RESOLUTION 2024-03
RAINBOW WATER DISTRICT
RESOLUTION AWARDING CONTRACT TO SHANNON & WILSON, INC. FOR CHASE PFAS REMEDIATION ALTERNATIVES FEASIBILITY STUDY PHASE 2

WHEREAS, Rainbow Water District is a domestic water supply district organized under Oregon Revised Statues (ORS) Chapter 264, and ORS 264.410 provides that "the power and authority given to districts is vested in and shall be exercised by a board of five commissioners, each of whom shall be an elector of the district", and the Rainbow Water District Board of Commissioners also serves as the Local Contract Review Board (LCRB), and

WHEREAS, Chase Wells No. 1-4 have detections of PFAS compounds and will either require treatment or replacement of these contaminated sources or a combination of these options, and it is necessary to conduct environmental and geologic/hydrogeologic analysis to determine the location of PFAS contamination on the Chase site and whether or not it is possible to modify wells or drill replacement wells that reduce or eliminate PFAS contamination,

WHEREAS, the Oregon Administrative Rules (OAR) provide procedures for selecting consultants for engineering and related services, and OAR 137-048-0200(1)(b) allows direct selection of a consultant if the estimated fee is less than $100,000, and

WHEREAS, Shannon & Wilson, Inc. provides hydrogeologic consulting services and previously investigated this site for Chase Well No. 5, and this firm has proposed to provide field support and direct a well driller taking soil borings and sealing all boreholes, collecting soil and water samples and analyzing the data, and providing a report of findings with recommendations on how to proceed with existing and future supply wells, for an estimated fee of $44,523, and

WHEREAS, the Rainbow Water District Board of Commissioners acting as the Local Contract Review Board determines that:

1. Shannon & Wilson can provide professional hydrogeologic services to evaluate potential PFAS impacts to the Chase Wellfield site and report their findings, and
2. BIL-EC grant funds will be received and is budgeted as revenue to be expended in the Fiscal Year 2024-25 Materials & Services budget, and

NOW THEREFORE BE IT RESOLVED that the Rainbow Water District Board of Commissioners acting as the Local Contracts Review Board awards the Chase Wellfield PFAS Alternatives Feasibility Study Phase 2 Project to Shannon & Wilson, Inc. and authorizes expenditure of up to $50,000 from the Fiscal Year 2024-25 Materials & Services budget.

ADOPTED by a vote of _____ Yes votes and _____ No votes this 5th day of June 2024.

_____
President
Board of Commissioners and LCRB

Attest:

_____
Secretary-Treasurer
Board of Commissioners and LCRB

SHANNON & WILSON

April 8, 2024

Jamie Porter
Rainbow Water District
1550 N 42nd Street
Springfield, OR. 97477

RE: CHASE WELLFIELD PFAS INVESTIGATION SUPPORT

We are pleased to submit this proposal and cost estimate for providing Hydrogeologic Services for evaluating potential for per- and polyfluoroalkyl substances (PFAS) impacts to the Chase Wellfield in Springfield, Oregon.

BACKGROUND

The Rainbow Water District (RWD) operates a potable water supply wellfield in Springfield Oregon. The wellfield is located northeast of downtown Springfield, on the south side of the McKenzie River. The wellfield is located within unconsolidated alluvial deposits that overlie basalt bedrock. The Wellfield consists of four older wells, Chase Wells 1, 2, 3, and 4 and a new well, Chase Well 5. RWD is considering replacing one of their older existing wells with a new production well but is concerned about the potential for PFAS contamination.

To evaluate the risk of PFAS contamination in the wellfield, RWD would like to complete a subsurface investigation in up to three locations where a potential new well could be located. The investigation would consist of drilling three test boring using a sonic drilling method to advance the borehole up to a total depth of 240 feet in each boring. During drilling a temporary PVC casing would be installed at depths of 50, 150, and 240 feet in order to collect a water sample for laboratory testing of PFAS constituents. At each water sample collection depth, the well would be developed for up to 1 hour to ensure a turbidity free sample.

SCOPE OF SERVICES AND DELIVERABLE

The scope of services outlined in this proposal provide planning, drilling, testing, and data evaluation support for the PFAS investigation at the Chase Wellfield. Please note, this proposal does not include drilling contractor costs or water quality laboratory testing fees.

Shannon & Wilson Services

Shannon & Wilson will provide the following services to support RWD on this project:

- Field work planning and coordination with selected drilling contractor;
- During drilling of each test boring a Hydrogeologist will observe and document the drilling process;
- Collect a water sample for laboratory testing of PFAS constituents at three depths in each test boring;
- Evaluate the drilling and laboratory testing results;
- Prepare a draft and final report documenting the field investigation work and testing results.

Our cost estimate is included as an attachment to the proposal. We will begin pursuing this task upon receipt of a written notice to proceed.

TERMS AND CONDITIONS

Our fee for the above services and the terms and conditions under which our services are offered will be in accordance with our Standard General Terms and Conditions, attached to and an integral part of our proposal. Billing for the above scope of services will be on a time-and-expense basis; we will invoice for the actual time and expenses incurred. If you are unwilling or unable to accept these terms and conditions, we are willing to negotiate these terms and conditions and their associated impacts on our approach, scope of services, schedule, and price. At the time you accept our proposal, you must notify us in writing of your intent to negotiate. If you do not submit written notification to the contrary, we will proceed on the basis you accept our proposal as stated.

If this proposal meets with your approval, please sign in the space provided and return one signed copy of this letter, which will constitute your authorization for us to proceed with the services. The estimated fee and schedule for this work is firm for 60 days from the date of this proposal. Should acceptance and authorization for this work come after 60 days, we will review our estimate to determine if any changes have occurred that would affect the cost or schedule.

If you have any questions or would like to discuss project scope, fee structure, or how we can further assist you, please contact me at 458-3146.

Sincerely,

SHANNON & WILSON

Jim Bailey
Well Services Director

Attachment: Cost Estimate
Standard General Terms and Conditions
Important Information About Your Environmental Site Assessment/Evaluation Proposal

ACCEPTANCE

I accept the above conditions and authorize the work to proceed.

By: _____ Printed Name: _____

Title: _____ Date: _____

HYDROGEOLOGICAL FEE ESTIMATE
CHASE WELLFIELD PFAS INVESTIGATION SUPPORT
SCOPE OF WORK

SHANNON & WILSON, INC.

TASKS/SUBTASKS	HOURS					LABOR $					ODC	TOTAL
	Principle	Sr. Assoc.	Jr Hydro	GIS/WP	Total	Principal	Senior Ass.	Jr Hydro	GIS/WP	Total		
						$310.00	$245.00	$145.00	$110.00			
Drilliing Specifications and Bid Support	1.0	8.0	8.0		17.0	$310	$1,960	$1,160		$3,430	$2,763	$6,193
Drilling Field Support		8.0	120.0		128.0		$1,960	$17,400		$19,360		$19,360
Data Analysis		16.0	32.0	2.0	50.0		$3,920	$4,640	$220	$8,780		$8,780
Report		16.0	24.0	4.0	44.0		$3,920	$3,480	$440	$7,840		$7,840
TOTAL	***1.0***	***48.0***	***184.0***	***6.0***	***239.0***	***$310***	***$11,760***	***$26,680***	***$660***	***$39,410***	***$2,763***	***$42,173***

Overhead Direct Costs (ODC)					
Airfare		each		$	-
Vehicle	600	mile	$0.585	$	351
Per Diem (first day)	1	day		$	-
Per Diem (full day)	8	day	$79	$	632
Per Diem (Last day)	1	day		$	-
Lodging	8	night	$185	$	1,480
Miscellaneous (parking, taxi)	1	LS	$300	$	300
Total - Laboratory Testing				***$***	***2,763***

Misc Expenses					
Airfare		each		$	-
Water Level pressure transducer		day	$50	$	-
Vehicle		mi	$0.585	$	-
Water quality meter	5	day	$50	$	250
Lodgeing		day	$176	$	-
Soil Testing	12	each	$175	$	2,100
Per Diem (full day)		day	$79	$	-
Per Diem (half day)		each	$59	$	-
Other Expenses				***$***	***2,350***

ASSUMPTIONS:

-See Scope of Work for list of assumptions.

SUBCONTRACTORS					
		LS		$	-
		LS		$	-
		foot		$	-
		foot		$	-
		LS		$	-
		LS		$	-
		Hour		$	-
		day		$	-
		Hour		$	-
		LS		$	-
Contingency (10%)		percent		$	-
TOTAL - Subcontractors				***$***	***-***

FEE ESTIMATE SUMMARY		
Tasks/Subtasks (subtotal)	$	39,410
Overhead Direct Costs	$	2,763
Subcontractors	$	-
Other Expenses	$	2,350
TOTAL	***$***	***44,523***

RESOLUTION 2024-04
RAINBOW WATER DISTRICT
RESOLUTION AWARDING CONTRACT TO HOLT SERVICES, INC. FOR SOIL BORINGS TO CHARACTERIZE CHASE WELLFIELD PFAS CONTAMINATION

WHEREAS, Rainbow Water District is a domestic water supply district organized under Oregon Revised Statues (ORS) Chapter 264, and ORS 264.410 provides that "the power and authority given to districts is vested in and shall be exercised by a board of five commissioners, each of whom shall be an elector of the district", and the Rainbow Water District Board of Commissioners also serves as the Local Contract Review Board (LCRB), and

WHEREAS, Chase Wells No. 1-4 have detections of PFAS compounds and will either require treatment or replacement of these contaminated sources or a combination of these options, and it is necessary to conduct environmental and geologic/hydrogeologic analysis to determine the location of PFAS contamination on the Chase site and whether or not it is possible to modify existing wells or drill replacement wells, and

WHEREAS, a contract was awarded to Shannon & Wilson, Inc. by Resolution 2024-XX to provide hydrogeological consulting services for the Chase Wellfield PFAS Remediation Alternatives Feasibility Study Phase 2, which will involve directing a well driller for collection of soil and water samples, and

WHEREAS, based on some inquiries made in 2023 the estimated cost to use a sonic drill rig and complete three soil borings to a depth of 240 feet, while collecting groundwater and soil samples, would be less than $200,000 and OAR 137-047-0270 allows Intermediate Procurements of Goods or Services greater than $25,000 and less than or equal to $250,000 pursuant to ORS 279B.070, seeking at least three informally solicited competitive price quotes, and

WHEREAS, bids were requested from three capable well drilling companies, and Schneider Water Services (St. Paul, OR) declined to propose, but a bid in the amount of $159,221.53 was received from Western States Soil Conservation, Inc. (Hubbard, OR), and a low bid of $148,810 was received from Holt Services, Inc. (Vancouver, WA), and

WHEREAS, accepting the bid from Holt Services would best serve the interests of the district, and based on the line item values from the bid received from Holt Services, Rainbow may elect to drill a fourth soil boring and the driller's cost would increase to an estimated $197,280, and

WHEREAS, the Fiscal Year 2024-25 Materials and Services budget includes $300,000 for this work, to include well drilling, environmental sampling, and hydrogeologic/geologic consultant, and

WHEREAS, the Rainbow Water District Board of Commissioners and Local Contracts Review Board determines that:

1. Well driller services are needed to collect soil borings and groundwater samples via use of a sonic drill rig, to understand the depth and extent of PFAS contamination on the Chase Wellfield site, and

2. The bid from Holt Services, Inc. is determined to be lowest quote that will best serve the interests of Rainbow Water District and the contractor has schedule availability, and

NOW THEREFORE BE IT RESOLVED that the Rainbow Water District Board of Commissioners acting as the Local Contract Review Board accepts the low bid of $148,810 and awards the contract for soil borings to characterize the Chase Wellfield PFAS contamination to Holt Services, Inc., and

NOW THEREFORE BE IT FURTHER RESOLVED that the Rainbow Water District Board of Commissioners acting as the Local Contract Review Board authorizes the Rainbow Water District Superintendent to adjust the scope of work and manage the contractor, with authority to expend as much as $200,000 from the Fiscal Year 2024-25 Materials & Services budget for the well drilling contractor's work, and

ADOPTED by a vote of _____ Yes votes and _____ No votes this 5th day of June 2024.

_____
President
Board of Commissioners and LCRB

Attest:

_____
Secretary-Treasurer
Board of Commissioners and LCRB

HOLT SERVICES INC
EMPLOYEE OWNED

12305 NE 56th Street
Vancouver, WA 98682
360 718-9410

ESTIMATE 4/2/2024

Client: Shannon & Wilson
Contact: Jim Bailey
Email: Jim Bailey <Jim.Bailey@shanwil.cor
Tel: 206-695-6804

Project: Rainbow Water Dist., Eugene, Or

Drill Type: **TSI 150 CC Sonic Drill**

Description	Unit	Quantity	Price	Total
Mobilization/Demobilization	EA	1	$ 2,500.00	$ 2,500.00
Certified Payroll/Admin	LS	0	$ 500.00	$ -
Night/Weekend surcharge	DY	0	$ 900.00	$ -
Oregon Start Card	EA	0	$ 450.00	$ -
GT Hole Report	EA	3	$ 20.00	$ 60.00
Per diem/Daily travel - three person crew	DY	14	$ 750.00	$ 10,500.00
Daily travel	DY	0	$ 300.00	$ -
Set-up/Clean up/Decon	HR	6	$ 600.00	$ 3,600.00
Drill & sample sonic 0 - 100 ft	FT	300	$ 50.00	$ 15,000.00
Drill & sample sonic 100 - 200 ft	FT	300	$ 60.00	$ 18,000.00
Drill & sample sonic 200 - 300 ft	FT	120	$ 60.00	$ 7,200.00
8" conductor casing	FT	150	$ 80.00	$ 12,000.00
7" conductor casing	FT	450	$ 75.00	$ 33,750.00
Drive sample 0 - 50 ft	EA	0	$ 150.00	$ -
Borehole sealing and patch	FT	720	$ 25.00	$ 18,000.00
2-inch Sch 40 PVC well construction	FT	0	$ 50.00	$ -
Temporary 2-inch for water sampling	FT	1320	$ 15.00	$ 19,800.00
8-inch flush completion	EA	0	$ 550.00	$ -
12-inch flush completion	EA	0	$ 700.00	$ -
6-inch above grade completion with bollards	EA	0	$ 1,800.00	$ -
Additional hourly/Stand-by/Safety meetings	HR	0	$ 600.00	$ -
Well development	HR	14	$ 600.00	$ 8,400.00
55 gallon DOT 17H drum	EA	0	$ 140.00	$ -
IDW disposal - per drum	EA	0	$ 150.00	$ -
Wooden core box - 5 ft of sample	EA	0	$ 120.00	$ -
Bobcat	DY	0	$ 300.00	$ -
Mobilization/Demobilization - Air-knife	EA	0	$ 750.00	$ -
Per diem/Daily travel - two person crew	DY	0	$ 500.00	$ -
Daily travel	DY	0	$ 300.00	$ -
Concrete core - standard slab	EA	0	$ 500.00	$ -
Air knife/vacuum excavate - 4 hour minimum	HR	0	$ 350.00	$ -
Subtotal				**$ 148,810.00**
Sales Tax			0.0%	$ -

Scope: 3 Borings to 240'
Sonic samples will be collected in plastic bagging only
Two step down casings will be required at approx. 50' (8") & 150' (7")
Temporary 2" PVC will be used to collect water quality samples at
50', 150' & 240'
Assume 1hr of development for each water sample
No permanent installs
All drill cuttings and development water will be spread on site near borings

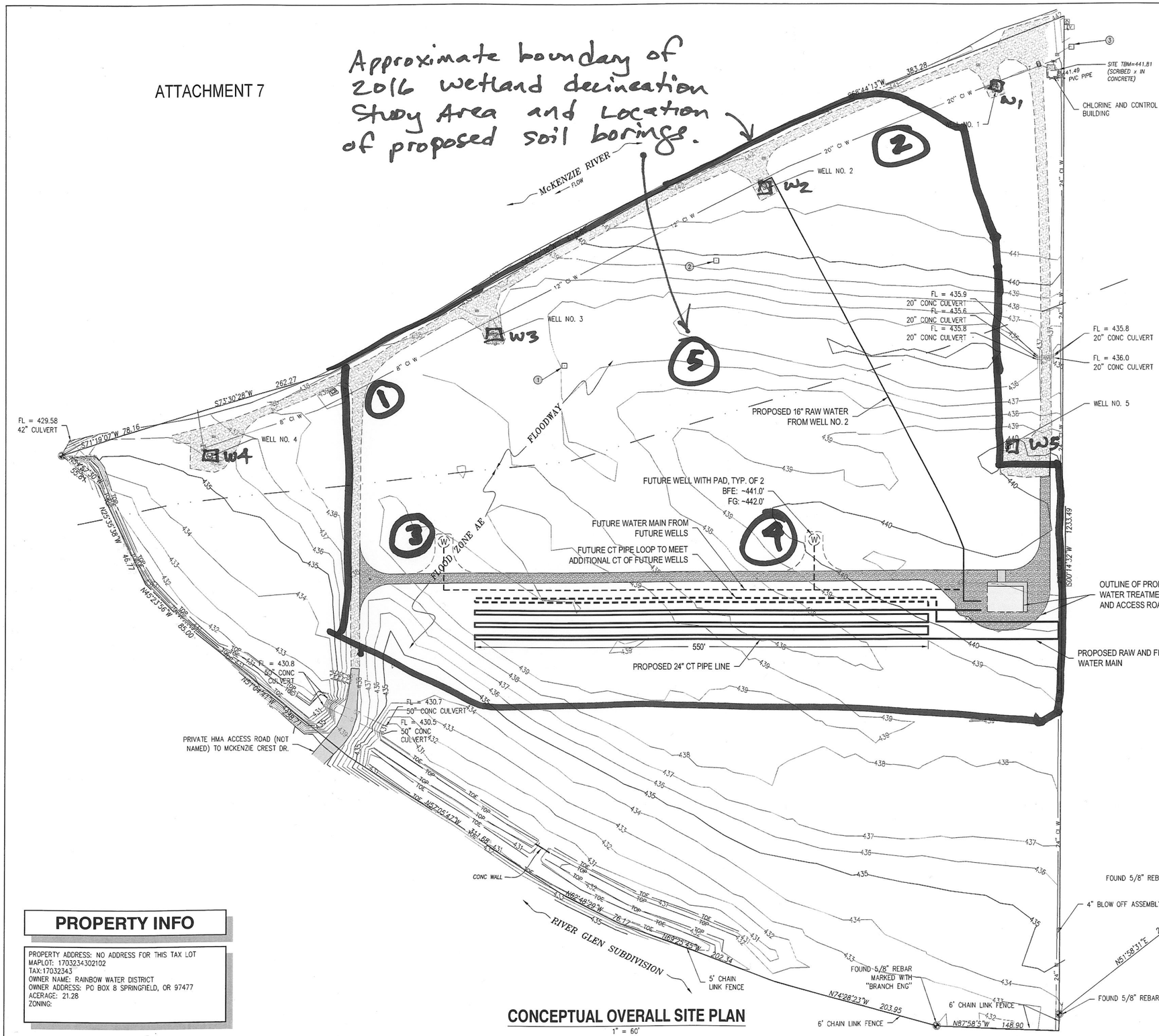
This budget is valid for 30 days

Total Cost Estimate **$ 148,810.00**
Prepared by: Paul Smith

Notes/Assumptions:
No work hour restrictions. Stand-by rates apply if work hours are restricted.
Standard labor rates. No state prevailing or Davis Bacon. No USL&H coverage.
Utility locates, traffic control & site security provided by others.
Construction/Sealing rates are based on actual borehole size volumes.
Subject to final review of terms and conditions; net 30 payment terms.

ATTACHMENT 7

Approximate boundary of 2016 wetland decineation Study Area and Location of proposed soil borings.



5 soil Boring (typ.)

SITE NOTES

1. EXISTING SITE FORMALLY USED AS FILBERT ORCHARD. NO SEPTIC SYSTEMS ARE KNOWN TO BE ON THIS SITE.
2. THIS DOES NOT CONSTITUTE A BOUNDARY SURVEY AND IS SUBJECT TO ANY INACCURACIES A SUBSEQUENT SURVEY MAY DISCLOSE.
3. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ARE BASED ON A COMBINATION OF VISIBLE FACILITIES LOCATED ABOVE GROUND, AS-BUILTS, AND UTILITY LOCATE MARKS. NO CERTIFICATION IS MADE TO ACTUAL LOCATION OF UNDERGROUND UTILITIES.
4. SURVEY DATUM NGVD29: ELEVATION ARE GPS DERIVED USING GEOID12A AND CONVERTED TO NGVD29 USING NGS VERTCON. NAVD88-NGVD29= 3.61 FEET.
5. CONFINE SITE DISTURBANCE AND CONSTRUCTION ACTIVITIES TO THE MINIMUM AREA POSSIBLE.
6. PRESERVE AND PROTECT EXISTING MONUMENTS AND CONTROL POINTS
7. MAINTAIN ACCESS TO OWNER FACILITIES AT ALL TIMES.

CONTROL POINTS

POINT	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	HUB & TACK CONTROL POINT 1	118437.94'	204577.95'	436.96'
2	HUB & TACK CONTROL POINT 2	118564.60'	204762.32'	439.81'
3	HUB & TACK CONTROL POINT 3	118824.11'	205193.84'	441.87'

PROPERTY INFO

PROPERTY ADDRESS: NO ADDRESS FOR THIS TAX LOT
MAPLOT: 17032343402102
TAX:17032343
OWNER NAME: RAINBOW WATER DISTRICT
OWNER ADDRESS: PO BOX 8 SPRINGFIELD, OR 97477
ACERAGE: 21.28
ZONING:

CONCEPTUAL OVERALL SITE PLAN

1" = 60'

LEGEND

- PROPERTY LINE
- SANITARY CONTROL AREA
- EASEMENT
- W — WATER LINE
- T — UNDERGROUND COMMUNICATION LINE
- OHP — OVERHEAD POWER LINE
- TOP — TOP OF BANK/SLOPE
- TOE — TOE OF BANK/SLOPE
- ST — CULVERT PIPE
- 1170 — MAJOR CONTOUR LINE
- 1171 — MINOR CONTOUR LINE
- TOP OF RIVER BANK
- FLOODWAY BOUNDARY
- ROADWAY ASPHALT AREA
- CONCRETE PAD
- GRAVEL ROADWAY
- BUILDING
- WATER METER BOX
- WATER VALVE
- WATER BLOW OFF ASSEMBLY
- UNKNOWN MANHOLE
- EXISTING WELL HEAD
- ELECTRICAL TRANSFORMER
- ELECTRICAL VAULT
- POWER POLE
- SURVEY CONTROL POINT
- FOUND SURVEY MONUMENT

RH2 ENGINEERING, INC.
www.rh2.com
Portland, OR
6500 SW Macadam Ave, Suite 125

RAINBOW WATER DISTRICT
CHASE WELLFIELD
WATER TREATMENT PLANT

CONCEPTUAL OVERALL SITE PLAN

PRELIMINARY

ENGINEER: PGL	JOB NO: 815-127
REVIEWED: KMP	CLIENT: RWD
SAVE DATE: Aug 8, 2016	FILENAME: CWWTP-D-C01_CTOPTIONS.DWG
PLOT DATE: Aug 8, 2016	

REVISIONS

NO.	DATE	DESCRIPTION	BY	REVIEW

SCALE: SHOWN

0" 1" 2"

DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: C01 SHEET NO.: 2 13

RESOLUTION 2024-05
RAINBOW WATER DISTRICT
RESOLUTION AWARDING CONTRACT TO EUROFINS EATON ANALYTICAL FOR LABORATORY ANALYTICAL SERVICES RELATED TO PFAS SAMPLING

WHEREAS, Rainbow Water District is a domestic water supply district organized under Oregon Revised Statues (ORS) Chapter 264, and ORS 264.410 provides that "the power and authority given to districts is vested in and shall be exercised by a board of five commissioners, each of whom shall be an elector of the district", and the Rainbow Water District Board of Commissioners also serves as the Local Contract Review Board (LCRB), and

WHEREAS, Chase Wells No. 1-4 have detections of PFAS compounds and will either require treatment or replacement of these contaminated sources or a combination of these options, and it is necessary to conduct environmental and geologic/hydrogeologic analysis to determine the location of PFAS contamination on the Chase site and whether or not it is possible to modify existing wells or drill replacement wells, and

WHEREAS, a contract was awarded to Shannon & Wilson, Inc. by Resolution 2024-03 to provide hydrogeological consulting services for the Chase Wellfield PFAS Remediation Alternatives Feasibility Study Phase 2, and a contract was awarded to Holt Services, Inc. for sonic soil boring drilling services to allow collection of soil and groundwater samples by Resolution 2024-04, and

WHEREAS, OAR 137-047-0270 allows Intermediate Procurements of Goods or Services greater than $25,000 and less than or equal to $250,000 pursuant to ORS 279B.070, and Rainbow sought at least three informally solicited competitive price quotes for PFAS sample analysis associated with the Phase 2 Feasibility Study, and

WHEREAS, bids were requested from five west coast analytical laboratories to analyze both soil and groundwater for PFAS using EPA Method 1633, and two firms (BSK Associates and McCampbell Analytical) were not certified for the requested methods but price quotes were received from Weck Laboratories, Enthalpy Analytical, and Eurofins Eaton Analytical, and

WHEREAS, based on an estimated 36 soil samples, 36 groundwater samples, and shipping for 12 coolers, the low bid of $31,500 from Eurofins Eaton Analytical would best serve the interests of the district, and the project budget would allow for the collection of additional samples based on the quoted price and as need is determined during field investigation, and

WHEREAS, the Fiscal Year 2024-25 Materials and Services budget includes $300,000 for this work, to include well drilling, environmental sampling, and hydrogeologic/geologic consultant, and

WHEREAS, the Rainbow Water District Board of Commissioners and Local Contracts Review Board determines that:

1. The bid from Eurofins Eaton Analytical is determined to be lowest quote that will best serve the interests of Rainbow Water District for the Remediation Alternatives Feasibility Study Phase 2 project, and Eurofins has already performed PFAS sample analysis for the district and would provide consistency in lab contacts, and
2. It may be desirable for Eurofins Eaton Analytical to provide analytical sampling for PFAS for work outside the scope and budget of the Remediation Alternatives Feasibility Study Phase 2 project, and

NOW THEREFORE BE IT RESOLVED that the Rainbow Water District Board of Commissioners acting as the Local Contract Review Board awards the contract for PFAS laboratory analysis to Eurofins Eaton Analytical, and

NOW THEREFORE BE IT FURTHER RESOLVED that the Rainbow Water District Board of Commissioners acting as the Local Contract Review Board authorizes the Rainbow Water District Superintendent to adjust the scope of work and manage the laboratory work, with authority to expend as much as $45,000 from the Fiscal Year 2024-25 Materials & Services budget for laboratory sample analyses associated with the Remediation Alternatives Feasibility Study Phase 2, and further authorizes the use of Eurofins Eaton Analytical for other PFAS-related testing outside the scope and budget of the Remediation Alternatives Feasibility Study Phase 2 project subject to existing budgeted funds.

ADOPTED by a vote of _____ Yes votes and _____ No votes this 5th day of June 2024.

_____
President
Board of Commissioners and LCRB

Attest:

_____
Secretary-Treasurer
Board of Commissioners and LCRB

eurofins | Environment Testing

Eurofins Eaton Analytical Pomona
941 Corporate Center Drive
Pomona, CA 91768-2642

Prepared for:
Jamie Porter
Rainbow Water District
1550 N 42nd Street
Springfield, OR 97477
jamie@rwdonline.net | Tel: 1-(541) 746-1676

Prepared by: Calcagno, Kevin
Date: 4/23/2024 Expiration Date: 12/31/2024

Project: PFAS - Water & Soil

Quote Number: 38007079 - 1

1,4 Dioxane — TAT: 15_Days (Business Days)

Matrix	Method	Test Description	Quantity	Unit Price	Extended Price
Drinking Water	522	1,4 Dioxane (RL = 0.07 ug/L)	5	$ 175.00	$ 875.00
		Total 1,4 Dioxane			**$ 875.00**

PFAS - Water — TAT: 15_Days (Business Days)

Matrix	Method	Test Description	Quantity	Unit Price	Extended Price
Water	533	25x PFAS Chemicals	1	$ 350.00	$ 350.00
Water	533	Field Reagent Blank 25x PFAS Chemicals (if necessary)	0	$ 350.00	$ 0.00
Water	537.1	18x PFAS Chemicals	1	$ 250.00	$ 250.00
Water	537.1	Field Reagent Blank 18x PFAS Chemicals (if necessary)	0	$ 250.00	$ 0.00
Water	Draft-4 1633	EPA 1633 Method List (40x PFAS Chemicals)	1	$ 425.00	$ 425.00
Water	Total PFCA-Dif	Total PFCA (Treatment Difference)	0	$ 0.00	$ 0.00
Water	Total PFCA-Sum	Total PFCA (Summary) (Pre)	0	$ 0.00	$ 0.00
Water	Total PFCA-Sum	Total PFCA (Summary) (Post)	0	$ 0.00	$ 0.00
Water	537 (modified)	TOPS Assay by EPA 537M (24x PFAS Chemicals) (Pre)	1	$ 975.00	$ 975.00
Water	537 (modified)	TOPS Assay by EPA 537M (24x PFAS Chemicals) (Post)	0	$ 0.00	$ 0.00
		Total PFAS - Water			**$ 2,000.00**

PFAS - Solid — TAT: 15_Days (Business Days)

Matrix	Method	Test Description	Quantity	Unit Price	Extended Price
Solid	Draft-4 1633	EPA 1633 Method List (40x PFAS Chemicals)	1	$ 425.00	$ 425.00
Solid	537 (modified)	TOPS Assay by EPA 537M (24x PFAS Chemicals) (Pre)	1	$ 975.00	$ 975.00
Solid	537 (modified)	TOPS Assay by EPA 537M (24x PFAS Chemicals) (Post)	0	$ 0.00	$ 0.00
Solid	Total PFCA-Dif	Total PFCA (Treatment Difference)	0	$ 0.00	$ 0.00
Solid	Total PFCA-Sum	Total PFCA (Summary) (Pre)	0	$ 0.00	$ 0.00
Solid	Total PFCA-Sum	Total PFCA (Summary) (Post)	0	$ 0.00	$ 0.00
		Total PFAS - Solid			**$ 1,400.00**

Quote Other Charges

Description	Quantity	Unit Price	Extended Price
Sample Kit Delivery - Standard	1	$ 0.00	$ 0.00
Sample Kit Return Shipping	1	$ 75.00	$ 75.00

eurofins | Environment Testing

Eurofins Eaton Analytical Pomona
941 Corporate Center Drive
Pomona, CA 91768-2642

Prepared for:
Jamie Porter
Rainbow Water District
1550 N 42nd Street
Springfield, OR 97477
jamie@rwdonline.net | Tel: 1-(541) 746-1676

Prepared by: Calcagno, Kevin
Date: 4/23/2024 Expiration Date: 12/31/2024

Project: PFAS - Water & Soil

Quote Number: 38007079 - 1

Quote Other Charges (Continued)

Description	Quantity	Unit Price	Extended Price
Deliverable - Level 2 QC Report (PDF)	1	$ 0.00	$ 0.00
Total Other Charge			**$75.00**

Total Other Charges	**$ 75.00**
Total Analysis Charges	**$ 4,275.00**
Grand Total for Quote 38007079	**$ 4,350.00**

***Quoted charges do not include sales tax. Applicable sales tax will be added to invoices where required by law.*

eurofins | Environment Testing

Eurofins Eaton Analytical Pomona
941 Corporate Center Drive
Pomona, CA 91768-2642

Prepared for:
Jamie Porter
Rainbow Water District
1550 N 42nd Street
Springfield, OR 97477
jamie@rwdonline.net | Tel: 1-(541) 746-1676

Prepared by: Calcagno, Kevin
Date: 4/23/2024 Expiration Date: 12/31/2024

Project: PFAS - Water & Soil

Quote Number: 38007079 - 1

PROJECT DETAILS

Acceptance Signature

Submitted by: Kevin Calcagno by electronic signature

Accepted By: _____

RECEIPT OF SAMPLES BY EUROFINS EATON ANALYTICAL CONSTITUTES ACCEPTANCE OF THE TERMS & CONDITIONS BELOW, NOT WITHSTANDING ANY PROVISIONS TO THE CONTRARY IN CLIENT'S PURCHASE ORDER, UNLESS AN ALTERNATIVE AGREEMENT HAS BEEN SIGNED BY US.

PFAS Blank

Field Reagent Blank (FRB):

The FRBs are prepared by Eurofins Eaton Analytical and include an FRB sample bottle filled with reagent grade water and preservatives plus a second, empty FRB sample bottle. At the sampling site, open the FRB bottle and pour the reagent water into the second sample bottle. FRBs are required by the method but the number of FRBs to collect (for each site, for each representative sample or not at all) is at the discretion of the customer and/or regulator overseeing the project. [Non-UCMR]

FRB supplies (bottles and reagent water) are provided at no charge with every cooler. If the correlating field sample tests positive for any PFAS analyte, then the FRB is tested and billable at the sample unit rate.

MyEOL

Use of Eurofins Eaton Analytical's on-line data management tool and interactive portal, MyEOL, provides clients with 24/7 access to all project information, including: sample results, data reports, EDDs, and invoices. This tool enables clients to manage their analytical data electronically and eliminates shipping costs and paper consumption, thereby reducing impacts on the environment. **Eurofins Eaton Analytical is pleased to provide access to MyEOL at no additional charge.** Please contact your Project Manager to create a MyEOL account and to discuss how this tool may help you efficiently manage your analytical data.

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Eurofins Eaton Analytical Pomona
941 Corporate Center Drive
Pomona, CA 91768-2642

Prepared for:
Jamie Porter
Rainbow Water District
1550 N 42nd Street
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Prepared by: Calcagno, Kevin
Date: 4/23/2024 Expiration Date: 12/31/2024

Project: PFAS - Water & Soil

Quote Number: 38007079 - 1

Analytical Sample Information

Analysis Method	Matrix	Preservative	Client Sub List Desc Container	Volume Required	Holding Time
1,4 Dioxane (GC/MS SIM)			1,4 Dioxane (RL = 0.07 ug/L)		
522_PREC	Drinking Water	Sodium Sulfite/Sodium Bisulfate	Amber Glass 125 mL - NaSO3/NaHSO4	200 mL	28 Days
Fluorinated Alkyl Substances			TOPS Assay by EPA 537M (24x PFAS Chemicals) (Post)		
PFC_IDA	Solid	None	Soil Jar 4oz Plastic	30 g	14 Days
Fluorinated Alkyl Substances			TOPS Assay by EPA 537M (24x PFAS Chemicals) (Pre)		
PFC_IDA	Solid	None	Soil Jar 4oz Plastic	30 g	14 Days
Per- and Polyfluoroalkyl Substances by LC/MS/MS			EPA 1633 Method List (40x PFAS Chemicals)		
1633	Solid	None	Soil Jar 4oz Plastic	30 g	90 Days
Fluorinated Alkyl Substances			TOPS Assay by EPA 537M (24x PFAS Chemicals) (Post)		
PFC_IDA	Water	None	Plastic 125mL - unpreserved	250 mL	14 Days
Fluorinated Alkyl Substances			TOPS Assay by EPA 537M (24x PFAS Chemicals) (Pre)		
PFC_IDA	Water	None	Plastic 125mL - unpreserved	250 mL	14 Days
Per- and Polyfluoroalkyl Substances by LC/MS/MS			EPA 1633 Method List (40x PFAS Chemicals)		
1633	Water	None	1633 - PFAS - SAC	1 NONE	28 Days
Perfluorinated Alkyl Acids (LC/MS)			18x PFAS Chemicals		
537.1_DW_PREC	Water	Trizma	Plastic 250ml - Trizma	750 mL	14 Days
Perfluorinated Alkyl Acids (LC/MS)			Field Reagent Blank 18x PFAS Chemicals (if necessary)		
537.1_DW_PREC	Water	Trizma	Plastic 250ml - Trizma	750 mL	14 Days
Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water			25x PFAS Chemicals		
533	Water	Ammonium Acetate	Plastic 250ml – Ammonium Acetate	750 mL	28 Days
Perfluorinated and Polyfluorinated Alkyl Substances in Drinking Water			Field Reagent Blank 25x PFAS Chemicals (if necessary)		
533	Water	Ammonium Acetate	Plastic 250ml – Ammonium Acetate	750 mL	28 Days

Hold Times listed above represent the minimum allotted time between sampling and lab extraction, prep or analysis.

Multiple analyses may be consolidated into fewer containers. Please contact your Project Manager for clarification when requesting sample containers.

Except for some special tests, all samples should be kept cold at 6 degrees C.

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EUROFINS EATON ANALYTICAL, LLC
TERMS AND CONDITIONS OF SALE (Short Form)

When a purchaser ("Client") places an order for laboratory, consulting or sampling services from Eurofins Eaton Analytical, LLC. ("EEA"), a Delaware limited liability company, EEA shall provide the ordered services pursuant to these Terms and Conditions and the related Quotation or Price Schedule, or as agreed in a negotiated contract. In the absence of a written agreement to the contrary, a client order constitutes an acceptance by the Client of EEA's offer to do business under these Terms and Conditions, and an agreement to be bound by these Terms and Conditions. Receipt of a Client's samples at an EEA laboratory constitutes acceptance of these Terms and Conditions (in the absence of any other negotiated contract). No contrary or additional terms and conditions expressed in a Client's document shall be deemed to become a part of the contract created upon acceptance of these Terms and Conditions, unless accepted by EEA in writing.

1. ORDERS, RECEIPT OF SAMPLES AND PROJECT SETUP

1.1 A Client may place an order (i.e., specify a Scope of Work) either by submitting a purchase order to EEA in writing or by telephone subsequently confirmed in writing, or by negotiated contract. Whichever option the Client selects for placing an order, the order shall not be valid unless it contains sufficient specification to enable EEA to carry out the Client's requirements. In particular, samples must be accompanied by: a) adequate instruction on type of analysis requested, and b) complete written disclosure of the known or suspected presence of any hazardous substances, as defined by applicable federal or state law. If a Client fails to provide these required disclosures accompanying the submission of samples, and such failure results in an interruption in the lab's ability to process work due to contamination of instruments or work areas, the Client will be responsible for the costs of clean-up and recovery.

1.2 Unit Prices assume that samples are a single-phase matrix and that analyses can be performed in accordance with the laboratory's standard analytical procedures. If additional handling is required, additional fees may apply.

Examples of special handling fees include (but are not limited to):

- Matrices requiring additional dilutions or special clean up steps.
- Multiphasic samples requiring separate preparations and/or analyses.
- Special sub-sampling procedures.
- Extra disposal costs for unique waste streams.

1.3 Pricing listed in the proposal will expire 90 days from the quote date unless the project is awarded/confirmed within that time. Unless otherwise set forth in written agreement, EEA reserves the right to adjust pricing on an annual basis to adjust for positive changes in the Consumer Price Index, supply chain shortages and other factors that can affect cost of goods sold.

1.4 The Client shall provide one week's advance notice of the sample delivery schedule, or any changes to the schedule, whenever possible. Upon timely delivery of samples, EEA will use its best efforts to meet mutually agreed turnaround times. All turnaround times will be calculated from the point in time when EEA has determined that it can proceed with defined work following receipt, inspection of samples, and resolution of any discrepancies in Chain-of-Custody forms and project guidance regarding work to be done (Sample Delivery Acceptance). Rush turnaround times not requested in advance of the delivery of samples and specifically agreed to by the lab are not guaranteed. If the Client changes the sample delivery schedule prior to Sample Delivery Acceptance, EEA reserves its rights to modify its turnaround time commitment, change the date upon which EEA will accept samples, or refuse Sample Delivery Acceptance for the affected samples.

1.5 EEA reserves the right, exercisable at any time, to refuse or revoke Sample Delivery Acceptance for any sample which in the sole judgment of EEA: a) is of unsuitable volume; b) may pose a risk or become unsuitable for handling, transport, or processing for any health, safety, environmental or other reason, whether or not due to the presence of any hazardous substance in the sample and whether or not such presence has been disclosed to EEA by the Client; or
c) holding times cannot be met, due to passage of more than 48 hours from the time of sampling or 1/2 the holding time for the requested test, whichever is less.

1.5 EEA will provide sample containers and coolers to support the sampling of water samples. Additional sampling containers may be provided (up to 10%) in case of breakage. EEA expects that samples and supplies will be returned to the lab, including empty coolers and a reasonable percentage of the projected sample load - 90% or higher of the expected/quoted sample number. Kits not received back by the projected deadline or as agreed with the Project Manager ("PM") will be billed at the current market rate.

The containers and preservatives required by the project shall be delivered via ground transportation within the contiguous USA. A minimum of 7 business days advance notice is required in order to achieve shipment by ground transportation. Supply shipments outside of contiguous USA or requiring priority delivery due to insufficient lead time for ground transportation shall be charged to the client at EEA's cost. Alternatively, EEA can ship the supplies via carrier of choice by the client using the client's shipping account.

Unused sample containers cannot be returned to EEA for reuse due to possible contamination.

Courier Services are offered by some EEA facilities. Where offered, the cost of the services will vary based on the distance traveled, the scope of the project being supported, and whether sufficient notice (typically 2 business days) is provided to facilitate efficient scheduling. If no details are described in this quotation and you are interested in learning more about courier options, please contact your Project Manager to inquire about availability and cost.

When using Eurofins couriers there may be additional stops before returning to the lab so a delay in initiation of testing is possible.

1.6 Prior to Sample Delivery Acceptance, the entire risk of loss or damage to samples remains with the Client, except where EEA provides courier services. In no event will EEA have any responsibility or liability for the action or inaction of any carrier shipping or delivering any sample to or from EEA's premises. Client is responsible for assuring that any sample that contains or may contain any hazardous substance to be delivered to EEA's premises is properly packaged, labeled, transported and delivered, all in accordance with applicable laws.

1.7 EEA reserves the right to begin processing samples upon receipt, unless the Client specifically notifies EEA in writing prior to sample receipt that the samples are to be held without preparation or other processing or pending receipt of a purchase order. EEA shall under no circumstances be responsible for missed holding times or turnaround times or for re-sampling costs if samples are released from hold with less than 48 hours or 1/2 the holding time for the requested test remaining, whichever is less.

Unless dictated by contract, quotations are based on the scope of work defined in the quote request. If the volume of samples submitted is less than 80% of the projected volume, a surcharge of 10% of the total project cost may be assessed.

2. PAYMENT TERMS

2.1 Services performed by EEA will be in accordance with prices quoted and later confirmed in writing or as stated in the Price Schedule. Quoted prices do not include sales tax. Applicable sales tax will be added to invoices where required by law.

2.2 Invoices may be submitted to Client upon completion of any sample delivery group. Billing corrections must be requested within 30 days of invoice date. Payment in advance is required for all clients except those whose credit has been established with EEA. For clients with approved credit, payment terms are net 30 days from the date of invoice by EEA, unless alternative terms have been agreed in a separate written agreement. Payment shall be made without retainage and shall not be contingent upon the receipt of funds from third parties. All overdue payments are subject to an additional interest and service charge of one- and one-half percent (1.5%) (or the maximum rate permissible by law, whichever is less) per month or portion thereof from the due date until the date of payment. All fees are charged or billed directly to the Client. The billing of a third party will not be accepted without a statement, signed by the third party, acknowledging, and accepting payment responsibility in accordance with these payment terms.

2.3 If Client fails to make timely payment of its invoices, EEA reserves the right to pursue all appropriate remedies, including withdrawing certifications, suspending work, and withholding delivery of data under this order without

recourse. Client shall be responsible for all reasonable fees, expenses, and costs of collection including but not limited to arbitrator's and attorney's fees. EEA reserves the right to refuse to proceed with work at any time based upon an unfavorable Client credit report.

3. CHANGE ORDERS, TERMINATION

3.1 Changes to the Scope of Work, price, or result delivery date may be initiated by EEA after Sample Delivery Acceptance due to any condition which conflicts with analytical, QA or other protocols warranted in these Terms and Conditions. EEA will not proceed with such changes until an agreement with the Client is reached on the amount of any cost, schedule change or technical change to the Scope of Work, and such agreement is documented in writing. The laboratory's reporting limit, detection limits, and control limits are subject to change as these values are updated periodically to reflect analytical sensitivity and capability.

3.2 Changes to the Scope of Work, including but not limited to increasing or decreasing the work, changing test and analysis specification, or acceleration in the performance of the work may be initiated by the Client after Sample Delivery Acceptance. Such change must be documented in writing and may result in a change in cost and turnaround time commitment. EEA's acceptance of such changes is contingent upon technical feasibility and operational capacity.

3.3 Suspension or termination of all or any part of the work may be initiated by the Client upon thirty (30) day written notice to EEA. EEA will be compensated consistent with Section 2 of these Terms and Conditions. EEA will complete all work in progress and be paid in full for all work completed, including all costs incurred and reasonable profit margin, even if EEA does not issue a final or partial report.

3.4 A fee will be charged for cancellation of samples/analyses after a project is received in the laboratory. The fee will be based on the status of analysis at the time of cancellation in accordance with the following categories:

- Received – 35%
- Prepped – 50%
- Analyzed – 95%

3.5 Data will be delivered at the proposed turnaround time in Business Days from Sample Receipt unless otherwise agreed upon. TAT begins the day the laboratory performing analyses receives the samples (day of lab receipt = day zero) and all Chain of Custody (CoC) discrepancies are resolved.

3.6 Samples received after 4:00 PM or anytime on a weekend will be considered received the next business day.

3.7 For samples that require subcontracting, the TAT starts the first business day that the samples are received at the subcontract laboratory.

3.8 Samples will only be accepted with a legible and complete CoC.

3.9 All samples should be shipped to the lab on the day they are collected.

3.10 Expedited turnaround times may be available and must be pre-approved by the laboratory. Expedited turnaround delivery is contingent upon meeting the agreed upon delivery date/time and number of samples. Samples received after 4:00PM or anytime on a weekend will be considered received the next business day. Results will be provided via e-mail or web portal by close of business in the lab's time zone unless another time has been agreed to in advance.

3.11 Expedited turnaround time surcharges for standard analyses are:

- 5 Business Days TAT = 1.5 x listed unit price
- 3 Business Days TAT = 2.0 x listed unit price

3.12 Different surcharges may apply for specialty analyses. These will be provided in your quotation. Weekend TAT can be arranged on a project-specific basis at an additional cost.

3.12 Every effort will be made by the laboratory to meet method and regulatory holding times for an analysis. The laboratory will accept and attempt to run analysis within holding time regardless of the difference between the holding time and the receipt time.

However, the laboratory will not consider itself at fault for missed holding times if the laboratory receives samples that require tests with less than 48hrs holding times when the samples were not shipped on the same day of sampling and/or if the samples are received with less than 1/2 of the holding time remaining.

4. PROJECT DELIVERABLES

4.1 EEA will provide two analytical report formats, a final report in PDF format and a standard EEA EDD if required or requested. Both electronic report formats will be delivered via email or web portal. If additional formats or retroactive deliverables are requested, costs of report generation will be billable. Charges will be based on labor and materials cost of report generation and data retrieval.

4.2 Unless a level III or IV deliverable is specifically listed on the pricing page, this quotation includes delivery of a Level I or II report. Level III or IV reports are available at an additional charge. Please note that level III and IV reports are not available for Pharmaceuticals and Personal Care Products (PPCP) methods.

5. WARRANTIES AND LIABILITY

5.1 Where applicable, EEA will use appropriate and approved analytical test methods. EEA has referenced these methods in its Laboratory Quality Manuals and has documented them in Standard Operating Procedures. EEA reserves the right based on its reasonable judgment to deviate from these methodologies as necessary or appropriate to the extent required by the nature or composition of the sample, which deviations, if any, will be made on a basis consistent with recognized standards of the industry and/or EEA's Laboratory Quality Manuals. Client may request that EEA perform according to a mutually agreed Quality Assurance Project Plan (QAPP). If samples arrive prior to agreement on a QAPP, EEA will proceed with analyses under its standard Quality Manuals then in effect. EEA will not be responsible for any resampling or other charges if work must be repeated to comply with a subsequently finalized QAPP.

5.2 EEA shall start preparation and/or analysis within holding times provided that Sample Delivery Acceptance occurs within 48 hours of sampling or 1/2 of the holding time for the test, whichever is less, unless the Client has specifically requested that EEA hold the samples without preparation or other processing or pending receipt of a purchase order. Where resolution of inconsistencies leading to Sample Delivery Acceptance does not occur within this period, EEA will use its best efforts to meet holding times and will proceed with the work provided that, in EEA's judgment, the chain-of-custody or definition of the Scope of Work provide sufficient guidance. Reanalysis of samples to comply with EEA's Quality Manuals will be deemed to have met holding times provided the initial analysis was performed within the applicable holding time. Where reanalysis demonstrates that sample matrix interference is the cause of failure to meet any Quality Manual requirements, the warranty will be deemed to have been met.

5.3 EEA warrants that it possesses and maintains all licenses and certifications that are required to perform services under these Terms and Conditions provided that such requirements are specified in writing to EEA prior to Sample Delivery Acceptance. EEA will notify the Client in writing of any decertification or revocation of any license, or notice of either, that affects work in progress.

5.4 The warranty obligations set forth in Sections 4.1, 4.2 and 4.3 are the sole and exclusive warranties given by EEA in connection with any services performed by EEA or any results generated from such services, and EEA gives and makes NO OTHER REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. No representative of EEA is authorized to give or make any other representation or warranty or modify this warranty in any way.

5.5 Client's sole and exclusive remedy for breach of warranty in connection with any services performed by EEA will be limited to repeating any services performed, contingent on the Client's providing, at the request of EEA and at the Client's expense, additional sample(s) if necessary. Any reanalysis requested by the Client generating results consistent with the original results will be at the Client's expense. If resampling is necessary, EEA's liability for resampling costs will be limited to actual cost or one hundred and fifty dollars ($150) per sample, whichever is less.

5.6 EEA's liability for any and all causes of action arising hereunder, whether based in contract, tort, warranty, negligence or otherwise, shall be limited to the lesser amount of compensation for the services performed or $100,000. All claims, including those for negligence, shall be deemed waived unless suit thereon is filed within one year after EEA's completion of the services. Under no circumstances, whether arising in contract, tort (including negligence), or otherwise, shall EEA be responsible for loss of use, loss of profits, or for any special, indirect, incidental or consequential damages occasioned by the services performed or by application or use of the reports prepared.

5.7 In no event shall EEA have any responsibility or liability to the Client for any failure or delay in performance by EEA that results, directly or indirectly, in whole or in part, from any cause or circumstance beyond the reasonable

control of EEA. Such causes and circumstances include, but are not limited to, acts of God, acts of Client, acts or orders of any governmental authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, equipment breakdown, matrix interference or unknown highly contaminated samples that impact instrument operation, unavailability of supplies from usual suppliers, difficulties or delays in transportation, mail or delivery services, or any other cause beyond EEA's reasonable control.

6. RESULTS, WORK PRODUCT

6.1 Data or information provided to EEA or generated by services performed under this agreement shall only become the property of the Client upon receipt in full by EEA of payment for the entire order. Ownership of any analytical method, QA/QC protocols, software programs or equipment developed by EEA for performance of work will be retained by EEA. Client shall not disclose such information to any third party without EEA's express prior consent.

6.2 Data and sample materials provided by Client or at Client's request, and the result obtained by EEA shall be held in confidence (unless such information is generally available to the public or is in the public domain or Client has failed to pay EEA for all services rendered or is otherwise in breach of these Terms and Conditions), subject to any disclosure required by law or legal process.

6.3 Should the results delivered by EEA be used by the Client or Client's client, even though subsequently determined not to meet the warranties described in these Terms and Conditions, then the compensation will be adjusted based upon mutual agreement. In no case shall the Client unreasonably withhold EEA's right to independently defend its data.

6.4 EEA reserves the right to perform the services at any laboratory in the Eurofins Environment Testing ("Eurofins") network. If a Client has requested a particular location for the work, EEA will inform the Client when operational constraints require the work to be performed at another Eurofins location. In addition, EEA reserves the right to subcontract services ordered by the Client to another laboratory or laboratories, if, in EEA's sole judgment, it is reasonably necessary, appropriate or advisable to do so. EEA will in no way be liable for any subcontracted services (outside the Eurofins network) except for work performed at laboratories which have been audited and approved by EEA.

6.5 If a listed method is discontinued by EEA, samples requiring that method may be subcontracted with permission from the client. EEA, however, will not honor the quoted prices if samples are subcontracted.

6.6 EEA will dispose of non-hazardous samples, sample extracts and digestates after sample hold time expiration or at 45 days from date of collection, whichever is less. Alternatively, samples can be returned to the client for disposal. Cost of return shipping will be billable to the client. Longer storage periods may be requested and may be accommodated if space allows, and for an additional charge. Any samples for projects that are canceled or not accepted, or for which return was requested, will be returned to the Client at its own expense. EEA reserves the right to return to the Client any sample or unused portion of a sample that is not within EEA's permitted capability or the capabilities of EEA's designated waste disposal vendor(s). ALL DIOXIN, MIXED WASTE, AND RADIOACTIVE SAMPLES WILL BE
RETURNED TO THE CLIENT, unless prior arrangements for disposal are made.

6.7 Unless a different time period is agreed to in an order under these Terms and Conditions, EEA agrees to retain all records for five (5) years.

6.8 If EEA is required to respond to legal process related to services for Client, Client agrees to reimburse EEA for hourly charges for personnel involved in the response and attorney's fees reasonably incurred in obtaining advice concerning the response, preparation to testify, and appearances related to the legal process, travel and all reasonable expenses associated with the litigation. Additional consulting beyond that normally associated with lab reports will be billed at EEA's current published rates.

7. INSURANCE

7.1 During the performance of services under these Terms and Conditions, EEA shall maintain in force Workers' Compensation and Employer's Liability Insurance in accordance with the laws of the states having jurisdiction over EEA's employees who are engaged in the performance of the work. EEA shall also maintain during such period Comprehensive General and Contractual Liability (limit of $1,000,000 per occurrence; $2,000,000 aggregate), Comprehensive Automobile Liability, owned and hired ($1,000,000 combined single limit), Professional Liability Insurance (limit of $5,000,000 per claim/aggregate), and Pollution Liability Insurance (limit of $1,000,000 per claim/aggregate).

8. MISCELLANEOUS PROVISIONS

8.1 These Terms and Conditions, together with any additions or revisions which may be agreed to in writing by EEA, embody the whole agreement of the parties and provide the only remedies available. There are no promises, terms, conditions, understandings, obligations or agreements other than those contained herein, and these Terms and Conditions shall supersede all previous communications, representations, or agreements, either verbal or written, between the Client and EEA. These Terms and Conditions, and any transactions or agreements to which they apply, shall be governed both as to interpretation and performance by the laws of the state where EEA's services are performed.

8.2 The invalidity or unenforceability, in whole or in part, of any provision, term or condition hereof shall not affect in any way the validity or enforceability of the remainder of these Terms and Conditions, the intent of the parties being that the provisions be severable. The section headings of these Terms and Conditions are intended solely for convenient reference and shall not define, limit or affect in any way these Terms and Conditions or their interpretations. No waiver by either party of any provision, term or condition hereof or of any obligation of the other party hereunder shall constitute a waiver of any subsequent breach or other obligation.

8.3 The obligations, liabilities, and remedies of the parties, as provided herein, are exclusive and in lieu of any others available at law or in equity. Indemnifications, releases from liability and limitations of liability shall apply, notwithstanding the fault, negligence or strict liability of the party to be indemnified, released, or whose liability is limited, except to the extent of sole negligence or willful misconduct

RESOLUTION NO. 2024-06

RESOLUTION OF THE RAINBOW WATER DISTRICT AUTHORIZING A LOAN FROM THE SAFE DRINKING WATER REVOLVING LOAN FUND

BY ENTERING INTO A FINANCING CONTRACT
WITH THE OREGON INFRASTRUCTURE FINANCE AUTHORITY

The Rainbow Water District Board of Commissioners (the "Governing Body") of the Rainbow Water District (the "Recipient") finds:

A. The Recipient is a community water system as defined in Oregon Administrative Rule 123-049-0010.

B. The Safe Drinking Water Act Amendments of 1996, Pub.L. 104-182, as amended (the "Act"), authorize any community or nonprofit non-community water system to file an application with the Oregon Infrastructure Finance Authority of the Business Development Department ("the IFA") to obtain financial assistance from the Safe Drinking Water Revolving Loan Fund.

C. The Recipient has filed an application with the IFA to obtain financial assistance for a "safe drinking water project" within the meaning of the Act, and the IFA has approved the Recipient's application for financial assistance.

D. The Recipient is required, as a prerequisite to the receipt of financial assistance from the IFA, to enter into a Financing Contract with the IFA, number EC2409, substantially in the form attached hereto as Exhibit 1. The project is described in Exhibit C to that Financing Contract (the "Project").

E. Notice relating to the Recipient's consideration of the adoption of this Resolution was published in full accordance with the Recipient's charter and laws for public notification.

NOW THEREFORE, BE IT RESOLVED by the Governing Body of the Recipient as follows:

1. Financing Loan Authorized. The Governing Body authorizes the President to execute the Financing Contract and the Promissory Note (the "Financing Documents") and such other documents as may be required to obtain financial assistance including a loan from the IFA on the condition that the principal amount of the loan from the IFA to the Recipient is not more than $300,000 (with $300,000 eligible for principal forgiveness if contract conditions are met) and the interest rate is not more than 1.0%. The proceeds of the loan from the IFA must be applied solely to the "Costs of the Project" as such term is defined in the Financing Contract.

2. Sources of Repayment. Amounts payable by the Recipient are payable from the sources described in Section 4 of the Financing Contract and the Oregon Revised Statutes Section 285A.213(5) which include:

(a) Revenue from any water system project of the Recipient, including special assessment revenue;
(b) Amounts withheld under subsection 285A.213(6);

(c) The general fund of the Recipient;
(d) Any combination of sources listed in paragraphs (a) to (c) of this subsection; or
(e) Any other source.

3. Additional Documents. The President is hereby authorized to enter into any agreements and to execute any documents or certificates which may be required to obtain financial assistance from the IFA for the Project pursuant to the Financing Documents.

4. Tax-Exempt Status. The Recipient covenants not to take any action or omit to take any action if the taking or omission would cause interest paid by the Recipient pursuant to the Financing Documents not to qualify for the exclusion from gross income provided by Section 103(a) of the Internal Revenue Code of 1986, as amended. The President of the Recipient may enter into covenants on behalf of the Recipient to protect the tax-exempt status of the interest paid by the Recipient pursuant to the Financing Documents and may execute any Tax Certificate, Internal Revenue Service forms or other documents as may be required by the IFA or their bond counsel to protect the tax-exempt status of such interest.

DATED this 5th day of June, 2024.

_____

Doug Keeler
President, Board of Commissioners

ATTEST:

_____

Lou Allocco
Secretary-Treasurer, Board of Commissioners

SAFE DRINKING WATER REVOLVING LOAN FUND
BIL-EMERGING CONTAMINANTS
PLANNING AWARD ONLY
FINANCING CONTRACT

Project Name: Remediation Alternatives Feasibility Study Phase 2

Project Number: EC2409

This financing contract ("Contract"), dated as of the date the Contract is fully executed, is made by the State of Oregon, acting by and through its Oregon Infrastructure Finance Authority of the Oregon Business Development Department ("OBDD"), and Rainbow Water District ("Recipient") for financing of the project referred to above and described in Exhibit C ("Project"). This Contract becomes effective only when fully signed and approved as required by applicable law. Capitalized terms not defined in section 1 and elsewhere in the body of the Contract have the meanings assigned to them by Exhibit A.

This Contract includes the following exhibits, listed in descending order of precedence for purposes of resolving any conflict between two or more of the parts:

Exhibit A	General Definitions
Exhibit B	Loan Security
Exhibit C	Project Description
Exhibit D	Project Budget
Exhibit E	Information Required by 2 CFR § 200.332(a)(1)
Exhibit F	Certification Regarding Lobbying

SECTION 1 - KEY TERMS

The following capitalized terms have the meanings assigned below.

"Estimated Project Cost" means $300,000.

"Forgivable Loan Amount" means $300,000.

"Interest Rate" means 1.00% per annum.

"Maturity Date" means the 9th anniversary of the Repayment Commencement Date.

"Payment Date" means December 1.

"Project Closeout Deadline" means 90 days after the earlier of the Project Completion Date or the Project Completion Deadline.

"Project Completion Deadline" means 24 months after the date of this Contract.

"Repayment Commencement Date" means the first Payment Date to occur after the Project Closeout Deadline.

SECTION 2 - FINANCIAL ASSISTANCE

OBDD shall provide Recipient, and Recipient shall accept from OBDD as financing for the Project specified a non-revolving loan in an aggregate principal amount not to exceed the Forgivable Loan Amount.

"Loan" means the loan described in this section 2.

Notwithstanding the above, the aggregate total of Financing Proceeds disbursed under this Contract shall not exceed the Costs of the Project.

SECTION 3 - DISBURSEMENTS

A. Reimbursement Basis. The Financing Proceeds shall be disbursed to Recipient on an expense reimbursement or costs-incurred basis. Recipient must submit each disbursement request for the Financing Proceeds on an OBDD-provided or OBDD-approved disbursement request form ("Disbursement Request").

B. Financing Availability. OBDD's obligation to make, and Recipient's right to request, disbursements under this Contract terminates on the Project Closeout Deadline.

C. Payment to Contractors. OBDD, in its sole discretion, may make direct payment to suppliers, contractors and subcontractors and others for sums due them in connection with the Project, instead of reimbursing Recipient for those sums.

SECTION 4 - LOAN PAYMENT; PREPAYMENT; FORGIVENESS

A. Promise to Pay. Recipient shall repay the Loan and all amounts due under this Contract in accordance with its terms. Payments required under this Contract are, without limitation, payable from the sources of repayment described in the Act and this Contract, including but not limited to Exhibit B, and the obligation of Recipient to make all payments is absolute and unconditional. Payments will not be abated, rebated, set-off, reduced, abrogated, terminated, waived, postponed or otherwise modified in any manner whatsoever. Payments cannot remain unpaid, regardless of any contingency, act of God, event or cause whatsoever, including (without limitation) any acts or circumstances that may constitute failure of consideration, eviction or constructive eviction, the taking by eminent domain or destruction of or damage to the Project, commercial frustration of purpose, any change in the laws, rules or regulations of the United States of America or of the State of Oregon or any political subdivision or governmental authority, nor any failure of OBDD to perform any agreement, whether express or implied, or any duty, liability, or obligation arising out of or connected with the Project or this Contract, or any rights of set off, recoupment, abatement or counterclaim that Recipient might otherwise have against OBDD or any other party or parties; provided further, that payments hereunder will not constitute a waiver of any such rights.

B. Interest. Interest accrues at the Interest Rate on each disbursement from the date of disbursement until the Loan is fully paid. All unpaid interest accrued to the Repayment Commencement Date is (in addition to the first regular installment payment due) payable on the Repayment Commencement Date. Interest is computed by counting the actual days occurring in a 360-day year.

   Recipient authorizes OBDD to calculate accrued interest as necessary under this Contract, including for purposes of determining a loan amortization schedule or determining the amount of a loan prepayment or loan payoff. Absent manifest error, such calculations will be conclusive.

C. Loan Payments. Starting on the Repayment Commencement Date and then on each succeeding Payment Date, Recipient shall make level installment payments of principal and interest, each payment sufficient to pay the interest accrued to the date of payment and so much of the principal as will fully amortize the Loan by the Maturity Date, on which date the entire outstanding balance of the Loan is due and payable in full.

D. Loan Prepayments.

(1) Mandatory Prepayment. Recipient shall prepay all or part of the outstanding balance of the Loan as required by this Contract.

(2) Optional Prepayment. Recipient may prepay all or part of the outstanding balance of the Loan on any day except a Saturday, Sunday, legal holiday, or day that banking institutions in Salem, Oregon are closed.

E. Application of Payments. Regardless of any designation by Recipient, payments and prepayments by Recipient under this Contract or any of the Financing Documents will be applied first to any expenses of OBDD, including but not limited to attorneys' fees, then to unpaid accrued interest (in the case of prepayment, on the amount prepaid), then to the principal of the Loan. In the case of a Loan prepayment that does not prepay all the principal of the Loan, OBDD will determine, in its sole discretion, the method for how the Loan prepayment will be applied to the outstanding principal payments. A scheduled payment received before the scheduled repayment date will be applied to interest and principal on the scheduled repayment date, rather than on the day such payment is received.

F. Forgiveness. Subject to satisfaction by Recipient of any special conditions in Exhibit C, if Recipient completes the Project by the Project Completion Deadline in accordance with the terms of this Contract, and provided that no Event of Default has occurred, OBDD shall, 90 days after the Project Completion Date, forgive repayment of the Forgivable Loan Amount and any interest accrued thereon and cancel the Forgivable Loan. The Forgivable Loan Amount and any interest forgiven remain subject to the requirements of OAR 123-049-0050, incorporated by this reference, and which survive payment of the Loan.

The above-described modification will be effective without the necessity of executing any further documents. However, at OBDD's request, Recipient shall execute and deliver to OBDD such additional agreements, instruments and documents as OBDD deems necessary to reflect such modification, including but not limited to an amendment to the Contract.

SECTION 5 - CONDITIONS PRECEDENT

A. Conditions Precedent to OBDD's Obligations. OBDD's obligations are subject to the receipt of the following items, in form and substance satisfactory to OBDD and its Counsel:

(1) This Contract duly signed by an authorized officer of Recipient.

(2) Such other certificates, documents, opinions and information as OBDD may reasonably require.

B. Conditions to Disbursements. As to any disbursement, OBDD has no obligation to disburse funds unless all following conditions are met:

(1) There is no Event of Default.

(2) The representations and warranties made in this Contract are true and correct on the date of disbursement as if made on such date.

(3) OBDD, in the reasonable exercise of its administrative discretion, has sufficient moneys in the Fund for use in the Project and has sufficient funding, appropriations, limitations, allotments and other expenditure authority to make the disbursement.

(4) OBDD (a) has received a completed Disbursement Request, (b) has received any written evidence of materials and labor furnished to or work performed upon the Project, itemized receipts or invoices for payment, and releases, satisfactions or other signed statements or forms as OBDD may require, (c) is satisfied that all items listed in the Disbursement Request are reasonable and that the costs for labor and materials were incurred and are properly included in the Costs of the Project, and (d) has determined that the disbursement is only for costs defined as eligible costs under the Act and any implementing administrative rules and policies.

(5) Any conditions to disbursement elsewhere in this Contract or in the other Financing Documents are met.

SECTION 6 - USE OF FINANCIAL ASSISTANCE

A. Use of Proceeds. Recipient shall use the Financing Proceeds only for the activities described in Exhibit C and according to the budget in Exhibit D. Recipient may not transfer Financing Proceeds among line items in the budget without the prior written consent of OBDD.

B. Costs of the Project. Recipient shall apply the Financing Proceeds to the Costs of the Project in accordance with the Act and Oregon law, as applicable. Financing Proceeds cannot be used for costs in excess of one hundred percent (100%) of the total Costs of the Project and cannot be used for pre-Award Costs of the Project, unless permitted by Exhibit C.

C. Costs Paid for by Others. Recipient may not use any of the Financing Proceeds to cover costs to be paid for by other financing for the Project, whether from OBDD or from another State of Oregon agency or any third party.

SECTION 7 - REPRESENTATIONS AND WARRANTIES OF RECIPIENT

Recipient represents and warrants to OBDD:

A. Estimated Project Cost, Funds for Repayment. A reasonable estimate of the Costs of the Project is shown in section 1, and the Project is fully funded. Recipient will have adequate funds available to repay the Loan, and the Maturity Date does not exceed the usable life of the Project.

B. Organization and Authority.

(1) Recipient (a) is a Municipality under the Act, and validly organized and existing under the laws of the State of Oregon, and (b) owns a community water system, as defined in the Act and OAR 123-049-0010.

(2) Recipient has all necessary right, power and authority under its organizational documents and under Oregon law to (a) execute and deliver this Contract and the other Financing Documents, (b) incur and perform its obligations under this Contract and the other Financing Documents, and (c) borrow and receive financing for the Project.

(3) This Contract and the other Financing Documents have been duly executed by Recipient, and when executed by OBDD, are legal, valid and binding, and enforceable in accordance with their terms.

C. Full Disclosure. Recipient has disclosed in writing to OBDD all facts that materially adversely affect the Project, or the ability of Recipient to make all payments and perform all obligations required by

this Contract and the other Financing Documents. Recipient has made no false statements of fact, nor has it omitted information necessary to prevent any statements from being misleading. The information contained in this Contract and the other Financing Documents is true and accurate in all respects.

D. Pending Litigation. Recipient has disclosed in writing to OBDD all proceedings pending (or to the knowledge of Recipient, threatened) against or affecting Recipient, in any court or before any governmental authority or arbitration board or tribunal, that, if adversely determined, would materially adversely affect the Project or the ability of Recipient to make all payments and perform all obligations required by this Contract and the other Financing Documents.

E. No Events of Default.

(1) No Events of Default exist or occur upon authorization, execution or delivery of this Contract or any of the Financing Documents.

(2) Recipient has not violated, and has not received notice of any claimed violation of, any agreement or instrument to which it is a party or by which the Project or its property may be bound, that would materially adversely affect the Project or the ability of Recipient to make all payments and perform all obligations required by this Contract and the other Financing Documents.

F. Compliance with Existing Agreements and Applicable Law. The authorization and execution of, and the performance of all obligations required by, this Contract and the other Financing Documents will not: (i) cause a breach of any agreement, indenture, mortgage, deed of trust, or other instrument, to which Recipient is a party or by which the Project or any of its property or assets may be bound; (ii) cause the creation or imposition of any third party lien, charge or encumbrance upon any property or asset of Recipient; (iii) violate any provision of the charter or other document pursuant to which Recipient was organized or established; or (iv) violate any laws, regulations, ordinances, resolutions, or court orders related to Recipient, the Project or its properties or operations.

G. Governmental Consent. Recipient has obtained or will obtain all permits and approvals, and has made or will make all notifications, declarations, filings or registrations, required for the making and performance of its obligations under this Contract and the other Financing Documents, for the financing or refinancing and undertaking and completion of the Project.

SECTION 8 - COVENANTS OF RECIPIENT

Recipient covenants as follows:

A. Notice of Adverse Change. Recipient shall promptly notify OBDD of any adverse change in the activities, prospects or condition (financial or otherwise) of Recipient or the Project related to the ability of Recipient to make all payments and perform all obligations required by this Contract or the other Financing Documents.

B. Compliance with Laws. Recipient shall comply with all applicable laws, rules, regulations and orders of any court or governmental authority that relate to this Contract or the other Financing Documents, the Project and the operation of the System of which the Project is a component. In particular, but without limitation, Recipient shall comply with the following, as applicable:

(1) Federal procurement requirements of 2 CFR part 200, subpart D.

(2) State labor standards and wage rates found in ORS chapter 279C, and federal prevailing wage provisions in accordance with the federal Davis-Bacon Act, as amended, 40 U.S.C. §§ 3141 to 3144, 3146 and 3147 (2002). SAFE DRINKING WATER IN OREGON: Sections 3, 4, and 5

and Appendixes A & B of the Program Guidelines & Applicant's Handbook for the Federally Funded Safe Drinking Water Revolving Fund & Drinking Water Protection Loan Fund (June 2024) ("Safe Drinking Water Handbook"), available at https://www.oregon.gov/biz/Publications/SDWhandbook.pdf.

(3) Federal Crossing-Cutting Authorities. All federal laws, executive orders and government-wide policies that apply by their terms to projects and activities receiving federal financial assistance, regardless of whether the Act makes them applicable ("Cross-Cutting Authorities"). Section 5.5 of the Safe Drinking Water Handbook contains a link to a list of the Cross-Cutting Authorities.

(4) Lobbying. Recipient acknowledges and agrees that the Costs of the Project will not include any Lobbying costs or expenses incurred by Recipient or any person on behalf of Recipient, and that Recipient will comply with federal restrictions on lobbying at 40 C.F.R. Part 34 and will not request payment or reimbursement for Lobbying costs and expenses. "Lobbying" means influencing or attempting to influence a member, officer or employee of a governmental agency or legislature in connection with the awarding of a government contract, the making of a government grant or loan or the entering into of a cooperative agreement with such governmental entity or the extension, continuation, renewal, amendment or modification of any of the above. Recipient shall submit to OBDD a Certification Regarding Lobbying, the form of which is attached as Exhibit F, and any applicable quarterly disclosure statement of covered lobbying activity. Recipient will cause any entity, firm or person receiving a contract or subcontract utilizing Loan proceeds in excess of $100,000 to complete the same certification and any applicable disclosure statement and submit them to Recipient. Recipient shall retain such certifications and make them available for inspection and audit by OBDD, the federal government or their representatives. Recipient shall forward any disclosure statements to OBDD.

(5) Federal Audit Requirements. The Loan is federal financial assistance, and the Federal Assistance Listing (formerly CFDA) Number and Name is "66.468, Capitalization Grants for Drinking Water State Revolving Funds." Recipient is a sub-recipient.

(a) If Recipient receives federal funds in excess of $750,000 in Recipient's fiscal year, it is subject to audit conducted in accordance with the provisions of 2 CFR part 200, subpart F. Recipient, if subject to this requirement, shall at its own expense submit to OBDD a copy of, or electronic link to, its annual audit subject to this requirement covering the funds expended under this Contract and shall submit or cause to be submitted to OBDD the annual audit of any subrecipient(s), contractor(s), or subcontractor(s) of Recipient responsible for the financial management of funds received under this Contract.

(b) Audit costs for audits not required in accordance with 2 CFR part 200, subpart F are unallowable. If Recipient did not expend $750,000 or more in Federal funds in its fiscal year, but contracted with a certified public accountant to perform an audit, costs for performance of that audit shall not be charged to the funds received under this Contract.

(c) Recipient shall save, protect and hold harmless OBDD from the cost of any audits or special investigations performed by the Federal awarding agency or any federal agency with respect to the funds expended under this Contract. Recipient acknowledges and agrees that any audit costs incurred by Recipient as a result of allegations of fraud, waste or abuse are ineligible for reimbursement under this or any other agreement between Recipient and the State of Oregon.

(6) Disadvantaged Business Enterprises. Recipient will implement the good faith efforts for solicitation and contracting with Disadvantaged Business Enterprises ("DBE") described in the Safe Drinking Water Handbook. This applies to all solicitation and contracting for construction, equipment, supplies, engineering or other services that constitute the Project financed by this Contract. Recipient will maintain documentation in a Project file and submit the required forms, as described in the Safe Drinking Water Handbook. Recipient will ensure that all prime contractors implement the good faith efforts for solicitation and contracting, and comply with all DBE procurement forms, statements, and reporting requirements.

Recipient will ensure that each procurement contract includes the following term and condition:

> "The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies."

(7) Contract Provisions. The contract provisions listed in 2 CFR Part 200, Appendix II are obligations of Recipient, as applicable, and must be included, as applicable, by Recipient in its contracts related to the Project.

(8) Infrastructure Investment and Jobs Act. Comply with all federal requirements applicable to the assistance received (including those imposed by the Infrastructure Investment and Jobs Act ("IIJA"), Public Law No. 117-58) which includes, but is not limited to, the following requirements: that all of the iron and steel, manufactured products, and construction materials used in the Project are to be produced in the United States ("Build America, Buy America Requirements") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or the Project is otherwise covered by a general applicability waiver; or (ii) all of the contributing Agencies have otherwise advised the Participant in writing that the Build America, Buy America Requirements are not applicable to the Project.

(9) Record Keeping. Comply with all record keeping and reporting requirements under all applicable legal authorities, including any reports required by the funding authority (such as EPA and the State of Oregon), such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the applicable legal requirements and this Agreement may result in a default hereunder that results in a repayment of the assistance agreement in advance of the maturity of the Bonds, termination and repayment of grants, cooperative agreements, direct assistance or other types of financial assistance, and/or other remedial actions.

(10) Comply with the applicable EPA general terms and conditions available at: https://www.epa.gov/system/files/documents/2022-09/fy_2022_epa_general_terms_and_conditions_effective_october_1_2022_or_later.pdf

(11) Incorporation by Reference. The above state and federal laws, rules, regulations and orders are incorporated by reference in this Contract to the extent required by law.

C. Project Completion Obligations. Recipient shall:

(1) When procuring professional consulting services, provide OBDD with copies of all solicitations at least 10 days before advertising, and all contracts at least 10 days before signing.

(2) Complete the Project using its own fiscal resources or money from other sources to pay for any Costs of the Project in excess of the total amount of financial assistance provided pursuant to this Contract.

(3) Complete the Project no later than the Project Completion Deadline, unless otherwise permitted by OBDD in writing.

(4) No later than the Project Closeout Deadline, Recipient must deliver to OBDD an electronic copy of the final Phase 2 Feasibility Study.

D. Financial Records. Recipient shall keep accurate books and records for the revenues and funds that are the source of repayment of the Loan, separate and distinct from its other books and records, and maintain them according to generally accepted accounting principles established by the Government Accounting Standards Board in effect at the time. Recipient shall have these records audited annually by an independent certified public accountant, which may be part of the annual audit of all records of Recipient.

E. Inspections; Information. Recipient shall permit OBDD, and any party designated by OBDD, the Oregon Secretary of State's Office, the federal government and their duly authorized representatives: (i) to inspect, at any reasonable time, the property, if any, constituting the Project; and (ii) at any reasonable time, to inspect and make copies of any accounts, books and records, including, without limitation, its records regarding receipts, disbursements, contracts, investments and any other related matters, and financial statements or other documents related to its financial standing. Recipient shall supply any related reports and information as OBDD may reasonably require. In addition, Recipient shall, upon request, provide OBDD with copies of loan documents or other financing documents and any official statements or other forms of offering prospectus relating to any other bonds, notes or other indebtedness of Recipient that are issued after the date of this Contract.

F. Records Maintenance. Recipient shall retain and keep accessible all books, documents, papers, and records that are directly related to this Contract, the Project or the Financing Proceeds for a minimum of six years, or such longer period as may be required by other provisions of this Contract or applicable law, following the Project Closeout Deadline. If there are unresolved issues at the end of such period, Recipient shall retain the books, documents, papers and records until the issues are resolved.

G. Economic Benefit Data. OBDD may require Recipient to submit specific data on the economic development benefits of the Project and other information to evaluate the success and economic impact of the Project, from the date of this Contract until six years after the Project Completion date. Recipient shall, at its own expense, prepare and submit the data within the time specified by OBDD.

H. Professional Responsibility. A professional engineer or architect, as applicable, registered and in good standing in Oregon, will be responsible for the design and construction of the Project. All service providers retained for their professional expertise must be certified, licensed, or registered, as appropriate, in the State of Oregon for their specialty.

I. Notice of Event of Default. Recipient shall give OBDD prompt written notice of any Event of Default, or any circumstance that with notice or the lapse of time, or both, may become an Event of Default, as soon as Recipient becomes aware of its existence or reasonably believes an Event of Default is likely.

J. Contributory Liability and Contractor Indemnification.

(1) If any third party makes any claim or brings any action, suit or proceeding alleging a tort as now or hereafter defined in ORS 30.260 ("Third Party Claim") against a party (the "Notified Party") with respect to which the other party may have liability, the Notified Party must promptly notify the other party in writing and deliver a copy of the claim, process, and all legal pleadings related to the Third Party Claim. Either party is entitled to participate in the defense of a Third Party Claim, and to defend a Third Party Claim with counsel of its own choosing. The foregoing provisions are conditions precedent for either party's liability to the other in regard to the Third Party Claim.

If the parties are jointly liable (or would be if joined in the Third Party Claim), the parties shall contribute to the amount of expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred and paid or payable in such proportion as is appropriate to reflect their respective relative fault. The relative fault of the parties shall be determined by reference to, among other things, the parties' relative intent, knowledge, access to information and opportunity to correct or prevent the circumstances resulting in such expenses, judgments, fines or settlement amounts. Each party's contribution amount in any instance is capped to the same extent it would have been capped under Oregon law if that party had sole liability in the proceeding. This Section shall survive termination of this Contract.

(2) Recipient shall take all reasonable steps to require its contractor(s) that are not units of local government as defined in ORS 190.003, if any, to indemnify, defend, save and hold harmless the State of Oregon and its officers, employees and agents ("Indemnitee") from and against any and all claims, actions, liabilities, damages, losses, or expenses (including attorneys' fees) arising from a tort (as now or hereafter defined in ORS 30.260) caused, or alleged to be caused, in whole or in part, by the negligent or willful acts or omissions of Recipient's contractor or any of the officers, agents, employees or subcontractors of the contractor ("Claims"). It is the specific intention of the parties that the Indemnitee shall, in all instances, except for Claims arising solely from the negligent or willful acts or omissions of the Indemnitee, be indemnified by the contractor from and against any and all Claims. This Section shall survive termination of this Contract.

K. Further Assurances. Recipient shall, at the request of OBDD, authorize, sign, acknowledge and deliver any further resolutions, conveyances, transfers, assurances, financing statements and other instruments and documents as may be necessary or desirable for better assuring, conveying, granting, assigning and confirming the rights, security interests and agreements granted or intended to be granted by this Contract and the other Financing Documents.

L. Exclusion of Interest from Federal Gross Income and Compliance with Code.

(1) Recipient shall not take any action or omit to take any action that would result in the loss of the exclusion of the interest on any Lottery Bonds from gross income for purposes of federal income taxation, as governed by Section 103(a) of the Code. OBDD may decline to disburse the Financing Proceeds if it finds that the federal tax exemption of the Lottery Bonds cannot be assured.

(2) Recipient shall not take any action (including but not limited to the execution of a management agreement for the operation of the Project) or omit to take any action that would cause any Lottery Bonds to be "private activity bonds" within the meaning of Section 141(a) of the Code. Accordingly, unless Recipient receives the prior written approval of OBDD, Recipient shall not permit in excess of ten percent (10%) of either (a) the Financing Proceeds or (b) the Project financed or refinanced with the Financing Proceeds to be directly or indirectly used in any

manner that would constitute "private business use" within the meaning of Section 141(b)(6) of the Code, including not permitting more than one half of any permitted private business use to be "disproportionate related business use" or private business use unrelated to the government use of the Financing Proceeds. Unless Recipient receives the prior written approval of OBDD, Recipient shall not directly or indirectly use any of the Financing Proceeds to make or finance loans to persons other than governmental units, as that term is used in Section 141(c) of the Code.

(3) Recipient shall not directly or indirectly use or permit the use of any of the Financing Proceeds or any other funds, or take any action or omit to take any action, which would cause any Lottery Bonds to be "arbitrage bonds" within the meaning of Section 148(a) of the Code.

(4) Recipient shall not cause any Lottery Bonds to be treated as "federally guaranteed" for purposes of Section 149(b) of the Code, as may be modified in any applicable rules, rulings, policies, procedures, regulations or other official statements promulgated or proposed by the Department of the Treasury or the Internal Revenue Service with respect to "federally guaranteed" obligations described in Section 149(b) of the Code. For purposes of this paragraph, any Lottery Bonds will be treated as "federally guaranteed" if: (a) all or any portion of the principal or interest is or will be guaranteed directly or indirectly by the United States of America or any agency or instrumentality thereof, or (b) five percent (5%) or more of the proceeds of the Lottery Bonds will be (i) used in making loans if the payment of principal or interest is guaranteed in whole or in part by the United States of America or any agency or instrumentality thereof, or (ii) invested directly or indirectly in federally insured deposits or accounts, and (c) none of the exceptions described in Section 149(b)(3) of the Code apply.

(5) Recipient shall assist OBDD to ensure that all required amounts are rebated to the United States of America pursuant to Section 148(f) of the Code. Recipient shall pay to OBDD such amounts as may be directed by OBDD to satisfy the requirements of Section 148(f) applicable to the portion of the proceeds of any tax-exempt bonds, including any Financing Proceeds or other amounts held in a reserve fund. Recipient further shall reimburse OBDD for the portion of any expenses it incurs related to the Project that is necessary to satisfy the requirements of Section 148(f) of the Code.

(6) Upon OBDD's request, Recipient shall furnish written information regarding its investments and use of the Financing Proceeds, and of any facilities financed or refinanced therewith, including providing OBDD with any information and documentation that OBDD reasonably determines is necessary to comply with the arbitrage and private use restrictions that apply to the Lottery Bonds.

(7) Notwithstanding anything to the contrary, so long as is necessary to maintain the exclusion from gross income for purposes of federal income taxation of interest on any Lottery Bonds, the covenants contained in this subsection will survive the payment of the Loan and the Lottery Bonds, and the interest thereon, including the application of any unexpended Financing Proceeds. Recipient acknowledges that the Project may be funded with proceeds of the Lottery Bonds and that failure to comply with the requirements of this subsection could adversely affect any exclusion of the interest on the Lottery Bonds from gross income for federal income tax purposes.

(8) Neither Recipient nor any related party to Recipient, within the meaning of 26 C.F.R. § 1.150-1(b), shall purchase any Lottery Bonds, from which proceeds were used to finance the Project, in an amount related to the amount of the Loan.

SECTION 9 - DEFAULTS

Any of the following constitutes an "Event of Default":

A. Recipient fails to make any Loan payment when due.

B. Recipient fails to make, or cause to be made, any required payments of principal, redemption premium, or interest on any bonds, notes or other material obligations, for any other loan made by the State of Oregon.

C. Any false or misleading representation is made by or on behalf of Recipient, in this Contract, in any other Financing Document or in any document provided by Recipient related to this Loan or the Project or in regard to compliance with the requirements of section 103 and sections 141 through 150 of the Code.

D. (1) A petition, proceeding or case is filed by or against Recipient under any federal or state bankruptcy or insolvency law, and in the case of a petition filed against Recipient, Recipient acquiesces to such petition or such petition is not dismissed within 20 calendar days after such filing, or such dismissal is not final or is subject to appeal;

(2) Recipient files a petition seeking to take advantage of any other law relating to bankruptcy, insolvency, reorganization, liquidation, dissolution, winding-up or composition or adjustment of debts;

(3) Recipient becomes insolvent or bankrupt or admits its inability to pay its debts as they become due, or makes an assignment for the benefit of its creditors;

(4) Recipient applies for or consents to the appointment of, or taking of possession by, a custodian (including, without limitation, a receiver, liquidator or trustee) of Recipient or any substantial portion of its property; or

(5) Recipient takes any action for the purpose of effecting any of the above.

E. Recipient defaults under any other Financing Document and fails to cure such default within the applicable grace period.

F. Recipient fails to perform any obligation required under this Contract, other than those referred to in subsections A through E of this section 9, and that failure continues for a period of 30 calendar days after written notice specifying such failure is given to Recipient by OBDD. OBDD may agree in writing to an extension of time if it determines Recipient instituted and has diligently pursued corrective action.

SECTION 10 - REMEDIES

A. Remedies. Upon any Event of Default, OBDD may pursue any or all remedies in this Contract or any other Financing Document, and any other remedies available at law or in equity to collect amounts due or to become due or to enforce the performance of any obligation of Recipient. Remedies may include, but are not limited to:

(1) Terminating OBDD's commitment and obligation to make any further disbursements of Financing Proceeds under the Contract.

(2) Declaring all payments under the Contract and all other amounts due under any of the Financing Documents immediately due and payable, and upon notice to Recipient the same become due and payable without further notice or demand.

(3) Barring Recipient from applying for future awards.

(4) Withholding amounts otherwise due to Recipient for application to the payment of amounts due under this Contract, pursuant to ORS 285A.213(6) and OAR 123-049-0040.

(5) Foreclosing liens or security interests pursuant to this Contract or any other Financing Document.

(6) Exercising any remedy listed in OAR 123-049-0040.

B. Application of Moneys. Any moneys collected by OBDD pursuant to section 10.A will be applied first, to pay any attorneys' fees and other fees and expenses incurred by OBDD; next, to pay interest due on the Loan; next, to pay principal due on the Loan, and last, to pay any other amounts due and payable under this Contract or any of the Financing Documents.

C. No Remedy Exclusive; Waiver; Notice. No remedy available to OBDD is intended to be exclusive, and every remedy will be in addition to every other remedy. No delay or omission to exercise any right or remedy will impair or is to be construed as a waiver of such right or remedy. No single or partial exercise of any right power or privilege under this Contract or any of the Financing Documents shall preclude any other or further exercise thereof or the exercise of any other such right, power or privilege. OBDD is not required to provide any notice in order to exercise any right or remedy, other than OBDD notice required in section 9 of this Contract.

D. Default by OBDD. In the event OBDD defaults on any obligation in this Contract, Recipient's remedy will be limited to injunction, special action, action for specific performance, or other available equitable remedy for performance of OBDD's obligations.

SECTION 11 - MISCELLANEOUS

A. Time is of the Essence. Recipient agrees that time is of the essence under this Contract and the other Financing Documents.

B. Relationship of Parties; Successors and Assigns; No Third Party Beneficiaries.

(1) The parties agree that their relationship is that of independent contracting parties and that Recipient is not an officer, employee, or agent of the State of Oregon as those terms are used in ORS 30.265.

(2) Nothing in this Contract gives, or is to be construed to give, directly or indirectly, to any third persons any rights and benefits greater than those enjoyed by the general public.

(3) This Contract will be binding upon and inure to the benefit of OBDD, Recipient, and their respective successors and permitted assigns.

(4) Recipient may not assign or transfer any of its rights or obligations or any interest in this Contract or any other Financing Document without the prior written consent of OBDD. OBDD may grant, withhold or impose conditions on such consent in its sole discretion. In the event of an assignment, Recipient shall pay, or cause to be paid to OBDD, any fees or costs incurred because of such assignment, including but not limited to attorneys' fees of OBDD's Counsel and Bond Counsel. Any approved assignment is not to be construed as creating any obligation of OBDD beyond those in this Contract or other Financing Documents, nor does assignment relieve Recipient of any of its duties or obligations under this Contract or any other Financing Documents.

(5) Recipient hereby approves and consents to any assignment, sale or transfer of this Contract and the Financing Documents that OBDD deems to be necessary.

C. Disclaimer of Warranties; Limitation of Liability. Recipient agrees that:

(1) OBDD makes no warranty or representation, either express or implied, as to the value, design, condition, merchantability or fitness for particular purpose or fitness for any use of the Project or any portion of the Project, or any other warranty or representation.

(2) In no event are OBDD or its agents liable or responsible for any direct, indirect, incidental, special, consequential or punitive damages in connection with or arising out of this Contract or the existence, furnishing, functioning or use of the Project.

D. Notices and Communication. Except as otherwise expressly provided in this Contract, any communication between the parties or notices required or permitted must be given in writing by personal delivery, email, or by mailing the same, postage prepaid, to Recipient or OBDD at the addresses set forth below, or to such other persons or addresses that either party may subsequently indicate pursuant to this Section.

Any communication or notice by personal delivery will be deemed effective when actually delivered to the addressee. Any communication or notice so addressed and mailed will be deemed to be received and effective five (5) days after mailing. Any communication or notice given by email becomes effective 1) upon the sender's receipt of confirmation generated by Recipient's email system that the notice has been received by Recipient's email system or 2) Recipient's confirmation of receipt, whichever is earlier. Notwithstanding this provision, the following notices may not be given by email: notice of default or notice of termination.

If to OBDD:
Deputy Director
Oregon Business Development Department
775 Summer Street NE Suite 200
Salem, OR 97301-1280

If to Recipient:
Superintendent
Rainbow Water District
1550 N. 42nd Street
PO Box 8
Springfield, OR 97477

E. No Construction against Drafter. This Contract is to be construed as if the parties drafted it jointly.

F. Severability. If any term or condition of this Contract is declared by a court of competent jurisdiction as illegal, invalid or unenforceable, that holding will not invalidate or otherwise affect any other provision.

G. Amendments, Waivers. This Contract may not be amended without the prior written consent of OBDD (and when required, the Department of Justice) and Recipient. This Contract may not be amended in a manner that is not in compliance with the Act. No waiver or consent is effective unless in writing and executed by the party against whom such waiver or consent is sought to be enforced. Such waiver or consent will be effective only in the specific instance and for the specific purpose given.

H. Attorneys' Fees and Other Expenses. To the extent permitted by the Oregon Constitution and the Oregon Tort Claims Act, the prevailing party in any dispute arising from this Contract is entitled to recover its reasonable attorneys' fees and costs at trial and on appeal. Reasonable attorneys' fees cannot exceed the rate charged to OBDD by its attorneys. Recipient shall, on demand, pay to OBDD reasonable expenses incurred by OBDD in the collection of Loan payments.

I. Choice of Law; Designation of Forum; Federal Forum. The laws of the State of Oregon (without giving effect to its conflicts of law principles) govern all matters arising out of or relating to this Contract, including, without limitation, its validity, interpretation, construction, performance, and enforcement.

Any party bringing a legal action or proceeding against any other party arising out of or relating to this Contract shall bring the legal action or proceeding in the Circuit Court of the State of Oregon for Marion County (unless Oregon law requires that it be brought and conducted in another county). Each party hereby consents to the exclusive jurisdiction of such court, waives any objection to venue, and waives any claim that such forum is an inconvenient forum.

Notwithstanding the prior paragraph, if a claim must be brought in a federal forum, then it must be brought and adjudicated solely and exclusively within the United States District Court for the District of Oregon. This paragraph applies to a claim brought against the State of Oregon only to the extent Congress has appropriately abrogated the State of Oregon's sovereign immunity and is not consent by the State of Oregon to be sued in federal court. This paragraph is also not a waiver by the State of Oregon of any form of defense or immunity, including but not limited to sovereign immunity and immunity based on the Eleventh Amendment to the Constitution of the United States.

J. Integration. This Contract (including all exhibits, schedules or attachments) and the other Financing Documents constitute the entire agreement between the parties on the subject matter. There are no unspecified understandings, agreements or representations, oral or written, regarding this Contract.

K. Execution in Counterparts. This Contract may be signed in several counterparts, each of which is an original and all of which constitute one and the same instrument.

SIGNATURE PAGE FOLLOWS

Recipient, by its signature below, acknowledges that it has read this Contract, understands it, and agrees to be bound by its terms and conditions.

STATE OF OREGON
acting by and through its
Oregon Business Development Department

By: _____
Edward Tabor, Infrastructure and
Program Services Director

Date: _____

RAINBOW WATER DISTRICT

By: _____
Doug Keeler, Board President

Date: _____

APPROVED AS TO LEGAL SUFFICIENCY IN ACCORDANCE WITH ORS 291.047:

/s/ David Berryman as per email dated 30 May 2024
David Berryman, Assistant Attorney General

EXHIBIT A - GENERAL DEFINITIONS

As used in this Contract, the following terms have the meanings below.

"Act" means "Safe Drinking Water Act," 42 U.S.C. Sec. 300f, and all subsequent amendments, including the Amendments of 1996, Public Law 104-182.

"Award" means the award of financial assistance to Recipient by OBDD dated 15 May 2024.

"C.F.R." means the Code of Federal Regulations.

"Code" means the Internal Revenue Code of 1986, as amended, including any implementing regulations and any administrative or judicial interpretations.

"Costs of the Project" means Recipient's actual costs (including any financing costs properly allocable to the Project) that are (a) reasonable, necessary and directly related to the Project, (b) permitted by generally accepted accounting principles to be Costs of the Project, and (c) are eligible or permitted uses of the Financing Proceeds under applicable state or federal statute and rule.

"Counsel" means an attorney at law or firm of attorneys at law duly admitted to practice law before the highest court of any state, who may be of counsel to, or an employee of, OBDD or Recipient.

"Financing Documents" means this Contract and all agreements, instruments, documents and certificates executed pursuant to or in connection with OBDD's financing of the Project.

"Financing Proceeds" means the proceeds of the Forgivable Loan.

"Forgivable Loan" means the forgivable Loan described in section 2.

"Loan" means the Loan described in section 2. of this Contract.

"Lottery Bonds" means any bonds issued by the State of Oregon that are special obligations of the State of Oregon, payable from unobligated net lottery proceeds, the interest on which is exempt from federal income taxation, together with any refunding bonds, used to finance or refinance the Project through the initial funding or refinancing of all or a portion of the Loan.

"Municipality" means any entity described in ORS 285B.410(9).

"ORS" means the Oregon Revised Statutes.

"Project Completion Date" means the date on which Recipient completes the Project.

"System" means Recipient's drinking water system, which includes the Project or components of the Project, as it may be modified or expanded from time to time.

EXHIBIT B – LOAN SECURITY

A. Full Faith and Credit Pledge. Recipient pledges its full faith and credit and taxing power within the limitations of Article XI, sections 11 and 11 b, of the Oregon Constitution to pay the amounts due under this Contract. This Contract is payable from and secured by all lawfully available funds of Recipient.

B. Pledge of Net Revenues of the System

(1) All payment obligations under this Contract and the other Financing Documents are payable from the revenues of Recipient's System after payment of operation and maintenance costs of the System ("Net Revenues"). Recipient irrevocably pledges and grants to OBDD a security interest in the Net Revenues to pay all of its obligations under this Contract and the other Financing Documents.

(2) Recipient shall not incur, without the prior written consent of OBDD, any obligation payable from or secured by a lien on and pledge of the Net Revenues that is on parity or superior to OBDD Lien.

(3) Notwithstanding the requirements of subsection 2 of this section B, loans previously made and loans made in the future by OBDD to Recipient that are secured by the Net Revenues may have a lien on such Net Revenues on parity with OBDD Lien. Nothing in this paragraph will adversely affect the priority of any of OBDD's liens on such Net Revenues in relation to the lien(s) of any third party(ies).

EXHIBIT C - PROJECT DESCRIPTION

Recipient will procure a hydrogeologic consultant and a well driller to perform approximately four (4) soil borings which will consist of collecting soil and groundwater samples at the Chase Wellfield site and will have them analyzed at a laboratory to determine the feasibility of relocating Recipient's wells.

EXHIBIT D – PROJECT BUDGET

Line Item Activity	OBDD Funds
Phase 2 Feasibility Study- Hydrogeologic Consultant, Well Driller, Sample Analysis	$300,000
Total	$300,000

EXHIBIT E - INFORMATION REQUIRED BY 2 CFR § 200.332(A)(1)

Federal Award Identification:

(i) Subrecipient* name (which must match registered name in SAM): Rainbow Water District

(ii) Subrecipient's Unique Entity Identifier (SAM): D73YHGMMFBK1

(iii) Federal Award Identification Number (FAIN): 02J50601

(iv) Federal Award Date: 20 September 2023

(v) Sub-award Period of Performance Start and End Date: beginning at Contract execution and ending on the last day of the month occurring 24 months after the date of this Contract.

(vi) Sub-award budget period Start and End Dates: beginning at Contract execution and ending on the last day of the month occurring 24 months after the date of this Contract.

(vii) Total Amount of Federal Funds Obligated by this action by the pass-through entity to the subrecipient: $300,000

(viii) Total Amount of Federal Funds Obligated to the subrecipient by the pass-through entity including the current financial obligation: $300,000

(ix) Total Amount of the Federal Award committed to the subrecipient by the pass-through entity: $300,000

(x) Federal award project description as required to be responsive to the Federal Funding Accountability and Transparency Act (FFATA): This agreement provides funding to Oregon Health Authority under the Safe Drinking Act: Section 1452 and Infrastructure Investment and Jobs Act (IIJA) PL117-58. The purpose of this agreement is for a capitalization grant which provides funds for the recipient's Drinking Water State Revolving Fund (DWSRF) program with the primary purpose to address emerging contaminants in drinking water with a focus on projects addressing perfluoroalkyl and polyfluoroalkyl substances (PFAS). Emerging contaminants refer to substances and microorganisms, including manufactured or naturally occurring physical, chemical, biological, radiological, or nuclear materials, which are known or anticipated in the environment, that may pose newly identified or re-emerging risks to human health, aquatic life, or the environment. These substances, microorganisms or materials can include many different types of natural or manufactured chemicals and substances – such as those in some compounds of personal care products, pharmaceuticals, industrial chemicals, pesticides, and microplastics. Section 1452 of the Safe Drinking Water Act (SDWA) authorizes the state to utilize funds to further the health protection objectives of SDWA. The state has submitted an Intended Use Plan (IUP) as part of the application package for this capitalization grant. This IUP contains a list of the capital projects that address emerging contaminants that may receive funding from this grant. The recipient may also use some of the funding for specific "set-asides" to provide technical assistance to small systems, program administration, state program management and other allowable uses. The benefits of this grant will be to capitalize the recipient's DWSRF with primary purpose to address emerging contaminants in drinking water with a focus on projects addressing PFAS. The fund can be used for eligible set-aside activities related to PFAS and other emerging contaminants. These public health benefits will be statewide. Subrecipient activities include the implementation of the IIJA emerging contaminants program to ensure safe and adequate supplies of drinking water.

(xi) Name of Federal awarding agency, pass-through entity, and contact information for awarding official of the Pass-through entity:

(a) Name of Federal awarding agency: U.S. Environmental Protection Agency

(b) Name of pass-through entity: Oregon Business Development Department

(c) Contact information for awarding official of the pass-through entity: Jon Unger, Infrastructure Programs Manager, 503-507-7107

(xii) The Federal Assistance Listing (formerly CFDA) Number and Name: 66.468 Capitalization Grants for Safe Drinking Water State Revolving Fund,
Amount: $300,000

(xiii) Is Award R&D? No

(xiv) Indirect cost rate for the Federal award: 10%

* For the purposes of this Exhibit E, "Subrecipient" refers to Recipient and "pass-through entity" refers to OBDD.

** The total amount of federal funds obligated to the Subrecipient by the pass-through entity is the total amount of federal funds obligated to the Subrecipient by the pass-through entity during the current state fiscal year.

EXHIBIT F – CERTIFICATION REGARDING LOBBYING OR RESERVED

(Awards in excess of $100,000)

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signed _____

Title Board President, Rainbow Water District

Date _____

TECHNICAL MEMORANDUM

Client:	Rainbow Water District
Project:	PFAS Treatment Feasibility Study
Project File:	RWD 0230099.00.0001
Project Manager:	Kyle Pettibone, PE
Composed by:	Mika Emoto, EIT (WA)
Reviewed by:	Barney Santiago, PE (WA)
Subject:	PFAS Treatment Alternatives Analysis
Date:	May 28, 2024

Introduction

The Rainbow Water District (District) is a public water system in Springfield, Oregon with approximately 2,400 connections and 6,300 customers. The District owns and operates eight wells in addition to three wells jointly owned with the Springfield Utility Board (SUB). Sampling for per- and polyfluoroalkyl substances (PFAS) between 2020 and 2023 revealed contamination in 7 of 11 District-owned wells. In addition, levels of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) at two of the three entry points for these wells exceeded the U.S. Environmental Protection Agency's (EPA) proposed Maximum Contaminant Levels (MCLs) of 4 parts per trillion (ppt). RH2 Engineering, Inc., (RH2) was retained by the District to evaluate PFAS treatment alternatives for the three sites (Chase Wellfield, I-5 Wellfield, and Q Street Well) and develop planning-level cost estimates for budgeting purposes. The three wells that are jointly owned with SUB have been evaluated separately and are not included in this study.

Regulatory Basis

PFAS is a group of synthetic chemicals that were invented in the 1930s and have been incorporated into everyday items since the 1950s. They are used to make products like cookware and clothing resistant to water, stains, and heat. Due to the strong carbon-fluorine bonds in their chemical structure, PFAS compounds do not degrade easily in the environment and are thus known as "forever chemicals." They also are mobile through soil and can contaminate drinking water sources. The main exposure routes are thought to be through drinking water, food, and products containing PFAS.

The full impact of PFAs on human health is still being investigated. A study by the Center of Disease Control and Prevention found PFAS in 97 percent of blood serum samples collected from the American sample population. Other research suggests that exposure adversely affects metabolism, fertility, the immune system, and more. Additionally, it may pose an increased risk of kidney or prostate cancer.

In April 2024, the EPA published its final regulation of six PFAS compounds through the National Primary Drinking Water Regulations (NPDWR). MCLs are proposed for PFOS and PFOA at 4 ppt each, hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX), perfluorononanoic acid (PFNA), and perfluorohexanesulfonic acid (PFHxS) at 10 ppt each, and mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS through a combined Hazard Index (HI). Compliance with the PFAS NPDWR will be determined based on a running annual average.

The proposed HI regulates PFHxS, PFNA, HFPO-DA, and PFBS concentrations as a group. The sum of the four concentrations, each normalized to its Health-Based Water Concentration (HBWC), must be less than 1. The unitless HI is calculated as follows:

$$Hazard\ Index = \left(\frac{[GenX]}{10\ ppt}\right) + \left(\frac{[PFBS]}{2000\ ppt}\right) + \left(\frac{[PFNA]}{10\ ppt}\right) + \left(\frac{[PFHxS]}{10\ ppt}\right)$$

Initial monitoring results will determine a system's ongoing compliance monitoring frequency; default quarterly monitoring may be reduced to once or twice every 3 years if levels remain below one-third of the MCLs.

Table 1 provides a summary of federal PFAS regulations.

Table 1
Federal PFAS Regulations

MCL (EPA NPDWR)	
PFOA	4 ppt
PFOS	4 ppt
PFHxS	10 ppt
PFNA	10 ppt
HFPO-DA (i.e. GenX Chemicals)	10 ppt
Hazard Index	1.0 (unitless)

Existing Wells and PFAS Levels

The District has conducted preliminary PFAS monitoring at its wells multiple times since 2020. **Table 2** summarizes well depth and pumping capacity for each of the District's sites.

Table 2
Current Well Capacities and Resulting PFAS Detections

Well Name	Depth to Top of Upper Screen (ft)	Total Depth (ft)	Current Capacity (gpm)	PFAS Detected
Chase Wellfield				
Well No. 1	20	60	325	Yes
Well No. 2	18	142	550	Yes
Well No. 3	127	189	220	Yes
Well No. 4	55	235	550	Yes
Well No. 5	147	290	190	No
I-5 Wellfield				
Well No. 1	130	360	1,180	Yes*
Well No. 2	120	380	1,550	Yes
Other Well Sources				
Q Street Well	110	312	250	Yes

*Note: PFAS was detected in samples after the April 2023 analysis was complete.

Chase Wellfield

Five wells and a water treatment plant (WTP) are located near the McKenzie River and within an area commonly referred to as the Chase Wellfield. Well Nos. 1 through 4 were drilled at the Chase Wellfield between 1969 and 1975. Well No. 5 was added in 2015, and up to two new wells may be drilled in the future to offset declining well productivity.

In 2014, the Oregon Health Authority (OHA) determined that Well No. 2 met the criteria for classification as groundwater under the direct influence of surface water (GWUDI). The consequent Chase Wellfield WTP, completed in 2018, provides pre-filtration, long term 2 enhanced surface water treatment rule (LT2) filtration, and chlorination for Well No. 2 water. A chlorine contact time (CT) pipeline ensures that *Giardia lamblia* and virus inactivation requirements are met before caustic soda is injected for corrosion control. Water from Well Nos. 1, 3, 4, and 5 is injected separately with chlorine and caustic soda from the WTP, then blended with treated Well No. 2 water before being sent to distribution. **Figure 1** shows the existing well, WTP, and piping layout at the Chase Wellfield.

PFOS and PFOA

Between May 2020 and April 2023, raw water samples were collected five times from Well No. 1, Well No. 2, and the Chase Wellfield entry point. Well Nos. 3, 4, and 5 were sampled four times over the same period. The six compounds of interest were measured from these samples using EPA Test Method 533 or 537.1. **Table 3** reports the highest concentration across samples for PFOS and PFOA at each location. The lab reporting limit was 2 ppt for both PFOS and PFOA.

Table 3
Chase Wellfield Maximum Concentrations for PFOS and PFOA

	PFOS (ppt)	PFOA (ppt)
EPA MCL	4.0	4.0
Chase Wellfield Entry Point	**7.9**	**4.2**
Well No. 1	**16.0**	**8.4**
Well No. 2	**13.0**	**6.9**
Well No. 3	**6.2**	3.2
Well No. 4	**4.2**	Non-Detect
Well No. 5	Non-Detect	Non-Detect

Source samples from Well Nos. 1 and 2 consistently exceeded 4 ppt for both compounds. The PFOS limit was exceeded once for Well No. 3 and twice for Well No. 4. Neither compound was detected for Well No. 5 across the samples. These results roughly align with the depth to the upper well screens reported in **Table 2**; concentrations are highest for the shallower wells and non-detect for the deepest well.

Historically, the District has relied on Well Nos. 1, 2, 3, and 4 to provide the majority of the supply from the Chase Wellfield, whereas Well No. 5 has provided supplemental supply. While blending of PFAS and non-PFAS contaminated sources is an effective strategy in some situations, calculations based on testing results and **Table 2** well capacities suggest that blended water would still exceed the MCL for PFOS and would remain close to the MCL for PFOA. A historical review of the testing results from the entry point tends to support these calculations, with average PFOS and PFOA concentrations of 7.4 and 3.5 ppt, respectively.

Hazard Index

Levels of PFHxS, PFNA, HFPO-DA, and PFBS were measured in raw water samples from all Chase wells and the Chase Wellfield entry point on September 28, 2022. Testing results are used to obtain the HI values in **Table 4**. If a contaminant was not detected in a sample, the concentration for that contaminant was assumed to be zero.

Table 4
HI Calculations Using Chase Wellfield Sample Results

	MCL/HBWC (ppt)	Entry Point (ppt)	Well No. 1 (ppt)	Well No. 2 (ppt)	Well No. 3 (ppt)	Well No. 4 (ppt)	Well No. 5 (ppt)
GenX	10.0	ND	ND	ND	ND	ND	ND
PFBS	2,000.0	2.9	7.3	4.8	ND	ND	ND
PFNA	10.0	ND	ND	ND	ND	ND	ND
PFHxS	10.0	ND	2.1	ND	ND	ND	ND
Calculated HI	1.000	0.001	0.214	0.002	0.000	0.000	0.000

ND = Non-Detect

No HI exceeded the proposed MCL of 1, with the entry point's HI at one-thousandth of the limit. These testing results suggest that GenX, PFBS, PFNA, and PFHxS are not the main concern for the Chase Wellfield under the proposed PFAS NPDWR.

I-5 Wellfield

The Interstate 5 (I-5) Wellfield consists of two wells located next to I-5 and north of the SUB-owned Sports Way Well. The wells are operated year-round, with only one well running in the winter and both wells running as needed in the summer. Water from both wells is combined before being treated with chlorine gas.

PFAS testing for the I-5 Well No. 1, Well No. 2, and entry point was conducted in September 2022 and April 2023 using EPA Test Methods 533 and 537.1. No detections were made in September 2022 across all testing locations; however, PFOS and PFBS were detected in Well No. 2 and entry point water in April 2023. **Table 5** summarizes the maximum concentrations found during the April 2023 testing and the calculated HI for each testing location. The HI was calculated assuming a zero concentration for non-detect compounds.

Table 5
I-5 Wellfield April 2023 PFAS Testing and HI Calculation Results

	MCL/HBWC (ppt)	Well No. 1 (ppt)	Well No. 2 (ppt)	Entry Point (ppt)
PFOS	4.0	ND	3.3	2.1
PFOA	4.0	ND	3.2	ND
GenX	10.0	ND	ND	ND
PFBS	2,000.0	ND	ND	2.1
PFNA	10.0	ND	ND	ND
PFHxS	10.0	ND	ND	ND
Calculated HI	1.000	0.000	0.000	0.001

The entry point PFOS concentration was around half the EPA MCL of 4 ppt. At this level, the District would remain compliant with the MCL but would need to conduct quarterly PFOS monitoring at the I-5 Wellfield. PFBS concentrations are low compared to its HBWC, with a calculated HI at the entry point at one-thousandth of the proposed MCL.

Q Street Well

The Q Street Well is located next to Highway 126 and less than 1 mile from the Chase Wellfield. The well is used as a peaking well during the summer season. Water currently is treated with chlorine gas.

PFAS levels were measured at the Q Street Well entry point in March 2020, September 2021, September 2022, and April 2023. No compounds were detected in either September 2021 or 2022, while September 2022 and April 2023 testing revealed elevated levels of PFOS. **Table 6** reports maximum concentrations between March 2020 and April 2023 using EPA Test Methods 533 and 537.1. The HI was calculated assuming a zero concentration for non-detect compounds.

Table 6
Q Street Well PFAS Testing and HI Calculation Results

	MCL/HBWC (ppt)	Well Entry Point (ppt)
PFOS	4.0	7.3
PFOA	4.0	2.7
GenX	10.0	ND
PFBS	2,000.0	ND
PFNA	10.0	ND
PFHxS	10.0	2.8
Calculated HI	1.000	0.280

PFOS concentrations exceeded 4 ppt on both testing dates, while PFOA levels remained at or above half of the proposed MCL. Moderate PFHxS levels compared to its HBWC resulted in a calculated HI near one-third of the MCL level that would trigger quarterly monitoring for GenX, PFBS, PFNA, and PFHxS. One or more seasonal influences may explain why monitoring in the fall 2021 and 2022 resulted in non-detect levels of these same compounds.

Alternatives Analysis

Two main treatment options for PFAS removal are granular activated carbon (GAC) and anion exchange, also known as ion exchange (IX). Both GAC and IX absorb PFAS compounds and other raw water constituents until the media is exhausted. The GAC or IX process should be located downstream of existing filtration and upstream of chlorination to extend the life of the PFAS treatment media and more economically treat water to drinking water standards.

PFOS, PFOA, and PFNA are long-chain PFAS compounds, and GAC and IX are equally capable of adsorbing these compounds. GenX, PFBS, and PFHxS are short-chain PFAS compounds. IX is more effective at adsorbing short-chain compounds.

For the District's system and PFAS testing results, GAC and IX should treat long-chain PFAS compounds similarly. If GenX, PFBS, or PFHxS raw water concentrations increase at the District's sites in the future, then IX may be more effective. However, long-chain compounds (i.e. PFAS, PFOA, and PFNA) are the main concern under current conditions and proposed regulations.

As PFAS compounds are adsorbed by the GAC or IX media, the PFAS concentration in the filter effluent will slowly rise from non-detect to a detectable level. In general, media sites are adsorbed in the filter bed in a top-down manner. For these reasons, manufacturers recommend that treatment systems should be installed with a minimum of two treatment vessels installed in series and operating in a lead-lad configuration. Once the lead vessel can no longer reduce PFAS levels below the MCL, that vessel is isolated for media changeout, and the lag vessel is switched to the lead and continues producing safe drinking water.

When media replacement is necessary, it can be removed manually through fluidizing the media and flushing to waste or by vactoring the media out of the filter vessel. Virgin media is then either manually placed by bags/supersacks or fluidized if the vessel has that feature. Determining the point at which the media will be exhausted and need to be replaced can be estimated based on bench scale or pilot scale testing and measured in the field as effluent PFAS concentrations increase. In the event that PFAS concentrations increase, treated bed volumes would decrease accordingly, but the treatment system sizing, empty bed contact time (EBCT), and media would still work as anticipated.

Exhausted GAC and IX media may be disposed of through incineration or solid waste landfilling. Spent GAC can be reactivated, but the media needs to be removed and hauled for reactivation. PFOA and PFOS compounds are considered hazardous waste under the Comprehensive Environmental Response, Compensation, and Liability Act. Exhausted GAC and IX must be managed to comply accordingly.

Nanofiltration and reverse osmosis technologies require water to be pumped through high pressure membranes. These technologies are relatively more expensive and generate a high volume of brine waste concentrated with PFAS; therefore, they were not considered in this evaluation.

Chase Wellfield

Based on well pumping capacities, the PFAS treatment system at the Chase Wellfield should be sized to treat up to 2,000 gallons per minute (gpm) of water. Both GAC and IX systems were considered in multiple treatment configurations. The GAC or IX process should be located downstream of LT2 filtration for Well No. 2 water and upstream of chlorination for all wells.

Treatment System Options

The following sections present system parameters for GAC and IX systems based on manufacturer proposals.

Granular Activated Carbon

GAC contactors are recommended to have 20 minutes of EBCT to remove PFAS. Spent GAC can be reactivated, but the media needs to be removed and hauled for reactivation. The existing Chase Wellfield WTP filters require prechlorination to prevent biofilm growth on the filter cartridges. Since PFAS treatment will be downstream of these filters and GAC will adsorb chlorine, the chlorine residual for Well No. 2 water entering the GAC contactors should be optimized to be as low as possible. Low chlorine residuals should not impact GAC media life.

While natural organic matter can also interfere with GAC's removal of PFAS, it is anticipated that this should be minimized through Well No. 2 water filtration.

RH2 contacted two GAC contactor manufacturers for proposals. One manufacturer, Calgon Carbon (Calgon), proposed two of its Model 12-40 systems. Each system consists of two 26-foot-tall filter vessels each filled with 40,000 pounds of GAC. Alternatively, Tonka Water (Tonka) proposed a system consisted of eight 15-foot-tall filter vessels each filled with approximately 20,000 pounds of GAC. **Table 7** compares design parameters for the two systems.

Table 7
Chase Wellfield Design Parameters for GAC Systems

Parameter	Calgon	Tonka
Design Flow (gpm)	2,000	2,000
GAC Media per Vessel	40,000 lbs	20,000 lbs*
Total Number of Vessels	4	8
Diameter (ft)	12	12
Height (ft, in)	26' 7"	15' 7"
Vessel Pressure Rating (psi)	125	100
Liquid Loading Rate (gpm/ft^2)	8.8	4.4
EBCT, Lead-Lag Configuration (min)	10 lead, 10 lag	10 lead, 10 lag
Equipment Cost	$1,260,000	$2,840,000

cf = cubic feet
gpm/ft^2 = gallons per minute per square foot
*Note: Assumed GAC density is 33.7 pounds per cubic foot.

New vessels are estimated to have a lead time of up to 40 weeks. The GAC media itself has a 4 to 6 week lead time and a unit cost of $1.90 per pound in 2,200-pound supersacks, for $304,000 and $258,000 total in media replacement costs for Calgon and Tonka, respectively. According to Calgon's rapid small-scale column test (**Attachment 1**), GAC media is expected to last at least 2 years.

When comparing the alternatives, it should be noted that the District currently treats water from its Weyerhaeuser Wellfield for pentachlorophenol (PCP) with Calgon's Filtrasorb 200 (F200) GAC media. For the Chase Wellfield, Calgon has proposed its F400 media, which is a premium GAC with a higher iodine number recommended for PFAS treatment. Both the F200 and F400 media can remove PCP and PFAS, but PFAS breakthrough would occur more quickly with F200 than with F400. Further, it should be noted that Calgon claims the F400 will remove PCP as well as F200 does. Additional information on F400 is found in **Attachment 2**. If the District chooses to implement a Calgon system at the Chase Wellfield, future equipment or media order sharing between wellfields may be possible. Differences in media price and breakthrough time for each individual treatment process should be considered before changing media types.

Ion Exchange

IX specially engineered for PFAS removal is recommended to have a minimum 3-minute EBCT, which results in a smaller filter footprint and volume of media compared to GAC. IX resin media currently is more expensive than GAC media in terms of price per pound of media, but this may change as IX technology advances in the future. IX technology engineered for PFAS removal is advancing to be able to regenerate the media onsite, but that process is not available at this time. Because IX resin is susceptible to oxidative damage from chlorine, the chlorine residual of the influent water would need to be reduced to less than 0.05 parts per million either by quenching with a chemical, such as meta-bisulfite, or pre-treating with a small GAC adsorber. Similar to GAC, a new post-chlorination system would need to be installed to provide a free-chlorine residual in the finished water after IX. Sulfates and nitrates can compete with PFAS for resin adsorption sites. While IX is estimated to have a longer life than GAC, it may be susceptible to biological fouling before the resin is exhausted.

Two IX vessel manufacturers provided proposals for the Chase Wellfield. **Table 8** lists design parameters for the two systems. De Nora Water Technologies, LLC, (De Nora) recommended two SORB-FX systems each consisting of 2 vessels with a 10-foot diameter. The other manufacturer, Loprest Water Treatment Company (Loprest), proposed 4 vessels with a 12-foot diameter. The EBCT in lead-lag configuration for both systems is estimated to be between 3 and 4 minutes.

Table 8
Chase Wellfield Design Parameters for IX Systems

Parameter	De Nora	Loprest
Design Flow (gpm)	2,000	2,000
IX Media per Vessel	344 cf	452 cf
Total Number of Vessels	4	4
Diameter (ft)	10	12
Height (ft, in)	19’ 5”	--
Vessel Pressure Rating	100	100
Liquid Loading Rate (gpm/ft^2)	12.7	8.8
Equipment Cost	$1,610,000	$1,750,000

New vessels are estimated to have a lead time of up to 26 weeks. Complete systems are estimated at $1.61M for De Nora and $1.75M for Loprest. The IX resin media engineered for PFAS removal has a 1 to 2 month lead time and a unit cost of $375 per cubic foot of media, or $516,000 for De Nora and $678,000 for Loprest. According to De Nora’s IX pilot study report (**Attachment 3)**, IX media can be expected to last about 170 days.

Recommended System

All proposed systems are capable of treating PFAS to below non-detect levels. Calgon's Model 12-40 GAC system is the most economical of the four systems at $1.26M. A general arrangement drawing is found in **Attachment 4**. In addition to equipment costs, the following were considered when developing this recommendation:

- System footprint.
- Media life, replacement cost, and disposal options.
- Ability to remove target PFAS compounds.
- District familiarity with treatment alternative.

Based on these parameters, Calgon's Model 12-40 system is the initial recommendation for PFAS treatment at the Chase Wellfield and is used as a basis of design for sizing and cost estimates. The Model 12-40 system requires the same number of vessels as both IX systems with a similar footprint. While GAC media lifespan is estimated at about a year less than IX media, the lower replacement media costs compensate for the difference over a 20-year life cycle. Additionally, GAC media may be regenerated while IX cannot. Also, while GAC does not remove short-chain PFAS compounds as well as IX, as previously discussed, long-chain compounds are the main concern at the Chase Wellfield. Finally, the District is familiar with Calgon GAC systems due to PCP treatment at its Weyerhaeuser Wellfield. A conceptual site plan based on the Model 12-40 system is shown in **Figure 2**.

Finally, it should be noted that the District conducted small-scale testing with both Calgon F400 GAC and De Nora SORB-FX IX media. Testing results provided breakthrough information for both media types and are included as **Attachments 1 and 3**. Pilot study results confirm the initial recommendation regarding media and the associated sizing and cost estimates.

Filter Backwashing

The pressure drop (headloss) across a filter naturally increases as more particulates are collected. Problems can occur if this headloss rises too high, which can occur with hydraulic crushing of the media or contaminant breakthrough. The backwash procedure is designed to dislodge and rinse away most of a filter's trapped particulates, resulting in a clean filter with reduced headloss. That said, manufacturers generally recommend GAC and IX to be backwashed rarely to maintain top-down PFAS adsorption over the life of the media; however only when headloss is high, should GAC and IX PFAS treatment systems be backwashed.

Table 9 presents the headloss for the Calgon Model 12-40 system with clean media based on total flow rate. When operating in lead-lag configuration at the design flow rate of 1,000 gpm per system, a total headloss of 14 pounds per square inch (psi) is expected. Headloss decreases as the flow rate is lowered.

Table 9
Calgon Model 12-40 System Total Headloss by Flow Rate

Flow Rate (gpm)	Total Headloss (psi)
1,000	14.0
900	12.0
800	10.5
700	8.5
600	7.0

IX resin beds typically have higher headloss than GAC. The headloss per IX lead-lag vessel pair with clean media is estimated at up to 17 psi. Headloss and backwash needs over GAC and IX media life will be better understood with pilot testing. Booster pumping may be required due to the anticipated headloss from GAC or IX filters.

Table 10 provides backwash system parameters based on the Calgon Model 12-40 GAC system. A centrally located valve manifold can be configured to backwash one vessel without interrupting flow to the other. Since the production capacity during backwash is less than the required backwash flow rate, water will be sourced from the distribution system. All water used in the backwash procedure should be collected in a backwash storage tank. The tank should be sized to store the backwash for the lead vessel from each of the two trains.

Table 10
Backwash System Parameters for Calgon Model 12-40 System

Parameter	Value
Backwash Flow Rate (gpm)	1,700
Backwash Superficial Velocity (gpm/ft^2)	15.0
Bed Expansion (%)	25
Backwash Duration (min/vessel)	15
Backwash Volume (gal/train)	26,000
Backwash Storage Tank Volume (gal)	52,000

Since PFAS will remain adsorbed onto the media during backwash, most of the water can be recycled to the front of the treatment train. However, the water should be given ample time to allow the solid particulate to settle out first. Testing should be performed to determine sediment settling and backwash recovery rates. The remaining backwash water can be discharged to the existing infiltration pond or conveyed to a tanker truck for off-site disposal. With no recycling implemented, the pond likely would need to be upsized to accept backwash flow.

Water Blending Options

The District may choose to treat water among the five wells in a number of ways. Different considerations arise based on the treatment configuration, which are discussed as follows.

PFAS Treatment for All Wells

Since all but one well requires PFAS treatment, the District could choose to provide PFAS treatment for all wells and locate the PFAS system downstream of where the groundwater and GWUDI systems combine. While this option could reduce the amount of piping needed to separate and re-route between PFAS versus non-PFAS well sources, it is likely to complicate the existing surface water treatment and chemical feed systems since chlorination needs to occur downstream of PFAS treatment. Assuming that Well No. 2 remains a GWUDI source, this alternative is not recommended.

Treat Only PFAS Sources

Since no PFAS compounds were detected in Well No. 5 water, the District may choose to only treat Well Nos. 1 through 4 for PFAS before blending with Well No. 5 water.
Figures 2 and **3** illustrate this approach. Under this alternative, new site piping would be needed to re-route well water to the PFAS treatment system, but the existing points for disinfection and compliance would largely remain the same. Again, since chlorination needs to occur downstream of the proposed PFAS treatment but upstream of the existing CT pipelines, it is assumed that a separate treatment train will be required for GWUDI/PFAS sources (i.e. Well No. 2).

Finally, it should be noted that the District is considering either removing Well No. 2 from operation or redrilling the well such that it is no longer a GWUDI source. If accomplished, the existing WTP with LT2 treatment will no longer be necessary. In addition, any replacement well likely would be drilled and screened within the lower aquifer (similar to Well No. 5) where there may be a reduced risk of PFAS contamination.

Structure Options

Regardless of whether GAC or IX is implemented at the Chase Wellfield, the vessels will require a significant footprint. The District may either house the vessels in a building or anchor them on a concrete pad with the vessels exposed to the environment. A building would be much more expensive than a concrete pad; a 2,400-square-foot building would cost about $1.5M to $2.0M as opposed to $50k to $100k for an outdoor installation. Finally, a building may reduce aesthetic concerns regarding PFAS treatment, although the concrete pad and vessels may be placed strategically north of and in line with the existing WTP to minimize the additional obstruction of views to the neighbors. **Figure 4** shows the proposed vessel positioning relative to the existing WTP for the outdoor installation alternative.

Figure 4
Chase Wellfield PFAS Treatment Vessel Positioning

Permitting

The Chase Wellfield is located within the Federal Emergency Management Agency (FEMA) 100-year flood hazard area, which is shown as Zone AE on Flood Insurance Rate Map No. 41039-C1134F. These zones define areas that pose a 1 percent annual risk of flooding. The base flood elevation (BFE) of a 100-year flood at the site was determined to be 441.6 feet above mean sea level. **Figure 5** shows the Chase Wellfield in Zone AE. Whether the PFAS treatment system is installed within a building or as an outdoor installation, permitting the installation of the treatment system within the floodplain will likely be the same and will be similar to the Chase WTP. Specifically, a Floodplain Fill/Removal Permit and/or Floodplain Development Permit will be required, including a certification of no-rise demonstrating that the project will not increase the BFE within the floodway. A Building Permit will also be required for either installation, as well as OHA Plan Review. Finally, depending on how backwash and backwash waste water is managed, a National Pollutant Discharge Elimination System Permit could be required from the Oregon Department of Environmental Quality.

Figure 5
Chase Wellfield Zone AE Floodplain and Floodway Designation

I-5 Wellfield

The District plans to convey water from the I-5 Wellfield to the SUB-owned Sports Way site. Once there, the combined water will be treated for PFAS compounds and chlorinated at a proposed treatment facility. A *PFAS Treatment Feasibility Study* was prepared by Stantec in September 2023 for SUB which sized the combined I-5/Sports Way PFAS treatment system for 5,150 gpm. The proposed system consists of six trains with two GAC vessels per train. The overall cost for the GAC system was estimated at $8.3M. Further system design and cost information can be found in **Attachment 5**.

Q Street Well

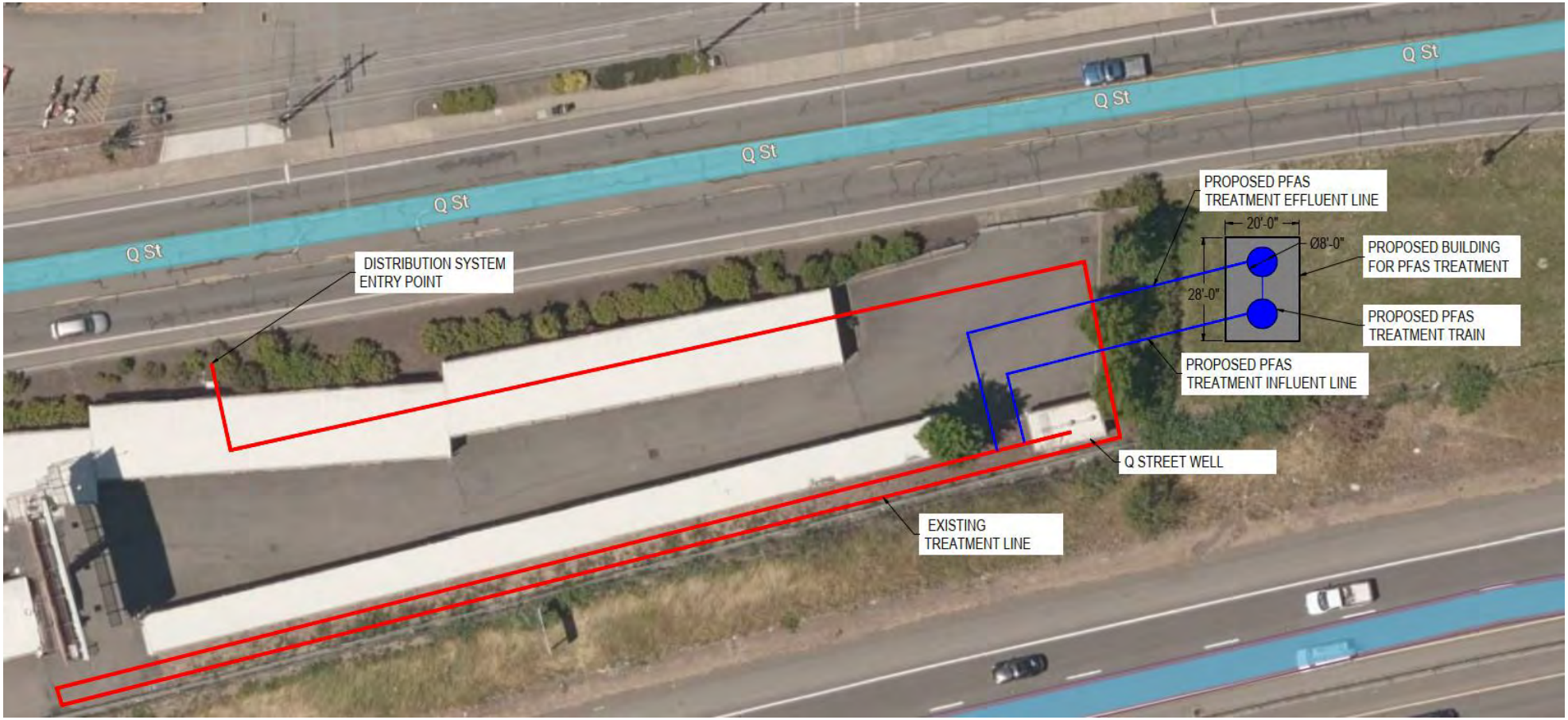
To treat the Q Street Well for PFAS, Calgon proposed its Model 8 system, consisting of 2 vessels each filled with 10,000 pounds of GAC. **Table 10** lists design parameters for this system. Media replacement costs are based on an estimate of $1.90 per pound of GAC media.

Table 10
Calgon Model 8 System Design Parameters for Q Street Well

Parameter	Value
Design Flow (gpm)	250
Media	F400 GAC
Media per Vessel (lbs)	10,000
Total Number of Vessels	2
Diameter (ft)	8’
Height (ft, in)	16’ 4”
Total Headloss, Lead-Lag Operation (psi)	6
Equipment, Delivery, Initial Fill Cost	$300,000
Media Replacement Cost	$19,000 every 2 years

The Model 8 system would be located outside of the Q Street WTP. PFAS treatment would be implemented upstream of the existing chlorine injection. A general arrangement drawing is found in **Attachment 6**. One PFAS treatment siting option is directly east of the building on land owned by the Oregon Department of Transportation. **Figure 6** shows the approximate sizing of the system compared to the existing WTP. Similar to the Chase Wellfield discussion, the proposed PFAS treatment system could be installed either within a building or outdoors depending on the preferences of the District and affected community. The cost to construct a building can be expected to range from $0.4 to 0.6M, whereas an outdoor installation would be expected to be an order of magnitude less.

Figure 6
Q Street Conceptual PFAS Treatment Site Plan



Typical backwash parameters for the Calgon Model 8 system are presented in **Table 11**. An underground vault and pump station to dispose of backwash water is estimated at $200,000.

Table 11
Backwash System Parameters for Calgon Model 8 System

Parameter	Value
Backwash Flow Rate (gpm)	500
Backwash Superficial Velocity (gpm/ft^2)	9.9
Bed Expansion (%)	25
Backwash Duration (min/vessel)	15
Backwash Volume (gal/vessel)	7,500

Planning-Level Capital Costs

This section summarizes the planning-level capital costs for the Chase Wellfield and Q Street Well. A construction contingency of 30 percent is applied to the total, as well as 35-percent indirect costs for engineering design, permitting, bidding services, and construction services.

Chase Wellfield

Cost estimates for the Chase Wellfield are provided for the Calgon Model 12-40 GAC system in **Table 12** and **Table 13**. Both estimates assume that the groundwater and GWUDI sources have their own dedicated PFAS treatment trains, no booster pump is needed, and backwash water recycling is implemented. **Table 12** provides total costs for outdoor vessels, while **Table 13** includes a 2,400-square-foot concrete masonry unit building with a metal roof.

Table 12
Chase GAC PFAS Treatment Costs with Outdoor Vessels

Item	Unit	Quantity	Total Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	LS	1	$343,200
Site Work	LS	1	$255,000
Structural	LS	1	$550,000
Mechanical	LS	1	$1,977,000
Electrical	LS	1	$500,000
Telemetry and Automatic Control	LS	1	$150,000
Construction Cost Subtotal			**$3,775,200**
Construction Contingency (30%)			$1,132,600
Total Estimated Construction Cost			**$4,908,000**
Indirect Costs (35%)			$1,717,800
Total Project Cost			**$6,626,000**

Table 13
Chase GAC PFAS Treatment Costs with Vessel Housing

Item	Unit	Quantity	Total Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	LS	1	$482,200
Site Work	LS	1	$255,000
Structural	LS	1	$1,940,000
Mechanical	LS	1	$1,977,000
Electrical	LS	1	$500,000
Telemetry and Automatic Control	LS	1	$150,000
Construction Cost Subtotal			**$5,304,200**
Construction Contingency (30%)			$1,591,300
Total Estimated Construction Cost			**$6,896,000**
Indirect Costs (35%)			$2,413,600
Total Project Cost			**$9,310,000**

Q Street Well

Costs for the Q Street Well were estimated assuming installation of the Calgon Model 8 system in a new 560-square-foot building with a backwash vault and disposal pump station. This is presented in **Table 14**.

Table 14
Q Street Well PFAS Treatment System Costs

Item	Unit	Quantity	Total Cost
Mobilization, Demobilization, Site Prep, and Cleanup (10%)	LS	1	$151,800
Site Work	LS	1	$152,000
Structural	LS	1	$536,000
Mechanical	LS	1	$550,000
Electrical	LS	1	$200,000
Telemetry and Automatic Control	LS	1	$80,000
Construction Cost Subtotal			**$1,669,800**
Construction Contingency (30%)			$501,000
Total Estimated Construction Cost			**$2,171,000**
Indirect Costs (35%)			$759,850
Total Project Cost			**$2,931,000**

Conclusion

The next steps for the District include preliminary design, permitting, final design, bidding, and construction for the Chase Wellfield and Q Street Well PFAS treatment systems. The preliminary design task will build upon Calgon's rapid small-scale column test and De Nora's IX pilot study to further develop design criteria and overall life-cycle costs. OHA will need to approve the basis of design report and final design documents before the systems can be implemented.

Figures

Figure 1 – Chase Wellfield Existing Site Plan

Figure 2 – Chase Wellfield Conceptual Site Plan

Figure 3 – Chase Wellfield Process and Instrumentation Diagram

Attachments

Attachment 1 – Calgon Rapid Small-Scale Column Test Report

Attachment 2 – Calgon Carbon F400

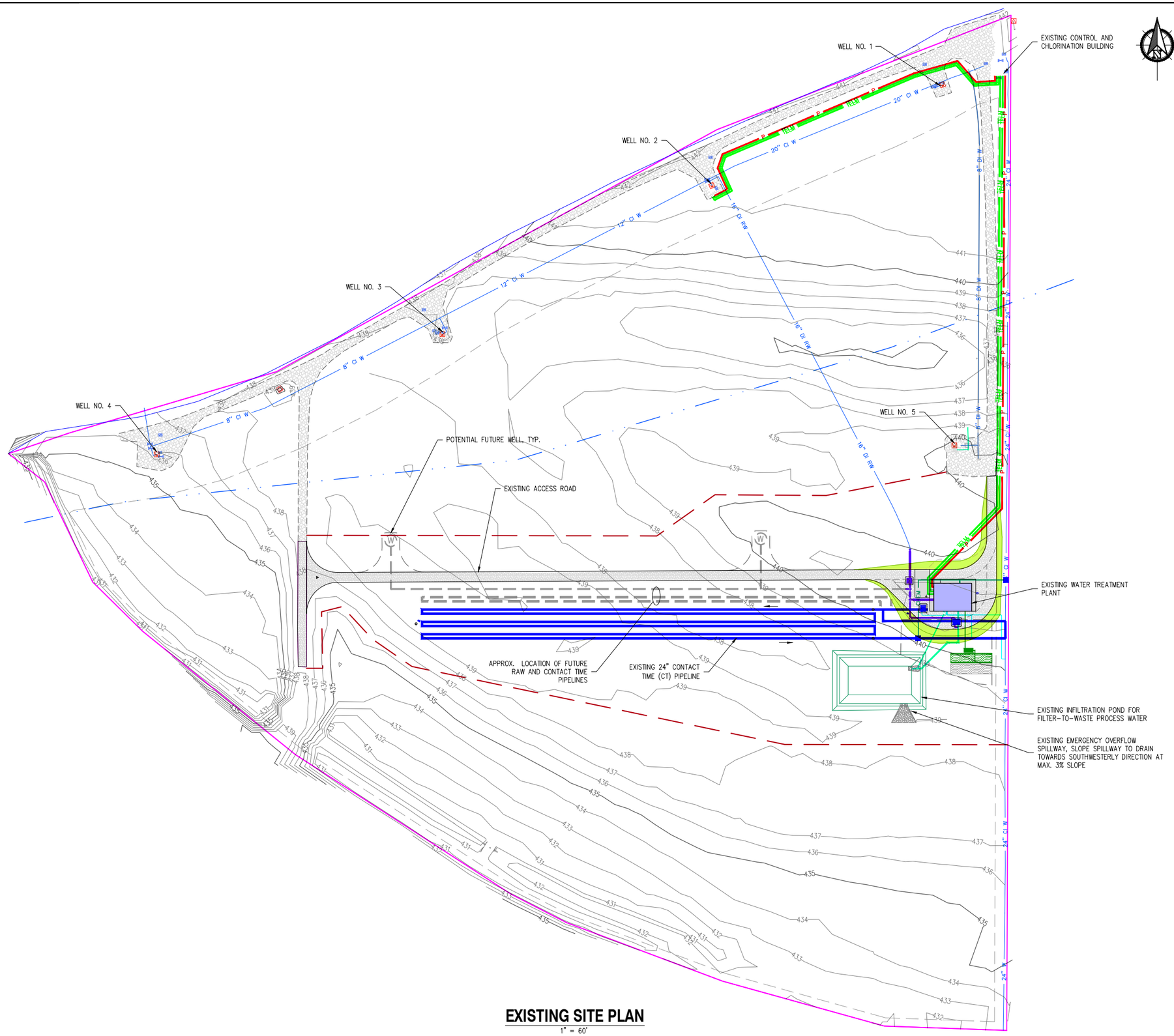
Attachment 3 – De Nora Ion Exchange Pilot Study Report

Attachment 4 – Calgon Carbon Model 12-40 General Arrangement

Attachment 5 – I-5 Wellfield/Sports Way Report

Attachment 6 – Calgon Carbon Model 8 General Arrangement

Figures



EXISTING SITE PLAN

1" = 60'

RH2

RAINBOW WATER DISTRICT
CHASE WELLFIELD
PFAS TREATMENT FEASIBILITY

Rainbow Water District

EXISTING SITE PLAN

REVISIONS

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REVIEWED:
DATE:
PLOT DATE:
CLIENT: RWD
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SCALE: SHOWN

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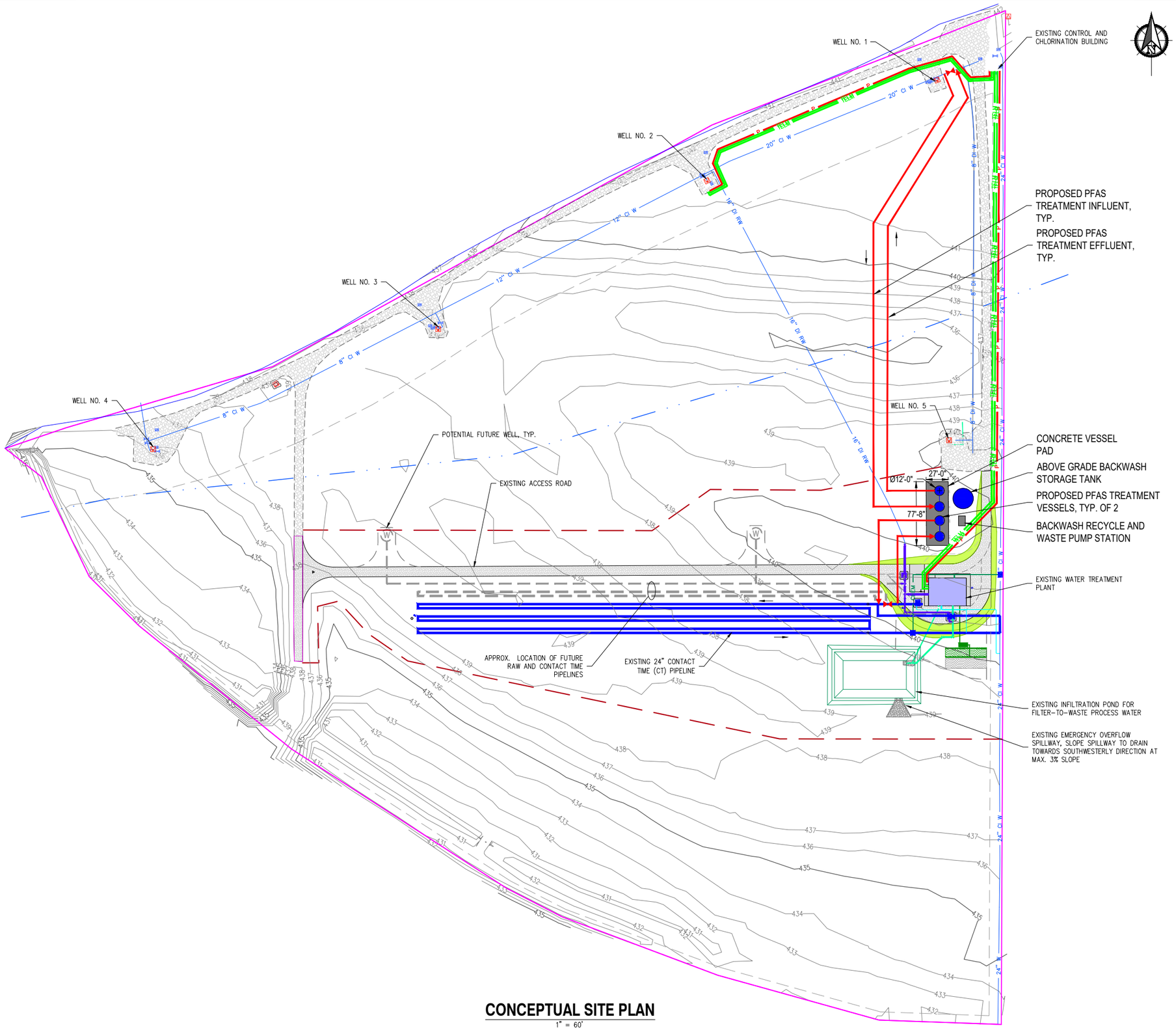
DRAWING IS FULL SCALE WHEN BAR MEASURES 2"

DWG NO.: C01

SHEET NO.:



CONCEPTUAL SITE PLAN

1" = 60'

RH2

RAINBOW WATER DISTRICT
CHASE WELLFIELD
PFAS TREATMENT FEASIBILITY

CONCEPTUAL SITE PLAN

Rainbow Water District

REVISIONS			
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			REVIEW

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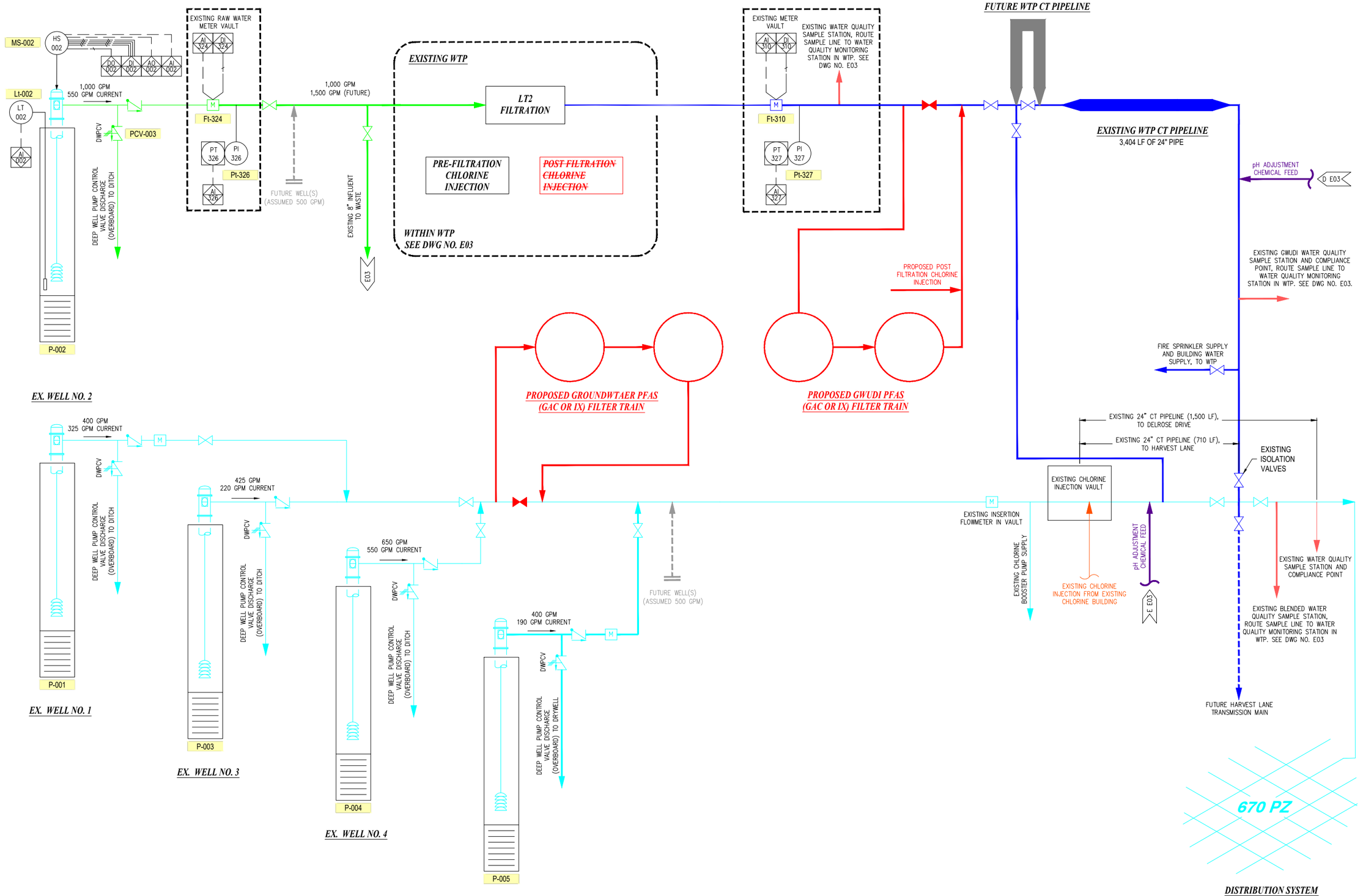

RAINBOW WATER DISTRICT
CHASE WELLFIELD
PFAS TREATMENT FEASIBILITY

WELL SOURCES AND CT PIPELINE P&ID

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Attachment 1

Calgon Rapid Small-Scale Column Test Report

CONFIDENTIAL

Calgon Carbon Corporation

Pittsburgh, PA

Technical Service Report No. 20231052

Rapid Small-Scale Column Test for The Removal of Per- and Polyfluoroalkyl Substances from Potable Water using Filtrasorb® 400 Granular Activated Carbon

Prepared For:

Rainbow Water District WTP
Bothell, WA

Author: Adam Creveling

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Date: January 8, 2024

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E. Townsend
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S. Briczinski Rainbow Water District RSSCT 20231052 SB20241

INTRODUCTION

Calgon Carbon Corporation, hereinafter CCC, conducted a Constant Diffusivity Rapid Small-Scale Column Test (RSSCT) to treat potable water sourced from the Rainbow Water District Water Treatment Plant (WTP). The RSSCT evaluated the performance of Filtrasorb 400 (F400) for the removal of per- and polyfluoroalkyl substances (PFAS) and total organic carbon (TOC). The RSSCT simulated a Model 12-40 vessel with a flow rate of 1,000 gallons per minute (gpm) operating for two years.

Due to their useful properties, such as oil and water repellency, PFAS have been used in a variety of manufacturing processes since the mid-20th century. PFAS are problematic because of their stability and persistence in the environment, mobility, and bioaccumulative nature. PFAS substances are generally divided into two main categories: perfluoroalkyl sulfonates and perfluoroalkyl carboxylates, of which perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are respective examples.

The Environmental Protection Agency's (EPA's) proposed maximum contaminant levels (MCLs) are 4 ng/L (ppt) for both PFOA and PFOS. In addition, the hazard index incorporates the compounds GenX (HFPO-DA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), and perfluorohexanesulfonic acid (PFHxS). The hazard index is calculated using the following formula and has a MCL of 1.

$$Hazard\ Index\ (unitless) = \frac{HFPO-DA\ (ppt)}{10} + \frac{PFBS\ (ppt)}{2{,}000} + \frac{PFNA\ (ppt)}{10} + \frac{PFHxS\ (ppt)}{9}$$

The state of Washington has set State Action Levels (SALs) for PFOA, PFOS, PFNA, PFHxS, and PFBS are summarized in Table 1.

Table 1. Washington SALs

Compound	SAL (ppt)
PFOA	10
PFOS	15
PFNA	9
PFHxS	65
PFBS	345

SUMMARY and RESULTS

The RSSCT was conducted using virgin F400 activated carbon to determine the effective bed life for PFAS removal. The RSSCT simulated a 12-foot diameter vessel containing 40,000 lb of F400 GAC at a flow rate of 1,000 gpm and providing 9.6 minutes of empty-bed contact time (EBCT) after backwashing.

PFAS and TOC breakthrough curves from the RSSCT are shown in Figure 1, and raw data is shown in Tables 2 and 3. Complete simulation details are shown in Table 3. At completion, the RSSCT simulated 760 days of operation (equivalent to 1,095 million gallons treated).

The following conclusions may be drawn from the test results:

- PFOA, PFOS, and PFBS were the only PFAS compounds with detections above the MRL (minimum reporting limit) in the feed water, with concentrations of 3.5, 7.5, and 3.4 ppt respectively. These are below both the EPA MCLs and the Washington SALs limits. The feed water had a TOC concentration of 0.33 ppm.
- Carbon use rate results are summarized in Table 1.

Table 1. Carbon use rate results

Carbon usage milestone		Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	Carbon use rate (lb. GAC / 1,000 gallons)
PFOA	Initial detection over MRL	641	923	115,851	0.043
	50% breakthrough	378	545	68,961	0.073
PFOS	Initial detection over MRL	397	572	72,397	0.070
	50% breakthrough *	851	1,225	152,803	0.033
PFBS	Initial detection over MRL	581	837	105,273	0.048
	50% breakthrough	378	545	68,961	0.073
TOC	Initial detection over MRL	53.8	77.4	9,683	0.516
	50% breakthrough	169	243	31,312	0.164

* These values were extrapolated

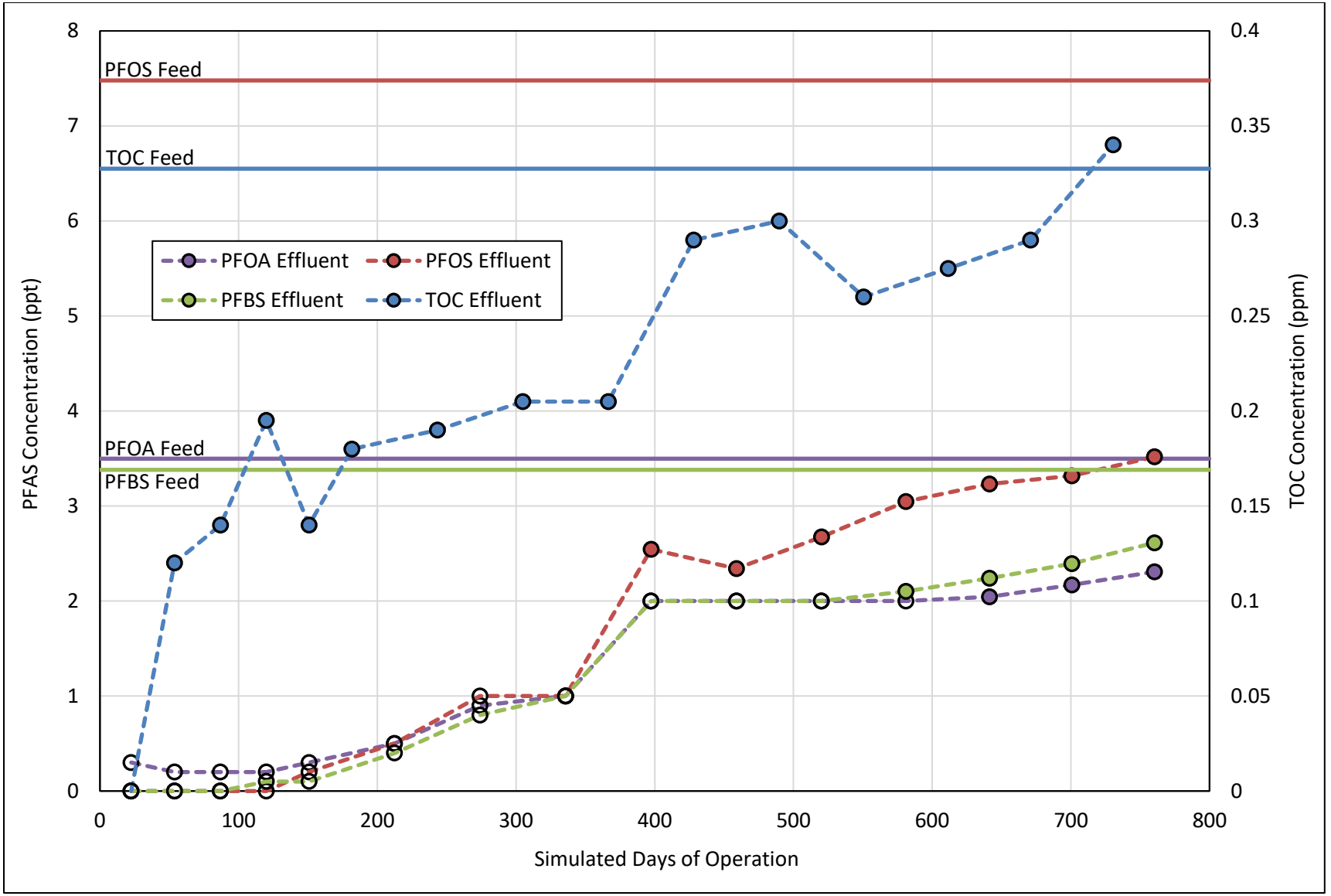

Figure 1. PFOA, PFOS, PFBS, and TOC concentration vs simulated days of operation; results below the reporting limit are shown as an open point

Table 2. TOC and PFAS (1/2) raw data

Sample	Time collected	Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	TOC (ppm)	PFBS (ppt)	PFHxA (ppt)	HFPO-DA (ppt)	PFHpA (ppt)	PFHxS (ppt)	ADONA (ppt)	PFOA (ppt)	PFOS (ppt)	PFNA (ppt)
Feed 1	11/9/2023	--	--	--	0.33	3.4	2 J	<0.075	1 J	1 J	<0.031	3.5	7.3	0.2 J
Feed 2	11/13/2023	--	--	--	0.33	3.5	2 J	<0.074	1 J	1 J	<0.030	3.6	7.8	0.2 J
*Feed 3	11/15/2023	--	--	--	0.88	3.3	2 J	<0.076	1 J	1 J	<0.031	3.5	7.3	0.2 J
Sample 1	11/9/23 12:20	22.5	32.4	3,643	<0.1	<0.038	2 J	<0.076	0.7 J	<0.095	<0.031	0.3 J	<0.095	0.3 J
Sample 2	11/9/23 18:00	53.8	77.4	9,683	0.12	<0.038	0.5 J	<0.077	0.5 J	<0.096	<0.032	0.2 J	<0.096	0.2 J
Sample 3	11/10/23 0:00	86.9	125	16,077	0.14	<0.039	0.1 J	<0.077	0.4 J	<0.097	<0.032	0.2 J	<0.097	0.1 J
Sample 4	11/10/23 6:00	120	173	22,471	0.20	0.1 J	0.2 J	<0.078	0.4 J	<0.097	<0.032	0.2 J	<0.097	0.2 J
Sample 5	11/10/23 12:00	151	217	28,019	0.14	0.1 J	0.2 J	<0.078	0.4 J	<0.097	<0.032	0.3 J	0.2 J	0.2 J
Sample 6	11/10/23 18:00	182	262	33,566	0.18	--	--	--	--	--	--	--	--	--
Sample 7	11/11/23 0:00	212	306	39,113	--	0.4 J	0.4 J	<0.078	0.4 J	0.08 J	<0.032	0.5 J	0.5 J	0.2 J
Sample 8	11/11/23 6:00	243	350	44,660	0.19	--	--	--	--	--	--	--	--	--
Sample 9	11/11/23 12:00	274	395	50,208	--	0.8 J	0.7 J	0.1 J	0.6 J	0.2 J	<0.031	0.9 J	1 J	0.2 J
Sample 10	11/11/23 18:00	305	439	55,755	0.21	--	--	--	--	--	--	--	--	--
Sample 11	11/12/23 0:00	336	483	61,302	--	1 J	0.9 J	0.2 J	0.6 J	0.3 J	<0.032	1 J	1 J	0.2 J
Sample 12	11/12/23 6:00	367	528	66,850	0.21	--	--	--	--	--	--	--	--	--
Sample 13	11/12/23 12:00	397	572	72,397	--	2 J	1 J	0.3 J	0.9 J	0.6 J	<0.033	2 J	2.5	0.3 J
Sample 14	11/12/23 18:00	428	617	77,944	0.29	--	--	--	--	--	--	--	--	--
Sample 15	11/13/23 0:00	459	661	83,491	--	2 J	1 J	0.2 J	0.8 J	0.5 J	<0.032	2 J	2.3	0.2 J
Sample 16	11/13/23 6:00	490	705	89,039	0.30	--	--	--	--	--	--	--	--	--
Sample 17	11/13/23 12:00	520	749	94,450	--	2 J	1 J	0.2 J	0.9 J	0.5 J	<0.032	2 J	2.7	0.3 J
Sample 18	11/13/23 18:00	551	793	99,862	0.26	--	--	--	--	--	--	--	--	--
Sample 19	11/14/23 0:00	581	837	105,273	--	2.1	1 J	0.2 J	0.9 J	0.7 J	<0.032	2 J	3.0	0.2 J
Sample 20	11/14/23 6:00	612	881	110,684	0.28	--	--	--	--	--	--	--	--	--
Sample 21	11/14/23 12:00	641	923	115,851	--	2.2	2 J	0.2 J	0.9 J	0.7 J	<0.032	2.0	3.2	0.2 J
Sample 22	11/14/23 18:00	671	966	121,017	0.29	--	--	--	--	--	--	--	--	--
Sample 23	11/15/23 0:00	701	1,009	126,183	--	2.4	2 J	0.3 J	1 J	0.7 J	<0.032	2.2	3.3	0.2 J
Sample 24	11/15/23 6:00	731	1,052	131,350	0.34	--	--	--	--	--	--	--	--	--
Sample 25	11/15/23 12:00	760	1,095	136,516	--	2.6	2 J	0.3 J	1 J	0.7 J	<0.032	2.3	3.5	0.3 J

J = Estimated value between the limit of detection and reporting limit

* The TOC is likely high on this sample because it was pulled when the feed was very low, where debris at the bottom of the container can contribute to a higher value

Table 3. PFAS (2/2) raw data

Sample	Time collected	Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	9Cl-PF3ONS (ppt)	PFDA (ppt)	NMeFOSAA (ppt)	PFUnA (ppt)	NEtFOSAA (ppt)	11Cl-PF3OUdS (ppt)	PFDoA (ppt)	PFTrDA (ppt)	PFTA (ppt)
Feed 1	11/9/2023	--	--	--	<0.009	<0.059	<0.019	<0.058	<0.070	<0.030	<0.038	<0.036	<0.035
Feed 2	11/13/2023	--	--	--	<0.009	<0.058	<0.018	<0.057	<0.068	<0.030	<0.037	<0.035	<0.034
Feed 3	11/15/2023	--	--	--	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 1	11/9/23 12:20	22.5	32.4	3,643	<0.010	<0.060	<0.019	0.2 J	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 2	11/9/23 18:00	53.8	77.4	9,683	<0.010	<0.061	<0.019	0.1 J	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 3	11/10/23 0:00	86.9	125	16,077	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 4	11/10/23 6:00	120	173	22,471	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 5	11/10/23 12:00	151	217	28,019	<0.010	0.1 J	<0.019	0.2 J	<0.072	0.1 J	0.2 J	0.1 J	0.1 J
Sample 7	11/11/23 0:00	212	306	39,113	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 9	11/11/23 12:00	274	395	50,208	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 11	11/12/23 0:00	336	483	61,302	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 13	11/12/23 12:00	397	572	72,397	<0.010	<0.064	<0.020	<0.063	<0.075	<0.032	<0.040	<0.038	<0.037
Sample 15	11/13/23 0:00	459	661	83,491	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 17	11/13/23 12:00	520	749	94,450	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 19	11/14/23 0:00	581	837	105,273	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 21	11/14/23 12:00	641	923	115,851	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 23	11/15/23 0:00	701	1,009	126,183	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 25	11/15/23 12:00	760	1,095	136,516	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036

J = Estimated value between the limit of detection and reporting limit

Table 4. Simulation details

Parameter	Full-Scale Adsorber	RSSCT
RSSCT Scale Factor	--	118
Carbon Mesh Size	12×40	120×200
Mean Particle Diameter	1.10 mm	100 µm
Carbon A.D.	0.575 g/cc	0.550 g/cc
Adsorber I.D.	12 feet	0.622 cm
Weight of Carbon in Adsorber	40,000 lb	0.232 g
Flow Rate	1,000 gpm	6.0 mL/min
EBCT	9.6 minutes	4.2 seconds
Operation Time	760 days	6.4 days
Volume of Water Treated	1,095	14.3 gallons

MATERIALS and METHODS

RSSCT Design

The RSSCT simulated a 12-foot adsorber containing 40,000 lb of F400 12×40, operating at 1,000 gpm, and providing 9.6 minutes of EBCT after backwashing. See Table 4 for design parameters used in the simulation. The RSSCT ran for 760 simulated days (equivalent to 1,095 million gallons treated). A description of the RSSCT is shown in Appendix A.

RSSCT Carbon Preparation

A current production sample of virgin F400 12×40 GAC was systematically re-sized to 120×200 mesh for use in the RSSCT. The test carbon was dried at 105° C for 16 hours and allowed to cool in a desiccator. Prior to the introduction of the challenge water, the column was pre-wetted with deionized water for approximately 16 hours.

RSSCT Influent Preparation

CCC received four 5-gallon containers of water on October 23, 2023. Three of the containers were combined and used as the feed. The RSSCT consumed 14.3 gallons of water.

RSSCT Sampling

Samples were collected four times per day via an automated sample collector into 8-oz. plastic bottles. The TOC samples were collected manually into 40-mL vials from the 8-oz. bottles.

The flow rate of the RSSCT was closely monitored throughout the study. Composite samples of the RSSCT effluent, minus discrete samples for testing, were collected once per day. From this data, average flow rates were calculated, and the flow rate was adjusted as necessary.

Analytical

TOC samples were analyzed in CCC's analytical laboratory using SM 5310B Total Organic Carbon, High Temperature Combustion. PFAS samples were analyzed by STRIDE Center for PFAS Solutions using EPA 537 Version 1.1 Modified. See Table 5 for full list of PFAS analytes.

Table 5. PFAS compounds tested (STRIDE)

Full name	Abbreviation	CAS#
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorohexanoic acid	PFHxA	307-24-4
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanoic acid	PFNA	375-95-1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
Perfluorodecanoic acid	PFDA	335-76-2
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
Perfluoroundecanoic acid	PFUnA	2058-94-8
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTA	376-06-7

Appendix A: Rapid Small-Scale Column Test (RSSCT) Procedure

The RSSCT procedure uses a miniature carbon-filled column to rapidly simulate the adsorption breakthrough curve that would be obtained by treating an aqueous stream in a large adsorption system. This technique has been shown to accurately simulate the carbon treatment of a wide range of waters and wastewaters under various conditions.

The principal advantage of the RSSCT procedure compared to the one-inch diameter column adsorption test is its increased speed. Typically, an RSSCT can be completed in < 1 to 15 percent of the time required for a one-inch diameter study.

To predict the volume breakthrough curve for the full-scale adsorber, the RSSCT results must be multiplied by the volume scale factor determined for each carbon type. The time breakthrough curve for the full-scale adsorber can be calculated by either of two methods. First, one can divide the predicted volumes calculated above by the flow rate of the full-scale system. Second, one can multiple the run time by the scale factor determined for each carbon type.

The following equations for comparison between small- and full-scale are shown below:

$$\frac{EBCT_{SC}}{EBCT_{LC}} = \left[\frac{d_{p,SC}}{d_{p,LC}}\right]^{2-x} = \frac{t_{SC}}{t_{LC}}$$

$$\frac{V_{SC}}{V_{LC}} = \frac{d_{p,LC}}{d_{p,SC}}$$

$$M_{SC} = EBCT_{LC}\left[\frac{d_{p.SC}}{d_{p,LC}}\right]^{2-x} Q_{SC} * \rho_{LC}$$

where $d_{p,SC}$ and $d_{p,LC}$ are the particle sizes for the small and large GAC; x is the diffusivity constant to be used, 0 for constant and 1 for proportional diffusivity; t_{SC} and t_{LC} are the corresponding elapsed times in the small- and large-scale column tests, respectively; V_{SC} and V_{LC} are the hydraulic loadings in the RSSCT and large-scale columns, respectively; M_{SC} and Q_{SC} are the mass of carbon and flow rate in the small-scale column; and ρ_{LC} is the apparent density of the full-scale carbon.

Appendix B: Sales Spec Sheet

SALES SPECIFICATION SHEET

FILTRASORB 400

Granular Activated Carbon

Test	Specification Min	Specification Max	Calgon Carbon Test Method
IODINE NUMBER, mg/g	1000	-	TM-4,ASTM D4607
MOISTURE (AS PACKAGED), wt%	-	2	TM-1,ASTM D2867
ABRASION NUMBER	75	-	TM-9,AWWA B604
EFFECTIVE SIZE, mm	0.55	0.75	TM-8,ASTM D2862
UNIFORMITY COEFFICIENT	-	1.9	TM-8,ASTM D2862
FCC - WATER EXTRACTABLE, wt%	-	4	TM-43,FCC
12 US MESH [1.70 mm], wt%	-	5	TM-8,ASTM D2862
< 40 US MESH [0.425 mm] (PAN), wt%	-	4	TM-8,ASTM D2862

Typical Properties:

This product complies with ANSI/AWWA B604 (2012) – Granular Activated Carbon.

This product complies with the requirements for activated carbon as defined by the Food Chemicals Codex (FCC) (Latest Edition) published by the U.S. Pharmacopeia.

This product is produced under supervision of the Islamic Food and Nutrition Council of America (IFANCA).

This product is prepared under the supervision of the Kashruth Division of the Orthodox Union and is Kosher.

Only products bearing the NSF Mark are Certified to NSF/ANSI/CAN 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packing or documentation shipped with the product.

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press. 12030-10/09/2018

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Attachment 2

Calgon Carbon F400

Data Sheet

FILTRASORB® 400

Granular Activated Carbon

Applications

FILTRASORB 400 activated carbon can be used in a variety of liquid phase applications for the removal of dissolved organic compounds. FILTRASORB 400 has been successfully applied for over 40 years in applications such as drinking and process water purification, wastewater treatment, and food, pharmaceutical, and industrial purification.

Description

FILTRASORB 400 is a granular activated carbon for the removal of dissolved organic compounds from water and wastewater as well as industrial and food processing streams. These contaminants include taste and odor compounds, organic color, total organic carbon (TOC), industrial organic compounds such as TCE and PCE, and PFAS.

This activated carbon is made from select grades of bituminous coal through a process known as reagglomeration to produce a high activity, durable, granular product capable of withstanding the abrasion associated with repeated backwashing, hydraulic transport, and reactivation for reuse. The raw coal is mined and subsequently manufactured into GAC in the United States to ensure the highest quality and consistency in the finished product. Activation is carefully controlled to produce a significant volume of both low and high energy pores for effective adsorption of a broad range of high and low molecular weight organic contaminants.

FILTRASORB 400 is formulated to comply with all the applicable provisions of the AWWA Standard for Granular Activated Carbon (B604) and Food Chemicals Codex. This product may also be certified to the requirements of NSF/ANSI 61 for use in municipal water treatment facilities. Only products bearing the NSF Mark are certified to the NSF/ANSI 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packaging or documentation shipped with the product.

Features / Benefits

- Produced in the United States from a pulverized blend of high quality, domestically mined bituminous coals resulting in a consistent, high quality product.
- Carbon granules are uniformly activated through the whole granule, not just the outside, resulting in excellent adsorption properties and constant adsorption kinetics.
- The reagglomerated structure ensures proper wetting while also eliminating floating material.
- High mechanical strength relative to other raw materials, thereby reducing the generation of fines during backwashing and hydraulic transport.
- Carbon bed segregation is retained after repeated backwashing, ensuring the adsorption profile remains unchanged and therefore maximizing the bed life.
- Reagglomerated with a high abrasion resistance, which provides excellent reactivation performance.
- High density carbon resulting in a greater adsorption capacity per unit volume.

Specifications[1]	FILTRASORB 400
Iodine Number, mg/g	1000 (min)
Moisture by Weight	2% (max)
Effective Size	0.55–0.75 mm
Uniformity Coefficient	1.9 (max)
Abrasion Number	75 (min)
Screen Size by Weight, US Sieve Series	
On 12 mesh	5% (max)
Through 40 mesh	4% (max)

[1]Calgon Carbon test method

Typical Properties*	FILTRASORB 400
Apparent Density (tamped)	0.54 g/cc
Water Extractables	<1%
Non-Wettable	<1%

*For general information only, not to be used as purchase specifications.

Safety Message

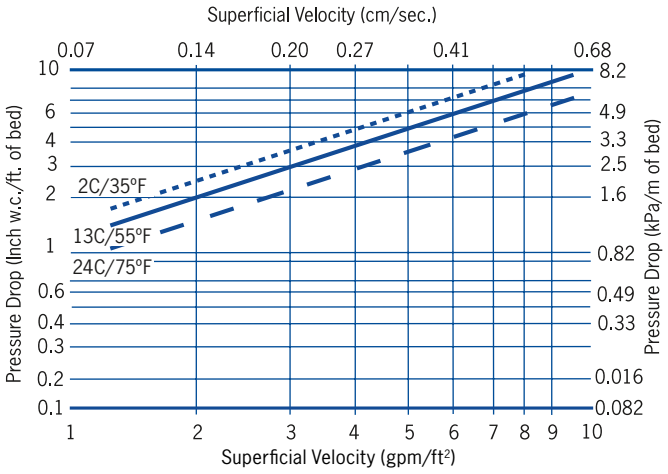
Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

1.800.4CARBON calgoncarbon.com

DS-FILTRA40019-EIN-E1

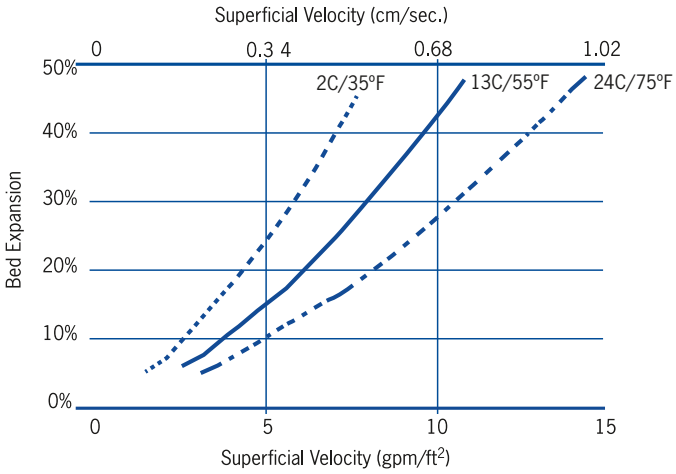
Typical Pressure Drop

Based on a backwashed and segregated bed



Typical Bed Expansion During Backwash

Based on a backwashed and segregated bed



Conditioning and Backwashing

Backwashing and conditioning fresh GAC before placing into operation is critical to GAC performance. The reasons for backwashing before placing fresh media online are to: (1) size segregate the media so subsequent backwashing will return the media to the same relative position in the bed, (2) remove any remaining air from the bed, and (3) remove media fines which can lead to excessive pressure drop and flow restriction. In addition, proper backwashing is a crucial step to collecting the most representative and meaningful post-start up data on compounds of interest, such as metals listed in the NSF/ANSI 61 standard.

Below are the recommended steps for proper conditioning and backwashing of GAC based on Filtrasorb 400 GAC being backwashed at 55°F:

1. Fully submerge GAC bed in clean, contaminant free water for at least 16 hours (overnight)
2. Open backwash inlet and begin up-flow at 3 gpm/ft² for 2 minutes
3. Increase flow to 5 gpm/ft² and maintain for 2 minutes
4. Increase flow to 7 gpm/ft² and maintain for 2 minutes
5. Increase flow to 8.5 gpm/ft² and maintain for 30 minutes*
6. Decrease flow to 7 gpm/ft² and maintain for 2 minutes
7. Decrease flow to 5 gpm/ft² and maintain for 2 minutes
8. Decrease flow to 3 gpm/ft² and maintain for 2 minutes
9. Close backwash inlet and stop flow

*Duration representative of initial backwash conditions. Required duration during operational backwashes can be shorter but will vary by utility, solids load, and GAC throughput. Contact Calgon Carbon for more information"

Design Considerations

FILTRASORB 400 activated carbon is typically applied in down-flow packed-bed operations using either pressure or gravity systems. Design considerations for a treatment system is based on the user's operating conditions, the treatment objectives desired, and the chemical nature of the compound(s) being adsorbed.

Safety Message

Wet activated carbon can deplete oxygen from air in enclosed spaces. If use in an enclosed space is required, procedures for work in an oxygen deficient environment should be followed.

DS-FILTRA40019-EIN-E1

Attachment 3

De Nora Ion Exchange Pilot Study Report

May 17, 2024

Mr. Barney Santiago, PE
RH2 Engineering, Inc.
22722 29th Drive SE, STE 210
Bothell, WA 98021

Subject: **Rainbow Water District PFAS Removal Pilot, De Nora Proposal P-142161**

Dear Mr. Santiago:

De Nora Water Technologies is pleased to present the PFAS Removal Pilot Summary Report for the Rainbow Water District, using the SORB™ FX PFAS Removal System from De Nora.

INTRODUCTION:

De Nora and Rainbow Water District executed a pilot-scale project to confirm Per- and Polyfluorinated Substances (PFAS) removal technologies as a final polishing step downstream of the existing water treatment system. Recent additions to the United States National Primary Drinking Water Regulations (NPDWR) have established a maximum contaminant level (MCL) for six PFAS in drinking water. PFOA, PFOS, PFHxS, PFNA, and HFPO-DA are regulated contaminants with individual MCLs. In addition, PFAS mixtures containing at least two or more of PFHxS, PFNA, HFPO-DA, and PFBS are regulated using a Hazard Index MCL to account for the combined levels of these PFAS in drinking water.

The purpose of the De Nora SORB™ FX contaminant removal system is to remove regulated PFAS compounds to non-detect levels so as to meet US EPA (Environmental Protection Agency) regulations, be compliant with ANSI/NSF Standard 61, and to determine the life of PFAS-selective Ion Exchange resin to be used in the full-scale 2,000 gpm PFAS removal system (De Nora project reference # P-140244). In addition, since the resin used to remove PFAS is not exclusively selective for only the regulated components, additional PFAS types will be removed as well.

PILOT SPECIFICATIONS:

Table 1. Single Use Resin Column Operation Recommendations	
Column Segment Dims.	(2" SCH80) 2.375" OD, 1.913" ID, 10" Height
Resin Bed Depth	36" Total | 9" per Segment
Total Resin Volume	1695.6 mL Total | 423.9 mL per Segment
Expected Pressure Drop	~1.0 psi/ft of Resin (at 50° F)
Total Service Flow	813.9 L/day (565.2 mL/min)
Linear Velocity	7.48 gpm/ft2
Total Specific Flow Rate	20 BV/hr. (3 min. EBCT)

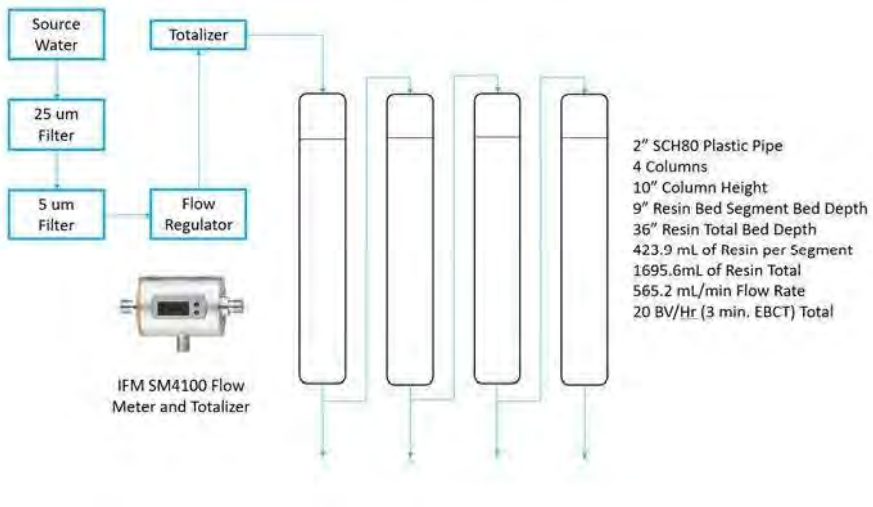


Fig. 1 – Single Use Resin Pilot Schematic:

Fig. 2 – Pilot System installed at Chase Well #2

METHODS:

Operation and Sampling Regime:

- The pilot may run either on raw filtered water from the well head or an equalization tank. Rainbow Water District operated the system directly connected to the water supply.
- One (1) 120 V power outlet was required to power the flow totalizers (IFM SM4100).
- Pilot was installed in the water treatment building which is a temperature controlled and covered structure
- Column flow was monitored nearly 3 days, adjusted as needed, and filters changed out every 2 weeks or more frequently as needed.
- The instantaneous flow rate, flow total, date and time of readings were recorded manually in a log sheet supplied by De Nora. Any notes regarding shutdown or other operating disruptions were transmitted to De Nora.
- Samples were collected in plastic bottles provided by a third party lab and stored in a refrigerator according to EPA Method 537 or other similar methods. Analysis collection was performed on an approximately monthly basis.

All data collected was transcribed into an Excel file for data analysis following the conclusion of the pilot operating period. The results and analysis of those data and are included herein.

PFAS MONITORING	CHASE WELL # 1 (source sample)		
SAMPLE DATE	05/27/20	08/31/20	09/27/21
PFOS	16.0	14.0	10.0
PFOA	8.4	7.0	5.8
PFNA	ND	ND	ND
PFHxS	2.3	2.1	ND
PFHxA	5.0	3.8	3.2
PFBS	5.2	4.7	7.2
PFHpA	2.8	2.0	ND

PFAS MONITORING	CHASE WELL # 2 (source sample)		
SAMPLE DATE	05/27/20	08/31/20	09/27/21
PFOS	12.0	9.8	12.0
PFOA	6.4	5.0	6.1
PFNA	ND	ND	ND
PFHxS	ND	ND	2.0
PFHxA	3.8	2.7	3.8
PFBS	3.5	3.0	5.8
PFHpA	2.0	ND	ND

PFAS MONITORING	CHASE WELL # 3 (source sample)		
SAMPLE DATE	05/27/20	08/31/20	09/27/21
PFOS	3.9	3.6	
PFOA	ND	ND	

PFAS MONITORING	CHASE WELL # 4 (source sample)		
SAMPLE DATE	05/27/20	08/31/20	09/27/21
PFOS	3.6	3.8	
PFOA	ND	ND	

PFAS MONITORING	CHASE WELL # 5 (source sample)		
SAMPLE DATE	05/27/20	08/31/20	09/27/21
PFOS	ND	ND	
PFOA	ND	ND	

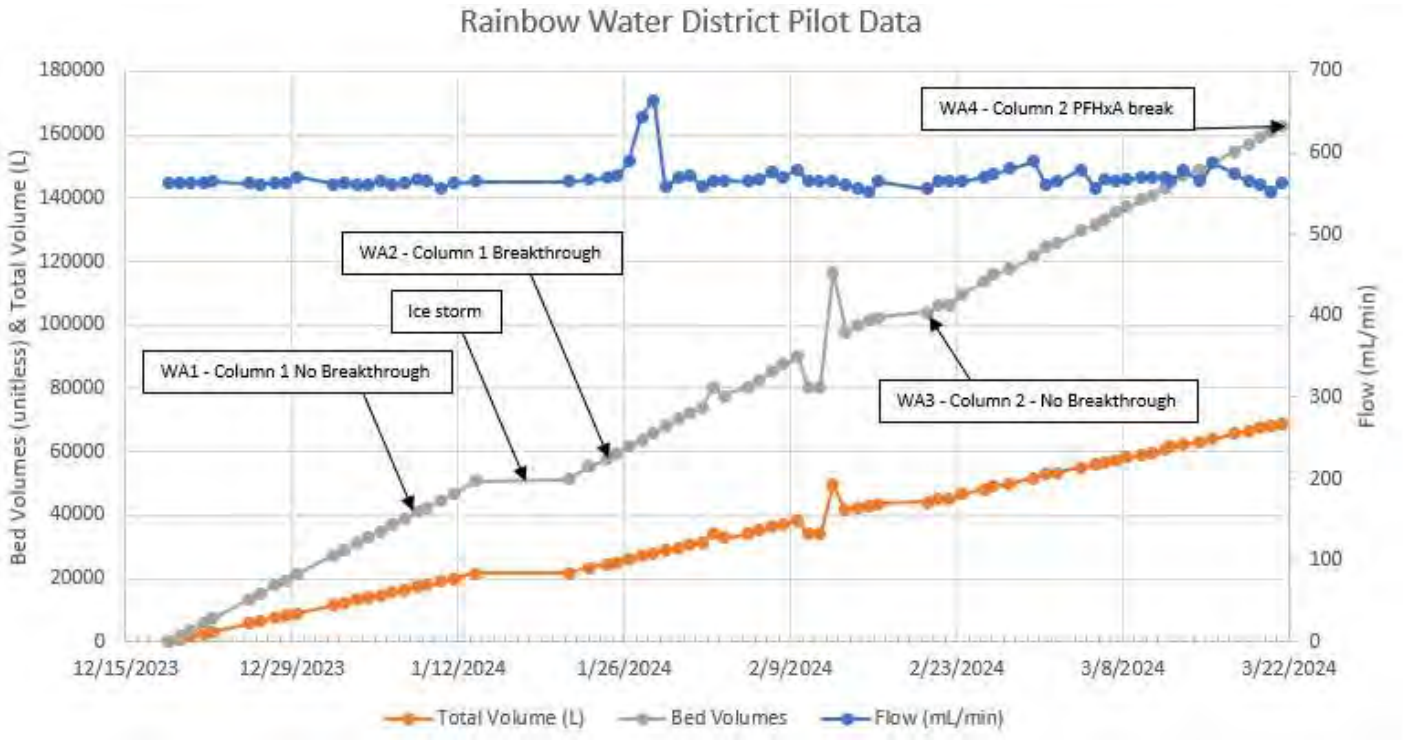
EPA#	ANALYTES	RESULTS	UNITS
	EPA Regulated		
1005	ARSENIC	ND	mg/l
1010	BARIUM	0.004	mg/L
1015	CADMIUM	ND	mg/l
1020	CHROMIUM	ND	mg/L
1035	MERCURY	ND	mg/l
1045	SELENIUM	ND	mg/L
1075	BERYLLIUM	ND	mg/L
1074	ANTIMONY	ND	mg/L
1085	THALLIUM	ND	mg/L
1024	CYANIDE, AVAILABLE	ND	mg/l
1025	FLUORIDE	ND	mg/L
1041	NITRITE-N	ND	mg/l
1040	NITRATE-N	3.16	mg/L
1038	TOTAL NITRATE/NITRITE	3.15	mg/l
	EPA Regulated (Secondary)		
1028	IRON	ND	mg/L
1032	MANGANESE	ND	mg/l
1050	SILVER	ND	mg/L
1017	CHLORIDE	5.2	mg/L
1055	SULFATE	7.1	mg/L
1095	ZINC	0.011	mg/L
1052	SODIUM	8.0	mg/L
1915	HARDNESS as Calcium Carbonate	60.2	mg/L
1064	ELECTRICAL CONDUCTIVITY	172	uS/cm
0100	TURBIDITY	0.23	NTU
1036	NICKEL	ND	mg/l

Fig. 3 Water Quality Analysis provided by Barney Santiago of RH2 Engineering, Inc.

LABORATORY TEST RESULTS:

De Nora Water Technologies is pleased to report the findings of pilot-scale study with Rainbow Water District performed from 12/18/2024 to 3/21/2024 to remove PFAS from Chase Well #2.

BED VOLUME DATA:



Note 1: A Power Outage occurred during an Ice Storm between 1/13 and 1/21/2024 that resulted in no volume readings for these days. We do not anticipate this occurrence was the cause of the subsequent breakthrough, but there is a potential that something beyond our knowledge may have affected or caused said breakthrough.

Note 2: There appears to be anomalous total flow readings for the dates of February 10 – 14th, however, since the trend of the following totalized flow data continues as predicted following those dates, the cause may have been a misreading of the flow totalizer (e.g., the wrong units of volumes may have been selected). This anomaly had no impact on the overall data analysis.

Regardless of the breakthrough on Column 1, testing was moved to the second column from this point forward, as breakthrough was assumed to have occurred per the test results. Column 2 was tested for the duration of the pilot and saw no breakthrough until the final test date of 3/21/2024.

Table 2. Data and Calculations		
Bed Volume Estimate	375,000	Unitless
Flow rate	2,000	gpm
No. of Trains	2.0	
Diameter of Vessels	10'	
Volume of Resin/vessel	344.0	Cubic ft.
Volume of Treated Water/Vessel	129,000,000	Cubic ft.
	964,987,080	gallons
Estimated Run Time Lead Vessel@ Full Flow	241,246	minutes
	167	days
Breakthrough 25%	57,773	
Light Breakthrough @ 50%	162,444	
Difference	104,671	
Estimate for 50 - 75%	104,671	
Estimate for 75 - 100%	104,671	
Estimate for Total	371,786	

ADJUSTMENTS AND CHANGES:

The pilot ended on 3/21/24. In retrospect, it would have been of interest to keep taking samples from Column 1 even after breakthrough to see which PFAS analytes were breaking through, and which were still being picked up by the resin in Column 1.

RECOMENDATIONS AND NEXT STEPS:

The following recommendations are based on the water quality data provided and the on-site testing conducted:

1. De Nora projects no less than 964,987,080 gallons (about 3,652,871,742 L) per vessel to be treated to non-detect for all measured PFAS species prior to breakthrough occurs and a resin changeout would need to be implemented.
2. If operated at peak design flow, continuously twenty-four hours per day, this would translate into approximately 170 days of operation before the lead tanks (which represent 50% of the total media volume) in the lead-lag configuration would require media replacement. The time for complete media replacement is estimated at approximately 340 days.
3. It should be noted that the first species of PFAS to be detected breaking through the bed was PFHxA, which is currently an unregulated contaminant. No currently regulated components were detected to break through column #2 by the conclusion of the pilot study.
4. If Rainbow Water bases the operation of the system on only regulated PFAS species, it is highly likely that the predicted bed volumes treated would be higher than estimated in conclusion 1.

De Nora is free and available to discuss the treatment of PFAS for Rainbow Water District.

We are looking forward to your acceptance.

Best regards,

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Appendices


J77754-1 UDS Level 2 Report Final Repo


J88273-1 UDS Level 2 Report Final Repo

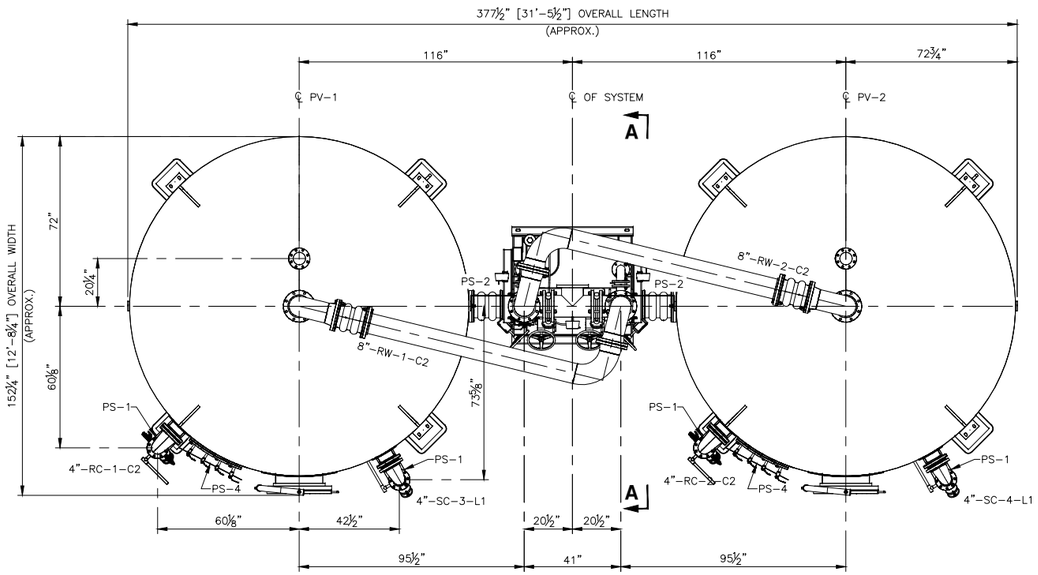

J83914-1 UDS Level 2 Report Final Repo


J79913-1 UDS Level 2 Report Final Repo

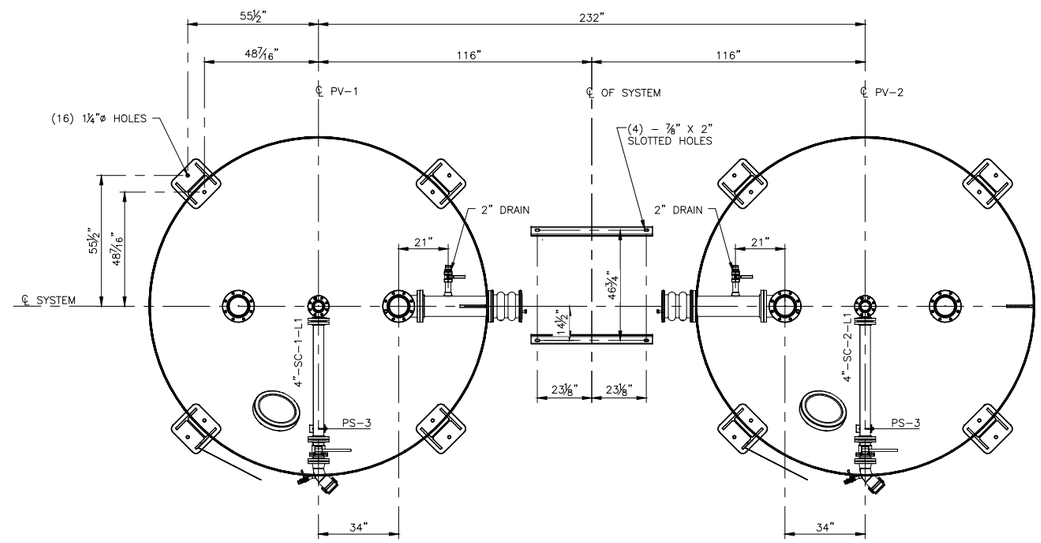

Pilot Data Rainbow Water District Final..

Attachment 4

Calgon Carbon Model 12-40 General Arrangement



PLAN



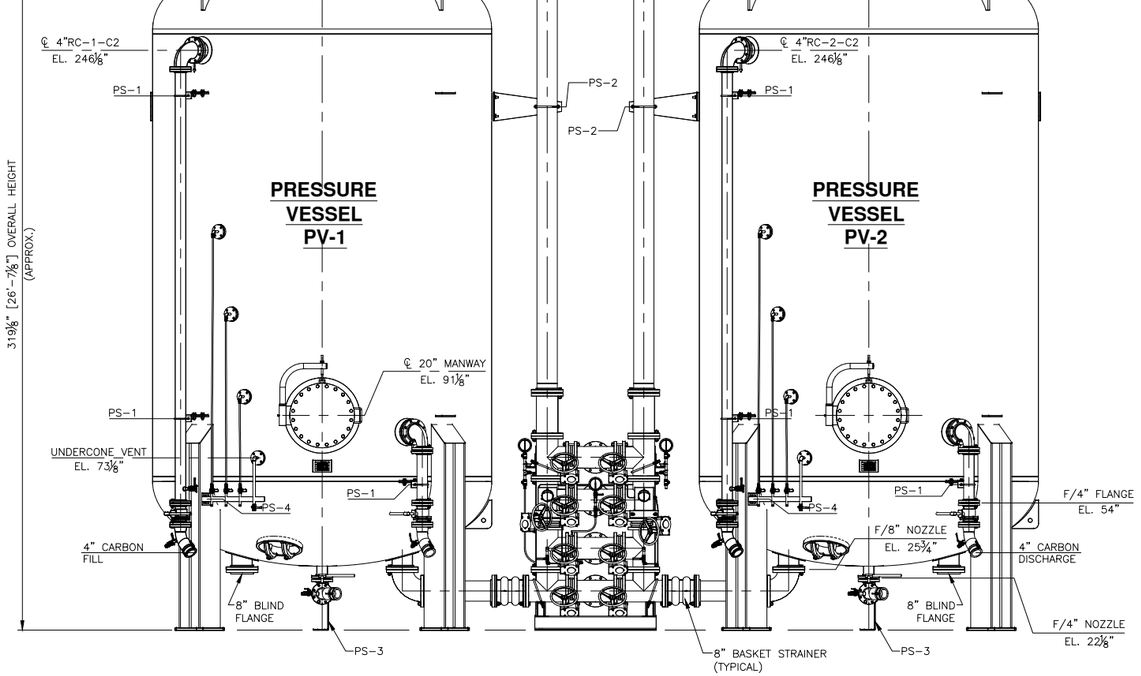
SYSTEM DATA	
DESIGN CONDITIONS	125 PSIG @ 140° F
DESIGN CODE	ASME SECTION VIII DIVISION1
APPROXIMATE WEIGHTS (LB.)	
VESSEL (EMPTY)	31,000
CARBON (PER VESSEL)	40,000
VESSEL (OPERATING)	191,000
SYSTEM (EMPTY)	69,000
SYSTEM (OPERATING)	391,000

PAINT INFORMATION

ITEM	MFG.	COLOR	SAMPLE
VESSEL	HEMPEL	GRAY	
PIPING	HEMPEL	GRAY	
SUPPORTS	HEMPEL	GRAY	

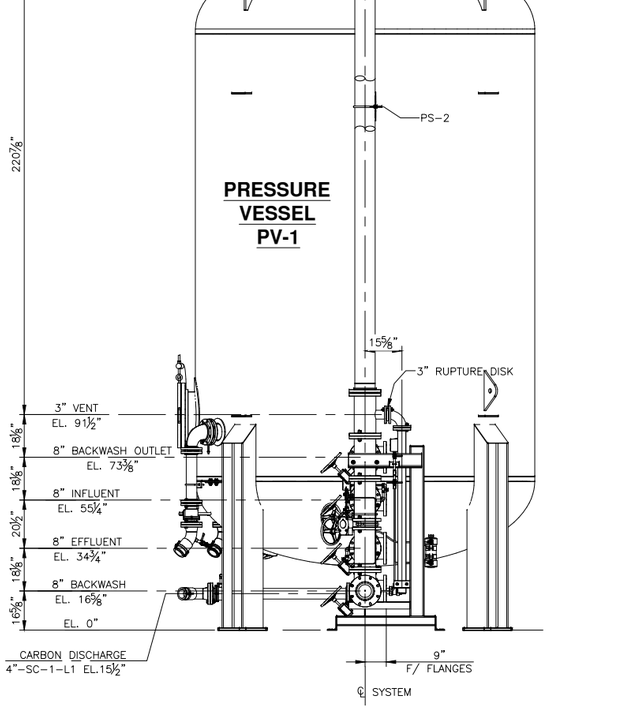
PIPE SUPPORT SCHEDULE

#	DRAWING NO.	DESCRIPTION	QTY.
PS-1	90160401	4" CARBON FILL 4" CARBON DISCHARGE (UPPER)	6
PS-2	90130162	8" INFLUENT	2
PS-3	90130158	4" CARBON DISCHARGE	2
PS-4	90170541	SAMPLE AND VENT	2

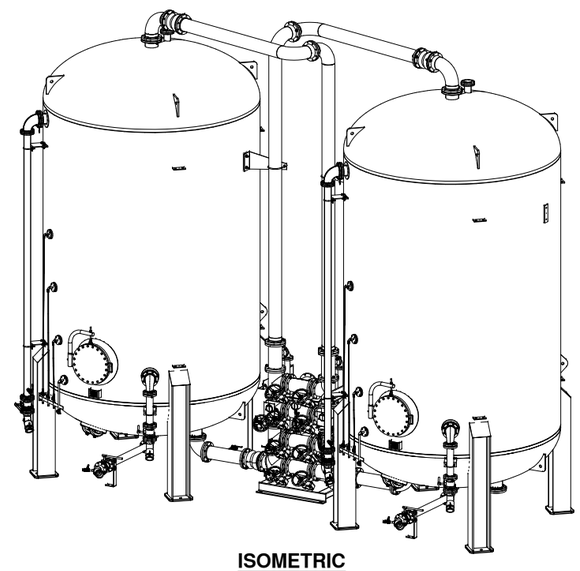


ELEVATION

LOWER PLAN



VIEW A-A



ISOMETRIC

REV	DESCRIPTION	APP	DATE
0	ISSUED FOR FABRICATION	RES	11/29/2022

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

NSF Certified to NSF/ANSI 61 & 372

	NAME	DATE
DRAFTER	JCB	10/4/2022
DESIGNER		
CHECKER	RES	11/29/2022
APPROVAL		
PROJECT No.	STANDARD	

CalgonCarbon — A Kuraray Company

CLIENT: STANDARD

TITLE: MODULAR ADSORBER SYSTEM
MODEL 12-40 DWC, 8" PIPING
GENERAL ARRANGEMENT

DWG. Size	SHEET No.	SCALE
D	1 OF 1	NONE

DWG. No. 90220764 REV. 0

V:\Products\Carbon\Model 12-40\General Arrangement\90220764 M12-40 DWC GA.dwg Nov 29, 2022 - 1:24pm

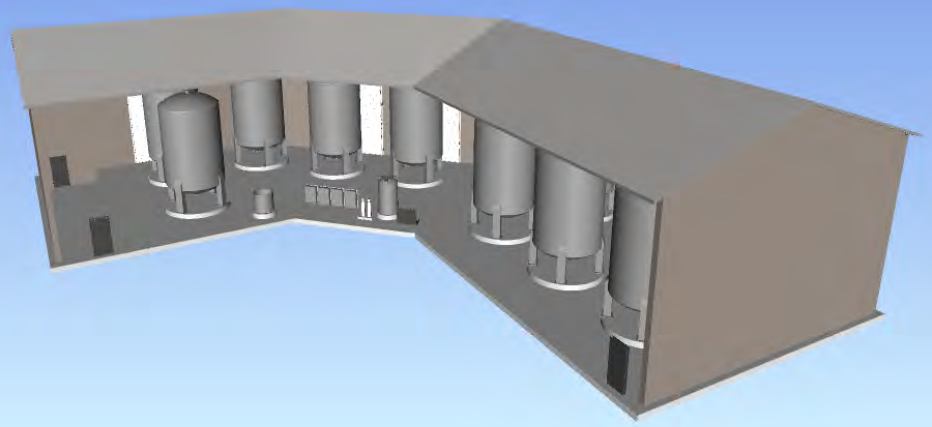
Attachment 5

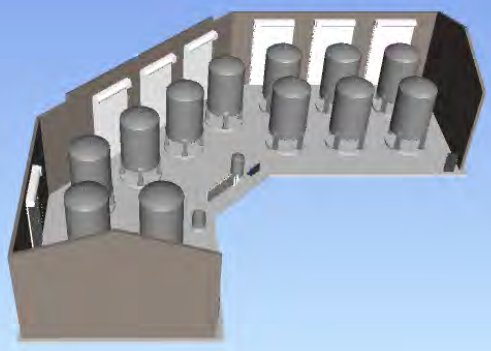
I-5 Wellfield/Sports Way Report

Springfield Utility Board

PFAS Treatment Feasibility Study

September 2023





Springfield Utility Board

Springfield Utility Board PFAS Treatment Feasibility Study Report

Stantec

Prepared for:
Springfield Utility Board

Prepared by:
Stantec

September 29, 2023

Revision	Description	Author	Quality Check	Independent Review
0	Internal Draft	Brian Rowbotham	Andrew Nishihara	Stephanie Elliott
1	Final Draft	Brian Rowbotham	Andrew Nishihara	N/A

Sign-off Sheet

This document entitled Springfield Utility Board PFAS Treatment Feasibility Study Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Springfield Utility Board (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by _____

(signature)

Brian Rowbotham

Reviewed by _____

(signature)

Stephanie Elliott

Approved by _____

(signature)

Andrew Nishihara

Approved by _____

(signature)

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
BV	Bed Volume
CCL	Contaminant Candidate List
CMU	Concrete Masonry Unit
DOC	Dissolved Organic Carbon
EBCT	Empty Bed Contact Time
EPA	Environmental Protection Agency
GAC	Granular Activated Carbon
GAL	Gallons
GPM	Gallons per Minute
HI	Hazard Index
HBWC	Health Based Water Concentrations
IX	Ion Exchange
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal

MG/L	Milligram per Liter
NOM	Natural Organic Material
NPDWR	National Primary Drinking Water Regulations
OSHG	On-site Hypochlorite Generation
PFC	Perfluorocarbons
PPB	Parts per Billion
PPD	Pounds per Day
PPT	Parts per Trillion
RCRA	Resource Conservation and Recovery Act
SUB	Springfield Utility Board
TOG	Total Organic Carbon
UCMR	Unregulated Contaminant Monitoring Rule

1.0 Introduction and Background

The Springfield Utility Board (SUB), located in Springfield, OR serves water to 60,000 plus water consumers. SUB water sources include surface water and groundwater. SUB has three groundwater wells, Sports Way Well, Southern Pacific (SP) Well, and Maia Well, with varying levels of Per- and Polyfluoroalkyl Substances (PFAS) contamination. A group of wells owned and operated by Rainbow Water District, that are adjacent to the Sports Way Well, also pump into SUB and RWD's distribution system and have PFAS contamination. Sports Way Well is located off Sports Way St. in the north part of Springfield, OR. The SP and Maia Wells are located on either side of OR-126 in the east part of Springfield, OR. The well locations, common header, and entry points are marked on the map below in **Figure 1**.

Figure 1: SUB Well location with PFAS Contamination

SUB is considering treatment for these four well sites because the Environmental Protection Agency (EPA) is proposing a new National Primary Drinking Water Regulation (NPDWR) to establish Maximum Contaminant Levels (MCL) and Maximum

Contaminant Level Goals (MCLG) for six identified PFAS in drinking water. **Table 1** presents the proposed MCLs for the six PFAS. Additional details on the proposed regulations are discussed in **Section 2.0**.

Table 1: EPA proposed MCLs and MCLGs for PFAS

Compound	Proposed MCLG	Proposed MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (ppt, also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFNA	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index
PFHxS		
PFBS		
HFPO-DA (Commonly referred to as GenX Chemicals)		

The three SUB wells have been sampled for PFAS compounds from 2019 through 2023 and their results are shown below in **Table 2**. Since the SP and Maia Wells can combine prior to reaching customers, their combined water was sampled, and their results are also included below.

Based on the sampling results, the SP Well has PFOA levels above the proposed MCL. At the combined header of the SP and Maia Wells, the PFOA level is still above the MCL, but once it reached the entry point the PFOA level was below the MCL but still above the MCLG. The other PFAS compounds found in the SP Well and Maia Well will not be regulated under the EPA's proposed MCL, but they were detected during sampling. The Sportsway Well has PFOS levels below the MCL, but above the MCLG. The entry point of the combined Sportsway/I5 also has levels of PFOS and PFOA, both below the MCL but above the MCLG.

Table 2: SP, Maia, and Sportsway Wells PFAS Results

Sample Location: SP Well						
	PFHpA	PFHxA	PFOA	PFBA	6:2 FTS	PFPeA
Max (ppt)	14	25	7.2	19	4.1	31
Average* (ppt)	10.8	19.6	6.0	15.3	3.5	26
Min (ppt)	7.7	14.1	4.5	13	ND	22
Sample Location: Maia Well						
	PFHxA	PFHpH	PFBA	PFPeA		
Max (ppt)	4.5	2.6	5.5	6.5		
Average* (ppt)	2.9	2.6	3.8	4.4		
Min (ppt)	ND	ND	ND	2.3		

Sample Location: SP/Maia Common Header (pre-chlorination)						
	PFHpA	PFHxA	PFOA			
Max (ppt)	8.5	15.4	4.7			
Average* (ppt)	6.7	10.1	4.1			
Min (ppt)	ND	2.5	ND			
Sample Location: SP/Maia Entry Point						
	PFHpA	PFHxA	PFOA	PFBA	PFPeA	
Max (ppt)	5.4	10	3.4	9.3	15	
Average* (ppt)	5.3	9.1	3.2	8.8	15	
Min (ppt)	5.3	8.1	3.0	8.2	15	
Sample Location: Sportsway Well						
	PFOS					
Max (ppt)	2.5					
Average* (ppt)	2.2					
Min (ppt)	ND					
Sample Location: Sportsway/I5 Entry Point						
	PFOS	PFOA				
Max (ppt)	2.3	2.2				
Average* (ppt)	2.3	2.2				
Min (ppt)	ND	ND				

*Average of detected values

Additional water quality parameters are shown below in **Figure 2** through **Figure 4** and **Table 3** from the most recent sampling event taking in June 2023. Results from the lab and field data for the water quality parameters indicate there will be no water quality challenges for PFAS treatment. The dissolved organic carbon (DOC) and total organic carbon (TOC) concentrations are very low, resulting in minimal fouling issues.

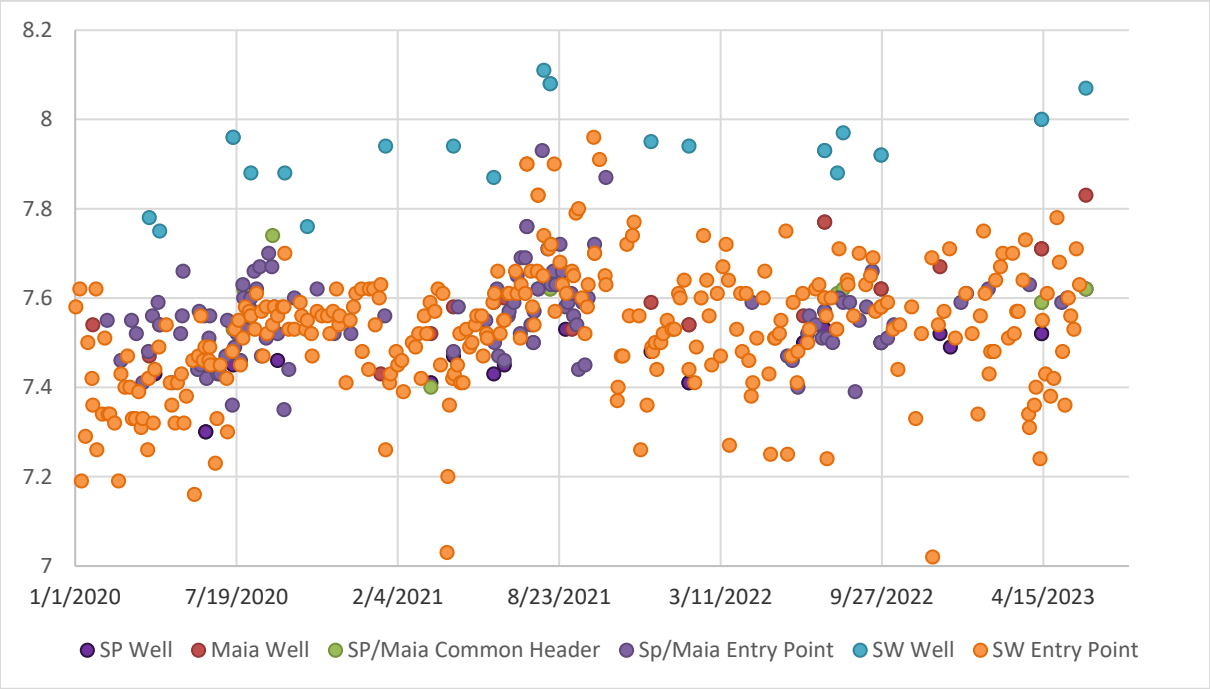


Figure 2: June 2023 Field pH Results

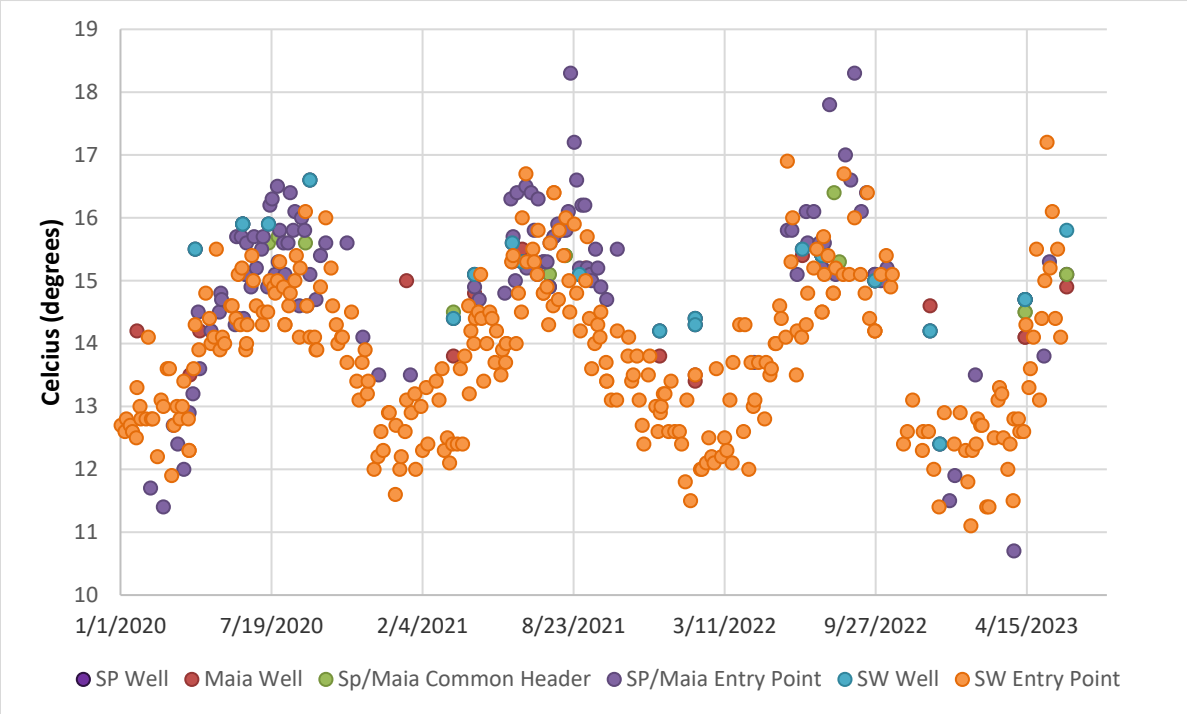


Figure 3: June 2023 Field Temperature Results

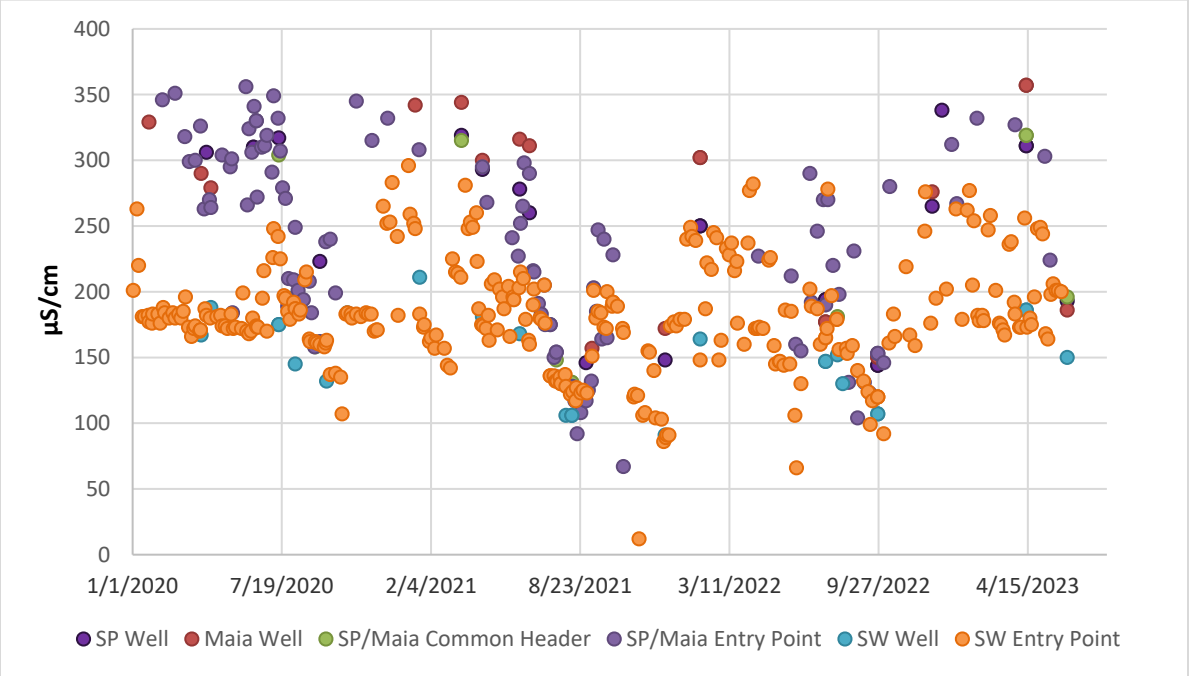


Figure 4: June 2023 Field Conductivity Results

Table 3: June 2023 Lab Results

	SP Well	Maia Well	SP/Maia Common Header	SW Well
Sulfide (mg/L)	ND	ND	ND	ND
Ammonia-N (mg/L)	ND	ND	ND	ND
Total Suspended Solids (mg/L)	< 10	< 10	< 10	< 10
Fluoride (mg/L)	0.053	< 0.05	< 0.05	< 0.05
Manganese (mg/L)	< 0.002	< 0.002	< 0.002	< 0.002
Arsenic (mg/L)	0.0011	0.003	0.00115	4.8
Sodium (mg/L)	11	15	12	14
Potassium (mg/L)	1.7	1.4	1.6	1.7
Magnesium (mg/L)	9.9	9.9	9.5	9.9
Iron (mg/L)	< 0.01	< 0.01	< 0.01	< 0.01
Sulfate (mg/L)	3	2.6	2.8	3.6
Nitrite-N (mg/L)	<0.05	<0.05	<0.05	<0.05

	SP Well	Maia Well	SP/Maia Common Header	SW Well
Nitrate (mg/L)	0.59	0.46	0.53	0.53
Chloride (mg/L)	7.3	6.2	6.7	3.2
Total Organic Carbon (mg/L)	0.19	0.11	0.18	< 0.1
Dissolved Organic Carbon (mg/L)	<0.1	<0.1	0.14	< 0.1
Calcium (mg/L)	18	15	17	13
Alkalinity (mg/L as CaCO3)	95	89	95	73
Bicarbonate Alkalinity (mg/L as CaCO3)	95	89	95	73
Carbonate Alkalinity (mg/L as CaCO3)	< 2	< 2	< 2	< 2

2.0 Regulatory Review

PFAS was first noticed in the 1970's when levels of PFAS were detected in the bloodstream of factory workers and by the 1990's PFAS was detected in the bloodstream of the general public. By 2002, 3M voluntarily phased out manufacturing of C8 PFAS with final completion in 2008. Along a parallel timeline, the EPA issued significant new rules under the toxic substances control act related to PFAS. In 2006 the EPA started PFOA Stewardship Program, and eight major manufacturers committed to reducing PFOA and other C8 precursors through emission and product content. It was reported that 95% reduction was achieved by 2011, with manufacturer elimination by 2015.

Between 2009 and 2012 the EPA placed six of the most commonly detected PFAS on the Contaminant Candidate List (CCL) and then on the Unregulated Contaminant Monitoring Rule (UCMR) 3 for mandatory testing. For UCMR 3, all applicable public water utilities were required to test for 21 List 1 contaminants during a 12-month period from January 2013 through December 2015, including PFOS, PFOA, PFNA, PFHpA, PFHxS, and PFBS. A provisional health advisory was set for PFOA and PFOS to 0.2 parts per billion (ppb) and 0.4 ppb respectively.

In 2015 the agency for toxic substance and disease registry updated the toxicological profile for PFAS. As the PFOS and PFOA human half-life is 5-8 years, and as they can have negative reproductive, developmental, liver, kidney, and immunological impacts, in 2016 the combined health advisory limit of PFOS and PFOA was set at 0.07 ppb. By

2019, 16 states had enforcement or guidance limits and by 2021 the number of states with independent enforcement or guidance limits grew to 26.

UCMR 5 was established in December 2021 to establish nationwide monitoring for 29 PFAS and lithium drinking water. All drinking water systems serving more than 3,300 people are to participate in the UCMR and sample for the chemical contaminants between 2023 and 2025. UCMR 5 provides critically needed data to improve the EPA's understanding of the 29 PFAS compounds in the drinking water.

In March 2023, the EPA announced the proposed NPDWR to establish MCLs and MCLGs for six PFAS including PFOA, PFOS, PFNA, HFPO-DA, PFHxS, and PFBS. The proposed MCLs and MCLGs are shown in **Table 1**. For PFOA and PFOS, the MCL is 4 ppt. For the other four contaminants the EPA is using a hazard index (HI). HI calculations are based on Health Based Water Concentrations (HBWC). HBWC is the concentration under which there are no anticipate negative health effects expected for each contaminant. The HI is calculated using the equation below. The HI is calculated as a running average of the course of a year. A HI greater than 1.0 would exceed the proposed MCL and require treatment to reduce the PFAS should the rule be promulgated.

$$\frac{Genx}{10\ ppt} + \frac{PFBS}{2000\ ppt} + \frac{PFNA}{10\ ppt} + \frac{PFHxS}{9\ ppt} = Hazard\ Index\ Value$$

After the announcement of the proposed regulation the EPA requested public comment on the proposed NPDWR and the public comment period ended on May 30, 2023. The EPA received 120,000 comments at the close of the comment period. Should the NPDWR be finalized states, territories, and tribes are required to submit a revised program to the EPA for approval within two years or can request an extension of up to two years in certain circumstances. For the states, territories, and tribes to be approved for a program revision they are required adopt revisions at least as stringent as the NPDWR.

3.0 Treatment Alternative Analysis

SUB is considering GAC and IX for PFAS treatment at their contaminated wells. Both are common methods of treating PFAS contaminated drinking water.

3.1 GAC Media Overview

GAC is a commonly used media in drinking water treatment, typically used to adsorb natural organic matter (NOM), taste and odor compounds, volatile organic compounds, and synthetic organic compounds from water. GAC has also been shown to be very effective for PFAS removal. Activated carbon is an effective adsorbent because it is a

highly porous material. Adsorption onto GAC is achieved by leveraging the large surface area inherent with granules of GAC, which provide surface area for PFAS to sorb onto. The hydrophobic (water fearing) tail portion of PFAS molecules are attracted to the GAC surfaces with a resultant physical interaction. Stronger interaction occurs with longer chain PFAS compounds. GAC media can be manufactured from bituminous coal, lignite coal, peat, wood, and coconut shells, however coal-based GAC is typically used for PFAS removal. There are several manufacturers that have GAC media available for PFAS removal.

The selection of GAC media is site-specific and requires testing. Treatment efficiency is impacted by influent water parameters, such as manganese and iron concentrations, and pretreatment is sometimes required to achieve desired water quality parameters.

Stantec has found that GAC treatment can be effective for up to 99% PFAS removal. A 99% removal of PFAS contaminants via GAC treatment could achieve finished water concentrations well below the proposed MCLs for SUB. It is expected that this treatment technology would be able to bring PFAS concentrations to non-detectable levels with proper design based on pilot study outcomes.

3.1.1 Technology Providers

Several technology providers for GAC vessels, media, and media support services are available in the Pacific Northwest region of the United States. The list below includes major providers of this technology:

- TIGG Adsorption Systems by Newterra can provide granular activated carbon media, vessels, and media system management including on-site exchange and off-site disposal services.
- AqueoUS Vets can provide granular activated carbon media, vessels, and media system management including on-site media exchange services.
- Evoqua Water Technologies (Desotec) offers granular activated carbon media, vessels, and media exchange services.
- Calgon Carbon (Kuraray) can provide granular activated carbon media, vessels, and media management services.

3.1.2 Typical Technology Footprint and Layout

PFAS treatment in drinking water using adsorptive media is typically designed with vessels in a lead/lag configuration (series). The lead/lag terminology means that raw water flows in series through a vertical pressure filter vessel (also referred to as a contactor) to a lag vessel. This process provides redundancy in treatment and operational flexibility. The effluent from the lead vessel is sampled regularly to monitor

concentrations of PFAS. If PFAS concentrations rise to a predetermined threshold the operator coordinates the exchange of media in the lead vessel.

Excess PFAS in the effluent stream from the lead vessel will be captured by the lag vessel. Upon completing the exchange of media in the lead vessel the piping system serving the vessels is valved to reverse the flow such that the lag vessel becomes lead, and the newly exchanged vessel becomes the lag. Refer to **Figure 5** below for an illustration of lead-lag flow. By conducting treatment in this manner, the utility can maximize the capacity of each vessel's media over time while ensuring redundancy and compliance with desired water quality standards.

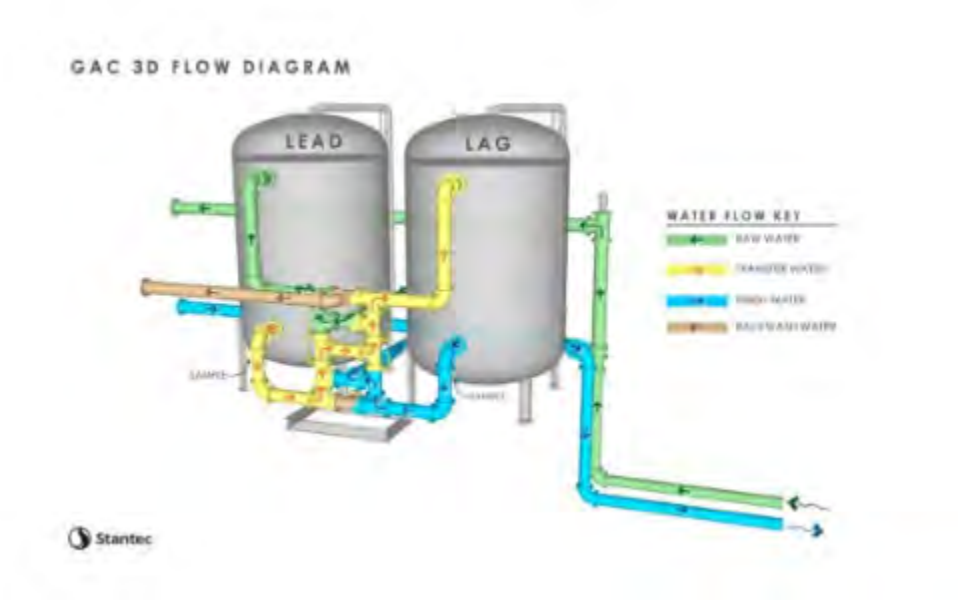


Figure 5: Lead/Lag Schematic

3.1.3 Ability to be Accommodated within Existing Infrastructure and Site Considerations

Among other things, sample tap placement, chlorination injection point placement, and piping reconfigurations would have to be considered for the installation of GAC vessels. GAC media is capable of adsorbing residual chlorine. Due to chlorine and PFAS potentially competing for sorption sites on the GAC media, dechlorination upstream of the GAC vessels should be considered as a method to extend the life of the media. Whether or not dechlorination takes place prior to GAC treatment, a chlorination feed injection point downstream of the GAC vessels would likely be necessary to provide an adequate chlorine residual throughout the distribution system. Sample taps upstream and downstream of each GAC unit would also be recommended to allow sufficient water quality monitoring. In addition, the decision to treat all or a portion of the flow would

impact the amount of floor space required. Various configurations should be evaluated for the existing infrastructure and site constraints.

3.1.4 Technology Operational and Maintenance Requirements

The following operational and maintenance parameters must be considered with GAC technology:

- Empty Bed Contact Time (EBCT)
- Bed Volumes to Breakthrough
- Finished water quality goals
- Treatment residuals (i.e., rinse and backwash waste) management

EBCT is a design parameter to determine the amount of time the water being treated is in contact with the granular activated carbon. EBCT is calculated by dividing the volume of the empty bed by the influent flow rate:

$$EBCT = \frac{Vf}{Q}$$

Where Vf = volume of GAC media (including porosity volume), ft3

Q = flow rate to GAC vessel, ft^3/hr

Generally, an EBCT of at least 10 minutes is recommended and shown to be effective for the removal of PFAS via GAC technology.

Breakthrough is defined as when the contaminants in the GAC effluent exceed the required treatment target. When breakthrough is approaching. A bench-scale or pilot-scale test can help project when breakthrough would occur for a specific water source and contaminant along with the likely required media replacement frequency. Backwash waste management is required for GAC technology and can be supported with backwash holding tanks with eventual disposal to sewers.

Media replacement, based on specific operational parameters, will be necessary (regeneration is not currently an option for PFAS).

3.1.5 Pilot Study Results

Accelerated piloting was performed on the SP Well using both Granulated Activated Carbon (GAC) and PFAS-Selective Ion Exchange (IX) Media from Purolite. A final pilot report was completed in February 2022. Based on the results of the piloting, the breakthrough for GAC is expected at 45,000 bed volumes (BV), which relates to 10

months at a flowrate of 1,800 gallons per minute (gpm) and 24/7 operation and the GAC consumption rate is expected to be about 2,800 cubic feet (ft^3)per year or 95,000 pounds (lbs) per year. The breakthrough for IX is expected at 500,000 BV, which relates to 1.8 years at a flowrate of 1,800 gpm and 24/7 operation and the IX consumption rate is expected to 250 ft^3 per year or 11,000 lbs per year.

The GAC pilot system was sized as shown in **Table 4**. The GAC pilot ran for one month and related to about 489 BV and breakthrough was not observed. The GAC pilot column was run on average about two hours a day, which is typical to the full-scale operation. The results of the pilot study indicated GAC breakthrough is expected around 45,000 BV as a generous guess. If the operation of the well and treatment system was run 24/7, breakthrough is expected to occur after 0.85 years. At two hours of operation a day, the same set of lead vessels would last 10 years. Although it is unusual to keep a media running in the field for 10 to 20 years.

Table 4: GAC Pilot Unit Sizing from Table 4 of the Final Pilot Report

Design Parameters		Full Scale	Pilot			
		11.6 min EBCT	2 min EBCT	4 min EBCT	6 min EBCT	8 min EBCT
Flow Rate	gpm	1,800	0.330	0.330	0.330	0.330
Number of Trains		4	1	1	1	1
Vessel Diameter	feet	12	0.33	0.33	0.33	0.33
Flow per Vessel	gpm	450	0.330	0.330	0.330	0.330
Media Volume per vessel	cubic feet	700	0.089	0.178	0.267	0.356
liters of resin for pilot	liters		2.523	5.045	7.568	10.090
Vessel Area	square feet	113	0.087	0.087	0.087	0.087
Bed Depth	feet	6.2	1.02	2.04	3.06	4.1
Linear Velocity	gpm/ft2	4.0	3.8	3.8	3.8	3.8
Specific Flow Rate	gpm/ft3	0.6	3.7	1.9	1.2	0.9
EBCT	minutes	11.6	2.0	4.0	6.1	8.1
Projected throughput	BV	45,000	45,000	45,000	45,000	45,000
Days between exchanges	days	364	63	126	189	252
Gallons projected per run	Million gallons	801.1				

3.2 Ion Exchange (IX) Overview

With IX resins, positively charged anionic particles attract the negative charges of the hydrophilic functional heads of PFAS molecules. The charge on the IX media attracts and orients the charged portion of the PFAS molecules to the surface of the hydrophilic resin. The saturated resin is replaced by new resin. Saturated resin is incinerated or disposed of by other means.

In comparison to GAC, IX can offer some key advantages:

- IX media has been shown to outperform GAC media for PFAS removal in some waters, resulting in a longer time until breakthrough and media replacement.
- IX media requires a significantly smaller EBCT, resulting in less media required for treatment which may ultimately result in lower disposal costs.
- The IX vessels occupy a smaller footprint than GAC vessels, with lower pressure requirements and energy usage.

The selection of IX resin is site-specific and requires testing. Treatment efficiency is impacted by influent water parameters, such as manganese and iron. The rate of exchange is impacted by influent water characteristics and may require pretreatment. IX removal of PFAS varies depending on the parameters of the influent water, type of IX resin used, and dimensions of the resin bed. Removal rates can range from 77% to 97% for PFOA, from 90 to 99% for PFOS, and from 57% to 99% for other forms of PFAS. Based on Stantec's prior experience with PFAS pilot testing, it is expected that IX treatment could achieve non-detectable concentrations for PFAS contaminants for SUB’s groundwater supplies.

3.2.1 Available IX Products and Technology Providers

There are several available IX products for PFAS treatment, which can be comprised of different materials, namely, macroporous or gel. The following manufacturers and technology providers offer a variety of IX resins, vessels, and media management services:

- Purolite
- Dupont Water Solutions
- LanXess
- Evoqua

3.2.2 Typical Technology Footprint and Layout

IX filters can be arranged in a series (lead-lag) configuration or parallel configuration; however, the series configuration is most appropriate for PFAS removal. In series, the lead (primary) filter removes the larger portion of PFAS. The lag (secondary) filter then further treats the effluent from the lead filter and can be switched to the lead position once the water quality of the effluent from the original lead filter is no longer providing the desired treatment outcomes.

Due to IX filters' particular sensitivity to the contaminants of influent, the primary filter could be GAC, followed by an IX filter. Pilot studies have shown significant reduction in resin fouling and improved PFAS removal in this configuration. Depending on water quality characteristics and desired treatment outcomes, this configuration could be considered.

Generally, IX filters are smaller than GAC, both in terms of required height and footprint, due to the fact that IX requires a shorter EBCT, typically from 2 to 5 minutes. The depth and diameter of the IX vessel is determined by the required EBCT, with consideration of adequate freeboard above media bed.

3.2.3 Ability to be accommodated within Existing Infrastructure and Site Considerations

Among other things, sample tap placement and piping reconfigurations would have to be considered for the installation of IX vessels. A chlorination feed injection point downstream of the IX vessels would likely be necessary to provide an adequate chlorine residual throughout the distribution system. Sample taps upstream and downstream of each IX unit would also be recommended to allow sufficient water quality monitoring. In addition, the decision to treat all or a portion of the flow would impact the amount of floor space required. Various configurations should be evaluated for the existing infrastructure and site constraints.

3.2.4 Technology Operational and Maintenance Requirements

Traditionally, IX resin could be regenerated, however due to the difficulty of destroying PFAS contaminants, regeneration is not currently possible in drinking water applications. Spent resin must be destroyed and incineration is currently the most common disposal method. Treatment residuals created through rinsing, media installation, or backwashing must be disposed of in an appropriate manner, which currently is typically through the sewer.

Oxidizing agents commonly used for water treatment, such as chlorine, can irreversibly damage IX resin. While macroporous IX resins are now commercially available for PFAS treatment applications, which may be better suited to withstand raw water containing chlorine (i.e., CalRes 2301), damaged or deformed resins due to oxidant contact will reduce overall performance of the IX filters and can result in harmful byproducts or poor effluent quality. Therefore, preventative measures upstream of IX vessels are recommended, and may include GAC, ultraviolet radiation, or pretreatment with a reducing agent.

Backwashing is relatively infrequent for IX for PFAS removal. Effluent from backwashing must be disposed of properly. Backwashing is conducted to remove built up material and redistribute resins. It is possible that backwashing of IX media will only be required

during the installation of media. Throughout the course of operations, it may be determined that resin requires backwashing during normal operations as a means to improve treatment efficiency.

3.2.5 Pilot Study Results

In addition to the GAC pilot, an IX media pilot column was also analyzed over the same duration and the same source water as the GAC pilot test. The IX pilot system was sized as shown in **Table 5**. The IX pilot ran for one month and related to about 10,820 BV and breakthrough was not observed. The IX pilot column was run on average about 2-3 hours a day, which is typical to the full-scale operation. The results of the pilot study indicated IX breakthrough is expected around 500,000 BV. If the operation of the well and treatment system was run 24/7, breakthrough is expected to occur after 1.8 years. At 2 hours of operation a day, the same set of lead vessels would last 22 years. Although it is unusual to keep a media running in the field for 10 to 20 years.

Table 5: IX Pilot Unit Sizing from Table 3 of the Final Pilot Report

Design Parameters		Full Scale	2 min EBCT	15 second EBCT
Flow Rate	gpm	1,800	0.330	0.330
Number of Trains		1	1	1
Vessel Diameter	feet	12	0	0.163
Flow per Vessel	gpm	1800	0.330	0.330
Media Volume per vessel	cubic feet	480	0.088	0.011
Liters of resin for pilot	liters		2.499	0.312
Vessel Area	square feet	113	0.021	0.021
Bed Depth	feet	4.2	4.2	0.526
Linear Velocity	gpm/ft2	15.9	15.7	15.75
Specific Flow Rate	gpm/ft3	3.8	3.7	29.92
EBCT		2 min	2 min	15 sec
Projected throughput	BV	925,000	925,000	575,000
Days to breakthrough of 2 ppt PFOA	days	1281	1285	100
Gallons projected per run	Million gallons	1,795.2		

3.3 Technology Recommendation

The following criteria was used in evaluation of a technology recommendation for the PFAS treatment systems:

- Operational ease and familiarity

- Flexibility in future for retrofitting of system for a different media type
- Historical track record of proven treatment

SUB owns and operates an existing GAC treatment system and is familiar with the media change out process, backwashing, and required maintenance needs and costs but does not have experience with IX media vessels. GAC pressure vessels can be retrofitted in the future to use IX media if the proper underdrain system is specified. However, IX systems require a smaller media volume to achieve the same EBCT and therefore if an IX system is installed initially, will be insufficient for GAC treatment unless vessels are added. Installing GAC initially gives SUB the flexibility in the future to modify the system to use IX or a combination of both media in the future. Lastly, GAC has been used for many years for treatment of PFAS and many other emerging contaminants.

For these considerations GAC is recommended as the preferred treatment technology and is reflected in the design drawings/design criteria presented in section 5 of this report.

4.0 Waste Disposal Analysis

The GAC or IX media will need to be replaced once the water quality sampling results indicates the PFAS concentration with each system has increased to approximately 50% of influent levels because it is assumed the lead vessel is exhausted. It is anticipated that 50% of the IX or GAC total inventory should be replaced approximately halfway through the complete replacement cycle.

To remove the exhausted GAC or IX media, a specialty contractor will be required to remove the GAC as a slurry using a vacuum truck connected to a vessel. The tank internals may be inspected while empty via the manways provided with the tank. The replacement GAC will be pumped in as a slurry by a top entry pipe.

The current, most-common methods of disposal for exhausted GAC or IX media include:

- Landfilling
- High-Temperature Incineration
- Media Reactivation (for GAC only)

4.1 Landfilling

Landfilling is an acceptable method of disposing of exhausted GAC or IX, but the requirements and type of landfill depend on how the GAC or IX is classified. Landfills

which receive municipal solid waste may not be willing or able to accept certain types of GAC, because of the presence of contaminants. Oregon Health Authority (OHA) should be consulted about landfilling options once the agency has made a determination on whether the exhausted GAC or IX media is classified as a non-Resource Conversation and Recovery Act (RCRA) waste.

Initial information reconnaissance produced these concepts for landfilling:

- Haul GAC or IX media to a landfill
- Transport GAC or IX media to a landfill in Oregon, which is willing/able to accept it

The primary concern about landfilling the exhausted GAC or IX media appears to be whether it will leach organics or other contaminants, and then re-contaminate the groundwater. A lined landfill would reduce/eliminate those concerns. However, it is still not clear whether perfluorocarbons (PFCs) will “leach” out of the GAC or IX media within an un-lined landfill environment.

Columbia Ridge Landfill (Subtitle D) In Arlington, OR, may accept exhausted GAC or IX media but no other landfills are known.

4.2 High-Temperature Incineration

Based on initial discussions incineration will have a higher transportation and handling cost than landfilling; one of the closest approved incineration facilities is located in Utah. This facility is owned and operated by OIT, and they currently incinerate bulk loads of GAC from various industries including: Arctic Living, Tesoro, and Petrostar.

4.3 Media Regeneration

Reactivation of GAC is a proven which can be less expensive than purchasing virgin replacement GAC and then disposing of the exhausted GAC. Reactivation of IX media is not a viable option, so media regeneration only refers to disposal of GAC. The exhausted media is shipped by the Owner to a licensed reactivation facility and then the reactivated media is returned to the Owner. Since the high-temperature regeneration process causes some of the GAC to be “lost”, a certain amount of virgin GAC needs to be added to the reactivated media to return the same volume as was shipped.

The viability of this method depends on the type of GAC used, the cost of replacement GAC, the frequency and volume of GAC replacements, shipping costs, and disposal options/costs. OHA may also have to approve this “disposal” method since the reactivated media will be used to treat drinking water. Reactivation of GAC is often limited to “large” installations which are located within a few hundred miles of a reactivation facility. Therefore, regenerating GAC from the SUB wells may not be cost-

effective due to the relatively-small amount of media and the long distance required for shipping. There are no known NSF-approved GAC reactivation facilities in Oregon and the closest known facility is located in Gila Bend, AZ.

Calgon is a major producer of coal-based GAC and also owns/operates GAC regeneration facilities. They have two facilities that are fully permitted to accept RCRA hazardous waste and they are located in Catlettsburg, KY and Pittsburg, PA.

Based on this initial analysis, regeneration of GAC may be worth consideration by SUB, if coal-based GAC is selected for use and depending on whether Calgon is selected as the GAC supplier. The decision on which type of GAC to use will be made after the GAC System Supplier is selected. Stantec suggests receiving bids for both types of GAC, as part of the GAC System Supplier selection process.

One major influencing factor will be the exhaustion rate of the two types of GAC. If it is determined that one type of GAC will last longer than the other before exhaustion, then this might be more of a deciding factor than whether regeneration can be considered.

4.4 Recommendations

The selected disposal method may be influenced by the type of GAC to be used, the GAC supplier, the cost of the initial GAC load, and subsequent replacement GAC costs. Therefore, **it is recommended that the SUB wait until after the GAC System Supplier and GAC media has been selected by the Construction Contractor before proceeding further with detailed comparisons of disposal alternatives**.

Of the three GAC disposal methods currently available to SUB, it is believed that the most-reliable and cost-effective method would be local disposal of GAC or IX media to Columbia Ridge Landfill, assuming they will accept it and OHA will give their approval. This method minimizes the need to transport GAC or IX media out of Oregon. It will be good for SUB to have multiple disposal options available for future consideration. Consideration of a GAC regeneration approach may also be worth investigating if GAC is the selected media, once better costs for the disposal options are known and once the type and supplier of GAC has been determined.

If transporting the exhausted GAC to a remote location is to be considered further (for landfilling, incineration or disposal), it may be worth considering methods to reduce the water content prior to shipping, to reduce the weight and transport costs. The weight of wet GAC is approximately 25% greater than the weight of dry GAC.

5.0 Design Criteria and System Layouts

Treatment for both I-5 wells (owned and operated by Rainbow Water District) and Sports Way well will occur at the existing Sports Way site. Flow from the two well sites combine in the existing 24" diameter detention line. The detention line will be tapped just downstream of the mixing point and combined flow will be sent to the new treatment facility. Treatment for Maia and SP wells will occur at one site near the SP well. Combined flow will be sent from the existing 48" detention line to the new treatment facility. Flow rates of the two proposed treatment facilities are summarized below in **Table 6**.

Table 6. Flow Rate Summary

Design Parameter	Value	
Facility	Sports Way/I-5	SP/Maia
System Flow (gpm)	5,150	1,800
PFAS target (mg/L)	Non-detect	Non-detect

The proposed treatment systems will consist of pressurized GAC contact vessels in a lead/lag configuration housed in a concrete masonry unit (CMU) building. SUB has indicated the desire for redundancy in contact vessels and onsite hypochlorite generation systems in case of failure of any system components. These extra vessels could be eliminated in future design phases to reduce costs and building footprints. The proposed contactor units have the ability to be converted to IX in the future if desired to increase system capacity within the existing treatment footprint. Design criteria for the proposed treatment system is shown below in **Table 7**. Process Flow Diagrams for both systems are found on the following pages.

Table 7. GAC System Design Criteria

Design Parameter	Value	
Facility	Sports Way/I-5	SP/Maia
Type	Pressure Contactor	Pressure Contactor
Media	GAC	GAC
Number of Trains	6	3
Number of Contactors/Train	2	2
Design Flow/Train (gpm) – Total/Firm	858/1,030	600/900
Contactor Diameter (ft)	12	12
Media Weight, Dry (lb)	40,000	40,000
Liquid Loading Rate (gpm/sf) – Total/firm	9.1/7.6	8.0/5.3
Empty Bed Contact Time		

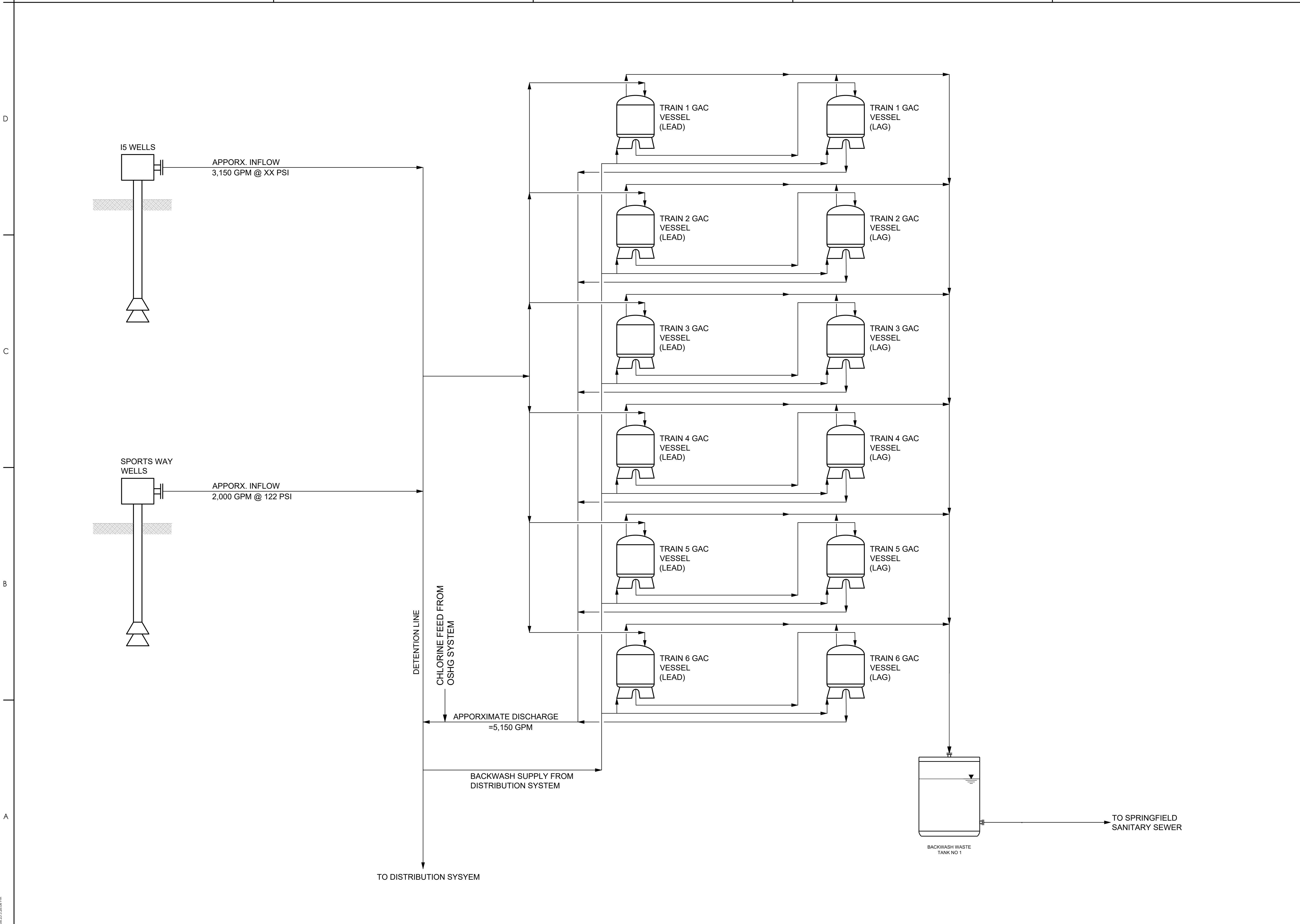
Lead Vessel (min)	10	10
Lag Vessel (min)	10	10
Total EBCT Per Train (min)	20	20
Total Headloss	8.5/11	5.5/9.5
Backwash Superficial Velocity (gpm/sf)	10	10
Backwash Flow Rate Per Contactor (gpm)	1,127	1,127
Minimum Bed Expansion During Backwash (%)	30	30
Backwash Duration (min)	15	15
Backwash Waste Volume/contactor (gal)	17,000	17,000
Backwash Storage Tank Size (gal)	25,000	25,000
Material of Construction	Steel	Steel
Diameter (ft)	15	15
Height (ft)	30	30

Flow from the treatment system will be routed from the existing wellhead, through the proposed treatment systems, and back into the distribution system. A hydraulic analysis was performed based on the discharge pressures found in the pump testing reports provided by SUB, proposed piping for the new treatment systems, and the typical head loss generated by the GAC media systems to confirm booster pumping is not needed. At the design flow rates approximately 8-10 psi of pressure loss is generated by the new treatment systems and associated piping. The discharge pressures, system head loss and anticipated system pressures are presented below in Table 8.

Table 8. System Pressures

Pressure	Value	
Facility	Sports Way/I-5	SP/Maia
Discharge pressure (psi)	122	110
System head loss (psi)	10	8
Anticipated distribution pressure (psi)	112	102
Required distribution system pressure (psi)	100	92

Based on this analysis booster pumping will not be required for the new system. A more detailed hydraulic analysis should be performed after property acquisition, treatment building locations and other details are established to confirm the lack of need for booster pumping found in this initial hydraulic analysis.



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Client/Project
SPRINGFIELD UTILITY BOARD
MCKENZIE RIVER WATER SUPPLY
SPRINGFIELD OREGON

Project No.: 2002006101
File Name: 01G-01
Scale:

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Title
FIGURE-6
SPORTS WAY/I-5
TREATMENT FACILITY PFD

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01G-01

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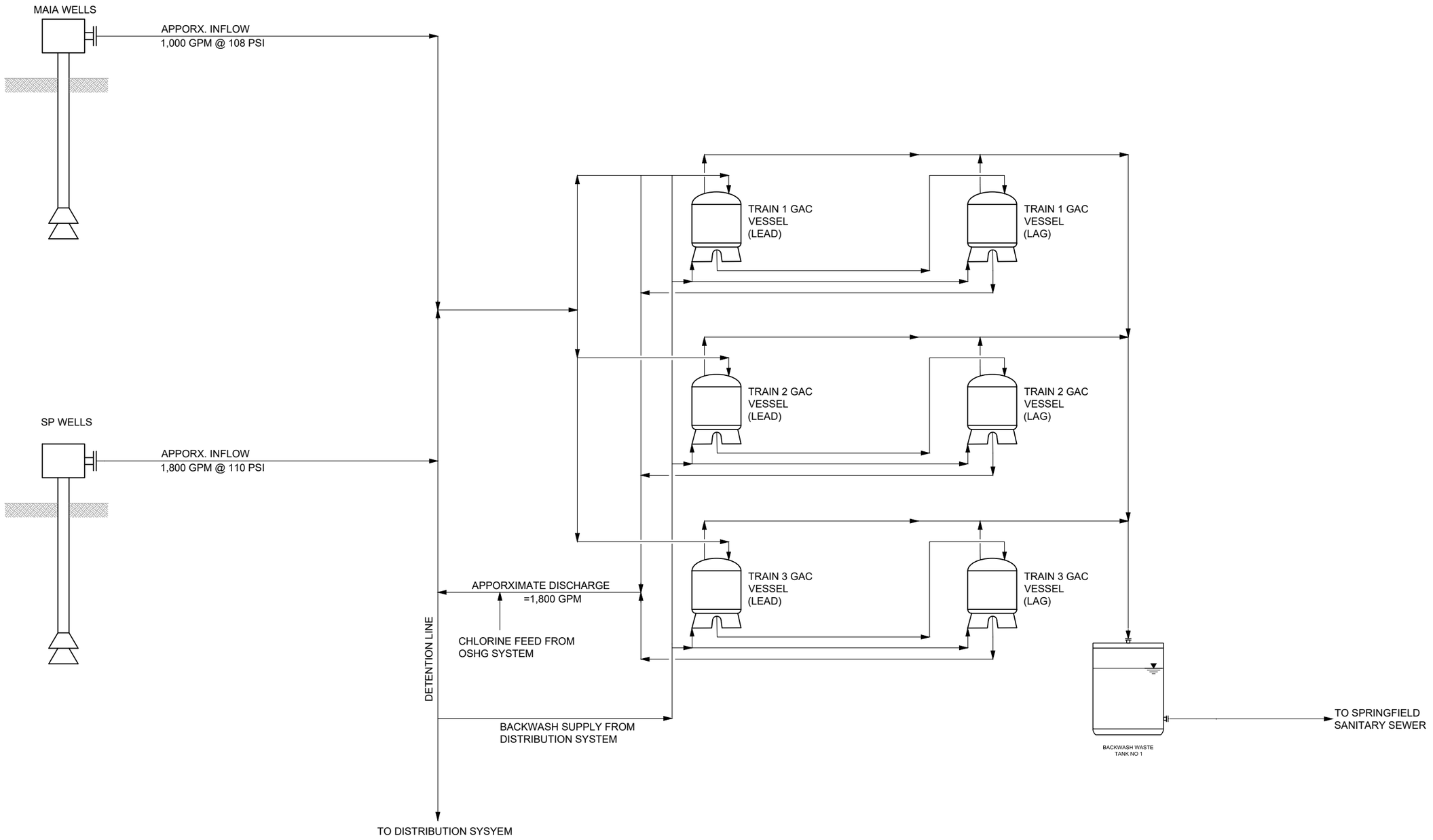

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Title
FIGURE-7
SP/MAIA TREATMENT FACILITY PFD

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01G-02

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The existing well sites provide disinfection by gaseous chlorine. Although these systems are still functional, they are located in populated areas and serve as a safety hazard in case of a cylinder leak or failure. Chlorine shortages in recent years have also highlighted a vulnerability in resiliency for many systems. To eliminate safety hazards and increase system resiliency SUB would like to convert from gaseous chlorine to on-site hypochlorite generation (OSHG) where readily available salt and water is combined to form a brine solution and an electrical current is passed through creating a solution of 0.8% sodium hypochlorite which can be used for disinfection. OSHG systems will be located at each of the two proposed treatment facilities and their design criteria is summarized below in **Table 9**.

Chlorine contact time (CT) is achieved by both sites through use of large diameter detention lines. Currently at the I-5/Sports Way facilities, chlorine is dosed at each well site. In the future chlorine for both I-5 and Sports Way wells will be injected at the Sports Way site, decreasing the CT for the I-5 wells. The CT strategy should be discussed with OHA once the treatment location and piping arrangements have been finalized during detailed design. At SP/Maia the treatment system will need to pull combined water somewhere downstream of the current entry point to the detention line and significantly alter the chlorine contact time. A new detention line may be required and the exact strategy for maintaining chlorine contact time will be determined after SUB has determined property acquisition and location of the new treatment system.

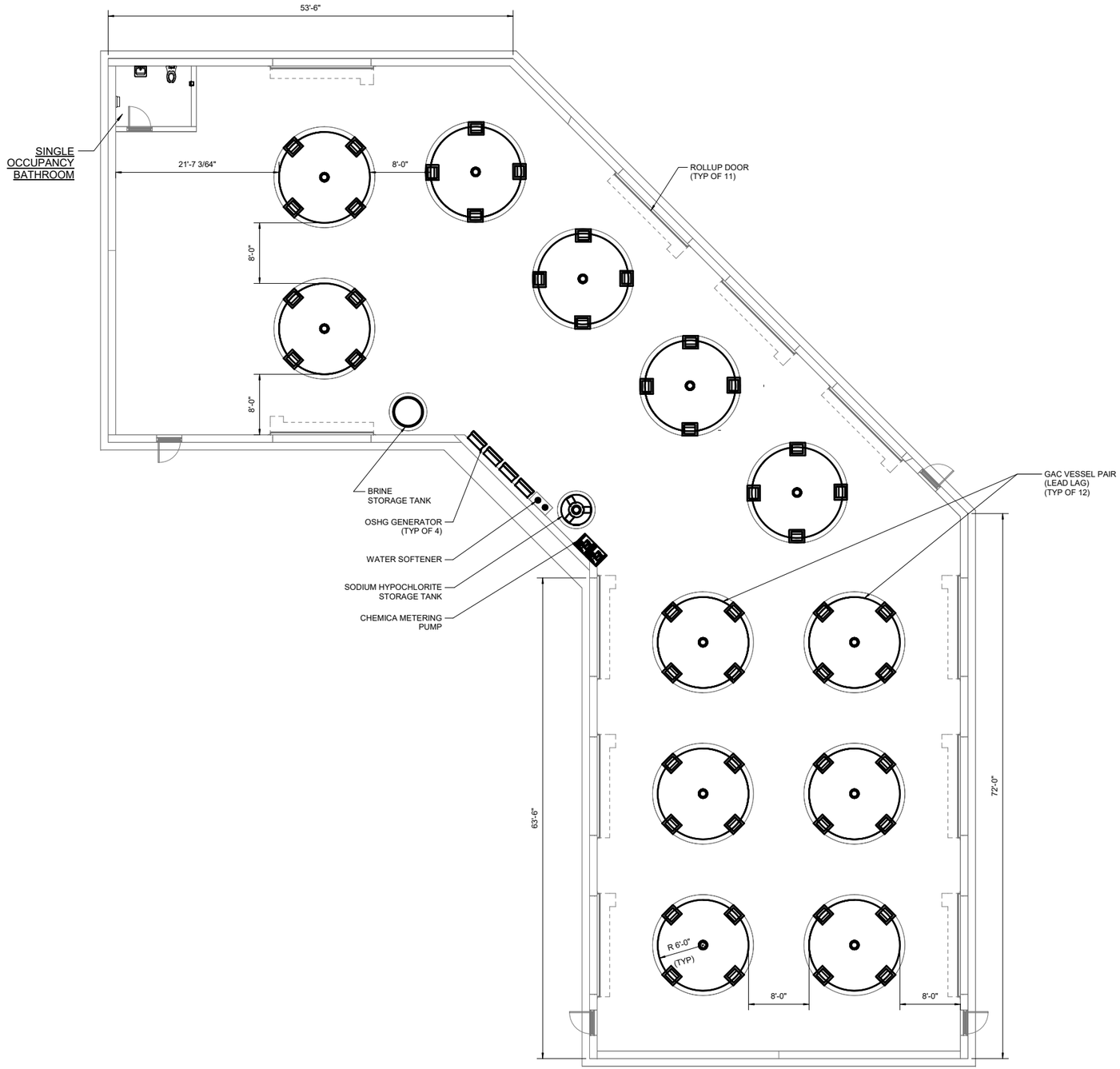
Table 9. Sodium Hypochlorite Generation Design Criteria

Design Parameter	Value	
Facility	Sports Way/I-5	SP/Maia
Average chlorine dose (mg/L)	0.65	0.65
Average chlorine use (ppd)	42	15
Salt Use (ppd)	126	45
Number of OSHG units	4	2
Capacity (ppd) – Total/firm	80/60	40/20
Max dose at max flow (mg/L)	1.23	1.75
0.8% Sodium Hypochlorite Storage Tank Volume (gal)	615	300
Brine Tank Volume (gal)	370	100
Brine Tank Salt Storage (days)	22	54

SUB operates a GAC treatment system for treatment of other contaminants. Due to its outdoor location and inclement weather the contact vessels have had to be repainted and repaired several times due to corrosion. The outdoor location of these contactors also poses difficulty for operations staff. Operations staff will need to visit and monitor the new facilities daily. To remedy these issues the proposed treatment systems will be located in CMU-block buildings which also house a unisex bathroom, and the OSHG

system for each facility. Layouts of these two proposed facilities and building isometrics are shown below in Figures 7 and 8. Rollup doors are located in front of all contact vessels in case of the need to remove/replace in the future and to also make replacement of the GAC media easy in the future.

The building layout and shape at Sports Way/I-5 has been optimized to best fit on the constrained site. SUB is currently in the process of inquiring about the acquisition of additional property to house these facilities. Land purchase costs are not included in this report and the building footprints are assumed to work with existing property owned by SUB.



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SPORTS WAY PLAN

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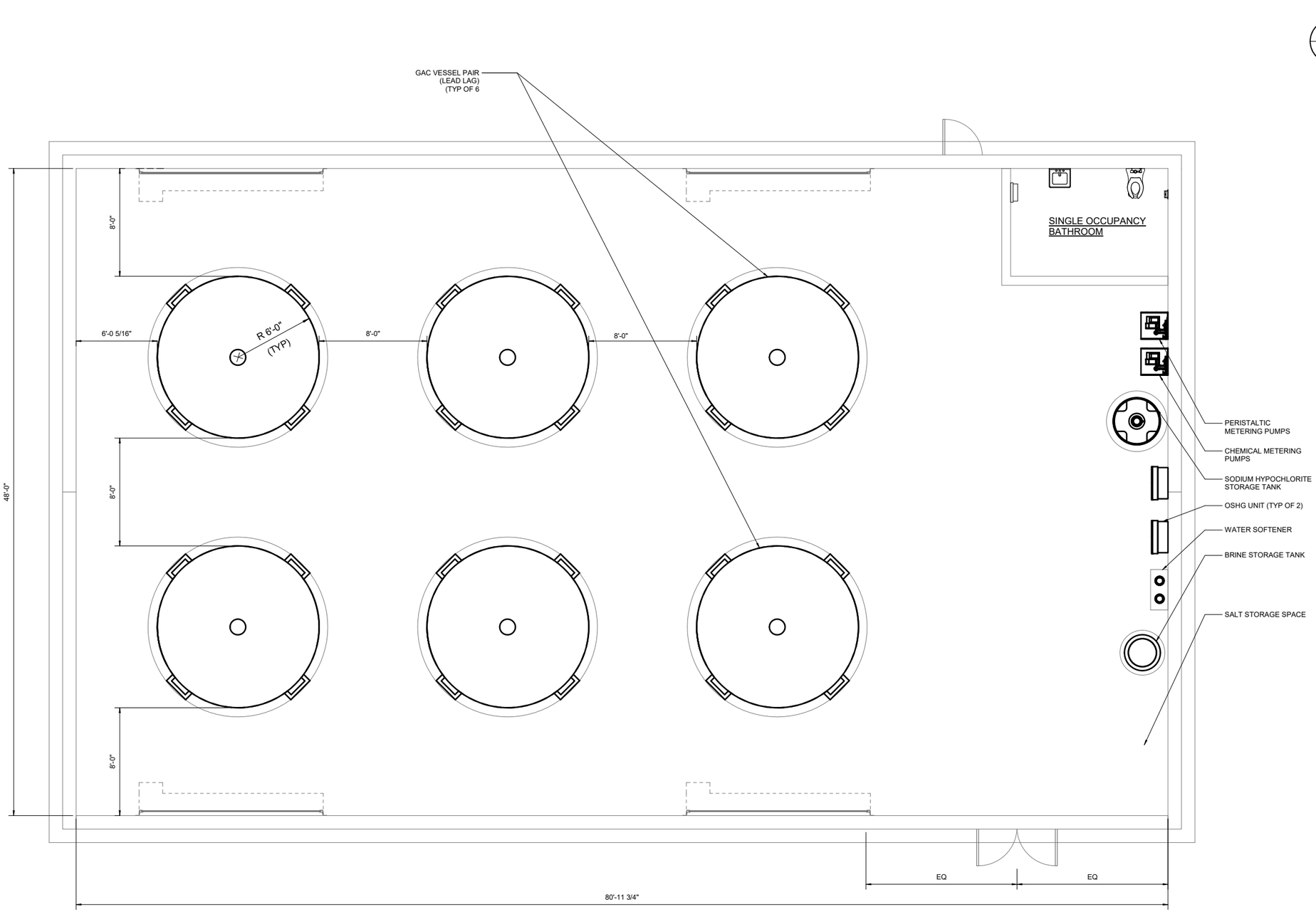

PLAN

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SP MAIA PLAN

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6.0 Construction Cost Estimate

A cost estimate was prepared based on the preliminary layouts and site plans discussed with SUB. The cost estimate is Class 5 in accordance with Association for the Advancement of Cost Engineering (AACE) guidelines. Typically, for a Class 5 estimate, engineering is only advanced to a conceptual level and the estimate provides expected accuracy of -50 to +100%. Equipment costs were provided for several vendors for the GAC vessels/media and OSHG equipment. The preliminary cost estimates for each site are shown below in **Table 10**. A detailed estimate including assumptions and included details can be found in **Appendix A**.

Table 10. OPCC

Cost Estimate		
	Sports Way/I-5	**SP/Maia**
Building Structure	$4,381,673	$2,310,650
GAC Filter System	$8,311,650	$3,411,008
OSHG System	$360,504	$292,393
Site Work	$783,932	$1,718,756
Sub-Total	**$13,458,125**	**$7,732,806**
General Conditions	$603,810	
General Allowances	$142,616	
Electrical Power and Control Equipment	$222,459	
All Sites Construction Subtotal(1)	**$21,570,465**	
Design and Construction Engineering	$4,314,113	
Land Acquisition	$2,000,000(2)	
Project Total	**$27,884,578**	

(1) Construction subtotal includes contingency
(2) Land acquisition costs provided by SUB

7.0 Funding Sources

Many government funding and financing programs have been designed to support the unique funding needs of public water utilities and municipalities. Recognizing what municipal and water utilities need, the loans may offer flexible repayment terms to allow for more gradual rate increases and maturities that more accurately reflect the asset life of water infrastructure. Grant programs are designed to channel funding to disadvantaged communities with acute and urgent infrastructure needs.

Funding Sources
September 29, 2023

Representatives from government funding and financing programs offer assistance to identify and line up funding and financing.

However, these same government programs can have cumbersome and lengthy application cycles. With competitive programs, there is no guarantee application efforts will result in capital for the project. Also, if an applicant is successful, recipients of State and Federal grants or loans must agree to reporting and compliance requirements. Depending on the location and project, these can add significant costs – costs that might outweigh the benefits of lower rates, longer and more flexible terms, and grant funding. Though the Oregon Drinking Water State Revolving Fund does not, certain revolving loan programs available through state or federal agencies can charge administrative fees for managing the programs while the loan is outstanding, making the effective interest rates similar to what a municipality could achieve if they are a higher rated bond issuer.

A list of potential project funding programs is presented in **Table 11**.

Table 11. Potential Funding Programs

Program	**Administrator/s**
Drinking Water State Revolving Fund (DWSRF)	Oregon Health Authority (OHA) Oregon Infrastructure Finance Authority (IFA)
Water Infrastructure Finance and Innovation Act (WIFIA)	Environmental Protection Agency (EPA)
Pre-Disaster Mitigation Grant Program (PDM) and Building Resilient Infrastructure and Communities (BRIC)	Oregon Office of Emergency Management (OEM) (Applicant) Federal Emergency Management Agency (FEMA)
Public Works Program	U.S. Economic Development Agency (EDA)
Special Public Works Program	Business Oregon IFA
Water Wastewater Program	Business Oregon IFA

Emerging Contaminants (EC) in Small or Disadvantaged Communities Grant (SDC)	Oregon Health Authority (OHA) Business Oregon IFA Environmental Protection Agency (EPA)

As this project progresses to its next phase, these programs can be investigated further with SUB's funding lead for applicability, requirements, and timing.

8.0 Recommendations and Next Steps

SUB should continue with their application for BIL funds through submitting a letter of interest to Business Oregon for Safe Drinking Water Revolving Loan Funds by the September 15th date discussed in project meetings. There is also still a large amount of uncertainty in the final EPA MCL that is projected to be released in 2024. Stantec recommends waiting on that final ruling before proceeding with procuring equipment or advancing design phases.

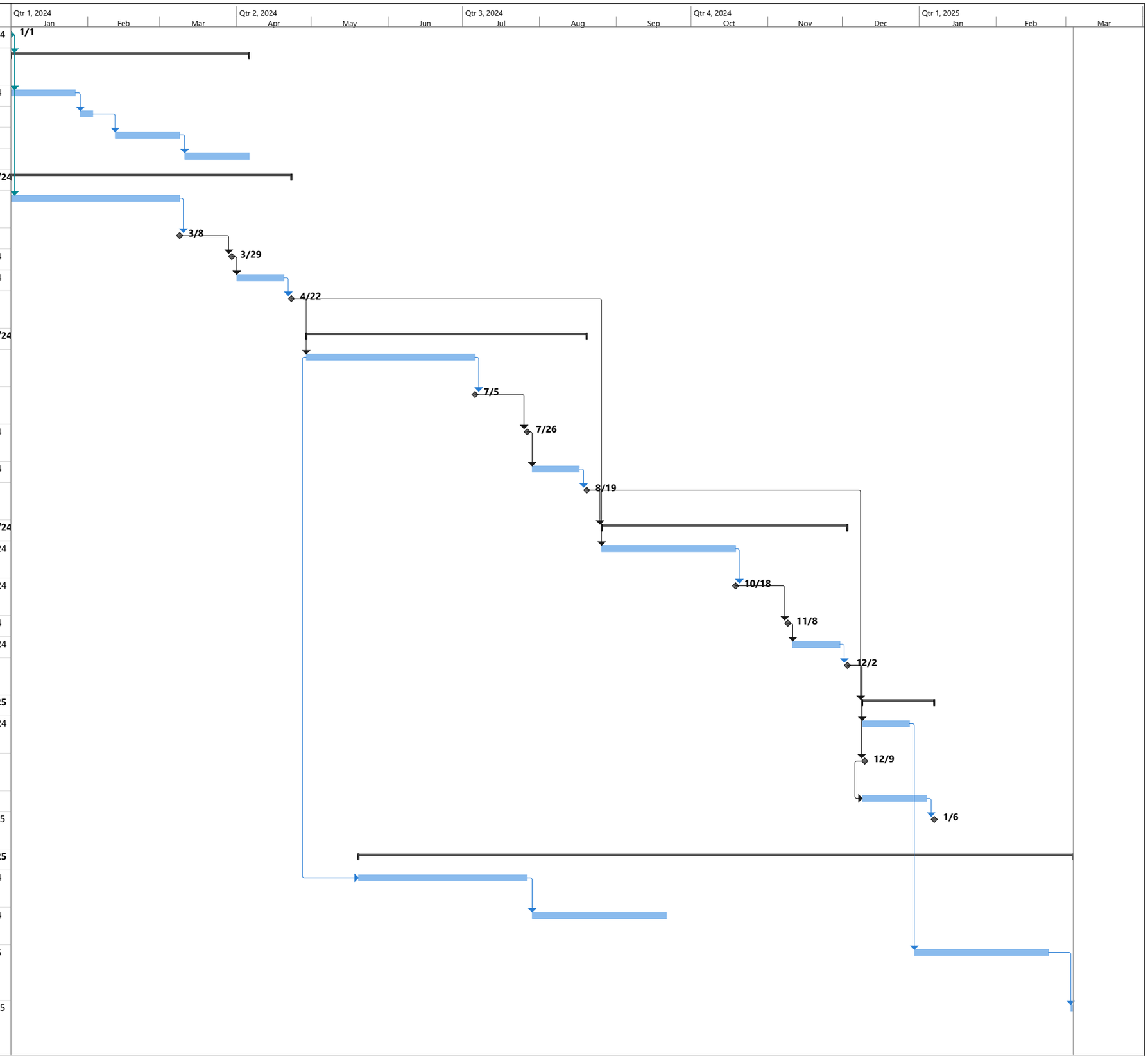
After a funding determination has been made an evaluation of the projected costs against available funding should be undertaken to ensure the project elements included in this report can be constructed with available funds and identify any other funding sources that may help secure construction of the project.

After final design has been initiated pre-purchasing pressure vessels and media is recommended to secure equipment that may be in high demand with the recent rulings.

9.0 Draft Design Schedule

A draft design schedule is presented below in Figure 10 that assumes a notice to proceed of January 1st, 2024. A key feature of the schedule below is bidding of the filter equipment during the 60% design phase to ensure manufacturing and delivering of the equipment does not delay construction and startup of the proposed facilities.

ID	Task Mode	Task Name	Duration	Start	Finish
1		Notice to Proceed	0 days	Mon 1/1/24	Mon 1/1/24
2		**Geotechnical Investigation**	**70 days**	**Mon 1/1/24**	**Fri 4/5/24**
3		Review Existing Dat	20 days	Mon 1/1/24	Fri 1/26/24
4		Drilling	5 days	Mon 1/29/24	Fri 2/2/24
5		Lab Analysis	20 days	Mon 2/12/24	Fri 3/8/24
6		Report	20 days	Mon 3/11/24	Fri 4/5/24
7		**30% Design**	**81 days**	**Mon 1/1/24**	**Mon 4/22/24**
8		30% Design Development	50 days	Mon 1/1/24	Fri 3/8/24
9		30% Design Workshop	0 days	Fri 3/8/24	Fri 3/8/24
10		30% Submittal to S	0 days	Fri 3/29/24	Fri 3/29/24
11		30% Review by SUB	15 days	Mon 4/1/24	Fri 4/19/24
12		30% Comments Workshop	0 days	Mon 4/22/24	Mon 4/22/24
13		**60% Design**	**81 days**	**Mon 4/29/24**	**Mon 8/19/24**
14		60% Design Development	50 days	Mon 4/29/24	Fri 7/5/24
15		60% Design Workshop	0 days	Fri 7/5/24	Fri 7/5/24
16		60% Submittal to SUB	0 days	Fri 7/26/24	Fri 7/26/24
17		60% Review by SUB	15 days	Mon 7/29/24	Fri 8/16/24
18		60% Comments Workshop	0 days	Mon 8/19/24	Mon 8/19/24
19		**90% Design**	**71 days**	**Mon 8/26/24**	**Mon 12/2/24**
20		90% Design Development	40 days	Mon 8/26/24	Fri 10/18/24
21		90% Design Workshop	0 days	Fri 10/18/24	Fri 10/18/24
22		90% Submittal to S	0 days	Fri 11/8/24	Fri 11/8/24
23		90% Review by SUB	15 days	Mon 11/11/2	Fri 11/29/24
24		90% Comments Workshop	0 days	Mon 12/2/24	Mon 12/2/24
25		**100% Design**	**21 days**	**Mon 12/9/24**	**Mon 1/6/25**
26		100% Design Development	15 days	Mon 12/9/24	Fri 12/27/24
27		Building Permit Package	0 days	Mon 12/9/24	Mon 12/9/24
28		Building Permit Rev	20 days	Mon 12/9/24	Fri 1/3/25
29		Issued For Construction Package	0 days	Mon 1/6/25	Mon 1/6/25
30		**Bidding**	**206 days?**	**Mon 5/20/24**	**Mon 3/3/25**
31		Bid and Award: Filter Equipment	50 days?	Mon 5/20/24	Fri 7/26/24
32		Filter Equipment Shop Drawings	40 days?	Mon 7/29/24	Fri 9/20/24
33		Bid and Award: Construction General Contractor	40 days?	Mon 12/30/24	Fri 2/21/25
34		Assign Treatment Equipment Contracts to General	1 day?	Mon 3/3/25	Mon 3/3/25



Project: Final Design Schedule
Date: Fri 8/18/23

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

Appendix A - OPCC

OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Overview

Project	**Springfield Utility Board PFAS Treatment Facilities**			*Job Number*	2002003165	*Estimate Total*	**$21,571,000**
Location	Springfield, OR			*Task Number*	Task 02	*Accuracy Range*	**-20% to +30%**
Overview	Sports Way & SP Maia facilities for PFAS treatment			*Submittal Date*	25-Aug-23	*Prime Contractor*	GENERAL CONTRACTOR as GC
Contact	Brian Rowbotham	*Avg Flow-MGD*	NA	*Prepared By*	Jim Ward	*Project Bid & Delivery*	BID/BUILD without Preconstruction
Phone	(503) 207-4369	*Max Flow-MGD*	NA	*Version #*	001	*Construction Duration*	VARIES BY WBS ITEM

OPCC Model Philosophy & Methodology

*This proprietary model, developed on an Excel platform, is a tool utilized for preparing class 4-5 OPCC estimates, and follows the principles involved with conceptual estimating as well as the general estimating guidelines developed within Stantec. The absence of both mature design deliverables and a comprehensive scope identity typically encountered early in a project design effort has driven the establishment of this model, which continues to provide historically reliable and surprisingly detailed cost estimates. This is accomplished through a "BASIS-OF-ESTIMATE" and "FORCED DETAIL" methodology which builds an initial foundation of the primary "estimatable" scope items. After generating this "go-by" basis of work, the model internally produces baseline costs through application of cost-analyses and parametric functions, manipulation of historical & equipment size/capacity data, and traditional unit-cost methodologies using definable values of quantity, count, dimensions, service, productivity, and/or end-use. These bare costs are then further "conditionalized" & "localized" based upon a combination of both perceived and known conditions involving the site location, site conditions, scope specifics, material selections, and likely risk issues, all of which are selected from dropdowns within the "ASSUMPTIONS" section heading each division of work. The subsequent direct costs are initially established for the three primary installation elements of labor **(MH$)**, construction materials/consumables & construction equipment **(M&CE$)**, and major engineered/procured equipment **(EQ$)**, and are summarized into a work breakdown structure (WBS) for adjustment with select/anticipated burdens & mark-ups for the Subcontractor(s) and Prime Contractor, and final Estimator add-ons for contingency & escalation. All miscellaneous supporting costs for completing the estimate are also included, with this valuation based upon years of observed and proven ratios and percentages.*

Glossary of Potential OPCC Output Sheets

Sheet Name	Purpose/Description
OPCC BASIS-OF-ESTIMATE CHECKLIST	Matrix identifying the primary OPCC scope & project delivery issues, including an indication of initial responsibility and inclusion
OPCC BASIS-OF-ESTIMATE	Clarifications and/or exceptions related specifically to the project scope and perceived issues
OPCC ESTIMATE & MODEL CLARIFICATIONS	Clarifications and/or exceptions related specifically to the OPCC model and related estimating issues
OPCC LABOR RATE STANDARDS	Development of the DIV manhour rates per the indicated source of initial base and fringe trade rates adjusted then for work schedule
OPCC COMMODITY STANDARDS	Construction commodity items listing with costs currently utilized in the OPCC model and based on monthly updates from ENR
WBS ITEM COST OVERVIEW	Report presenting the OPCC WBS items fully allocated with Prime Contractor, Estimator Gross Adjustments, and all other cost burdens
OPCC SUMMARY	Report identifying the specifics on how the cost build-up occurs from Installing Contractor's direct cost to Owner's final cost-of-work
WBS COST DISTRIBUTION & BUILD-UP	Report presenting the detail by both WBS and CSI division on the build-up from Contractor's direct cost to Owner's final cost-of-work
WBS MANHOURS DISTRIBUTION	Report presenting the installing Contractor's estimated final installation manhours by both WBS and CSI division
PRELIMINARY CONSTRUCTION SCHEDULE	Basic bar-chart presentations of the WBS line items, one with projections of cashflow and construction manpower loading
INSTALLATION OVERVIEW	Development of the construction baseline standards, assumptions, and localizing factors, including a roll-up of the DIV worksheets
DIV 1s (01) PRIME CONTRACTOR STAFF	Development of the anticipated Prime Contractor supervisory staff labor, travel/living needs, and camp costs (where applicable)
DIV 1g (01) GENERAL CONDITIONS	Development of the anticipated general conditions needs and tradesmen camp costs (where applicable)
DIV 1p (01) PASS-THRU COSTS	Development of the anticipated pass-through (i.e. unburdened) costs such as rental, operating, and supply/install quotes
DIV 2c (02 & 31-35) COMMON SITEWORK	Development of the "common" (i.e. self-performed) site/civil construction items by type, dimension, & quantity
DIV 2s (02 & 31-35) SPECIALTY SITEWORK	Development of the "specialty" (i.e. subcontracted) site/civil construction items by type, dimension, & quantity
DIV 2w (33) WELL WORK	Development of the subcontracted well construction items by type, dimension, & quantity
DIV 3 (03) CONCRETE	Development of the cast-in-place concrete construction items by type, dimension, & quantity, along with CY, and tons of rebar
DIV 4 (04) MASONRY	Development of the masonry building systems which include built-in allowances for doors, windows, & misc openings
DIV 5 (05) METALS	Development of the miscellaneous metal items by type, dimension, quantity, and tons
DIVS 3 & 5-8 (03 & 05-08) BUILDINGS	Development of steel & specialty building systems which include built-in allowances for doors, windows, & misc openings
DIVS 7-10 (07-10) COATINGS & FINISHES	Development of the field-applied coatings & finishes by type, dimension, & quantity, along with SF
DIV 13f (33) FIELD-ERECTED TANKS	Development of the field-erected metal tanks & components by type, dimension, & quantity, along with tons, SF, and gallons
DIV 13s (33) SHOP-FABRICATED TANKS	Development of the shop-fabricated metal tanks & components by type, dimension, & quantity, along with tons, and gallons
DIVS 11i-15i (21-23) MECHANICAL INSTALLATION	Development of the mechanical installation work by parametrics, dimension, & quantity data
DIV 16i (25-28 & 33) ELECTRICAL INSTALLATION	Development of the electrical installation by parametrics, dimension, & quantity data
DIVS 16e (25-28 & 33) ELECTRICAL EQUIPMENT	Development of the electrical equipment including switchboards, MCC's, transformers, gensets, control panels, & process controls
WBS CONNECTED ELECTRICAL LOADS	Report presenting the WBS-level and connected amperage & KVA loads per the voltage selected, along with forecast of actual load
MISCELLANEOUS CALCULATORS	Collection of quick models for sizing pipe & wire/conduit, along with install data for wire, bus duct, vent duct, PE pipe, & lagoons
EXCAVATION CALCULATOR	Model for calculating specific earthwork quantities from defined structural and trench excavation scope in either US or metric
REBAR CALCULATOR	Model for calculating specific quantities of concrete & rebar from defined structural design data in either US or metric
DIVS 11-16 (40-45) PROCESS EQUIPMENT	Development via a P&ID of the project process & mechanical equipment breakdown with all related items by size/capacity & quantity
BUILDING COST INDEXES	Both historical and future cost indexes used by the Navy for forecasting escalation, and provides guidance for OPCC estimates

OPCC BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Version	Date	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	001	25-Aug-23	2002003165

Basis-of-Estimate Items

NOTE: Item numbers in brown font indicate an auto-fill checkmark and/or variable text that adjusts with selection(s) made in other OPCC sheets

#	Work Scope & Estimate Content	*OPCC Status* INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
1	*This OPCC version # 001 replaces all previous estimate versions in their entirety for this specific project and/or scope*	✓		
2	*Estimator review of the project site and/or work area, either via a physical walk-through or photographic/video records*			✓
3	*Class 4 Opinion-of-Probable-Operating-Cost (OPOC) estimate with operating & maintenance forecasts*	✓		
4	*July 2023 RS Means Construction Cost Indexes for Eugene, OR utilized to baseline material & install cost trends*	✓		
5	*July 2023 ENR Construction Economics data utilized to baseline select commodity costs*	✓		
6	*2023 RSMeans Construction Labor Rates publication for Eugene, OR utilized to baseline labor costs*	✓		
7	*20% ESTIMATE contingency for potential issues related to Estimator judgements, take-offs, omissions, etc.*	✓		
8	*10% SCOPE contingency for potential growth related to design changes, Owner preferences, regulatory issues, etc.*	✓		
9	*Construction estimated to start August 2023 with February 2024 mid-point and completion in August 2024*	✓		
10	*0.73% GENERAL escalation to mid-point of construction established per APR's assigned to MH, M&CE, & EQ costs*	✓		
11	*1% SPECIAL escalation as a one-time lump sum escalation adjustment for updating the MH, M&CE, & EQ database costs*	✓		
12	*Taxes, including (but not limted to) sales, gross-receipts, professional, use, and/or Value-Added*			✓
13	*General Conditions allowances in DIV 1 for work reasonably anticipated but not currently quantifiable*	✓		
14	*Allowances in DIVS 2-16 for the work that can be reasonably anticipated but not currently quantifiable*	✓		
15	*Allowance for future inflation*		✓	
16	*Duties, tariffs, and/or import & export fees including any related expenses*			✓
17	*Commissions and/or royalties including any related expenses*			✓
18	*Liquidated damages including any related expenses*			✓
19	*Prime Contractor to be GENERAL CONTRACTOR as GC*	✓		
20	*Prime Contractor solicited, bid, & contracted based upon BID/BUILD without Preconstruction*	✓		
21	*Prime Contractor to pre-plan work sequencing, equipment pre-purchase, and/or early site mobilization as needed*			✓
22	*Prime Contractor to provide staff (re: DIV 1) for the project management & construction oversight needs*	✓		
23	*Prime Contractor to self-perform select construction work and/or equipment procurement scope*	✓		
24	*Prime Contractor to provide Construction Manager-at-Risk (i.e. CMAR) services*			✓
25	*Prime Contractor to provide Guaranteed Maximum Pricing (i.e. GMP)*			✓
26	*Prime Contractor to have direct contractual & reporting responsibilities to OWNER or OWNER'S Rep*	✓		
27	*Prime Contractor to provide a safety program including management, training, reporting, & mitigation responsibilities*	✓		
28	*Prime Contractor to provide a QA/QC program including testing, inspecting, reporting, & mitigation responsibilities*	✓		
29	*Oversight of the Prime Contractor by OWNER'S 2nd-party Engineer*		✓	
30	*Oversight of the Prime Contractor by OWNER'S 2nd-party safety and/or QC professional*		✓	
31	*Allowance for non-competitive bid conditions (i.e. < 4 qualified bids)*		✓	
32	*Construction labor primarily at local Prevailing Wage/Davis Bacon rates*	✓		
33	*40-hour work week, based upon an anticipated schedule of (5)-8 hr days Mon-Fri*	✓		
34	*Multiple-shift construction schedule*			✓
35	*Reduction of the construction duration due to an overtime work schedule*			✓
36	*Installation manhour rate adjustments due to anticipated issues with labor pool, location, and/or work conditions*			✓
37	*Installation manpower productivity adjustment due to anticipated issues with labor pool, location, and/or work conditions*			✓
38	*Installation manhour productivity adjustments due to shut-downs, phasing, demolition, and/or PPE requirements*			✓
39	*Remote site rotation allowance for eligible tradesmen, supervision, & Prime Contractor field staff*			✓
40	*Remote travel & camp allowance for eligible tradesmen, supervision, and/or Prime Contractor staff*			✓
41	*Project engineering, design, & permitting services*		✓	
42	*Geotechnical testing, engineering, & design services*		✓	
43	*Engineering support services during construction & start-up*		✓	
44	*Supply & installation per standards typically anticipated for Municipal & Governmental work*	✓		
45	*OCIP (i.e. Owner-controlled-insurance-program) covering all insurance & bond costs at all tiers for this project*			✓

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OPCC BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

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Basis-of-Estimate Items

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#	Work Scope & Estimate Content	*OPCC Status* INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
46	*Property acquisitions, leases, easements, right-of-ways, and related fees, costs, & schedule impacts*			✓
47	*Financing, leasing, legal services, and related fees, costs, & schedule impacts*			✓
48	*Work permits, inspections, and related fees, costs, & schedule impacts*			✓
49	*Water-use permits, inspections, and related fees, costs, & schedule impacts*			✓
50	*Environmental/ecological permits, inspections, and related fees, costs, & schedule impacts*			✓
51	*Cultural/preservation work permits, inspections, and related fees, costs, & schedule impacts*			✓
52	*Discharge permits, inspections, and related fees, costs, & schedule impacts (i.e. NPDES, POTW, SWPPP, etc.)*		✓	
53	*Water/wastewater/air sampling, collection, analysis, and/or pilot treatability studies*			✓
54	*Building and trades-work construction permits, inspections, and related fees & costs*	✓		
55	*Work anticipated within a Greenfield site assessed to be Mostly Clear Above & Below Grade*	✓		
56	*Consideration for both negligible congestion and negligible spread of existing yard and/or systems infrastructure*	✓		
57	*Hazardous materials/work conditions requiring personal protection and equipment*			✓
58	*High-work conditions requiring personal fall protection equipment*			✓
59	*Clean-room work conditions requiring personal protection and equipment*			✓
60	*Underwater work requiring diver(s) with surface support team and equipment*			✓
61	*Weather (i.e. precipitation) and/or temperature considerations during execution of the work*	✓		
62	*Disadvantaged and/or minority business enterprise considerations for select work*	✓		
63	*System/process oversight of operations and maintenance during start-up & training*	✓		
64	*System/process operations and maintenance during functional and/or performance testing*		✓	
65	*System/process operations and maintenance from commissioning & forward*		✓	
66	*Supply and/or procurement of major EQ items within DIVS 11-15*	✓		
67	*Domestic (US) overland shipping of procured items to project site*	✓		
68	*Stretch-wrapping of select EQ (excluding permanent materials) for shipping and/or on-site storage*	✓		
69	*Crating of select EQ (excluding permanent materials) for shipping and/or on-site storage*			✓
70	*Containerization of select EQ (excluding permanent materials) for shipping and/or on-site storage*			✓
71	*Primary excavation issue of Dust Control considered within the construction area(s)*	✓		
72	*Secondary excavation issue of Underground Obstructions considered within the construction area(s)*	✓		
73	*0.30-0.4 (x G) Peak acceleration consideration for construction of buildings & structures*	✓		
74	*Category IV - Essential facility risk consideration for construction of buildings & structures*	✓		
75	*Zone I - 130 MPH wind consideration for construction of buildings & structures*	✓		
76	*Minimum of 1,800 PSF uniform soil-bearing capacity in construction area(s)*		✓	
77	*Minimum of 200 PCI uniform soil modulus of subgrade in construction area(s)*		✓	
78	*Maximum of 0.500 INCH uniform soil settlement potential in construction area(s)*		✓	
79	*Maximum of 0.250 INCH differential soil settlement potential in construction area(s)*		✓	
80	*Slurry walls for select areas, excavation, and/or structures*			✓
81	*Deep foundations for select structures*			✓
82	*Soil pre-loading and/or over-excavation with recompaction (of excavated material) for select areas*			✓
83	*Shoring, lagging, cribbing, and/or trench boxes for select areas, excavations, and/or structures*			✓
84	*Steel sheet piling for select areas, excavations, and/or structures*			✓
85	*Saw-cutting and/or core-drilling within select areas*			✓
86	*Potholing and/or utility locating within select areas*	✓		
87	*Traffic controls within select areas*	✓		
88	*Erosion controls within select areas*	✓		
89	*Dewatering due to excessive surface run-on, aquifers/springs, and/or high water table within select areas*			✓
90	*Removal/disposal of existing native topsoil, vegetation, trees, and/or fencing within select areas*	✓		

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Basis-of-Estimate Items

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#	Work Scope & Estimate Content	*OPCC Status* INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
91	*Removal/disposal of existing EQ, piping, electrical, structures, rubble, and/or debris within select areas*			✓
92	*Relocation of existing utilities, ductbank, utilidors, chases/tunnels, pipe, and/or conduit/wiring*			✓
93	*Remediation due to hazardous materials within select areas*			✓
94	*Remediation due to cultural (i.e. historical, archaeological, etc.) content within select areas*			✓
95	*Landscaping, irrigation, seeding, sodding, mulching, plantings, and/or restoration within select areas*	✓		
96	*Temporary fencing system for safety/security/privacy purposes around select site/construction areas*	✓		
97	*Permanent fencing system for safety/security/privacy purposes around select system/project areas*			✓
98	*Asphalt paving, patching, and/or repairing of select road, parking, and miscellaneous areas*	✓		
99	*Curb & gutter system for select road, parking, and/or landscaping areas*			✓
100	*Outdoor lighting units for select areas*	✓		
101	*Concrete-filled steel pipe bollards/guardposts for protecting select equipment, area(s), and/or structure(s)*	✓		
102	*Secondary containment for select areas, tanks, and/or structures*	✓		
103	*Secondary containment of select piping systems*			✓
104	*Emergency diesel generator(s) including automatic transfer switching and on-board fuel system(s)*			✓
105	*Emergency power sized to maintain full operation of select treatment, building, & support systems*			✓
106	*Paralleling gear for multiple emergency generators*			✓
107	*Double-walled bulk diesel storage tank system with level indication and transfer pumping*			✓
108	*Sealing, waterproofing, and/or chemical-resistant finish for select field-constructed surfaces*	✓		
109	*Coating and/or galvanizing of select steel building and canopy structural components*	✓		
110	*LEED construction (with certification) of select building structures and/or components*			✓
111	*Usage cost of utilities (i.e. electric, water, natural gas, sewerage, etc.) utilized during construction*		✓	
112	*Assistance in removal, abatement, and/or disposal of existing fluids, sludges, and residuals*		✓	
113	*PPE stations and placarding of project hazards including noise, moving machinery, and chemicals*	✓		
114	*Heat, light, ventilation, entry switches, utility outlets, and/or sump pumps for select vault structures*			✓
115	*Fire protection systems, materials, equipment, and/or placarding within select areas*			✓
116	*Grounding and/or lightning protection systems, materials, and/or equipment within select areas*	✓		
117	*Concrete strength (28 day minimum) provided at 4,000 PSI (6½-7½ sacks/CY)*	✓		
118	*Type II (lo heat & sulfate resist) cement utilized in structural concrete*	✓		
119	*A615-Plain Steel (qty in tons) reinforcement bar utilized in structural concete, supplied and installed by rebar Subcontractor*	✓		
120	*Material of construction varies for personnel accessways and is dependent on location and/or exposure*	✓		
121	*Piping and/or wiring supports primarily utilizing Galv Steel Strut*	✓		
122	*Local safety disconnect switches for select motorized equipment*	✓		
123	*Local HOA and/or ON-OFF control stations for select equipment*			✓
124	*Combination eyewash and shower stations (including tempered water system/supply) in select areas*	✓		
125	*ADA (Americans with Disabilities Act) accessibility in select areas*			✓
126	*Valved end-connections and/or by-passes for select in-line instrumentation and control valves*			✓
127	*Solenoid-controlled water stations for select sealwater and/or flushwater systems*			✓
128	*Stairway access & perimeter handrailing for select building interior elevated spaces*	✓		
129	*Ductwork system for select equipment and/or tankage*			✓
130	*Ductwork system for select areas and/or structures*			✓
131	*Coating of select pipe, fittings, and valves*	✓		
132	*Heat-tracing of select pipe, fittings, & valves*	✓		
133	*Insulation & jacketing of select pipe, fittings, & valves*			✓
134	*Heat-tracing of select tankage*	✓		
135	*Insulation & jacketing of select tankage*	✓		

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OPCC BASIS-OF-ESTIMATE CHECKLIST

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

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Basis-of-Estimate Items

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#	Work Scope & Estimate Content	*OPCC Status* INCLUDED As OPCC Scope	EXCLUDED But By Others	EXCLUDED Or Not Required
136	*Architectural treatments and/or finishes similar for all building structures*	✓		
137	*Permanent overhead crane/hoist system(s) that are stand-alone and/or integrated to select structure(s)*			✓
138	*Field-erected tank(s) with either field-applied coating(s) or factory-applied finish(es)*			✓
139	*Scope-wide safety management system with communications/PA and health & safety monitoring*			✓
140	*Scope-wide security management system with access controls and intrusion monitoring*			✓
141	*Scope-wide surveillance management system with video monitoring & archiving*			✓
142	*Access to the work area considered as Relatively Easy throughout the project execution*	✓		
143	*Patching, repairing, and/or restoring of select existing local infrastructure utilized during work*	✓		
144	*Location for stockpiling, spreading, and/or disposal of surplus soil < 7.5 mile radius from ISBL*	✓		
145	*Location for stockpiling, spreading, and/or disposal of clearing & grubbing waste < 7.5 mile radius from ISBL*	✓		
146	*Location for stockpiling, spreading, or disposal of demolition waste < 7.5 mile radius from ISBL*			✓
147	*Payment of fee(s) associated with soil and waste stockpiling, spreading, and/or disposal*	✓		
148	*Continuous free & clear access, easement, and/or right-of-way to work area*		✓	
149	*Oversize, overweight, and/or drop-deck trailer accessibility to work area*		✓	
150	*Public and/or main access roads which are suitable and available throughout construction*		✓	
151	*Material and equipment laydown, staging, and/or storage area(s) within 100' of work area*		✓	
152	*Parking area(s) for installation personnel within 100' of work area*		✓	
153	*480 V primary power supply/tie-in location (with sufficient ampacity) within 250' of work area*		✓	
154	*480 V back-up power supply/tie-in location (with sufficient ampacity) within 100' of work area*			✓
155	*Hydro-test water supply (with sufficient pressure & volume) or tie-in location within 100' of work area*		✓	
156	*Disposal location for hydro-test fluids within 100' of work area*		✓	
157	*Potable water supply (with sufficient pressure & volume) or tie-in location within 100' of work area*		✓	
158	*Utility and/or fire protection water supply (with sufficient pressure & volume) or tie-in location within 100' of work area*		✓	
159	*Sanitary waste piping tie-in location (with sufficient capacity) within 100' of work area*			✓
160	*Compressed and/or instrument air supply (with sufficient pressure & volume) or tie-in location within 100' of work area*			✓
161	*Steam and/or fossil fuel supply (with sufficient pressure & volume) or tie-in location within 100' of work area*			✓
162	*Influent and/or effluent piping (of sufficient size) or tie-in location within 100' of work area*			✓
163	*Return and/or recycle piping (of sufficient size) or tie-in location within 100' of work area*			✓
164	*Treatment chemical supply (of sufficient size & concentration) or tie-in location within 100' of work area*			✓
165	*Landline and/or high-speed internet service (of sufficient bandwidth) or tie-in location within 100' of work area*		✓	
166	*High-speed wireless internet service availability (with sufficient speed & bandwidth) within 100' of work area*		✓	
167	*Integration of existing power, process, and site (i.e. safety, security, and/or surveillance) controls to new systems*		✓	
168	*Integration of new power controls to existing systems*	✓		
169	*Integration of new process controls to existing systems*	✓		
170	*Integration of new site controls (i.e. safety, security, and/or surveillance) to existing systems*			✓
171	*Remote monitoring, alarm, & control of new process and/or site management systems*			✓
172	*Local set-aside of select equipment, piping, electrical, metals, and misc. materials subject to demolition*			✓
173	*Salvaging/recovery of select equipment, piping, electrical, metals, and misc. materials subject to demolition*			✓
174	*Public art costs, contributions, community outreach, and related impact on construction, cost, and/or schedule*			✓
175	*Owner's engineering, program/project management, and/or oversight costs*			✓
176	*Independent project and/or system commissioning costs and related impact on schedule*			✓

END

Stantec

OPCC BASIS-OF-ESTIMATE

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

B-O-E Clarifications

NOTE: Item numbers in brown font indicate an auto-fill and/or variable text that adjusts with selection(s) made in other OPCC sheets

1	This opinion of probable construction costs (OPCC) has been assigned a Class 5 (i.e. PLANNING or ORDER-OF-MAGNITUDE) level status per our judgement of the level of project definition, expected accuracy range, and other characteristics per the estimating guidelines developed within Stantec. The estimating methodologies primarily utilized within a class 5 OPCC typically involves capacity factoring, parametrics, simple modeling techniques, judgement, and analogy
2	Per internationally recognized guidelines, the accuracy range limits for this specific OPCC class would be as follows: LOW end = (-)20% to (-)50%, and HIGH end = (+)30% to (+)100%, with a 90% confidence that the actual cost will fall within the bounds of these ranges after application of the appropriate contingencies.
3	Considering the estimate class vs. quality of scope definition, amount of contingency, and perceived OPCC reliability, it is the Estimator's judgement that the MINIMUM class accuracy range limits should apply, specifically -20% to +30%. These percentages should be applied to the estimate total to establish the OPCC accuracy range in USD
4	Stantec's opinions, recommendations and assessments are limited by a) the accuracy and completeness of information upon which it may reasonably rely, b) schedule constraints or scope limitations, c) unknown or variable site or other conditions, d) other factors beyond Stantec's control. Any estimates as to construction costs or quantities are limited by a lack of control over financial and/or market conditions, including the future price of labor, materials, and prospective bidding environments and procedures. Consultant does not warrant or guarantee the accuracy or completeness of its Services to the extent impacted by these limitations and Client should limit its reliance on the Services in like manner.
5	A combination of "ESTIMATE "and "SCOPE" contingencies has been included in this OPCC for covering not only the potential issues related to any Estimator judgements, take-offs, or omissions, but also providing for the potential project growth due to design changes/revisions, undefined regulatory considerations, Owner preferences, and general unknowns that could arise over the duration of the project. Please note however that escalation due to code and/or technology changes has not been considered.
6	Subcontractor(s) mark-ups applied to procured/engineered equipment items is currently established at 5% for Overhead & General Conditions and 7% for Profit. The subsequent 2nd tier mark-ups applied by the Prime Contractor on Subcontractor costs are currently established at 1% for General & Administration and 2% for Profit
7	The following scope definition deliverable(s) provided by Others comprise the primary resource used for preparing this OPCC estimate: a. Stantec Springfield Utility Board PFAS Feasibility report (35 Word pages) received via email link dated 11Aug23 b. AqueoUSvets GAC pressure filter quotation email received via email link dated 10Aug23 c. Stantec site plan sketches (2 PDF sheets) received via email dated 10Aug23 d. Stantec treatment building arrangement drawings (2 PDF sheets) received via email link dated 10Aug23 e. Evoqua hypochlorite generator equipment information received via email link dated 10Aug23 f. Various scope clarification emails, messaging, and/or discussions up to the submittal date of this OPCC
8	Specific issues related to this OPCC include: a. A Special Escalation factor has been included to bring the available cost estimating database resources up to current anticipated levels b. AqueoUSvets GAC filter quotation dated 08Aug23 utilized for this OPCC estimate c. Buildings constructed with 10" CMU exterior walls with interior rigid foam insulation covered with steel paneling, and steel standing seam roof system d. Buildings provided with central floor trench system (with low point sump) in which are run common filter header pipes for RW, FW, & BW lines e. Per direction, (1) additional 20 PPD OSEC-L hypochlorite wall-mount generator has been estimated for each facility as to provide some redundancy f. All site/yard piping anticipated with open & laid-back trenching with exception of SP Maia 10" BW line section requiring jack & bore crossing at existing RR track g. Both raw water and finished water lines outside of building are anticipated to be cement-lined DIP h. Presumption is that the backwash waste pipelines have the residual pressure to make it to the remote existing manhole i. It is anticipated that both facilities could be constructed simultaneously j. Allowances are included for: i. 250 LF of ductbank supplying 480 VAC feeder to building from nearest available source for each site ii. Clearing of site, pipe trenching/HDD, and ductbank areas iii. Patching & repairing of pipe trenching/HDD and ductbank paved areas iv. Restoration of site, pipe trenching/J&B, and ductbank areas v. Temporary stormwater control, erosion control, traffic control measures, & potholing
9	Although there are uncertainties associated with the current tariff situation, the allowance presently included in the OPCC SUMMARY sheet for SPECIAL escalation is intended to partially absorb any impact of applicable tariffs
10	The Prime Contractor is anticipated to self-perform the following installation scope in this OPCC: a. DIV 1g General Conditions b. DIV 1s Site Staffing for Project Management & Construction Oversight c. DIV 2c Common Sitework d. DIV 3 Concrete e. DIV 5i INSTALL: Miscellaneous Metals f. DIVS 5-8 Buildings & Components
11	Additionally, the Prime Contractor is anticipated to procure the following direct from the Fabricators, Manufacturers and/or Vendors: a. DIVS 11-15s SUPPLY: Process & Mechanical EQ
0	The primary change(s) reflected in this current OPCC from the previous version include: a. Addition of 25,000 gallon steel backwash tank (outdoor) with insulation, jacketing, and electric heat-trace
12	***END***

OPCC ESTIMATE & MODEL CLARIFICATIONS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

Model Clarifications

1 Although not included in this OPCC estimate, the largest potential impact on the Owner's cost for this project, and as demonstrated in the table below, may be the number of qualified Contractor(s) that are solicited and subsequently responsive to a bid request:

Bids Solicited & Received	1	2 - 3	4 - 5	6 - 7	8 or more
Potential Cost Deviation From This OPCC Scope & Estimate	+25% to +100%	+10% to +25%	0% to +10%	0% to -10%	-10% to -20%

2 This model utilizes the addition of a suffix to select CSI division numbers for differentiating the scope of supply and subsequent worksheets. Specifically, DIV 1 utilizes **(s)** for site staffing, **(g)** for general conditions, and **(p)** for pass-thru scope items; DIVS 5, 15, & 16 use **(s)** for procurement of equipment and/or fabrications and **(i)** for installation of equipment and/or fabrications; DIV 2 applies **(c)** for common sitework, **(s)** for specialty sitework, and **(w)** for well work**;** and DIV 13 utilizes **(f)** for field-erected tanks and **(s)** for shop-fabricated tanks

3 The OPCC LABOR RATE STANDARDS sheet is provided to highlight the methodology behind development of the blended rate which is then applied based on the CSI division. The fringe benefits rate is anticipated to cover those paid by the employer and/or union such as vacation, pension, training, advancement funds, and health & welfare contributions. For any overtime work, the applicable overtime factor (i.e. multiplier) is applied to the MH base rate, while the fringe benefits cost is applied straight-up against each MH worked.

4 Wage rate adjustments and/or overtime work hours may be applied within this OPCC in anticipation of attracting the highest quality tradesmen for this project, and considers that the availability of this talent could otherwise be compromised depending on the current labor market conditions of the area.

5 The percentages applied for the establishing the indirect costs are estimates based upon the Estimator's judgement concerning the scope of work, anticipated work schedule, and risk allocation deemed necessary at the time of this submittal.

6 The absence of engineering costs is intended to represent that all engineering services are excluded, including but not limited to design, permitting, procurement, geotechnical investigations, contractor solicitation, bid, & selection, and support/oversight during construction, start-up, & commissioning.

7 The designation of both the PROJECT DELIVERY method and PRIME CONTRACTOR has a direct bearing on the final OPCC cost, so the designation of these in the OPCC is important. For example, a typical local General Contractor executing the work as PRIME (and possibly CM as well) will require a cost structure that differs significantly from an EPCM as PRIME, most notably regarding the work being self-performed vs. subcontracted, the potential travel/living costs involved, and the tiers of mark-ups/burdens applied.

8 The *"Assumptions"* section at the top of each DIV sheet should be referenced for identifying a portion of the "forced-detail" utilized in the OPCC, including both perceived and known issues such as specific components, materials of construction, site concerns, and working conditions that could impact the cost basis of this OPCC.

9 The *"General Conditions Allowances"* section in DIV 1 sheet, and *"Allowances"* section at bottom of DIVS 2-17 sheets, are all comprised of "potential" cost items initially based on type & quantity of work occurring within each CSI division, with the intention of covering items that could be reasonably anticipated but cannot yet be fully defined and/or quantified.

10 The totals for each of these Allowance sections identified above should be considered as more reliable and representative of an appropriate overall cost, rather than considering each individual line item cost (or absence thereof) that comprise this total, any of which may or may not actually end up being necessary.

11 The manhours developed for each work item reflects the total, whether it be executed by an "individual" or "crew", with the manhour rates depicted thoughout the OPCC having been developed to reflect a blend of the anticipated ratios of trade labor and supervision for each CSI division. These individual blended DIV rates include adjustments for any overtime and/or shift work identified in the INSTALLATION OVERVIEW sheet.

12 The overall composite rates provided in the MODEL LABOR RATE STANDARDS sheet is for informational purposes only and reflects the weighting effect due to the actual divisions and scope of work comprising the project.

13 The OPCC BASIS-OF-ESTIMATE CHECKLIST sheet is provided as a quick reference of those scope, execution, and cost items *INCLUDED* in the OPCC, those *EXCLUDED* from the OPCC but anticipated as necessary and the responsibility of Others, and those *EXCLUDED* from the OPCC because they are not required or believed to be unnecessary.

14 The DIV 1 costs are split up into separate sheets, with the DIV 1s PRIME CONTRACTOR STAFF sheet carried as part of the *"Prime Contractor"* section of the OPCC SUMMARY sheet, while the DIV 1c GENERAL REQUIREMENTS sheet costs are carried as part of the direct cost subtotal line within the *"Cost-of-Work"* section of the OPCC SUMMARY sheet. The third cost sheet is the DIV 1p PASS-THRU ALLOWANCES which typically is carried only in the PRIME CONTRACTOR cost summary sections of the OPCC. This split is due to the anticipation that the general conditions would primarily be executed utilizing trades labor, construction tools/equipment, and consumable materials.

15 The DIV 15 MECHANICAL INSTALLATION sheet and DIV 16 ELECTRICAL INSTALLATION sheet material selection drop-downs (5 each) at the top ASSUMPTIONS section, along with the associated percentage, are intended to represent an overall materials profile and utilization anticipated throughout the project.

16 There may be instances where highly un-symmetrical or complex structures will be dimensionally and/or geometrically "smoothed" to establish more-simplified units that comply with the OPCC input cell templates, all in an attempt to maintain the overall component aspect ratios and overall size. This typically occurs in the DIV sheets utilizing dimensional data inputs.

17 The PRELIMINARY CONSTRUCTION SCHEDULE sheet, if provided, attempts to present all the forecast and WBS totals in a means approximating the anticipated "normal" distribution over the job duration. Typically, the overall construction duration should be considered as more accurate than the individual WBS item durations.

18 The DIVS 3 & 5-8 BUILDINGS/COMPONENTS sheet includes a composite cost of all structural & architectural scope required for the building shell (walls and/or roof). All other building-related construction scope is costed elsewhere, such as sitework & excavation (re: DIV 2), concrete slabs & foundations (re: DIV 3), masonry (re: DIV 4), miscellaneous metals (re: DIV 5), finishes (re: DIVS 9-10), HVAC, fire protection, utilities, & plumbing (re: DIV 15), and HVAC power/controls, fire detection/alarm, utilities, & lighting (re: DIV 16).

19 With exception of those process equipment budget costs provided by Others, all buy-out equipment costs in the DIVS 11-16 PROCESS EQUIPMENT sheets are anticipated to be of US origin and have been derived either through best judgement of the Estimator or extrapolation of similar items from an independent equipment quote/purchase database.

20 Equipment packages identified as "Skid" units are anticipated to be procured as assembled, pre-piped, pre-valved, pre-wired, pre-switched, and pre-painted by the Manufacturer to the fullest extent possible, typically requiring only re-assembly of the required shipping breakdown, touch-up paint, & off-skid piping/wiring homeruns.

21 The DIVS 11-16 PROCESS EQUIPMENT sheets provide equipment line-item breakdowns of the subtotal for the *"Process Equipment Installation Summary"* sections at the top of the DIV 15 MECHANICAL INSTALLATION and DIV 16 ELECTRICAL INSTALLATION sheets. Each field-installed process/mechanical equipment item within the DIVS 11-16 PROCESS EQUIPMENT sheets provides parametric costing for all necessary DIV 15 mechanical work such as off-load, handle, set, anchor, grout, and needed hangars/brackets/supports, pipe, fittings, manual valves, check valves, pressure gauges, and sample ports, and for all necessary DIV 16 electrical equipment such as off-load, handle, set, anchor, grout, and needed hangars/brackets/supports, disconnect/safety switches, raceway, flex-conduit, fittings, wire, terminations, and grounding.

22 In instances where PRECONSTRUCTION time is indicated, this duration for the front-end scope/construction issues, some which are typically outside the installing Contractor(s) responsibility and control. This time may incude, if applicable, final Contractor negotiation(s), Prime and/or Subcontractor pre-construction efforts including early staffing & mobilization, work sequence pre-planning, permit, submittal, & approval cycles, and procurement of specilized/long-lead equipment. If required, coordination for any special demolition, work phasing, and/or shut-downs may also apply.

OPCC ESTIMATE & MODEL CLARIFICATIONS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

Model Clarifications

Estimate Classification Guidelines Currently Followed:

CLASS 1	Engineering is from 95% to 100% complete, and would comprise virtually all engineering and design documentation of the project including Integrated Project Plans, Project Master Schedules, Escalation Strategy, Work Breakdown Structure, Project Code of Accounts, Contracting Strategy, Block Flow Diagrams, Plot Plans, Process Flow Diagrams, Utility Flow Diagrams, Piping and Instrumentation Diagrams, Heat and Material Balances, Process Equipment Lists, Specifications & Datasheets, General Equipment Arrangement Drawings, Spare Parts Lists, Mechanical Discipline Drawings, Electrical Discipline Drawings, Instrumentation/Control System Discipline Drawings, Civil Drawings, Structural Drawings, Project Execution Plans, and Commissioning Plans. Typical accuracy ranges for Class 1 estimates are from -10% to +15% and sometimes higher depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Class 1 estimates involve the highest degree of deterministic estimating methods, and require a great amount of effort. ***NOTE: Because these estimates are prepared in the greatest detail for an actual upcoming project, they are typically always prepared by an installing Contractor either as a bid response or for an active project change order.***
CLASS 2	Engineering is from 70% to 90% complete, and would comprise at a minimum the following: process flow diagrams, utility flow diagrams, piping and instrumentation diagrams, heat and material balances, final plot plan, final layout drawings, complete engineered process and utility equipment lists, single line diagrams for electrical, electrical equipment and motor schedules, vendor quotations, detailed project execution plans, researching and work force plans, etc. Typical accuracy ranges for Class 2 estimates are from -15% to +20% and sometimes higher depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Class 2 estimates are prepared in great detail, and often involve tens of thousands of unit cost line items. ***NOTE: This class typically reflects the final estimate prepared as an Engineer's Estimate or Opinion-of-Probable-Construction-Cost (i.e. OPCC).***
CLASS 3	Engineering is from 45% to 60% complete, and would comprise at a minimum the following: process flow diagrams, utility flow diagrams, preliminary piping and instrument diagrams, plot plan, developed layout drawings, and essentially complete engineered process and utility equipment lists. Typical accuracy ranges for Class 3 estimates are from -30% to +50% and sometimes higher depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Class 3 estimates are typically prepared using more deterministic estimating methods than stochastic methods. Factoring and other stochastic methods may be used to estimate less-significant areas of the project.
CLASS 4	Engineering is from 25% to 30% complete, and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams for main process systems, etc. Typical accuracy ranges for Class 4 estimates are from +/- 15 to 50% (sometimes higher), depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Class 4 estimates virtually always use stochastic estimating methods such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit costs/ratios, and other parametric and modeling techniques.
CLASS 5	Engineering is from 0% to 25% complete, and would be prepared within a very limited amount of time and with little effort expended - sometimes requiring less than an hour to prepare. Often the proposed plant type, location, and capacity are only known at the time of preparation. Typical accuracy ranges for Class 5 estimates are from -50% to +100% and sometimes higher depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Class 5 estimates virtually always use stochastic estimating methods such as equipment factors, Lang factors, Hand factors, Chilton factors, Peters-Timmerhaus factors, Guthrie factors, the Miller method, gross unit costs/ratios, and other parametric and modeling techniques.

END

OPCC LABOR RATE STANDARDS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

NOTE: Fringes are those benefits paid by the employer and/or union such as vacation, pension, training, advancement funds, and health & welfare contributions

Labor Rate Basis & Adjustments

Prevailing Wage/Davis Bacon

Rate Escalation Factor	1.00
Trade Supervision Premium	$2.00
Incidental Overtime Allowance	0.0%
Non-Specific Rate Adjustment	

Closest RSMeans City Rate — Eugene

State — OR

County of Site Location — Lane County

Trades Labor Rate Data Source — 2023 RSMeans Publication: Labor Rates for the Construction Industry

Construction Work Schedule — (5)-8 hr days Mon-Fri

Overtime Factors on Base Rate

	Hrs <= 8	Hrs > 8
M-F	1X Base	1½X Base
Sat	1½X Base	2X Base
Sun	2X Base	3X Base

Manhour Rate Data

Straight-Time Trades Labor

Trade	Base	Fringes	Total	Trade	Base	Fringes	Total	Trade	Base	Fringes	Total
Helpers-5 Trades Avg	$33.60	$16.13	$51.99	Operator-Oiler	$44.02	$16.35	$60.37	Rodman-Reinforcing	$41.13	$30.72	$71.85
Common Bldg Laborer	$34.98	$16.55	$51.53	Operator-Mechanic	$53.81	$16.35	$70.16	Roofer-Composition	$36.23	$19.83	$56.06
Asbestos/Insulate Worker	$0.00	$0.00	$79.76	Glazier	$44.43	$25.09	$69.52	Roofer Helper	$0.00	$0.00	$42.05
Boilermaker	$40.46	$30.59	$71.05	Lather	$44.74	$18.91	$63.65	Sheet Metal Worker	$0.00	$0.00	$76.43
Bricklayer	$41.83	$23.18	$65.01	Millwright	$50.24	$19.21	$69.45	Sprinkler Installer	$42.15	$26.59	$68.74
Bricklayer Helper	$36.25	$16.55	$52.80	Painter-Ordinary	$23.45	$8.63	$32.08	Steamfitter/Pipefitter	$48.93	$34.04	$82.97
Carpenter	$44.97	$19.21	$64.18	Painter-Structural Steel	$23.45	$8.63	$32.08	Stone Mason	$34.79	$20.10	$54.89
Cement Finisher	$40.81	$21.17	$61.98	Pile Driver	$45.74	$19.21	$64.95	Structural Steel Worker	$41.13	$30.72	$71.85
Electrician	$0.00	$0.00	$64.71	Plasterer	$41.16	$19.23	$60.39	Welder-Structural Steel	$41.13	$30.72	$71.85
Operator-Crane/Shovel	$55.97	$16.35	$72.32	Plasterer Helper	$36.25	$16.55	$52.80	Tile Layer	$37.65	$20.83	$58.48
Operator-Medium	$45.26	$16.35	$61.61	Plumber	$48.93	$34.04	$82.97	Tile Layer Helper	$28.29	$15.30	$43.59
Operator-Light	$44.02	$16.35	$60.37	Plumber Helper	$0.00	$0.00	$68.70	Truck Driver-Heavy	$31.10	$16.73	$47.83

(comments)

OPCC Composited & Weighted Labor Rate

OPCC Straight-Time (ST) Labor Base Rate

Base	Fringes	Fringes %	Total
$41.64	$21.20	50.9%	**$62.84**

OPCC Over-Time (OT) Labor Base Rate

Base	Fringes	Fringes %	Total

Impact of Work Schedule on OPCC Composite Labor Rate

Weekly Schedule	*Monday thru Friday*				*Saturday*				*Sunday*				*Composite Rate Impact*		
	Day = 8 Hr		Day > 8 Hr		Day = 8 Hr		Day > 8 Hr		Day = 8 Hr		Day > 8 Hr				
Hours & Workdays	ST MH per Week	ST $ per Week	OT MH per Week	OT $ per Week	OT MH per Week	OT $ per Week	OT MH per Week	OT $ per Week	OT MH per Week	OT $ per Week	OT MH per Week	OT $ per Week	TOTAL MH per Week	TOTAL $ per Week	TOTAL $ per MH Rate
(4)-10 hr days Mon-Fri (w/o OT)	40	$2,514	0	$0	0	$0	0	$0	0	$0	0	$0	40	$2,514	**$62.84**
(5)-8 hr days Mon-Fri	40	$2,514											40	$2,514	**$62.84**
(5)-8 hr days Mon-Fri + Incidental O	40	$2,514	0	$0	0	$0	0	$0	0	$0	0	$0	40	$2,514	**$62.84**
(4)-10 hr days Mon-Fri (with OT)	32	$2,011	8	$669									40	$2,680	**$67.00**
(6)-8 hr days Mon-Sat	40	$2,514	0	$0	8	$669	0	$0	0	$0	0	$0	48	$3,183	**$66.31**
(4)-12 hr days Mon-Fri	32	$2,011	16	$1,339									48	$3,349	**$69.78**
(5)-10 hr days Mon-Fri	40	$2,514	10	$837	0	$0	0	$0	0	$0	0	$0	50	$3,350	**$67.00**
(7)-8 hr days Mon-Sun	40	$2,514			8	$669			8	$836			56	$4,019	**$71.76**
(5)-10 hr days Mon-Fri + 8 hrs Sat	40	$2,514	10	$837	8	$669	0	$0	0	$0	0	$0	58	$4,019	**$69.30**
(5)-12 hr days Mon-Fri	40	$2,514	20	$1,673									60	$4,187	**$69.78**
(6)-10 hr days Mon-Sat	40	$2,514	10	$837	8	$669	2	$209	0	$0	0	$0	60	$4,228	**$70.47**
(5)-12 hr days Mon-Fri + 8 hrs Sat	40	$2,514	20	$1,673	8	$669							68	$4,856	**$71.41**
(6)-10 hr days Mon-Sat + 8 hrs Sun	40	$2,514	10	$837	8	$669	2	$209	8	$836	0	$0	68	$5,064	**$74.47**
(7)-10 hr days Mon-Sun	40	$2,514	10	$837	8	$669	2	$209	8	$836	2	$292	70	$5,356	**$76.52**
(6)-12 hr days Mon-Sat	40	$2,514	20	$1,673	8	$669	4	$418	0	$0	0	$0	72	$5,274	**$73.25**
(6)-12 hr days Mon-Sat + 8 hrs Sun	40	$2,514	20	$1,673	8	$669	4	$418	8	$836			80	$6,110	**$76.37**
(7)-12 hr days Mon-Sun	40	$2,514	20	$1,673	8	$669	4	$418	8	$836	4	$584	84	$6,694	**$79.69**

Stantec

OPCC LABOR RATE STANDARDS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Establishing OPCC Blended Labor Rates for Each DIV

Fully-Burdened Rate includes allowances for payroll deducts & workers compensation insurance, and small tools & safety gear, as well as Subcontractor allowances (where applicable) for overhead & general conditions, profit, insurances, & bonds, and finally for the Prime Contractor's overall project allowances for insurances, general & administrative, profit, & bonds. NOTE: Taxes are excluded in these rates

DIVS 1-2: General Requirements & Sitework

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Operator (crane)	2	$72.32	$72.32	$144.64
Operator (medium)	4	$61.61	$61.61	$246.44
Driver (heavy)	2	$47.83	$47.83	$95.66
Operator (mechanic)	1	$70.16	$70.16	$70.16
Operator (oiler)	1	$60.37	$60.37	$60.37
Pile Driver	1	$64.95	$64.95	$64.95
Helper/Apprentice	2	$51.99	$51.99	$103.98
Laborer	4	$51.53	$51.53	$206.12
Supervision	3	$74.32	$74.32	$222.96
Total Count	**20**		Total Cost	**$1,215**

Blended Base Rate = $60.76

Fully-Burdened Rate = $86.10 $98.46

DIV 3: Concrete

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Carpenter	4	$64.18	$64.18	$256.72
Rodman	4	$71.85	$71.85	$287.40
Cement Finisher	3	$61.98	$61.98	$185.94
Operator (crane)	1	$72.32	$72.32	$72.32
Operator (medium)	1	$61.61	$61.61	$61.61
Helper/Apprentice	2	$51.99	$51.99	$103.98
Laborer	2	$51.53	$51.53	$103.06
Supervision	3	$73.85	$73.85	$221.55
Total Count	**20**		Total Cost	**$1,293**

Blended Base Rate = $64.63

Fully-Burdened Rate = $91.58

DIV 4: Masonry

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Bricklayer	6	$65.01	$65.01	$390.06
Stone Mason	2	$54.89	$54.89	$109.78
Operator (light)	1	$60.37	$60.37	$60.37
Helper/Apprentice	2	$51.99	$51.99	$103.98
Laborer	2	$51.53	$51.53	$103.06
Supervision	2	$67.01	$67.01	$134.02
Total Count	**15**		Total Cost	**$901**

Blended Base Rate = $60.08

Fully-Burdened Rate = $97.35

DIV 5: Miscellaneous Metals

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Struct Stl Worker	5	$71.85	$71.85	$359.25
Welder-Struct Stl	2	$71.85	$71.85	$143.70
Operator (crane)	1	$72.32	$72.32	$72.32
Operator (medium)	3	$61.61	$61.61	$184.83
Boilermaker	2	$71.05	$71.05	$142.10
Helper/Apprentice	2	$51.99	$51.99	$103.98
Supervision	3	$73.05	$73.05	$219.15
Total Count	**18**		Total Cost	**$1,225**

Blended Base Rate = $68.07

Fully-Burdened Rate = $96.46

DIVS 5-8: Buildings & Components

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Struct Stl Worker	1	$71.85	$71.85	$71.85
Operator (crane)	4	$72.32	$72.32	$289.28
Operator (medium)	1	$61.61	$61.61	$61.61
Sheetmetal Worker	2	$76.43	$76.43	$152.86
Glazier	1	$69.52	$69.52	$69.52
Roofer (composition)	2	$56.06	$56.06	$112.12
Sprinkler Installer	1	$68.74	$68.74	$68.74
Helper/Apprentice	2	$51.99	$51.99	$103.98
Supervision	2	$73.85	$73.85	$147.70
Total Count	**16**		Total Cost	**$1,078**

Blended Base Rate = $67.35

Fully-Burdened Rate = $95.44

DIVS 7-10: Coatings & Finishes

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Painter (structural)	5	$32.08	$32.08	$160.40
Tile Layer	1	$58.48	$58.48	$58.48
Plasterer	1	$60.39	$60.39	$60.39
Painter (ordinary)	3	$32.08	$32.08	$96.24
Lather	1	$63.65	$63.65	$63.65
Helper/Apprentice	2	$51.99	$51.99	$103.98
Supervision	2	$65.65	$65.65	$131.30
Total Count	**15**		Total Cost	**$674**

Blended Base Rate = $44.96

Fully-Burdened Rate = $72.85

DIV 13: Field-Erect & Shop-Fab Tanks

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Struct Stl Worker				
Welder-Struct Stl				
Operator (crane)				
Operator (medium)				
Operator (light)				
Helper/Apprentice				
Supervision				
Total Count			Total Cost	

DIV 15: Piping & Mechanical

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Millwright	1	$69.45	$69.45	$69.45
Steamfitter/Pipefitter	6	$82.97	$82.97	$497.82
Plumber	2	$82.97	$82.97	$165.94
Operator (medium)	1	$61.61	$61.61	$61.61
Insulator	1	$79.76	$79.76	$79.76
Helper/Apprentice	2	$51.99	$51.99	$103.98
Supervision			$84.97	$169.94
Total Count	**15**		Total Cost	**$1,148**

Blended Base Rate = $76.57

Fully-Burdened Rate = $124.06

DIV 16: Electrical and I&C

Labor Trade	Trade Count Ratio	Initial Means Prevail Rate	Final OPCC Direct Rate	Trade Cost
Electrician	6	$64.71	$64.71	$388.26
Operator (light)	1	$60.37	$60.37	$60.37
Helper/Apprentice	2	$51.99	$51.99	$103.98
Supervision	2	$66.71	$66.71	$133.42
Total Count	**11**		Total Cost	**$686**

Blended Base Rate = $62.37

Fully-Burdened Rate = $101.05

OPCC COMMODITY STANDARDS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

NOTE: The dates indicate the ENR monthly construction economics pricing (20-city average) time of publication for each of the indicated indices & material categories

Index & Material Pricing Categories	*Pricing Date*
COST INDICES: Construction (CCI), Building (BCI), & Material (MCI)	3-Jul-23
CONCRETE: Asphalt Paving, Cement, Crushed Stone, Sand, Concrete, & Block	3-Jul-23
PIPE: Sewer, Water, & Drain Pipe: RCP, CS, PE, PVC, DIP, & COP	10-Jul-23
WOOD: Lumber, Plywood, Plyform, Part Board, Gypsum Board, & Insulation	17-Jul-23
METALS: Structural Steel, Rebar, CS Sheet, AL sheet, SS Sheet, & H-Pile	24-Jul-23

Unit Abbreviations

BAG: *70 lbs* — ***LF:*** *Linear foot*
C: *100 count* — ***MBF:*** *1,000 board-feet*
CWT: *100 lbs* — ***MSF:*** *1,000 square feet*
CY: *Cubic yard* — ***SF:*** *Square foot*
HR: *Hour* — ***TON:*** *2,000 lbs*

Monthly Data

Asphal Paving, Cement……	Type/Size	Unit	Unit Cost
Asphalt Paving	PG 58	TON	$606.79
	Cutback MC800	TON	$438.24
	Rapid set	TON	$389.28
	Slow set	TON	$410.15
Portland Cement (delivered)	Type I	TON	$207.09
Masonry Cement (delivered)	70 LB	BAG	$15.30
Crushed Stone	Base course	TON	$19.94
	Concrete course	TON	$22.94
	Asphalt course	TON	$23.06
Sand	Concrete	TON	$21.03
	Masonry	TON	$21.09
Concrete-Ready Mix (delivered)	3,000 psi	CY	$162.81
	4,000 psi	CY	$171.28
	5,000 psi	CY	$183.70
Concrete Block (delivered)	Normal - 8" x 8" x 16"	C	$214.29
	Light - 8" x 8" x 16"	C	$209.13
	12" x 8" x 16"	C	$305.27

Sewer, Water, & Drain…...	Type/Size	Unit	Unit Cost
Reinforced concrete pipe (C76)	12" Ø (rubber gasket)	LF	$27.83
	24" Ø (rubber gasket)	LF	$55.89
	36" Ø (rubber gasket)	LF	$117.90
	48" Ø	LF	$190.92
Corrugated steel pipe (galv)	12" Ø (16 gauge)	LF	$16.95
	36" Ø (14 gauge)	LF	$46.75
	60" Ø (12 gauge)	LF	$98.32
Polyethylene pipe (perf/corr)	Underdrain - 4" Ø	LF	$1.12
Polyvinylchloride Pipe	Sewer - 4" Ø (D3034)	LF	$3.22
	Sewer - 8" Ø (D3034)	LF	$11.16
	Water - 6" Ø (C900)	LF	$11.42
	Water - 8" Ø (C900)	LF	$15.84
	Water - 12" Ø (C900)	LF	$26.57
Ductile Iron Pipe (CL150)	6" Ø	LF	$28.91
	8" Ø	LF	$41.75
	12" Ø	LF	$59.44
Copper Water Tubing	Type L - 1/2" Ø	LF	$2.96
	Type L - 1-1/2" Ø	LF	$11.52

Lumber, Plywood……	Type/Size	Unit	Unit Cost
2x4	S4S - Pine	MBF	$1,162.51
2x4	S4S - Fir	MBF	$958.83
2x4	S4S - Common	MBF	$915.06
2x6	S4S - Common	MBF	$931.57
2x8	S4S - Common	MBF	$871.19
2x10	S4S - Common	MBF	$1,027.32
Plywood	5/8" thick	MSF	$1,040.07
Plyform	3/4" thick	MSF	$1,765.77
Particle Board (underlayment)	5/8" thick	MSF	$901.01
Gypsum Board (regular)	1/2" thick	MSF	$448.17
Roofing Insulation	Unfaced	SF	$11.20
Wall Insulation	Unfaced	SF	$10.32

Structural Steel, Rebar……	Type/Size	Unit	Unit Cost
Standard Structural Shapes	Average	CWT	$97.36
Channel Beam	6" deep - 8.2 LB/LF	CWT	$87.41
I-Beam	6" deep - 12.5 LB/LF	CWT	$103.26
Wide-Flange	8" deep - 31 LB/LF	CWT	$101.41
Reinforcing Bars	Grade 60 - #4	CWT	$75.60
Hot-Rolled Carbon Steel Plate	12 gauge - 48" x 10'	CWT	$91.74
Building Sheet & Plate-Aluminum	3003H14 - 36" x 96"	CWT	$326.48
Stainless Steel Sheet	14 gauge	CWT	$309.78
	16 gauge	CWT	$315.68
	20 gauge	CWT	$321.37
Stainless Steel Plate	304 - 1/4" x 72" x 240"	CWT	$316.29
	316 - 1/4" x 96" x 140"	CWT	$369.10
Steel Piling (H-pile)	HP10x42 (A572)	CWT	$41.27

Cost Indices	Type	Unit	Unit Cost/Index
CCI	Construction cost index	-	13,424.98
	Common labor index	-	25,080.22
	Wages	HR	48.30
BCI	Building cost index	-	8,179.87
	Skilled labor index	-	11,686.01
	Wages	HR	64.56
MCI	Material cost index	-	6,011.05
	Cement	TON	206.77
	Steel	CWT	97.05
	Lumber	MBF	1,034.90

NOTE: ENR ceased providing data after 31Mar14 for **Gravel** (3/4" to 1-1/2" and 3/8" to 3/4"-TON), **Masons Lime** (TON), **Standard Modular Brick** (M), **Vitrified Clay Pipe** (premium joint-12" Ø and 24" Ø-LF), **Common 4x6** (S4S-MBF), **Common 4x12** (S4S-MBF), **Regular Gypsum Board** (5/8" thick-MSF), **Type X Gypsum Board** (1/2" thick and 5/8" thick-MSF), **Epoxy-Coated Reinforcing Bar** (CWT), and **Expanded Metal Lath** (diamond & ribbed-CWT).

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WBS COST OVERVIEW

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

The DIRECT Cost column reflects the Installing Contractor's raw cost to supply and/or install the indicated WBS scope item. The ALLOCATED (i.e. sell) cost column reflects addition of the Installing Contractor Burdens & Add-Ons applied by CSI division, along with proportional allocation of the Prime Contractor and Estimator Gross Adjustments costs.

Subsequent worksheets titled OPCC SUMMARY and WBS COST DISTRIBUTION & BUILD-UP provide more detail on transitioning from DIRECT to ALLOCATED cost

The Electric Power & Control Equipment cost is allocated by the percentage derived through comparing the amperage load in each WBS item/group to the project Total Connected Amperage Load of 412 amps at 480V.

Summary Data

Level 1 Summary by WBS

WBS ID or #	WBS Description			Facility ALLOCATED Total	WBS DIRECT Cost	WBS ALLOCATED Cost (Sell)	Comment
1	General Conditions				$603,810	$0	Cost has been allocated proportionally to each WBS scope item below
2	General Allowances				$142,616	$0	Cost has been allocated proportionally to each WBS scope item below
3	Electric Power & Control Equipment				$222,459	$0	Cost has been allocated by amperage load of each WBS scope item below
4	**SPORTS WAY FACILITY**			**$13,837,759**	$0	$0	
5	Building Structure				$2,127,380	**$4,381,673**	
6	GAC Filter System				$4,562,857	**$8,311,650**	
7	Hypochlorite System				$185,795	**$360,504**	
8	Site & Yard Work				$402,735	**$783,932**	
9	**SP MAIA FACILITY**			**$7,732,806**	$0	$0	
10	Building Structure				$1,116,661	**$2,310,650**	
11	GAC Filter System				$1,863,630	**$3,411,008**	
12	Hypochlorite System				$151,912	**$292,393**	
13	Site & Yard Work				$863,394	**$1,718,756**	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
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0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
0	0				$0	$0	
TOTALS					$12,243,249	**$21,570,566**	

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OPCC SUMMARY

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Project Delivery & Bid Scope	BID/BUILD without Preconstruction	*EQ Inspections & Start-Up Assistance*	2.05%
Prime Contractor	GENERAL CONTRACTOR as GC	*EQ Spare Parts & Special Tools/Supplies*	1.24% for Start-Up Supply Only
Construction Execution	PRIME with 30% of Direct Cost by SUBS	*Packing & Freight Categories*	EQ (excluding permanent materials)
Payroll Deductions & Workers Compensation	38.00%	*Packing & Freight*	5.20%
Small Tools & Personal Safety Gear	3.50%	*Years From OPCC to Construct Mid-Point*	0.49
Tax Type & Categories Applied	TAX EXCLUDED and/or EXEMPT	*MH$ GENERAL Escalation APR*	3.00%
Tax Rate Applied - Lane County	0.000%	*M&CE$ GENERAL Escalation APR*	2.00%
Builders Risk Insurance - Carried by PRIME	1.75%	*EQ$ GENERAL Escalation APR*	1.00%
Liability Insurances - SUBS	0.550%	*Estimate Contingency*	20.0%
Umbrella & Vehicle Insurances - SUBS	0.250%	*Scope Contingency*	10.0%
Bonds (P&P-Supply) - SUBS	1.30%	*SPECIAL Escalation: MH$, M&CE$, & EQ$*	1.0%
Overhead & General Conditions - SUBS	5.00%	*Anticipated Construction-Only Duration*	51 weeks
Profit - SUBS	7.00%	*Special Project Consideration*	NOT APPLICABLE

Installing Contractor Cost-of-Work (COW)

Description	Basis	TOTAL
Direct Cost-of-Work	Total of DIVS 1-16 Sheets Less DIV 1s Prime Contractor Field Staff Sheet & DIV 1p Pass-Thru Costs Sheet	***$12,243,249***
Payroll Deductions & Workers Compensation	38% of Installation Labor Direct Cost (i.e. both Prime & Subcontractor's without fringes)	*$486,255*
Small Tools & Personal Safety Gear	3.5% of Installation Labor Direct Cost (i.e. both Prime & Subcontractor's without fringes)	*$44,787*
EQ Inspections & Start-Up Assistance	2.05% of Buy-Out Equipment Cost	*$142,652*
EQ Spare Parts & Special Tool/Materials	0.84% of Buy-Out Equipment Cost	*$86,446*
Packing & Freight	5.2% of Buy-Out Equipment Cost	*$361,850*
Sales Tax: NOT REQUIRED		
	Running Total A	***$13,365,239***
Overhead & General Conditions	5% of Subcontractor's Labor, Construction Materials/Consumables & Equipment, and Buy-Out Equipment Costs	*$199,330*
Profit	7% of Subcontractor's Labor, Construction Materials/Consumables & Equipment, and Buy-Out Equipment Costs	*$293,015*
	Running Total B	***$13,857,584***
Builders Risk Insurance: CARRIED BY PRIME BELOW		
Liability Insurance	0.55% of Subcontractor's Labor Costs	*$10,196*
Umbrella & Vehicle Insurances	0.25% of Subcontractor's Labor and Construction Materials/Consumables & Equipment Costs	*$10,061*
Bonds-Payment, Performance, & Supply	1.3% of Subcontractor's Labor, Construction Materials/Consumables & Equipment, and Buy-Out Equipment Costs	*$58,490*
	Running Total C	***$13,936,331***
Gross Receipts Tax: NOT APPLICABLE		
	Cost-of-Work (COW) Subtotal	***$13,936,331***

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OPCC SUMMARY

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Prime Contractor Costs

Description	Basis		TOTAL
Field Supervisory Staff Labor	DIV 1s PRIME CONTRACTOR FIELD STAFF sheet		*$769,774*
Field Supervisory Staff Travel & Living	DIV 1s PRIME CONTRACTOR FIELD STAFF sheet		*$23,165*
Field Supervisory Staff Remote Camp: NOT REQUIRED			
Tradesmen & Craft Supervision Remote Camp: NOT REQUIRED			
		Running Total D	***$792,939***
Insurances-Builders Risk, Umbrella, Liability, and/or Vehicle)	2.4% of Prime's Portion of Running Total B + 2.4% of Subcontractor's Portion of Running Total B		*$332,582*
		Running Total E	***$1,125,521***
General & Administrative	4% of (Prime's Portion of COW Subtotal & Running Total E) + 1% of Subcontractor's Portion of COW Subtotal		*$463,826*
Profit	6% of (Prime's Portion of COW Subtotal + Running Total E) + 2% of Subcontractor's Portion of COW Subtotal		*$719,031*
Project Engineering : BY OTHERS			
Pass-Thru Costs: NOT REQUIRED			
		Running Total F	***$2,308,378***
Bonds-Payment, Performance, Supply, and/or Maintenance	0.8% of COW Subtotal + Running Total F		*$129,958*
		Running Total G	***$2,438,336***
Gross Receipts Tax: NOT APPLICABLE			
		Prime Contractor Costs Subtotal	***$2,438,336***

Estimator Gross Adjustments

Description	Basis	TOTAL
GENERAL Escalation	0.73% composite rate on COW Subtotal + Prime Contractor Costs Subtotal	*$119,752*
ESTIMATE Contingency	20% on COW Subtotal + Prime Contractor Costs Subtotal	*$3,274,933*
SCOPE Contingency	10% on COW Subtotal + Prime Contractor Costs Subtotal	*$1,637,467*
SPECIAL Escalation	1% on COW Subtotal + Prime Contractor Costs Subtotal	*$163,747*
	Estimator Gross Adjustments Subtotal	***$5,195,899***

OPCC Total

OPCC GRAND TOTAL	***$21,570,566***

Glossary of OPCC Summary Terms

PROJECT DELIVERY & BID SCOPE: Identifies the bid & installation work scope approach (i.e. Bid/Build or Design/Build), which subsequently establishes the baseline burdens and add-on rates.

PRIME CONTRACTOR: Identifies the entity having the overall construction oversight and/or construction management responsibilities, which adjusts a portion of the assigned burden & add-ons.

CONSTRUCTION EXECUTION: Identifies the entity actually performing the supply/install work scope, which finalizes the balance of the assigned burden and add-on rates.

PAYROLL DEDUCTIONS & WORKERS COMP: Percent applied to the supply/install Contractor(s) base MH rate (i.e. excluding fringes) to cover the payroll taxes (FICA, FUTA, & SUTA), payroll insurances, pension contributions, union assessments, bonus programs (excluding profit sharing), training funds, industry/administrative funds, and state workers compensation insurance.

SMALL TOOLS & PERSONAL SAFETY GEAR: Percent applied to the supply/install Contractor(s) base MH rate (i.e. excluding fringes) to cover the supply and/or replacement of the small "expendable" items (i.e. hand tools, hand-held power tools, etc.), and personal protection equipment, with any single item value anticipated to be no greater than $250.

TAX TYPE & CATEGORIES APPLIED: Identifies the type of tax and the MH, M&CE, and/or EQ cost categories to which the tax percentage assigned below shall apply.

TAX RATE: Percent applied to the categories identified above which calculates the supply/install or Prime Contractor(s) tax burden.

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OPCC SUMMARY

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

BUILDERS RISK INSURANCE: Percent applied to the direct MH, M&CE, & EQ costs to cover the capital and installation risk insurance carried either by the Owner or Prime Contractor (carried under the Prime section).

LIABILITY INSURANCES: Percent applied to the supply/install Subcontractor(s) direct MH cost for the general liability insurances.

UMBRELLA & VEHICLE INSURANCES: Percent applied to the supply/install Subcontractor(s) direct MH & M&CE costs for the umbrella & vehicle insurances.

PAYMENT, PERFORMANCE, & SUPPLY BONDS: Percent applied to the supply/install Contractor(s) applicable direct MH, M&CE, & EQ costs for the bonds to ensure satisfactory completion & payment to suppliers, Vendors, & Subcontractors.

OVERHEAD & GENERAL CONDITIONS: Percent applied to supply/install Contractor(s) direct MH, M&CE, & EQ costs for direct/indirect field overhead expenses, indirect home office expenses, and general conditions incurred during installation.

PROFIT: Percent applied to the supply/install Subcontractor(s) direct MH, M&CE, & EQ costs for the profit.

EQ INSPECTIONS & START-UP ASSISTANCE: Percent applied to the direct EQ costs for the tax-exempt services provided by the Manufacturer/Vendor, such as installation inspections and start-up assistance, including all related T&L costs.

EQ EXTRA MATERIALS & SPARE PARTS: Identifies the additional buy-out EQ supplies to be provided by either the Manufacturer or Vendor, such as special tools, lubricants, & spare parts.

PACKING & FREIGHT CATEGORIES: Identifies the EQ and/or M&CE cost categories to which the freight percentage assigned below is applied.

PACKING & FREIGHT: Percent applied to the categories identified above for the supply/install Contractor(s) freight costs for packing, shrink-wrapping, crating, containerization and/or shipping expenses.

LABOR ESCALATION APR: General annual percentage rate applied to direct labor (MH) and Prime Contractor staff travel and living costs, which is then pro-rated from date of this OPCC to projected mid-point of construction.

MATERIALS ESCALATION APR: General annual percentage rate applied to direct construction materials, consumbables, and construction equipment costs (M&CE), which is then pro-rated from date of this OPCC to projected mid-point of construction.

EQUIPMENT ESCALATION APR: General annual percentage rate applied to direct costs for process and buy-out equipment (EQ), which is then pro-rated from date of this OPCC to projected mid-point of construction.

YEARS OF ESCALATION: Identifies the "life" of this OPCC (starting from the completion date of the OPCC), over which the APR escalation rates identified above will be applied, and reflecting the overall time anticipated to pass for executing pre-con issues that could include sampling, surveys/testing, bench tests, design development, Contractor solicitations/negotiations, Prime and/or Subcontractor site staffing, site set-up, submittals/approvals, early/long-lead equipment procurement, and planning/coordination for any special demolition, phasing, and/or shut-downs.

ESTIMATE CONTINGENCY: Percent applied to the direct MH, M&CE, & EQ costs for the purpose of covering the potential Estimator errors/omissions, variability with the take-off and quantification efforts, and misinterpretation of the design documents.

SCOPE CONTINGENCY: Percent applied to the direct MH, M&CE, & EQ costs for covering the potential growth due to design changes/revisions, Owner preferences, and unknown regulatory requirements.

GENERAL ESCALATION: Composite increase(s) typically expected on the supply/install Contractor(s) direct MH and M&CE, & EQ costs, which is then pro-rated from date of this OPCC to projected mid-point of construction

SPECIAL ESCALATION: A one-time increase applied to the supply/install Contractor(s) direct MH, M&CE, & EQ costs. This adjustment is specifically applied for the current perceived and unusual current market concerns and supply chain issues, and serves to update the internal OPCC database and historical cost data resources which are beyond the reach of General Escalation. Although this attempt has been made to account for these issues, it is strongly suggested to review and further adjust for these specific conditions prior to any bid solicitation and/or award.

ANTICIPATED CONSTRUCTION DURATION: Identifies the total construction duration (from physical notice-to-proceed mobilization through to substantial completion) either in weeks, months, or years for the project with the labor headcount and production efficiency assigned in this OPCC, and excluding time for testing & final completion/sign-off.

SPECIAL PROJECT CONSIDERATION: Identifies the anticipated special project considerations for demolition, rehabilitation, phasing, personal protective equipment (PPE) needs, or a combination of these.

PROJECT STAFF LABOR: The costs attributable to the labor hours generated by all the Prime Contractor's on-site and home-office based personnel directly billable to the project.

PROJECT STAFF TRAVEL, LIVING, & OTHER: The costs attributable to the travel, living, & miscellaneous related costs generated by all the Prime Contractor's on-site and home-office based personnel directly billable to the project.

PROJECT STAFF CAMP ALLOWANCE: The anticipated total cost for providing all Tradesmen and Supervision with travel to/from a remote work site, as well as the establishment & maintenance of a remote camp

TRADESMEN & SUPERVISION CAMP ALLOWANCE: The anticipated total cost for providing all Tradesmen and Supervision with travel to/from a remote work site, as well as the establishment & maintenance of a remote camp.

PASS-THRU COSTS: Costs which bypass the typical installing Contractors burdens & mark-ups, but as part of the Prime Contractor's responsibility will still receive costs for bonds, gross receipts tax (if applicable), escalation, and contingency

INSURANCES: An allowance for the overall project builders risk insurance, as well as the miscellaneous umbrella, vehicle, and liability insurances carried by the Prime Contractor.

GENERAL & ADMINISTRATIVE: The costs attributable to the Prime Contractor's indirect costs that are attributable to labor, supplies, materials, equipment, tools, facilities and/or overheads, both field and home office, during execution of the project.

PROJECT & CONSTRUCTION MANAGEMENT FEE: The anticipated profit for the Prime Contractor in executing and/or managing the project.

PROJECT ENGINEERING: The forecasted cost of the project engineering effort, which may include geotechnical testing and design, detailed project design, and/or support and oversight during construction.

BONDS: Percent applied to the applicable overall project MH, M&CE, & EQ costs for the bonds to ensure satisfactory completion (to the Owner) and payment to the suppliers, Vendors, & Subcontractors.

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WBS COST DISTRIBUTION & BUILD-UP

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Project Cost Breakdown by DIV & WBS

NOTE: ROSE header cells denote the DIV scope being self-performed by the Prime Contractor, while BLUE header cells denote Subcontracted work for this DIV scope (if existing) under the Prime Contractor's oversight

WBS	Description	DIV 1(g) (01) General Conditions	DIV 2(c) (02, 31-35) Common Site Work	DIV 2(s,w) (02, 31-35) Specialty Site Work & Wells	DIV 3 (03) Concrete	DIV 4 (04) Masonry	DIV 5(s) (05) SUPPLY Metals	DIV 5(i) (05) INSTALL Metals	DIVS 5-8 (05-08) Buildings & Components	DIVS 7-10 (07-10) Coatings & Finishes	DIV 13(f,s) (33) Field-Erect & Shop-Fab Tanks	DIVS 11-15(e) (40-45) SUPPLY Process & Mech EQ	DIVS 11-15(i) (21-23) INSTALL Process & Mech EQ	DIV 16(e) (25-28, 33) SUPPLY Power & I&C EQ	DIV 16(i) (25-28, 33) INSTALL Power & I&C EQ	TOTAL
SECTION 1: Installing Contractor Direct Costs																
1	General Conditions	$603,810														$603,810
2	General Allowances	$0	$15,882	$10,825	$7,870	$5,829	$2,967	$1,299	$9,586	$469	$0	$0	$69,028	$2,392	$16,469	$142,616
3	Electric Power & Control Equipment													$159,482	$62,977	$222,459
	SPORTS WAY FACILITY	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	Building Structure		$28,544		$312,906	$737,613	$141,033	$70,942	$433,403	$16,654		$9,225	$185,975	$1,650	$189,436	$2,127,380
6	GAC Filter System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$4,290,000	$203,049	$0	$69,808	$4,562,857
7	Hypochlorite System											$150,000	$20,282		$15,513	$185,795
8	Site & Yard Work	$0	$33,400	$127,451	$18,942	$0	$6,818	$2,223	$0	$0	$0	$140,000	$43,391	$3,500	$27,011	$402,735
9	**SP MAIA FACILITY**															
10	Building Structure	$0	$14,769	$0	$173,865	$439,272	$43,134	$11,197	$205,595	$14,589	$0	$9,225	$103,692	$1,650	$99,673	$1,116,661
11	GAC Filter System											$1,725,000	$103,726		$34,904	$1,863,630
12	Hypochlorite System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$122,256	$16,729	$0	$12,927	$151,912
13	Site & Yard Work		$29,165	$594,242	$18,942		$6,818	$2,223				$140,000	$43,391	$3,500	$25,114	$863,394
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
15																
	SECTION 1 SUBTOTALS	$603,810	$121,759	$732,519	$532,523	$1,182,714	$200,770	$87,884	$648,584	$31,712	$0	$6,585,706	$789,262	$172,174	$553,832	**$12,243,249**
SECTION 2: Installing Contractor Burdens & Add-Ons																
	Payroll Deducts & Workers Comp	$38,248	$17,725	$52,698	$75,771	$97,685		$12,882	$15,774	$4,344			$119,188		$51,940	$486,255
	Small Tools & Personal Safety Gear	$3,523	$1,633	$4,854	$6,979	$8,997		$1,187	$1,453	$400	$0		$10,978		$4,784	$44,787
	Equipment Inspection & Start-Up Assist						$4,116					$135,007		$3,530		$142,652
	Equipment Spare Parts & Special Tools	$0		$0			$2,494					$81,813		$2,139		$86,446
	Packing & Freight						$10,440					$342,457		$8,953		$361,850
	Sales Tax - NOT APPLICABLE	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Overhead & General Conditions			$39,504		$64,470	$10,891			$1,823			$45,971	$9,340	$27,332	$199,330
	Profit	$0	$0	$58,070	$0	$94,771	$16,010	$0	$0	$2,680	$0	$0	$67,578	$13,729	$40,178	$293,015
	Builders Risk Insurance (see below)															
	Liability Insurance	$0	$0	$1,649	$0	$3,057		$0	$0	$136	$0		$3,729		$1,625	$10,196
	Umbrellla & Vehicle Insurances			$2,219		$3,622				$102			$2,582		$1,535	$10,061
	Bonds	$0	$0	$11,590	$0	$18,919	$3,181	$0	$0	$536	$0	$0	$13,511	$2,728	$8,025	$58,490
	Gross Receipts Tax - NOT APPLICABLE															
	SECTION 2 SUBTOTALS	$41,771	$19,358	$170,583	$82,750	$291,520	$47,132	$14,069	$17,227	$10,021	$0	$559,277	$263,538	$40,419	$135,419	**$1,693,082**
	RUNNING TOTAL: Sections 1-2	$645,580	$141,117	$903,101	$615,273	$1,474,234	$247,902	$101,953	$665,811	$41,732	$0	$7,144,983	$1,052,800	$212,593	$689,251	**$13,936,331**
	INCREASE FROM SECTION 1	6.9%	15.9%	23.3%	15.5%	24.6%	23.5%	16.0%	2.7%	31.6%	0.0%	8.5%	33.4%	23.5%	24.5%	**13.8%**

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Project Cost Breakdown by DIV & WBS

NOTE: ROSE header cells denote the DIV scope being self-performed by the Prime Contractor, while BLUE header cells denote Subcontracted work for this DIV scope (if existing) under the Prime Contractor's oversight

W B S Description	*DIV 1(g) (01)* General Conditions	*DIV 2(c) (02, 31-35)* Common Site Work	*DIV 2(s,w) (02, 31-35)* Specialty Site Work & Wells	*DIV 3 (03)* Concrete	*DIV 4 (04)* Masonry	*DIV 5(s) (05)* **SUPPLY** Metals	*DIV 5(i) (05)* **INSTALL** Metals	*DIVS 5-8 (05-08)* Buildings & Components	*DIVS 7-10 (07-10)* Coatings & Finishes	*DIV 13(f,s) (33)* Field-Erect & Shop-Fab Tanks	*DIVS 11-15(e) (40-45)* **SUPPLY** Process & Mech EQ	*DIVS 11-15(i) (21-23)* **INSTALL** Process & Mech EQ	*DIV 16(e) (25-28, 33)* **SUPPLY** Power & I&C EQ	*DIV 16(i) (25-28, 33)* **INSTALL** Power & I&C EQ	TOTAL
SECTION 3: Prime Contractor															
Field Supervisory Staff Labor															$769,774
Field Supervisory Staff Travel & Living															$23,165
Field Supervisory Staff Remote Camp: NOT REQUIRED															
Trades & Supervison Remote Camp: NOT REQUIRED															$0
Insurances (builders risk, umbrella, liability and/or vehicle)															$332,582
General & Administrative															$463,826
Profit															$719,031
Project Engineering: BY OTHERS															$0
Pass-Thru Costs: NOT REQUIRED															
Bonds (payment, performance, supply, and/or maintenance)															$129,958
Gross Receipts Tax - NOT APPLICABLE															
SECTION 3 SUBTOTAL															**$2,438,336**
RUNNING TOTAL: Sections 1-3															**$16,374,667**
INCREASE FROM SECTION 2															17.5%
SECTION 4: Estimator Gross Adjustments															
GENERAL Escalation															$119,752
ESTIMATE Contingency															$3,274,933
SCOPE Contingency															$1,637,467
SPECIAL Escalation															$163,747
SECTION 4 SUBTOTAL															**$5,195,899**
GRAND TOTAL: Sections 1-4															**$21,570,566**
INCREASE FROM SECTION 3															31.7%

WBS MANHOURS DISTRIBUTION

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

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Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

DIV Manhours

NOTE: ROSE header cells denote the DIV scope being self-performed by the Prime Contractor, while BLUE header cells denote Subcontracted work for this DIV scope (if existing) under the Prime Contractor's oversight

WBS	Description	*DIV 1s-1g* *(01)* Prime Staff & GC's	*DIV 2c* (02, 31-35) Common Site Work	*DIV 2s-2w* *(02, 31-35)* Specialty Site Work & Wells	*DIV 3* (03) Concrete	*DIV 4* (04) Masonry	*DIV 5i* (05) INSTALL Metals	*DIVS 5-8* (05-08) Buildings & Components	*DIVS 7-10* (07-10) Coatings & Finishes	*DIV 13f-13s* (33) Field-Erect &\ Shop-Fab Tanks	*DIVS 11i-15i* (21-23) INSTALL Process & Mech EQ	*DIV 16i* (25-28, 33) INSTALL Power & I&C EQ	TOTAL MANHOURS		
0	Prime Contractor	8,976											8,976	52	4
1	General Conditions	3,250											3,250		
2	General Allowances	0	196	66	89	124	14	18	7	0	880	195	1,591	52	1
3	Electric Power & Control Equipment											736	736		
4	SPORTS WAY FACILITY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Building Structure		341		3,563	5,176	746	802	258		1,517	1,792	14,196		
6	GAC Filter System	0	0	0	0	0	0	0	0	0	2,302	469	2,772	13	5
7	Hypochlorite System										187	104	291		
8	Site & Yard Work	0	421	918	179	0	34	0	0	0	478	251	2,281	61	1
9	SP MAIA FACILITY														
10	Building Structure	0	179	0	2,044	3,094	148	390	233	0	856	937	7,881	22	9
11	GAC Filter System										1,185	235	1,419		
12	Hypochlorite System	0	0	0	0	0	0	0	0	0	154	87	241	4	1
13	Site & Yard Work		369	3,494	179		34				478	241	4,794		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MANHOURS TOTAL	12,226	1,506	4,478	6,053	8,394	977	1,210	499		8,037	5,047	**48,428**		

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INSTALLATION OVERVIEW

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Project and Owner Market	Municipal & Governmental	*General Allowances*	Low: 1.5%
Installation Labor Classification	Prevailing Wage/Davis Bacon	*Pipe/Raceway Layout*	Typical Manifolds & Branches
Installation Labor Work Schedule	(5)-8 hr days Mon-Fri	*Pipe/Raceway Supports*	Galv Steel Strut
Installation Labor Work Shifts	1 Shift (daylight)	*Area Seismic Rating*	0.30-0.4 (x G) Peak acceleration
Installation Shift Differential Pay		*Area Frost Depth*	5"-10"
Installation Labor Productivity	90% (7.2 hrs production/8 hrs)	*Area Wind Zone*	Zone I - 130 MPH
Bldg & Structure Risk Category	Category IV - Essential facility	*High/Elevated Work*	
Project Site Condition	Greenfield	*Clean Room Work*	
Site Condition Assessment	Mostly Clear Above & Below Grade	*Hazardous Work*	
Site Location Accessibility	Relatively Easy	*Hot Weather Work*	10% performed over 95°
Installed Work Congestion	5% of Work Congested	*Cold Weather Work*	5% performed under 30°
Installed Work Spread	15% of Work Spread Out	*Rain or Snow Work*	25% of work in Rain/Snow
Owner's Project Representative	Engineer	*Evening/Night Work*	
Maximum Pipe Size & Flow Rate	48"Ø: 11,270(g)-45,110(p) GPM	*DBE & MBE Work*	5% of work by DBE/MBE

Work Anticipated to be Self-Performed by Prime Contractor

☑ DIV 1 Site Mgmt & Oversight Staff	☐ DIV 4 Masonry	☐ DIVS 11-15 INSTALL EQ: Process and Mechanical
☑ DIV 1 General Conditions	☐ DIV 5 SUPPLY EQ: Miscellaneous Metals	☐ DIV 13 Field-Erected Tanks
☑ DIV 2 Common Site Work	☑ DIV 5 INSTALL EQ: Miscellaneous Metals	☐ DIV 13 Shop-Fabricated Tanks
☐ DIV 2 Specialty Site Work	☑ DIVS 5-8 Buildings & Components	☐ DIV 16 INSTALL EQ: Process & Mechanical
☐ DIV 2 Well Work	☐ DIVS 7-10 Finishes	☐ DIV 16 SUPPLY EQ: Electrical and I&C
☑ DIV 3 Concrete	☑ DIVS 11-15 SUPPLY EQ: Process & Mechanical	☐ DIV 16 INSTALL EQ: Electrical and I&C

Direct Cost Roll-Up of DIVS 1-17 Sheets

CSI 1995	CSI 2004	Description *(NIS = not in scope)*	SF	CY	TON	MH	MH $	M&CE $	EQ $	TOTAL
DIV 1s	01	*Prime Contractor Staff*								*$792,939*
DIV 1g	01	*General Conditions*				2,500	$151,910	$451,900		*$603,810*
DIV 1p	01	*Pass-Thru Costs*								
DIV 2c	02,31-35	*Common Site Work*				1,159	$70,399	$51,360		*$121,759*
DIV 2s	02,31-35	*Specialty Site Work*				3,444	$209,300	$523,219		*$732,519*
DIV 2w	33	*Well Work - NIS*								
DIV 3	03	*Concrete*		580	32.8	4,656	$300,940	$231,584		*$532,523*
DIV 4	04	*Masonry*	11,349			6,457	$387,976	$794,738		*$1,182,714*
DIV 5e	05	*EQ: Miscellaneous Metals*			20.7				$200,770	*$200,770*
DIV 5i	05	*INSTALL: Miscellaneous Metals*				752	$51,165	$36,719		*$87,884*
DIVS 5-8	05-08	*Buildings & Components*	11,807			931	$62,649	$585,935		*$648,584*
DIVS 7-10	07-10	*Coatings & Finishes*	4,260			384	$17,254	$14,457		*$31,712*
DIV 13f	33	*Tanks: Field Erected - NIS*	1,056							
DIV 13s	33	*Tanks: Shop Fabricated - NIS*								
DIVS 11e-15e	40-45	*EQ: Process & Mechanical*							$6,585,706	*$6,585,706*
DIVS 11i-15i	21-23	*INSTALL: Process & Mechanical*				6,183	$473,380	$315,882		*$789,262*
DIV 16e	25-28,33	*EQ: Electrical and I&C*							$172,174	*$172,174*
DIV 16i	25-28,33	*INSTALL: Electrical and I&C*				3,882	$242,126	$311,706		*$553,832*
		DIVS 1-16 DIRECT COST TOTAL				30,348	$1,967,099	$3,317,500	$6,958,650	***$13,036,188***

DIV 1s (01) PRIME CONTRACTOR FIELD STAFF

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

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Assumptions

Travel & Living Base Location	Local Only	*Lodging (short vs. long)*	
Per-Diem T&L Option		*Vehicle (rent vs. lease)*	$55 vs. $18 per Day
Meals, Meetings, & Incidentals		*Fuel-Oil-Maintenance*	$5 per Day
Baggage Check-In Fees		*Vehicle Sharing*	
Airport or Off-Site Parking		*Meals (exludes meetings)*	$50 per Day
Personal Vehicle Mileage		*Incidentals*	$5 per Day

Prime Contractor Field Supervisory Staff

Labor Allowances

Anticipated Project Construction Duration

51 weeks

Labor During Construction

Labor Category Allowance	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
Head Count	0.0	1.0	0.0	1.5	2.0	2.0	0.0	1.0	1.0
Project Coverage		10%		100%	100%	10%		10%	50%
Travel & Living Classification	0	VEHICLE+	0	VEHICLE	VEHICLE	HOME OFFICE	0	VEHICLE	EXEMPT
Travel & Living Coverage	0%	100%	0%	100%	100%	0%	0%	100%	0%
Meals, Meetings, & Incidentals	0	YES	0	NO	NO	NO	0	NO	NO
Shift Coverage	0	1st	0	1st	1st	1st	0	1st	1st
Work Hours per Week		40		40	40	40		40	40
Base Rate + Benefits at 38%		$123		$100	$85	$77		$108	$39
Travel & Living Cycle in Days		1		1	1			1	

Labor Summary

Labor Metric	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
LABOR Hours		204		3,060	4,080	408		204	1,020
LABOR Cost		$25,135		$306,339	$345,613	$31,419		$21,994	$39,274

Labor Total

Labor Hours	Labor Cost
8,976	$769,774

Labor Cost Assignment to Alternate WBS

WBS	%	WBS Hours	WBS Cost

DAY-BASED (i.e. Local) Travel Allowances

Expenses During Construction

DAILY Expense Allowance	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
Per-Diem Option									
Meals/Meetings		$50							
Vehicle		$18		$18	$18			$18	
Fuel-Oil-Maintenance (FOM)		$5		$5	$5			$5	
Incidentals		$5							

Travel Summary

Travel & Living Metric	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
DAY Cost		$78		$23	$23			$23	
DAY Count		26		383	510			26	
DAYS Cost		$2,028		$8,809	$11,730			$598	

Day-Based Travel Total

Day Count	Day Cost
945	$23,165

Day-Based Cost Assignment to Alternate WBS

WBS	%	WBS Cost
0	0%	
0	0%	

DIV 1s (01) PRIME CONTRACTOR FIELD STAFF

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TRIP-BASED (i.e. Remote) Travel & Living Allowances

Expenses During Construction

TRIP Expense Allowance	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
Surface Travel									
Baggage Fees									
Airport Parking									
Personal Mileage									
Lodging									
Meals/Meetings									
Vehicle									
Fuel-Oil-Maintenance (FOM)									
Incidentals									

Travel & Living Summary

Travel & Living Metric	Project Director	Project/Construct Manager	Construction Manager	Construction Superintendent	Construction Engineers	Inspectors & Health & Safety	Scheduling & Estimating	Start-Up, Test & Commission	Clerical & Administrative
TRIP Cost									
TRIP Count									
TRIPS Cost									

Trip-Based Travel & Living Total

Trip Count	Trip Cost

Trip-Based Cost Assignment to Alternate WBS

WBS	%	WBS Cost
0	0%	
0	0%	

Prime Contractor Field-Supervisory Staff Camp

Considerations During Construction

Travel Metrics & Cost		Daily Cost	
Work Days per Week	0	*Meals & Tips*	$0
Rotation Cycle - Weeks	0.0	*Mobility & Tips*	$0
Rotation Cycle - Idle Days	0.0	*Mobility Fuel, Oil, & Maint*	$0
1-Way Travel Time- Hours	0.0	*Lodging & Tips*	$0
Air Transportation	$0	*Housekeeping & Tips*	$0
Ground Transport & Tips	$0	*Laundry & Tips*	$0
Baggage Fees	$0	*Incidentals*	$0

Camp Cost Assignment to Prime Contractor

☑ Yes-Assign to Prime

Camp Cost Assignment to Alternate WBS

WBS	%	WBS Cost
0	0%	
0	0%	

Camp $ per MH	Eligible MH's	Total Camp $

Miscellaneous

WBS	Description	Quantity	Trades MH	MH @ $0	M&CE $	EQ $	TOTAL
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
Subtotal - Miscellaneous							

Prime Contractor Field Supervisory Staff Total

	MH	MH @ $86 (avg)	T&L $	Camp $	M&CE $	EQ $	TOTAL
DIV 1s TOTAL	8,976	$769,774	$23,165				***$792,939***

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Glossary of Travel & Living Terms

CONSTRUCTION PROJECT COVERAGE: Duration of labor categories presence on site during construction, including Pre-Construction (Pre-Con) time if allowed

SHORT VS. LONG: Identifies the anticipated short-term higher cost "rental" usuallly applying for (1) month or less, versus a longer term and less expensive "lease" option

EXEMPT: Personnel originating *LOCAL* to the project site who do not have a need or expectation of generating travel & living expenses.

HOME OFFICE : Home office personnel (i.e. Denver, CO based) originating either *LOCAL* or *REMOTE* to the project site who typically would not generate any travel & living expenses.

VEHICLE: Personnel originating *LOCAL* to the project site who are reimbursed 100% for the eligible daily expenses of a vehicle and related fuel-oil-maintenance thoughout the individual's project time (re: "Construction Coverage").

VEHICLE +: Personnel originating *LOCAL* to the project site who are reimbursed 100% for the eligible daily expenses of meals, potential meetings coverage, and incidentals, all in addition to the vehicle and related fuel-oil-maintenance thoughout the individual's project time (re: "Construction Coverage").

MIXED: Personnel originating *LOCAL* to the project site who are reimbursed 100% for the eligible daily expenses of a vehicle and related fuel-oil-maintenance, miscellaneous & incidental costs, and meals and potential meetings coverage (depending on staff position) at the indicated duration (re: "Travel & Living Cycle in Days"), as well as the eligible travel expenses to & from the home office location at the indicated frequency (re: "Travel & Living Frequency") and project time (re: "Construction Coverage").

TRIPS: Personnel originating *REMOTE* to the project site who are reimbursed 100% for the eligible travel expenses to & from their remote home/home office location at the indicated frequency (re: "Travel & Living Frequency") and durations (re: "Travel & Living Cycle in Days") thoughout the individual's project time (re: "Construction Coverage").

PER-DIEM: Personnel originating *REMOTE* to the project site who receive a negotiated lump-sump daily stipend intended to cover 100% of the living costs for a full-time project area residence, as well as the travel expenses to & from their home location at the indicated/negotiated frequency thoughout the individual's project time (re: "Construction Coverage").

CAMP: Personnel originating *REMOTE* to the project site who are provided a pre-negotiated residence and boarding (i.e. meals, transportation, & laundry), along with a negotiated lump-sump daily stipend intended to cover 100% of the personal living costs for this full-time project area residence, as well as the travel expenses to & from their home location at the indicated/negotiated frequency thoughout the individual's project time (re: "Construction Coverage").

REMOTE: Personnel originating *REMOTE* to the project site who are reimbursed 100% for the eligible living expenses related to a full-time project area residence, as well as the eligible travel expenses to & from their home location at the indicated frequency (re: "Travel & Living Cycle in Days") thoughout the individual's project time (re: "Construction Coverage").

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DIV 1g (01) GENERAL CONDITIONS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Overall General Conditions Level Average

General Requirements

General Conditions Allowances

Anticipated Project Construction Duration

51 weeks

Temporary Construction Facilities

Prime Staff	Subcontractor(s)	Owner/Rep	Meeting & Kitchen	Decon & Change	Tools & Equip	Mats & Equip	Sanitation	Health & Safety
Single-Wide OfficeTrailer	*Single-Wide OfficeTrailer*	*Single-Wide OfficeTrailer*	*Single-Wide Specialty Trailer*	*Single-Wide Specialty Trailer*	*Storage Trailer Unit(s)*	*CONNEX Box 8' x 40'*	*Portable Toilet(s)*	*First-Aid & Sanitize Station*
1					0	2	2	2
Unit Cost per Month	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*	*Unit Cost per Month*
$667						$182	$121	$91

Temporary Site & Project Conditions

WBS	Category	Category Includes…..	Trades MH	MH @ $61	M&CE $	TOTAL
	Mobilization	Site occupancy with delivery/layout/staging coordination of facilities, utilities, equipment, & materials	260	$15,799	$11,900	*$27,699*
	Field Office: Facilities	Lease, deliver, and set-up trailers, containers, toilets, & first-aid/sanitize stations	30	$1,823	$17,500	*$19,323*
	Field Office: Carpentry	Supply/install facility decks, porches, canopies, ramps, stairways, landings, & misc accessways	30	$1,823	$1,500	*$3,323*
	Field Office: Utilities	Install & connect electric, water (potable, utility, and/or fire), gas/propane, telecommunications, & internet	10	$608	$1,700	*$2,308*
	Field Office: Equipment	Desks, chairs, tables, file cabinets, drawing racks, shelving, water coolers, refrigerators, & microwaves			$1,000	*$1,000*
	Field Office: Tools	Landline phones, computers, software, faxes, printers, copiers, & coffee makers	20	$1,215	$10,500	*$11,715*
	Field Office: Supplies	Copy & printer paper, ink cartridges, pens/markers, coffee, tea, hot chocolate, bottled water, & cups	10	$608	$3,500	*$4,108*
	Field Office: Incidentals	Petty cash, lockboxes, postage, Fedex, reproduction, meetings, meals, workshops, & janitorial services	40	$2,431	$1,500	*$3,931*
	Field Staff: Safety	Training, certifications, personal protection equipment (>$250), celebrations, events, & awards			$2,600	*$2,600*
	Field Staff: Communications	Cell phones, I-Pads, portable radios, LAN, pagers, docking/charging stations, & batteries			$3,300	*$3,300*
	Field Staff: Public Relations	Advertising, solicitations, public notices, MBE programs, community service/outreach, & progress meetings			$10,400	*$10,400*
	Construction: Accessibility	Bridges, cross-overs, scaffolds, decking, ramps, platforms, landings, sidewalks, docks, & stairways	50	$3,038	$6,700	*$9,738*
	Construction: Aids	Specialty equipment such as barge(s), tower crane, crawler crane, large forklift, loader, or hoist/lift	260	$15,799	$95,200	*$110,999*
	Construction: Aids Support	Equipment mats, dunnage, spreaders, slings, rollers, dollies, maintenance, & FOG (fuel-oil-grease)	30	$1,823	$47,600	*$49,423*
	Construction: Permitting	Applications, permits, inspections, notifications, approvals, fees, & support documentation			$57,100	*$57,100*
	Construction: QA & QC	Submittals, samples, tests, inspections, & certifications, & miscellaneous consultants/subcontractors	100	$6,076	$29,600	*$35,676*
	Construction: Main Utilities	Install & remove supply, control, and distribution sytem for temporary construction power & water	150	$9,115	$11,100	*$20,215*
	Construction: Mobile Utilities	Gensets, work lighting, heaters, fans, compressors, pumps, welders, & miscellaneous appliances	100	$6,076	$7,400	*$13,476*
	Work Area: Accessibility	Temporary roads, ramps, re-routes, turn-arounds, overpasses, haul routes, & parking/laydown areas	170	$10,330	$15,700	*$26,030*
	Work Area: Protection	Security lighting, visual barriers, fencing, barricades, & protection for existing trees, plants, and/or structure	90	$5,469	$8,100	*$13,569*
	Work Area: Safety & Health	Signage, fall/debris nets, ventilation blowers, fire extinquishers, first-aid supplies, water, ice, & cups	80	$4,861	$7,100	*$11,961*
	Work Area: Passive Security	Guard shacks, work-time entry/exit guards, & video surveillance & recording system				
	Work Area: Active Security	24-hour watchman & monitoring of video surveillance system				
	Work Area: Transportation	Golf carts, remote parking facilities, & daily transportation to/from remote parking				
	Work Area: Housekeeping	Handling of waste dunnage & crating, general trash collection, waste containers, & tipping/disposal fees	70	$4,253	$5,200	*$9,453*
	Controls: Site	Surveys, layouts, benchmarks, monuments, aerial & progress photos/videos, & GPS			$15,900	*$15,900*
	Controls: Environmental	Stormwater, erosion, dirt, mud, dust, noise, ice, snow, excessive cold/heat, pollution, & pest	40	$2,431	$1,800	*$4,231*
	Controls: EQ & Materials	Handling, transport, storage, staging, maintenance, & damage/loss management	50	$3,038	$3,000	*$6,038*
	Controls: Passive Traffic	Barriers, cones, steel cover plates, traffic control signage/flashers, & long-term detours	50	$3,038	$2,600	*$5,638*
	Controls: Active Traffic	Day flagmen & nightly changes in barriers, traffic control signage/flashers, & short-term detours				
	Startup: Initial	Install punchlists, alignments, gross adjustments, 1st fill oils & lubricants, loop checks, and functional testin	90	$5,469	$3,100	*$8,569*
	Startup: Clean & Disinfect	Pipe, tank, and equipment flushing, cleaning, disinfecting, & fluids/waste handling & disposal	60	$3,646	$2,900	*$6,546*
	Startup: Final	Calibrations, fine adjustments, 1st fill of fuels & chemicals/reagents, & operational training/testing,	80	$4,861	$8,700	*$13,561*
	Startup: Test & Commission	Functional/operational punchlisting, O&M manuals, on-line interfacing/coordination, & performance testing	90	$5,469	$13,400	*$18,869*
	Close-Out: Project	Punchlist sign-offs, record/as-built documents, warranty initiation, & bond closure/sign-offs	100	$6,076	$23,800	*$29,876*
	Close-Out: Site	Disconnect utilities and remove carpentry, construction equipment/tools, & surplus materials	20	$1,215	$1,500	*$2,715*
	Demobilization	Final housekeeping, remove temporary facilities & utilities, and restore related areas	420	$25,521	$19,000	*$44,521*
1	**Subtotal - General Conditions Allowances**		2,500	$151,910	$451,900	***$603,810***

DIV 1g (01) GENERAL CONDITIONS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Tradesmen & Craft Supervision Camp

Considerations During Construction

Travel Metrics & Cost		Daily Cost	
Work Days per Week	0	*Meals & Tips*	$0
Rotation Cycle - Weeks		*Mobility & Tips*	$0
Rotation Cycle - Idle Days		*Mobility Fuel, Oil, & Maint*	$0
1-Way Travel Time- Hours		*Lodging & Tips*	$0
Air Transportation	$0	*Housekeeping & Tips*	$0
Ground Transport & Tips	$0	*Laundry & Tips*	$0
Baggage Fees	$0	*Incidentals*	$0

Camp Cost Assignment to Prime Contractor

☑ Yes-Assign to Prime

Camp Cost Assignment to Alternate WBS

WBS	%	WBS Cost
0	0%	
0	0%	

Camp $ per MH	Eligible MH's	Total Camp $

Miscellaneous

WBS	Description	Quantity	Trades MH	MH @ $0	M&CE $	EQ $	TOTAL
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
				$			
Subtotal - Miscellaneous							

General Requirements Total

	MH	MH @ $61 (avg)	M&CE $	Camp $	EQ $	TOTAL
DIV 1g TOTAL	2,500	$151,910	$451,900			***$603,810***

DIV 2c (02,31-35) COMMON SITE WORK

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Clearing & Grubbing	Topsoil (strip & store)	*Stormwater Control*	(re: General General Allowances)
Primary Excavation Issue	Dust Control	*Temporary Shoring*	
Secondary Excavation Issue	Underground Obstructions	*Temporary Dewatering*	
Hauling & Disposal Distance	10.1 - 15.0 miles roundtrip	*Temporary Erosion Control*	(re: General General Allowances)
Base, Bed, & Fill Supply	100% Import	*Temporary Traffic Control*	(re: General General Allowances)
General Excavations		*Saw-Cutting*	
General Base & Fill		*Core-Drilling*	
Structural Excavations	Excavate & Fill w/ Partial Haul	*Pot-Holing*	(re: General General Allowances)
Structural Base	Crushed Stone ¾"-1½"	*Liners & Geo-Materials*	
Trench Excavations	Excavate & Fill w/ Partial Haul	*Random Base & Fill*	
Trench Bedding & Fill	Gravel ¾"-1½"	*(un-assigned)*	

Common Site Work Scope

Structural Excavations

WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ $61	M&CE $	TOTAL
5	*Sports Way bldg slab area*	1	1.30	162.7	54.0	1.5	45	506	649	171	$10,417	$3,624	*$14,041*
5	*Compacted Base*	33%	1.2	1.7	3.0			169	228	32	$1,946	$6,552	*$8,498*
5	*Sports Way bldg trench area*	1	1.30	140.0	11.0	2.0	45	137	175	50	$3,010	$998	*$4,008*
5	*Compacted Base*	25%	1.2	1.7	3.0			34	46	7	$414	$1,327	*$1,741*
5	*Sports Way bldg sump area*	1	1.30	7.0	7.0	2.0	45	6	8	2	$135	$44	*$179*
5	*Compacted Base*	25%	1.2	1.7	3.0			2	2		$19	$58	*$77*
8	*Sports Way BW tank pad area*	1	1.30	23.0	23.0	2.0	45	46	59	17	$1,035	$340	*$1,375*
8	*Compacted Base*	25%	1.2	1.7	3.0			12	16	2	$142	$449	*$591*
10	*SP Maia bldg slab area*	1	1.30	86.0	53.0	1.5	45	265	340	94	$5,700	$1,921	*$7,621*
10	*Compacted Base*	33%	1.2	1.7	3.0			88	119	17	$1,053	$3,428	*$4,481*
10	*SP Maia bldg trench area*	1	1.30	57.0	11.0	2.0	45	57	73	21	$1,268	$417	*$1,685*
10	*Compacted Base*	25%	1.2	1.7	3.0			14	19	3	$174	$551	*$725*
10	*SP Maia bldg sump area*	1	1.30	7.0	7.0	2.0	45	6	8	2	$135	$44	*$179*
10	*Compacted Base*	25%	1.2	1.7	3.0			2	2		$19	$58	*$77*
13	*SP Maia BW tank pad area*	1	1.30	23.0	23.0	2.0	45	46	59	17	$1,035	$340	*$1,375*
13	*Compacted Base*	25%	1.2	1.7	3.0			12	16	2	$142	$449	*$591*
0		0	0.00	0.0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
0		0	0.00	0.0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
Subtotal - Structural Excavations								1,069	1,372	438	$26,645	$20,601	***$47,245***

Ductbank Excavations

WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ $61	M&CE $	TOTAL
8	*480V Ductbank*	1	1.30	250	4.1	3.7	45	270	347	96	$5,828	$1,745	*$7,573*
8	*Compacted Bedding & Fill*	8%	1.3	1.7	3.0			22	35	5	$287	$978	*$1,265*
13	*480V Ductbank*	1	1.30	250	4.1	3.7	45	270	347	96	$5,809	$1,959	*$7,769*
13	*Compacted Bedding & Fill*	8%	1.3	1.7	3.0			22	35	5	$287	$978	*$1,265*
0		0	0.00	0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
0		0	0.00	0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
Subtotal - Ductbank Excavations								541	693	201	$12,211	$5,660	***$17,871***

Miscellaneous Work

WBS	Description	Qty	Each	Unit MH	Unit M&CE $	Total Units	MH	MH @ $61	M&CE $	TOTAL
	Sports Way Facility									
8	*Treatment site area clear-LS*	1	1	40	$2,000	1	40	$2,431	$2,000	*$4,431*
8	*Pipelines & DB route clear-LS*	1	1	24	$1,200	1	24	$1,458	$1,200	*$2,658*
8	*Pipelines & DB route restore-LS*	1	1	60	$3,000	1	60	$3,646	$3,000	*$6,646*
8	*Treatment site & fence restore-LS*	1	1	80	$4,000	1	80	$4,861	$4,000	*$8,861*

DIV 2c (02,31-35) COMMON SITE WORK

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

	SP Maia Facility									
13	*Treatment site area clear-LS*	1	1	16	$800	1	16	$972	$800	*$1,772*
13	*Pipelines & DB route clear-LS*	1	1	24	$1,200	1	24	$1,458	$1,200	*$2,658*
13	*Pipelines & DB route restore-LS*	1	1	100	$5,000	1	100	$6,076	$5,000	*$11,076*
13	*Treatment site restore-LS*	1	1	24	$1,200	1	24	$1,458	$1,200	*$2,658*
	Subtotal - Miscellaneous Work						368	$22,361	$18,400	***$40,761***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $61	M&CE $	TOTAL
2	**Subtotal - General Allowances**	10.0		151	$9,182	$6,699	***$15,882***

Common Site Work Total

	MH	MH @ $61	M&CE $	TOTAL
DIV 2c TOTAL	1,159	$70,399	$51,360	**$121,759**

DIV 2s (02,31-35) SPECIALTY SITE WORK

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Primary Excavation Issue	Dust Control	*Sheet Piling*	
Secondary Excavation Issue	Underground Obstructions	*Sheet Piling Services*	
Hauling & Disposal Distance	10.1 - 15.0 miles roundtrip	*Asphalt Paving*	Super Duty (large dump trucks)
Base, Bedding, & Fill Supply	100% Import	*Curb & Gutter*	
Excavations	Excavate & Fill (balanced)	*Liners & Geo-Materials*	
Excavation Base, Bed, & Fill	Gravel ¾"-1½"	*Random Base & Fill*	
Deep Foundations		*Fences & Gates*	Temp GS Chain Link w/ Slats & W
Deep Foundation Services		*Landscape & Restore*	Seed & Plants (sm)
Slurry Walls		*Dive Team*	

Specialty Site Work Scope

Excavations

WBS	Description	Qty	Type	Lng-Iss	Wd-Bse	Deep	Cut °	CY	TON	MH	MH @ $61	M&CE $	TOTAL
8	*Sports Way RW & FW 20" lines*	1	1.50	72.0	4.5	6.0	45	177	227	74	$4,519	$1,105	*$5,624*
8	*Compacted Bedding & Fill*	57%	1.3	1.7	3.0			100	155	14	$874	$4,393	*$5,266*
8	*Sports Way BWW 10" line*	1	1.50	460.0	2.7	6.0	45	892	1,144	325	$19,771	$5,329	*$25,101*
8	*Compacted Bedding & Fill*	29%	1.3	1.7	3.0			258	400	34	$2,042	$11,347	*$13,389*
13	*SP Maia RW 12" line*	1	1.50	90.0	3.0	5.0	45	138	177	59	$3,555	$865	*$4,420*
13	*Compacted Bedding & Fill*	43%	1.3	1.7	3.0			59	92	9	$522	$2,611	*$3,133*
13	*SP Maia FW 48" line*	1	1.50	375.0	6.0	10.0	45	2,252	2,888	580	$35,265	$12,253	*$47,518*
13	*Compacted Bedding & Fill*	37%	1.3	1.7	3.0			835	1,297	87	$5,294	$36,765	*$42,059*
13	*SP Maia BWW 10" line*	1	1.50	910.0	2.7	6.0	45	1,759	2,256	522	$31,690	$9,910	*$41,600*
13	*Compacted Bedding & Fill*	29%	1.3	1.7	3.0			508	789	58	$3,513	$22,370	*$25,882*
13	*SP Maia BWW pipe jacking pit*	1	1.50	25.0	10.0	10.0	45	230	295	96	$5,816	$1,431	*$7,247*
13	*Compacted Base*	5%	1.3	1.7	3.0			11	18	2	$100	$505	*$605*
13	*SP Maia BWW pipe receiving pit*	1	1.50	15.0	10.0	10.0	45	156	200	66	$3,995	$974	*$4,969*
13	*Compacted Base*	5%	1.3	1.7	3.0			8	12	1	$68	$342	*$411*
0		0	0.00	0.0	0.0	0.0	0						
0		0%	0.0	0.0	0.0								
	Subtotal - Excavations							5,603	7,186	1,926	$117,024	$110,200	***$227,225***

Asphalt Paving

WBS	Description	Qty	Type	Lng-Bse	Wide/Ø	Dp-Cut°	Thick	GAL-SF	TON	MH	MH @ $61	M&CE $	TOTAL
8	*Sports Way asphalt repair*	1	1.2	375	8	0.0	0.42	3,000	91	38	$2,339	$9,946	*$12,285*
8	*Compacted Base*	1	1.2	3	1.0	0	0.83	3,000	125	14	$834	$3,847	*$4,681*
13	*SP Maia asphalt repair*	1	1.2	490	8	0.0	0.42	3,920	119	48	$2,907	$12,689	*$15,596*
13	*Compacted Base*	1	1.2	3	1.0	0	0.83	3,920	163	17	$1,016	$4,950	*$5,966*
0		0	0.0	0	0	0.0	0.00						
0		0	0.0	0	0.0	0	0.00						
	Subtotal - Asphalt Paving							6,920	499	117	$7,095	$31,432	***$38,528***

Miscellaneous Work

WBS	Description	Qty	Each	Unit MH	Unit M&CE $	Total Units	MH	MH @ $61	M&CE $	TOTAL
	Sports Way Facility									
8	*20" RW DI pipe & ftgs-LF*	1	72	0.59	$245	72	42	$2,572	$17,659	*$20,232*
8	*RW cut-in/tie-in to exist 24" -LS*	1	1	16	$2,400	1	16	$972	$2,400	*$3,372*
8	*20" FW DI pipe & ftgs-LF*	1	72	0.59	$245	72	42	$2,572	$17,659	*$20,232*
8	*FW cut-in/tie-in to exist 24" -LS*	1	1	16	$2,400	1	16	$972	$2,400	*$3,372*
8	*10" BWW HDPE pipe & ftgs-LF*	1	460	0.16	$16	460	73	$4,461	$7,264	*$11,725*
8	*FW cut-in/tie-in to exist MH -LS*	1	1	16	$1,200	1	16	$972	$1,200	*$2,172*
	SP Maia Facility									
13	*12" RW DI pipe & ftgs-LF*	1	90	0.32	$341	90	29	$1,746	$30,650	*$32,396*
13	*RW cut-in/tie-in to exist 48" -LS*	1	1	16	$2,400	1	16	$972	$2,400	*$3,372*

DIV 2s (02,31-35) SPECIALTY SITE WORK

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

13	*48" FW DI pipe & ftgs-LF*	1	375	1.59	$662	375	595	$36,176	$248,334	*$284,510*
13	*FW cut-in/tie-in to exist 48" -LS*	1	1	32	$8,000	1	32	$1,944	$8,000	*$9,944*
13	*10" BWW HDPE pipe & ftgs-LF*	1	980	0.16	$16	980	156	$9,504	$15,476	*$24,980*
13	*FW cut-in/tie-in to exist MH -LS*	1	1	16	$1,200	1	16	$972	$1,200	*$2,172*
13	*Jack & bore mob & demob-LF*	1	1	150	$7,500	1	150	$9,115	$7,500	*$16,615*
13	*J&B 24" steel casing & jacking-LF*	1	30	4.27	$367	30	128	$7,778	$11,012	*$18,791*
13	*J&B annular grout pump & fill-CF*	1	3	8	$250	3	22	$1,357	$698	*$2,055*
	Subtotal - Miscellaneous Work						1,351	$82,087	$373,854	***$455,941***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $61	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0		51	$3,093	$7,732	***$10,825***

Specialty Site Work Total

	MH	MH @ $61	M&CE $	TOTAL
DIV 2s TOTAL	3,444	$209,300	$523,219	**$732,519**

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Concrete Cement Type	Type II (lo heat & sulfate resist)	Foundation Style	Grade Wall with Strip Footer
Concrete Mix Additives	1 Admixture (generic)	Foundation Depth	Varies by Structure
Concrete Mix Strength	4,000 PSI (6½-7½ sacks/CY)	Foundation Width	18" (excludes haunch slope)
ACI Installation Code	ACI 350R (environmental)	Footer Width	2½x Foundation Width
Concrete Reinforcement	A615-Plain Steel (qty in tons)	Slope of Haunch Foundation	
Reinforcement Density	Normal	Base Slab Wall Cantilever	1' Past Wall (all sides)
Reinforcement Supply/Install	Rebar Subcontractor	Elevated Channels & Troughs	
Concrete Placement Method	Primarily Pump	Embedments	Typical Types & Densities

CIP Concrete Scope

Housekeeping Pad & Sidewalk Structures

WBS	Description	Qty	Type	Long	Wd-Ø	Sides	Clear	TON	CY	Component	Thick	MH	MH @ $65	M&CE $	TOTAL
	Sports Way Facility	0	0.0	0.0	0.0	0.0	0.00				0.0				
5	*GAC filter legs*	48	5.0	2.0	2.0	4.0	0.00	0.12	3.6	*Rectangular Pad*	0.5	242	$15,665	$1,805	*$17,470*
5	*Brine storage tank*	1	5.0	0.0	4.0	8.0	0.25	0.01	0.3	*Octagonal Pad*	0.5	41	$2,639	$207	*$2,846*
5	*Hypochlorite storage tank*	1	5.0	0.0	5.0	8.0	0.25	0.02	0.5	*Octagonal Pad*	0.5	60	$3,848	$306	*$4,154*
5	*Chemical metering pump skid*	2	5.0	2.0	2.0	4.0	0.00	0.00	0.1	*Rectangular Pad*	0.5	19	$1,233	$98	*$1,330*
5	*Softener skid*	1	5.0	3.0	1.5	4.0	0.00	0.00	0.1	*Rectangular Pad*	0.5	11	$733	$56	*$790*
		0	0.0	0.0	0.0	0.0	0.00				0.0				
	Sports Way Facility	0	0.0	0.0	0.0	0.0	0.00				0.0				
10	*GAC filter legs*	24	5.0	2.0	2.0	4.0	0.00	0.06	1.8	*Rectangular Pad*	0.5	121	$7,832	$903	*$8,735*
10	*Brine storage tank*	1	5.0	0.0	2.5	8.0	0.25	0.00	0.1	*Octagonal Pad*	0.5	19	$1,205	$93	*$1,298*
10	*Hypochlorite storage tank*	1	5.0	0.0	5.0	8.0	0.25	0.02	0.5	*Octagonal Pad*	0.5	60	$3,848	$306	*$4,154*
10	*Chemical metering pump skid*	2	5.0	2.0	2.0	4.0	0.00	0.00	0.1	*Rectangular Pad*	0.5	19	$1,233	$98	*$1,330*
10	*Softener skid*	1	5.0	3.0	1.5	4.0	0.00	0.00	0.1	*Rectangular Pad*	0.5	11	$733	$56	*$790*
		0	0.0	0.0	0.0	0.0	0.00				0.0				
		0	0.0	0.0	0.0	0.0	0.00				0.0				
	Subtotal - Housekeeping Pads & Sidewalks							0.2	7.2			603	$38,969	$3,928	***$42,897***

Rectangular Slab Structures

WBS	Description	Qty	Type	Long	Wide	Fndtn	Factor		CY	Component	Thk/Dp	MH	MH @ $65	M&CE $	TOTAL
5	*Sports Way building slab*	1	5.0	157.7	49.0	1	2.00		239	*Slab*	0.83	1,126	$72,771	$94,294	*$167,065*
			Total $	$236,490		TON	18.5		23	*Grade Wall*	1.00	302	$19,520	$8,797	*$28,317*
			Tot CY	318					57	*Strip Footer*	1.00	320	$20,697	$20,410	*$41,108*
8	*Sports Way BW tank pad*	1	5.0	20.0	20.0	2	2.00		15	*Slab*	1.00	70	$4,516	$5,852	*$10,368*
			Total $	$13,805		TON	1.2		5	*Haunch*	1.00	28	$1,781	$1,656	*$3,437*
			Tot CY	20											
10	*SP Maia building slab*	1	5.0	81.0	48.0	1	2.00		120	*Slab*	0.83	566	$36,612	$47,440	*$84,051*
			Total $	$126,991		TON	9.6		14	*Grade Wall*	1.00	187	$12,073	$5,441	*$17,514*
			Tot CY	169					35	*Strip Footer*	1.00	198	$12,802	$12,624	*$25,426*
13	*SP Maia BW tank pad*	1	5.0	20.0	20.0	2	2.00		15	*Slab*	1.00	70	$4,516	$5,852	*$10,368*
			Total $	$13,805		TON	1.2		5	*Haunch*	1.00	28	$1,781	$1,656	*$3,437*
			Tot CY	20											
		0	0.0	0.0	0.0	0	0.00				0.00				
											0.00				
	Subtotal - Rectangular Slabs							30.5	527			2,895	$187,069	$204,023	***$391,092***

Rectangular Wall & Tank Structures

WBS	Description	Qty	Type	Long	Wide	SW	To/Bo	Fndtn	CY	Component	Thk/Dp	MH	MH @ $65	M&CE $	TOTAL
5	*Sports Way bldg pipe trench walls*	1	5.0	135.0	6.0	2.0	1.0	3			0.00				
			Total $	$33,508			Cntlvr	2.00			0.00				
			Tot CY	18			Wall Factor	2.02			0.00				
			TON	0.8			F&F Sides	2.00			0.00				
									18	*Wall*	0.83	397	$25,631	$7,877	*$33,508*
5	*Sports Way bldg trench sump walls*	1	5.0	3.0	3.0	3.0	1.0	3			0.00				
			Total $	$7,721			Cntlvr	2.00			0.00				
			Tot CY	1			Wall Factor	2.44			0.00				
			TON	0.1			F&F Sides	2.00			0.00				
									1	*Wall*	0.67	105	$6,812	$910	*$7,721*

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

5	*Hypochlorite tank contain wall*	1	5.0	9.0	9.0	1.5	1.0	3									
			Total $	$8,597			Cntlvr	2.00									
			Tot CY	2			Wall Factor	2.15									
			TON	0.1			F&F Sides	2.00									
									2	*Wall*	0.67	117	$7,565	$1,032	*$8,597*		
10	*SP Maia bldg pipe trench walls*	1	5.0	52.0	6.0	2.0	1.0	3									
			Total $	$14,248			Cntlvr	2.00									
			Tot CY	8			Wall Factor	2.06									
			TON	0.3			F&F Sides	2.00									
									8	*Wall*	0.83	169	$10,899	$3,349	*$14,248*		
10	*SP Maia bldg trench sump walls*	1	5.0	3.0	3.0	3.0	1.0	3									
			Total $	$7,721			Cntlvr	2.00									
			Tot CY	1			Wall Factor	2.44									
			TON	0.1			F&F Sides	2.00									
									1	*Wall*	0.67	105	$6,812	$910	*$7,721*		
10	*Hypochlorite tank contain wall*	1	5.0	9.0	9.0	1.5	1.0	3									
			Total $	$8,597			Cntlvr	2.00									
			Tot CY	2			Wall Factor	2.15									
			TON	0.1			F&F Sides	2.00									
									2	*Wall*	0.67	117	$7,565	$1,032	*$8,597*		
		0	0.0	0.0	0.0	0.0	0.0	0									
								0.00									
								0.00									
								0.00									
Subtotal - Rectangular Walls & Tanks								1.4	31			1,010	$65,283	$15,110	***$80,393***		

Ductbank Structures

WBS	Description	Qty	Type	Long	Wide	TON	CY	Component	Thick	MH	MH @ $65	M&CE $	TOTAL
8	*480V Ductbank*	1	5.0	244	1.10	0.17	7.1	*Tinted Concrete*	0.70	40	$2,586	$2,550	*$5,136*
13	*480V Ductbank*	1	5.0	244	1.10	0.17	7.1	*Tinted Concrete*	0.70	40	$2,586	$2,550	*$5,136*
0		0	0.0	0	0.00				0.00				
0		0	0.0	0	0.00				0.00				
Subtotal - Ductbanks						0.33	14			80	$5,172	$5,100	***$10,272***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $65	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0		69	$4,447	$3,422	***$7,870***

CIP Concrete Total

	Rebar	CY		MH	MH @ $65	M&CE $	TOTAL
DIV 3 TOTAL	33	580		4,656	$300,940	$231,584	***$532,523***

Stantec

DIV 4 (04) MASONRY

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Exterior Type & Finish	10" CMU with Split or Rib Face	*Interior Type & Finish*	8" CMU with Paint/Seal Face (2)
Exterior CMU Type/Quality	2-Cell Units	*Interior CMU Type/Quality*	2-Cell Units
Exterior Cell Fill	Rebar & Concrete-Fill (total)	*Interior Cell Fill*	Rebar & Concrete-Fill (total)
Exterior Wall Openings	Average Density (30%)	*Interior Wall Openings*	Very Low Density (10%)
Exterior Cavity Treat		*Interior Cavity Treat*	
Exterior Architecture Treat	Minimum Enhancement	*Interior Architecture Treat*	
Insulation & Liner	Int Rigid Foam w/ Stl Liner	*(un-assigned)*	

Masonry Scope

Exterior Masonry Structures

WBS	Description	Qty	Type	Long	Wide	High	Cell	Open	Cavity	Corner	Gable	Wall SF	MH	MH @ $60	M&CE $	TOTAL
	Sports Way Facility		0				0	0	0	0	0.00					
5	*Exterior walls & doors*	1	17	157.7	49.0	16	9	6	1	5	0.00	6,861	3,915	$235,230	$493,911	*$729,142*
			0				0	0	0	0	0.00					
	SP Maia Facility		0				0	0	0	0	0.00					
10	*Exterior walls & doors*	1	17	81.0	48.0	16	9	6	1	4	0.00	4,128	2,313	$138,982	$291,819	*$430,801*
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
	Subtotal - Exterior Masonry Structures											10,989	6,228	$374,212	$785,731	***$1,159,943***

Interior Masonry Structures

WBS	Description	Qty	Type	Long	Wide	High	Cell	Open	Cavity	Corner	Gable	Wall SF	MH	MH @ $60	M&CE $	TOTAL
	Sports Way Facility		0				0	0	0	0	0.00					
5	*Exterior walls & doors*	1	7	18		10	9	4	1	4	0.00	180	67	$4,015	$4,456	*$8,471*
			0				0	0	0	0	0.00					
	SP Maia Facility		0				0	0	0	0	0.00					
10	*Exterior walls & doors*	1	7	18		10	9	4	1	4	0.00	180	67	$4,015	$4,456	*$8,471*
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
			0				0	0	0	0	0.00					
	Subtotal - Interior Masonry Structures											360	134	$8,030	$8,912	***$16,942***

General Allowances

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WBS		Factor		MH	MH @ $60	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0		95	$5,734	$95	***$5,829***

Masonry Total

	SF	MH	MH @ $60	M&CE $	TOTAL
DIV 4 TOTAL	11,349	6,457	$387,976	$794,738	***$1,182,714***

Project Name	Location	Version	Estimator	Date	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	001	Jim Ward	25-Aug-23	2002003165

Assumptions

Access Assemblies	Galv Steel Structure & Grate	*Guardposts & Bollards*	Varies by Structure
Gratings & Coverplates	Galv Steel Structure & Grate	*Racks & Bents*	
Hatches & Covers	Aluminum	*Elevated Decks*	
Hoist & Crane Rails		*Fabrications Level*	Standard

Metals Scope

Access Stairways & Landings

WBS	Description	Qty	Type	Wide	High	Style	Risers	Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
	Sports Way Facility	0	0.00	0.0	0.0	0.0							
5	*Restroom roof access*	1	4.89	2.5	9.8	1.0	15	24	$1,640	$1,029	0.60	$8,232	*$10,901*
		0	0.00	0.0	0.0	0.0							
	SP Maia Facility	0	0.00	0.0	0.0	0.0							
10	*Restroom roof access*	1	4.89	2.5	9.8	1.0	15	24	$1,640	$1,029	0.60	$8,232	*$10,901*
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
	Subtotal - Access Stairways & Landings						30	48	$3,281	$2,058	1.19	$16,463	***$21,802***

Access Handrails & Toeplates: Areas & Structures

WBS	Description	Qty	Type	Long	Wide/Ø	Style	LF	Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
	Sports Way Facility	0	0.00			0.0							
5	*Restroom roof perimeter railing*	1	4.89	19.0		2.0	19	17	$1,173	$521	0.07	$4,170	*$5,865*
		0	0.00			0.0							
	SP Maia Facility	0	0.00			0.0							
10	*Restroom roof perimeter railing*	1	4.89	19.0		2.0	19	17	$1,173	$521	0.07	$4,170	*$5,865*
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
	Subtotal - Handrails & Toeplates: Areas & Structures						38	34	$2,347	$1,043	0.14	$8,341	***$11,730***

Grating & Coverplates: Areas & Structures

WBS	Description *(NIS = not in scope)*	Qty	Type	Long	Wide/Ø	Style	SF	Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
	Sports Way Facility	0	0.00	0.0	0.0	0.0							
5	*Pipe trench grating*	1	4.89	135.0	6.0	4.0	810	177	$12,058	$4,797	9.94	$76,749	*$93,604*
5	*Trench sump grating*	1	4.89	3.0	3.0	2.0	9	4	$241	$62	0.10	$996	*$1,298*
		0	0.00	0.0	0.0	0.0							
	SP Maia Facility	0	0.00	0.0	0.0	0.0							
10	*Pipe trench grating*	1	4.89	52.0	6.0	4.0	312	69	$4,672	$1,859	3.85	$29,737	*$36,267*
10	*Trench sump grating*	1	4.89	3.0	3.0	2.0	9	4	$241	$62	0.10	$996	*$1,298*
		0	0.00	0.0	0.0	0.0							
		0	0.00	0.0	0.0	0.0							
	Subtotal - Grating & Coverplates: Areas & Structures						1,140	253	$17,211	$6,780	14.00	$108,477	***$132,468***

Hatches & Covers: Ductbanks

WBS	Description	Qty	Type	Long	Wide/Ø	Style	SF	Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
8	*480V Ductbank handholes*	2	4.01	3.0	3.0	4.0	18	26	$1,797	$426	0.12	$6,818	*$9,041*
13	*480V Ductbank handholes*	2	4.01	3.0	3.0	4.0	18	26	$1,797	$426	0.12	$6,818	*$9,041*
0		0	0.00	0.0	0.0	0.0							
0		0	0.00	0.0	0.0	0.0							
	Subtotal - Hatches & Covers: Ductbanks						36	53	$3,594	$852	0.24	$13,635	***$18,081***

Guardposts & Bollards

WBS	Description	Qty	Type	Wide/Ø	High	Style	Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
	Sports Way Facility	0	0.00	0.00	0.0	0.00						
5	*OH door bollards & fndtns-8"*	22	1.13	0.67	7.0	1.00	232	$15,779	$17,847	3.39	$35,695	*$69,321*
5	*2X mandoor guard post & fndtns-4"*	2	0.71	0.34	7.0	1.00	18	$1,230	$553	0.11	$1,106	*$2,889*
		0	0.00	0.00	0.0	0.00						
	Sports Way Facility	0	0.00	0.00	0.0	0.00						
5	*OH door bollards & fndtns-8"*	8	1.13	0.67	7.0	1.00	84	$5,738	$6,490	1.23	$12,980	*$25,208*
5	*2X mandoor guard post & fndtns-4"*	2	0.71	0.34	7.0	1.00	18	$1,230	$553	0.11	$1,106	*$2,889*
		0	0.00	0.00	0.0	0.00						
	Subtotal - Guardposts & Bollards						352	$23,977	$25,443	4.83	$50,887	***$100,307***

Stantec

DIV 5 (05) METALS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Version	Estimator	Date	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	001	Jim Ward	25-Aug-23	2002003165

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
2	**Subtotal - General Allowances**	1.0		11	$756	$543	0.3	$2,967	***$4,266***

Miscellaneous Metals Total

		Erect MH	MH @ $68	M&CE $	TON	Assembly $	TOTAL
	DIV 5 TOTAL	752	$51,165	$36,719	20.71	$200,770	***$288,654***

DIVS 3 & 5-8 (03,05-08) BUILDINGS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

PE Steel Building (SB)		*Flat Roof (FR)*	8" Hollow Pre-Cast Plank
SB Add-On's		*FR Services (re: DIVS 15-17)*	
SB Services (re: DIVS 15-17)		*Arched Fabric (AF)*	
PE Steel Roof (SR)	Coated Structurals & Kynar Panels	*AF Services (re: DIVS 15-17)*	
SR Add-On's		*Interior Architectural Level*	
SR Services (re: DIVS 15-17)	HV-Light-Plumb	*Exterior Architectural Level*	
Precast Tilt-Up Wall System		*Climate Type for Services*	Northwest US (or similar)

Buildings/Components Scope

Pre-Engineered Steel Roof System

WBS	Description	Qty	Type	Lng-Skrt	Wd-Flrs	Hi-OC	SF-Lev	TON-Watt		MH	MH @ $67	M&CE $	TOTAL
5	*Sports Way building structure*	1	1.20	157.7	49.0	18.0	7,728	71.6		613	$41,284	$391,012	*$432,296*
5	*HV-Light-Plumb (re: DIVS 15-16)*	1	6	0.0	1	8	1.00	8	Watts/SF				
10	*SP Maia building structure*	1	1.20	81.0	48.0	18.0	3,888	34.8		296	$19,963	$184,526	*$204,489*
10	*HV-Light-Plumb (re: DIVS 15-16)*	1	6	0.0	1	4	1.00	8	Watts/SF				
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
		0	0.00	0.0	0.0	0.0							
0		0	0	0.0	0	0	0.00	0					
	Subtotal - Pre-Engineered Steel Roof System						11,616.0	106.4		909	$61,248	$575,538	***$636,785***

Flat Roof System

WBS	Description	Qty	Type	Lng-Wall	Wd-Flrs	Hi-OC	SF-Lev	Watt		MH	MH @ $60	M&CE $	TOTAL
5	*Sports Way bldg RR roof-8" PC plank*	1	5	10.8	8.8	9.0	96			4	$237	$869	*$1,106*
5		1	1	2.00	1	4	1.00	0					
10	*SP Maia bldg RR roof-8" PC plank*	1	5	10.8	8.8	9.0	96			4	$237	$869	*$1,106*
10		1	1	2.00	1	4	1.00	0					
		0	0	0.0	0.0	0.0							
0		0	0	0.00	0	0	0.00	0					
		0	0	0.0	0.0	0.0							
0		0	0	0.00	0	0	0.00	0					
		0	0	0.0	0.0	0.0							
0		0	0	0.00	0	0	0.00	0					
		0	0	0.0	0.0	0.0							
0		0	0	0.00	0	0	0.00	0					
		0	0	0.0	0.0	0.0							
0		0	0	0.00	0	0	0.00	0					
	Subtotal - Flat Roof System						191			8	$475	$1,738	***$2,213***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor	MH	MH @ $67	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0	14	$927	$8,659	***$9,586***

Buildings/Components Total

	SF	MH	MH @ $67	M&CE $	TOTAL
DIVS 3 & 5-8 TOTAL	11,807	931	$62,649	$585,935	***$648,584***

DIVS 7-10 (07-10) COATINGS & FINISHES

Stantec

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Version	Estimator	Date	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	001	Jim Ward	25-Aug-23	2002003165

Assumptions

CIP Concrete	Varies by Structure	*Buildings - Exterior*	
Tanks - Exterior		*EIFS Structure System*	
Tanks - Interior		*EIFS Finish System*	
Pipes & Ducts		*Finishes Level*	Standard
Buildings - Spaces	Restroom-Unisex (RR)	*Contain & Clean-Up (C&C)*	Minimum
Buildings - Interior	C-Acoust; W-Paint; F-Resilient	*(un-assigned)*	

Finishes Scope

CIP Concrete Finishes: Areas & Structures

WBS	Description	Qty	Type	Long	Wide/Ø	Hi/Dp	To/Bo	C&C	SF	MH	MH @ $45	M&CE $	TOTAL
	Sports Way Facility												
5	*Pipe trench: Exterior waterproof*	1	10.0	136.7	7.7	2.8		1.2	818	34	$1,515	$2,076	*$3,591*
5	*Trench sump: Exterior waterproof*	1	10.0	53.7	7.7	2.8		1.2	348	14	$644	$882	*$1,526*
5	*NaOCl containment & HK pad: Epoxy*	1	11.0	9.0	9.0	1.5	1.00	1.2	144	22	$983	$665	*$1,648*
	SP Maia Facility												
10	*Pipe trench: waterproof*	1	10.0	53.7	7.7	2.8		1.2	348	14	$644	$882	*$1,526*
10	*Trench sump: waterproof*	1	10.0	53.7	7.7	2.8		1.2	348	14	$644	$882	*$1,526*
10	*NaOCl containment & HK pad: Epoxy*	1	11.0	9.0	9.0	1.5	1.00	1.2	144	22	$983	$665	*$1,648*
	Subtotal - CIP Concrete Finishes: Areas & Structures								2,149	120	$5,412	$6,053	***$11,465***

Building Finishes & Built-Ins: Interior

WBS	Description	Qty	Space	Finish	Long	Wide	High	C&C	CF	MH	MH @ $45	M&CE $	TOTAL
	Sports Way Facility												
5	*Unisex RR: C-acoust, W-paint, F-resil*	1	3	48	10	8	9.0	1.2	720	129	$5,793	$4,096	*$9,889*
	SP Maia Facility												
10	*Unisex RR: C-acoust, W-paint, F-resil*	1	3	48	10	8	9.0	1.2	720	129	$5,793	$4,096	*$9,889*
	Subtotal - Building Finishes & Built-Ins: Interior								1,440	258	$11,587	$8,191	***$19,778***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $45	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0		6	$255	$214	***$469***

Finishes Total

	SF	MH	MH @ $45	M&CE $	TOTAL
DIVS 7-10 TOTAL	4,260	384	$17,254	$14,457	***$31,712***

DIVS 11i-15i (21-23) MECHANICAL INSTALLATION

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Piping System Material 1	Sch 40 CS-Butt Weld	80%	*Tagging & Labeling*	Standard (plastic & 316SS)
Piping System Material 2	Sch 80 PVC-Socket Weld	15%	*Area & Structure Ductwork*	
Piping System Material 3	Sch 40 Galv CS-Thread	5%	*Air & Liquid Distributors*	
Piping System Material 4			*Face Pipe Assemblies*	Duplex Columns-Pipe > 8' Ø
Piping System Material 5			*Media*	Granular: Mono-Media
Pipe Installation Code	ASME B31.3 - Process Piping		*Media Supports*	
Pipe Insulation & Jacketing			*Tank Insulation*	2½" Thick Spray-On U/F
Pipe Protection & Coating	Enamel or Acrylic Paint		*Tank Insulation Jacketing*	Acrylic Spray-on Jacketing
Equipment & Tank Ductwork			*Tank Heat-Tracing*	Electric-Trace (tape) System

Mechanical Installation Scope

Process Equipment Installation Summary

Breakdown of this section's subtotal by all the major equipment scope items is provided in the DIVS 11-17 PROCESS EQUIPMENT sheets

WBS	Description *(NIS = not in scope)*	Qty	Type	%	MH	MH @ $77	M&CE $	TOTAL
	Equipment Rig & Set (re: DIVS 11-17)	1	1.00		383	$29,338	$20,999	*$50,337*
0	*Equipment Pipe & Valve (re: DIVS 11-17)*	1	1.00		1,688	$129,258	$112,737	*$241,995*
0	*Pipe & Valve Insulation Allowance NIS*	0	0.00	0%				
2	*Pipe & EQ Coating Allowance*	1	1.20	80%	551	$42,190	$12,123	*$54,313*
2	*Tagging & Labeling Allowance*	1			34	$2,630	$422	*$3,051*
	Subtotal - Process Equipment Installation Summary				2,657	$203,416	$146,281	***$349,697***

DIVS 5-8 PE Steel Roof Structure Mechanical, HVAC, Fire Protection, & Plumbing

WBS	Description	Qty	Type	Floors	A-Level	Scope	SF	MH	MH @ $77	M&CE $	TOTAL
5	*Sports Way building structure*	1	6	1	1.00	1.02	7,728	971	$74,358	$83,759	*$158,117*
10	*SP Maia building structure*	1	6	1	1.00	1.02	3,888	489	$37,410	$42,140	*$79,549*
0	0	0	0	0	0.00	0.00					
	Subtotal - DIVS 5-8 PE Steel Roof Mechanical						11,616	1,460	$111,767	$125,899	***$237,666***

Face Pipe Assemblies (installation only)

WBS	Description	Qty	Type	Long	Wide/Ø	SF	MH	MH @ $77	M&CE $	TOTAL
0	***Sports Way Facility***	0	0.00	0.0	0.0					
6	*12' pressure GAC filters*	12	2.00	0.0	12.0	1,357	651	$49,883	$6,049	*$55,932*
0	0	0	0.00	0.0	0.0					
0	***SP Maia Facility***	0	0.00	0.0	0.0					
11	*12' pressure GAC filters*	6	2.00	0.0	12.0	679	326	$24,941	$3,025	*$27,966*
0	0	0	0.00	0.0	0.0					
	Subtotal - Face Pipe Assemblies					2,036	977	$74,824	$9,074	***$83,899***

Media (installation only)

WBS	Description	Qty	Type	Long	Wide/Ø	Deep	CF	MH	MH @ $77	M&CE $	TOTAL
0	***Sports Way Facility***	0	0.00	0.0	0.0	0.0					
6	*12' pressure GAC filters*	12	2.50	0.0	12.0	10.0	13,572	305	$23,329	$9,044	*$32,373*
0	0	0	0.00	0.0	0.0	0.0					
0	***SP Maia Facility***	0	0.00	0.0	0.0	0.0					
11	*12' pressure GAC filters*	6	2.50	0.0	12.0	7.0	4,750	178	$13,632	$4,756	*$18,388*
0	0	0	0.00	0.0	0.0	0.0					
	Subtotal - Media						18,322	483	$36,961	$13,800	***$50,761***

Tank Insulation & Jacketing

WBS	Description	Qty	Type	Long	Wide/Ø	SW	To/Bo	SF	MH	MH @ $77	M&CE $	TOTAL
	Sports Way BW Tank	0	0.0	0.0	0.0	0.0	0					
8	*UF insulation, acrylic jacket, & HT*	1	1.4	0.0	14.0	24.0	1	1,210	257	$19,708	$8,080	*$27,788*
		0	0.0	0.0	0.0	0.0	0					
	SP Maia BW Tank	0	0.0	0.0	0.0	0.0	0					
13	*UF insulation, acrylic jacket, & HT*	1	1.4	0.0	14.0	24.0	1	1,210	257	$19,708	$8,080	*$27,788*
		0	0.0	0.0	0.0	0.0	0					
		0	0.0	0.0	0.0	0.0	0					
	Subtotal - Tank Insulation & Jacketing							2,419	515	$39,415	$16,160	***$55,575***

DIVS 11i-15i (21-23) MECHANICAL INSTALLATION

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $77	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0		91	$6,996	$4,668	***$11,664***

Mechanical Installation Total

	MH	MH @ $77	M&CE $	TOTAL
DIV 15 TOTAL	6,183	$473,380	$315,882	***$789,262***

DIV 16i (25-28,33) ELECTRICAL INSTALLATION

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

Raceway System Material 1	Rigid Galv Steel-RGS (hung)	60%	*Tagging & Labeling*	Standard (plastic & 316SS)
Raceway System Material 2	Sch 80 PVC (hung)	40%	*Site Lighting Units*	Surface Mount-LED
Raceway System Material 3			*Typical Motor Efficiency*	90% (average)
Raceway System Material 4			*Local Power Factor*	0.80 (anticipated)
Raceway System Material 5			*1Ø Controls Voltage*	120V
Local/Field Switches	Safety Disconnects Only		*3Ø Low Voltage*	480V
Equipment Installed	All Electrical Gear & Equipment		*3Ø Medium Voltage*	
Grounding & Lightning	Structures		*3Ø High Voltage*	
Pipe & EQ Heat-Tracing			*(un-assigned)*	

Electrical Installation Scope

Process Equipment Installation Summary

Breakdown of this section's subtotal by all the major equipment scope items is provided in the DIVS 11-17 PROCESS EQUIPMENT sheets

WBS	Description *(NIS = not in scope)*	Qty	Type	%	MH	MH @ $62	M&CE $	TOTAL
	Equipment Rig & Set (re: DIVS 11-17)	1	1.00		162	$10,125	$1,144	*$11,269*
0	*Equipment Wire & Switch (re: DIVS 11-17)*	1	1.00		779	$48,572	$122,208	*$170,780*
2	*Grounding & Lightning Allowance*	1	3.00		67	$4,201	$1,378	*$5,579*
2	*Pipe and Tank Heat-Tracing Allowance*	2	0.00	0%	12	$748	$750	*$1,498*
2	*Tagging & Labeling Allowance*	1			14	$844	$363	*$1,207*
	Subtotal - Process Equipment Installation Summary				1,034	$64,490	$125,843	***$190,333***

DIVS 5-8 PE Steel Roof Structure Electrical, Lighting, HVAC, & Fire Protection

WBS	Description	Qty	Type	Floors	A-Level	Scope	SF	MH	MH @ $62	M&CE $	TOTAL
5	*Sports Way building structure*	1	6	1	1.00	0.70	7,728	1,112	$69,321	$61,543	*$130,864*
10	*SP Maia building structure*	1	6	1	1.00	0.70	3,888	559	$34,876	$30,962	*$65,838*
0	*0*	0	0	0	0.00	0.00					
0	*0*	0	0	0	0.00	0.00					
0	*0*	0	0	0	0.00	0.00					
0	*0*	0	0	0	0.00	0.00					
	Subtotal - DIVS 5-8 PE Steel Roof Electrical						11,616	1,671	$104,197	$92,505	***$196,702***

Site Lighting Units

WBS	Description	Qty	Type	Lumens Each	Install	Lamp	Total Watts	MH	MH @ $62	M&CE $	TOTAL
	Sports Way Facility		0.0		0.00	0.00					
5	*Overhead door area-Wall pak-LED*	22	4.0	22,500	1.10	1.46	5,500	149	$9,275	$26,425	*$35,699*
			0.0		0.00	0.00					
	SP Maia Facility	0	0.0		0.00	0.00					
10	*Overhead door area-Wall pak-LED*	8	4.0	22,500	1.10	1.46	2,000	54	$3,373	$9,609	*$12,982*
		0	0.0		0.00	0.00					
		0	0.0		0.00	0.00					
		0	0.0		0.00	0.00					
		0	0.0		0.00	0.00					
	Subtotal - Site Lighting Units						7,500	203	$12,647	$36,034	***$48,681***

480V Ductbank - Sports Way Facility 400 Amp Feeder from Local Utility Source

New Ductbank LF: 250 | Existing Duct LF: | Extend Duct & Wire LF: 20

WBS	System Components	Tot Qty	Tot LF	Unit MH	Unit M&CE $	MH	MH @ $62	M&CE $	TOTAL
0	0		0	0.0000	$0.00				
8	*4 inch PVC Sch 80 duct & ftgs*	1	280	0.1200	$5.90	38	$2,387	$2,188	*$4,575*
8	*2 inch PVC Sch 80 duct & ftgs*	1	280	0.0800	$3.90	26	$1,591	$1,446	*$3,037*
8	*1/0 load wire (1 per phase)*	3	880	0.0242	$3.05	24	$1,515	$3,550	*$5,066*
8	*# 2 ground wire*	1	300	0.0160	$1.68	5	$341	$668	*$1,009*
8	*CAT 6 cable*	1	300	0.0143	$0.85	5	$305	$338	*$642*
8	*Fiber optic cable (24 strand)*	1	300	0.0841	$1.95	29	$1,792	$775	*$2,567*
8	*#4/0 ground wire & rods*	1	270	0.0351	$5.00	11	$673	$1,788	*$2,461*
8	*Termination & Connector Allowance*	2	2	16	$525	36	$2,237	$1,391	*$3,628*
0	0		0	0.0000	$0.00				
	Subtotal - 480V Ductbank					174	$10,841	$12,145	***$22,986***

DIV 16i (25-28,33) ELECTRICAL INSTALLATION

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

480V Ductbank - SP Maia Facility 300 Amp Feeder from Local Utility Source

New Ductbank LF: 250 | Existing Duct LF: 0 | Extend Duct & Wire LF: 20

WBS	System Components	Tot Qty	Tot LF	Unit MH	Unit M&CE $	MH	MH @ $62	M&CE $	TOTAL
13	0		0	0.0000	$0.00				
13	*4 inch PVC Sch 80 duct & ftgs*	1	280	0.1200	$5.90	38	$2,387	$2,188	*$4,575*
13	*2 inch PVC Sch 80 duct & ftgs*	1	280	0.0800	$3.90	26	$1,591	$1,446	*$3,037*
13	*# 2 load wire (1 per phase)*	3	880	0.0178	$1.93	18	$1,111	$2,244	*$3,355*
13	*# 3 ground wire*	1	300	0.0130	$1.37	4	$277	$546	*$823*
13	*CAT 6 cable*	1	300	0.0143	$0.85	5	$305	$338	*$642*
13	*Fiber optic cable (24 strand)*	1	300	0.0841	$1.95	29	$1,792	$775	*$2,567*
13	*#4/0 ground wire & rods*	1	270	0.0351	$5.00	11	$673	$1,788	*$2,461*
13	*Termination & Connector Allowance*	2	2	16	$525	36	$2,237	$1,391	*$3,628*
0	0		0	0.0000	$0.00				
	Subtotal - 480V Ductbank					166	$10,373	$10,716	***$21,089***

Precast Structures: Ductbanks

WBS	Description	Qty	Type	Long	Wide/Ø	SW	Walls	T/B	CF	MH	MH @ $62	M&CE $	TOTAL
8	*480V Ductbank handholes*	2	5	3.00	3.00	3.00	0.50	0.25	50	6	$346	$1,093	*$1,440*
13	*480V Ductbank handholes*	2	5	3.00	3.00	3.00	0.50	0.25	50	6	$346	$1,093	*$1,440*
0		0	0	0.00	0.00	0.00	0.00	0.00					
0		0	0	0.00	0.00	0.00	0.00	0.00					
0		0	0	0.00	0.00	0.00	0.00	0.00					
0		0	0	0.00	0.00	0.00	0.00	0.00					
	Subtotal - Precast Structures: Ductbanks								100	11	$693	$2,187	***$2,880***

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor	MH	MH @ $62	M&CE $	TOTAL
2	**Subtotal - General Allowances**	1.0	49	$3,049	$4,191	***$7,240***

Electrical Installation Total

	MH	MH @ $62	M&CE $	TOTAL
DIV 16i TOTAL	3,308	$206,289	$283,621	***$489,911***

DIV 16e (25-28,33) ELECTRICAL EQUIPMENT

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Assumptions

480V EQ Rating	NEMA 1 Gasketed (Std)	*120V EQ Rating*	NEMA 12 (Std)
4.16KV EQ Rating		*Process Controls EQ*	Economy SCADA
12.47KV EQ Rating		*Site Controls EQ*	
SWGR Main Breakers		*Process & Site Controls*	Local Monitor & Control Only
MCC Main Breakers	All Voltages - (1) Main Only	*Power/Controls Siting*	Centralized
Walk-In SWGR & MCC		*(un-assigned)*	

Electrical Equipment Scope

120V Power Equipment

WBS	Description (NIS = not in scope)	Qty	AMP	MH	MH @ $62	M&CE $	EQ $	TOTAL
3	*PNLBRD (panelboard) Package with Main Breaker - 24 pole*	2	100	23	$1,464	$1,826	$5,405	*$8,695*
0	*ON-OFF Local Control Switches - NIS*	0						
0	*HAND-OFF-AUTO Local Control Switches - NIS*	0						
0	*LCP (local control panel) Components - NIS*	0						
0	*Fabrication, Assembly, Testing, & Enclosure(s) - NIS*	0						
0	*Engineering & Testing - NIS*	0						
0	*Lightning & Surge Protection Devices - NIS*	0						
	Subtotal - 120V Power Equipment			23	$1,464	$1,826	$5,405	***$8,695***

480V Power Equipment

WBS	Description (NIS = not in scope)	Qty	AMP	KW	MH	MH @ $62	M&CE $	EQ $	TOTAL
3	*PNLBRD (panelboard) Package with Main Breaker - 42 pole*	2	200		35	$2,195	$2,556	$7,475	*$12,227*
0	*GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS*	0						$0	
0	*GENSET Paralleling Gear Package - NIS*	0							
0	*SWBRD (Switchboard) Package & Main Breaker(s) - NIS*								
3	*MCC (motor control center) Package & Main Breaker(s) Allowance - 1 section(s)*	2			65	$4,039	$3,785	$27,600	*$35,424*
3	*XFRMR (transformer) Package & Main Breaker Allowance - 150 KVA*	2			106	$6,586	$6,171	$12,535	*$25,292*
3	*Metering, Monitoring, & Communication Device Allowance*	2						$2,645	*$2,645*
3	*Lightning & Surge Protection Device Allowance*	2						$1,265	*$1,265*
3	*Test & Analyze (i.e. arc-flash study, short-circuit study, harmonic analysis)*	2			31	$1,923	$1,877	$1,150	*$4,950*
	Subtotal - 480V Power Equipment				236	$14,744	$14,389	$52,670	***$81,803***

4.16KV Power Equipment

WBS	Description (NIS = not in scope)	Qty	KW	MH	MH @ $0	M&CE $	EQ $	TOTAL
0	*GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS*	0					$0	
0	*GENSET Paralleling Gear Package - NIS*	0						
0	*SWBRD (Switchboard) Package & Main Breaker(s) - NIS*	0						
0	*MCC (motor control center) Package & Main Breaker(s) - NIS*	0						
0	*XFRMR (transformer) Package & Main Breaker - NIS*	0						
0	*Metering, Monitoring, & Communication Devices - NIS*	0						
0	*Lightning & Surge Protection Devices - NIS*	0						
0	*Testing & Analysis - NIS*	0						
	Subtotal - 4.16KV Power Equipment							

12.47KV Power Equipment

WBS	Description (NIS = not in scope)	Qty	KW	MH	MH @ $0	M&CE $	EQ $	TOTAL
0	*GENSET Package with ATS, Integral Fuel System, & Noise Enclosure - NIS*	0					$0	
0	*GENSET Paralleling Gear Package - NIS*	0						
0	*SWBRD (Switchboard) Package & Main Breaker(s) - NIS*	0						
0	*MCC (motor control center) Package & Main Breaker(s) - NIS*	0						
0	*XFRMR (transformer) Package & Main Breaker - NIS*	0						
0	*Metering, Monitoring, & Communication Devices - NIS*	0						
0	*Lightning & Surge Protection Devices - NIS*	0						
0	*Testing & Analysis - NIS*	0						
	Subtotal - 12.47KV Power Equipment							

DIV 16e (25-28,33) ELECTRICAL EQUIPMENT

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Date	Estimator	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	25-Aug-23	Jim Ward	001	2002003165

Process Controls Equipment

WBS	Description (NIS = not in scope)	Qty	MH	MH @ $62	M&CE $	EQ $	TOTAL
3	*Process Control System, HMI, RTU, & Software Package Allowance*	1	211	$13,172	$9,073	$38,824	*$61,069*
3	*Fabrication, Vent/AC, Assembly, Testing, & Indoor (coated steel) Enclosure(s)*	1				$11,316	*$11,316*
3	*Engineering, Programming, Testing, & Training Allowance*	1				$37,260	*$37,260*
3	*UPS, Antenna, Lightning, & Surge Protection Device Allowance*	1	79	$4,940	$1,701	$10,672	*$17,313*
3	*Integration Allowance (i.e. this process control system to existing)*	1	16	$988	$680	$3,335	*$5,003*
	Subtotal - Process Controls Equipment		306	$19,099	$11,455	$101,407	***$131,961***

Site Controls Equipment

WBS	Description (NIS = not in scope)	Qty	MH	MH @ $0	M&CE $	EQ $	TOTAL
0	*Health & Safety System Components Package - NIS*	0					
0	*Security System Components Package - NIS*	0					
0	*Surveillance System Components Package - NIS*	0					
0	*Fabrication, Assembly, Testing, & Indoor (coated steel) Enclosure(s)*	0					
0	*Engineering, Programming, Testing, & Training - NIS*	0					
0	*UPS, RTU, Antenna, Lightning, & Surge Protection Devices - NIS*	0					
0	*Integration - NIS*	0					
	Subtotal - Site Controls Equipment						

Miscellaneous Work

WBS	Description	Qty	Each	Unit MH	Unit M&CE $	Unit EQ $	MH	MH @ $0	M&CE $	EQ $	TOTAL
	Subtotal - Miscellaneous Work										

Demolition & Disposal

WBS	Description	Qty	Each	Unit MH	Unit M&CE $	Unit EQ $	MH	MH @ $0	M&CE $	EQ $	TOTAL
	Subtotal - Demolition & Disposal										

General Allowances

This summary category is intended to provide coverage of the miscellaneous DIV work scope and/or related items that could be needed but are currently either too minor to consider at this estimate class level, or cannot be reliably quantified currently. ***NOTE: The absence of an assigned WBS code below indicates this allowance cost is being allocated across the identified scope items above when these DIV costs are exported to other worksheets.***

WBS		Factor		MH	MH @ $62	M&CE $	EQ $	TOTAL
2	**Subtotal - General Allowances**	1.0		8	$530	$415	$2,392	***$3,337***

Electrical Equipment Total

	MH	MH @ $62	M&CE $	EQ $	TOTAL
DIV 16e TOTAL	575	$35,837	$28,085	$161,874	***$225,796***

WBS CONNECTED ELECTRICAL LOADS

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Version	Estimator	Date	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	001	Jim Ward	25-Aug-23	2002003165

Assumptions

NOTE: These load values have been established on the connected electrical load, with breaker & starter loads based on the size utilized. Total probable load(s) are used for sizing transformer(s) & generator(s), based on a forecast of 85% of the total connected load to account for the installed spare(s) & part-time equipment load(s)

	Voltage	Amps	KVA	KW
Total Connected Load	480	412	342	273
	Percent	**Amps**	**KVA**	**KW**
Total Probable Load	85%	350	291	232

WBS Load Summary

Connected Load for WBS Items 4-51

WBS	Area/Name	Voltage	Amps	KVA
4	**SPORTS WAY FACILITY**			
5	Building Structure	480	195	162
6	GAC Filter System	480	60	50
7	Hypochlorite System	480	15	12
8	Site & Yard Work	480	0	0
9	**SP MAIA FACILITY**			
10	Building Structure	480	102	85
11	GAC Filter System	480	30	25
12	Hypochlorite System	480	10	8
13	Site & Yard Work	480	0	0
14				
15				
16				
17				
18				
19				
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41				
42				
43				
44				
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46				
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48				
49				
50				
51				

Connected Load for WBS Items 52-99

WBS	Area/Name	Voltage	Amps	KVA
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
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DIVS 11-16 (40-45) PROCESS EQUIPMENT

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

Equipment Scope

			DIVS 11-16 EQ & Related Components	DIVS 11-15 EQ Buyout	DIV 15 EQ & Piping Installation				DIV 16 EQ Buyout	DIV 16 Power and I&C Installation			
WBS	Item (NIS-not in scope)	Qty		TOTAL	MH	MH $	M&CE $	TOTAL	TOTAL	MH	MH $	M&CE $	TOTAL
	Sports Way Facility												
	Building												
5	*Structure-157' x 49'*	1			80	$6,112	$5,331	$11,443					
5	*Power & control connectivity*	1								32	$2,006	$4,215	$6,221
5	*High/Low sump float switch assembly*	1			2	$116	$83	$199	$350				
5	*120 VAC signal*	1								8	$521	$1,095	$1,616
5	*Slide rail sump pump-50 gpm @ 50'-SS*	1		$4,500	48	$3,700	$3,145	$6,845					
5	*480 VAC power (1 hp)*	1								19	$1,167	$2,453	$3,620
5	*120 VAC signal*	2								14	$846	$1,779	$2,625
5	*PS & PI assembly (pipe mount w/ valve)*	1			4	$312	$262	$574	$750				
5	*120 VAC signal*	1								8	$521	$1,095	$1,616
5	*Eyewash/shower station-Indoor*	1		$850	19	$1,480	$1,258	$2,738					
5	*FS package with audio & visual alarms*	1			2	$116	$83	$199	$450				
5	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
5	*Water tempering system*	1		$3,500	24	$1,850	$1,573	$3,423					
5	*120 VAC power & signal*	1								19	$1,167	$2,453	$3,620
5	*Washdown hose & reel assembly*	1		$375	14	$1,110	$944	$2,054					
5	*Water FS*	1			3	$208	$174	$382	$100				
5	*120 VAC FS signal*	1								8	$521	$1,095	$1,616
	GAC Filter System												
6	*Vendor filter package quote*	12		$4,290,000									
6	*12' Ø pressure filter skid packages*	12			815	$62,395	$52,348	$114,743					
6	*LCP*	12								200	$12,504	$26,278	$38,782
6	*Valve actuators-motorized*	96								160	$10,003	$21,022	$31,026
	Hypochlorite System												
7	*Vendor 40 PPD system package quote*	1		$105,000									
7	*(1) additional 20 PPD generator-Estimated*	1		$45,000									
7	*20 PPD wall-mount generator unit*	3			61	$4,680	$3,926	$8,606					
7	*120 VAC power & signal*	3								40	$2,501	$5,256	$7,756
7	*Hypochlorite tank-5' Ø-615 gal-HDPE*	1			14	$1,110	$944	$2,054					
7	*Hypochlorite level transducer*	1			5	$416	$349	$765					
7	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
7	*Hypochlorite tank blower*	1			14	$1,040	$872	$1,912					
7	*120 VAC power*	1								10	$625	$1,314	$1,939
7	*Brine saturator tank-4' Ø-370 gal-HDPE*	1			19	$1,480	$1,258	$2,738					
7	*Kinetico water softener skid*	1			14	$1,040	$872	$1,912					
7	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
7	*Duplex hypochlorite feed pump skid*	1			16	$1,248	$1,047	$2,295					
7	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
	EQ SHEET TOTAL			**$4,449,225**	1,155	$88,414	$74,469	**$162,883**	**$1,650**	559	$34,884	$73,310	**$108,194**
	TOTAL: ALL DIVS 11-17 EQ SHEETS			**$6,585,706**	2,071	$158,596	$133,736	**$292,333**	**$10,300**	941	$58,696	$123,353	**$182,049**

Stantec

DIVS 11-16 (40-45) PROCESS EQUIPMENT

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

Equipment Scope

			DIVS 11-16 EQ & Related Components	*DIVS 11-15 EQ Buyout*	*DIV 15 EQ & Piping Installation*			*DIV 16 EQ Buyout*	*DIV 16 Power and I&C Installation*			
WBS	Item *(NIS-not in scope)*	Qty	TOTAL	MH	MH $	M&CE $	TOTAL	TOTAL	MH	MH $	M&CE $	TOTAL
	Backwash Tank											
8	Tank-14' Ø x 24'-25k gal-Coated steel	1	$140,000	97	$7,401	$6,290	$13,691					
8	*Differential pressure DP LIT*	1		14	$1,040	$872	$1,912	$3,500				
8	*120 VAC power & signal*	1							13	$834	$1,752	$2,585
	SP Maia Facility											
	Building											
10	*Structure-81' x 48'*	1		54	$4,128	$3,600	$7,728					
10	*Power & control connectivity*	1							22	$1,355	$2,847	$4,201
10	*High/Low sump float switch assembly*	1		2	$116	$83	$199	$350				
10	*120 VAC signal*	1							8	$521	$1,095	$1,616
10	*Slide rail sump pump-50 gpm @ 50'-SS*	1	$4,500	48	$3,700	$3,145	$6,845					
10	*480 VAC power (1 hp)*	1							19	$1,167	$2,453	$3,620
10	*120 VAC signal*	2							14	$846	$1,779	$2,625
10	*PS & PI assembly (pipe mount w/ valve)*	1		4	$312	$262	$574	$750				
10	*120 VAC signal*	1							8	$521	$1,095	$1,616
10	*Eyewash/shower station-Indoor*	1	$850	19	$1,480	$1,258	$2,738					
10	*FS package with audio & visual alarms*	1		2	$116	$83	$199	$450				
10	*120 VAC power & signal*	1							10	$625	$1,314	$1,939
10	*Water tempering system*	1	$3,500	24	$1,850	$1,573	$3,423					
10	*120 VAC power & signal*	1							19	$1,167	$2,453	$3,620
10	*Washdown hose & reel assembly*	1	$375	14	$1,110	$944	$2,054					
10	*Water FS*	1		3	$208	$174	$382	$100				
10	*120 VAC FS signal*	1							8	$521	$1,095	$1,616
	GAC Filter System											
11	*Vendor filter quote*	6	$1,725,000									
11	*12' Ø pressure filter skid packages*	6		407	$31,198	$26,174	$57,371					
11	*LCP*	6							100	$6,252	$13,139	$19,391
11	*Valve actuators-motorized*	48							80	$5,002	$10,511	$15,513
	Hypochlorite System											
12	*Vendor 20 PPD OSEC-L system quote*	1	$77,256									
12	*(1) additional 20 PPD generator-Estimated*	1	$45,000									
12	*20 PPD wall-mount generator unit*	2		41	$3,120	$2,617	$5,737					
12	*120 VAC power & signal*	2							27	$1,667	$3,504	$5,171
12	*Hypochlorite tank-5' Ø-615 gal-HDPE*	1		14	$1,110	$944	$2,054					
12	*Hypochlorite tank level transducer*	1		5	$416	$349	$765					
12	*120 VAC power & signal*	1							10	$625	$1,314	$1,939
12	*Hypochlorite tank blower*	1		14	$1,040	$872	$1,912					
12	*120 VAC power*	1							10	$625	$1,314	$1,939
12	*Brine saturator tank-2.5' Ø-100 gal-HDPE*	1		14	$1,110	$944	$2,054					
	EQ SHEET TOTAL		**$1,996,481**	777	$59,454	$50,185	**$109,639**	**$5,150**	348	$21,728	$45,663	**$67,392**

Stantec

DIVS 11-16 (40-45) PROCESS EQUIPMENT

CLASS 5 ESTIMATE - PRIVILEGED & CONFIDENTIAL

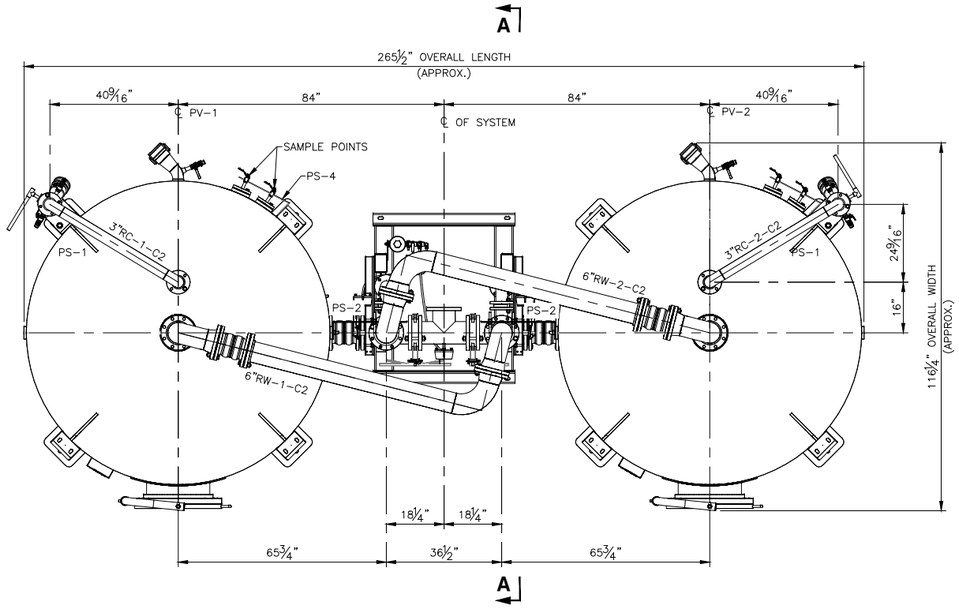
Project Name	Location	Estimator	Date	Version	Job #
Springfield Utility Board PFAS Treatment Facilities	Springfield, OR	Jim Ward	25-Aug-23	001	2002003165

Equipment Scope

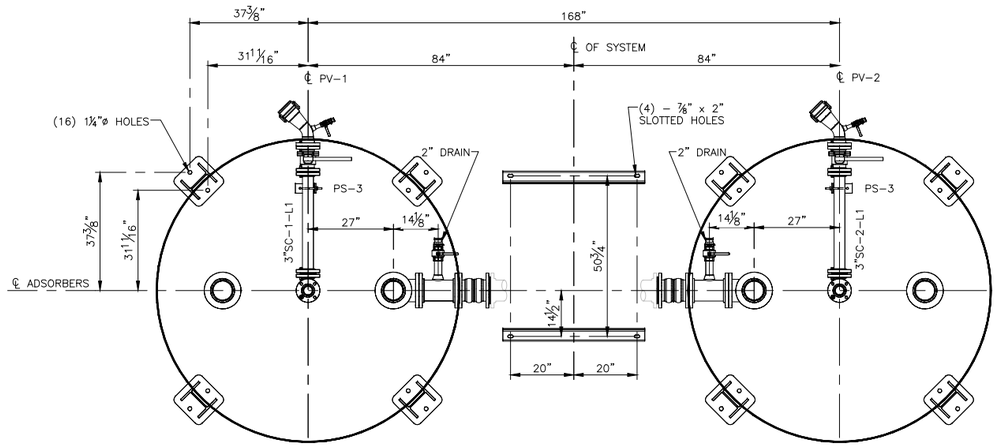
			DIVS 11-16 EQ & Related Components	*DIVS 11-15 EQ Buyout*	*DIV 15 EQ & Piping Installation*			*DIV 16 EQ Buyout*	*DIV 16 Power and I&C Installation*			
WBS	Item *(NIS-not in scope)*	Qty		TOTAL	MH	MH $	M&CE $	TOTAL	TOTAL	MH	MH $	M&CE $	TOTAL
12	*Kinetico water softener skid*	1			14	$1,040	$872	$1,912					
12	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
12	*Duplex hypochlorite feed pump skid*	1			16	$1,248	$1,047	$2,295					
12	*120 VAC power & signal*	1								10	$625	$1,314	$1,939
	Backwash Tank												
13	*Tank-14' Ø x 24'-25k gal-Coated steel*	1		$140,000	97	$7,401	$6,290	$13,691					
13	*Differential pressure DP LIT*	1			14	$1,040	$872	$1,912	$3,500				
13	*120 VAC power & signal*	1								13	$834	$1,752	$2,585
	END												
EQ SHEET TOTAL				**$140,000**	140	$10,728	$9,082	**$19,810**	**$3,500**	33	$2,084	$4,380	**$6,464**

Attachment 6

Calgon Carbon Model 8 General Arrangement



PLAN



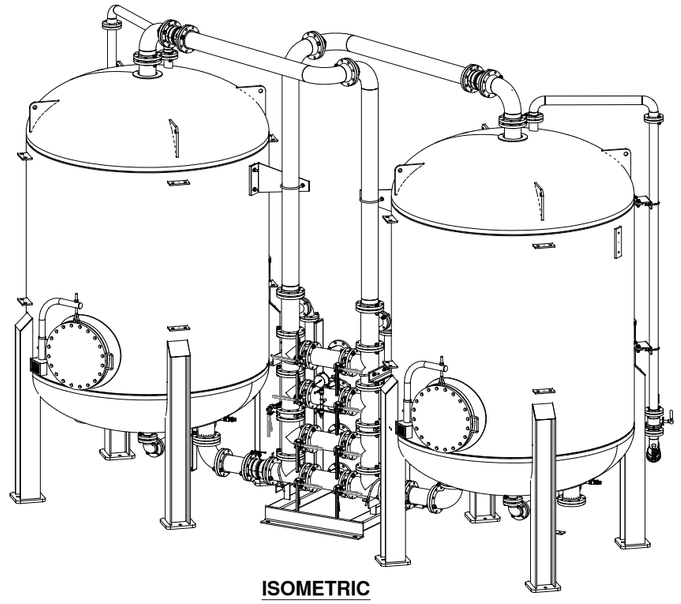
LOWER PLAN

UNDER DRAIN NOT SHOWN FOR CLARITY

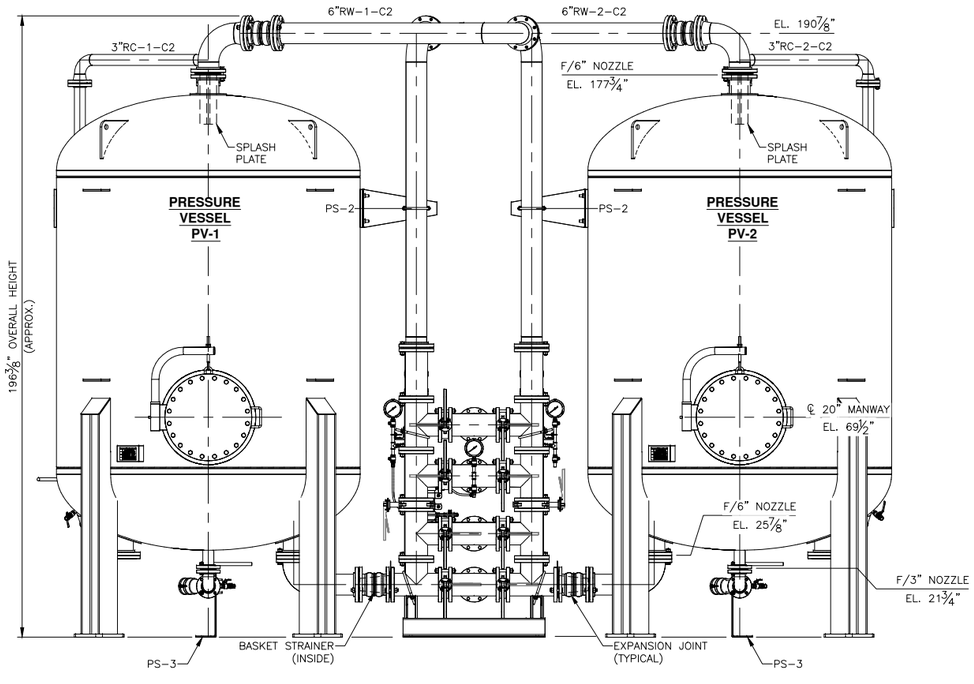
SYSTEM DATA	
DESIGN CONDITIONS	125 PSIG @ 140° F
DESIGN CODE	ASME SECTION VIII DIVISION1
APPROXIMATE WEIGHTS (LB.)	
VESSEL (EMPTY)	7,600
CARBON (PER VESSEL)	10,000
VESSEL (OPERATING)	46,400
SYSTEM (EMPTY)	19,000
SYSTEM (OPERATING)	98,000

PAINT INFORMATION			
ITEM	MFG.	COLOR	SAMPLE
VESSEL	HEMPEL	GRAY	
PIPING	HEMPEL	GRAY	
SUPPORTS	HEMPEL	GRAY	

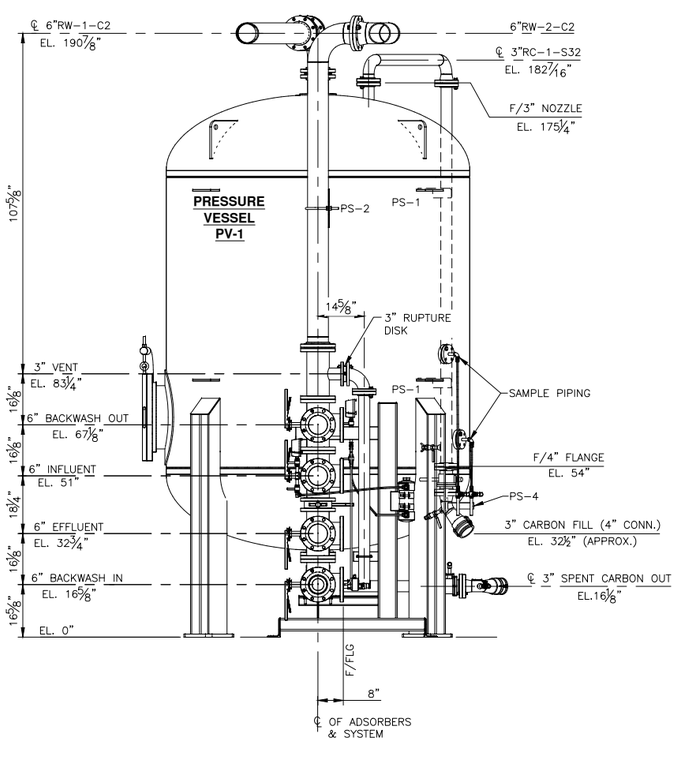
PIPE SUPPORT SCHEDULE (PER SYSTEM)			
	QTY	REFERENCE DRAWING No.	LINE #
PS-1	4	90110040	3"RC
PS-2	2	90130156	6"RW
PS-3	2	90130160	3"SC
PS-4	2	90170541	SAMPLE



ISOMETRIC



ELEVATION



VIEW A-A

NSF Certified to NSF/ANSI 61 & 372

REV	DESCRIPTION	APP	DATE
2			
1			
0	ISSUED FOR FABRICATION	RES	11/23/2022

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

	NAME	DATE
DRAFTER	BKM	10/26/2022
DESIGNER		
CHECKER	RES	11/22/2022
APPROVAL		
PROJECT No.	STANDARD	

CalgonCarbon A Kuraray Company

CLIENT: STANDARD

TITLE: DRINKING WATER TREATMENT SYSTEM MODEL 8 DWC, 6" PIPING GENERAL ARRANGEMENT

DWG. Size	SHEET No.	SCALE
D	1 OF 1	NONE

DWG. No. 90220772 REV. 0

CONFIDENTIAL

Calgon Carbon Corporation

Pittsburgh, PA

Technical Service Report No. 20231052

Rapid Small-Scale Column Test for The Removal of Per- and Polyfluoroalkyl Substances from Potable Water using Filtrasorb® 400 Granular Activated Carbon

Prepared For:

Rainbow Water District WTP
Bothell, WA

Author: Adam Creveling

Adam Creveling

Date: January 8, 2024

cc: L. Munla
E. Townsend
B. Goecke
M. Lutz
R. Klingbeil
A. Nordmann
S. Briczinski Rainbow Water District RSSCT 20231052 SB20241

INTRODUCTION

Calgon Carbon Corporation, hereinafter CCC, conducted a Constant Diffusivity Rapid Small-Scale Column Test (RSSCT) to treat potable water sourced from the Rainbow Water District Water Treatment Plant (WTP). The RSSCT evaluated the performance of Filtrasorb 400 (F400) for the removal of per- and polyfluoroalkyl substances (PFAS) and total organic carbon (TOC). The RSSCT simulated a Model 12-40 vessel with a flow rate of 1,000 gallons per minute (gpm) operating for two years.

Due to their useful properties, such as oil and water repellency, PFAS have been used in a variety of manufacturing processes since the mid-20th century. PFAS are problematic because of their stability and persistence in the environment, mobility, and bioaccumulative nature. PFAS substances are generally divided into two main categories: perfluoroalkyl sulfonates and perfluoroalkyl carboxylates, of which perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are respective examples.

The Environmental Protection Agency's (EPA's) proposed maximum contaminant levels (MCLs) are 4 ng/L (ppt) for both PFOA and PFOS. In addition, the hazard index incorporates the compounds GenX (HFPO-DA), perfluorobutane sulfonate (PFBS), perfluorononanoic acid (PFNA), and perfluorohexanesulfonic acid (PFHxS). The hazard index is calculated using the following formula and has a MCL of 1.

$$Hazard\ Index\ (unitless) = \frac{HFPO-DA\ (ppt)}{10} + \frac{PFBS\ (ppt)}{2{,}000} + \frac{PFNA\ (ppt)}{10} + \frac{PFHxS\ (ppt)}{9}$$

The state of Washington has set State Action Levels (SALs) for PFOA, PFOS, PFNA, PFHxS, and PFBS are summarized in Table 1.

Table 1. Washington SALs

Compound	SAL (ppt)
PFOA	10
PFOS	15
PFNA	9
PFHxS	65
PFBS	345

SUMMARY and RESULTS

The RSSCT was conducted using virgin F400 activated carbon to determine the effective bed life for PFAS removal. The RSSCT simulated a 12-foot diameter vessel containing 40,000 lb of F400 GAC at a flow rate of 1,000 gpm and providing 9.6 minutes of empty-bed contact time (EBCT) after backwashing.

PFAS and TOC breakthrough curves from the RSSCT are shown in Figure 1, and raw data is shown in Tables 2 and 3. Complete simulation details are shown in Table 3. At completion, the RSSCT simulated 760 days of operation (equivalent to 1,095 million gallons treated).

The following conclusions may be drawn from the test results:

- PFOA, PFOS, and PFBS were the only PFAS compounds with detections above the MRL (minimum reporting limit) in the feed water, with concentrations of 3.5, 7.5, and 3.4 ppt respectively. These are below both the EPA MCLs and the Washington SALs limits. The feed water had a TOC concentration of 0.33 ppm.
- Carbon use rate results are summarized in Table 1.

Table 1. Carbon use rate results

Carbon usage milestone		Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	Carbon use rate (lb. GAC / 1,000 gallons)
PFOA	Initial detection over MRL	641	923	115,851	0.043
	50% breakthrough	378	545	68,961	0.073
PFOS	Initial detection over MRL	397	572	72,397	0.070
	50% breakthrough *	851	1,225	152,803	0.033
PFBS	Initial detection over MRL	581	837	105,273	0.048
	50% breakthrough	378	545	68,961	0.073
TOC	Initial detection over MRL	53.8	77.4	9,683	0.516
	50% breakthrough	169	243	31,312	0.164

* These values were extrapolated

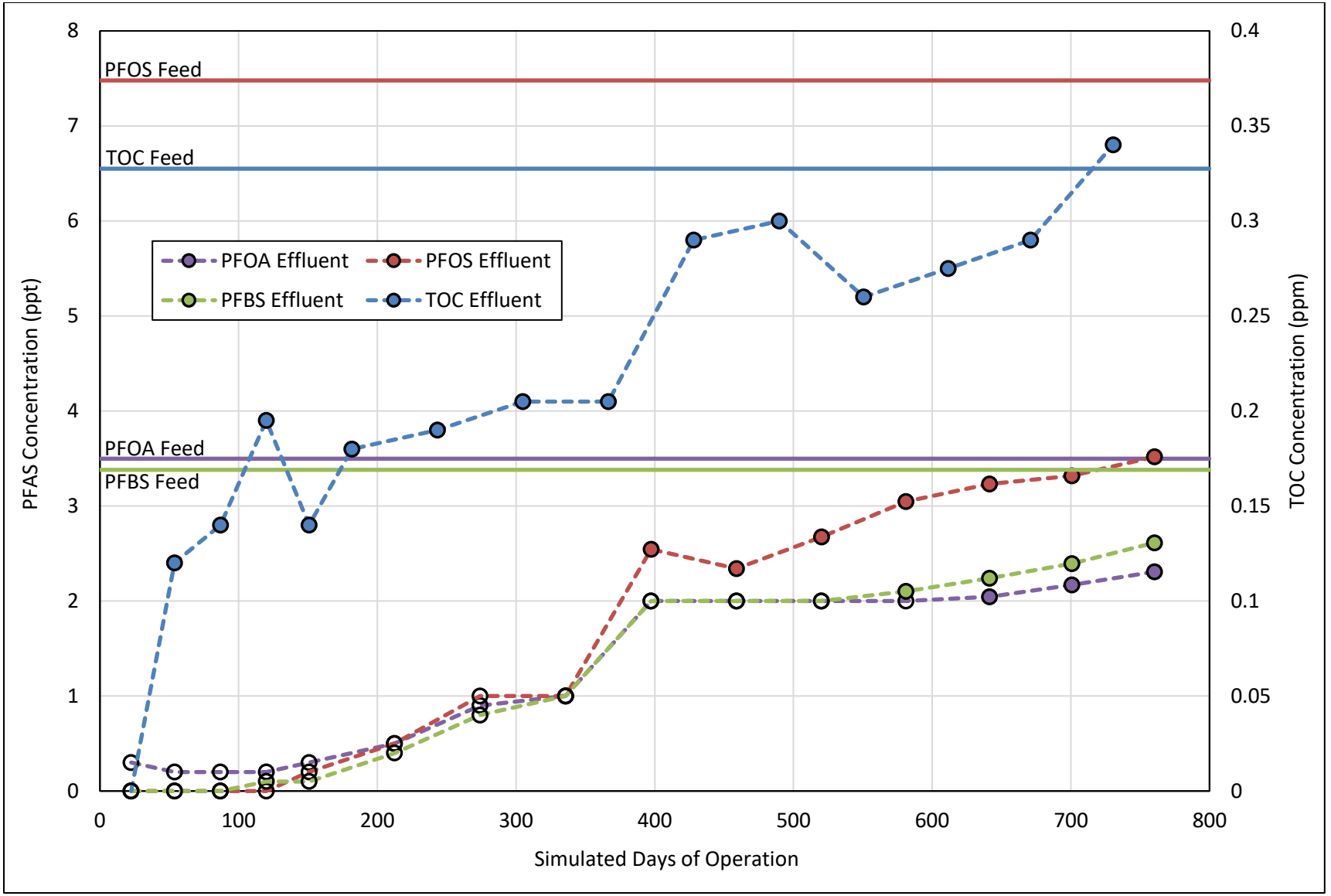


Figure 1. PFOA, PFOS, PFBS, and TOC concentration vs simulated days of operation; results below the reporting limit are shown as an open point

Table 2. TOC and PFAS (1/2) raw data

Sample	Time collected	Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	TOC (ppm)	PFBS (ppt)	PFHxA (ppt)	HFPO-DA (ppt)	PFHpA (ppt)	PFHxS (ppt)	ADONA (ppt)	PFOA (ppt)	PFOS (ppt)	PFNA (ppt)
Feed 1	11/9/2023	--	--	--	0.33	3.4	2 J	<0.075	1 J	1 J	<0.031	3.5	7.3	0.2 J
Feed 2	11/13/2023	--	--	--	0.33	3.5	2 J	<0.074	1 J	1 J	<0.030	3.6	7.8	0.2 J
*Feed 3	11/15/2023	--	--	--	0.88	3.3	2 J	<0.076	1 J	1 J	<0.031	3.5	7.3	0.2 J
Sample 1	11/9/23 12:20	22.5	32.4	3,643	<0.1	<0.038	2 J	<0.076	0.7 J	<0.095	<0.031	0.3 J	<0.095	0.3 J
Sample 2	11/9/23 18:00	53.8	77.4	9,683	0.12	<0.038	0.5 J	<0.077	0.5 J	<0.096	<0.032	0.2 J	<0.096	0.2 J
Sample 3	11/10/23 0:00	86.9	125	16,077	0.14	<0.039	0.1 J	<0.077	0.4 J	<0.097	<0.032	0.2 J	<0.097	0.1 J
Sample 4	11/10/23 6:00	120	173	22,471	0.20	0.1 J	0.2 J	<0.078	0.4 J	<0.097	<0.032	0.2 J	<0.097	0.2 J
Sample 5	11/10/23 12:00	151	217	28,019	0.14	0.1 J	0.2 J	<0.078	0.4 J	<0.097	<0.032	0.3 J	0.2 J	0.2 J
Sample 6	11/10/23 18:00	182	262	33,566	0.18	--	--	--	--	--	--	--	--	--
Sample 7	11/11/23 0:00	212	306	39,113	--	0.4 J	0.4 J	<0.078	0.4 J	0.08 J	<0.032	0.5 J	0.5 J	0.2 J
Sample 8	11/11/23 6:00	243	350	44,660	0.19	--	--	--	--	--	--	--	--	--
Sample 9	11/11/23 12:00	274	395	50,208	--	0.8 J	0.7 J	0.1 J	0.6 J	0.2 J	<0.031	0.9 J	1 J	0.2 J
Sample 10	11/11/23 18:00	305	439	55,755	0.21	--	--	--	--	--	--	--	--	--
Sample 11	11/12/23 0:00	336	483	61,302	--	1 J	0.9 J	0.2 J	0.6 J	0.3 J	<0.032	1 J	1 J	0.2 J
Sample 12	11/12/23 6:00	367	528	66,850	0.21	--	--	--	--	--	--	--	--	--
Sample 13	11/12/23 12:00	397	572	72,397	--	2 J	1 J	0.3 J	0.9 J	0.6 J	<0.033	2 J	2.5	0.3 J
Sample 14	11/12/23 18:00	428	617	77,944	0.29	--	--	--	--	--	--	--	--	--
Sample 15	11/13/23 0:00	459	661	83,491	--	2 J	1 J	0.2 J	0.8 J	0.5 J	<0.032	2 J	2.3	0.2 J
Sample 16	11/13/23 6:00	490	705	89,039	0.30	--	--	--	--	--	--	--	--	--
Sample 17	11/13/23 12:00	520	749	94,450	--	2 J	1 J	0.2 J	0.9 J	0.5 J	<0.032	2 J	2.7	0.3 J
Sample 18	11/13/23 18:00	551	793	99,862	0.26	--	--	--	--	--	--	--	--	--
Sample 19	11/14/23 0:00	581	837	105,273	--	2.1	1 J	0.2 J	0.9 J	0.7 J	<0.032	2 J	3.0	0.2 J
Sample 20	11/14/23 6:00	612	881	110,684	0.28	--	--	--	--	--	--	--	--	--
Sample 21	11/14/23 12:00	641	923	115,851	--	2.2	2 J	0.2 J	0.9 J	0.7 J	<0.032	2.0	3.2	0.2 J
Sample 22	11/14/23 18:00	671	966	121,017	0.29	--	--	--	--	--	--	--	--	--
Sample 23	11/15/23 0:00	701	1,009	126,183	--	2.4	2 J	0.3 J	1 J	0.7 J	<0.032	2.2	3.3	0.2 J
Sample 24	11/15/23 6:00	731	1,052	131,350	0.34	--	--	--	--	--	--	--	--	--
Sample 25	11/15/23 12:00	760	1,095	136,516	--	2.6	2 J	0.3 J	1 J	0.7 J	<0.032	2.3	3.5	0.3 J

J = Estimated value between the limit of detection and reporting limit

* The TOC is likely high on this sample because it was pulled when the feed was very low, where debris at the bottom of the container can contribute to a higher value

Table 3. PFAS (2/2) raw data

Sample	Time collected	Simulated days of operation	Gallons treated (x1,000,000)	Bed volumes treated	9Cl-PF3ONS (ppt)	PFDA (ppt)	NMeFOSAA (ppt)	PFUnA (ppt)	NEtFOSAA (ppt)	11Cl-PF3OUdS (ppt)	PFDoA (ppt)	PFTrDA (ppt)	PFTA (ppt)
Feed 1	11/9/2023	--	--	--	<0.009	<0.059	<0.019	<0.058	<0.070	<0.030	<0.038	<0.036	<0.035
Feed 2	11/13/2023	--	--	--	<0.009	<0.058	<0.018	<0.057	<0.068	<0.030	<0.037	<0.035	<0.034
Feed 3	11/15/2023	--	--	--	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 1	11/9/23 12:20	22.5	32.4	3,643	<0.010	<0.060	<0.019	0.2 J	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 2	11/9/23 18:00	53.8	77.4	9,683	<0.010	<0.061	<0.019	0.1 J	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 3	11/10/23 0:00	86.9	125	16,077	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 4	11/10/23 6:00	120	173	22,471	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 5	11/10/23 12:00	151	217	28,019	<0.010	0.1 J	<0.019	0.2 J	<0.072	0.1 J	0.2 J	0.1 J	0.1 J
Sample 7	11/11/23 0:00	212	306	39,113	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 9	11/11/23 12:00	274	395	50,208	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 11	11/12/23 0:00	336	483	61,302	<0.010	<0.060	<0.019	<0.059	<0.071	<0.031	<0.038	<0.036	<0.035
Sample 13	11/12/23 12:00	397	572	72,397	<0.010	<0.064	<0.020	<0.063	<0.075	<0.032	<0.040	<0.038	<0.037
Sample 15	11/13/23 0:00	459	661	83,491	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 17	11/13/23 12:00	520	749	94,450	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 19	11/14/23 0:00	581	837	105,273	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.039	<0.037	<0.036
Sample 21	11/14/23 12:00	641	923	115,851	<0.010	<0.061	<0.019	<0.060	<0.071	<0.031	<0.038	<0.037	<0.036
Sample 23	11/15/23 0:00	701	1,009	126,183	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036
Sample 25	11/15/23 12:00	760	1,095	136,516	<0.010	<0.061	<0.019	<0.060	<0.072	<0.031	<0.039	<0.037	<0.036

J = Estimated value between the limit of detection and reporting limit

Table 4. Simulation details

Parameter	Full-Scale Adsorber	RSSCT
RSSCT Scale Factor	--	118
Carbon Mesh Size	12×40	120×200
Mean Particle Diameter	1.10 mm	100 µm
Carbon A.D.	0.575 g/cc	0.550 g/cc
Adsorber I.D.	12 feet	0.622 cm
Weight of Carbon in Adsorber	40,000 lb	0.232 g
Flow Rate	1,000 gpm	6.0 mL/min
EBCT	9.6 minutes	4.2 seconds
Operation Time	760 days	6.4 days
Volume of Water Treated	1,095	14.3 gallons

MATERIALS and METHODS

RSSCT Design

The RSSCT simulated a 12-foot adsorber containing 40,000 lb of F400 12×40, operating at 1,000 gpm, and providing 9.6 minutes of EBCT after backwashing. See Table 4 for design parameters used in the simulation. The RSSCT ran for 760 simulated days (equivalent to 1,095 million gallons treated). A description of the RSSCT is shown in Appendix A.

RSSCT Carbon Preparation

A current production sample of virgin F400 12×40 GAC was systematically re-sized to 120×200 mesh for use in the RSSCT. The test carbon was dried at 105° C for 16 hours and allowed to cool in a desiccator. Prior to the introduction of the challenge water, the column was pre-wetted with deionized water for approximately 16 hours.

RSSCT Influent Preparation

CCC received four 5-gallon containers of water on October 23, 2023. Three of the containers were combined and used as the feed. The RSSCT consumed 14.3 gallons of water.

RSSCT Sampling

Samples were collected four times per day via an automated sample collector into 8-oz. plastic bottles. The TOC samples were collected manually into 40-mL vials from the 8-oz. bottles.

The flow rate of the RSSCT was closely monitored throughout the study. Composite samples of the RSSCT effluent, minus discrete samples for testing, were collected once per day. From this data, average flow rates were calculated, and the flow rate was adjusted as necessary.

Analytical

TOC samples were analyzed in CCC's analytical laboratory using SM 5310B Total Organic Carbon, High Temperature Combustion. PFAS samples were analyzed by STRIDE Center for PFAS Solutions using EPA 537 Version 1.1 Modified. See Table 5 for full list of PFAS analytes.

Table 5. PFAS compounds tested (STRIDE)

Full name	Abbreviation	CAS#
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorohexanoic acid	PFHxA	307-24-4
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanesulfonic acid	PFHxS	355-46-4
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanoic acid	PFNA	375-95-1
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
Perfluorodecanoic acid	PFDA	335-76-2
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9
Perfluoroundecanoic acid	PFUnA	2058-94-8
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6
11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11Cl-PF3OUdS	763051-92-9
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTA	376-06-7

Appendix A: Rapid Small-Scale Column Test (RSSCT) Procedure

The RSSCT procedure uses a miniature carbon-filled column to rapidly simulate the adsorption breakthrough curve that would be obtained by treating an aqueous stream in a large adsorption system. This technique has been shown to accurately simulate the carbon treatment of a wide range of waters and wastewaters under various conditions.

The principal advantage of the RSSCT procedure compared to the one-inch diameter column adsorption test is its increased speed. Typically, an RSSCT can be completed in < 1 to 15 percent of the time required for a one-inch diameter study.

To predict the volume breakthrough curve for the full-scale adsorber, the RSSCT results must be multiplied by the volume scale factor determined for each carbon type. The time breakthrough curve for the full-scale adsorber can be calculated by either of two methods. First, one can divide the predicted volumes calculated above by the flow rate of the full-scale system. Second, one can multiple the run time by the scale factor determined for each carbon type.

The following equations for comparison between small- and full-scale are shown below:

$$\frac{EBCT_{SC}}{EBCT_{LC}} = \left[\frac{d_{p,SC}}{d_{p,LC}}\right]^{2-x} = \frac{t_{SC}}{t_{LC}}$$

$$\frac{V_{SC}}{V_{LC}} = \frac{d_{p,LC}}{d_{p,SC}}$$

$$M_{SC} = EBCT_{LC}\left[\frac{d_{p.SC}}{d_{p,LC}}\right]^{2-x} Q_{SC} * \rho_{LC}$$

where $d_{p,SC}$ and $d_{p,LC}$ are the particle sizes for the small and large GAC; x is the diffusivity constant to be used, 0 for constant and 1 for proportional diffusivity; t_{SC} and t_{LC} are the corresponding elapsed times in the small- and large-scale column tests, respectively; V_{SC} and V_{LC} are the hydraulic loadings in the RSSCT and large-scale columns, respectively; M_{SC} and Q_{SC} are the mass of carbon and flow rate in the small-scale column; and ρ_{LC} is the apparent density of the full-scale carbon.

Appendix B: Sales Spec Sheet

SALES SPECIFICATION SHEET

FILTRASORB 400

Granular Activated Carbon

Test	Specification Min	Specification Max	Calgon Carbon Test Method
IODINE NUMBER, mg/g	1000	-	TM-4,ASTM D4607
MOISTURE (AS PACKAGED), wt%	-	2	TM-1,ASTM D2867
ABRASION NUMBER	75	-	TM-9,AWWA B604
EFFECTIVE SIZE, mm	0.55	0.75	TM-8,ASTM D2862
UNIFORMITY COEFFICIENT	-	1.9	TM-8,ASTM D2862
FCC - WATER EXTRACTABLE, wt%	-	4	TM-43,FCC
12 US MESH [1.70 mm], wt%	-	5	TM-8,ASTM D2862
< 40 US MESH [0.425 mm] (PAN), wt%	-	4	TM-8,ASTM D2862

Typical Properties:

This product complies with ANSI/AWWA B604 (2012) – Granular Activated Carbon.

This product complies with the requirements for activated carbon as defined by the Food Chemicals Codex (FCC) (Latest Edition) published by the U.S. Pharmacopeia.

This product is produced under supervision of the Islamic Food and Nutrition Council of America (IFANCA).

This product is prepared under the supervision of the Kashruth Division of the Orthodox Union and is Kosher.

Only products bearing the NSF Mark are Certified to NSF/ANSI/CAN 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packing or documentation shipped with the product.

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press. 12030-10/09/2018

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