3 is a public comment period for items not on the agenda. Additional public comment will be invited on agenda items as they are discussed.

September 22,2020

To: OLWSD Board

From: Kevin Williams K.W.

Re: Jennings Lodge CPO Meeting

1. The first presentation tonight involved Dave Hunt,Jon Pugsley and Melissa Erlbaum. They spoke about a children's safety levy that will be on the ballot in November. It will be a ten year levy in duration and the monies collected will be used exclusively for children in Clackamas County.

The money will fund the gamut from preventive measures to treatment programs for children that have been neglected or abused, been subjected to domestic violence and childhood trauma or have been victims of human trafficking and sexual abuse.

2. The second presentation involved Karen Buehrig and Brett Setterfield from Clackamas County Transportation. Karen serves as the Chief Planner and shared information about projects coming up n the unincorporated area. She even mentioned Oatfield which I thought we had heard was off the table for now?

She spoke a great deal about expansion of mass transit in our area but it is hard to imagine we need growth when the ridership numbers are way down. She was asked a question about equitable division of funding from the increased vehicle registration. The basic question was that our area seems to pay a lot of money without much in services for our dollars.

Commissioner Savas was attending the meeting and offered that projects in the unincorporated area seem to cost more due to surface water management requirements. I am always confused by this supposition because I know that many local jurisdictions are signatories on the MS4 permit and I have never heard from our staff that we are requiring any actions above and beyond what all signatories should be doing to satisfy permit requirements?

3. The rest of the meeting was the business meeting that involved election of the secretary for the group, review of a land use permit for 717 SE Roethe Road. This permit involves parceling an existing lot to several lots. They also discussed the recent polling on the Map-It program within this group. There will be further information coming out in the near future.

September 23, 2020

To: OLWSD Board

From: Kevin Williams K.W.

Re: Sunrise Water Authority Board meeting

1. I substituted for Paul with tis meeting. It was interesting that the meeting started at 6:00 p.m. but it started with an executive session so I was sitting on the virtual sideline until they allowed me in at 6:9. They approved their agenda, approved their minutes and then moved on to the Managers report.

2. Wade shared a great deal of information about the Riverside fire. It has burned about 150,000 acres to this point. For perspective the next most recent fire in the watershed occurred in 2014. It was known as the PIT 6 fire. It burned just over 5,500 acres. There were few known instances of fire retardant drops on this current fire so contamination of drinking water is not a concern from it. However there are concerns about increased sediments from runoff.

3. There was an unplanned curtailment of water use request during the major wind driven fire growth. When Clackamas County began expanding the evacuation orders and boundaries many people from Sunrise and neighboring districts began watering their homes and roofs in areas that weren't really at risk. This required major efforts by water plants to attempt to meet the demand. When our plant staff informed Wade about what was happening he initiated a request to the county to tell people to slow down their water usage so it could be used for firefighting efforts.

4. Wade reported that he had been watching river flows carefully and saw several days where river flows were below 800 cfs on the Clackamas. As yo may recall that was the lower limit set by the state when they issued our proposed water rights settlement. That is back in the courts but that doesn't mean that won't become the standard at some point.

5. Wade reported that the backfilling around their new reservoir is almost complete and the project is looking pretty good.

They went into a work session at tis point to discuss their new building and financing of it. I excused myself and left the meeting.

September 25, 2020

To: OLWSD Board

From: Kevin Williams K.W.

Re: North Clackamas County Water Commission

1. The meeting began with the approval of the minutes from the June 25th meeting and moved along to the consent calendar. We authorized the check run for this period, re-ppointed Cable Huston as the legal counsel for the commission and re-appointed Brown and Brown Northwest as our insurance provider.

2. (A) We then held the election of officers for FY2020-2021. I was elected to the Chair and Chris Hawes from Sunrise was elected Vice-Chair.

(B) We received an update on collaboration efforts with South Fork Water. John Collins attended the meeting and filled us in on the Water Plant Operator apprenticeship program he is working with Wade to launch. CCC has opted not to sponsor the program so they have found at in Sacramento State that will be involved. They also have managed to get BOLI on board with the program so a lot of the basic organizing is progressing well. Many other water jurisdictions near us have expressed interest in the program.

Wade and John also described a situation during the windstorm/Riverside fire blowup that showed how cooperative the water suppliers tend to work with each other. Jon lost power to his intake at his plant for three days after the wind event. We supplied him with water from our plant to keep them going. When the fire got rolling along we were having some problems meeting our demand. South Fork sent water right back to us and helped us out.

(C) Wade explained to the Commission how the various roles of the Plant Management positions are a shared responsibility of Sunrise and Oak Lodge. It turns out that there was an under estimation of how much engineering time would be required this fiscal year so Wade wanted to let everyone know that the amount budgeted would need to go up to reimburse Sunrise at the correct funding level.

(D) We convened the Local Contract Review Board to discuss the proposed draft Procurement rules. They are very similar to the ones we adopted at Oak Lodge.There appears to be some extra sole source language and that is due to the Water Plant having some hardware pieces that you can't buy off the shelf locally. We actually use a supplier in Belgium for some of the repair/maintenance parts. We will likely be adopting these at the December meeting.

3. Quarterly business items discussed included Financial , Operations and Mangers reports. Gail did a great job with the Financial report. Water production at the plant was interesting this summer. In June the plant produced 233.1 million gallons at a daily average of 7.7 MGD. In July it produced 398.2 million gallons at a daily average of 12.8 MGD. In August it produced 442.2 million gallons at a daily average of 14.2 MGD. Wade reported that he has heard staff saying that we could be at 18 MGD for the month of September. The plants capacity was built for 20 MGD so at some point in the not so distant future we could be looking at increasing our membrane filtering capacity. The basic infrastructure to do that is there from my understanding.I think we would simply need to purchase the membranes themselves and reconfigure some of the plumbing.

Wade also reported that during the windstorm we had some nights where staff at the plant slept on cots at the plant so they could maintain the water intake. We had many logs and other debris coming down the river that plugged the intake. The crew was utilizing fire hoses and chain saws to keep things rolling. Having been in the Public Works business for 32 years and responding and managing many emergencies during that time I have a deep appreciation of Staff so committed to the organizations that make up NCCWC.

We had a lot of discussion about the Riverside fire and I would ask you to go look at the SWA Board meeting minutes rather than having me retype it.

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*POSTED PER REQUIREMENTS 9/18/2020

Agenda Item 4.1

Minutes of June 25, 2020
Board of Directors Meeting & Public Hearing on Budget

BOARD MEMBERS PRESENT:		
Matt Tracy	NCCWC	City of Gladstone
Paul Gornick	NCCWC	Oak Lodge Water Services
Kevin Williams	NCCWC	Oak Lodge Water Services
Chris Hawes	NCCWC	Sunrise Water Authority
Kevin Bailey	NCCWC	Sunrise Water Authority
STAFF PRESENT:		
Wade Hathhorn	NCCWC	Sunrise Water Authority
Rob Moody	NCCWC	OLWS Ind. Finance Consultant
ATTENDEES:		
Sarah Jo Chaplen		Oak Lodge Water Services
Laural Casey		Oak Lodge Water Services
Tim Jannsen		Sunrise Water Authority
Wayne Barstow		Sunrise Water Authority
Kim Anderson		Sunrise Water Authority

CONVENE PUBLIC HEARING ON FY 2020-21 BUDGET

1. Open Public Comment

   Director Tracy opened the Public Hearing at 5:30 p.m.

   General Manager confirmed there were no members of the public in attendance.

2. Board Comments and Discussion

   There were none.

   General Manager Hathhorn explained the purpose of the LB-1 form and what details would be overviewed and discussed during the regular Board meeting.

3. Adjourn Public Hearing

   Director Tracy called for a motion to close the public hearing on the FY 2020-2021 Budget. Director Hawes moved, Directors Gornick and Williams seconded. Director Tracy called for comments. There were none. Director Tracy called for a vote. Voting Aye: Directors Tracy, Hawes, Bailey, Williams, and Gornick.

NORTH CLACKAMAS COUNTY WATER COMMISSION

September 24, 2020

Agenda Item 7.3

Subject: Manager's Report

Presenter(s): Wade Hathhorn, General Manager

Board Action: Open discussion

Attachments: None

Update on Fire Impacts

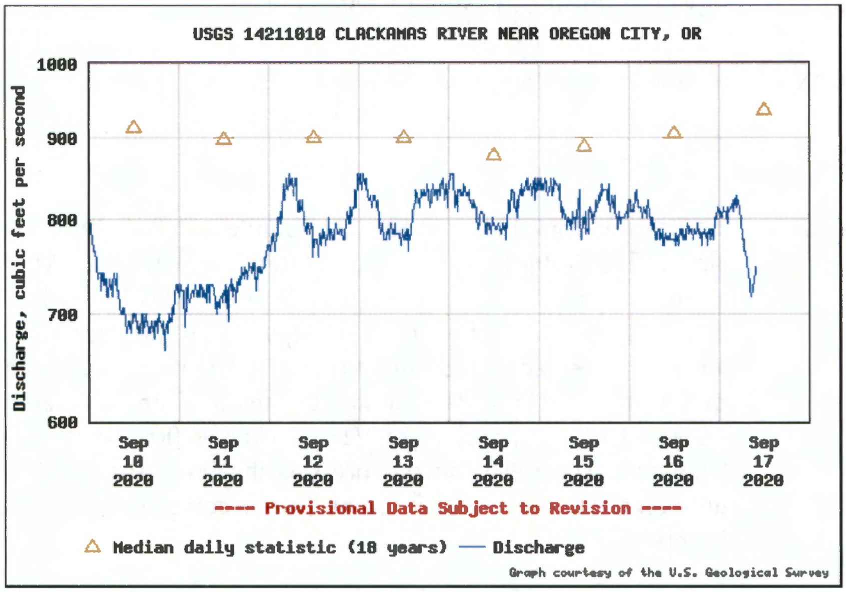
The fires in Clackamas and Marion Counties, along with those throughout other parts of the State, have been devastating. For the NCCWC, the fire of greatest interest is that known as the Riverside fire. This fire burns (or burned) nearly 150,000 acres, most of which is situated within the upper Clackamas River basin. Concerns have been raised about present and future impacts to our drinking water source, including increased sediment from runoff and possible contamination from fire retardant chemicals. As of 9/16, few known fire retardant chemicals have been deployed in controlling and suppressing this fire. That said, we will not know the full extent of these threats for some time to come, as firefighters continue to battle this blaze.

However, the basin has experienced a similar major fire in the recent past. In 2014, the PIT 36 fire occurred in a similar location and burned just over 5,500 acres (finally extinguished in 2015). Fire retardant chemicals were used in the suppression of the PIT 36 fire. Though much smaller in size than the present Riverside fire, there were few observable impacts from the PIT 36 event. At the onset of late summer and fall rains, potential increased sediment and turbidity were masked by the increased river flows. Moreover, by this same period of the year, demand had been reduced allowing the NCCWC to operate using (only) the membrane portion of its plant, which is effective at treating increased turbidity. That same dilution effect basically eliminated the measurable (or concern) levels of fire retardant chemicals in the raw water source.

Notwithstanding, the present Riverside fire is much larger in scale and impact. Hence, its aftermath may pose a greater threat in terms of sediment, organics and other contaminants once it begins to rain. Dilution by increased flows and reduced demand, allowing principal treatment by membranes, remain as "tools" or elements in our favor. The NCCWC staff are also coordinating with the other Clackamas providers to prepare for increased monitoring and assistance as these events unfold. The three major treatment plants that share interconnections (CRW, South Fork and the NCCWC) rely on different treatment technologies, each with its own means for dealing with the anticipated conditions.

Update on River Flows

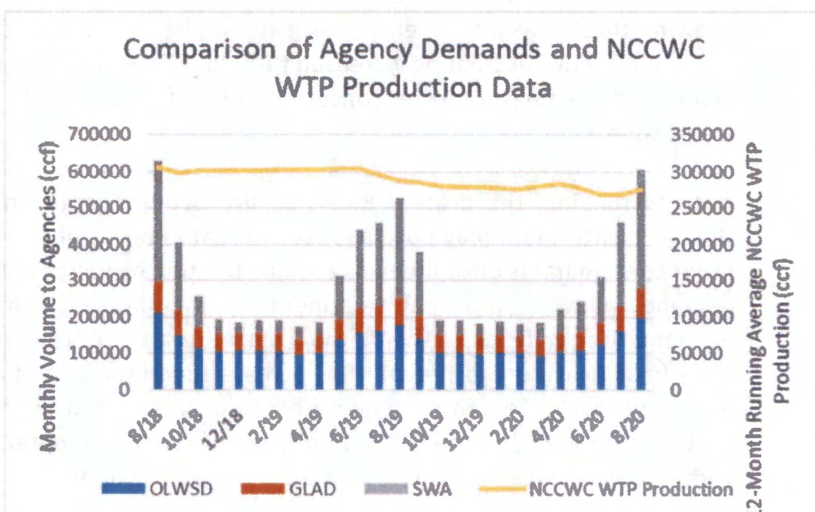
River flows had fallen below the anticipated future instream requirement of 800 cfs in early September. PGE began releasing stored water as part of their regular seasonal operations on the upper Clackamas River. Those operations have been intermittingly interrupted by the fire event(s).



Water availability conditions can changed rapidly in response to the weather conditions. We are carefully watching river flows at this time.

Summary of Production and Deliveries

The graph below shows a 12-month rolling average of total production and monthly deliveries to member agencies:



The seasonal impacts on demand are evidenced in the drop observed across subsequent summer periods.