RIVERSIDE

GROUP B WATER SYSTEM

RBE NO. 23092

JUNE 2024

RB Engineering

DESIGN → PERMIT → MANAGE

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1. CHAPTER 1 - DESCRIPTION OF WATER SYSTEM

1.1 Ownership and Management:

System Name: Riverside Group B Water System

Water System ID: Pending Approval

Type of Ownership: Private

Owner Name: Merrlawski Investments LLC
Address: 209 Crescent Beach Dr, Packwood, WA 98361
Phone Number: (360) 870-2561

Management Structure:

This system will be managed by a DOH approved Satellite Management Agency. The SMA will perform all daily, monthly and annual operations and management of the facilities.

1.2 Lewis County Public Health and Social Services:

Lewis County Public Health and Social Services

Director
Meja Hanlin **Phone: 360-740-1234** **Fax: 360-740-1480** **TDD Relay: 360-740-1480**
Environmental Health Supervisor
Kirsten Wecker **Email; Kirsten.wecker@lewiscountywa.gov** **Phone: 360-740-1238** **TDD Relay: 360-740-1480**
Senior Environmental Health Specialist – Water Program
Jeffrey Landrum, RS **Email: Jeffrey.landrum@Lewiscountywa.gov** **Phone: 360-740-1249** **Fax: 360-740-1245** **TDD Relay: 360-740-1480**

1.3 Checklist for New or Expanding Group B Water Systems:

Planning and Design Submittal Element	Group B Design Guidelines	Yes, Included	No, Not Applicable
Completed submittal checklist for a new or expanding		X	
Completed project approval application form	Chapter 2.2	X	
Property title notice	Chapter 2.6	X	
Service area map	Chapter 2.3	X	
Demonstrate compliance with SMA requirement	Chapter 2.5	X	
Demonstrate compliance with PWS Coordination Act	Chapter 2.4	X	
Completed Water Facilities Inventory (WFI)*	Chapter 2.8	X	
Water right permit or other needed Dept. of Ecology approval	Chapter 3.0		X
Well log	Chapter 4.1	X	
Well pump test report	Chapter 4.1	X	
Well water quality sampling results	Chapter 4.2	X	
Documentation of well site approval	Chapter 4.3	X	
Well sanitary control area protective covenants	Chapter 2.7 and 4.3	X	
Intertie agreement	Chapter 4.4		X
Well and pump house detailed drawings and specifications	Chapter 5.2 and 5.3	X	
Distribution system detailed drawing and specifications	Chapter 6.10	X	
Storage tank sizing, detailed drawings, and specifications	Chapter 7.6		X
Booster pump sizing, detailed drawings, and specifications	Chapter 8.0		X
Establish viability to treat for a primary mcl	Chapter 9.0		X
Primary contaminant treatment design	Chapter 9		X
Secondary treatment design	Chapter 10		X
Completed *Group B Design Report Workbook*		X	

* Completing a *Water Facilities Inventory Form* will expedite the review process. The department cannot approve a Group B design workbook for a new or expanding Group B water system without receiving information contained on a completed WFI.

OWNER AND DESIGNER CERTIFICATION:

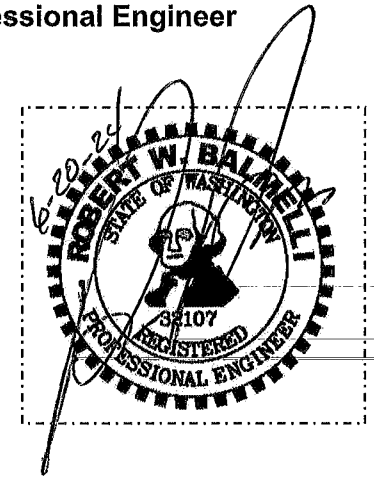
Engineer and Owner

Failure to complete all applicable sections of this workbook will result in denial of your application or delay in its approval. Please print all information.

Water System Engineer

Workbook prepared by	Robert Balmelli PE
Mailing Address	PO Box 923 Chehalis, WA 98532
Company Name	RB Engineering
Day Phone	(360) 740-8919

Professional Engineer



Water System Owner

Owner's Name	Merrlawski Investments, LLC
Owner's Mailing Address	209 Crescent Beach Dr Packwood, WA 98361
Day Phone	(360) 870-2561

Owners Statement of Accuracy and Responsibility:

I, the undersigned, do hereby attest that as the owner of this water system I am responsible for any maintenance or repairs involved in the continuing operation of this system and the accuracy of this project submittal.

Signature: _____ Date 4/8/24

Owner's Representative Signature _____ Date _____

3. CHAPTER 3 - BASIC PLANNING DATA AND INFORMATION

3.1 Property Information

Legal Description and Parcel Number

TAX PARCELS: 035067-002-003

LOT 3 LEWIS COUNTY SIMPLE SEGREGATION NO. SS-22-00031 RECORDED JULY 05, 2023 UNDER AUDITOR'S FILE NO. 3595299 IN BOOK 2 OF LLSM AT PAGE 160 BEING A PORTION OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER SECTION 2, GOVERNMENT LOT 1 OF SECTION 10, AND GOVERNMENT LOT 4 OF SECTION 11, ALL IN TOWNSHIP 13 NORTH, RANGE 9 EAST, W.M.

Applications

Well Site Inspection #:	WS23-00049, Expires 12.15.25, See Appendix A
Group B Design Review Application No.:	WAXX-XXXXX

Service Area

The service area for the new Group B Water System is shown on the water system plan in Appendix E and will be limited to the property described in the legal description above.

Recorded Documents

Declaration Covenant:
A 100-foot declaration covenant has been prepared for this project. A copy is included in Appendix B.

Notice to Future Property Owners:
A copy of the NTFP owners has been completed and is in Appendix B.

Easements:
Water and access easements are needed for this Group B water system. The limits of the new easements are included in the attached Civil plans.

Compliance Documents

Satellite Management Agency (SMA):

Tri-County Water SMA # 138
Management & Operations only
Brent Wilson
bwilson@moerkeandsons.com
(360) 748 -3805

A copy of the agreement is included in Appendix B.

Water Facilities Inventory:
A Completed WFI is included in Appendix A.

Land Use Zoning

The property is zoned RRC-R1 per agency zoning map.

Critical Areas

Wetlands:
There is a small Category III wetland mapped on the north boundary of the site, however, this will not affect the proposal and all setbacks will be met. The mapped wetland can be seen on the civil plans.

Streams:
The Cowlitz River runs along the east boundary line of the site. The well will be located greater than 200-feet from the river. The river and setbacks are shown on the civil plans.

Critical Aquifer:
The site is mapped as being within a Critical Aquifer Recharge Area, which appears to be from other nearby public wells. A CARA map is included in Appendix A of this report.

3.2 Water System Classifications

Different types of water systems are subject to different regulations. Start by establishing whether your proposed water system is a public water system. Next, determine the system classification.

A public water system is any system providing water for human consumption, excluding a system serving only one single-family residence, or a system with four or fewer service connections all of which serve residences on the same farm. See the complete definition in LCC8.55.040(69) and chapter 246-291-010 WAC.

Public water system classifications are based on population and number of connections served. There are two classifications, Group A and Group B.

Group A water systems serve 15 or more connections, OR an average of 25 or more people per day for 60 or more days within a calendar year.

Group B water systems serve fewer than 15 service connections and fewer than 25 people per day, OR 25 or more people per day for fewer than 60 days per year provided the system doesn't serve 1,000 or more people for two consecutive days (LCC8.55.020(1)).

These Guidelines cover the design standards applicable to certain types of Group B public water
systems (LCC8.55.020).

The proposed water system will provide service to 9 residential connections, and therefore will meet the standards of a Group B design.

4. CHAPTER 4 - SYSTEM ANALYSIS

4.1 Estimating Water Demand

Residential Water Demand

Residential MDD

The MDD is the maximum single-day demand the water supply must meet. It consists of in-home domestic demand, outdoor demand, nonresidential demand, and distribution system leakage. It's important to establish the proposed water system's MDD before you drill and test the water supply well. LCC8.55.110(3) specifies the minimum source capacity and minimum MDD for residential service connections, see Table 3.1.

Minimum MDD for Residential Connections

County	Gallons Per Day per Dwelling Unit	No. of Dwelling Units	Total System MDD (gallons per day)
Lewis	750	9	6,750

Residential PHD

It's important to establish the peak hourly demand (PHD) before designing the system of wells, pumps, pipes, and pressure tanks. The relationship between PHD, sustained well yield, and well pump capacity will determine whether the proposed water system requires atmospheric storage to supplement the supply source(s) to meet the expected PHD (see Table 3.2)

Minimum PHD for Residential Connections

Number of Dwelling Units	Peak Hour Demand (Gallons per Minute)
2	23
3	26
4	28
5	31
6	34
7	36
8	39
9	41

Fire Flow

Per conversations with Lewis County Fire Marshal Doyle Sanford, the water system is exempt from providing fire flow per the IFC and NFPA 1142. However, per request of the local Fire Chief, a 2,000 gallon storage tank has been included in the system for use in filling fire truck tanks in case of an emergency. The tank will be filled using a manual gate valve. Once the tank is full, the gate valve will remain closed until the tank is used and needs to be re-filled.

5. CHAPTER 5 – SOURCE OF SUPPLY

5.1 Source of Supply Analysis

The project will be served by one well source, which has been drilled and tested. The well is a 6-inch steel cased well 79" feet below ground surface. A copy of the well log is included in Appendix A.

Well Data Summary

Notice of Intent No.	WE55627	
Well ID Tag No.	BPH 997	
Well Driller	Moerke and Sons	
Well Diameter/Depth	6" Diameter – 79 Ft Deep	
Screens	Yes	
Surface Seal	Yes – 18 Feet Bentonite	
Pump Test	Air Test – 150 GPM	
Restrictive Layer	No	

Sanitary Control Area and Protection Inventory

Lewis County Health Department conducted a well site inspection prior to the well construction. The well site was approved on December 26, 2023. A copy of the well site approval map is included in Appendix A.

Wellhead Protection Inventory Summary

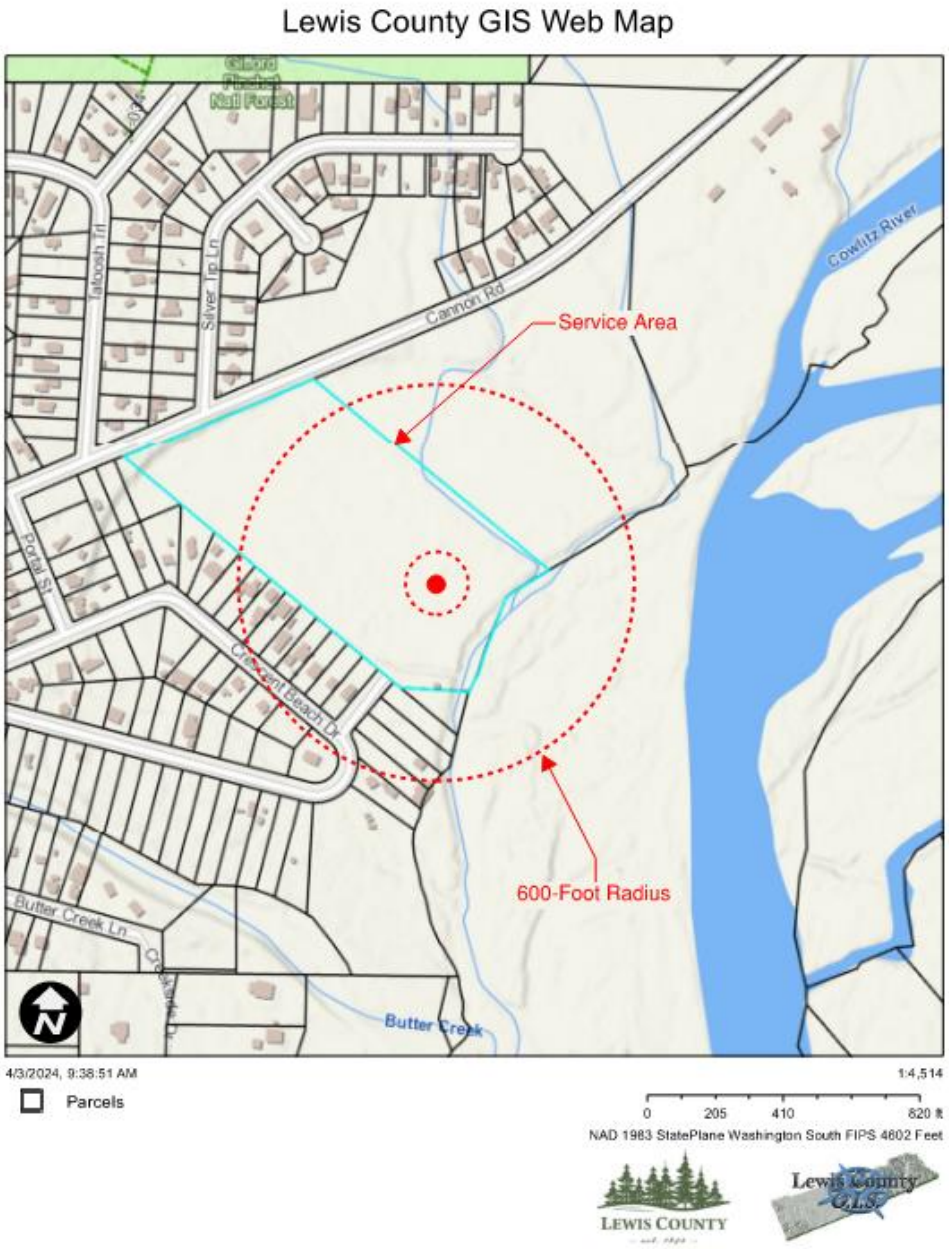
Potential Water Quality Threat	Yes	No	Unknown
Likely pesticide application		X	
Storm Water Injection Wells		X	
Other Injection Wells		X	
Abandoned Groundwater Wells		X	
Landfills, Dumps, Disposal Areas		X	
Know Hazardous Materials Site		X	
Another Water System w/Known Water Quality Problems		X	
Residential Development Greater than One House Per Acre	X		
Residential Septic Tanks	X		
Underground Storage Tanks		X	
Sewer Lines (Pressure or Gravity)		X	
Storm Water Disposal Areas		X	
Surface Water – If yes, Specify Distance from Well Site: 200 feet	X		

Intertie Information

The Group B System does not have an intertie with any other water system.

Site Map

The following site map shows the project's well location, 100-foot sanitary control area, and 600-foot preliminary short-term groundwater contribution area. A more detailed plan of the well's location and 100-foot SCA is included in the attached civil plans.



Pump Test Analysis

STEP Pump Test

Moerke and Sons Pump and Drilling completed the well testing on 3/20/2024. Based on that data, the targeted flow rate of 41 gpm stabilized after 10 minutes. The final step test was run at 51 gpm and stabilized after 50 minutes. After the final step test, the water level recovered almost immediately back to the static level.

Step Rate Test Results

Condition	Measured Result	Units
Static Water Level	8.33	FT
Last Step Down Test Flow Rate	51	GPM
Drawdown at Flow Rate	10.83	FT
Recovery Time	1	Min

Water Right Analysis

Per the Lewis County Groub B Water System Design Guidelines section 3.0.1, when assessing for water rights, assume 350 gallons per day per dwelling unit. The proposed system will have 9 dwelling units, which equates to 3,150 gallons per day. Per RCW 90.44.050, a water right permit exemption is allowed on systems withdrawing up to 5,000 gallons per day for group domestic use and irrigation up to ½ acre total. Therefore, this well can operate under the exempt well status.

Water Quality Analysis

This is a new water system and water quality testing was completed on the new source and no water treatment is required for this well source. The following testing was completed and all results are included in Appendix A of this Project.

Water Quality Results

Test Conducted	Test Results
Full Inorganic Chemicals (IOCS) Report	Satisfactory
Volatile Organic Chemicals (VOC's) Report	None Detected (ND) [1]
Bacteriological	Satisfactory

5.2 Water Treatment

Primary Contaminant Design

Type of treatment Process: No treatment of primary contaminants is required.

Secondary Contaminant Design

Type of treatment Process: No treatment of secondary contaminants is required.

6. CHAPTER 6 – PUMP, TANKS AND TDH CALCULATIONS

6.1 Storage

General Description and Condition

No storage is required for this system.

Operational Storage – OS

The proposed 82-gallon Prolite NSF61 certified bladder tank will provide pump cycling protection for the well pump.

Equalization Storage – ES

The well pump meets the PHD demand, so no Equalization Storage is required.

Standby Storage – SB

No standby storage is proposed for this water system.

Dead Storage – DS

There is no dead storage associated with this water system.

Fire Storage

A 2,000-gallon tank has been included in the design per request of the local fire department.

6.2 Distribution System

General Description and Condition

The proposed water system will consist of 300 LF of 2-inch schedule 40 pvc pipe. The system has been designed to maintain a minimum of 30 psi of water pressure at all service connections on the system. Water and Source Meters shall be the following or equivalent too: See Appendix C for meter specifications cut sheets.

Water Meters

Meter	Specification
Service Meter - Master Meter Multi-Jet	¾ Inch
Source Meter – Master Meter Multi-Jet	2 Inch

Well Pump Total Dynamic Head (TDH)

The following dynamic head calculations were used to determine the flow rate of the new well pumps.

Well Head TDH

Design Element	Elevation (FT)
Well Lift (From Draw Down Elevation)	11.78 Ft
Drop Pipe Friction Loss @ 41 GPM – 2-inch	12.12 Ft
Meter Friction Loss	10 Ft
Distribution Pipe Friction Loss	5.7 Ft
Highest Service Elevation	0 Ft
Residual Pressure at Service (38 PSI)	86.5 Ft
Total Design TDH for Well Source	126 Ft

Using a TDH of 126 feet and the selected 4-inch well pump, the resulting pump flow rate is 41 GPM. See pump curve and data in Appendix C.

6.3 Well Pump Operation

The new well pump proposed for this facility will operate on a variable frequency drive as listed below.

Pump On/Off Pressure Settings

Well Pump Design	Pump On	Comments
Constant Pressure Setting	40 psi	VFD
Discharge Rate	42 gpm	
TDH	126 Ft	

Well Pump Assembly Summary

Pump Data (1)	Test Results
Well Pump and Motor (2)	FloWise 4” Submersible Pump
Horsepower	1.5 HP, 230 Volt, Single Phase
Rated Flow Rate	35 GPM
Lead Free	Yes
Pump Curve	See Appendix C
Pump Inlet Elevation	60 Ft. Below Cap
Well Cap (2)	Campbell Cast Iron Well Cap
Drop Pipe Material (2)	Schedule 80 PVC
Drop Pipe Check Valve (2)	Campbell 80 Series
Pitless Adapter (2)	Campbell B-Series
Wire and Pump Wire & Pipe Protector(2)	Campbell

(1) All products to be NSF61 certified and Lead Free.
(2) See Design Plans for Model No. and Specifications.

6.4 Bladder and Reservoir Tanks

Pressure Storage Tank

The new water system will utilize the following Bladder Tank to act as a buffer tank for the new variable frequency drive pump system. See Appendix C for Material Specification Sheets.

Bladder Tank Specifications

Bladder Tank Manufacturer	Certifications	Volume	Number of Tanks
ProLite SS Series	NSF61, ASTM	82 Gallons	1 Tanks

6.5 Backflow Prevention Devices

Backflow devices are not required for this residential project.

7. CHAPTER 7 – FINANCIAL VIABILITY

7.1 Financial Viability Worksheet

The goal is to establish plans, policies, and procedures that give the system owner(s) the ability to obtain enough funds to cover the total cost of operating and maintaining a safe, reliable water system on a continuing basis. Rates and other revenue should be adequate to cover all anticipated expenses.

TOTAL EXPENSES	**1st Yr.**	**2nd Yr.**	**3rd Yr.**	**4th Yr.**
1. Wages & Benefits (Incl. SMA costs)	$500	$550	$575	$600
2. Electricity & other utilities	$720	$730	$740	$750
3. Chemical & Treatment	$0	$0	$0	$0
4. Monitoring Costs	$0	$0	$0	$0
5. Materials & Supplies	$150	$160	$170	$180
6. Repairs and Parts	$200	$200	$200	$200
7. Emergency Reserve Contribution	$0	$0	$0	$0
8. Asset Replacement Reserve Contribution	$200	$200	$200	$200
9. Principal & Interest Payments (For outstanding loans)	$0	$0	$0	$0
10. Taxes and Assessments	$140	$140	$140	$140
11. Insurance and Misc. Expenses	$250	$255	$260	$265
12. Total Expenses (Add lines 1 to 11)	$2160	$2235	$2285	$2335
TOTAL REVENUE FROM SOURCES OTHER THAN WATER RATES				
13. Hook Up and Other User Fees	$	$	$	$
14. Interest Earned	$	$	$	$
15. Other Revenue	$	$	$	$
16. Total Revenue (Add lines 13 to 15)	$	$	$	$
WATER RATE CALCULATIONS				
17. Remaining Revenue Required (Line 12 minus Line 16)	$	$	$	$
18. Number of Connections	$	$	$	$
19. Average Water Rate (Line 17 divided by Line 18)	$	$	$	$

8. CHAPTER 8 - CONSTRUCTION STANDARDS

8.1 Project Review Procedures

All project reports and construction documents shall be submitted to Lewis County for review and approval. Lewis County shall grant preliminary approval of the project prior to construction.

8.2 Design Standard, (Performance Standards and Sizing Criteria)

The performance and sizing standards shall conform to AWWA, APWA/WSDOT, and DOH guidelines. All components coming in contact with water shall be NSF approved materials. A Professional Engineer, registered in the State of Washington shall design all projects. All plans and project reports shall bear the seal of the engineer.

A 48-hour notice shall be given to the customers for a planned interruption of service. Every effort shall be made to kept the interruption of service to a minimum.

All excavations and shoring shall conform to L & I standards for worker safety.

All irrigation systems shall be installed with a DOH approved backflow prevention device. This includes all systems on the customer side of the service meter.

9. CHAPTER 9 – OPERATION AND MAINTENANCE

The components of this Group B Water System will require routine maintenance. Below are a list of components requiring maintenance by the SMA. WSDOH Preventive Maintenance Program Guide outlining recommended preventive maintenance procedures that can be done by the system owner can be found in Appendix C.

Groundwater Sources

Submersible Pump Systems

Pressure Tanks

Both interior and exterior inspections are needed to ensure maintenance of physical integrity, security, and high water quality. The type and frequency of the inspection depends on the type of tank, its susceptibility to vandalism, age, condition, and time since last cleaning or maintenance, history of water quality, plus other local criteria. Exterior inspections for obvious signs of intrusion or vandalism might occur daily or weekly. Periodic inspections of the storage tank for cracks, structural damage, integrity of hatches and vents, leaks, corrosion, and cathodic protection might occur monthly or quarterly. You should conduct a comprehensive inspection of the interior whenever you drain the tank for cleaning. Industry standards recommend a comprehensive inspection of tanks—inside and out—every five years, except for newly constructed tanks. You should inspect a new tank within 10 years of service and every five years thereafter.

Distribution Systems

Cross Connections

Sampling and Monitoring

Appendix A – Well and Testing Data

WATER WELL REPORT

DEPARTMENT OF ECOLOGY State of Washington

Type of Work:
☒ Construction
☐ Decommission ⟹ Original installation NOI No. _____

Notice of Intent No. WE55627
Unique Ecology Well ID Tag No. BPH 997
Site Well Name (if more than one well): _____
Water Right Permit/Certificate No. _____
Property Owner Name Merrlawski Investments Llc
Well Street Address 107 Riverside Dr
City Packwood County Lewis
Tax Parcel No. 035067002003
Was a variance approved for this well? ☐ Yes ☒ No
If yes, what was the variance for? _____

Proposed Use: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Dewatering ☐ Irrigation ☐ Test Well ☐ Other _____

Construction Type: ☒ New well ☐ Alteration ☐ Deepening ☐ Other _____

Method: ☐ Driven ☐ Jetted ☐ Cable Tool ☐ Dug ☒ Air- ☐ Mud-Rotary

Dimensions: Diameter of boring 6 in., to 80 ft.
Depth of completed well 79 ft.

Construction Details:

Casing	Liner	Diameter	From	To	Wall Thickness	Steel	PVC	Welded	Thread
☒	☐	6 in.	+4	74	.25 in.	☒	☐	☐	☐
☐	☐	____ in.	____	____	____ in.	☐	☐	☐	☐
☐	☐	____ in.	____	____	____ in.	☐	☐	☐	☐
☐	☐	____ in.	____	____	____ in.	☐	☐	☐	☐

Perforations: ☐ Yes ☒ No Type of perforator used _____
No. of perforations _____ Size of perforations _____ in. by _____ in.
Perforated from _____ ft. to _____ ft. below ground surface

Screens: ☒ Yes ☐ No ☒ K-Packer ⟹ Depth 73 ft.
Manufacturer's Name Johnson
Type Stainless Steel Model No. _____
Diameter 5 in. Slot size .020 in. from 74 ft. to 79 ft.
Diameter _____ in. Slot size _____ in. from _____ ft. to _____ ft.

Sand/Filter pack: ☐ Yes ☒ No Size of pack material _____ in.
Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft.
Material used in seal Bentonite Chips
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

Pump: Manufacturer's Name N/A Type: _____
H.P. _____ Pump intake depth: _____ ft. Designed flow rate: _____ gpm

Water Levels: Land-surface elevation above mean sea level _____ ft.
Stick-up of top of well casing +4 ft. above ground surface
Static water level 5 ft. below top of well casing Date 2/29/2024
Artesian pressure _____ lbs. per square inch Date _____
Artesian water is controlled by _____ (cap, valve, etc.)

Well Tests:
Was a pumping test performed? ☒ No ☐ Yes ⟹ by whom? _____
Yield _____ gpm with _____ ft. drawdown after _____ hrs.
Yield _____ gpm with _____ ft. drawdown after _____ hrs.
Yield _____ gpm with _____ ft. drawdown after _____ hrs.

Recovery data (time = zero when pump is turned off – water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of pumping test _____
Bailer test _____ gpm with _____ ft. drawdown after _____ hrs.
Air test 150 gpm with stem set at 78 ft. for 1 hrs. Date 2/29/2024
Artesian flow _____ gpm
Temperature of water _____ ° F Was a chemical analysis made? ☐ Yes ☒ No

Driller's Log/Construction or Decommission Procedure
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each layer penetrated, with at least one entry for each change of information. Use additional sheets if necessary.

Material	From	To
Top soil	0	1
Silt, sand, brown/soft	1	3
Sand, gravel, silt, cobbles, large rocks		
brown/hard	3	14
Sand, gravel, silt, cobbles, brown/hard, wb	14	80

Start Date 2/29/2024 Completed Date 2/29/2024

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Trainee ☐ PE – **Print Name** Chris Jones
Signature Chris Jones
License No. 2253
IF TRAINEE: Sponsor's License No.
Sponsor's Signature

Drilling Company Moerke & Sons Pump and Drilling
Address 1162 NW State Avenue
City, State, Zip Chehalis, WA 98532
Contractor's Registration No. MOERKSP072N5 Date 3/1/2024

LEWIS COUNTY
Washington's First County
est. 1845

Public Health & Social Services

360 NW North Street
Chehalis WA 98532

December 26, 2023

Chris Merritt
209 Crescent Beach Dr.
Packwood, WA 98361

RE: WS23-00049
Expiration: 12/15/2025

Dear Mr. Merritt.

Enclosed is a copy of the completed well site inspection for a proposed well to be drilled on TP#035067002003. The well is intended to serve as a water supply source for a Group B water system serving residential connections. The proposed well location, 121°39'32.996"W 46°38'6.621"N, is satisfactory with establishment of a protective Declaration of Covenant on the 100' radius Sanitary Control Area. The well must be drilled consistent with construction standards as required in WAC173-160. The well development must include seating and sealing the well cap and installing impervious electrical conduit. If completed in the 100-yr flood zone, the well casing top must be at least 2-ft above the flood plain elevation. The pumphouse must be built such that it is rodent proof, insulated, and weather tight, and at least 2-ft above the flood plain elevation.

Approval of a well site or preliminary plat does not constitute or imply approval of the proposed water system or subsequent permitting. Approval of the water system is contingent upon the water system construction and management plan meeting Lewis County Code 8.55 and the rules and regulations of the State of Washington.

If you have any questions, please call me at (360)740-1249.

Sincerely,

Jeff Landrum RS LG
Environmental Health Specialist, Water Program
2025 NE Kresky Ave. Chehalis, WA 98532

Attachments: Proposed Well Site Aerial Map
Well Site Inspection Form

Cc: Robert Balmelli PO Box 923 Chehalis, WA 98532

Lewis County Public Health & Social Services
Environmental Services Division

2025 NE Kresky Ave, Chehalis, WA 98532 • Phone: (360) 740-1146 • Fax: (360) 740-1245

Well Site Inspection Form

A well site approval is effective for 2 years

Permit Number: WS23-00049
Master Site review: 23-0671
Date Received: 11/16/23
Permit Tech: MDW

This section to be completed by applicant:

Water system/Applicant: Merrlawski Investments, LLC

Location/Site Address: 107 Riverside Dr., Packwood, WA 98361

Short Plat/Long Plat #: _____

Tax Parcel #: 035067002003 SE ¼ NE ¼ Sec. 10 Twnshp 13N Range 9E E/W

Owner Name: Merrlawski Investments, LLC
Address: 209 Crescent Beach Dr., Packwood, WA 98361
Phone: (360) 870-2561
Email: chris@olyeng.com

Representative: Chris Merritt
Address: 209 Crescent Beach Dr., Packwood, WA 98361
Phone: (360) 870-2561
Email: chris@olyeng.com

☐ Group A ☑ Group B ☐ Commercial ☐ Two Party ☐ Shared ☐ Two Connection

**See definitions on the last page of this application.*

Land use adjacent to the well site: Undeveloped

Acknowledgment and Permission to Enter

I understand that any permits issued by Lewis County, consistent with the attached site plan, are valid ONLY if construction is in according to this plan and all other conditions of the permit are followed.

Further I understand that County regulations require permission to County personnel to enter private property to conduct inspections. By my signature below, permission is granted for representatives of Environmental Services to enter and remain on and about the property for the sole purposed of performing required inspections relating to this permit.

By my signature below, I certify that I am either the current legal owner of this property or their authorized representative. With this document, I take full responsibility for the lawful actions that this document allows.

Signature: Christopher M. Merritt Digitally signed by Christopher M. Merritt Date: 2023.11.16 07:31:53 -08'00' Date: 11/16/23 Check One: ☑ Owner ☐ Authorized Agent

This section will be completed by Lewis County Environmental Health Staff

WS#: 23-00049 Planning Review #: MSR23-0671

Date Inspected: 12/15/2023 Expiration Date: 12/15/2025

Inspection Findings

1. Map provided was accurate, based on your observations at the well site. (Yes) No N/A

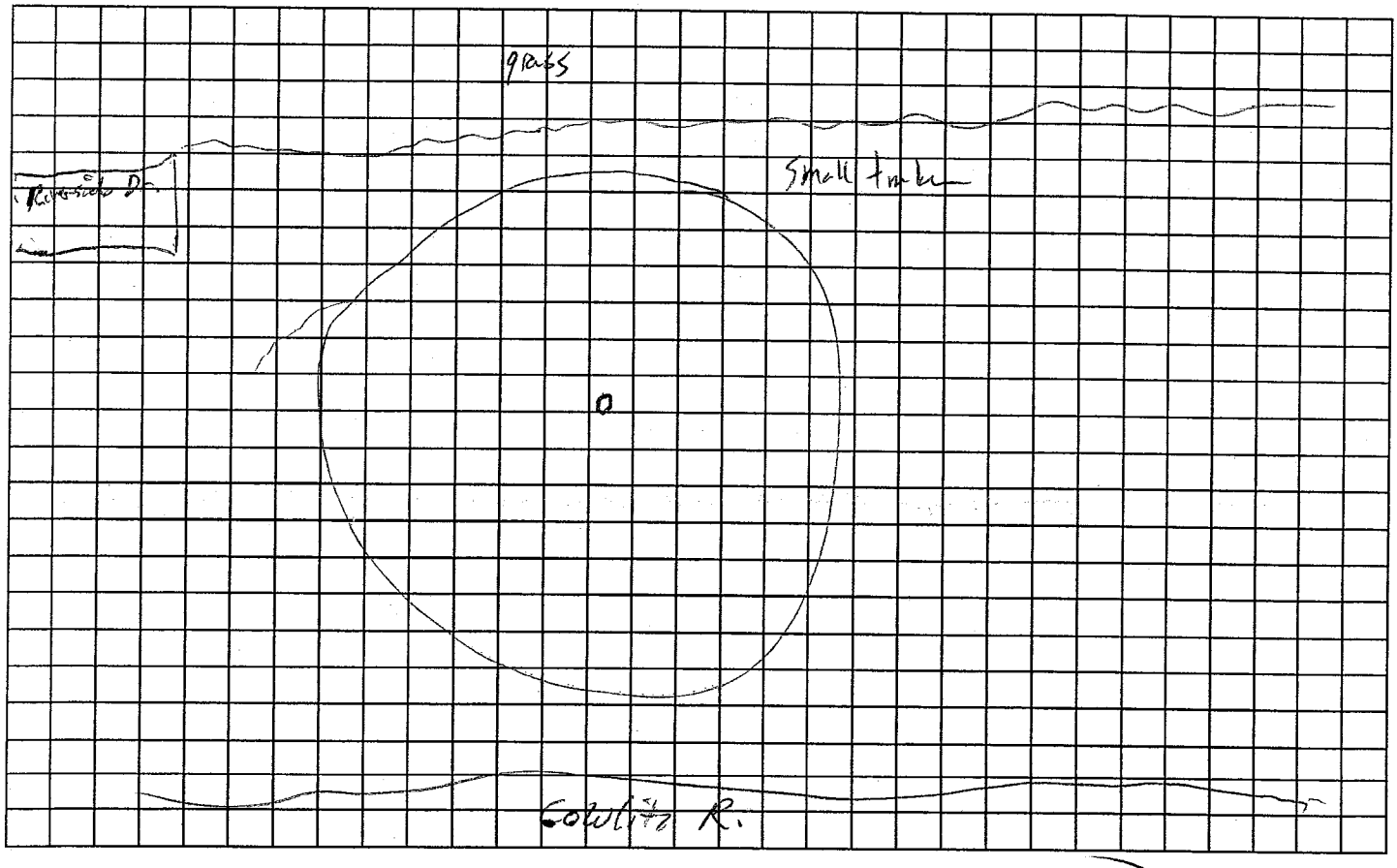
2. Slope of ground within the well site is such that potential contamination due to runoff and flooding is at a minimum. (Yes) No N/A

3. Site is safe from manmade and natural disasters. (Yes) No N/A

4. Public or private roads are placed as far as possible from well site. (Yes) No N/A

   a. If roads are present in the well site are they paved and properly ditched or drained to exclude surface runoff from the well? (Yes) No N/A

5. Contamination sources such as septic tanks/drain fields, chemicals, underground storage tanks, surface water, and dry wells are absent from the well site. (Yes) No N/A



Proposed well location inspected, well has not been drilled (Yes) No

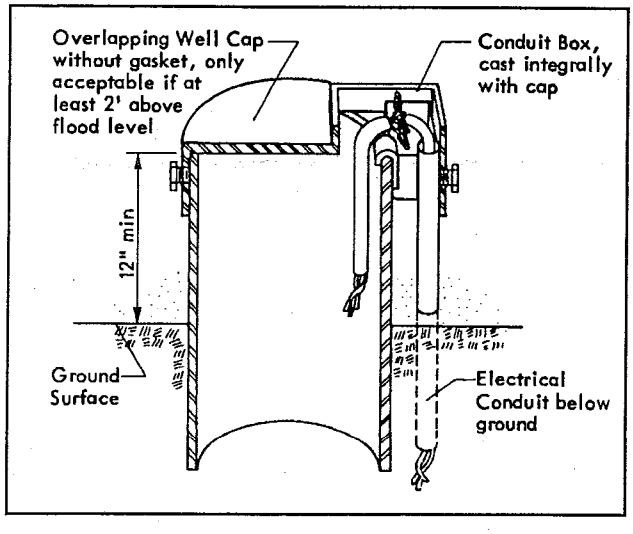
Proposed well site Pending.

Existing Wells:

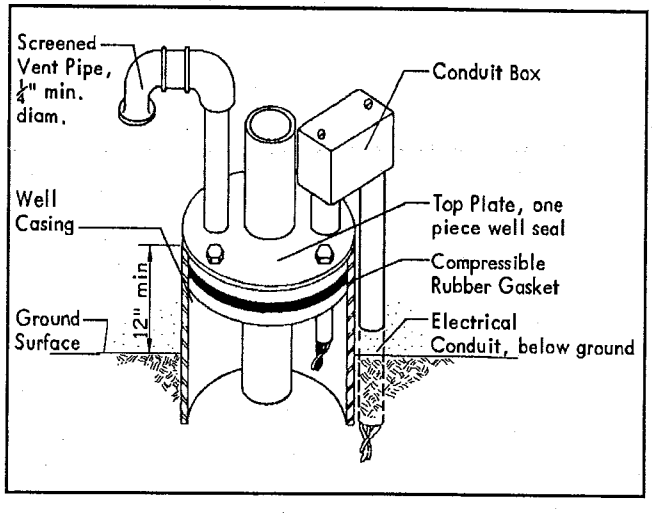
Well log: ___Yes X No Start Card #:_____ Unique Well ID:_____

6. The surface seal is present and satisfactory.	Yes	No	N/A
7. The sanitary seal is satisfactory and properly sealed	Yes	No	N/A
8. There is a satisfactory concrete slab around the casing.	Yes	No	N/A
9. The casing terminates at 6 to 12 inches above the floor. (if in flood plain must be above flood level)	Yes	No	N/A
10. Has a proper air vent and the vent is screened.	Yes	No	N/A
11. Conduits and junction boxes are sealed	Yes	No	N/A
12. If the well is in a pit, it's adequately constructed to prevent flooding.	Yes	No	N/A
13. General housekeeping is satisfactory.	Yes	No	N/A
14. The wellhead is accessible for maintenance.	Yes	No	N/A

Well constructed with an overlapping well cap and pitless adapter.



Well constructed with a well seal containing a compressible rubber gasket.



Diagrams obtained from the University of Missouri Extension web site 4/17/08.

General:

15. Well site is legally protected against contamination by covenants. Yes No N/A Pending

16. A source meter is installed. Yes No N/A Pending

In your opinion, overall, is the well and/or well site:

X **Satisfactory**

_____ **Satisfactory, with correctable deficiencies (see comments)**

_____ **Not satisfactory**

Sanitarian: Jeff Jedlicka **Date:** 12/22/2023

Comments:

- must be 2' above floodplain
- Est. well conenant
- Grp B design submittal - 9 lots residential
-

Definitions:

☐ **Group A Well:** Serves a Group A Water System under the jurisdiction of the Washington State Department of Health.

☒ **Group B Well:** Serves a system with three or more connections but less than 15 and populations of less than 25 people per day or one or more connections that serve a usage identified in LCC8.55.020 or LCC8.55.040((81). See LCC8.55 for further requirements.

☐ **Commercial:** A facility with two or less connections and less than 25 people per day. Most small businesses.

☐ **Two Party Well:** Serves two dwelling units on separate properties. See LCC8.55.020 Table 1

☐ **Shared Well:** Serves two dwelling units on the same property. See LCC8.55.020 Table 1

☐ **Two Connection:** Serves two dwelling units one of which is an ADU or temporary ADU not incorporated into the main structure of the primary residence.

Approval of a well site or preliminary plat does not constitute or imply approval of the proposed water system. Approval of the water system is contingent upon the water system construction and management plan meeting rules and regulations of LCC 8.55 and the State of Washington.

GENERAL INFORMATION:

OWNER/APPLICANT:
MERRLAWSKI INVESTMENTS, LLC
209 CRESCENT BEACH DR.
PACKWOOD, WA 98361

SITE ADDRESS:
0 RIVERSIDE DR.
PACKWOOD, WA 98361

TPN: 035067002003

PARCEL AREA: 12.8–ACRES

ZONING: RRC–R1

LOTS: 9

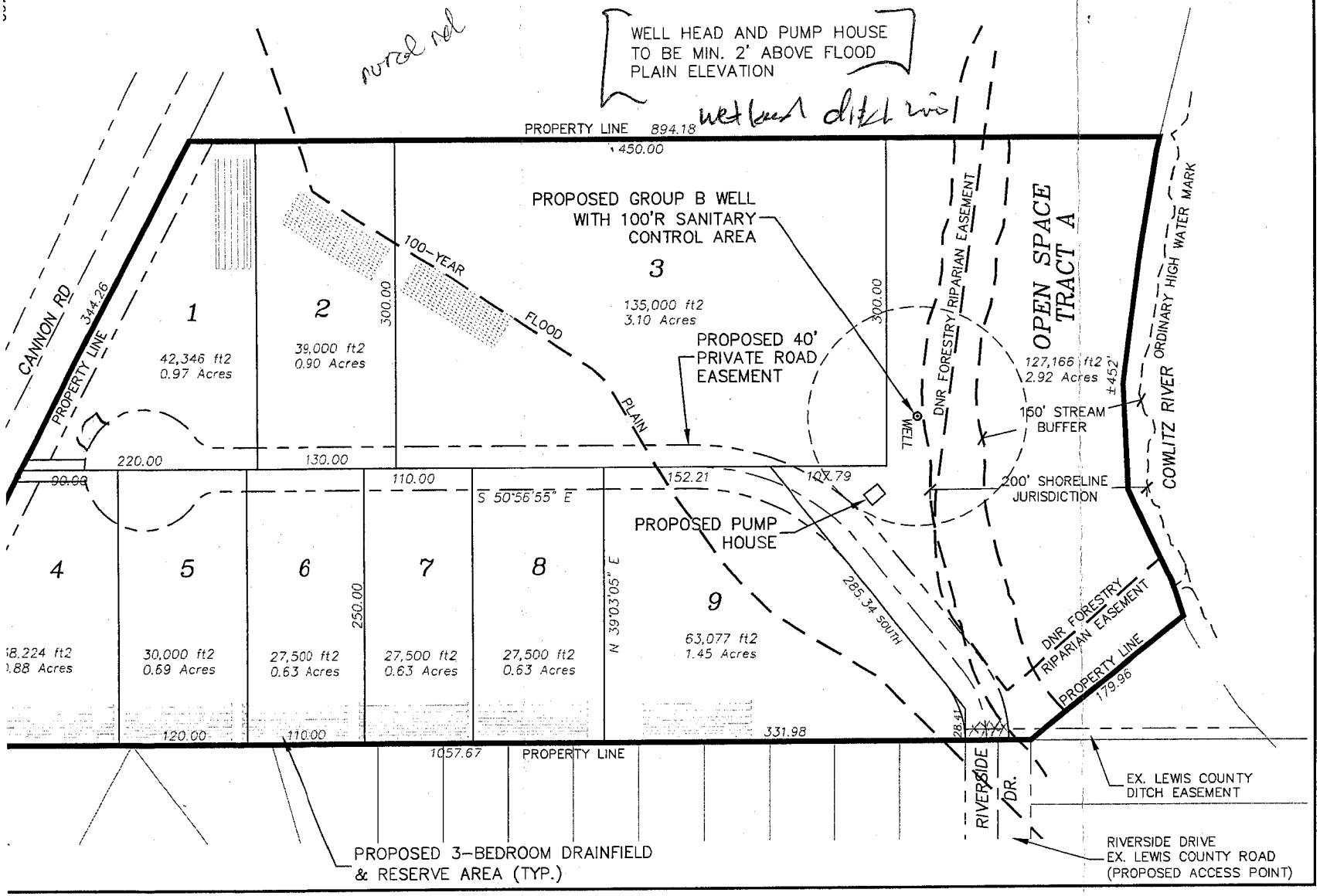
DENSITY: 0.7 UNITS/ACRE

WATER SUPPLY: GROUP B WELL, MAXIMUM 9 CONNECTIONS

SEWER SUPPLY: INDIVIDUAL LOT SEPTIC SYSTEMS

SITE

RIVER



DESIGNED BY: CMM
DRAWN BY: CMM
CHECKED BY:
SCALE: 1" = 100'
DATE: 10/13/23

RIVERSIDE

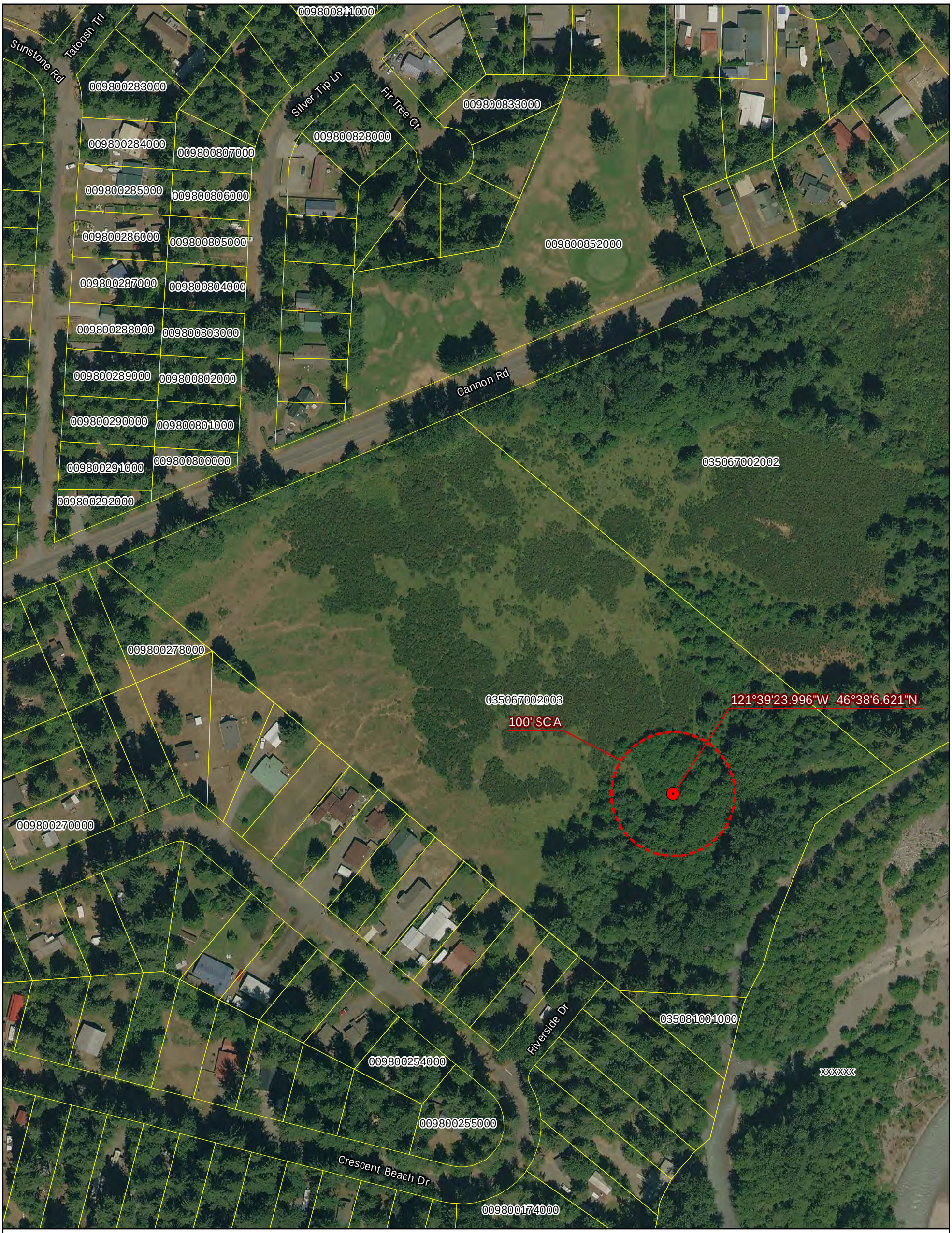
LEWIS COUNTY, WASHINGTON

SITE PLAN FOR WELL SITE INSPECTION

JOB NUMBER:

DRAWING NAME: SITE PLAN

SHEET: 1 OF 1



Merrlawski Investments LLC, Pending Group B Public Water System

Lewis County, Washington

Proposed Well Site

Parcels

Scale: 1 Inch = 150 Feet

This map was created by Lewis County Geographic Information Services. The accuracy of the map has not been verified, and it should be used for informational purposes only.

Aerial photograph is from 2021.

Datum: 1983 North American Datum
Projection: Lambert Conformal Conic
Coordinate System: State Plane Washington South FIPS 4606

LEWIS COUNTY G.I.S.

N

Tuesday, December 26, 2023
O:\maps\health\Merrlawski_Investments_well_site.mxd

Washington State Department of Health
Environmental Health Programs
Division of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

RETURN TO:

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
	Riverside Group B	Lewis	B	

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. Owner Number: 031654
Tri-County Water	Merrlawski Investments LLC	
TITLE: SMA #138	TITLE: Owner	
900 NW State St	209 Crescent Beach Dr	
Chehalis, WA 98532	Packwood, WA 98361	
STREET ADDRESS IF DIFFERENT FROM ABOVE	STREET ADDRESS IF DIFFERENT FROM ABOVE	
ATTN	ATTN	
ADDRESS	ADDRESS	
CITY STATE ZIP	CITY STATE ZIP	

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: 360.748.3805		Owner Daytime Phone: 360.870.2561	
Primary Contact Evening Phone: 360.748.3805		Owner Evening Phone: 360.870.2561	
Primary Contact Mobile/Cell Phone:		Owner Mobile/Cell Phone:	
Fax:	E-mail:	Fax	E-Mail:

WAC 246-290-420()) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY – SMA (check only one)

- ☐ Not applicable (Skip to #12)
- ☐ Owned and Managed
- × Managed Only
- ☐ Owned Only

SMA NAME: Tri-County Water SMA: #138

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

☐ Agricultural	☐ Hospital/Clinic	X Residential
☐ Commercial / Business	☐ Industrial	☐ School
☐ Day Care	☐ Licensed Residential Facility	☐ Temporary Farm Worker
☐ Food Service/Food Permit	☐ Lodging	☐ Other (church, fire station, etc.):
☐ 1,000 or more person event for 2 or more days per year	☐ Recreational / RV Park	

13. WATER SYSTEM OWNERSHIP (mark only one)

☐ Association	☐ County	☐ Investor	☐ Special District
☐ City / Town	☐ Federal	x Private	☐ State

14. STORAGE CAPACITY (gallons)

0 Gallons

15.	16	17.	18. SOURCE CATEGORY										19. USE			20	21. TREATMENT						22.	23.	24. SOURCE LOCATION			
SOURCE NUMBER	SOURCE NAME LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELLFIELD	SPRING	SPRING FIELD	SPRING IN SPRING FIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH (FEET)	CAPACITY (GALLONS PER MINUTE)	¼, ¼ SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Well #1 – BPH 997		X										X			Y	X						79	51	NE NW	10	13N	9E

If this water system serves 500 OR MORE single-family residences, please enter the total number of service connections on line 25, then skip to lines 29, 35 and 36. If this water system serves LESS THAN 500 single-family residences, complete entire form.	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)			
A. Full Time Single Family Residences (Occupied 180 days or more per year)	**9**		
B. Part Time Single Family Residences (Occupied less than 180 days per year)	**0**		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	**0**		
B. Full Time Residential Units in Apartments, Condos, Duplexes, Dorms that are occupied more than 180 days/year	**0**		
C. Part Time Residential Units in Apartments, Condos, Duplexes, Dorms that are occupied less than 180 days/year	**0**		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services (Campsites, RV Sites, Spigots, etc.)	**0**		
B. Institutional, Commercial or Industrial Services	**0**		
28. TOTAL SERVICE CONNECTIONS	**9**		

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or more days per year?_____ **23**_____

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
B. How many days per month are they present?	0	0	0	0	0	0	0	0	0	0	0	0
31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
B. How many days per month are they present?	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month?	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
B. How many days per month are they present?	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

34. GROUP B NITRATE SCHEDULE *This will be suppressed for all Group A systems*	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS

35. Reason for Submitting WFI:

☐ **Update-Change** ☐ **Update-No Change** ☐ **Inactivate** ☐ **Re-Activate** ☐ **Name change** ☒ **New System** ☐ **Other**_____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____ **DATE:** _____

PRINT NAME: **Robert Balmelli PE** **TITLE:** **Project Engineer**

WATER MANAGEMENT LABORATORIES INC.

1515 80th St E, Tacoma, WA 98404

COLIFORM BACTERIA ANALYSIS FORM

Date Sample Collected	Time Sample Collected	County
3 / 20 / 24 (Month / Day / Year)	4:00 ☐ AM ☐ PM	Lewis

Type of Water System (check only one box)

☐ Group A ☐ Group B ☒ Other PVT

Group A and Group B Systems – Provide from Water Facilities Inventory (WFI):

ID# ____ ____ ____ ____ ____ ____

System Name: Merrlawski Investments LLC

Contact Person: Anthony

Day Phone: (360) 748-3805 | Cell Phone: ( )

Email: | Eve. Phone: ( )

Send results to: (Print full name, address and zip code)

Moorke and Sons
11162 NW State Ave
Chehalis, WA 98532

SAMPLE INFORMATION

Sample collected by (name): Dawson

Specific location where sample collected: 107 Riverside Dr. Packwood, WA 98361 @well-head

Special instructions or comments:

Type of Sample (select only **one** type of sample from types 1 through 5 below)

1. ☐ **Routine Distribution Sample (A/P)**
   Chlorinated: Yes_____ No_____
   Chlorine Residual: Total____ Free____

2. ☐ **Repeat Sample (A/P)**
   (from distribution system after unsat. routine)
   Unsatisfactory routine lab number:
   ____ ____ ____ - ____ ____ ____ ____ ____ ____
   Unsatisfactory routine collect date:
   ____/____/____
   Chlorinated: Yes_____ No_____
   Chlorine Residual: Total_____ Free_____

3. **Ground Water Rule Source Sample**
   S | | |
   ☐ Triggered (A/P)
   ☐ Assessment (A/P)

4. **Surface or GWI Raw Source Water Sample** (Enumeration) S | | |
   ☐ *E. coli* ☐ Fecal Filtered Yes_____ No_____

5. ☒ Sample Collected for **Information Only:**

LAB USE ONLY **DRINKING WATER RESULTS** LAB USE ONLY

☐ **Unsatisfactory** Total Coliform Present **and** ☒ **Satisfactory**
☐ *E.coli* present ☐ *E.coli* absent

Bacterial Density Results: Total Coliform_____/100ml. *E.coli*_____/100ml.
Fecal Coliform_____/100ml. HPC_____/1 ml.

Replacement Sample Required: ☐ TNTC ☐ Sample too old
☐ Sample Volume ☐ Damaged Container ☐ _____

Date/Time Received: 3.21.24 4pm HI

Lab Reference Number: MMO

Receipt Temp C°:

Method Code: SM9223B

Date Reported to DOH: 3.28.24 MK

Lab Use Only: R

DOH Lab-Sample#: 089 76283

WATER MANAGEMENT LABORATORIES INC.

1515 80th St E, Tacoma, WA 98404

COLIFORM BACTERIA ANALYSIS FORM

Date Sample Collected	Time Sample Collected	County
3 / 20 / 24 (Month / Day / Year)	4 00 ☐ AM ☐ PM	Lewis

Type of Water System (check only one box)

☐ Group A ☐ Group B ☒ Other PVT

Group A and Group B Systems – Provide from Water Facilities Inventory (WFI):

ID# _____

System Name: Merlawski Investments LLC

Contact Person: Anthony

Day Phone: (360) 748-3805 | Cell Phone: ( )

Email: | Eve. Phone: ( )

Send results to: (Print full name, address and zip code)

Moore and Sons
1162 NW State Ave
Chehalis. WA 98532

SAMPLE INFORMATION

Sample collected by (name): Dawson

Specific location where sample collected:
107 Riverside Dr
Packwood, WA 98361

Special instructions or comments:
Swell - head

Type of Sample (select only **one** type of sample from types 1 through 5 below)

1. ☐ **Routine Distribution Sample (A/P)**
   Chlorinated: Yes_____ No_____
   Chlorine Residual: Total____ Free____

2. ☐ **Repeat Sample (A/P)**
   (from distribution system after unsat. routine)
   Unsatisfactory routine lab number:
   _____ - _____
   Unsatisfactory routine collect date:
   _____/_____/_____
   Chlorinated: Yes_____ No_____
   Chlorine Residual: Total_____ Free_____

3. **Ground Water Rule Source Sample**
   S | | |
   ☐ Triggered (A/P)
   ☐ Assessment (A/P)

4. **Surface or GWI Raw Source Water Sample** (Enumeration) S | | |
   ☐ *E. coli* ☐ Fecal Filtered Yes____ No_____

5. ☒ Sample Collected for **Information Only:**

LAB USE ONLY	DRINKING WATER RESULTS	LAB USE ONLY
☐ **Unsatisfactory** Total Coliform Present **and** ☐ *E.coli* present ☐ *E.coli* absent		☒ **Satisfactory**

Bacterial Density Results: Total Coliform_____/100ml. *E.coli*_____/100ml.
Fecal Coliform_____/100ml. HPC_____/1 ml.

Replacement Sample Required: ☐ TNTC ☐ Sample too old
☐ Sample Volume ☐ Damaged Container ☐ _____

Date/Time Received: 3.21.24 4pm JH	Lab Reference Number MMO
Receipt Temp C°:	Method Code: SM9223B
Date Reported to DOH 3/26/24 MK	Lab Use Only: R
DOH Lab Sample# 089 76284	

WATER MANAGEMENT LABORATORIES INC.
1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

Chemistry - Report of Analysis

Date Collected: 03-20-2024	System Group Type: (circle one) A B (Other)
Water System ID Number: N/A	System Name: Merrlawski Investments LLC
Lab Number / Sample Number: 089 / 01695	County: Lewis
Sample Location: 107 Riverside Dr, Packwood - Wellhead	Source Number(s): (list all sources if blended or composited)
Sample Purpose: (check appropriate box) [X] RC - Routine/Compliance (satisfies monitoring requirements) [ ] C - Confirmation (confirmation of chemical result)* [ ] I - Investigative (does not satisfy monitoring requirements) [ ] O - Other (specify - does not satisfy monitoring requirements)	Date Received: 03-21-2024 Date Reported: 03-29-2024 Supervisor Initials: RL
Sample Composition: (check appropriate box) [ ] S - Single Source [ ] B - Blended (list source numbers in "Source Number" field) [ ] C - Composite (list source numbers in "Source Number" field) [ ] D - Distribution Sample	Sample Type: (check one) [X] Pre-treatment/Untreated (Raw) [ ] Post-treatment (Finished) [ ] Unknown or Other Sample Collected by: Dawson Phone Number: 360-748-3805
Send Report & Bill to: Moerke & Sons Pump & Drilling 1162 Northwest State Avenue Chehalis WA 98532	Comments:

ANALYTICAL RESULTS

DOH#	ANALYTE	DATA QUALIFIER	RESULT	SDRL	TRIGGER	MCL	UNITS	EXCEED MCL?	DATE ANALYZED	METHOD/ INITIALS
0004	Arsenic	--	<0.0010	0.001	0.010	0.010	mg/L	No	03-22-2024	200.8/CP
0005	Barium	--	<0.10	0.1	2	2	mg/L	No	03-22-2024	200.8/CP
0006	Cadmium	--	<0.0010	0.001	0.005	0.005	mg/L	No	03-22-2024	200.8/CP
0007	Chromium	--	<0.0070	0.007	0.1	0.1	mg/L	No	03-22-2024	200.8/CP
0011	Mercury	--	<0.00020	0.0002	0.002	0.002	mg/L	No	03-22-2024	200.8/CP
0012	Selenium	--	<0.0020	0.002	0.05	0.05	mg/L	No	03-22-2024	200.8/CP
0110	Beryllium	--	<0.00030	0.0003	0.004	0.004	mg/L	No	03-22-2024	200.8/CP
0111	Nickel	--	<0.0050	0.005	--	--	mg/L	--	03-22-2024	200.8/CP
0112	Antimony	--	<0.0030	0.003	0.006	0.006	mg/L	No	03-22-2024	200.8/CP
0113	Thallium	--	<0.0010	0.001	0.002	0.002	mg/L	No	03-22-2024	200.8/CP
0116	Free Cyanide	--	<0.05	0.05	0.2	0.2	mg/L	No	03-23-2024	4500CNF/SK
0019	Fluoride	--	<0.20	0.2	2.0	4.0	mg/L	No	03-21-2024	300.0/PI
0114	Nitrite - N	--	<0.10	0.1	0.5	1.0	mg/L	No	03-21-2024	300.0/PI
0020	Nitrate - N	--	<0.20	0.5	5.0	10.0	mg/L	No	03-21-2024	300.0/PI

Lab Number / Sample Number: 089 / 01695

DOH#	ANALYTE	DATA QUALIFIER	RESULT	SDRL	TRIGGER	MCL	UNITS	EXCEED MCL?	DATE ANALYZED	METHOD/ INITIALS
0161	Total Nitrate/Nitrite - N	--	<0.40	0.5	5.0	10.0	mg/L	No	03-21-2024	300.0/PI
0008	Iron	--	0.17	0.1	--	0.3	mg/L	No	03-23-2024	3111B/CP
0010	Manganese	--	<0.010	0.01	--	0.05	mg/L	No	03-22-2024	200.8/CP
0013	Silver	--	<0.01	0.1	--	0.1	mg/L	No	03-22-2024	200.8/CP
0021	Chloride	--	2.6	20	--	250	mg/L	No	03-21-2024	300.0/PI
0022	Sulfate	--	2.9	50	--	250	mg/L	No	03-21-2024	300.0/PI
0024	Zinc	--	<0.20	0.2	--	5	mg/L	No	03-22-2024	200.8/CP
0014	Sodium	--	<5.0	5	--	--	mg/L	--	03-23-2024	3111B/CP
0015	Hardness	--	28.0	10	--	--	mg/L	--	03-22-2024	2340C/PI
0016	Conductivity	--	80.2	70	--	700	µmhos/cm	No	03-21-2024	2510B/TA
0017	Turbidity	--	3.65	0.1	--	--	NTU	--	03-21-2024	2130B/TA
0018	Color	--	<5.0	15	--	15	color units	No	03-21-2024	2120B/TA
0009	Lead	--	<0.0010	0.001	--	--	mg/L	--	03-22-2024	200.8/CP
0023	Copper	--	<0.020	0.02	--	--	mg/L	--	03-22-2024	200.8/CP

NOTES:

*** Confirmation:** Include the original lab number, sample number, and collection date of original sample in either comment section.

-- No exisiting value.

ANALYTE: The name of an analyte being tested for.

DATA QUALIFIER: A symbol or letter to denote addtional information about the result.

DOH#: Department assigned analyte number.

EXCEED MCL: (Maximum Contamination Level): Marked if the contaminant amount exceeds the MCL under chapters 246-290 and 246-291 WAC. Please contact the department's drinking water regional office in your area to determine follow-up actions.

METHOD/INITIALS: Analytical method used. / Initials of the analyst that performed the analysis.

mg/L: milligrams per liter or parts per million.

RESULT: The laboratory reported result.

SDRL: (State Detection Reporting Limit): The minimum reportable detection of an analyte as established by the Department of Health

TRIGGER: The department's drinking water response level. Systems with contaminants detected at concentrations in excess of this level may be required to take additional samples or monitor more frequently. Please contact the department's drinking water regional office in your area for further information.

LAB COMMENTS

MOERKE & SONS PUMP & DRILLING, INC

1162 NW State Avenue, Chehalis, WA 98532 (360) 748-3805

PUMP TEST

MERRLAWSKI INVESTMENTS LLC

209 CRESENT BEACH DR

PACKWOOD, WA 98361

3/20/2024

WELL SITE ADDRESS: 107 RIVERSIDE DR, PACKWOOD 98361

Pump Make & Model: 3HP 45GPM **Pump Set At: 60'**

Sounder Make & Model: WATERLINE 500

Make & Model: MASTER METER **Measured in: CUBIC**

MINUTES	GALLONS PER MINUTE	METER READING	LEVEL TO WATER	NOTES
0	24	99930	8'4"	
1	27	99955	10'	
2	21	99982	9'6"	
3	16	100003	9'2"	
4	17	100019	9'4"	
5	25	100036	9'6"	
6	28	100061	9'5"	
7	21	100089	9'5"	
8	18	100110	9'5"	
9	21	100128	9'5"	
10	21.6	100149	9'5"	
15	20.6	100257	9'5"	
20	25	100360	9'5"	stabelized @ 20 pgm
1	21	100385	9'5"	1 hr start
2	18	100406	9'5"	
3	16	100424	9'5"	
4	20	100440	9'4"	
5	23	100460	9'4"	
6	21	100483	9'4"	
7	17	100504	9'4"	
8	17	100521	9'4"	
9	19	100538	9'4"	
10	19.4	100557	9'4"	
15	19.4	100654	9'4"	
20	19.8	100751	9'4"	
25	19.6	100750	9'4"	
30	20.2	100949	9'4"	
35	20	100050	9'4"	
40	20.2	100150	9'4"	
45	20	101251	9'4"	
50	20.2	101351	9'4"	tds 92 ppm 13.2
55	20	101452	9'4"	
60	30	101552	9'4"	1 hr @ 20 gpm done
1	27	101582	10'	2 hr 31 gpm
2	22	101609	9'6"	
3	27	101631	9'7"	
4	31	101658	9'7"	
5	29	101689	9'7"	

6	24	101718	9'7"	
7	28	101742	9'7"	
8	32	101770	9'7"	
9	25	101802	9'7"	
10	25	101827	9'7"	
1	27	101884	9'7"	stabelized @ 31 gpm
2	31	101885	9'7"	flowtest 2 hr start
3	29	101914	9'7"	
4	25	101959	9'7"	
5	28	101967	9'7"	
6	27	102000	9'7"	
7	30	102027	9'7"	
8	35	102057	9'7"	
9	29	102092	9'7"	
10	28.6	102121	9'8"	
15	31.2	102264	9'8"	
20	29.8	102420	9'8"	
25	31	102569	9'8"	
30	29.8	102724	9'8"	
35	30.6	102873	9'8"	
40	31.2	103026	9'8"	
45	31	103182	9'8"	tds 40 ppm 13 c
50	31.2	103337	9'8"	
55	31	103493	9'8"	
60	31.3	103648	9'8"	
90	31.1	104587	9'8"	
120	34	105520	9'8"	2 hr @ 31 gpm complete
1	38	105554	9'10"	
2	37	105592	9'10"	3 hr @ 41 gpm start
3	39	105629	10'	
4	43	105668	10'1"	
5	41	105711	10'1"	
6	44	105752	10'2"	
7	46	105796	10'2"	
8	43	105842	10'2"	
9	39	105885	10'2"	
10	40	105924	10'2"	stabelized @ 41 gpm
1	42	105964	10'2"	
2	41	106006	10'2"	
3	43	106047	10'2"	
4	39	106090	10'2"	
5	40	106129	10'2"	
6	41	106169	10'2"	
7	40	106210	10'2"	
8	41	106250	10'3"	
9	42	106291	10'3"	
10	41.8	106333	10'3"	
15	42.2	106542	10'3"	
20	42	106753	10'3"	
25	41.5	106963	10'3"	
30	41.6	107171	10'3"	

35	41.4	107379	10'3"	
40	41.4	107586	10'3"	
45	41.2	107793	10'3"	
50	41.4	107999	10'3"	
55	41.4	108206	10'3"	
60	41.2	108413	10'3"	
90	41.2	109649	10'3"	
120	41.2	110885	10'3"	
150	41.4	112121	10'3"	
180	52	113363	10'3"	3 hr complete
1	52	113415	10'8"	4hr @ 51gpm
2	52	113467	10'8"	open discharge
3	51	113519	10'9"	
4	52	113570	10'9"	
5	52	113622	10'9"	
6	52	113674	10'9"	
7	51	113725	10'9"	
8	51	113776	10'9"	
9	52	113827	10'9"	
10	51.4	113879	10'9"	tds @ 29 ppm 12.9 c
15	51.2	114136	10'9"	
20	51.2	114392	10'9"	
25	51.4	114648	10'9"	
30	51.2	114905	10'9"	
35	51.2	115161	10'9"	
40	51.0	115417	10'9"	
45	51.2	115672	10'9"	
50	51.2	115928	10'10"	
55	51.2	116184	10'10"	
60	51.2	116440	10'10"	
90	51	117976	10'10"	
120	51.2	119506	10'10"	
150	51	121042	10'10"	
180	51.2	122572	10'10"	
210	51	124108	10'10"	
240		125638	10'10"	
0			10'10"	RECOVERY
1			8'4"	

SIGNATURE: _____

MOERKE AND SONS PUMP AND DRILLING

Appendix B – Recorded Documents and Agreement

DECLARATION OF COVENANT

Public Well

I (we) the undersigned, owner(s) in fee simple of the land described herein, hereby declare this covenant and place same on record.

I (we) the grantor(s) herein, am (are) the owner(s) in fee simple of (an interest in) the following described real estate situated in Lewis County, State of Washington; to wit: (Insert tax parcel number and full legal description.)

Parcel No. 035067002003 – LOT 3 LEWIS COUNTY SIMPLE SEGREGATION NO. SS-22-00031 RECORDED JULY 05, 2023 UNDER AUDITOR'S FILE NO. 3595299 IN BOOK 2 OF LLSM AT PAGE 160 BEING A PORTION OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER SECTION 2, GOVERNMENT LOT 1 OF SECTION 10, AND GOVERNMENT LOT 4 OF SECTION 11, ALL IN TOWNSHIP 13 NORTH, RANGE 9 EAST, W.M

On which the grantor(s) owns and operates a well supplying water for public use located on said real estate, at:

166 Feet South and 255 Feet West of the Northeast Corner of The Southeast Quarter of the Northeast Quarter of the Northwest Quarter of Section 10, Township 13 North, Range 9 East, W. M. Lewis County, Washington.

And grantor(s) is (are) required to keep the water supplied from said well free from impurities which might be injurious to the public health.

It is the purpose of these grants and covenants to prevent certain practice hereinafter enumerated in the use of said grantor(s) water supply.

NOW, THEREFORE, the grantor(s) agree(s) and covenant(s) that the grantor(s), his (her) (their) heirs, successors and assigns will not construct, maintain, or suffer to be constructed or maintained upon the said land of the grantor(s) and within 100 (one hundred) feet of the well herein described, so long as the same is operated to furnish water for public consumption, any potential source of contamination, such as septic tanks and drain fields, sewer lines, underground storage tanks, roads, railroad tracks, vehicles, structures, barns, feed stations, grazing animals, enclosures for maintaining fowl or animal manure, liquid or dry chemical storage, herbicides, insecticides, hazardous waste, or garbage of any kind or description.

These covenants shall run with the land and shall be binding to all parties having or acquiring any right, title, or interest in the land described herein or any part thereof, and shall inure to the benefit of each owner thereof.

Signed: _____ _____

Grantor(s)

Print Name: _____ _____

State of Washington)
)ss
County of _____)

I, the undersigned, a Notary Public in and for the above named County and State, do hereby certify that on this _____ day of _____, 20____, personally appeared before me _____ to me known to be the individual(s) described in and who executed the within instrument, and acknowledge that he (she) (they) signed and sealed the same as free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year last above written.

_____
Notary Public in and for the State of Washington,
Residing in:_____
My Commission Expires: _____

Group B Water System
Informational Notice to Titles on Property Served

The Washington State Department of Health and local health jurisdictions share administration of drinking water regulations. Contact your local health jurisdiction to determine which agency has administrative responsibility.

This property is served by a Group B public water system that received (check box that applies):

☐ Design approval under Chapter 246-291 Washington Administrative Code from the Washington Department of Health

☒ Design approval under Chapter 246-291 Washington Administrative Code or a local code from the **Lewis County Environmental Health Department** (local health jurisdiction)

At the time of approval:

Water System Name	**Riverside Group B**
Water System Identification Number	**Pending**
Water System Owner	**Merrlawski Investments LLC**

Record the parcel numbers of all parcels approved to be served by this water system:

1. 035067002003	2.

No other parcels, and no additional dwellings or buildings on one of the parcels listed above, can be served by this water system unless approved by the water system owner, and the department.

There are legal limits on the volume of water that can be withdrawn from the ground, and there may be limits on the total area that can be irrigated from this water system. Based on the design of this water system, each new parcel is permitted to irrigate no more than *21,780 square feet of lawn*. This limitation runs with the land and is not transferable to another property.

This water system has been granted one or more exceptions from specific provisions of the regulations, or a waiver (check all boxes that apply):

☒ No exceptions or waivers were granted

☐ A reduction in sanitary control area from 100 feet to _____ feet was approved

☐ An exception or waiver was granted (describe)

The water supply for this water system was tested and (check the box that applies):

☒ Determined to yield more than 5 gallons per minute

☐ Determined to yield 5 gallons per minute or less, and a low water supply contingency plan is available for review

Some small water systems are required by the local fire authority to provide fire suppression capacity. This water system (check box that applies):

☐ Is designed and constructed to provide fire suppression

☒ Is not designed and constructed to provide fire suppression

Ownership and/or operation and management by a Satellite Management Agency (SMA) were required at the time this water system was approved, provided an SMA was available at the time of approval (check box that applies).

☒ The name of the SMA is: **Tri-County Water, SMA No. 138**.

☐ No SMA was available when this water system was approved. This requirement may be applied at any time in the future.

At the time this water system was approved, the financial plan indicated the following water rate structure would be implemented (check all boxes that apply):

☒ All customers are metered

☒ Water will be billed based on metered use

☐ Water bills will be issued every *six months*

☐ The water rate will be:

☐ The method for establishing the annual water system budget is attached

☐ The process for funding a water system reserve account is attached

Routine water quality sampling is encouraged, but not required. At the time of approval, the owner of the water system (check box that applies):

☒ Intends to conduct the following routine water quality sampling:

Analyte and Location	Frequency	Reporting Results
e.g., coliform bacteria in the distribution system	*e.g., every three months*	*e.g., by phone within 24 hours*
Coliform bacteria in the dist system	*Once per year*	*By phone, within 12 hrs*
Nitrate from the well	*Every Three Years*	*By phone, within 12 hrs*

☐ Does not intend to conduct any routine sampling

At the time of water system approval, a water users' agreement (check box that applies):

☐ Exists and a copy can be obtained from _____

☒ Was not prepared

Describe the public notification procedure(s) that will be used to communicate with customers:

☒ By phone or email

☐ By posting to each customer's property (door hanger)

☐ Other: _____

4/8/24

RIVERSIDE DR. * Name Pending - WATER SYSTEM

GROUP B – ID# Not issued yet.

PURPOSED YEARLY CONTRACT AMOUNT: ***(This is a yearly cost breakdown, not a contract. Prices are subject to change – this purposed contact is good for 60 days from the above date.)***

SMA MONTHLY CONTRACT INCLUDES:

***** YEARLY OPERATION & MAINTENANCE** ***(exercise valves, Inspection of Well pump & Controls, Pressure Tanks, Pumps, Filtration, etc.)***

**** YEARLY BACTERIA SAMPLE & ** YEARLY NITRATE SAMPLE**

****** (IF APPLICABLE) YEARLY BACKFLOW CHECK MUST BE SCHEDULE BY THE OWNER OF THE WATER SYSTEM. IT MUST BE TESTED BY A CERTIFIED BACK FLOW TECHNICAN / COMPANY. (COST NOT INCLUDED IN CONTRACT) ** (TRI-COUNTY IS IN THE PROCESS OF BECOMING CERTIFIED – SUMMER 2024)***

SMA CHARGE: $621.00* YEARLY *(tax not included)*

NOT INCLUDED IN THE MONTHLY CONTRACT:

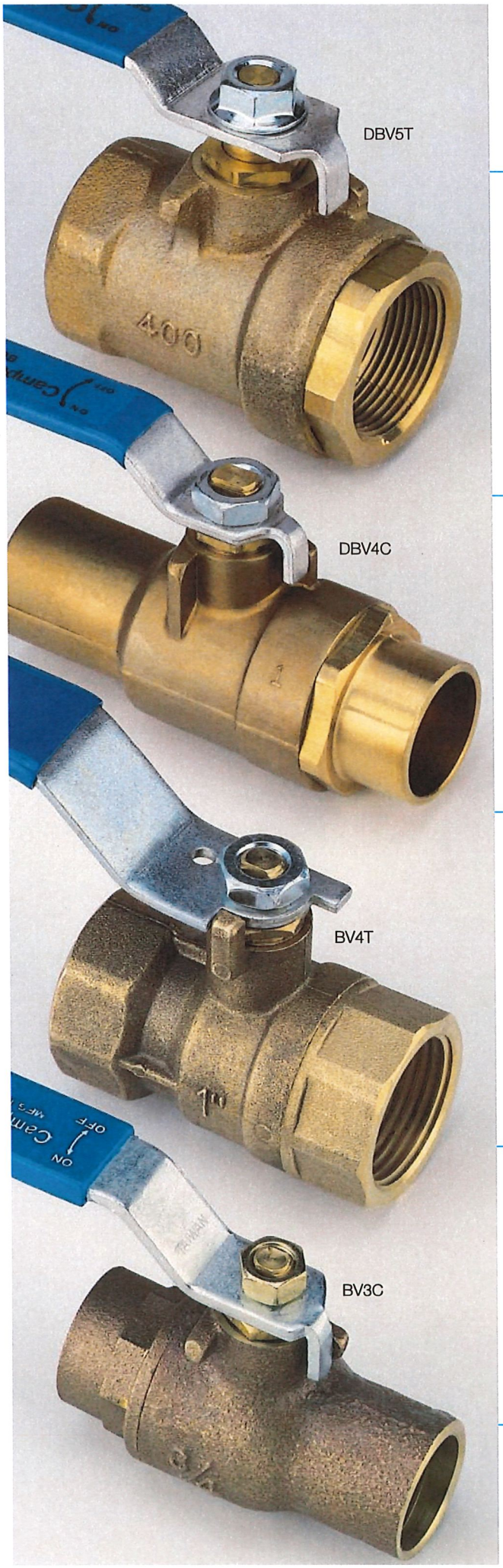
Any Additional Supplies - ***are at a 15% MARKUP (filters, pump controls, fittings, chlorine, etc.)- Plus Applicable Tax Rate.***

All Additional Samples – ***any additional samples that are required by the state or county health departments – Are at Cost – Plus any Applicable Tax Rate.***

OUR REGULAR LABOR RATE IS $100 PER HR. - DURING OPERATION HOURS. (8am - 4:30pm – Monday – Friday) & EMERGENCY CALLS (Weekends or after hours.)

Yearly Service Call	**$ 350.00**
Yearly Bacteria Sample	**$ 48.00**
Admin Charges	**$ 150.00**
1 Nitrate per year	**$ 48.00**
Total yearly Cost:	**$ 621.00**

Appendix C – Equipment Specification

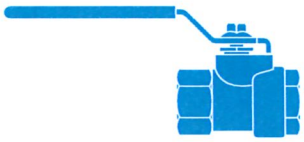


Campbell
Brass Ball Valves

H1

BRASS BALL VALVE (domestic, threaded)

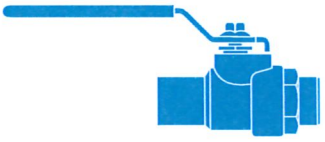
part	size	port	pcs/pkg	master ctn
DBV2T	1/2	.40	10	–
DBV3T	3/4	.65	10	–
DBV4T	1	.75	10	–
DBV5T	1-1/4	1.00	5	–
DBV6T	1-1/2	1.12	5	–
DBV8T	2	1.50	2	–



- Standard port for excellent flow
- 400 psi WOG, 125 SWP
- Certified red brass castings
- Chrome-plated brass ball with PTFE seats
- 90° lever handle

BRASS BALL VALVE (domestic, copper)

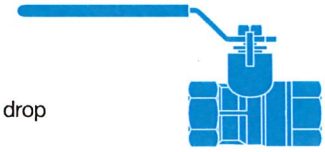
DBV2C	1/2	.40	10	–
DBV3C	3/4	.65	10	–
DBV4C	1	.75	10	–
DBV5C	1-1/4	1.00	5	–
DBV6C	1-1/2	1.12	5	–
DBV8C	2	1.50	2	–



- Standard port for excellent flow
- 400 psi WOG, 125 SWP
- Certified red brass castings
- Chrome-plated brass ball with PTFE seats
- 90° lever handle

BRASS BALL VALVE (imported, threaded)

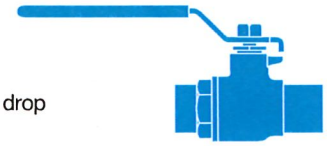
BV2T	1/2	.50	10	120
BV3T	3/4	.69	10	80
BV4T	1	.89	8	64
BV5T	1-1/4	1.10	4	32
BV6T	1-1/2	1.38	2	24
BV8T	2	1.77	2	16



- Full port for maximum flow and minimal pressure drop
- 600 psi WOG, 150 SWP
- Chrome-plated brass ball with PTFE seats
- 90° lever handle

BRASS BALL VALVE (imported, copper)

BV2C	1/2	.50	10	120
BV3C	3/4	.63	10	80
BV4C	1	.77	8	64
BV5C	1-1/4	1.00	4	32
BV6C	1-1/2	1.22	2	32
BV8C	2	1.47	2	16



- Full port for maximum flow and minimal pressure drop
- 600 psi WOG, 150 SWP
- Chrome-plated brass ball with PTFE seats
- 90° lever handle

Campbell Manufacturing, Inc.
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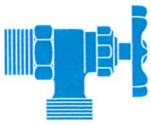
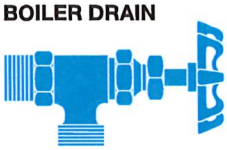
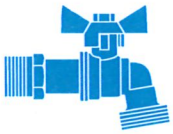
Bechtelsville, PA 19505-0207
800-523-0224, Fax 610-369-3580

H6

Campbell

Brass Service Valves

	part	size	pcs/ctn	master ctn
DRAIN VALVE	DVB2	1/2	Bulk	–
	DVB3	3/4	Bulk	–
	Domestic			
BOILER DRAIN	BD2	1/2	12	144
	BD3	3/4	12	144
	With stuffing box Imported			
HOSE BIBB (ball valve)	HBBV2T	1/2	12	144
	HBBV3T	3/4	12	144
	1/4 turn Ball Valve Hose Bibb with T-handle Imported			
HOSE BIBB	HB2T	1/2	12	144
	HB3T	3/4	12	144
	Imported			
HOSE BIBB (sampling faucet)	HBSF2T	1/2	12	144
	HBSF3T	3/4	12	144
	No garden hose thread Imported			
ANGLED SILL COCK (fpt)	ASC2T	1/2	12	144
	ASC3T	3/4	12	144
	With stuffing box Imported			
ANGLED SILL COCK (copper)	ASC2C	1/2	12	144
	ASC3C	3/4	12	144
	With stuffing box Imported			

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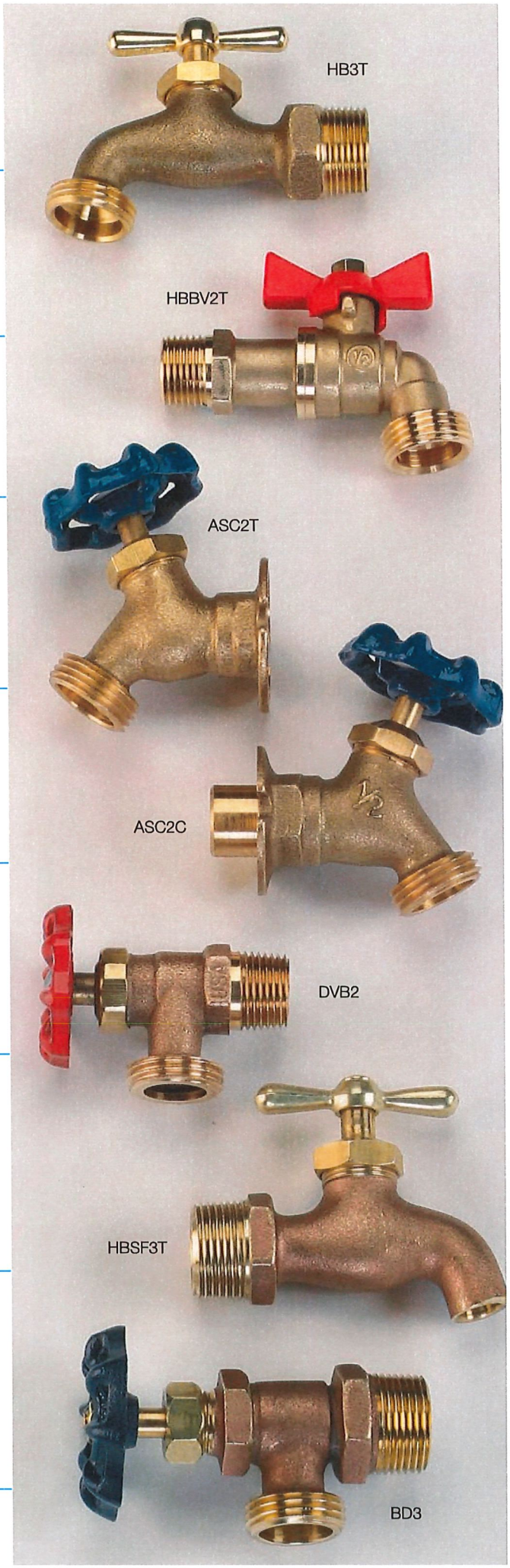


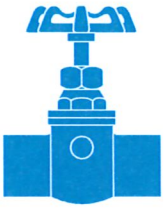
H4

Campbell

Imported Brass Service Valves

	part	size	pcs/ctn
STOP & WASTE VALVE (threaded)	SWV2T	1/2	12
	SWV3T	3/4	12

STOP & WASTE VALVE (copper)	SWV2C	1/2	12
	SWV3C	3/4	12



STOP VALVE (threaded)	SV2T	1/2	12
	SV3T	3/4	12

STOP VALVE (copper)	SV2C	1/2	12
	SV3C	3/4	12

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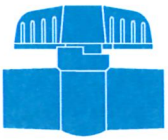
800-523-0224, Fax 610-369-3580

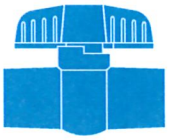
H2 Campbell

Imported Plastic Ball Valves

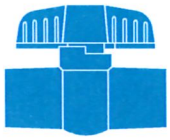
	part	size	pcs/ctn	master/ctn
MOLDED-IN-PLACE PVC BALL VALVE (threaded, PTFE seats)	PIBV2T	1/2	1	100
	PIBV3T	3/4	1	100
	PIBV4T	1	1	50
	PIBV5T	1-1/4	1	50
	PIBV6T	1-1/2	1	24
	PIBV8T	2	1	24



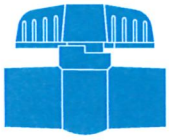
MOLDED-IN-PLACE PVC BALL VALVE (socket, PTFE seats)	PIBV2S	1/2	1	100
	PIBV3S	3/4	1	100
	PIBV4S	1	1	50
	PIBV5S	1-1/4	1	50
	PIBV6S	1-1/2	1	24
	PIBV8S	2	1	24
	PIBV12S	3	1	12
	PIBV16S	4	1	8



MOLDED-IN-PLACE PVC BALL VALVE (threaded, EPDM seats)	PIBV2T-R	1/2	1	100
	PIBV3T-R	3/4	1	100
	PIBV4T-R	1	1	50
	PIBV5T-R	1-1/4	1	50
	PIBV6T-R	1-1/2	1	24
	PIBV8T-R	2	1	24



MOLDED-IN-PLACE PVC BALL VALVE (socket, EPDM seats)	PIBV2S-R	1/2	1	100
	PIBV3S-R	3/4	1	100
	PIBV4S-R	1	1	50
	PIBV5S-R	1-1/4	1	50
	PIBV6S-R	1-1/2	1	24
	PIBV8S-R	2	1	24
	PIBV12S-R	3	1	12
	PIBV16S-R	4	1	8



- Shock-resistant PVC Sch. 80 body and ball
- ABS handle
- 150 psi working pressure (at 73°F)
- Standard port for excellent flow characteristics
- Variety of water supply, waste water, swimming pool, chemical feed, and irrigation applications for residential, commercial, industrial, marine, and agriculture use

MOLDED-IN-PLACE CPVC BALL VALVE (socket, PTFE seats)	PIBV2S-CPVC	1/2	1	100
	PIBV3S-CPVC	3/4	1	100
	PIBV4S-CPVC	1	1	100

- CPVC Sch. 80 body and ball
- ABS handle
- 75 psi working pressure (at 180°F)
- Standard port for excellent flow characteristics

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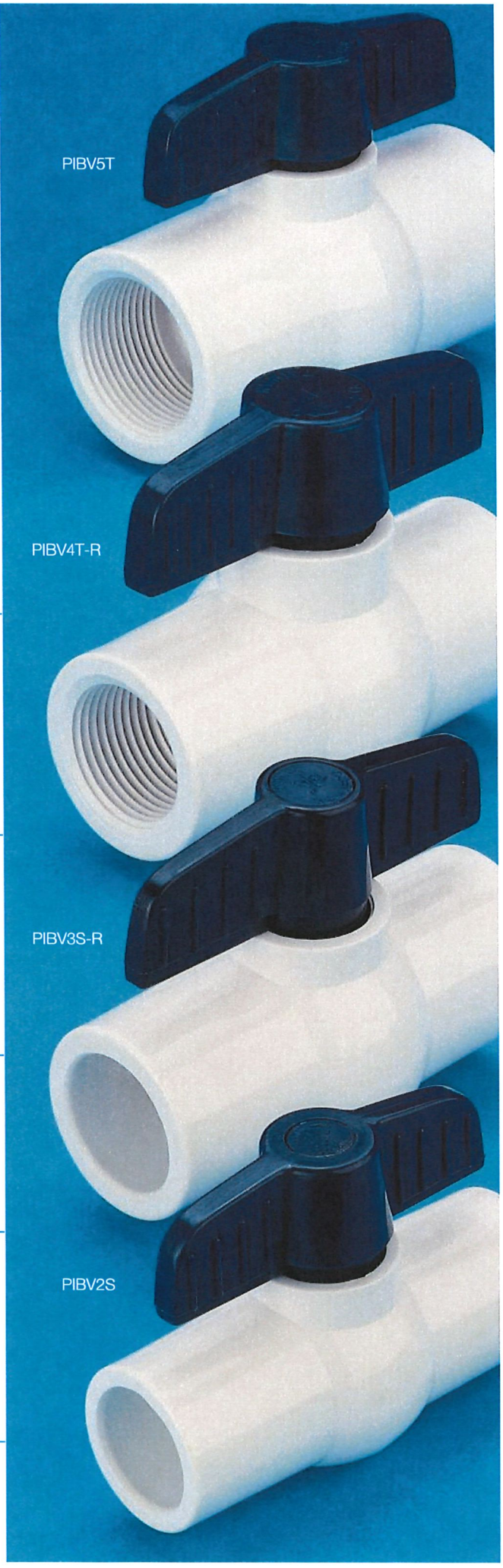


Grundfos CUE 100

Variable Frequency Drive

The all-new CUE 100 Smart VFD makes pump control easy with built-in connectivity options, the widest voltage range and fast installation in a broad range of applications.

Flexible operating modes:
Constant pressure, constant level, constant speed, solar tracking, and more

TECHNICAL DATA

Supply Voltage (AC)	1 x 90-265 VAC (widest range on market)
Supply Voltage (DC)	90 - 400 VDC
Enclosure	Fully sealed, NEMA 4X, IP66
Weight	24 Lbs.
Acoustics	66 dB(A)
Electrical Connections	Compression conduit fittings
Temperature Range	-20°C (-4°F) to 60°C (140°F)
Included Accessories	0-145 PSI transducer with 16ft cable, Heavy duty DVDT filter

Model	Max | in [A]	Motor Type	Maximum Motor Power	Max | out [A] (1)
CUE 100-20 (92939786)	15,5	2 wire, 1 phase, split phase	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) -115 V	13,5 (2)
		2 wire, 1 phase, PSC	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) - 115 V	11,5 (2)
		3 wire, 1 phase	2 HP (1,5 kW) - 230 V	13,5
		3 phase	0.5 HP (0,37 kW) - 115 V 2 HP (1,5 kW) - 230 V	9,5
CUE 100-30 (92939800)	22	2 wire, 1 phase, split phase	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) - 115 V	13,5 (2)
		2 wire, 1 phase, PSC	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) - 115 V	11,5 (2)
		3 wire, 1 phase	2 HP (1,5 kW) - 230 V	13,5
		3 phase	0.5 HP (0,37 kW) - 115 V 3 HP (2,2 kW) - 230 V	12,5
CUE 100-50 (92939803)	32	2 wire, 1 phase, split phase	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) - 115 V	13,5 (2)
		2 wire, 1 phase, PSC	1.5 HP (1,1 kW) - 230 V 0.5 HP (0,37 kW) - 115 V	11,5 (2)
		3 wire, 1 phase	3 HP (2,2 kW) - 230 V	17,5
		3 phase	0.5 HP (0,37 kW) - 115 V 5 HP (3,7 kW)-230 V	18,5

(1) It is recommended to select the device according to the motor current including the Service Factor (SF).

(2) In order to guarantee the starting of single-phase 2-wire motors, the internal protection of the IGBT module (50 A peak) can be exceeded for a limited time but not more than 60 A peak.

GRUNDFOS

Possibility in every drop

FEATURES & BENEFITS

Fast installation & easy startup

- Compact design with detachable front panel for easy mounting
- Preset operation values allow for simple setup or tailor parameters to specific application needs
- Panel keypad or dedicated app set-up options

Built-in connectivity

- Modbus and BACnet compatible
- SCADA system or Grundfos Connect integration allows for instant notifications, monitoring, analysis, and maintenance planning

Flexible configuration

- Compatible with almost any above or below-ground pump
- Wide range of operating modes: constant pressure, constant level, constant speed, solar tracking, and more
- Three methods of dry run production: pressure, current, and power factor
- 4 analog inputs and 3 digital inputs

Multi-drive capacity

- Connect up to eight drives for a single application with no additional accessories
- Rotating lead drive ensures system stays operational if the original lead drive malfunctions

Remote troubleshooting

- Extensive pump protection features maximize system uptime and minimize maintenance and repairs
- Remote control and monitoring with SmartBridge allows for direct support and system analysis (Cellular or wifi connection to smart device required)
- Real time clock stores 20 time and date stamped alarms

Widest voltage range in the market

- Compatible with AC or DC power
- AC supply voltage range is the widest on market (1 x 90-265 VAC)

Energy savings through variable speed control

- Reduced carbon emissions and ensure comfort and constant pressure for end users
- Compatible with permanent magnet motor pumps

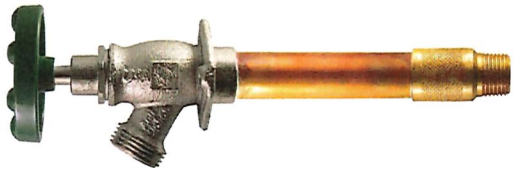
Grundfos
856 Koomey Rd
Brookshire, TX 77423
grundfos.com

CUE 100 Installation & Operation Manual

GRUNDFOS

Possibility in every drop

Internet #206292810 Model # 466-04LF Store SKU #599275 Store SO SKU #1001979425



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Arrowhead Brass

4 in. Lead Free Anti-Siphon Frost Free Hydrant with Built-In Vacuum Breaker

★★★★½ (26) Write a Review Questions & Answers (7)

- Applicable when connecting your interior to exterior water supply
- Features an exclusive longer lasting O-ring seal bonnet
- Arrow-Breaker technology prevents back-siphonage

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G4

Campbell FLOMATIC

Check Valves

UNLEADED ENVIRO-CHECK® FLOMATIC® VALVES

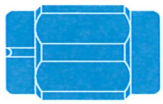
CHECK VALVE (80E-series)

part	size	pcs/ctn	master/ctn
4029E	1/2	1	100
4030E	3/4	1	100
4031E	1	1	49
4032E	1-1/4	1	36
4033E	1-1/2	1	25
4034E	2	1	16
4035E*	2-1/2	1	–
4036E*	3	1	–
4037E*	4	1	–

- Stainless steel spring
- Non-spin acetal poppet
  (* Unleaded bronze poppet on 2-1/2 thru 4" sizes)
- Nitrile (Buna-N) seal

UNLEADED ENVIRO-CHECK® FLOMATIC® VALVES

CHECK VALVE (100E-series)

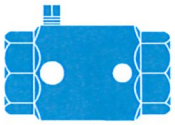


4201E	1	1	49
4202E	1-1/4	1	36

- Hex shaped body for easy wrenching
- Stainless steel spring
- Non-spin acetal poppet
- Nitrile (Buna-N) seal

UNLEADED ENVIRO-CHECK® FLOMATIC® VALVES

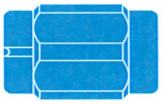
CHECK VALVE (80CE-series)



4061E	1	1	49
4062E	1-1/4	1	36

- 1/8" inlet tap, two 1/4" outlet taps, and 1/8" outlet tap with brass plug
- Stainless steel spring
- Non-spin acetal poppet
- Nitrile (Buna-N) seal

CHECK VALVE (80/100SS-series)



4201SS2**	1	1	49
4202SS2**	1-1/4	1	36
4033SS2	1-1/2	1	25
4034SS2	2	1	16

- 303 Stainless Steel one-piece body
  (**1" and 1-1/4" sizes have hex-style body)
- Stainless steel spring
- Non-spin acetal poppet
- Nitrile (Buna-N) seal

CHECK VALVE (80DI-series)

4031DI***C	1	1	49
4032DI***C	1-1/4	1	36
4033DI***C	1-1/2	1	25
7937C	2	1	16
7936	2-1/2	1	–
7938	3	1	–
7939	4	1	–
4088	5	1	–
4089	6	1	–
4090	8	1	–

- High strength epoxy-coated ductile iron body, disc, and follower (C1" thru 2" sizes have cast steel body)
- Stainless steel spring fasteners
- Ductile iron poppet
  (***1" thru 1-1/2" sizes have acetal poppet)
- Nitrile (Buna-N) seal

Campbell Manufacturing, Inc.
127 East Spring Street, P.O. Box 207
Bechtelsville, PA 19505-0207
800-523-0224, Fax 610-369-3580

All models are rated at
400 psi WOG maximum pressure and
180°F (80C) maximum operating temperature

Multi-Jet Water Meters

5/8", 3/4" and 1"

Our Multi-Jets quietly perform to a high standard. Yours.

Millions of our 5/8", 3/4", and 1" meters are in operation today. Using superior measurement technology, these meters represent the perfect balance between accuracy, cost, and longevity. With sensitivity to measure water flowing as low as 1/8 gallon per minute and accuracy unaffected by common particulates and build-up that would freeze other types, you can count on a Multi-Jet.

Our meters are designed with the future in mind as well. Choose from the many optional devices and you can create a modular reading system that has no equal. Remote Read? We can handle that. Wireless? We make it almost too easy. These meters are ready to work for you.

FEATURES & BENEFITS

- **Meets All AWWA Standards; NSF Certified**
- **Tamper Detection and Prevention**
- **Patented Frost Protection (option)**
- **High-Quality, Long-Life Parts**
- **Durable Basket Strainer Protects from Damage**

TECHNICAL SPECIFICATIONS:

AWWA/NSF Standards	Meets or exceeds all sections of AWWA Standard C-708, most recent revision; Certified by NSF to NSF/ANSI Standard 61.
Design/Operation	Velocity-type meter. Water, evenly distributed by multiple jet nozzles, flows past an impeller in the measuring chamber, creating an impeller velocity directly proportional to water flow rate. The meter's register integrates velocity into totalized flow.
Main Case	Choice of waterworks bronze case of 81% copper composition or EnviroBrass® II, 87% copper, low lead bronze. All main cases incorporates externally threaded ends and wrench pads to aid installation. Bronze register retaining rings are standard.
Measuring Chamber	The measuring chamber housing and measurement element are constructed of a durable synthetic polymer and can easily be removed from the main case without removal of the meter from the line. The chamber housing is constructed in two parts to allow access to the impeller. Measurement surfaces are not wear surfaces, providing sustained accuracy despite the presence of entrained solids in the water. A long-life, sapphire serves as a wear surface, with balanced water flows minimizing bearing wear.
Magnetic Drive	A reliable, direct magnetic drive provides linkage between measurement element and register. No intermediate gearing is required; no gearing is exposed to water.
Register	Standard direct read, DIALOG® Reading System and Electrical Output Registers are available. A six wheel odometer is standard.
Register Sealing	Direct read and DIALOG registers are permanently sealed, with a tempered glass lens, stainless steel base and wrap-around gasket to prevent intrusion of dirt or moisture.
Register Units	Registration available in U.S. gallons, cubic feet or cubic metres.
Test Circle	Large center sweep hand with ten clearly indicated gradations per minimum registration unit.
Low Flow/Leak Indicator	Center mounted indicator with high sensitivity resulting from direct one to one linkage to the measuring element.
Strainer	A rugged, 360-degree polymer basket strainer protects the critical measuring element from damage.
Frost Protection (option)	Patented, pressure-activated plug is expelled from the meter by expansion of freezing water. The frost plug can be replaced without meter removal or disassembly.
Adjusting Port	Sealed after factory calibration. Port is accessible for utility recalibration, to compensate for inaccuracy in older meters without parts replacement.
Tamper Detection	The Master Meter Multi-Jet adjusting port is sealed to prevent tampering and provides a visual indication of tampering attempts.

See reverse side for more specifications »

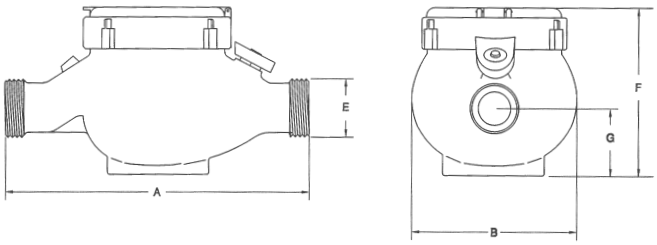
Multi-Jet Water Meters

5/8", 3/4" and 1"

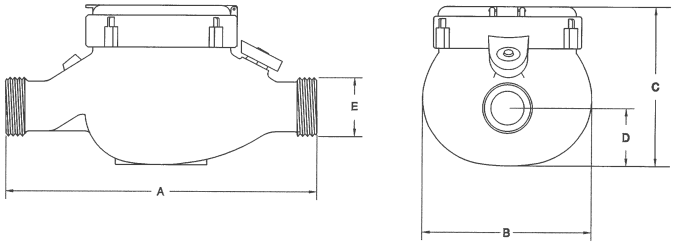
METER OPERATING CHARACTERISTIC/DIMENSION	5/8"	5/8" x 3/4"	3/4" SL	1"
Flow Rating (gpm)	20	20	30	50
Continuous Flow (gpm)	15	15	20	30
Normal Flow Range (gpm)	1-20	1-20	2-30	3-50
Low Flow (gpm)	1/4	1/4	1/2	3/4
Maximum Working Pressure (psi)	150	150	150	150
Maximum Working Temperature (°F)	122	122	122	122
Length (A below)	7-1/2"	7-1/2"	7-1/2"	10-3/4"
Width (B below)	3-3/4"	3-3/4"	3-3/4"	4-1/8"
Width, side-mounted DIALOG unit	4-1/2"	4-1/2"	4-1/2"	4-1/2"
Height, standard register with lid (C below)	4-1/8"	4-1/8"	4-1/8"	3-7/8"
Height with DIALOG register	4-7/8"	4-7/8"	4-7/8"	4-5/8"
Height, Frost Proof, standard register with lid 4-3/8" (F below)	4-3/8"	4-3/8"	4-3/8"	4-3/8"
Height, bottom to center line (D below)	1-3/16"	1-3/16"	1-3/16"	1-3/16"
Height, Frost Proof, bottom to center line (G below)	1-3/4"	1-3/4"	1-3/4"	1-3/4"
Meter Casing Spuds, Nominal Thread Size* (E below)	3/4"	1"	1"	1-1/4"
Weight (lbs)	3.6	3.7	3.6	5.25
Packed To Carton	6	6	6	4
Carton Weight (lbs)	23	23.6	23	22.4

*External Straight Threads

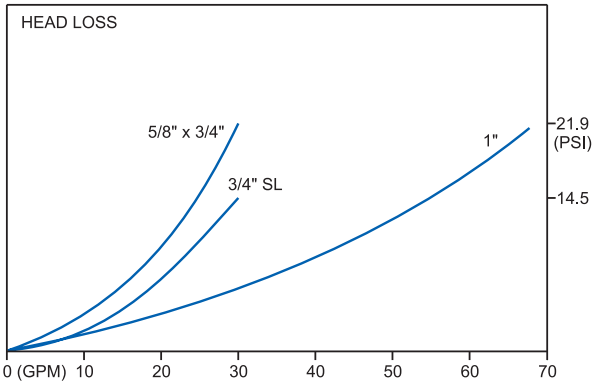
Frost Proof 5/8" to 1"



Standard 5/8" to 1"



Head Loss Curves



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INTERMEDIATE MULTI-JET

1-1/2" AND 2"

1.5" Bolted Flange Multi-Jet

2" Threaded Flange Multi-Jet

SMALL COMMERCIAL MEANS BIG BUSINESS

Maximize your revenue stream across a wide range of small commercial applications with our Intermediate Multi-jets. Capture accurate low flow readings where turbine meters fall short, with an easy to install meter that is tough enough to handle higher flows like a small turbine.

Choose a bolted oval flange or threaded design to meet your install needs and enjoy lifelong performance from a meter built to last while adapting to the future. Our unique, modular register design allows for hassle-free upgrades in new reading technologies. You can swap the brains of these meters long before their bodies need replacement. Smart design enables smart technology.

INFORMED BUSINESS DECISIONS — GOOD FOR YOU AND YOUR CUTOMERS.

Choose the optional DIALOG 3G® Integrated AMR Register and put our Connection*Free*™ AMR Technology to work for you and your business customers. 3G delivers powerful results with 4,000 read data logging that can define consumption profiles, pinpoint peaks and valleys in water usage and, when shared with your customers, can help them make informed decisions on water use that can impact conservation initiatives, and reduce customer billing complaints. In turn, 3G looks out for your utility's bottom line with vigilant Revenue Impact Alerts™ monitoring for leaks, theft (*backflow*), tamper, and zero consumption. Our award-winning register design houses all vital components — encoder, RF transmitter, battery and antenna — safely within the register's sealed stainless steel and tempered glass enclosure. We eliminated external wires, components and connections — the #1 cause of maintenance related issues on competitive designs. Master Meter Intermediate Multi-jet meters are designed with the future in mind for use in mobile and fixed network AMR/AMI data management systems.

FEATURES & BENEFITS:

- High Accuracy on Low Flow (1.5 GPM on 1-1/2" MJ)
- Modular Register Design Allows for Easy Upgrades to Future Read Technologies
- Meets All Applicable AWWA Standards; Optional NSF Certification.
- Tamper Detection and Prevention
- Precision Engineered Flow Components For Smooth Operation and Sustained Accuracy Under Tough Conditions
- With Optional 3G Integrated Register:
  - Better Serve Business Customers Who Demand Accountability with Rich 4,000 Read Data Logging Capabilities (scalable / customer defined resolution)
  - Protect Your Utility's Bottom Line:
    - Revenue Impact Alerts - Leak, Tamper, Theft (*backflow*) and Zero Consumption
    - Deploy District Metering Areas or Zones (DMA/DMZ) Advanced Infrastructure Leak Management Programs

REGISTER OPTIONS:

- DIALOG 3G Integrated AMR Register
- DIALOG 3G LCD Interpreter™
- DIALOG 2G® Pit
- DIALOG 2G Indoor
- Electrical Output Register
- Direct Read

READ:

- Direct Read/Manual
- Proximity/Wand Read - 2G
- Mobile Drive-By AMR - 3G
- Fixed Network AMI Solution - Utilizes the 3G technology backbone with simultaneous Mobile AMR and Fixed Network AMI data collection capabilities.

SIZES AVAILABLE:
1.5" & 2"

Compact Size | Enhanced Low Flow Sensitivity | Easily Upgradeable | AMR/AMI Migratable with 3G

MASTER METER
Reading the Future™

TECHNICAL SPECIFICATIONS:

AWWA Standard - Meets or exceeds all sections of Standard ANSI / AWWA C708, most recent revision for cold water multi-jet meters with AWWA bronze main cases.

NSF/ANSI Standard 61 -Optional EnviroBrass unleaded main case available.

Design/Operation - Velocity - type flow measurement. Water that is evenly distributed by multiple converging inlet ports flows past an impeller in the measuring chamber, creating an impeller velocity directly proportional to water flow rate. The meter's register integrates that velocity into totalized flow. An inherent advantage for this design is exceptionally low head loss for improved infrastructure efficiencies and unparalleled wear mitigation. The register assembly is removable under line pressure permitting seamless, simplified upgrades in reading technology.

Main Case - Choice of waterworks bronze case of 81% copper composition or EnviroBrass® II, 86% copper, unleaded bronze. Main case incorporates either compact externally threaded ends, or bolted flanged connections.

Measuring Chamber - The measuring chamber housing and measurement element are built with an advanced synthetic polymer. This tough, non-hydrolyzing material ensures durable wear. The chamber design optimizes water flow, eliminating harsh turbulence for smooth, easy, operation that minimizes bearing wear.

Measurement surfaces are not wear surfaces, providing sustained accuracy despite the presence of entrained solids in the water. A long-life, synthetic sapphire bearing serves as a wear surface. The chamber housing is constructed in two parts to allow access to the impeller.

Magnetic Drive - A reliable, direct magnetic drive provides linkage between measurement element and register. No intermediate gearing is required; no gearing is exposed to water.

Register - Standard Direct Read, DIALOG 2G and DIALOG 3G AMR System registers are available. Six wheel odometers are standard. Together, an integrated and migratable technology environment is attained; direct, proximity (wand), mobile AMR, and Fixed Network AMI.

Register Sealing - All Direct read and DIALOG® registers are IP-68 rated, permanently sealed with a scratch resistant glass lens, stainless steel base and wrap-around gasket to prevent intrusion of dirt or moisture.

Register Units - Registration available in either U.S. gallons, cubic feet or cubic meters.

Test Circle - Large center sweep hand with one hundred (100) clearly marked gradations on the periphery of the dial face.

Magnetic Drive - A reliable, direct magnetic drive provides linkage between measuring element and register so that no gearing is exposed to water.

Test Circle - Large center sweep hand with one hundred (100) clearly marked gradations near the periphery of the dial face.

Low Flow/Leak Indicator -Clearly visible leak indicator with high sensitivity resulting from direct one-to-one linkage to the measuring element.

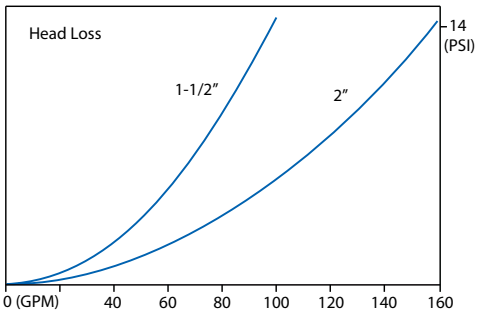
Strainer -A rugged, 360-degree polymer basket strainer protects the critical measuring element from damage.

Adjusting Port Detection -The Master Meter Multi-jet adjusting port is sealed after factory calibration to prevent tampering and provides a visual indication of tampering attempts. Port is accessible for utility recalibration to compensate for inaccuracy in older meters without parts replacement.

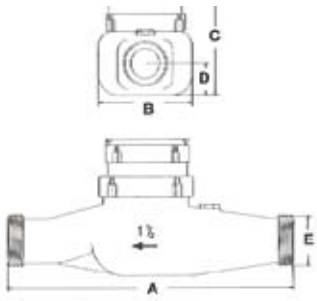
MULTI-JET WATER METER (1-1/2" AND 2")

METER OPERATING CHARACTERISTIC / DIMENSION	1-1/2" Threaded	1-1/2" Flanged	2" Threaded	2" Flanged
Flow Rating (gpm)	100	100	160	160
Continuous Flow (gpm)	75	75	120	120
Normal Flow Range (gpm)	5-100	5-100	8-160	8-160
Low Flow (gpm)	1-1/2	1-1/2	2	2
Maximum Working Pressure (psi)	150	150	150	150
Maximum Working Temperature (°F)	110	110	110	110
Length (A below)	12-5/8"	13"	15-1/4"	17"
Width (B below)	5-3/8"	5-3/8"	5-3/4"	5-3/4"
Height, standard register with lid (C below)	6-3/4"	6-3/4"	7-5/8"	7-5/8"
Height with DIALOG register	7-1/2"	7-1/2"	8-3/8"	8-3/8"
Height, bottom to center line (D below)	1-3/4"	1-3/4"	2-3/4"	2-3/4"
Meter Casing Spuds, Nominal Threadsize* (E below)	2"	N/A	2-1/2"	N/A
Weight (lbs)	11	12	20	24
Packed to Carton	1	1	1	1
Carton Weight (lbs)	12	14	22	26

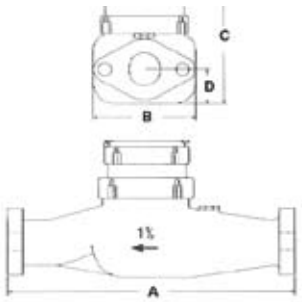
HEAD LOSS CURVES



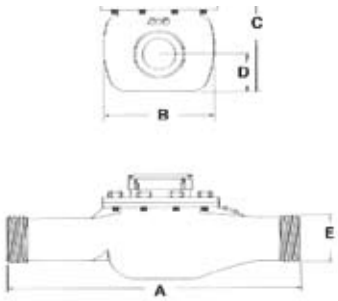
1-1/2 Threaded-End Multi-Jet



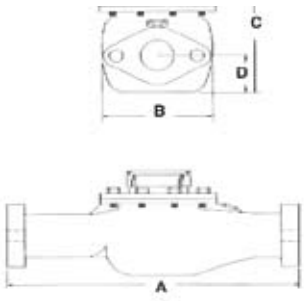
1-1/2 Flanged-End Multi-Jet



2" Threaded-End Multi-Jet



2" Flanged-End Multi-Jet



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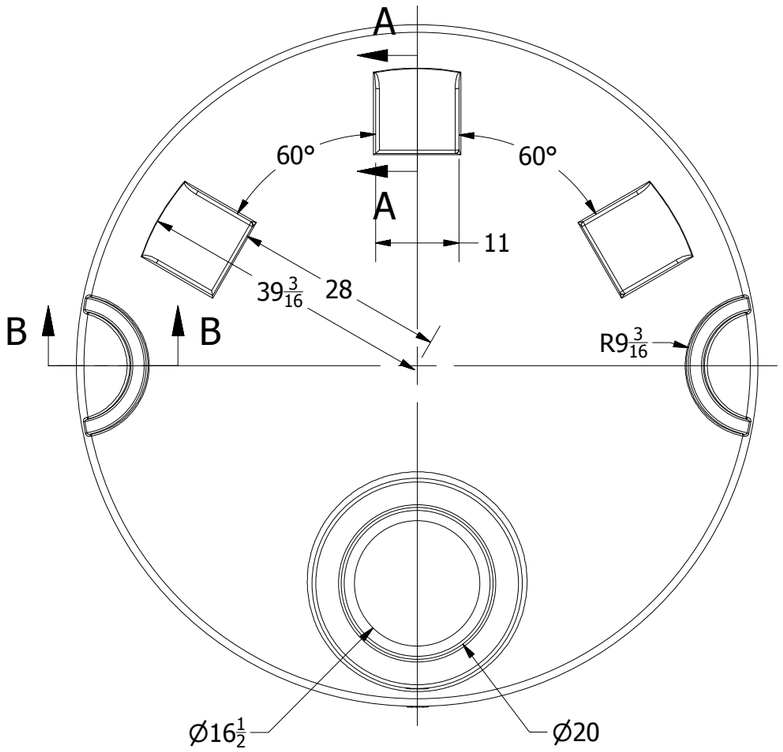
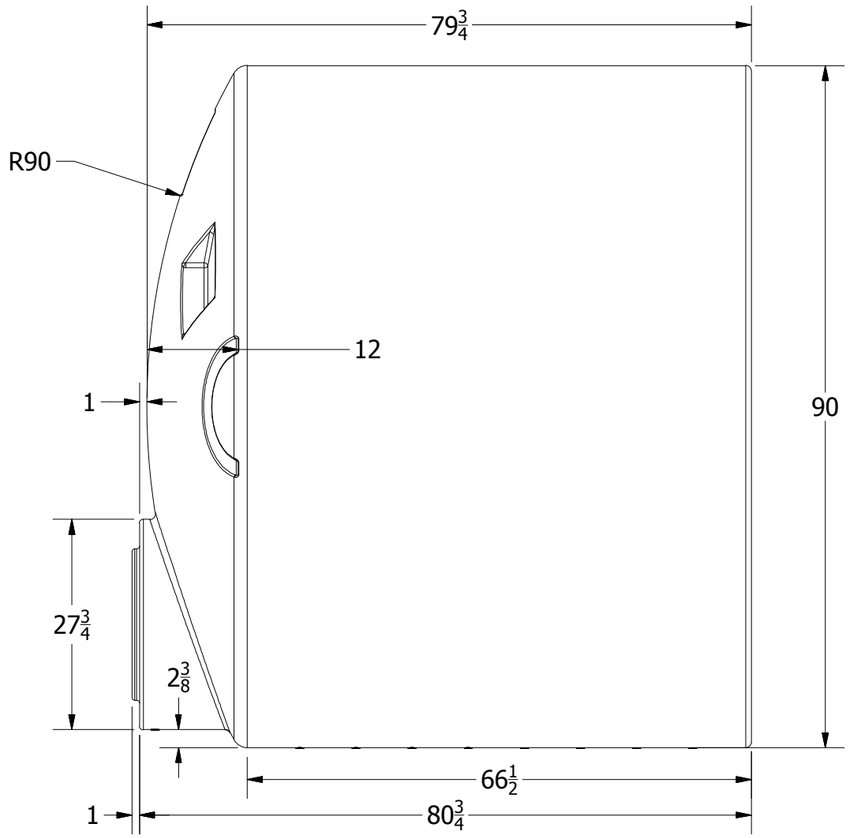
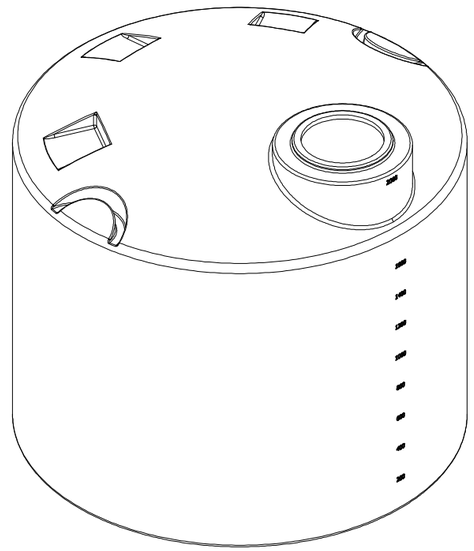
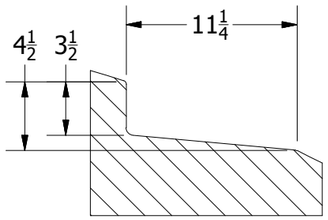
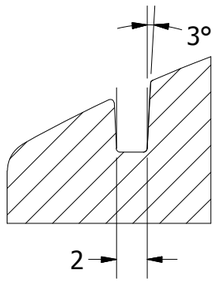






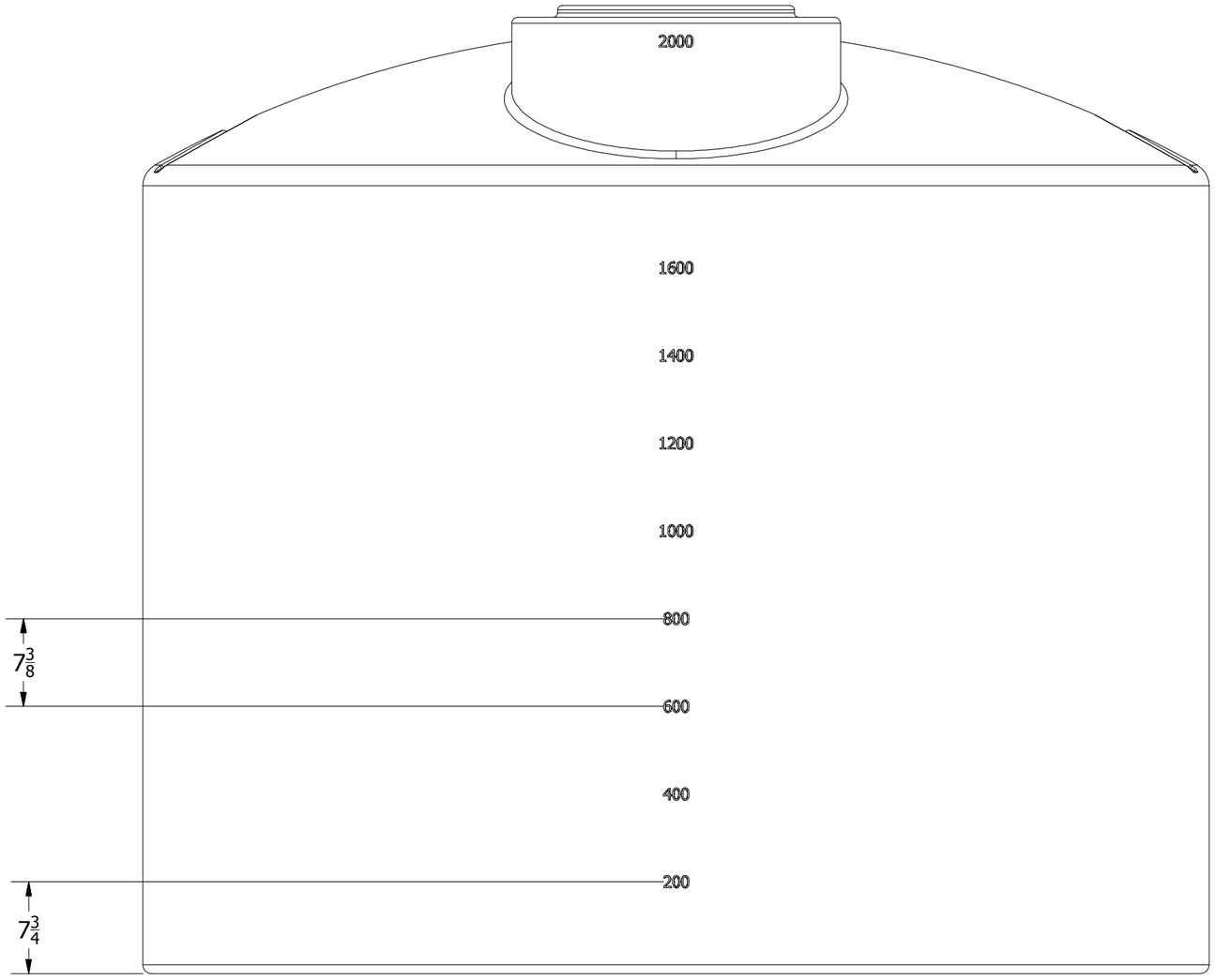


SECTION A-A
SCALE 1:10



SECTION B-B
SCALE 1:10

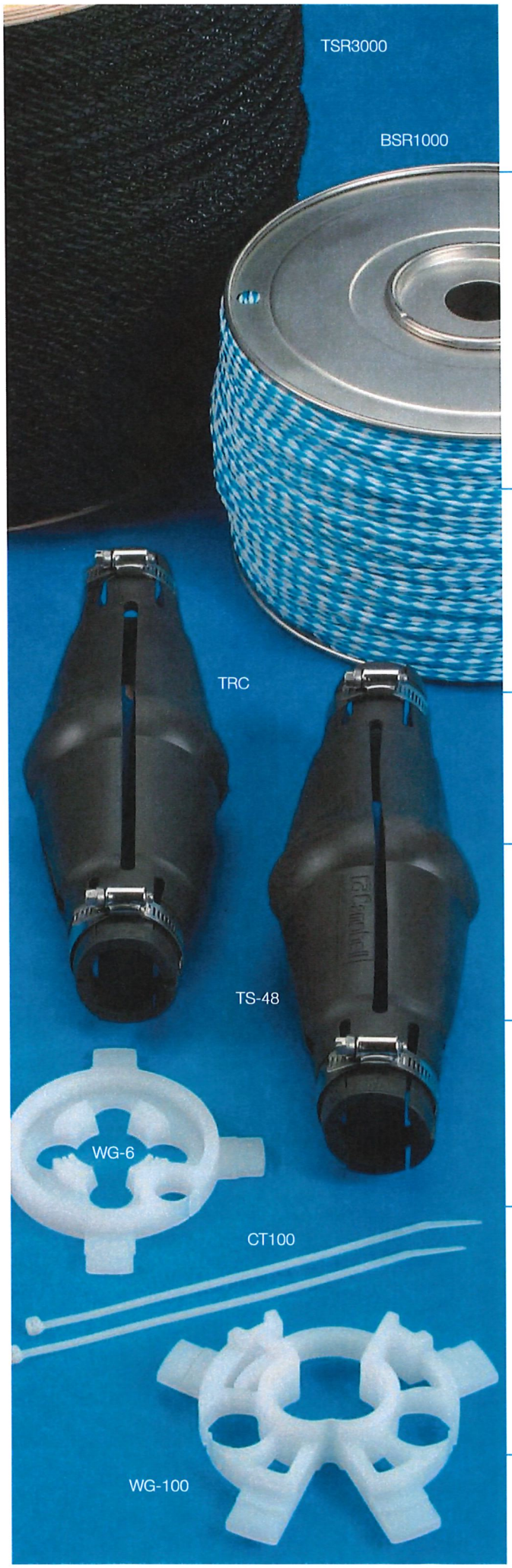
DRAWN Todd Bolzer	6/7/2013	NORWESCO, INC. SAINT BONIFACIUS, MN
CHECKED		TITLE: 2000 GALLON X 90 VERTICAL TANK
QA		
MFG		
APPROVED		
		SIZE B / DWG NO / REV
		SCALE: 1/16 / SHEET 1 OF 2



DRAWN Todd Bolzer	6/7/2013	NORWESCO, INC. SAINT BONIFACIUS, MN
CHECKED		TITLE
QA		2000 GALLON X 90 VERTICAL TANK
MFG		
APPROVED		

SIZE		DWG NO	REV
B			

SCALE: 1/16 SHEET 2 OF 2



Campbell
Installation Accessories

R1

part	drop pipe	casing i.d.	pcs/pkg
WG-100	1	4 to 6	48
WG-125	1-1/4	4 to 6	48

SELF-CLAMPING WIRE & PIPE PROTECTOR

Slips around pipe when needed, squeezes together with a pair of pliers and stays put ... without tape or hose clamps.
Won't slip, slide, float, or tilt.

- Molded, one-piece construction of virgin thermoplastic resin.
- Two large, snap-in holes to isolate wire and safety rope.
- Smooth edges to avoid damage to electrical cable.
- Open areas in design prevent "piston action" when pulling pump.
- Ready for use in 6" well casings (adaptable to 4" and 5" installations by cutting off tabs.)
- Fits standard galvanized pipe and 125-200 lb. poly pipe.

U.S. PAT. NO. 6,595,284
CAN. PAT. NO. 1,205,738

part	drop pipe	casing i.d.	pcs/pkg
WG-6	1 or 1-1/4	4 to 6	100

SNAP-IN CABLE GUARD

Molded polyethylene cable guards protect submersible wire from abrading against sides of well. Easy snap-in feature eliminates need for "fishing" wires through holes.

part	size	length	pcs/pkg	master ctn
CT100	1 to 1-1/4	8	100	—
CT200	1-1/2 to 4	15-1/2	100	—

CABLE TIE

Natural color nylon.
NOTE: Must be ordered in package quantities..

part	drop pipe	casing i.d.	pcs/pkg
TS-48	1 to 2	4 to 8	12

TORQUE STOP (flexible pvc)

Installed directly above submersible pump to protect pump from starting torque damage.
Injection molded from FDA-approvable PVC.
Includes 2 stainless steel clamps.

part	drop pipe	casing i.d.	pcs/pkg
TRC	1 to 2	4 to 8	28

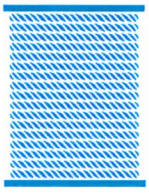
TORQUE RESISTOR (buna-n rubber)

Installed directly above submersible pump to protect pump from starting torque damage.
Includes 2 stainless steel clamps.

part	diameter	type	length	tensile strength	spool
BSR500	1/4 in.	braided	500 ft.	1000 lb.	metal
BSR1000	1/4 in.	braided	1000 ft.	1000 lb.	metal
BSR3000	1/4 in.	braided	3000 ft.	1000 lb.	wood
TSR500	1/4 in.	twisted	500 ft.	1000 lb.	metal
TSR1000	1/4 in.	twisted	1000 ft.	1000 lb.	metal
TSR3000	1/4 in.	twisted	3000 ft.	1000 lb.	wood
ESR500	7/32 in.	braided	500 ft.	700 lb.	metal
ESR1000	7/32 in.	braided	1000 ft.	700 lb.	metal

SAFETY ROPE (polypropylene)

Individually cartoned.



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800-523-0224, Fax 610-369-3580

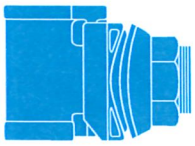
WATER SYSTEMS COUNCIL
LISTED
PITLESS ADAPTER STANDARD
PAS-97

Campbell *Pitless Adapters*

M1

part	drop pipe	casing o.d.	will support	replacement pressure seal°	master ctn
B-10	1	5-9/16 to 7	970 ft.**	L-1	12
B-80	1	8-5/8	970 ft.**	L-1	6
B-20	1-1/4	5-9/16 to 7	800 ft.**	L-2	6
B-120	1-1/4	8-5/8	800 ft.**	L-2	6
BP-10*	1	5-9/16 to 7	970 ft.**	L-1	12
BP-20*	1-1/4	5-9/16 to 7	800 ft.**	L-2	6
Pb B-10X	1	5-9/16 to 7	970 ft.**	OR-26T	12
Pb B-10XLF	1	5-9/16 to 7	970 ft.**	OR-26T	12
B-80X	1	8-5/8	970 ft.**	OR-26T	6
Pb B-20X	1-1/4	5-9/16 to 7	800 ft.**	OR-27T	6
Pb B-20XLF	1-1/4	5-9/16 to 7	800 ft.**	OR-27T	6
B-120X	1-1/4	8-5/8	800 ft.**	OR-27T	6
BP-10X*	1	5-9/16 to 7	970 ft.**	OR-26T	12
BP-20X*	1-1/4	5-9/16 to 7	800 ft.**	OR-27T	6

PITLESS ADAPTER (B-series)



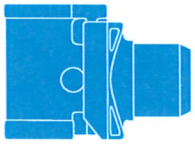
U.S. PAT. NO. 3,847,217

Pb Machined from lead-free alloys

part	drop pipe	casing o.d.	will support	replacement pressure seal°	master ctn
BF-10	1	-	970 ft.**	L-1	12
BF-10X	1	-	970 ft.**	OR-26T	12
BF-20	1-1/4	-	800 ft.**	L-2	6
BF-20X	1-1/4	-	800 ft.**	OR-27T	6

Concrete Tile models do not include external gasket, collar, or nut.

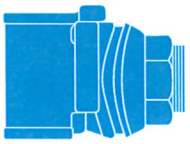
PITLESS ADAPTER (BF-series for concrete tile)



U.S. PAT. NO. 3,847,217

part	drop pipe	casing o.d.	will support	replacement pressure seal°	master ctn
B-300X	1	5-9/16 to 7	800 ft.**	OR-34T	12
B-380X	1	8-5/8	800 ft.**	OR-34T	12

PITLESS ADAPTER (B-300 series)



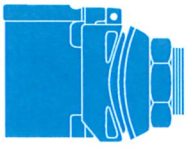
U.S. PAT. NO. 3,847,217

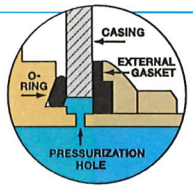
features

- All-American, highest-quality certified red-brass castings and precision machining for years of dependable service.
- Funnel-top female casting and tapered male slide for easier mating in well.
- Unique flanged gasket/collar seals tightly against casing and nipple.
- Your choice of replacement leather seals or PTFE coated O-rings **(X-models)**.

part	drop pipe	casing o.d.	will support	replacement pressure seal°	master ctn
PA800	1	5-9/16 to 7	800 lbs.	OR-PA800	16
PA825	1-1/4	5-9/16 to 7	900 lbs.	OR-PA825	12

PITLESS ADAPTER (imported)





*For installations requiring a pressurized point of attachment, a small hole between internal and external seals is utilized to maintain positive pressure at seal.

All items individually boxed.

**Feet of Schedule 40 steel pipe filled with water.

°Replacement pressure seal o-ring (OR) or leather (L)

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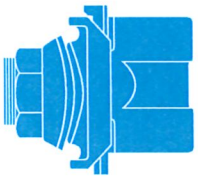
M2 Campbell *Pitless Adapters*

WATER SYSTEMS COUNCIL LISTED PITLESS ADAPTER STANDARD PAS-97

PITLESS ADAPTER (S-series)

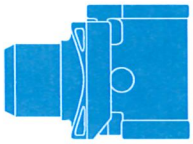


U.S. PAT. NO. 3,847,217

Ⓟb Machined from lead-free alloys

part	drop pipe	casing o.d.	will support**	replacement pressure seal°	master ctn
S-10	1	5-9/16 to 7	1500	L-1	6
S-50	1	6-5/8 to 7	1500	L-1	6
S-80	1	8-5/8	1500	L-1	6
S-20	1-1/4	5-9/16 to 7	1000	L-2	6
S-60	1-1/4	6-5/8 to 7	1000	L-2	6
S-120	1-1/4	8-5/8	1000	L-2	6
S-70	2	6-5/8 to 7	700	L-6	1
S-130	2	8-5/8	700	L-6	1
S-140	2	10-3/4	700	L-6	1
SP-10*	1	5-9/16 to 7	1500	L-1	6
SP-20*	1-1/4	5-9/16 to 7	1000	L-2	6
SP-70*	2	6-5/8 to 7	700	L-6	1
S-10X	1	5-9/16 to 7	1500	OR-26T	6
S-20X	1-1/4	5-9/16 to 7	1000	OR-27T	6
S-70X	2	6-5/8 to 7	700	OR-28T	1
Ⓟb S-70XLF	2	6-5/8 to 7	700	OR-28T	1
S-130X	2	8-5/8	700	OR-28T	1
S-140X	2	10-3/4	700	OR-28T	1
SP-10X*	1	5-9/16 to 7	1500	OR-26T	6
SP-20X*	1-1/4	5-9/16 to 7	1000	OR-27T	6
SP-70X	2	6-5/8 to 7	700	OR-28T	1

PITLESS ADAPTER (SF-series for concrete tile)



U.S. PAT. NO. 3,847,217

SF-10	1	–	1500	L-1	6
SF-10X	1	–	1500	OR-26T	6
SF-20	1-1/4	–	1000	L-2	6
SF-20X	1-1/4	–	1000	OR-27T	6
SF-70	2	–	700	L-6	1
SF-70X	2	–	700	OR-28T	1

Concrete Tile models do not include external gasket,collar, or nut.

DRAIN AND WIRE FITTING

part	discharge	casing o.d.			master ctn
DT-10X	1	5-9/16 to 7	–	–	1
DT-80X	1	8-5/8	–	–	1
DT-20X	1-1/4	5-9/16 to 7	–	–	1
DT-120X	1-1/4	8-5/8	–	–	1
DT-70X	2	6-5/8 to 7	–	–	1
DT-130X	2	8-5/8	–	–	1
DT-140X	2	10-3/4	–	–	1

Using the same quality brass castings and pressure-tight internal and external seals as our pitless adapters, this versatile tap fastens to well casing to allow well draining (liquid or gas), electrical cable insertion, bulkhead fitting, and many more uses.

features

- All-American, highest-quality certified red brass castings and precision machining for years of dependable service.
- Solid red brass castings with extra heavy walls make these our most rugged adapters.
- Tapered male and female castings are precision-matched for tight, yet easy-to-service, interlocking connection.
- Molded gasket and solid brass collar are flanged to securely seal both casing and nut.
- Wide, fine-threaded nut accommodates large wrench for tight, low-torque installation.
- Replaceable leather seals or PTFE-coated O-rings **(X-models)** in male casting.

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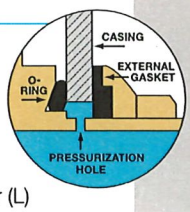
Fax 610-369-3580

*For installations requiring a pressurized point of attachment, a small hole between internal and external seals is utilized to maintain positive pressure at seal.



**Feet of Schedule 40 steel pipe filled with water.

°Replacement pressure seal o-ring (OR) or leather (L)

Campbell
Installation Accessories

PRESSURE GAUGE

part	face diam.	range	connection	pcs/ctn	master ctn
PG1	2	0-100	1/4 lm	1	Bulk
PG1T*	2	0-100	1/4 lm	1	100
PG1 1/8	2	0-100	1/8 lm	1	Bulk
PG2*	2	0-200	1/4 lm	1	100
PG3*	2	0-30	1/4 lm	1	100
PG4*	2	0-60	1/4 lm	1	100
PG5	2	0-160	1/4 lm	1	Bulk
PG6	2	0-300	1/4 lm	1	Bulk
PG7	2	0-400	1/4 lm	1	Bulk
PG8	2	0-600	1/4 lm	1	Bulk
PG9	2-1/2	0-30	1/4 lm	1	Bulk
PG10	2-1/2	0-60	1/4 lm	1	Bulk
PG11	2-1/2	0-100	1/4 lm	1	Bulk
PG13	2-1/2	0-200	1/4 lm	1	Bulk
PG14	2-1/2	0-300	1/4 lm	1	Bulk
PG16	2-1/2	0-600	1/4 lm	1	Bulk
PG20	2	0-15	1/4 lm	1	Bulk
PGV*	2	30VAC	1/4 lm	1	100
PGC*	2	30V-150P	1/4 lm	1	100
PGCBM-0*	2	0-100	1/8 cbm	1	100
PGCBM-1*	2	0-100	1/4 cbm	1	100
PGP1*	2	0-100	1/4 lm	1	100

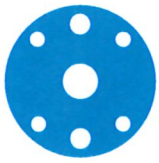
All gauges have steel cases and brass connections (except PGP1 which has a plastic case).
Gauge lenses are glass or polycarbonate.

PRESSURE GAUGE (liquid-filled)

PG1T-L*	2	0-100	1/4 lm	1	100
PG10T-L*	2-1/2	0-60	1/4 lm	1	50
PG11T-L*	2-1/2	0-100	1/4 lm	1	50
PG12T-L*	2-1/2	0-160	1/4 lm	1	50
PG13T-L*	2-1/2	0-200	1/4 lm	1	50
PG14T-L*	2-1/2	0-300	1/4 lm	1	50
PG15T-L*	2-1/2	0-400	1/4 lm	1	50
PG34T-L*	2-1/2	30-0 vacuum	1/4 lm	1	50

Glycerine-filled to reduce vibration.
Stainless steel case, polycarbonate lens, and brass connection.

TOP GUIDE



part	drop pipe	casing i.d.	pcs/ctn	master ctn
TG4A	1	4	Bulk	–
TG4B	1-1/4	4	Bulk	–
TG4 1/2A	1	4-1/2	Bulk	–
TG4 1/2B	1-1/4	4-1/2	Bulk	–
TG4 1/2T*	1	4-1/2	Bulk	–
TG5A	1	5	Bulk	–
TG5B	1-1/4	5	Bulk	–
TG5T*	1	5	Bulk	–
TG5 5/8A	1	5-5/8	Bulk	–
TG5 5/8B	1-1/4	5-5/8	Bulk	–
TG5 5/8P**	1	5-5/8	Bulk	–
TG5 5/8T*	1	5-5/8	Bulk	40
TG6A	1	6	Bulk	–
TG8A	1	8	Bulk	–

Made from molded styrene butadiene rubber.
** TG5 5/8P is molded from FDA-approvable PVC

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* Imported.

When American-made gauges are not available, imports will be substituted

Campbell

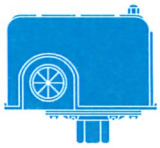
Square D Switches

S1

PRESSURE SWITCH (class 9013)

part	switch features	pcs/ pkg	master ctn
FRG2	reverse action switch	1	50
FSG2	standard	1	50
FSG2M4	low pressure cut-off	1	40
FSG2P	pulsation plug	1	50
FSG2M1	manual cut-off lever	1	40
FSG2G5	pilot light	1	50
FYG2	higher hp & pressure	1	50
GSG2	commercial	1	—
GHG2	commercial/higher pressure	1	—

All have 1/4" pipe tap.
Please specify pressure setting.
Orders of 200 or more combined switches will be direct-shipped from Square D.



PULSE PLUG

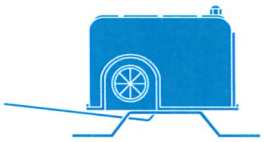
PULSE PLUG	50	—	

Nylon pulsation plug can be field-installed into FSG2, FRG2, or FYG2 switches that have a 1/4" NPSF internal connector. Not field-replaceable on FSG2G5 or other type G switches. Must be ordered in bag quantites (50 pcs per bag).

FLOAT SWITCH (class 9036)

DG2	standard (contacts close on liquid rise)	1	—
DG2R	reverse action (contacts open on liquid rise)	1	—

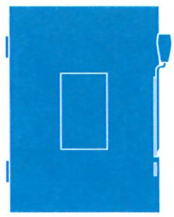
For open tank or sump applications.



SAFETY SWITCH (class 3130)

D211N	1	5

120/240VAC. Handles up to 2 hp pump. Accepts 2 screw-in fuses. 10000 RMS symmetrical short-circuit rating.



Other switches available upon request

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127 East Spring Street, P.O. Box 207
Bechtelsville, PA 19505-0207
800-523-0224, Fax 610-369-3580

Submittal Sheet
ProLiteSS Series
Water Systems Tank

Job Name: RIVERSIDE

Schedule #:

Location: PACKWOOD

Model #: CSS82

Engineer: RB Engineering

Representative:

Contractor: American Pump and Drilling

Description

ProLite SS series tanks are diaphragm type pre-charged hydro-pneumatic tanks designed for residential and commerical water wells, pressure booster, and irrigation systems

Materials of Construction

Shell: Polypropylene tank reinforced w/ fiberglass and sealed w/ epoxy resin

Diaphragm: Butyl rubber w/ copolymer polypropylene lower water chamber

Connection: Stainless steel elbow

Ratings

Max. Working Pressure:	150 PSI
Max. Working Temp:	140 F
Pre-Charge (adjustable):	38 PSI

NSF/ANSI 61
NSF/ANSI 372

Tank Specifications

Model	Diameter (inches)	Height (inches)	System Connection (inches)	Volume (gallons)	Drawdown (gallons)			Weight (lbs)
					20/40	30/50	40/60	
CSS 15	16.5	25.6	1	15	6.0	5.1	4.4	19
CSS 22	16.5	34.1	1	22	8.8	7.5	6.5	24
CSS 35	16.5	48.9	1	35	14.1	11.9	10.3	33.5
CSS 40	21.4	37.0	1 ¼	40	16.1	13.6	11.8	38
CSS 50	21.4	43.3	1 ¼	50	20.1	17.0	14.7	47
CSS 65	21.4	51.3	1 ¼	65	26.1	22.1	19.1	58
CSS 82	21.4	64.7	1 ¼	82	33.0	27.9	24.1	69.5
CSS 90	24.2	57.0	1 ¼	90	36.2	30.6	26.5	77
CSS 120	24.2	72.1	1 ¼	119	47.9	40.5	35.0	99.5

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A Swan Group Company

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For Residential, Commercial and Industrial Applications

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

Series LF3L, LF53L

Poppet Type Pressure Relief Valves for Protection Against Excessive Pressure

Sizes: LF3L: ¾" LF53L: ½"

Series LF3L and LF53L are used for protection against excessive pressure on domestic storage tanks or tankless water heaters. Similar in construction to Watts Model LF10L, the Model LF3L has no temperature relieving element. Model LF53L has the same basic design as Model LF3L except it is furnished in ½" size and does not comply with ASME requirements. Pressure range is 75-150psi (5.2-10.3 bar). Series LF3L and LF53L come in standard settings of 75, 100, 125 and 150psi (5.2, 6.9, 8.6 and 10.3 bar). These Pressure Relief Valves are popularly used in conjunction with the Model LF210 gas shutoff valve on gas water heaters to shut off gas to heater if water heater temperature exceeds 210°F (99°C). The LF3L and LF53L features Lead Free* construction to comply with Lead Free* installation requirements.

Features

- Furnished with test levers
- Relieves excessive pressure on storage tanks
- Relieves excessive pressure on tankless water heaters
- Compatible with Model LF210 gas shutoff valves

Models

Model LF3L Listed and certified by the National Board of Boiler and Pressure Vessel Inspectors to ASME section IV & by CSA to ANSI Z21.22/CSA 4.4

Model LF53L (Does not comply with ASME requirements) Listed and certified by CSA to ANSI Z21.22/CSA 4.4

Approvals

ASME*, CSA, NB* (*LF3L only)

Materials

Body: LF3L - Lead Free* copper alloy
LF53L - Lead Free* cast copper silicon alloy
Spring: Stainless steel
Disc: Silicone

LF3L

LF53L

Pressure

Pressure range: 75-150psi (5.2-10.3 bar)

Standard settings: 75, 100, 125 and 150psi (5.2, 6.9, 8.6 and 10.3 bar)

NOTICE

Maximum system operating pressure must not exceed 75% of valve set pressure.

Dimensions – Weights

MODEL	SIZE	HEIGHT		WIDTH		WEIGHT	
	in	*in*	*mm*	*in*	*mm*	*lbs.*	*gms*
LF3L	¾	3 11/64	80	1 5/32	40	13/32	181
LF53L	½	3½	89	1⅞	48	½	227

Capacity

MODEL	ASME CAPACITY (BTU/HR)				CSA CAPACITY
	75PSI	100PSI	125PSI	150PSI	(BTU/hr)
LF3L	200,000	257,000	314,000	370,000	200,000
LF53L	N/A	N/A	N/A	N/A	15,000

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

NOTICE

Inquire with governing authorities for local installation requirements

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

USA: T: (978) 689-6066 • F: (978) 975-8350 • Watts.com
Canada: T: (905) 332-4090 • F: (905) 332-7068 • Watts.ca
Latin America: T: (52) 81-1001-8600 • Watts.com

DO NOT REMOVE THIS WARNING TAG

WARNING

FAILURE TO FOLLOW INSTRUCTIONS BELOW CAN RESULT IN SERIOUS PERSONAL INJURY, DEATH AND/OR SEVERE PROPERTY DAMAGE

This Relief Valve is a Safety Valve designed to discharge water in the event of unsafe pressure build up.

INSTALLATION

In Accordance with ANSI Z21.22

No valve is to be placed between the safety relief valve and the tank. A discharge line shall be connected to the outlet of the valve and shall pitch downward from the valve. Discharge line shall terminate through plain (unthreaded) pipe with at least a 6" (152mm) air gap from building drain or other approved location where any discharge will be clearly visible. In no case may a discharge line be directly connected to a sewer line. No reducing coupling or other restriction shall be installed in the discharge line. The discharge line shall be installed to allow complete drainage of both the valve and the line. Discharge line material must conform to local plumbing codes or ASME requirements. Excessive length over 30' (9.14m), use of more than four elbows, or reducing discharge line size will cause a restriction and reduce the discharge capacity of the valve.

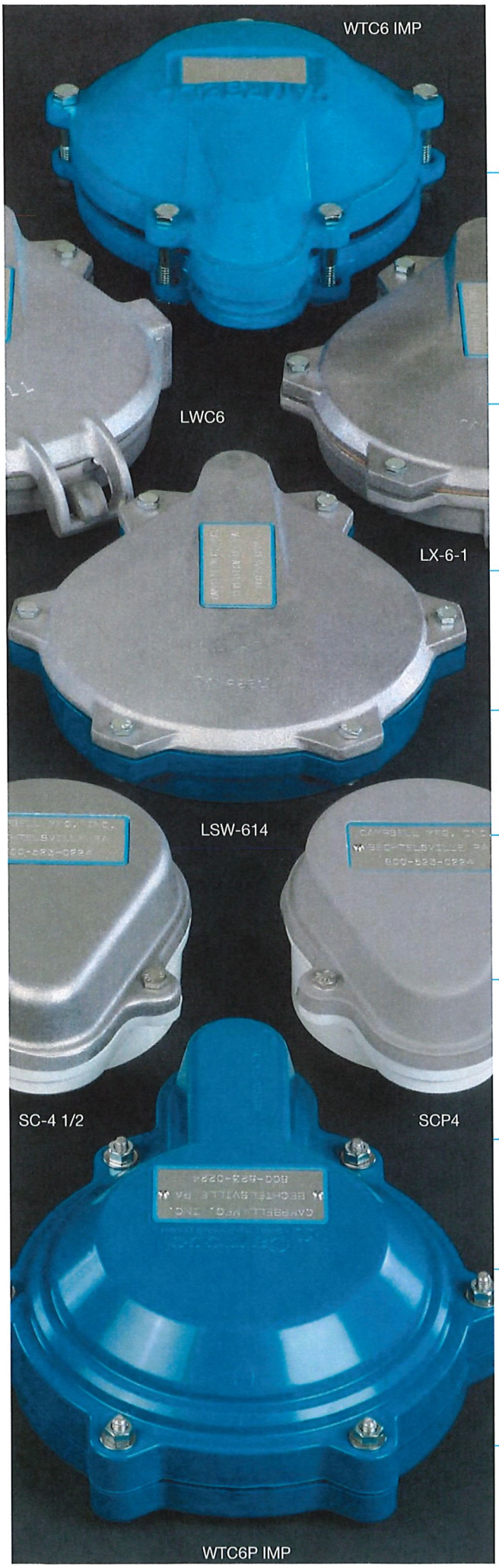
INSPECTION / MAINTENANCE

- At least once per year the water heater Owner must manually operate this valve to ensure wa terways are clear.
- Before lifting the lever, check to see that the discharge line is securely attached and properly installed to prevent injury or property damage.
- AVOID CONTACT WITH THE HOT WATER DISCHARGED DURING THE TEST TO PREVENT PERSONAL INJURY.
- If no water flows when the lever is operated, TURN OFF THE WATER HEATER (see water heater instruction manual) and CALL A PLUMBER IMMEDIATELY.
- At least every three years this valve should be inspected by a licensed plumbing contractor or quali fied service technician and replaced if necessary.
- If discharge occurs during normal operation CALL A PLUMBER IMMEDIATELY. Discharge in dicates an unsafe temperature or pressure con dition or a problem with this valve.
- Repair or alteration of this valve by anyone is prohibited by national safety standards/local codes.

Watts Regulator Co.

Tag-3L-RWH 0334 EDP#1915377

Printed in the U.S.A.



WATER SYSTEMS COUNCIL LISTED PITLESS ADAPTER STANDARD PAS-97

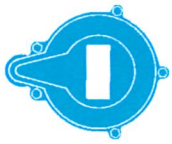
Campbell
Watertight Well Caps

L1

part	nom. well size	casing o.d.	conduit connect.	vent	pcs/ ctn	
WTC6	6 & 6-1/4	6-5/8	1 npt	9/16 screen[c]	1	**CAST IRON WELL CAP**
WTC6M	6 & 6-1/4	6-5/8	1 npt	9/16 screen & 1 npt[d]	1	
WTC6 IMP*	6 & 6-1/4	6-5/8	1 npt	9/16 screen[c]	1	
WTC6G	6 & 6-1/4	6-5/8	1 npt	9/16 screen[c]	1	
WTC6G IMP*	6 & 6-1/4	6-5/8	1 npt	9/16 screen[c]	1	

1/4" grounding lug on ring meets national electrical code requiring grounding of submersible pump.

WTC6G and WTC6G IMP caps are imported.



U.S. PATENT NO. 6,105,669

WTC6P	6 & 6-1/4	6-5/8	1-1/4 npt	9/16 screens (2)[c]	1	**ABS WELL CAP**
WTC6P IMP*	6 & 6-1/4	6-5/8	1-1/4 npt	9/16 screens (2)[c]	1	
WTC6P MLD*	6 & 6-1/4	6-5/8	1-1/4 npt	9/16 screens (2)[c]	1	
WTC6P-M	6 & 6-1/4	6-5/8	1-1/4 npt	9/16 screens (2)[c] & 1 npt[d]	1	
WTC6P-M IMP*	6 & 6-1/4	6-5/8	1-1/4 npt	9/16 screens (2)[c] & 1 npt[d]	1	

U.S. PATENT NO. 6,105,669

LP-4-1	4	4-1/2	1 npt	conduit[a]	1	**ALUMINUM WELL CAP (low profile)**
LP-5-1*	5	5-9/16	1 npt	conduit[a]	1	
LP-6-1*	6 & 6-1/4	6-5/8	1 npt	conduit[a]	1	
LX-4-1	4	4-1/2	1 npt	5/8 screen[c]	1	
LX-5-1*	5	5-9/16	1 npt	5/8 screen[c]	1	
LX-6-1*	6 & 6-1/4	6-5/8	1 npt	5/8 screen[c]	1	

LSW-614*	6-1/4 pvc	6.90	1 npt	5/8 screen[c]	1	**ALUMINUM/ABS WELL CAP (low profile)**
LSW-614V	6-1/4 pvc	6.90	1 npt	5/8 screen & 3/4 npt[b]	1	

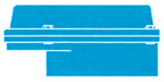
Constructed of injection-molded ABS plastic and aluminum.
Cap base can be solvent-welded directly to pvc well casing.

WT4*	4	4-1/2	1 npt	5/8 screen[c]	Bulk	**ALUMINUM WELL CAP (WT-style)**
WT5*	5	5-9/16	1 npt	5/8 screen[c]	Bulk	

Available in a set with T-series Pitless Adapter (see Section M)

SC-4*	4 pvc	4.50	1 npt	5/8 screen[c]	Bulk	**ALUMINUM/ABS WELL CAP (SC-style)**
SC-4 1/2*	4-1/2 pvc	4.95	1 npt	5/8 screen[c]	Bulk	
SC-5*	5 pvc	5.56	1 npt	5/8 screen[c]	Bulk	

Constructed of injection-molded ABS plastic and aluminum.
Cap base can be solvent-welded directly to pvc well casing.
Available in a set with T-series Pitless Adapter (see Section M)

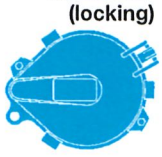


SCP4*	4 pvc	4.50	1 npt	5/8 screen[c]	Bulk	**ABS WELL CAP (SC-style)**

Constructed of injection-molded ABS plastic.
Cap base can be solvent-welded directly to pvc well casing.

LWC6*	6 & 6-1/4	6-5/8	1 npt	5/8 screen[c]	1	**ALUMINUM WELL CAP (locking)**

1/2" padlock locator holes to maintain well security.



* Custom imprinting included in price
(See page L2 for ordering information)
[a] Vent provision in conduit opening
[b] Tap in cover
[c] Brass screen in bottom casting
[d] Plugged tap in cover for large vent or well monitoring

Campbell Manufacturing, Inc.
127 East Spring Street, P.O. Box 207
Bechtelsville, PA 19505-0207
800-523-0224, Fax 610-369-3580

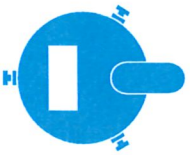
L2

Campbell
Ventilated Well Caps

WATER SYSTEMS COUNCIL LISTED PITLESS ADAPTER STANDARD PAS-97

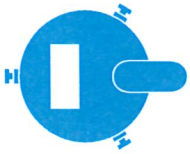
	part	nom. well size	casing o.d.	conduit connection	master ctn
CAST IRON CONDUIT WELL CAP (C-style)	C4	4	4-1/2	1-1/4	1
	C5	5	5-9/16	1-1/4	1
	C5 5/8	5-5/8	6	1-1/4	1
	C6[a]	6 & 6-1/4	6-5/8	1-5/8	1
	C6 IMP*[a]	6 & 6-1/4	6-5/8	1-5/8	1

[a] Accommodates 250 lb. poly conduit pipe.



CAST IRON CONDUIT WELL CAP (C-style, imported)	C5-6U[a]	5-5/8, 6 & 6-1/4	6 to 6-5/8	1-3/8	Bulk
	C5-6U IMP*[a]	5-5/8, 6 & 6-1/4	6 to 6-5/8	1-3/8	Bulk

[a] Accommodates 250 lb. poly conduit pipe.

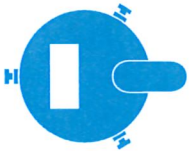


ALUMINUM CONDUIT WELL CAP (C-style)	C4A*	4	4-1/2	1-5/16	Bulk
	C5A*	5	5-9/16	1-5/16	Bulk

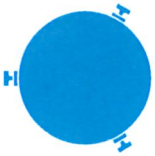
Available in a set with T-series Pitless Adapter (see catalog Section M)

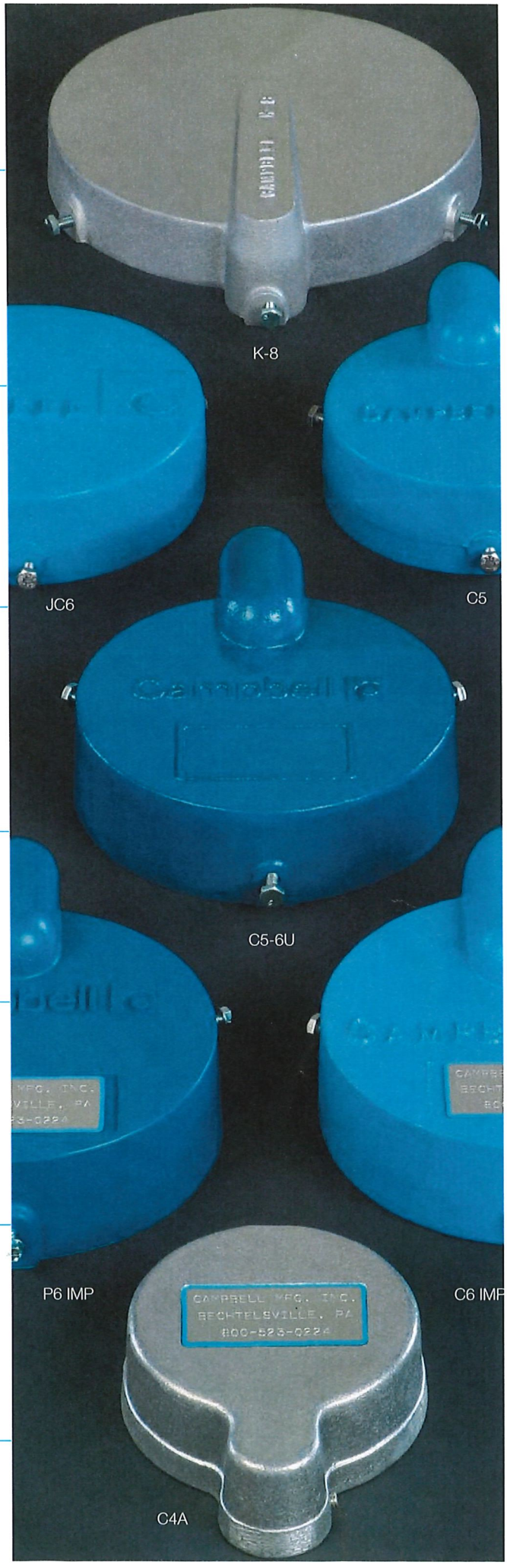
ALUMINUM CONDUIT WELL CAP (K-style)	K-6	6 & 6-1/4	6-5/8	1-1/4 i.d.	6
	K-8	8	8-5/8	1-1/4 i.d.	3
	K-10	10	10-3/4	1-5/8 i.d.	1

ABS CONDUIT WELL CAP (P-style)	P6	6 & 6-1/4	6-5/8	1-1/8	Bulk
	P6 IMP*	6 & 6-1/4	6-5/8	1-1/8	Bulk



CAST IRON NON-CONDUIT WELL CAP	JC4	4	4-1/2	–	1
	JC5	5	5-9/16	–	1
	JC5 5/8	5-5/8	6	–	1
	JC6	6 & 6-1/4	6-5/8	–	1





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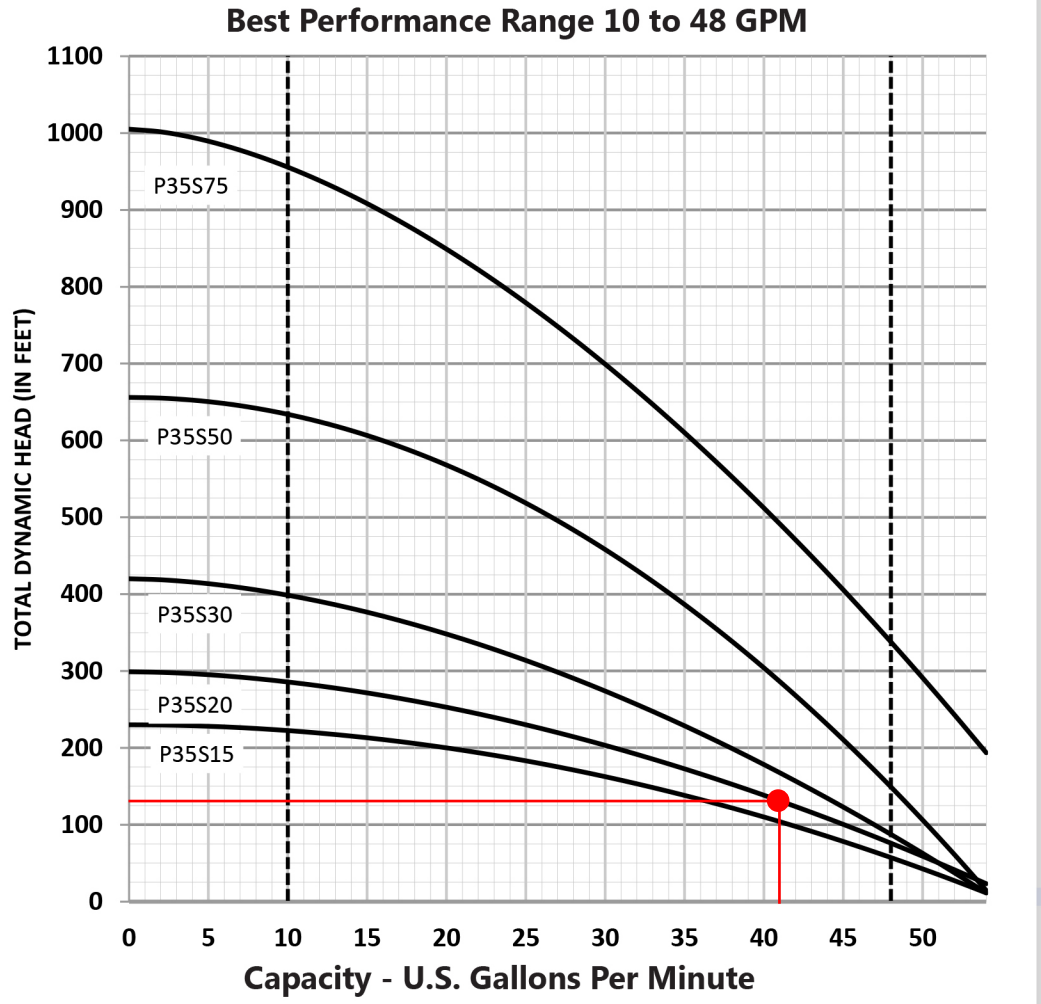
Bechtelsville, PA 19505-0207
800-523-0224, Fax 610-369-3580

*Custom imprinting included in price.
To order: Include printing information (maximum 3 lines; 28 spaces per line).
Minimum order is 24 caps.

35GPM

Discharge Size: 2" NPT



Pump End Only	GPM	HP	Stages	Discharge Size	Weight
P35S15	35	1.5	8	2" NPT	9
P35S20		2	10		10
P35S30		3	14		13
P35S50		5	22		19
P35S75		7.5	43		27

35GPM
Discharge Size: 2" NPT

Pump Model	PSI	Depth to Water Level in Feet - Capacity in U.S. Gallons Per Minute																										SHUT OFF
		20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	520	560	600	
P35S15	0		49	47	45	42	39	36	32	26	19																		FEET
	20	47	44	42	38	34	31	24	17																				230
	30	44	41	38	34	30	23	15																					
HP	40	41	37	33	29	22	14																						PSI
1-1/2	50	37	33	28	21	12																							100
	60	33	27	20	11																								
P35S20	0			48	47	45	43	40	37	34	32	28	22																FEET
	20	48	46	44	42	39	37	33	31	26	21	14																	299
	30	46	44	41	39	36	33	30	25	20	13																		
HP	40	43	41	39	36	33	29	24	19	11																			PSI
2	50	41	38	35	33	29	24	18																					129
	60	38	35	32	28	23	16																						
P35S30	0				48	47	45	44	42	40	39	37	34	33	31	28	24	20	15										FEET
	20	49	48	46	45	43	42	40	38	36	34	32	30	27	23	19	13												420
	30	48	46	45	43	41	40	38	36	33	32	29	26	22	18	12													
HP	40	46	44	43	41	39	37	35	33	32	29	25	22	17	11														PSI
3	50	44	43	41	39	37	35	33	31	28	25	21	16																182
	60	42	41	39	37	35	33	31	28	24	20	15																	
P35S50	0					49	48	47	46	45	44	43	43	42	41	39	39	38	37	36	34	32	30	29	27	25	24	22	FEET
	20	0	49	48	47	47	46	45	44	44	43	42	42	41	40	37	37	36	35	35	32	29	27	25	23	21	12		656
	30	49	48	47	46	46	45	44	44	43	42	42	41	40	39	36	36	35	34	34	30	28	26	25	23	16			
HP	40	48	47	46	45	45	44	44	43	42	40	40	39	38	37	35	35	34	33	33	27	24	22	19	16	11			PSI
5	50	47	46	45	44	44	43	43	42	41	39	39	38	37	36	33	33	32	32	31	25	20	19						284
	60	46	45	44	43	43	42	42	41	40	38	38	37	36	35	32	31	30	30	29	22	18	15						

Pump Model	PSI	Depth to Water Level in Feet - Capacity in U.S. Gallons Per Minute																										SHUT OFF
		50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	1200	1250	1300	1350	
P35S75	0					47	46	45	43	41	39	37	35	33	31	27	23	19	14										FEET
	20			49	48	46	45	43	41	41	37	35	33	31	28	24	19	14											1005
	30		49	48	47	45	44	42	41	39	36	34	32	29	26	22	17	12											
HP	40		49	48	46	45	43	42	40	38	35	33	31	28	24	20	15												PSI
7.5	50		48	47	46	44	42	41	39	37	34	33	30	26	22	17	12												435
	60	49	48	46	45	43	42	40	38	36	33	31	28	24	20	15													

Pump Capacity is in U.S. Gallons Per Minute

NO HASSLE **5 YEAR WARRANTY** **NO PAPERWORK**

To prove our confidence....

We back each pump with a 5 year standard warranty when installed by a licensed water systems professional.

Preventive maintenance program

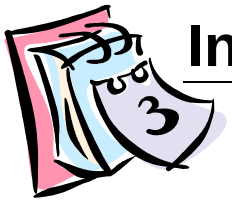
Guide for Group B public water systems using groundwater

August 2013

DOH 331-351b
Revised

Contents

If you need this publication in alternate format, call (800) 825-0127. For TTY/TDD, call (800) 833-6388.



Introduction

Why is a preventive maintenance program important to me?

A preventive maintenance program can prevent problems by helping you maintain your system properly. Knowing the ongoing needs of your system and taking action to meet those needs will enhance public health protection, improve your system's reliability, and reduce the costs of maintaining your water system.

How will this preventive maintenance program guide help me?

This guide provides a schedule of routine operation and maintenance (O&M) tasks for Group B drinking water systems using groundwater supply.

How is this guide organized?

This guide has four major sections. We designed each section to guide you through developing a preventive maintenance program for your water system.

1. **Recommended Preventive Maintenance**: A narrative of daily, weekly, monthly, and annual operation and maintenance (O&M) tasks.
2. **Recommended Websites and Publications**: Resources to help you find more detailed information or guidance.
3. **Troubleshooting Guides:** Guidance to help you troubleshoot problems with your water system. We organized it by water system component so it is easier to find troubleshooting guidance for a specific component.
4. **Recommended Operation and Maintenance Schedules**: We organized the O&M section by water system component so you can post the schedules where you can see the tasks you need to do. We did not define all tasks in the checklist because they are self-explanatory.

How can I customize these tools for my system?

Based on your system's requirements, you can add, subtract, or modify tasks and logs from this guide to meet your preventive maintenance program needs. Maintain a log of all preventive maintenance completed on your water system. It is also important to document quantitative measurements, such as water levels, pressure readings, and so on. Photographs with adequate field notes or videotape with audio explanation can be valuable tools.

We cannot over emphasize the importance of keeping records and documenting maintenance activities. Consistent forms and checklists help to ensure that you inspect and evaluate the same points each time. Organize and store records so they are readily accessible to verify that your water system is performing maintenance tasks and operational surveillance properly. Simple ways to organize your records include filing cabinets or card index files.

Recommended preventive maintenance

Daily
Weekly
Monthly
Quarterly
Biannually
Annually
As needed

Daily

Read source water meter and record water production. You should have a working, properly calibrated master water meter at each source of supply to accurately measure and record production. Take routine source-water meter readings and record them in a log. Calculate the amount of water used during a time period, usually daily or weekly, by subtracting the previous meter reading from the current meter reading. You can use data on your water system's water use throughout the year to evaluate source capacity, water rights, unusually high or low flows, excessive leakage, reduced pump output, unauthorized water use, and the adequacy of the treatment system capacity.

Measure and record chlorine residuals. Public water systems adding chlorine on a continuous basis—either for disinfection or in support of another treatment objective, such as iron removal—should monitor and record the free chlorine residual level daily. It is essential to understand the treatment objective for chlorine addition. The frequency of free chlorine residual sampling, and the required level of chlorine, will vary depending on the reason the system adds chlorine.

- **Chlorination for disinfection**
  Some drinking water supplies require disinfection because of concerns over source water quality. Systems with such sources must monitor and record free chlorine residual each calendar day at the "point of entry" to the distribution system, which is usually at or before the first customer connection downstream of the source. We will specify the minimum residual concentration required at the point of entry.

  Some drinking water supplies require disinfection because of concerns over the distribution system water quality. Applying chlorine at the source is the best way to ensure a consistent and reliable level of chlorine in the distribution system. Such systems must monitor and record free chlorine residual each working day (Monday – Friday, except holidays). The system must maintain free chlorine residual in the distribution system at a detectable level. We recommend a minimum chlorine residual of 0.2 milligrams per liter (mg/L).

- **Other treatment objectives**
  Some drinking water supplies must add chlorine to support a treatment objective other than disinfection (iron removal, for example). Such systems must monitor and record free chlorine residual each working day (Monday – Friday, except holidays), but we may approve of a reduced monitoring schedule.

Inspect chlorinators for proper operation. Make sure the chemical feed pump is not air locked and the chemical feed suction line is not plugged. Re-fill the chlorine solution tank as needed. Use proper personal protective gear when handling chemicals. Chemicals used in water treatment may be harmful to human health if not used properly. Make Material Safety Data Sheets available to ensure proper usage and personal protection.

Use an EPA-approved field test kit to measure free chlorine residuals. If you have not been testing the free chlorine residuals in your system, you will need to start by purchasing a diethyl-p-phenylenediamine (DPD) free chlorine residual test kit. Specifically, you will need a kit that reads from 0-3.5 parts per million (ppm) of free chlorine with a smallest reading increment of 0.1 ppm or mg/L. You

may purchase a kit from a water treatment company or a business that sells lab equipment, such as Hach Company (1-800-525-5940). Digital colorimetric test kits are available that offer greater accuracy if needed. Keep the manufacturer's instructions on proper use of the test kit in your Operations and Maintenance Manual and follow the recommended procedures. Note that high levels of manganese in the source water can interfere with these tests. Oxidized manganese will react directly with the DPD reagent developing a darker red color, resulting in a false (too high) free chlorine residual reading.

Conduct security checks. You should inspect source, pumping and storage facilities daily to ensure they continue to provide adequate protection against vandalism and unauthorized entry. Use appropriate fencing, locks, and locked well covers to protect the facilities from stray livestock and tampering. Post warning signs to deter trespassing. Warning signs should indicate a building and phone number for reporting incidents. Inspect fencing and gates for damage and needed repairs. Check hatches, locks, doors, windows, and vents for signs of intrusion or vandalism. Check all security lighting and alarms to ensure proper operation. Make sure all well caps, seals, and vents are intact and sealed. If you suspect any tampering, immediately contact local law enforcement and our regional office.

Check and record water levels in storage tanks. You should check the water level in each atmospheric storage tank and the pressure in your pressure tank system each day to ensure tank levels are within normal operating range. Check for evidence of overflow, erosion under the splash pad, warning lights, wet ground, and so on. If there is evidence of your reservoir overflowing, your pump controls may be malfunctioning. If the tank's level is below normal operating conditions, there may be a problem with your source of supply or water level controls.

Inspect wellheads. Wellhead covers, or seals, keep contaminated water and other material out of the well. Visually inspect all well covers and pump platforms. They should be elevated above the adjacent finished ground level, sloped to drain away from the well casing, and free of cracks or excessive wear. Below grade, wellheads can become flooded seasonally or after severe weather. Check for and remove any potential microbiological or chemical contaminant threats from within 100 feet of the well. For example, damaged electrical conduits can open a pathway for contaminants to enter the well casing.

Record well pump run times and pump cycle starts. If available, you should use the pump run hour meters and cycle counters on the control panel to record the running times and number of cycle starts for your well and booster pumps. You should take these readings about the same time everyday and record them in a daily well pump log. Comparing daily numbers will alert you to potential pump or pressure tank problems. If a pump cycles on-off more than 6 times an hour, it may indicate a bladder failure in a bladder tank or a "water-logged" condition in a hydropneumatic tank. High frequency pump cycling wears out the pump motor, switches, and controls. Many water systems use a pump alternator or lead/lag pump controllers. You can use the pump-run hour meter and pump cycle counter to verify these control systems are working properly.

Check for leaks and fix them immediately. Excess moisture in a well house or pump house can lead to premature failure of electrical control systems and create unsafe conditions for operators. Fix any leak you see as soon as possible.

Make sure the heating and cooling systems are working. You should check heaters daily throughout the winter to ensure they work properly. Make sure wiring and heaters are above floor level and not placed where water leakage could cause a safety hazard, an electrical outage, or short any breakers. Check ventilation and cooling systems during the hottest portion of the year to be sure there is proper ventilation in the pump house. Extremely high temperatures may damage electric motors.

Weekly

Check and record water levels in hydropneumatic pressure tanks. Pressure tanks come in all shapes and sizes. Maintaining pressure in these tanks is important for maintaining adequate pressure to the consumers. Hydropneumatic tanks can overfill, or waterlog, at times affecting overall system pressure. Monitoring pressure can help an operator identify leaks, open valves, and even well pump problems. Hydropneumatic tanks should have a sight tube installed so you can visually check the water level in the tank. Often, condensation that forms where water cools the metal on the lower portion of the tank makes the water level obvious. You can also detect this temperature difference by touch.

Record the pumping rate for each well or source water pump. Record the pumping rate from your well or source water pumps. You can do this if your system has a meter that registers flow. A change in pumping rate can indicate a pump problem. Remember, pumping rates will vary based on the water level in the well. For example, the pump produces less when the well is drawn down from the static water level to the deepest pumping level or the pump is pumping against a high head.

Inspect booster pump stations. Check on the condition of the pumps, such as vibration, heat, seal, and controls to ensure that booster pumps are operating properly. Take care when checking how hot a pump or motor may be. If you have two or more booster pumps, the pump operating times should be roughly equal. You can accomplish this automatically with a lead-lag controller, or by manually switching the lead pump on a set schedule. Check and record meter readings and pressure gauge readings on suction and discharge sides of pumps.

Check water pressure in each well house and each pump house. Check the system pressure in the well house and where you have booster pumps. You **s**hould have accurate gauges to monitor the performance of a pressurized water system. Pressure gauges should be on the suction and discharge lines of pumps. Pressure tanks should have pressure gauges on the discharge lines. You should check the gauges regularly and replace if damaged.

Monthly

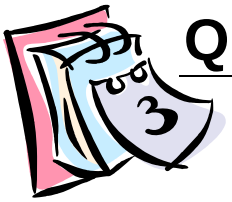
Inspect well pumps, motors, and controls. System operators should always be on the lookout for any defects in the system. Look, listen, and feel for unusual sights, sounds, or vibrations. Make sure pump seals are intact and the system is not running hot. Check all timers to ensure that pump operating times are equalized. Operate the controls manually to verify that they are working. When you shut down or turn off equipment for repairs, make sure it won't start up accidentally and cause injury. Observe the function of each control valve and pressure switch,

Check sump pumps, and well and pump house flood prevention or detection systems. Large leaks in a well or pump room can damage motors and other equipment and create unsafe conditions for operators. Leaks may also open pathways for contaminants to enter the water supply. Check any sump pumps for proper operation, and ensure proper operation of any internal leak detection system.

Read customers' meters. If your customers have meters, you should read them monthly or with your billing cycle, total them, and compare them to your system's master meter.

Read electric meter at pump house and record. Monitor and note any unusual or unexpected changes in electricity use over time. If pumping accounts for a large proportion of your system's energy use, track water production and compare it to energy use. In the winter, you will also need to consider energy use for heating. High meter readings can indicate that your booster or well pumps are working harder to perform their jobs. If so, that could mean maintenance is required now, or at least soon.

Maintain a 30 to 60 day supply of chlorine. Rotate stock to reduce decomposition and formation of unwanted byproducts, such as chlorite or chlorate. Sodium hypochlorite will lose strength over time. It will also lose strength when exposed to high temperatures or sunlight. For example, the rate strength is lost doubles with every 5° C rise in temperature. Strong light, especially direct sunlight, causes sodium hypochlorite to break down. Stronger solutions can also lose their strength faster than weak solutions. For example, a 15 percent solution stored under cool, dark conditions might lose 0.1 percent strength over a week, while in sunlight it could drop from 15 percent to 12 percent in one day. Because of this, you should always store your stock in containers with tight lids under cool, dark conditions. You should also consider the costs of ordering and storing large amounts of stock versus a smaller one- to two-month supply. Remember, when your stock loses strength in storage, you lose money.



Quarterly

Clean pump house and grounds. Keeping your pump house and grounds clean will help with overall system maintenance and operation. If dirt gets into lubricants, it can reduce the useful life of bearings. Dirt and moisture also will form an insulating coating on motor windings and can cause motors to burn out. In addition to cleaning, screen all drain and vent openings in the building to keep animals and insects out. During the summer, mow the areas around the pump house and storage tanks. Make sure grounds maintenance addresses fire hydrant accessibility. You should develop a weekly cleanliness log card to record your inspections.

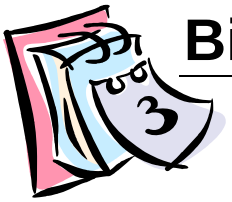
Inspect and clean chlorine solution feed lines and solution tanks. To ensure your chlorine feed system functions properly, inspect the lines for clogs or kinks and make sure the solution tanks are clean. Regular cleaning of the chlorine feed systems will help prevent many breakdowns in this equipment. Inert solids will build up sediment on the bottom of the solution tank and can clog the foot valve or damage the chlorinator.

Calibrate chlorinators. At least every three months, and particularly after the chlorinators have been overhauled, the pumps should be re-calibrated to ensure they deliver the right amount of chlorine solution to the system. Measure the amount of solution the pump withdraws over a given time period, record this value and speed/stroke length settings, and compare this rate with the desired feed rate. Refer to the manufacturer's instructions to adjust the feed pump accordingly. Be sure to record any new speed and stroke settings anytime you make a change.

Inspect and test standby power generation systems. You should test your emergency power generators and switchover controls periodically to ensure they are in proper operating condition.

Follow the manufacturer's maintenance recommendations. You should keep written records of the checks, operational tests, and maintenance performed. The manufacturer may recommend testing more frequently than once every three months.

Inspect storage tanks for sanitary deficiencies. You should inspect storage tanks to ensure they protect drinking water from contamination. Be sure to document the inspection, including photographs that will be useful for the next routine sanitary survey. Check vent screens for any openings to prevent small animals, bats, birds, insects, debris, dust, or organic matter from entering the tank. Check overflows for tight-closing flap valves or intact screens. Check the condition of the storage tank and look for cracks, structural damage, leaks, corrosion, and cathodic protection. Check the condition of the access hatch inner seal.



Biannually

Exercise half of all mainline valves. It is important to exercise all mainline valves in the system at least once a year to ensure you can locate them and confirm that you can open and close them during an emergency shutdown. You should exercise half of the mainline valves in the spring and the rest in the fall. Record the number and direction of turns to closure. Be sure to describe the condition (rusted, new, leaking, failing) of each valve in the appropriate column in a logbook. You should develop a map that identifies the valves and their locations. Keep this information in a secure place. It is important to be able to isolate the system or sections of the system. Be sure to schedule any failures for repair. You should develop forms to track the valve inspections and repairs or to note any scheduled repairs.

Operate all valves inside the well house, treatment plant, and pump house. You should routinely inspect and exercise all valves in a system. The frequency of inspection depends on the type of valve, but you should inspect the valves at least twice a year. The inspection should include completely closing, reopening, and re-closing the valve until it seats properly. Record the number and direction of turns to closure. Be sure to schedule leaking or damaged valves for repair. Use a logbook to track inspections. Update the log card routinely throughout the year.

Check pressure relief valves. All pressure tanks in public water systems must have an American Society of Mechanical Engineers (ASME) certified pressure relief valve (PRV) to protect them for overpressure conditions. Approved PRVs have tags indicating the ASME status and levels you can use to verify function. Use caution and follow the manufacturer's procedures. For more information, see ***Pressure Relief Valves on Pressure Tanks*** **(331-429)**.

Check and record static and pumping levels of each well. This important task will determine the reliability of the aquifer and establish baseline information that can be useful if others tap into the aquifer or take actions that will affect it, such as gravel mining. The static level is the water level in a well when the pump is off. The pumping level is the water level while the pump is operating. You can check these levels by using bubbler lines, electrical sensors, or manual drop lines. You should measure the pumping level at various stages of pumping, and during both the low demand and high demand times of the year. You should also measure the recharge time, which is the time it takes the water level in the well to return to the static level. You must disinfect and handle all equipment in a way to prevent contamination of the well. You should develop a static and pumping level logbook.

Inspect chemical safety equipment and repair or replace as needed. Review the use of all safety equipment and update safety training once each year. You should check and test the chemical safety equipment at least once each year to ensure it is operable. Follow the manufacturer's instructions on the proper upkeep of all safety equipment, including portable ventilators or respirators, safety harnesses or belts, goggles, gloves, hard hats, and protective clothing. You should also follow the manufacturer's instructions when calibrating detection devices for hazardous gases. Repair or replace all equipment as needed. Review all safety procedures. You should develop a safety logbook to record routine safety maintenance.

Annually

Flush the distribution system. You should flush the entire system in one direction, outward from plant or storage facility, at least once a year, depending on the quality of your source water. Systems with excessive iron or manganese that do not treat to remove these minerals may need to flush as often as monthly. Flushing clears any sediment in the lines. Use a logbook to track when you completed flushing.

Perform preventive maintenance on well house and pump house buildings. You should paint facility piping, buildings, and tanks regularly to prevent deterioration. Store all pipes, plumbing fittings, chemicals, tools, and other materials in a safe place. Check well house ventilation to ensure there are no blockages and that fans are operable. Inspect for excessive rust on exposed metal on pressure tanks, pipes, valves, controls, and fans that may be caused by corrosive chlorine vapors and poor ventilation. Deep pitting in pressure tank walls can compromise the structural integrity of the vessel. You can check the wall thickness with ultrasonic testing devices.

Inspect, clean, and repair control panels in well house. You should inspect the control panels in the pump house and treatment plant at least once a year for corrosion and other problems that could cause shorts or failures. Clean control panels carefully with air. Repair the panels if needed.

Overhaul chlorinators, including O-rings, check valves, and diaphragms. You should overhaul chemical feed pumps completely at least once a year. The overhaul should include cleaning the feeder head, cleaning and checking all valves and O-rings for wear, and cleaning and checking the condition of check valves and pump control valves. Replace any worn-out parts, including diaphragms. Keep spare parts on hand, so you can repair breakdowns quickly and replace worn parts when you disassemble the feeder for cleaning. You should keep a chemical feed pump repair and spare parts kit in the treatment building. Recalibrate the chlorinators to ensure they deliver the appropriate amount of chlorine solution to the system.

Review your emergency response plan. Review all contacts for accuracy, make sure all equipment is working, and ensure all procedures match the plant conditions, as they presently exist. Contact your local emergency response agency to update contacts, new processes, or chemical inventories.

Test each alarm. Make sure each alarm system is working properly.

Maintain air compressors. Air compressors often are used with water level controls to maintain the proper air/water balance in hydropneumatic tanks. To maintain airflow, you must keep the air intake filters clean. Replace and thoroughly clean dirty clogged filters. Moisture traps built into the filter/regulator keep moisture and dirt particles out of the pressure tank. Follow the manufacturer's instructions when cleaning and replacing air filters, and checking moisture traps. You must cover belt-driven air compressors with safety guards. Unprotected belts can cause serious injuries. Check air compressors and motors for any signs of malfunction. You should investigate unusual noises, vibrations, odors, and heat generation immediately; they can indicate mechanical problems. You should evaluate compressors that do not reach preset tank pressure. Bearings on most air compressors need lubrication. You must use food-grade oils and lubricants to prevent contamination of the water in the pressure tank.

As needed

Perform storage tank maintenance. Maintenance activities include cleaning, painting, and repairing structures. State drinking water rules require adherence to American Water Works Association (AWWA) Standards, National Sanitation Foundation (NSF), and American National Standards (ANSI) for disinfection procedures and approval of coatings.

Inspect storage tanks for defects. Both interior and exterior inspections are needed to ensure maintenance of physical integrity, security, and high water quality. The type and frequency of the inspection depends on the type of tank, its susceptibility to vandalism, age, condition, and time since last cleaning or maintenance, history of water quality, plus other local criteria. Exterior inspections for obvious signs of intrusion or vandalism might occur daily or weekly. Periodic inspections of the storage tank for cracks, structural damage, integrity of hatches and vents, leaks, corrosion, and cathodic protection might occur monthly or quarterly. You should conduct a comprehensive inspection of the interior whenever you drain the tank for cleaning. Industry standards recommend a comprehensive inspection of tanks—inside and out—every five years, except for newly constructed tanks. You should inspect a new tank within 10 years of service and every five years thereafter.

Clean storage tanks. Thoroughly clean tanks after any construction, maintenance, or repairs. Use a high-pressure water jet, sweep, scrub, or other methods to clean wall and floor surfaces thoroughly. You should flush all water and dirt from the tank. There are several AWWA-approved ways to disinfect a storage tank after you take it out of service for cleaning, inspection, or repairs. Here is the simplest way:

AWWA Standard C-652 Chlorination Method 3. Broom-clean the bottom of the tank. Then begin to add potable water until the tank is about 5 percent full. Next, add the appropriate quantity of chlorine directly into this water. The amount of chlorine you add should result in a free chlorine residual between 2.5 and 3.0 parts per million when the tank is completely full. If you use regular household chlorine bleach (6 percent chlorine by weight), add 1 gallon for every 20,000 gallons of tank capacity. Contact our regional office if you are unsure how much chlorine and what type of chlorine to add to your tank.

After adding chlorine, fill the remaining 95 percent of the tank with potable water and wait 24 hours. At the end of 24 hours, measure the free chlorine residual of the water inside the tank. If the water in the tank has a free chlorine residual of at least 2 parts per million, then collect a coliform sample from the tank. If the coliform sample is satisfactory, then you may place the reservoir directly back into service. If the coliform sample shows the presence of coliform, contact your regional office for instruction on further disinfection and testing.

When you plan to take a tank out of service for cleaning and disinfection, be sure to make provisions to maintain an adequate water supply and adequate water pressure in the distribution system at all times. You may need to coordinate this with your local fire protection authority. If you are unsure how to provide service while the tank is off-line, contact our regional office for technical assistance.

If you can't or don't want to take your tank out of service for inspection and cleaning, you should consider the cost and availability of using certified divers trained to inspect and clean a drinking water tank while the tank remains in service.

Contact an electrician to check running amps on well pumps. A change in running amps can indicate a change in the condition of the motors or pumps. When pumps start drawing more amps, it generally means you should repair the motors. Checking the amps and voltage on pumps can be complicated and dangerous. **Do not attempt it yourself**. Contact an electrician to complete this procedure. This task should be performed at least once a year and any time you sense a problem with your pump, such as unusual sounds, vibrations, or the pump is running hot.

Pressure tank supports. You must support pressure tanks to prevent tipping or falling. Hydropneumatic tanks tend to be large and very heavy when filled with water. Supports must be sturdy and maintained in good condition. Stacked blocks or boards can fail during an earthquake. Evaluate the structural condition of the supports and level of the seismic protection provided. Consult a qualified authority if you are unsure. Failure will result in extensive damage to any facilities near the pressure tank. Water leaks will damage more equipment.

Maintain a log of water line repairs. You should document repairs to the water distribution line, especially repair clamps placed on water lines. These clamps are not long-term or permanent repairs, so identifying the date and location of such repairs is very important in planning for future pipeline replacement. A thorough record of line replacements can also help to identify areas of the distribution system more prone to failure due to age, pipe material, soil conditions, vibration, or other causes.

Maintain physical protection of wellheads. Protect the wellhead from vehicular damage by installing barriers. Vehicles can severely damage vulnerable wellheads, potentially putting the continued operation of the system at risk.

Recommended websites and publications

Websites

Department of Health Office of Drinking Water http://www.doh.wa.gov/ehp/dw

U.S. Environmental Protection Agency (EPA) Groundwater and Drinking Water http://www.epa.gov/safewater/

EPA Small Systems Information and Guidance http://www.epa.gov/safewater/smallsys/ssinfo.htm

U.S. EPA Publications Search http://www.epa.gov/epahome/pubsearch.html

National Drinking Water Clearing House http://www.nesc.wvu.edu/ndwc/

American Water Works Association http://www.awwa.org/

Troubleshooting guides

Groundwater sources
Submersible well pump systems
Pressure tanks
Storage facilities
Hypochlorination problems
Distribution systems
Cross connections
Sampling and monitoring

Troubleshooting guide for groundwater sources		
Problem	**Possible cause**	**Possible solution**
Well pump won't start.	Circuit breaker or overload relay tripped.	Reset breaker or manual overload relay.
	Fuse is burned out.	Check for cause and correct, replace fuse(s).
	No power to switch box.	Check incoming power supply. Contact power company.
	Short, broken or loose wire.	Check for shorts and correct, tighten terminals, replace broken wires.
	Low voltage.	Check incoming line voltage. Contact power company if low.
	Defective motor.	Contact electrical contractor.
	Defective pressure switch.	Check voltage of incoming electric supply with pressure switch closed. Contact power company if voltage low. Perform maintenance on switch if voltage normal.
Well pump won't shut off.	Defective pressure switch.	Check switch for proper operation. Replace switch.
	Cut-off pressure setting too high.	Adjust setting.
	Float switch or pressure transducer not functioning.	Check and replace components or cable as needed.
Well pump starts and stops too frequently (excessive cycle rate).	Pressure switch settings too close.	Adjust settings.
	Pump foot valve leaking.	Check for backflow. Contact well contractor.
	Water-logged hydropneumatic tank.	Check air volume. Add air if needed. If persistent, check air compressor, relief valve, air lines and connections, and repair if needed.
Sand sediment in the water.	Problems with well screen or gravel envelope.	Contact well contractor.
Well pump operates with reduced flow.	Valve on discharge partially closed or line clogged.	Open valve, unclog discharge line.
	Well is over-pumped.	Check static water level and compare to past readings. If significantly lower, notify well contractor.
	Well screen clogged.	Contact well contractor.

Troubleshooting guide for groundwater sources (Cont.)		
Problem	**Possible cause**	**Possible solution**
Well house flooded without recent precipitation.	Check valve not operating properly.	Repair or replace check valve.
	Leakage occurring in discharge piping or valves.	Inspect and repair or replace as necessary.
Red or black water complaints.	Water contains excessive iron (red brown) or manganese (black water).	Test for iron and manganese at well. If levels exceed 0.3 mg/L iron or 0.005 mg/L manganese, contact our regional office, your technical assistance provider or water treatment contractor.
	Complainant's hot water needs maintenance.	Check hot water heater and flush if needed.
Raw water appears turbid or a light tan color following rainfall.	Surface water entering or influencing well.	Check well for openings that allow surface water to enter. Check area for sinkholes, fractures, or other physical evidence of surface water intrusion. Check water turbidity. Contact our regional office if >0.5 NTU. Check raw water for coliform bacteria. Contact our regional office immediately if positive.
Coliform tests are positive.	Recent flooding, recent well or well pump maintenance, or loss of power.	Contact our regional office immediately.
	Sanitary protection of well has been breached or wellhead is observed to be damaged	Contact our regional office immediately.

Troubleshooting guide for submersible well pump systems		
Problem	**Possible cause**	**Possible solution**
Pump won't start.	No power to switch box.	Check position of main electrical disconnect arm (main switch) and ensure that it is in the up (energized) position. If main power supply is interrupted, auxiliary power system (generator) should be started.
	Circuit breaker or overload relay tripped.	Reset breaker or overload relay. If pump does not start, start motor by turning the Hand/Off/Automatic (HOA) Switch to the HAND (manual) position for about 2 to 5 minutes (do not over pressurize the distribution system). If motor runs, return the HOA switch to the AUTO position. If motor does not run, see other probable causes below.
	Fuses burned out.	Check for cause and replace fuses with correct type and size fuses. Make sure to pull down (de-energize) the main electrical disconnect arm (main switch) before opening the panel and replacing the fuses.
	Defective pressure switch or automatic control system.	Turn the HOA Switch to the HAND (manual) position for a short period. If pump starts, the problem is in the automatic control system. Contact electrician experienced with industrial controls to repair automatic control system. Pump can be operated in manual position to supply water; however, the operator must monitor the discharge pressure (pressure on the distribution system) and ensure that the normal working pressure is not exceeded.
	All of the above checked and pump won't run.	Contact electrician experienced with industrial controls.
Pump won't shut off.	Defective pressure switch or automatic control system. High pressure cut-off switch may need adjustment.	Turn the HOA Switch to the OFF position. If pump stops, the problem is in the automatic control system. Contact electrician experienced with industrial controls to repair automatic control system. Pump can be operated in manual position to supply water; however, the operator must monitor the discharge pressure (pressure on the distribution system) and ensure that the normal working pressure is not exceeded. The pump should not be left in the OFF position, long enough to allow the distribution system pressure to drop below the normal minimum working pressure.

Troubleshooting guide for submersible well pump systems (Cont.)		
Problem	**Possible cause**	**Possible solution**
Pump starts too frequently.	Leaking foot valve or check valve.	During the OFF cycle, listen for water running back into the well and check the water flow meter to see if it is running backward. If there is a swing-type check valve in the discharge pipe in the well station it may be stuck in the open position. With the well pump running (on), try manually lifting and lowering the operating arm on the check valve. With the well pump off, slowly and gently push the operating arm to the closed position. If the problem persists, contact well service company.
	Water logged hydropneumatic tank.	See ***Simple control systems: Hydropneumatic tanks*** **(331-380)**.
	Defective pressure switch or automatic control system. High- or low-pressure cutoff switches may need adjustment.	Contact electrician experienced with industrial controls.
Fuses blow, circuit breaker or overload relays trip when pump is in operation.	Insufficient discharge head causing a high amperage (electrical current) draw.	Check water flow meter to see if the discharge rate is much higher than normal and the discharge pressure gauge to see if the pressure is lower than normal. If so, the water system could be out of water (no pressure) or there could be a very large leak in discharge line or in the distribution system. At the well station, with the pump running, try throttling back on the discharge gate valve until the pressure reached the normal operating pressure. DO NOT close the valve completely or operate the pump for an extended period time against a throttled valve. Immediately notify your supervisor.
	Incorrect voltage, excessive heat in control panel, motor overloaded, incorrect fuses, breakers, or overload relays.	Contact electrician experienced with industrial controls.
Pump won't deliver normal amount of water.	Discharge valve partially closed.	Fully open discharge valve and see if pump rate increases. Make sure pump does not break suction.
	Pump breaking suction, water level in well near or below pump intake. Air may be present in water drawn from sample tap.	Partially throttle discharge valve. The discharge rate may actually decrease, but the water level in the well should rise and the pump should no longer break suction. Contact well service company.
	Pump worn, hydraulic problems, intake plugging.	Contact well service company.

Troubleshooting guide for submersible well pump systems (Cont.)		
Problem	**Possible cause**	**Possible solution**
Sand in the water.	Problems with well screen or gravel envelope.	Partially throttle discharge valve until sand reduces or disappears. Contact well service company.
Air in the water.	If there is a check valve between the well pump and the hydropneumatic tank, and air is present on the well side of the check valve, then the pump may be breaking suction. In this case the water level in well is near or below the pump intake.	Partially throttle discharge valve. Contact well service company.
	If there is a check valve between the well pump and the hydropneumatic tank, and air is present only on the hydropneumatic tank side of the check valve and in the distribution system, then air from hydropneumatic tank may be entering water.	See troubleshooting guide for Hydropneumatic Tanks.
Auxiliary power system (generator) won't activate during loss of power supply.	Automatic transfer switch (ATS) is not functioning.	Manually start the auxiliary power system.
	No fuel.	Check fuel and add if necessary.
	Dead battery.	Jump-start or charge battery.
	Mechanical problem with engine/generator.	Contact auxiliary power system service company.

Troubleshooting guide for pressure tanks		
Problem	**Possible cause**	**Possible solution**
Well pump won't start.	Circuit breaker or overload relay tripped.	Reset breaker or manual overload relay.
	Fuse burned out.	Check for cause and correct, replace fuse(s).
	No power to switch box.	Check incoming power supply. Contact power company.
	Short, broken, or loose wire.	Check for shorts and correct, tighten terminals, replace broken wires.
	Low voltage.	Check incoming line voltage. Contact power company if low.
	Failed motor.	Contact electrical contractor.
	Defective pressure switch.	Check voltage of incoming electric supply with pressure switch closed. Contact power company if voltage low. Perform maintenance on switch if voltage normal.
Well pump won't shut off.	Defective pressure switch.	Refer to troubleshooting guide on Pumps and Pumping Facilities. Note: If the water supply pump is running constantly, excessive pressures can develop in the hydropneumatic tank and distribution system. The tank should be equipped with a pressure relief valve that opens at about 100 psi. This may protect the tank from damage but it is possible that the distribution system could be damaged if pressures exceed normal working pressures. Contact electrician experienced with industrial controls.
	Cut-off pressure setting too high.	Same as above.
	Float switch or pressure transducer not functioning.	Same as above.
Well pump starts and stops too frequently (excessive cycle rate).	Leaking foot valve or check valve.	Contact well specialist.
	Defective pressure switch or automatic control system. High- or low-pressure cutoff switches may need adjustment.	Contact well specialist or electrician.

Troubleshooting guide for pressure tanks (Cont.)		
Problem	**Possible cause**	**Possible solution**
	Excessive water use or major leak in water distribution system.	Locate and repair leak.
	Water-logged hydropneumatic tank.	Check air-to-water ratio from sight tube (if provided). If the tube is completely filled with water or if the water level exceeds ⅔ of the volume of the tank, then air will have to be introduced into the tank. Check tank and air system for leaks. The optimum air-to-water ratio in the hydropneumatic tank should be ⅔ water to ⅓ air. If the problem persists or there is no sight tube, contact water system specialist.
	Air-logged hydropneumatic tank.	Check air-to-water ratio from sight tube (if provided). If the tube is completely filled with air or if the water level is less than ½ the volume of the tank, then air will have to be bled from the tank. The optimum air-to-water ratio should be ⅔ water to ⅓ air. If the problem persists or there is no sight tube, contact water system specialist.
Sand or sediment in the water.	Problems with well screen or gravel envelope.	Contact well contractor.
	If there is iron or manganese in the well water and it is not removed before the hydropneumatic tank, and the air in the hydropneumatic tank comes into direct contact with the water in the tank, then the iron and manganese could be oxidizing and settling in the tank. Also, sediment could be present in the distribution system.	Check air-to-water ratio from sight tube (if provided). If the tube is completely filled with air or the water level is less than ½ the volume of the tank, then air will have to be bled from the tank. The optimum air-to-water ratio should be ⅔ water to ⅓ air. If the problem persists or there is no sight tube, contact water system specialist. If there is a physical separation between the air and water in the tank, then the separator could have broken. Contact water system specialist.
Air in the water.	If there is a check valve between the well pump and the hydropneumatic tank, and air is present on the well side of the check valve, then the pump may be breaking suction. In this case, the water level in well is near or below the pump intake.	Partially throttle discharge valve. Contact well service company.

Troubleshooting guide for pressure tanks (Cont.)		
Problem	**Possible cause**	**Possible solution**
	If there is a check valve between the well pump and the hydropneumatic tank, and air is present only on the hydropneumatic tank side of the check valve and in the distribution system, then air from hydropneumatic tank may be entering water.	Improve removal of iron and manganese. If the hydropneumatic tank is equipped with a drain, open the drain valve and discharge the sediment to waste.
Oil in the water.	Oil leaking from air compressor.	Check the oil separator on the discharge side to the air compressor. Notify water system specialist. Consider replacing the unit with a non-oil lubricated type unit.
Dirt and or bacteria in the water.	Inadequate disinfection.	Refer to troubleshooting guide on Hypochlorinators.
	Intake filters on air compressor broken or dirty.	Replace filter. Also review troubleshooting guide on Hypochlorinators. Contact water system specialist.
Excessively high distribution system pressure (greater than 70 psi).	Automatic pressure controls need adjustment or cut-out sequence is not functioning.	Refer to troubleshooting guide for Pumps and Pumping Facilities.
Excessively low distribution system pressure - normal working pressure below 40 psi or occasional pressures below 20 psi during peak usage.	Automatic pressure controls need adjustment or cut-in sequence is not functioning.	Refer to troubleshooting guide for Pumps and Pumping Facilities.
Corrosion on the outside of the tank.	Inadequate protective coating (paint).	Clean area with a wire brush. Prime and paint the surface. Do not chip rust from the tank unless it is drained and out of service. If chipping is required, contact a tank corrosion specialist. The tank may not be structurally sound and re-pressurizing could cause further damage or personal injury. Note: 50 psi exerts a pressure of 3.5 tons per square foot. Never paint the tank interior without first consulting with our regional office.

Troubleshooting guide for pressure tanks (Cont.)		
Problem	**Possible cause**	**Possible solution**
Tank is unstable and can easily be moved, or tank is supported by the piping.	Tank supports are inadequate.	Provide suitable and permanent supports so the tank can't be moved and the piping is not supporting the weight of the tank. This may require taking the system out of service while these repairs are made. Never try to move a tank that is pressurized. Contact your water system specialist.

Troubleshooting guide for storage facilities		
Problem	**Possible cause**	**Possible solution**
Loss of disinfectant residual.	Long detention time. Increase in temperature. Depletion of disinfectant from exposure to sunlight. Entry of chlorine demanding contaminants.	Cover reservoir. Reduce detention time with baffles, recirculation, inlet diffuser, mechanical mixer, pumps. Relocate inlet/outlet in tank. Size facility for more frequent turnover. Check screens on vents. Install bird wires and fences if necessary. Clean and disinfect storage facility.
Increase in heterotrophic plate count.	Loss of chlorine residual or contaminant entry.	Prevent loss of chlorine residual (see above) and rechlorinate storage tank. Check seals on hatches and screens on vents. Install bird wires and fences if necessary. Clean and disinfect storage facility.
Coliform bacteria occurrence.	Loss of chlorine residual. Contaminant entry. Sediment or biofilm build-up	Check seals on hatches and screens on vents. Install bird wires and fences if necessary. Clean and disinfect storage facility.
Disinfection byproducts formation.	Long detention time. Increase in pH or chlorine residual. Boosting chlorine. Organic matter contamination or algae growth.	Reduce detention time with baffles, recirculation, inlet diffuser, mechanical mixer, pumps. Relocate inlet/outlet in tank. Size facility for more frequent turnover. Look at alternative disinfectants.
Nitrification	Long detention time.	Reduce detention time with baffles, recirculation, inlet diffuser, mechanical mixer, pumps. Relocate inlet/outlet in tank. Increase turnover rate or size facility for more frequent turnover.
Sediment build-up	Excess suspended materials, lime, iron or manganese in source water. Minimal velocities allowing depositions. Contaminant entry.	Improve influent water quality. Reduce detention time with baffles, recirculation, inlet diffuser, mechanical mixer, pumps. Avoid scouring. Inspect and clean tank more frequently.
Floating material or surface film.	Build-up of iron or manganese sediments. Growth of iron or manganese forming bacteria.	Improve influent water quality. Avoid scouring. Inspect and clean tank more frequently.
Taste and odor complaints.	Long detention time. Growth of algae or other organisms. Contaminant entry. Leaching from internal coatings or new concrete tank. Source water potential for taste and odor such as high levels of hydrogen sulfides.	Cover open reservoirs. Check seals on hatches and screens on vents. Install bird wires and fences if necessary. Improve influent water quality. Chlorinate. Flush distribution system. Clean and disinfect storage tank.

Troubleshooting guide for storage facilities (Cont.)		
Problem	**Possible cause**	**Possible solution**
Growth of algae or other biological organisms.	Exposure to sunlight. Loss of chlorine residual. Long detention time. Sediment or biofilm build-up.	Cover open reservoirs. Check seals on hatches and screens on vents. Install bird wires and fences if necessary. Improve influent water quality. Flush distribution system. Clean and disinfect storage tank.
Contaminant entry.	Uncovered reservoirs or improper design of floating cover. Damaged or missing screens on vents and entry of bats, birds, rodents, or insects. Cross connection at drain or overflow.	Cover open reservoirs. Check seals on hatches and screens on vents. Install bird wires and fences if necessary. Flush distribution system. Clean and disinfect storage tank.
Increase in pH.	Long detention time in concrete storage.	Provide coating on concrete walls. Increase turnover rate. Fluctuate water levels more frequently.
Biodegradation of internal coatings.	Loss of chlorine residual allowing biological growth. Selection of wrong internal coating.	Prevent loss of chlorine residual. Chlorinate. Clean and disinfect storage tank.
Biofilm growth.	Loss of chlorine residual. Nutrients from coatings or contaminants. Corrosion of surface promoting biological and algae growth. Bacterial seeding.	Prevent loss of chlorine residual. Chlorinate. Clean and disinfect storage tank. Flush distribution system.
Color.	Decaying vegetative material. Algae growth in uncovered reservoirs. Sediment scouring. Iron or manganese.	Improve source water quality. Install treatment for iron and manganese. Increase cleaning frequency.
Red water.	Metals uptake from metal surfaces from lack of or improper cathodic protection. Iron or manganese.	Provide proper corrosion treatment. Install or calibrate cathodic protection. Use sequestering agent. Apply coatings properly.
Build-up of iron and manganese.	Iron and manganese in source water and long detention times. Oxidation and settling of iron or manganese. Improper sequestering agent dose.	Improve source water quality. Install or optimize sequestering system. Increase cleaning frequency.

Troubleshooting guide for hypochlorination problems		
Problem	**Possible cause**	**Possible solution**
Chemical feed pump won't run.	No power.	Check to see if plug is securely in place. Ensure that there is power to the outlet and control systems.
	Electrical problem with signal from well pump or flow sensor.	Check pump motor starter. Bypass flow sensor to determine if pump will operate manually. If you have a liquid level control, check the low-level cut-off switch. Repair or replace if necessary.
	Motor failure.	If the motor is cool and the power is on, the motor may have to be repaired or replaced. Check manufacturer's information.
	Motor overheating.	The motor is over-heated. The overload protection in the motor has opened. The motor will start again when it cools. Make sure that you have a proper voltage supply. Try to turn the motor shaft. If it does not turn, check for a binding pump mechanism.
Motor runs but diaphragm doesn't move.	The stroke adjustment may be set at zero.	Reset stroke adjustment control knob.
	The gear train may be stripped.	Replace any defective parts.
Motor runs, diaphragm moves but no solution is pumped.	Solution tank may be empty.	Check the solution level in the tank. If it is too low refill the tank.
	The pump may not be primed.	If not, prime it.
	Suction line may have an air lock.	Check the suction line for air locks. If there is an air lock, remove the anti-siphon spring from the discharge valve until the air lock is removed.
	The fittings may be loose.	Remove the fittings, clean off the old tape, put on new teflon tape, and replace FINGER tight.
	Leaks from the pump housing.	If there is solution dripping from the pump housing just behind the pump head, replace the diaphragm.

Troubleshooting guide for hypochlorination problems (Cont.)		
Problem	**Possible cause**	**Possible solution**
Motor runs, diaphragm moves but no solution is pumped.	Valves and O-rings may be dirty.	Check the valves. Clean them if they are dirty. Replace the O-rings if they are damaged. Make sure they are well-seated.
	Discharge line is blocked.	Check the discharge line for kinks or blockages.
Abnormal noise.	The chlorinator is probably mechanically damaged.	Check with your service representative. Switch operation to back up chlorinator.
Motor starts and stops.	The motor may be overheating.	If it is, a thermal protection switch may be causing the start-stop action. Check with the service representative.
Low chlorine residual at point of entry.	Improper procedure for running chlorine residual test or expired chemical reagents.	Check expiration date on chemical reagents. Check test procedure as described in test kit manual. Speed or stroke setting too low.
	Pump not feeding an adequate quantity of chlorine.	Damaged diaphragm or suction leak.
	Change in raw water quality.	Test raw water for constituents that may cause increased chlorine demand, such as iron and manganese.
	Pump air bound.	Check foot valve.
	Chlorine supply tank empty.	Fill supply tank.
	Reduced effectiveness of chlorine solution.	Check date that chlorine was received. Sodium hypochlorite solution may lose effectiveness after 30 days. If that is the case, the feed rate must be increased to obtain the desired residual.
	Damaged suction or discharge lines (cracks or crimps).	Clean or repair lines with problems.
	Connection at point of injection clogged or leaking.	Flush line and connection with mild acid such as acetic or muriatic. Replace any damaged parts that may be leaking.
Discharge line is blocked.	Speed and stroke setting inadequate.	Check manufacturer's recommendations for proper settings to prime pump.
	Suction lift too high due to feed pump relocation.	Check maximum suction lift for pump and relocate as necessary.

Troubleshooting guide for hypochlorination problems (Cont.)		
Problem	**Possible cause**	**Possible solution**
	Discharge pressure too high.	Check wellpump discharge pressure. Check pressure rating on chemical feed pump.
	Suction fitting clogged.	Clean or replace screen.
	Trapped air in suction line.	Ensure all fittings are tight.
	Suction line not submerged in solution.	Add chlorine solution to supply tank.
Loss of prime.	Solution tank empty.	Fill tank.
	Air leaks in suction fittings.	Check for cracked fittings.
	Foot valve not in vertical position.	Adjust foot valve to proper position.
	Air trapped in suction tubing.	Check connections and fittings.
Excessive chlorine residual at point of entry (POE).	Pump speed or stroke setting too high.	Verify dose rate and calibrate pump to get desired dose.
	Siphoning from solution tank.	Ensure the 4-in-1 anti-siphon valve on chemical feed pump is operating properly.
	Low well pump discharge pressure.	Ensure well pump discharge pressure is at least 25 psi.
Failure to pump against pressure.	Worn seal rings.	Worn seal rings and cartridge valves may need to be replaced. Use spare parts kit.
	Pumps maximum pressure rating to pump against may be exceeded by injection pressure.	Injection pressure cannot exceed the pump's maximum pressure. See information plate on pump.
	Ruptured diaphragm.	Replace pump diaphragm.
	Incorrect stroke length setting.	Check zero on pump and re-zero pump. See manufacturer's instructions.
	Tubing run on discharge is too long.	Longer tubing runs may create friction loss sufficient to reduce the pump's pressure rating. Consult manufacturer for more information.
	Clogged foot valve strainer.	Remove foot valve strainer when pumping slurries or when solution particles cause the strainer to clog.

Troubleshooting guide for distribution systems		
Problem	**Possible cause**	**Possible solution**
Dirty water complaints.	Localized accumulations of debris, solids/particulates in distribution mains.	Collect and preserve samples for analysis if needed. Isolate affected part of main and flush.
	Cross connection between water system and another system carrying non-potable water.	Collect and preserve samples for analysis if needed. Conduct survey of system for cross connections. Contact our regional office.
Red water complaints.	Iron content of water from source is high. Iron precipitates in mains and accumulates.	Collect and test water samples from water source and location of complaints for iron. If high at both sites, contact our regional office, your technical assistance provider, consulting engineer or water conditioning company for help with iron removal treatment.
	Cast iron, ductile iron, or steel mains are corroding causing rust in the water.	Collect and analyze samples for iron and corrosion parameters. Contact our regional office, your technical assistance provider, consulting engineer or water conditioning company for help with corrosion control treatment.
No or low water pressure.	Source of supply, storage or pumping station interrupted.	Check source, storage and pumping stations. Correct or repair as needed.
	System cannot supply demands.	Check to see if demands are unusually high. If so, try to reduce demand. Contact our regional office, your technical assistance provider or consulting engineer.
	Service line, meter or connections shutoff or clogged with debris.	Investigate and open or unclog service.
	Broken or leaking distribution pipes.	Locate and repair break or leak.
	Valve in system closed or broken.	Check and open closed isolation and pressure-reducing valves. Repair or contact contractor if valves are broken.
Excessive water usage.	More connections have been added to the system.	Compare increase in usage over time with new connections added over same period. If correlation evident, take action to curtail demand or increase capacity if needed. Contact our regional office, your, technical assistance provider or consulting engineer.
	Excessive leakage (>15% of production) is occurring, meters are not installed or not registering properly.	Conduct a water audit to determine the cause. If leakage is the cause, contact our regional office, your consulting engineer or leak detection contractor.
	Illegal connections have been made.	Conduct survey to identify connections.

Troubleshooting guide for cross connections		
Problem	**Possible cause**	**Possible solution**
Sudsy or soapy water.	Hose connected to an unprotected hose bib with the other end in a bucket or sink of soapy water.	Equip all hose bibs with an Atmospheric Vacuum Breaker.
Positive coliform.	Hose connected to an unprotected hose bib with the other end lying on the floor of the pump house, on the ground in the car wash area, in the wading or swimming pool or other nonpotable liquid.	Equip all hose bibs with an Atmospheric Vacuum Breaker.
	Unprotected potable water line feeding a lawn irrigation system.	Install a backflow preventer on the potable water line feeding the irrigation system.
	Submerged inlet, e.g. faucet submerged.	Relocate faucet above flood level.
Color in the water (unusual colors such as bright blue).	Backflow from toilet.	Get help. Bring in someone who understands cross connections to evaluate your system.
Organic odors.	Handheld pesticide/herbicide applicator attached to unprotected hose.	Don't use these devices.

Troubleshooting guide for sampling and monitoring		
Problem	**Possible cause**	**Possible solution**
Positive total coliform.	Improper sampling technique.	Check distribution system for low-pressure conditions, possibly due to line breaks or excessive flows that may result in a backflow problem.
	Contamination entering distribution system.	Ensure all staff are properly trained in sampling and transport procedures as described by lab procedures.
	Inadequate chlorine residual at the sampling site.	Check the operation of the chlorination system. Refer to issues described in the chapter on pumps and hypochlorination systems. Ensure that residual test is performed properly.
	Growth of biofilm in the distribution system.	Thoroughly flush affected areas of the distribution system. Superchlorination may be necessary in severe cases.
Chlorine taste and odor.	High total chlorine residual and low free chlorine residual.	The free chlorine residual should be at least 85% of the total chlorine residual. Increase the chlorine dose rate to get past the breakpoint to destroy some of the combined residual that causes taste and odor problems. Additional system flushing may also be required.
Inability to maintain adequate free chlorine residual at the furthest points of the distribution system or at dead end lines.	Inadequate chlorine dose at treatment plant.	Increase chlorine feed rate at point of application.
	Problems with chlorine feed equipment.	Check operation of chlorination equipment.
	Ineffective distribution system flushing program.	Review distribution system flushing program and implement improvements to address areas of inadequate free chlorine residual.
	Growth of biofilm in the distribution system.	Increase flushing in area of biofilm problem.

Appendix D – Design Calculation Spreadsheet

HYDRAULIC ANALYSIS

System ID

RBE Project No.	23092
Name of System	Riverside Group B
DOH ID Number	
Well Tag No.	BPH 997
Start Card No.	

Location

County	Lewis				
Address	"0" Riverside Dr, Packwood, WA 98361				
Quarter Section S-T-R	NE 1/4	NW 1/4	S 10	13N	9E
Wellsite Tax Parcel No.	35067002003				
Subdivision Name or Number					

Point of Contact

Robert Balmelli PE
PO Box 923
CHEHALIS, WA 98532
(360) 740-8919

Number of Connections	9		
Max Daily Demand (MDD)	6750	gallons	
Average Daily Demand (ADD)	3375.00	gallons	
Maximum Instantaneous Demand	41	gpm	
Population to Be Served	23		

Pump Sizing

Minimum Flow	41	gpm	(The lesser of MID or well capacity)
Pump Level	10.0	feet deep	
Highest Point of Delivery	2.0	feet	
Drop Pipe Friction	22.1	feet	(If using a booster pump, then drop pipe
Pipe Friction Loss	5.7		friction only, Otherwise, add friction losses
Loss Through Treatment	0.0		from distribution lines in Table A)
Residual Pressure Head	86.5	feet	38 psi
Total Dynamic Head	126	feet	

Well Pump

Make	FloWise	
Model	P35S20	
Power	2.00	hp
Drop Pipe (nominal size)	2.00	inch galv. iron pipe
"C" for Williams & Hazen equation	130	
Pump Setting	126	feet

HYDRAULIC ANALYSIS

Table A - Distribution System Hydraulic Analysis

Distribution System Analysis - Low Pressure Condition

From:	To:	Conns.	Elevation Difference (+/- feet)	Pipe Diameter (inches)	Length (feet)	MID (gpm)	Headloss per 100' (ft) *Table 5	Total Friction Headloss (ft)	Pressure (psi)
									40
Pumhouse	Lot 8/9	9	-2	2.0	21	41	2.9	0.6	41
Lot 8/9	Lot 2/3	7	1	2.0	160	36	2.3	3.7	39
Lot 2/3	Lot 6/7	5	0	2.0	10	31	1.7	0.2	39
Lot 6/7	Lot 5	3	0	2.0	93	26	1.3	1.2	38
Lot 5	Lot 1/4	2	0	2.0	8	23	1.0	0.1	38
							Total =	5.7	ft

Distribution System Analysis - High Pressure Condition

From:	To:	Conns.	Elevation Difference (+/- feet)	Pipe Diameter (inches)	Length (feet)	MID (gpm)	Headloss per 100' (ft) *Table 5	Total Friction Headloss (ft)	Pressure (psi)
									40
Pumhouse	Lot 8/9	9	-2	2.0	21	41	2.9	0.6	41
Lot 8/9	Lot 2/3	7	1	2.0	160	36	2.3	3.7	39
Lot 2/3	Lot 6/7	5	0	2.0	10	31	1.7	0.2	39
Lot 6/7	Lot 5	3	0	2.0	93	26	1.3	1.2	38
Lot 5	Lot 1/4	2	0	2.0	8	23	1.0	0.1	38
							Total =	5.7	ft

Storage Calculations

Project Name:	Riverside Group B			
RBE Project No:	23092			
Design Engineer:	Robert Balmelli PE			
Water System ID No:	Pending	Average Annual Rainfall (ARR):	45.66	Inches
Approved Connections: *	0	Water Rights:	0	ac ft
New Connections:	9	Sum. Source Capacity Qs:	51	gpm
Total Connections:	9	Largest Source Capacity Qi	51	gpm

Average Daily Demand: (ADD)

ADD = Recorded Data	375	gpd/ERU

Maximum Day Demand: (MDD)

MDD = 2.0(ADD) =	750	gpd/ERU

Peak Hour Demand: (PHD)

PHD = Per Lewis County	41	gpm	**Per LC**

Appendix E – Water System Plans