Public Health Division

Center for Health Protection, Drinking Water Services

Tina Kotek, Governor

October 9, 2025

Steven Wilson
wilson@shilohwater.com
Shiloh Water Systems
PO Box 257
Mt. Angel, OR 97362

Sent by email only.

Re: PR# 69-2025 – Residual Maintenance Chlorination
Western Christian School (PWS ID# 90582)
Final Approval

Dear Mr. Wilson,

On May 20, 2025 our office received plans and specifications for installing sodium hypochlorite for residual maintenance to address persistent total coliform positive samples in the distribution system at the Western Christian School (Public Water System ID# 90582). A plan review fee payment in the amount of $825 was also received on May 20, 2025. A land use compatibility statement is not being required for this project.

A Conditional Approval letter was issued on May 29, 2025, which outlined several conditions needing to be met during construction for final approval. An email was received on June 9, 2025 with more project details and a Project Final Approval Request form was receive on September 2, 2025. Conditions were further addressed in an email received on October 8, 2025, which included test results from sampling completed September 25, 2025 showing an absence of coliform bacteria and a free chlorine residual of 0.5 mg/l.

This project assigned plan review ID #69-2025 is now granted Final Approval as viewable on our website at: https://yourwater.oregon.gov/planreview.php?pwsno=90582.

Under OAR 333-061-0060(1)(b), submittals must be prepared by a Professional Engineer registered in Oregon, unless exempted by DWS. An exemption was granted for this submittal. **Note that by utilizing this exemption, the water system (Western Christian School) takes full responsibility for the design of the project.**

The remainder of this letter includes schematics and a description of the proposed disinfection system as well as monitoring requirements.

4-log disinfection evaluation:
Although not required to provide 4.0-log (99.99%) disinfection for viruses, under certain conditions, the installed system can provide this level of disinfection. The minimum chlorine residual required for 4-log disinfection = CTrequired / Time. For this system, the minimum chlorine residual needed for 4-log disinfection was calculated as follows:

1) **Minimum free chlorine residual required for 1 tank = 6.0 / 5 minutes = 1.2 mg/l**
2) **Minimum free chlorine residual required for 2 tanks = 6.0 / 10 minutes = 0.6 mg/l**

Note: this evaluation assumed that the 3rd tank with the lead pump is readily available for deep drawdowns to meet system demands (e.g., 50 gpm x 60 minutes = 3,000 gallons) and was therefore, not included in available contact time calculations. The first fill tank and second tank containing the lag pump should generally be available for disinfection under most conditions. **More details about this evaluation are enclosed with this letter.**

Monitoring Requirements:
As a non-transient non-community water system with newly installed chlorination, please remember to:

1. Measure the free chlorine residual in the distribution system at least twice a week (records to be kept on-site)
2. Measure the free chlorine residual at the same time and same location as coliform sampling and record the free chlorine residual on the coliform sampling lab reporting form.
3. Work with Christina Tisdell to identify disinfection byproduct (TTHM and HAA5) sampling locations and complete the disinfection byproducts rule compliance monitoring plan enclosed on the next page of this letter.

Thank you for your cooperation and patience in this plan review process and if you have any questions, please feel free to call me at 971-200-0288 or email me at evan.e.hofeld@oha.oregon.gov .

Sincerely,

Evan Hofeld, Regional Engineer
OHA-Drinking Water Services

CC: Daniel Graber, Western Christian School, dgraber@wcspioneers.org
Christina Tisdell, Polk County Community Development, tisdell.christina@co.polk.or.us

Stage 2 Disinfection Byproducts Rule

Compliance Monitoring Plan

Ground water system <500 population beginning on a routine (annual) schedule

Water system name: Western Christian School **PWS# 41** 90582

Monitoring location:

We will be taking 2 samples, with one sample analyzed for TTHM at a location with the highest anticipated TTHM concentration (near the end of the distribution system) and the other sample analyzed for HAA5 at a location with the highest anticipated HAA5 concentration near the entry point (at the first sink after treatment).

The sample sites will be marked on the lab reports as follows:

- "2DBPMAX" (high TTHM site), which is at the _____sink
- "2DBP-01" (high HAA5 site), which is at the _____sink

Monitoring dates:

Monitoring must occur during the month of highest TTHM & HAA5 concentrations or warmest water temperature. Based on this requirement, compliance monitoring will begin **September 2025** and continue **annually** thereafter.
Note: monitoring may be reduced or increased based on routine monitoring results.

Compliance Calculations:

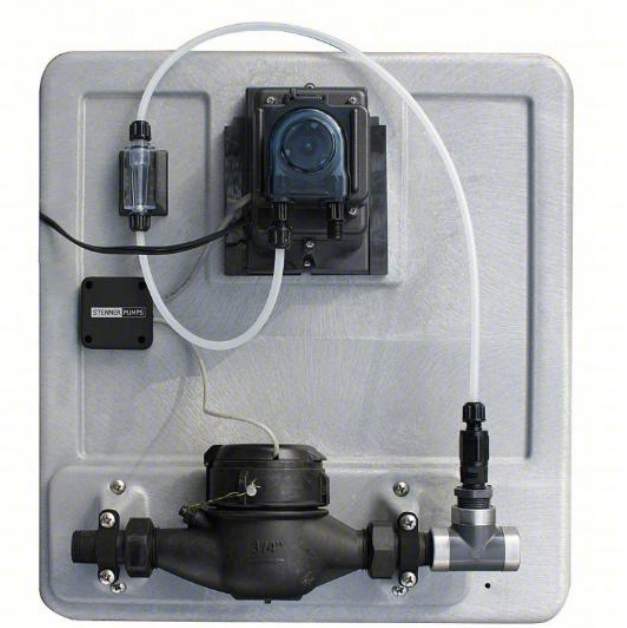
Compliance is based on annual monitoring results.
Compliance is achieved if TTHMs are ≤ 0.080 mg/L and HAA5s ≤ 0.060 mg/L.

Water treatment system project description

The two 16 gallon per day NSF-61 Stenner E20PHG Econ chlorine feed pumps are isolated on the fill line for each source (Well 1 and 2). The NSF-60 12.5% sodium hypochlorite is diluted with a 10 to 1 gallon ratio of water to sodium hypochlorite. The fill system/disinfection system is plumbed in 1” sch 40 PVC both filling the furthest “fill” tank at a rate of 5 GPM each. The three are connected by 4” sch 40 PVC. The spillway is approximate 77” from the floor of the tank from one tank to the next and so forth.

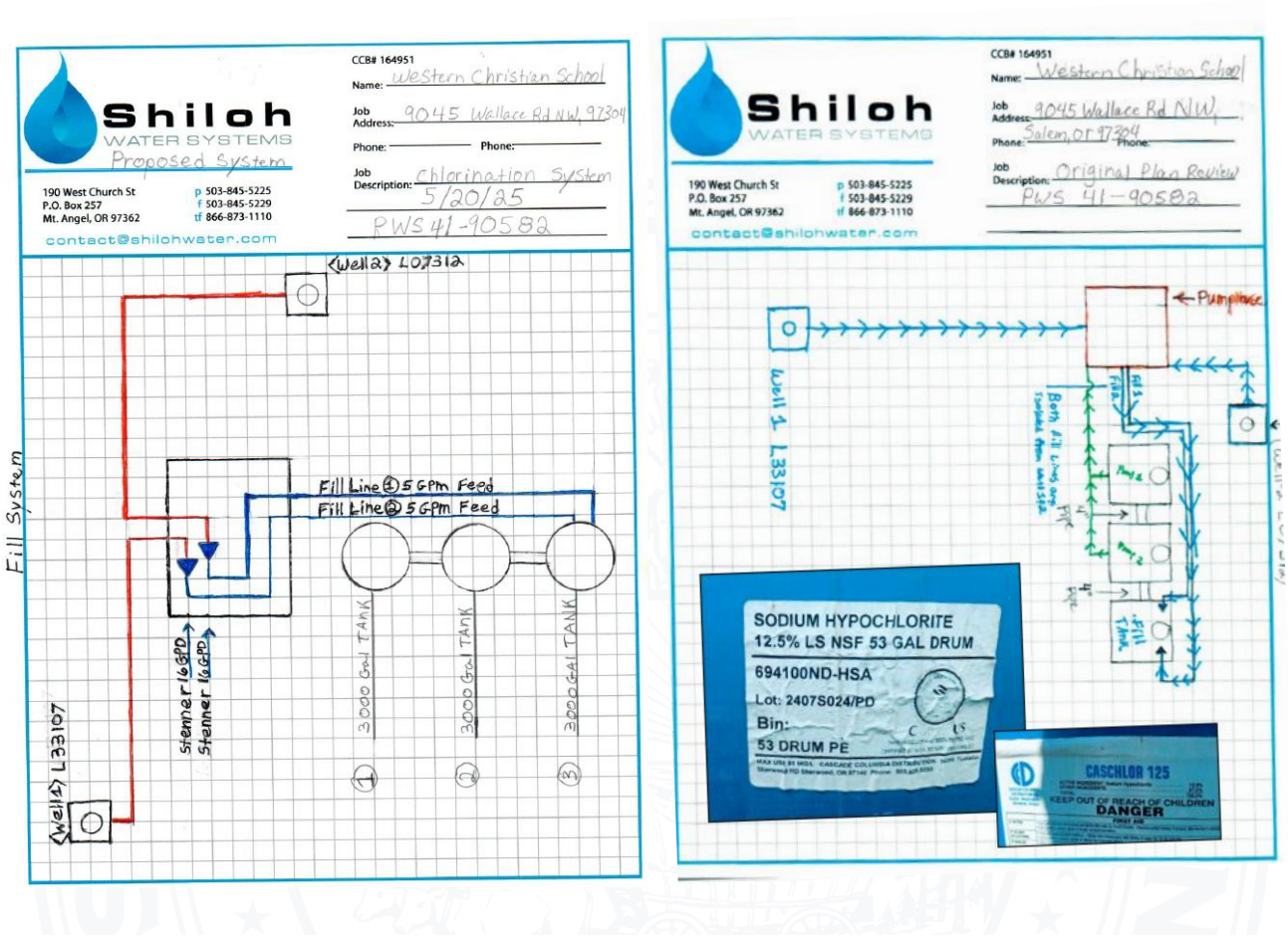
The rate of flow leaving the storage tanks is achieved by 2 submersible pumps. This is a lead lag system meaning pump 1 does all the heavy lifting. While pump 2 is there as a backup if pump 1 fails, pressure drops, or to supplement volume to the school if demand has increased for whatever reason.

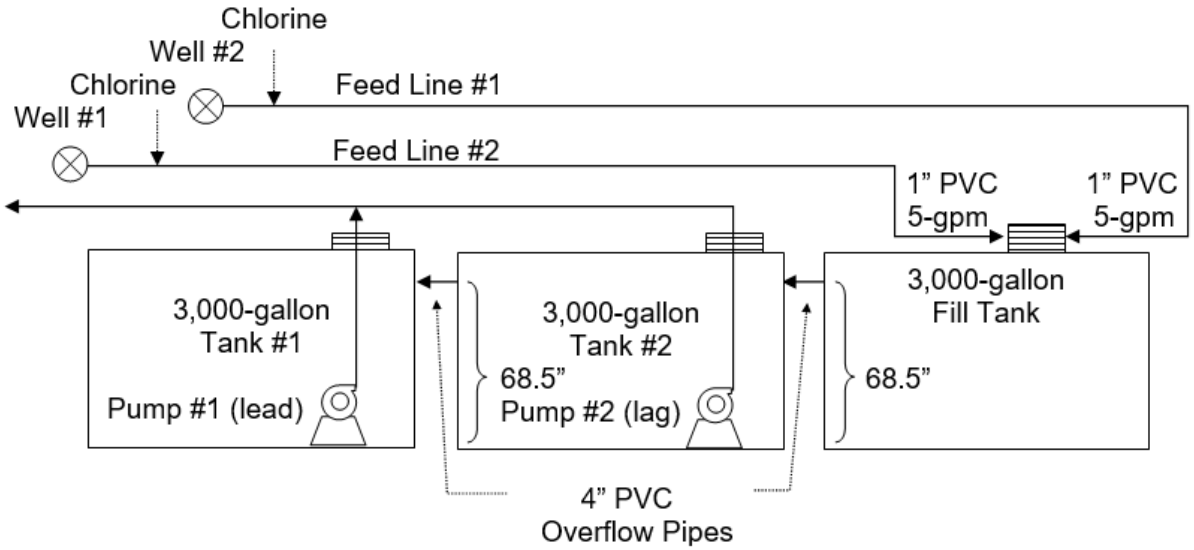
Stenner E20PHG chemical feed pump



STENNER Pump Mounted Panel System: 16 gpd Max. Flow Rate, 1.6 gpd Min. Flow Rate, 120V AC, 10:1

Item **29FJ82** Mfr. Model **E20PHG81S715G1**

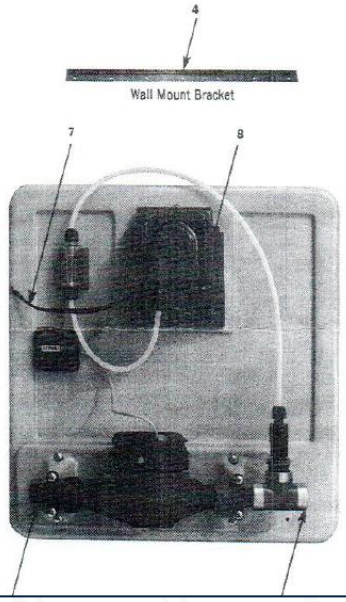

Shiloh
WATER SYSTEMS
Proposed System
190 West Church St
P.O. Box 257
Mt. Angel, OR 97362
p 503-845-5225
f 503-845-5229
tf 866-873-1110
contact@shilohwater.com
CCB# 164951
Name: Western Christian School
Job Address: 9045 Wallace Rd NW, 97304
Phone:
Job Description: Chlorination System
5/20/25
PWS 41-90582
Well 2 L07312
Fill System
Fill Line #1 5 GPM Feed
Fill Line #2 5 GPM Feed
Stenner 16GPD
Stenner 16GPD
3000 Gal TANK
3000 Gal TANK
3000 GAL TANK
Well 1 L33107
Shiloh
WATER SYSTEMS
190 West Church St
P.O. Box 257
Mt. Angel, OR 97362
p 503-845-5225
f 503-845-5229
tf 866-873-1110
contact@shilohwater.com
CCB# 164951
Name: Western Christian School
Job Address: 9045 Wallace Rd NW, Salem, OR 97304
Phone:
Job Description: Original Plan Review
PWS 41-90582
Pumphouse
Well 1 L33107
SODIUM HYPOCHLORITE
12.5% LS NSF 53 GAL DRUM
694100ND-HSA
Lot: 2407S024/PD
Bin:
53 DRUM PE
CASCHLOR 125
KEEP OUT OF REACH OF CHILDREN
DANGER


Chlorine
Well #2
Chlorine
Well #1
Feed Line #1
Feed Line #2
1" PVC
5-gpm
1" PVC
5-gpm
3,000-gallon
Tank #1
Pump #1 (lead)
3,000-gallon
Tank #2
68.5"
Pump #2 (lag)
3,000-gallon
Fill Tank
68.5"
4" PVC
Overflow Pipes

STENNER PUMPS

ECON METER SYSTEM START-UP INSTRUCTIONS

⚠WARNING TO BE INSTALLED AND MAINTAINED BY PROPERLY TRAINED PROFESSIONAL INSTALLER ONLY. READ MANUAL & LABELS FOR ALL SAFETY INFORMATION & INSTRUCTIONS.

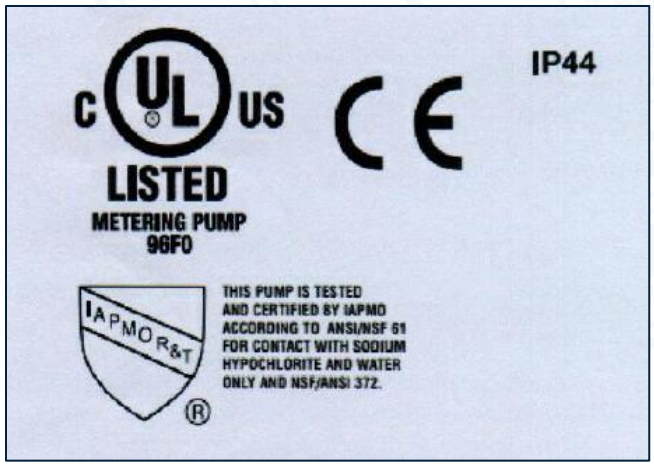


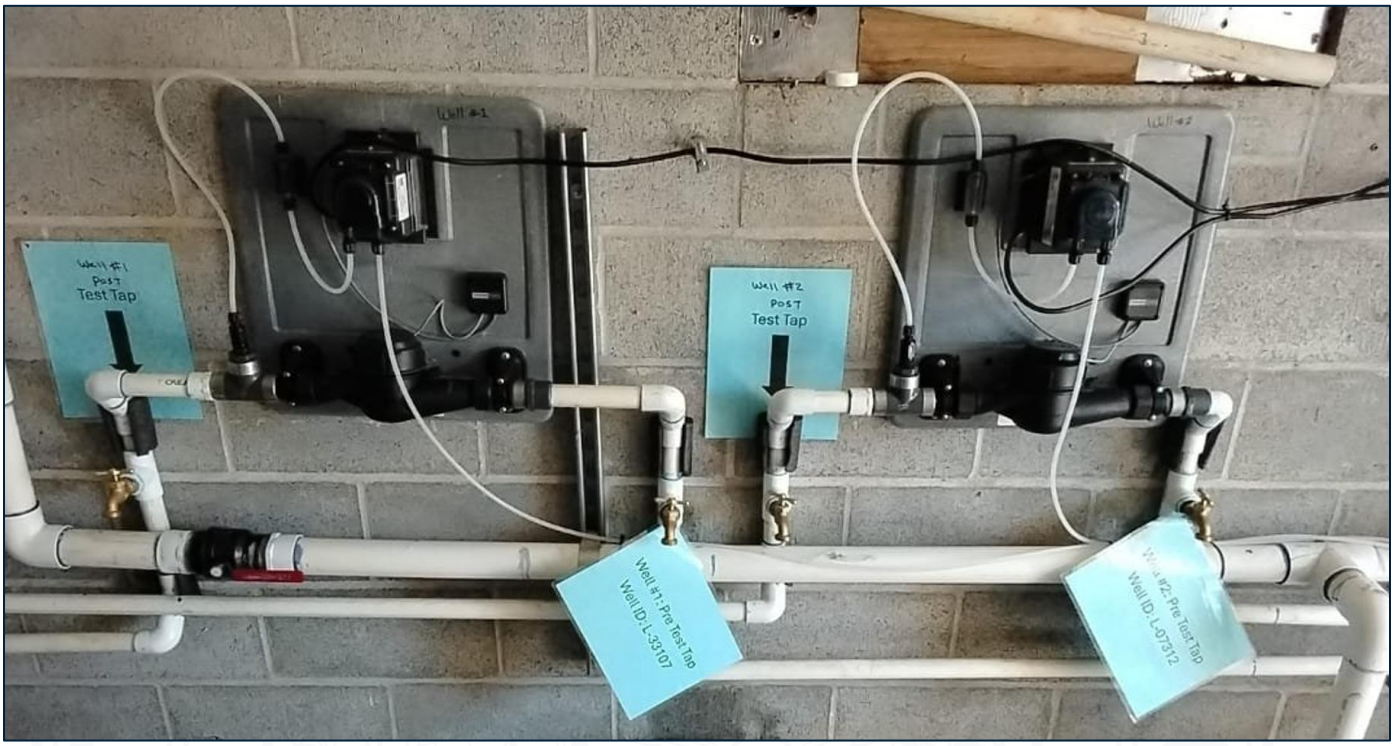
1. Select a dry location to mount panel to avoid water intrusion. When selecting the location, note the water flow direction as indicated on the flow meter. Location should allow mounting hardware to be anchored into studs or concrete to support the weight of the panel.
2. Isolate and depressurize the water system.
3. Mark location of lag bolt holes 14 1/4" above center line of the horizontal pipe.
4. Secure wall mount bracket to wall studs using the included lag bolts or other suitable hardware. Hang panel on to wall mount bracket.
5. For convenience, the panel has 3/4" NPT (or 1" NPT) connections on the inlet and outlet. Connect the inlet and outlet of the panel to the water system.
6. Cut necessary length of suction tubing and connect to the suction side of the pump. Secure the weighted strainer to one end and secure the tubing to the pump tube fitting with the provided nut and ferrule. **DO NOT** use wrenches or thread seal tape. Connection needs to be finger tightened.
7. Plug pump power cord into an appropriate receptacle as specified in the pump manual. Follow the wiring directions for your model and application.
8. Prime the pump, per the instruction manual, and observe the liquid being drawn from the solution tank. When it reaches the injection point, discontinue priming.
9. Pressurize the system slowly, check for leaks, and verify pump operation.

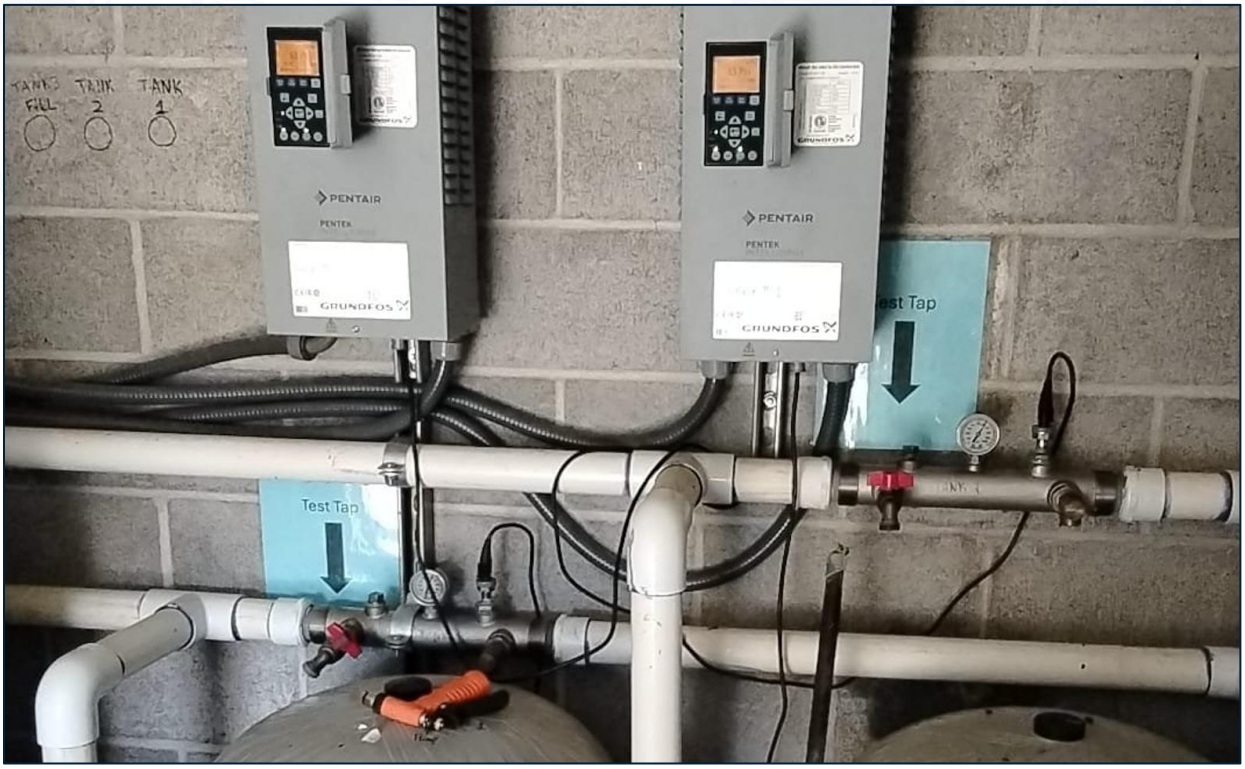
⚠ WARNING **When pressurizing the system, gradually allow water to flow. Shocking the meter by over speeding it with high flow rates can damage the internal assembly.**

⚠ CAUTION **Ensure the piping is properly aligned and supported both upstream and downstream of the panel.**

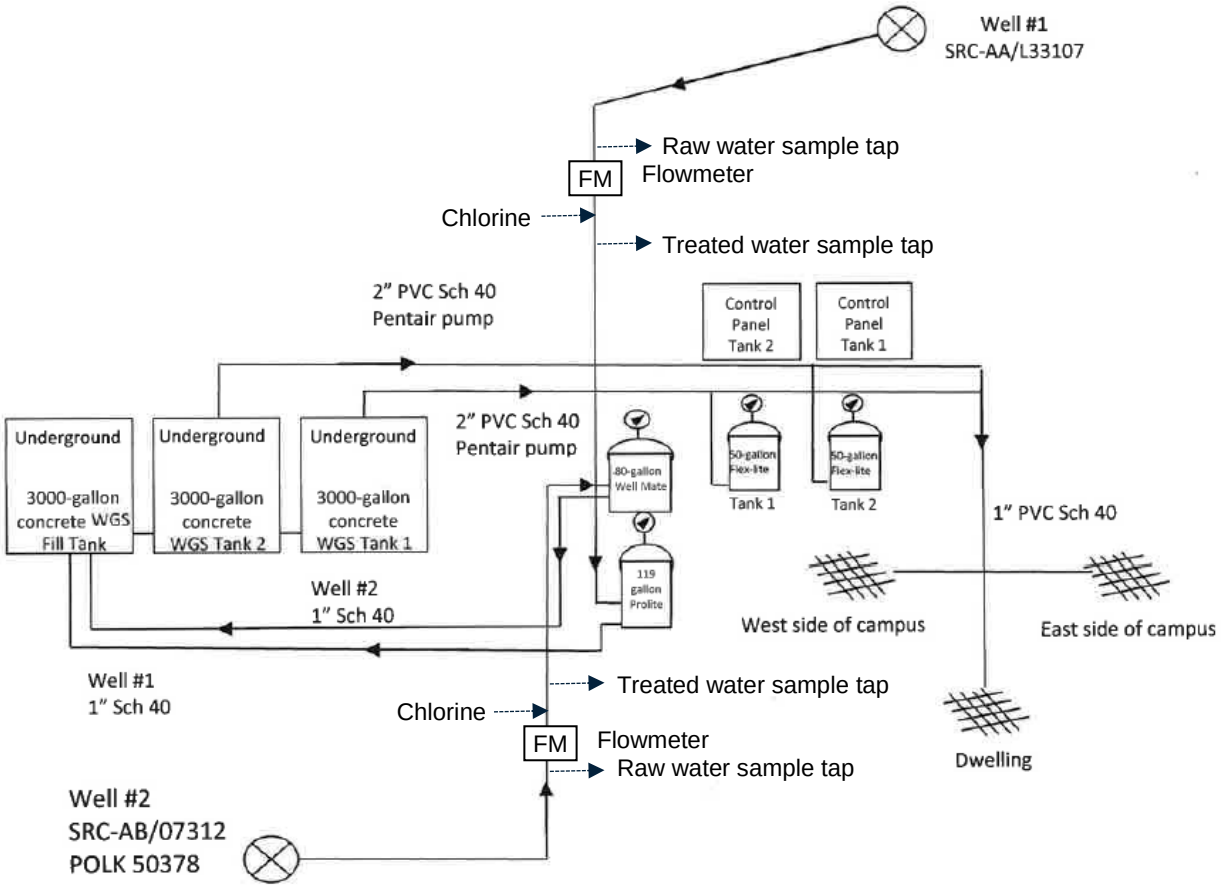
It is the installer's responsibility to comply with all national and local plumbing and electrical codes.




Well #1
Post
Test Tap
Well #2
Post
Test Tap
Well #1 Pre Test Tap
Well ID: L-93107
Well #2 Pre Test Tap
Well ID: L-07312


TANK
FILL
TANK
2
TANK
1
PENTAIR
PENTER
GRUNDFOS
PENTAIR
PENTER
GRUNDFOS
Test Tap
Test Tap

Water System Schematic

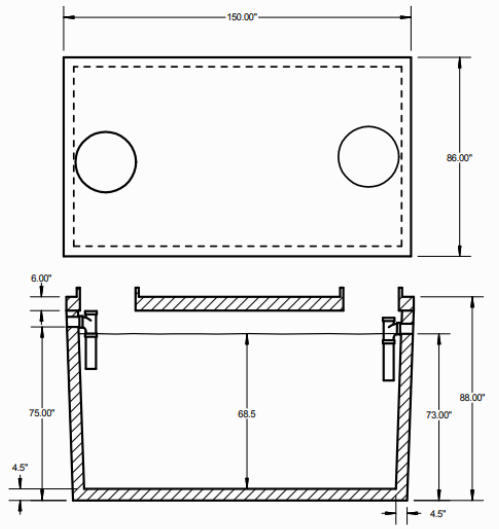


Willamette Graystone

Job Quote:	Brian Turley / Western Christian School	**Date :**	**07-08-2022**
Location:	9045 Wallace Rd. NW, Salem, OR 97304	**Product:**	**TW3000 specials x3**
To:	Brian	**Prep By:**	**Rick Kief**
Phone:	503-437-0745	**Ph.**	**541.726.7666**
Email:	bturley@turleyfarms.com		rick.kief@willamettegraystone.com

Item #	Description	Qty	Price/Unit	Total
	TANK 1			
TW3000	TANK WATER 3000 GALLON SPECIAL Tank 1	1	$ 4,606.00	$ 4,606.00
	SPECIAL ORDER SET UP	1	$ 230.00	$ 230.00
	6" CAST-A-SEAL FITTING	1	$ 180.00	$ 180.00
RR2430	RR2430 24" D X 30" H PVC RISER	2	$ 265.00	$ 530.00
FL24G4BWILLGRAY	WG LOGO 24" RISER LID W/BOLTS	2	$ 160.00	$ 320.00
ADHP10	RISER EPOXY WELD-ON 810 1PT	2	$ 47.00	$ 94.00
	SUB TOTAL			$ 5,960.00
	TANK 2			
TW3000	TANK WATER 3000 GALLON SPECIAL Tank 2	1	$ 4,606.00	$ 4,606.00
	SPECIAL ORDER SET UP	1	$ 230.00	$ 230.00
	6" CAST-A-SEAL FITTING	2	$ 180.00	$ 360.00
RR2430	RR2430 24" D X 30" H PVC RISER	2	$ 265.00	$ 530.00
FL24G4BWILLGRAY	WG LOGO 24" RISER LID W/BOLTS	2	$ 160.00	$ 320.00
ADHP10	RISER EPOXY WELD-ON 810 1PT	2	$ 47.00	$ 94.00
	SUB TOTAL			$ 6,140.00
	TANK 3			
TW3000	TANK WATER 3000 GALLON SPECIAL Tank 3	1	$ 4,606.00	$ 4,606.00
	SPECIAL ORDER SET UP	1	$ 230.00	$ 230.00
	6" CAST-A-SEAL FITTING	1	$ 180.00	$ 180.00
RR2430	RR2430 24" D X 30" H PVC RISER	2	$ 265.00	$ 530.00
FL24G4BWILLGRAY	WG LOGO 24" RISER LID W/BOLTS	2	$ 160.00	$ 320.00
ADHP10	RISER EPOXY WELD-ON 810 1PT	2	$ 47.00	$ 94.00
	SUB TOTAL			$ 5,960.00
NOTES	1. Please allow up to 6 weeks lead time to produce tanks when order is placed. 2. Please allow up to 5 weeks lead time to order and receive all Oreneo materials, so they are available to deliver. SOME ITEMS HAVE LONGER LEAD TIMES - SEE ADDITIONAL NOTES. 3. MATERIALS ONLY. QUOTE GOOD FOR 30 DAYS FROM THE DATE ABOVE. 4. DELIVERY/FREIGHT QUOTED IS SUBJECT TO CHANGE AND MAY BE ADJUSTED AT TIME OF DELIVERY DUE TO FUEL MARKET VOLATILITY. 5. Additional charges may apply for delivery if deviations from above - quoted based on driver and truck resources.			
691900	DELIVERY CHARGE	1	$ 682.00	$ 682.00
	**** QUOTE HONORED FOR 30 DAYS ***			
Date:	**Accepted:**		**TOTAL**	**$18,742.00**

WAITE CONCRETE PRODUCTS, LLC



3000 GALLON- SEPTIC TANK

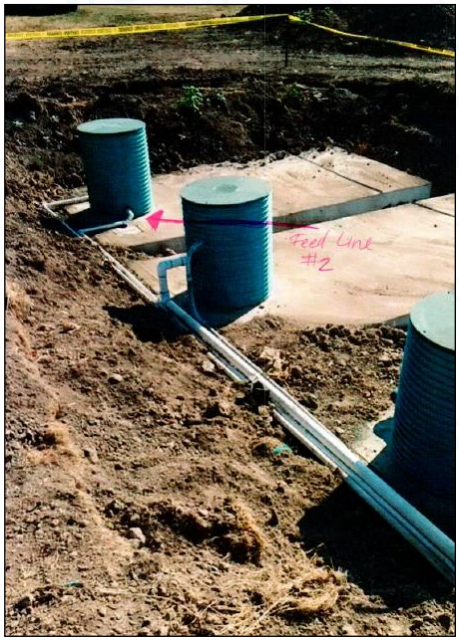
EXCAVATION DIMENSIONS

GALLON CAPACITY	WIDTH OF HOLE	LENGTH OF HOLE	HEIGHT OF TANK	INLET TO BOTTOM*	OUTLET TO BOTTOM*	TANK WEIGHT
3000	9'	14'	88"	75"	73"	24,000#

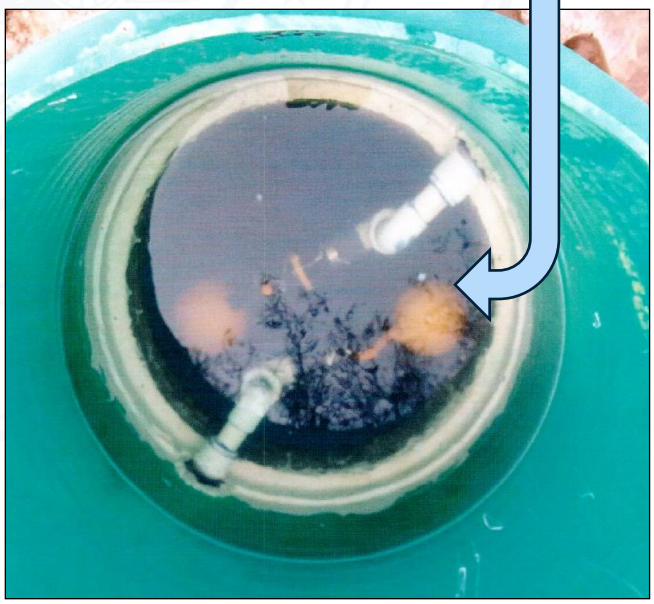
*MEASUREMENT FROM THE BOTTOM OF THE TANK TO BOTTOM OF INLET HOLE.
TANK INCLUDES: TWO- 24" or 30" RISER ADAPTERS 4" ABS INLET/OUTLET COUPLER

24526 S. HWY 99E • PO BOX 306 • CANBY, OR 97013 • TEL: 503 266 2670 • FAX: 503 266 7466

Downward turned tank air vents were raised further above grade and are equipped with insect screens. Hatches are equipped with locking hasps.



Fill Tank →



Oregon Health Authority

Drinking Water Services
Project Final Approval Request Form

Print

Project Name Disinfection System PR# 69-2025
Public Water System ID# 41- 90582
PWS Name Western Christian School

Click to locate PWS ID#

	YES	NO	DATE
1. Was the project undertaken? If so, what was the starting date?	☒	☐	7-9-25
2. If project was not undertaken, has the project been abandoned?	☐	☒	
3. Was the project completed? If so, when? If project not complete, estimated completion date: 8-13-25	☒	☐	8-13-25
4. If completed, was the work accomplished in conformance with all conditions listed in the Conditional Approval letter and DWS Construction Standards, Oregon Administrative Rule (OAR) 61-0050? **In the comments below or on a separate sheet please make clear how all conditions specified in the Conditional Approval letter were met.**	☒	☐	
5. If the project was completed, were there any differences between what is shown on the plans and what was actually installed?	☐	☒	
6. If the completed project is different from what is shown on the plans, were the plans modified to show as-built conditions?	☐	☒	
7. Have as-builts been sent to Drinking Water Services? **NOTE: As-builts are not required if there were no significant changes noted in 5.**	☐	☒	
8. Are the facilities operating? If so, starting when?	☒	☐	9-2-25

Signature of Engineer Steven W. Wilson Date 9-2-25
Name Steven W. Wilson OR PE# N/A
Firm Shiloh Water Systems inc Phone (503) 845-5225
Comments

PWS ID: 90582 ---- WESTERN CHRISTIAN SCHOOL OR41

Coliform Results

See also: Coliform Fact Sheet :: Coliform Schedules :: Archived Results :: MRDL Summary :: Batch Numbers

Sample types: AS=Assessment, CO=Confirmation, MU=Make-up, RP=Repeat, RT=Routine, SP=Special, TG=Triggered. See the glossary for more information.

Filter options: Show special samples :: Show rejected samples :: Include results older than 2022

Sample Date	# Samples	Sample Type	Coliform Type	Result	Sample ID	Repeat of Sample ID	Sample Site	Facility	Chlorine Residual	Received Date
Sep 25, 2025	1	RT	Total	Absent	170-1158-1		9045 WALLACE RD NW, SALEM OR 97304 - UTILITY SINK	DIST-A	0.50	Sep 30, 2025
		RT	E. coli	Absent	170-1158-1		9045 WALLACE RD NW, SALEM OR 97304 - UTILITY SINK	DIST-A	0.50	

Public Health Division
Drinking Water Services
Tina Kotek, Governor

OREGON HEALTH AUTHORITY

2/26/2025

DANIEL GRABER
WESTERN CHRISTIAN SCHOOL
9045 WALLACE RD NW
SALEM, OR 97304

RE:Installation of treatment to maintain a disinfectant residual due to persistent coliform bacteria at OR4190582

Dear DANIEL GRABER,

Due to recent coliform sample results, the Oregon Health Authority, Drinking Water Services (DWS) is requiring another coliform investigation. The number of coliform investigations at your water system without removing the source of the coliform bacteria requires the installation of treatment to maintain a disinfectant residual throughout the distribution system according to Oregon Administrative Rule 333-061-0032(6)(g).

Treatment must be installed no later than 8/30/2025. Plan review is required prior to installation. Please review the requirements at www.healthoregon.org/pwsplanreview.

If you have any questions please contact Christina Tisdell/Justine Bova at (503) 623-9237.

Respectfully,

Drinking Water Services

cc: Evan Hofeld, DWS
Christina Tisdell/Justine Bova, Polk County

800 NE Oregon Street, #640,Portland, OR 97232 | Voice: 971-673-0405
Fax: 971-673-0694 | All relay calls accepted | www.healthoregon.org/dws

Page 1

Oregon Department of Human Services – Drinking Water Program
Disinfection Verification Form – Groundwater Systems

PWSID Number: 90582 **County: Polk**

System Name: Western Christian School

Plan Review ID#: PR#69-2025 – Residual maintenance

Groundwater Source: EP for Wells (EP-A)

Sources				
Facility ID	Facility Name - Well Logs	Activity Status	Availability	Source Type
EP-A	EP FOR WELLS	A		GW
SRC-AA	WELL #1 - L33107	A	Permanent	GW
SRC-AB	WELL #2 - POLK50378	A	Permanent	GW

Operator and Phone Number: John Stephenson (503-363-2000) - Form completed by Evan Hofeld as part of plan review (PR#69-2025)

Please retain a copy of the completed form for your records.

Check the line below that applies to your groundwater system:

_____ **Our groundwater system is documenting that we provide 4-log inactivation of viruses, pending DWP review.**

_____ **Our groundwater system does not appear to provide 4-log inactivation of viruses.**

_____ **We do not know if our groundwater system provides 4-log inactivation of viruses.**

_____ **Our groundwater system has earlier been required by DWP to provide 4-log inactivation of viruses. Date of written notification (if known): _____**

X **Other: 4-log disinfection is not required – residual maintenance is only for persistent total coliform detections.**

Does Your System Provide 4-log Inactivation of Viruses? Only under certain scenarios as described below:

The minimum chlorine residual required for 4-log disinfection = CTrequired / Time

and is calculated for the following two scenarios:

1) **Minimum free chlorine residual required for 1 tank = 6.0 / 5 minutes = 1.2 mg/l**
2) **Minimum free chlorine residual required for 2 tanks = 6.0 / 10 minutes = 0.6 mg/l**

It is assumed that the 3rd tank with the lead pump is readily available for deep drawdowns to meet system demands (e.g., 50 gpm x 60 minutes = 3,000 gallons) and is therefore, not included in available contact time calculations. The first fill tank and second tank containing the lag pump, but should generally be available for disinfection under most conditions.

What is 4-log treatment?

If your system adds a chlorine compound, use the instructions below to document whether your system provides 4-log treatment (99.99 % removal and/or inactivation) of viruses. The concept of "CT" is used to verify this level of treatment.

"CT" is an indication of the effectiveness of chlorine addition to protect public health from bacteria, viruses and protozoa in drinking water. CT is achieved by providing enough time for chlorine to inactivate potentially harmful organisms in your drinking water before it is consumed. CT represents an abbreviation of chlorine **C**oncentration (measured at the first user of your drinking water) multiplied by contact **T**ime (the water's time of travel from the point of chlorine addition to your system and the first user).

Note that the following steps are intended to assist you in determining whether adequate disinfection is achieved in your system. The actual CT of your system will be determined in Step 1 below. The CT required for 4-log inactivation of viruses will depend on your groundwater source's pH, temperature and the free chlorine residual concentration in your water at the first user and will be determined in Step 2. In Step 3 the two values will be compared to determine whether or not you are documenting that your system provides 4-log inactivation, pending DWP review (1st or 2nd check box above).

Note:

If you have questions on how to calculate CT to make this determination, please check the 3rd box above and a DWP representative will contact you to assist in compiling the necessary information to make this determination. If you check the 3rd box, you may provide only the information designated by the **bolded** items in Step 1 to expedite this determination.

Additionally, if the DWP has required 4-log inactivation (disinfection with adequate contact time) to inactivate harmful pathogens in a confirmed contaminated source, please check the 4th box, with the date of the written DWP notification, if it is known. If the DWP verifies that your system provides 4-log inactivation of viruses, a representative will contact you to indicate the chlorine monitoring requirements and the minimum chlorine concentration that you will need to maintain at the first user.

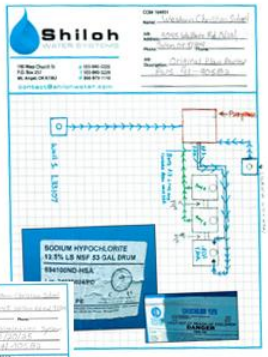
Page 3

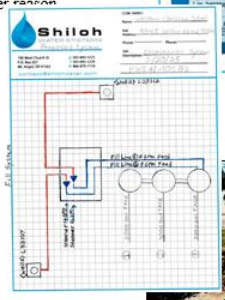
System Description

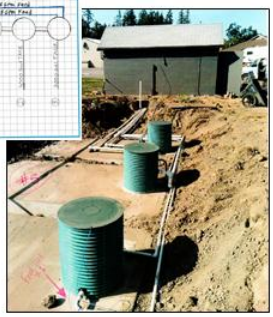
Note that the actual CT for your system is derived by calculating the individual CT values for all segments of your system where water is in contact with chlorine before the 1st user.

The feed pumps are isolated on the fill line for each source (Well 1 and 2). The fill system/disinfection system is plumbed in 1" sch 40 PVC both filling the furthest tank at a rate of 5 GPM each. For the tanks themselves they are connected by 4" sch 40 PVC. The spillway is approximate is approximately 77" from the floor of the tank from one tank to the next and so forth.

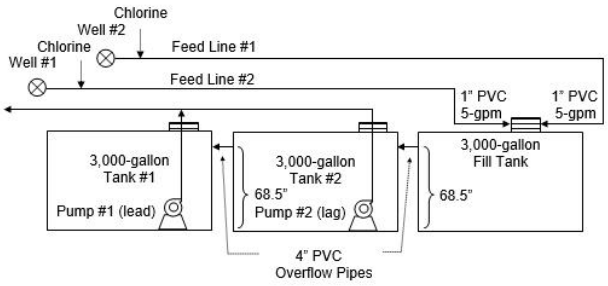
The rate of flow leaving the storage tanks is achieved by 2 submersible pumps. This is a lead lag system meaning pump 1 does all the heavy lifting. While pump 2 is there as a back up if pump 1 fails, pressure drops, or to supplement volume to the school if demand has increased for whatever reason.

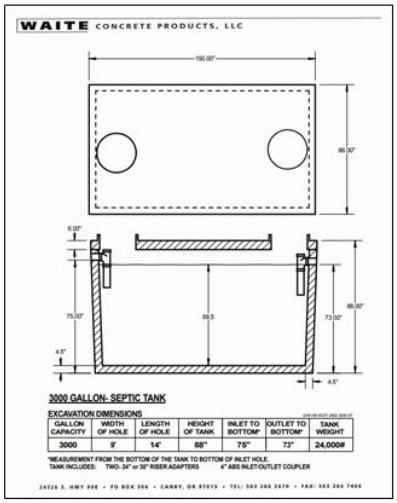






Page 4





Page 5

Step 1 – Determine effective volume and actual CT at the average free chlorine residual

Note:
- The fill tank is assumed to always remain full
The 2nd tank is generally to remain full but may be pumped down using the lag pump should the lead pump in tank 1 fail to operate or the demand drains tank 1.
The 3rd tank is generally considered available for pumping down as needed to meet demands as it contains the lead pump
For these reasons only scenarios involving the fill tank and the first tank are considered for this CT evaluation.

Total Volume for 1 Tank:

[150" outside length – (4.5" wall thickness x 2)] x [86" outside width – (4.5" wall thickness x 2)] x 68.5" deep
= 136.5" x 77" wide x 68.5" deep
= 719,969 cubic inches
= 416.65 cubic feet

416.65 x 7.48 gallons/cubic feet = **3,116-gallons**

(3,116 gallons) / (68.5" x 1ft/12") = 545.87 gallons/ft of depth for each tank

1.	**Average Free chlorine residual (C) measured at the first user**	0.5-mg/l
2.	**Total Volume of Reservoir (V_{Total})**	3,116 gallons For 1 tank (6,232 gallons for 2 tanks)
3.	**Lowest Operating Height (H_{Low}) of Reservoir**	68.5-inches (5.7-ft)
4.	Lowest Operating Volume (V_{Low}) = (H_{Low}/H_{Total}) × V_{Total}	3,116 gallons for 1 tank (6,232 gallons for 2 tanks)
5.	**Estimated Baffling Factor of Reservoir (BF) (see last page of handout)**	10%
6.	Effective Volume available for Contact Time (EV) = (V_{Low} × BF ÷ 100) or (Line 4 × Line 5 ÷ 100)	311.6-gallons for 1 tank (623.2-gallons for 2 tanks)

Page 6

7.	**Peak flow (F) through reservoir during busiest day, used for contact time**	60-gpm

Note How Peak Flow Was Determined:

No - Meter measuring flow leaving the tank
No - low equivalent based on a fixture count
Yes - Other: from 10/8/25 email from Ashley Dale at Shilo Water:

> "the maximum demand of flow leaving the tanks at about 60 GPM, however; I believe the school typically operates on less than 30 GPM. "

8.	Contact Time (T): (EV ÷ F) or (Line 6 ÷ Line 7)	5 minutes for 1 tank (10 minutes for 2 tanks)
9.	Actual CT: C x T = Line 1 x Line 8	
	Actual CT: C x T = Line 1 × Line 8	2.5 mg-minutes/L for 1 tank (5 mg-minutes/L for 2 tanks)

Step 2: Determine the CT required for your water system

1. System's groundwater source's *coldest* water temperature: 10 Degrees C. *Note*, that if temperature data is not available, refer to temperature on well log, or take a temperature measurement of the groundwater source. During review, DWP may request an additional measurement. For conversion, Degrees C = 5/9 × (Degrees F – 32).
2. In the table below circle the value that most closely relates to the temperature recorded in item 1 above. If your system's coldest water temperature is between two numbers, round down and circle the next lowest whole number.
3. In the table circle the CT value that is associated with the temperature identified above.

CT Values to Achieve 4-log Inactivation of Viruses by Free Chlorine, pH 6.0-9.0

A	Degrees C	5	6	7	8	9	10	11	12	13	14	15
B	CT	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0

Groundwater pH values are generally between 6.0 and 9.0; this is an assumption for this table. If the pH of your groundwater source is known to be outside this range, please contact DWP.

$CT_{required}$ = 6.0 at 10 deg C

==========

Step 3: Determine your system's ability to provide 4-log inactivation of viruses

Compare your Actual CT value from step 1 with the value you circled in the table above. If your actual water system CT from Step 1 is a number larger than the number you circled above, then your documentation indicates that your system provides at least 4-log inactivation of viruses. If your actual CT is a number less than the number you circled in the table above, then your system does not appear to provide 4-log inactivation of viruses.

Actual $CT_{achieved}$ is less than $CT_{required}$

Step 3: Determine minimum chlorine residual to achieve 4-log viral inactivation:

Minimum chlorine residual required for 4-log viral inactivation = CTrequired / Time

Minimum free chlorine residual required for 1 tank = 6.0 / 5 minutes = 1.2 mg/l
Minimum free chlorine residual required for 2 tanks = 6.0 / 10 minutes = 0.6 mg/l

Page 8

Example Calculation

1. System's free chlorine residual (in mg/L) at first user's service connection: 0.5 mg/L
2. Shortest amount of time (in minutes) water is coming into contact with the chlorine: 10 min.
3. Multiply number and enter result: (0.5 × 10) = 5 mg-minutes/L (Total CT)
4. System's groundwater source's coldest water temperature: 10 In Degrees C

This systems does not achieve 4-log inactivation of viruses because the value from Line 3(CT=5) is smaller than the value circled on Line B (CT for 10°C=6)

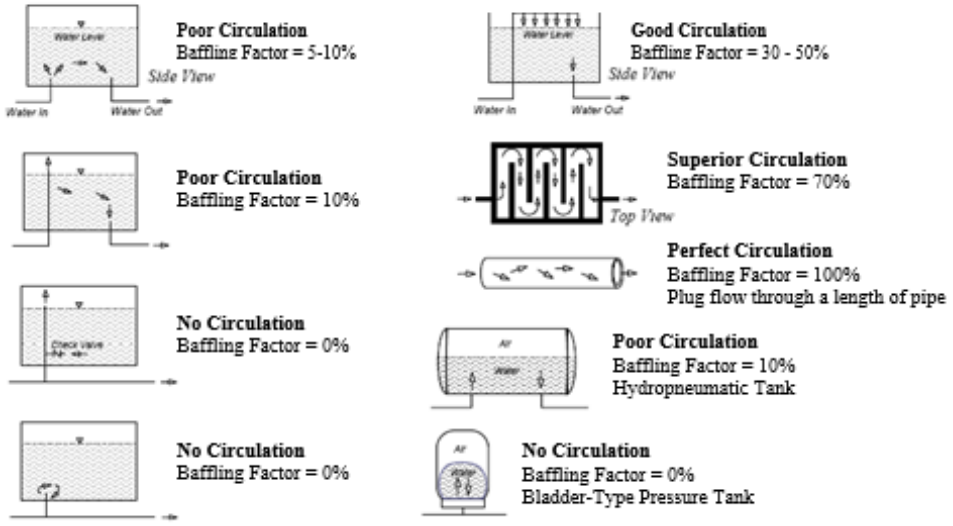
CT Values to Achieve Inactivation of Viruses by Free Chlorine, pH 6.0-9.0

A	Degrees C	5	6	7	8	9	10	11	12	13	14	15
B	4-log Inactivation	8.0	7.6	7.2	6.8	6.4	6.0	5.6	5.2	4.8	4.4	4.0

CT values provided in the tables are modified by linear interpolation between 5°C increments.

Estimated Baffling Factors for Storage Reservoirs* – Contact Time Calculation

Estimated Baffling Factors for Various Storage and Pressure Tanks



* Baffling Factor graphic provided courtesy of the Washington Dept. of Health-Office of Drinking Water (September 2009)