PIERS ISLAND WATER SYSTEM OPERATIONS PLAYBOOK

February 2021

Piers Island Water System Operations Playbook

Contents

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Introduction

The Piers Island Improvement District (PIID) is deemed to be a ''water supplier'' because it supplies drinking water for domestic purposes to more than one single-family residence. Our system is classified as a "small water system" because it services less than 500 persons (i.e., individuals, not service connections). As a water supplier, the PIID is therefore subject to provincial legislation governing the quality of the water it provides.

The Piers Island Improvement District was created in order to provide a governance mechanism to provide local services. Our *Letters Patent* define the "objects of the improvement district" as partly, "the acquisition, maintenance and operation of works for waterworks purposes and for the provision of fire protection" within the District in a manner that meets all applicable local, regional, provincial and federal regulations.

In 2006 the PIID commissioned the Capital Regional District (CRD) to complete a study to assess the requirements and costs associated with the CRD taking over responsibility from the PIID for the Piers Island water system. The report concluded that the water system would require $1.3M in initial upgrades and estimated the CRD annual charge to administer and operate our water system at $40,000 (in 2006). The decision was made at that time, by community assent, to keep ownership and management of the water system under the purview of the Improvement District, using local volunteers. As a result, the operating budget for the water system has been kept comparatively minimal.

Water Team – Roles and Responsibilities

The three main pieces of legislation relevant to drinking water quality on Piers Island are the ***BC Drinking Water Protection Act*** *(DWPA)* with its accompanying ***Drinking Water Protection Regulation*** *(DWPR)*, and the ***Guidelines for Canadian Drinking Water Quality***.

The *Guidelines for Canadian Drinking Water Quality* are published by Health Canada on behalf of the Federal-Provincial-Territorial Committee on Drinking Water. The guidelines have been developed for a variety of microbiological, chemical, physical and radiological parameters, and are recognized throughout Canada as the basic standard for water quality. They provide a convenient, reliable yardstick against which water quality can be measured so that problems can be quickly identified and corrected.

In addition, because provision of safe drinking water is a Provincial responsibility, the Ministry of Health has established its own parameters for water quality based on the

Guidelines. These are encompassed in the *BC Drinking Water Protection Act* and *BC Drinking Water Protection Regulation*. The DWPA regulates the design, construction and operation of water supply systems specific to surface water sources. The DWPR defines standards for potable water and provides more detailed information to the DWPA, such as monitoring frequency, water quality parameters, and operator certification requirements.

The basic requirements of the legislation on the water supplier are to:

a) Provide potable water
b) Disinfect all surface water
c) Notify the public when the water isn't safe and public health may be at risk

The basic requirements of the legislation on the water supply system are that it:

a) Be constructed in accordance with plans approved by a public health engineer.
b) Be operated in accordance with an operating permit.
c) Have an emergency response plan.
d) Be monitored by a certified operator if specified by the Drinking Water Officer (DWO)/Environmental Health Officer (EHO).

Health Authority and Drinking Water Officer

The Minister of Health, through the Provincial Health Officer, delegates responsibility for implementing potable water legislation to the various Health Authorities throughout the Province and appoints Drinking Water Officers (DWO) or Environmental Health Officers from within those authorities to monitor compliance for specific jurisdictions.

Piers Island falls under the jurisdiction of the Vancouver Island Health Authority (VIHA), also known as "Island Health", and our DWO is Richard Greve, whose office is located in the Gateway Village shopping centre in Saanich.

VIHA issues the annual operating permit for the PIID water system (which is posted in pump house #1). The DWO sets the terms of the operating permit and provides the oversight related to it, which includes:

- Monitoring test results (the lab sends copies of test results directly to VIHA, who then posts them on the VIHA web-site for public access).
- Annually conducting a site visit .
- Receiving and approving our Emergency Response Plan and Annual Water System Report.
- Providing the first point of escalation if a monitored parameter in relation to a water supply system fails to meet an established immediate reporting standard.
- Acting as our contact for construction permits related to the water supply system.
- Providing advice and guidance as needed.

Piers Island Improvement District (PIID)

Trustees

The PIID is the water supplier as defined in the applicable regulations. As the water supplier, the Trustees are responsible for:

a) Providing potable water.
b) Ensuring the water system is designed, constructed and maintained in compliance with the regulations by:
    i) Keeping required water system documentation
    ii) Performing on-going assessments of the system
    iii) Maintaining an inventory of system parts
    iv) Applying for all necessary permits and approvals for construction, installation, alteration or extension of the water supply system, or works, facilities or equipment that are intended to be the water supply system or part of the water supply system
c) Ensuring that the water system operation meets regulations and the terms of the operating permit, including:
    i) Testing and monitoring requirements
    ii) Providing Operators with the required qualifications
    iii) Establishing and maintaining approved operating procedures
d) Developing and maintaining an Emergency Response Plan
e) Reporting threats to the drinking water supply
f) Providing public notice of threats to drinking water supply
g) Making the following information available to the public:
    i) Water quality results
    ii) Emergency Response Plan
h) Meeting other applicable regulations as an employer

Water Operators

The Piers Island water system operators are the main frontline resources for the operation of the water system. The water operators are trained and certified and provide on-going support that extends beyond the 3-year tenure of the elected PIID water trustee. In this role, the operators are responsible for:

- Conducting the water quality monitoring program as prescribed by the Operating Permit, DWO and PIID Trustees.
- Taking and delivering biological, chemical, physical, radiological and aesthetic parameter samples to approved labs for processing.
- Preparing and distributing results of the water quality monitoring program.
- With the Trustee responsible for the water system, preparing and presenting an annual water quality report to the DWO and AGM.
- With the Water Trustee, preparing and maintaining procedural documentation and reporting.

- Responding to emergency situations including required notification procedures, as necessary.
- Regular and periodic maintenance of pump house equipment and tank.
- Undertaking a system wide flushing program at least once a year in conjunction with North Saanich.
- Annual meter reading and report preparation for water billing purposes.
- Ensuring all repair/replacement/cleaning of distribution system components is undertaken in a manner that meets disinfection requirements for potable water suppliers.
- Overall monitoring of the infrastructure and reporting to the PIID any issue that is of a serious repair/replacement nature.
- Providing feedback and suggestions to the PIID for possible improvement to the operation or water quality.

Requirements and Training

The *BC Drinking Water Protection Regulation* requires that all water systems providing domestic water to more than 500 persons be operated by trained personnel who have been certified through the Environmental Operators Certification Program Society of BC. When the legislation was enacted in 2003, small water systems (i.e., systems providing water to less than 500 persons) could be exempted from the certification requirement in situations where the Drinking Water Officer felt it was unnecessary due to the overall quality of the water being delivered to the public by the system as evidenced by the sampling regime and the vigilance demonstrated by the water department.

The Piers Island Operating Permit does not specify that a trained operator is required for our system, but nonetheless the PIID has mutually agreed with our DWO that it would be prudent to encourage the volunteers who handle the daily operations of the water system to complete the initial EOCP accreditation. This requires successful completion of a qualified course (2-day class, or on-line course options). The course provides a working knowledge of water distribution and water treatment practices and focuses on the basic aspects of system construction, operation, and maintenance for small systems. Upon completion of the course and 50 hours of hands-on experience, the trainee is eligible to write the EOCP's exam to become a certified "Small Water Systems Operator".

The 50 hours of hands-on experience needs to be tracked and provided to the EOCP as a prerequisite to challenging the certification exam. This can be on paper or a simple excel document with the following sample information:

Date	**Duration**	**Task**
Feb-05	1.00	Measuring Chlorine Residuals
Mar-21	3.00	Flushing Distribution System
Mar-24	2.00	Water Team Meeting

Apr-21	1.00	Measuring Chlorine Residuals
Jun-1	1.00	Sampling Coliforms
Jul-21	10.00	Cleaning Water Tower
Oct-22	3.00	Reading Water Meters
Nov-12	2.00	Flushing Undersea Lines
Etc.		

System Overview

The water supply for Piers Island is provided by the Capital Regional District Water System. Water sources from the Sooke reservoir, travels through the CRD distribution system to the Peninsula, and is ultimately purchased from the Corporation of the District of North Saanich. A metered service connection in a ground vault near the end of Piers Road in North Saanich conveys water to Piers Island via a single 2-inch pipe down to the beachhead and then via two submarine lines - an older one of 1 5/8" diameter PVC and a newer line of 2" PVC pipe. The submarine lines are weighted and lay on the channel floor running in two different ROW paths to emerge on Piers Island and travel up the east and west sides of the beach ramp road located between Lots #1 and #2 on McKenzie Crescent.

Pump House #1 (PH#1) is located at the junction of the ramp road and McKenzie Crescent and connects the intake supply to the island's distribution system. Normal routing through PH#1 directs the water from both submarine lines through a pressure-reducing valve (set at 80 psi), a solenoid valve (electronically connected to a float switch in the water tank), and a water meter (in Imperial Gallons). The water then exits the pump house and feeds into the main ring loop where it flows in both easterly and westerly directions, depending on demand.

The ring loop supplies water to 21 fire standpipes along the roadbed, and individual house services. It also replenishes the water reservoir via a 4 inch PVC spur that runs from the "quick fill" valves on the road (across from #70) up to the water tank. The new water storage tank which was installed in 2021 is a 55,000 IG, (252 m3) glass-fused to steel reservoir.

PH#2 is located immediately west of the tank and in one room houses a circulating pump, a flow meter, a data recorder, and a chlorination analysis system, and in a second room a chlorine injection pump and chlorine tank. A new “lean-to” addition on the east side of the pump house was built to house the piping and valve manifold for connecting to the new tank.

PH#2 also provides shelter for the PIVFD 911 connectivity and backup systems. Atop the water tank is a radio antennae. Adjacent to PH#2 is a large metal cabinet that houses the backup generator for the chlorination system, heating and lighting in the pump house.

Seven air valves are located at the high points along the main to allow air to escape from the system and to also provide a level of protection against back siphoning into the main should a negative water pressure situation occur in the main.

Six corporate gate valves are located at four locations along the main, roughly dividing the ring main into four quadrants to facilitate the isolation of the quadrants between the valves.

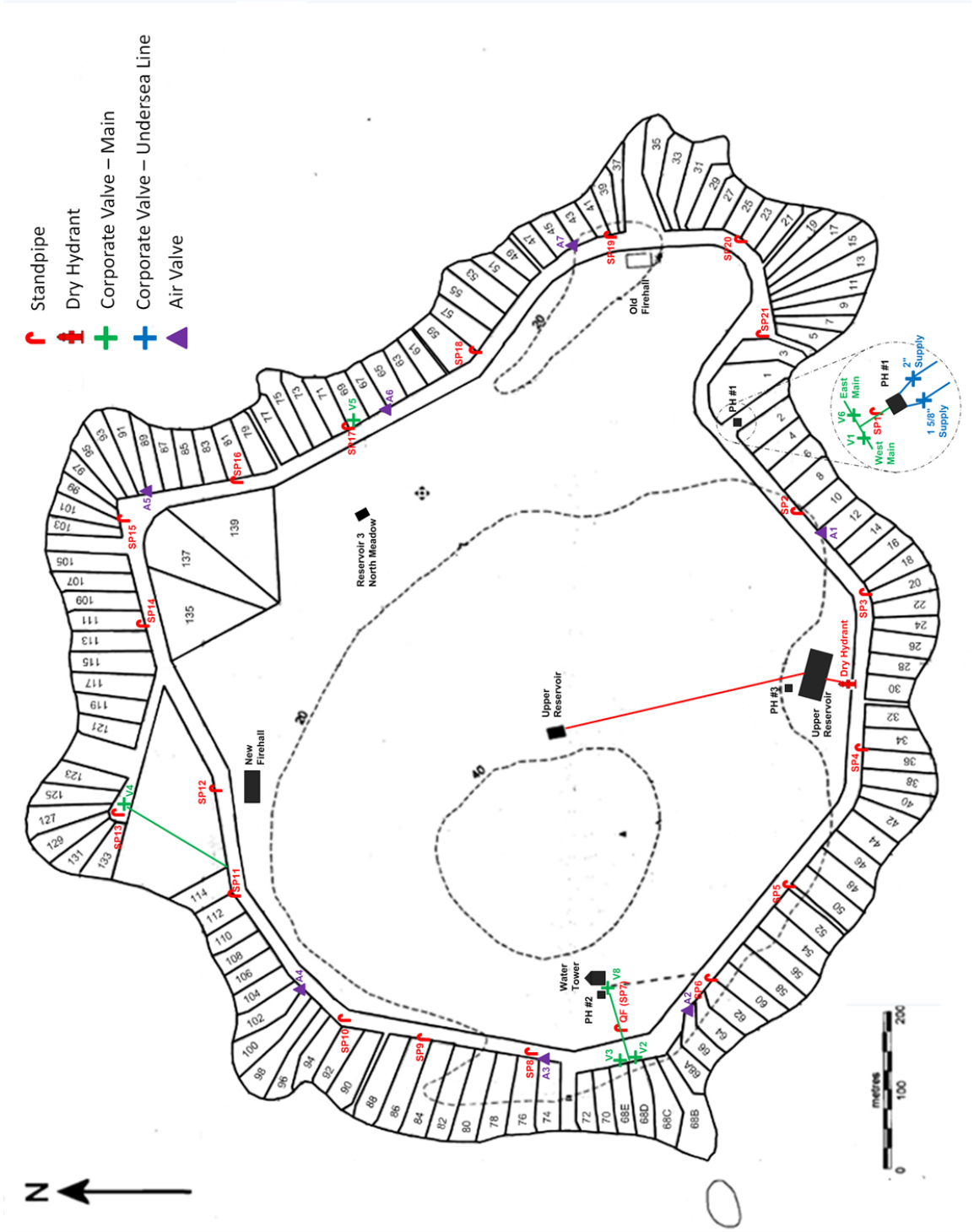
Across from lot #32 is a man-made clay dugout referred to as the Lower Reservoir with a maximum capacity of approximately 1,000,000 IG. Potential uses of this non-potable water source are:

1. To provide water to the roadside via a non-pressurized hydrant for firefighting or emergency domestic use. Because this slough is deemed a "non-potable source", by the PIID, point of use treatment to make the water safe for human consumption would be the sole responsibility of the individual user.
2. To provide water into the centre of the island via portable pumps for wildfire suppression.

The Lower Reservoir is protected by a chain-link fence. Maintenance is performed routinely to keep the area clear of excess vegetation and the grassland surrounding it mowed and trimmed. PH#3 is a small shed located at the west end of the reservoir that provides storage for water supplies and materials.

Near the summit of the island is another fenced reservoir referred to as the Upper Reservoir with a maximum capacity of approximately 500,000 IG. This non-potable water source is connected to the Lower Reservoir via a 1" buried pipeline.

A smaller, third reservoir is located near the orchard but is not accessible due to overgrowth. This non-potable water source is fenced and is of unknown capacity.


Standpipe
Dry Hydrant
Corporate Valve – Main
Corporate Valve – Undersea Line
Air Valve
Old Firehall
Reservoir 3 North Meadow
New Firehall
Upper Reservoir
Upper Reservoir
Dry Hydrant
PH #3
PH #1
PH #1
2" Supply
1 5/8" Supply
East Main
West Main
V6
V1
SP1
Water Tower
PH #2
QF (SP7)
V8
V3
V2
V4
V5
SP12
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Operations Calendar

Frequency	Activity Description	Duration
Daily	• Read and log the water consumption meter in PH#1 (currently being performed by a crew member.)	30 min
Weekly	• Measure and record chlorine residuals at PH#1 and PH#2 and at one island residence. Additionally, while at the pump houses weekly: PH#1: • Do visual check of equipment and address low temperatures with heater or lightbulb as needed. PH#2: • Do visual check of the circulating pump, flow meter, D1C controller, flow sensor, chlorine sensor and record data. • Do visual check of chlorine injection pump. • Check level of chlorine in tank in chlorination room to keep level above 10" or 18 gallons. As needed, add chlorine as per chart on wall. The amount added to the tank and frequency will depend on seasonal consumption but the objective is to have the supply last between sampling visits and to maintain a surplus bleach inventory of at least four (4 litre) bottles in case of an emergency. • Do a visual check of the water tank. NOTE: See Visual Checks Criteria at end of Calendar	60-90 min
Monthly	• At the first chlorine residual testing of the month, also draw samples for coliforms (e.coli, fecal and total). Take one sample from each pump house and one from a residence. Samples must be kept cold and delivered to an approved lab within 24 hours. Our account is with MB Labs on Henry Road in Sidney. (See Sampling Procedures below.) Additionally, on a monthly basis:	60 – 90 minutes plus travel

Frequency	Activity Description	Duration
	PH#1: • Open the bypass for a few minutes to refresh the line. • With water running, turn on pump at breaker and operate for a few minutes.	
	Piers Road Vault: Check for undersea line leaks • When water is not running, use the observation port to visually check that the vault meter is not moving. Meter dial should be idle (tank is not filling) or moving quickly (tank is filling).	5 minutes excluding travel
Every month or two	• Purchase Chlorine as needed (typically every two months in Winter and monthly in Summer.) Our account is with Acme Janitorial Supplies on Government Street.	60-90 min (w/ travel)
Quarterly	• Disinfection By-Product Sampling: Test for THM's every three months, when the coliforms are done in the first week of January, April, July and October. Two diaphragm sample bottles are drawn from each of the three locations. Deliver to the lab with the coliform samples. See Sampling Procedure below	
Bi-annually	PH#1 and PH#2 • Check and replace eyewash solution as recommended by supplier's information data sheet. • Operate the generators and log dates. Change and replenish fuel as necessary. (Currently performed by crew.) • Check beach lines at bottom of Piers Road.	30 min 60 min
Annually	• January/February – Prepare the Water Sampling Log Report and the Chlorination By-Products (Trihalomethanes) Report for the previous calendar year. See SOPs for preparation.	12 hours
	• January/February – Complete and submit the VIHA Annual Report and copies of the Water Sampling Log Report, the Chlorination By-Product (THM) Report and the VIHA Annual Inspection Report for the previous calendar year to our VIHA Drinking Water Officer. Post/distribute to residents. See SOP for preparation.	3 hours

Frequency	Activity Description	Duration
	• February – In February when the coliform samples are taken, also draw a Metal Scan sample at PH#2. (To avoid lead contamination, draw this sample from the 4" outlet sample port on the lean-to manifold. DO NOT DRAW THE SAMPLE FROM THE SINK TAP IN PH#2.	
	• Before the end of March, complete and mail or scan the Annual Water System Return Report to the Ministry of Forests, Lands and Natural Resource Operations. Post copy on PIID water webpage. See SOP for preparation.	3 hours
	• Spring – Arrange to have the VIHA Drinking Water Officer conduct the annual water system inspection. Affix the annual permit decal to the Operating Permit posted in PH#1 and attach a copy of the ViHA Annual Inspection Report to the relevant VIHA Annual Report when it is submitted.	3 hours
	• Spring – Flush the entire water distribution system. This is done in conjunction with North Saanich's annual flushing programme, usually in April-May. This involves flushing the undersea lines through PH#1, and the distribution main through the standpipes. See SOP	4 hours
	• Summer – Arrange tank warranty inspections by Greatario representative as per Operations manual and Warranty documentation. See Operations Manual.	1 day
	• Late Summer – order parts to prepare for servicing the chlorination system. (We have an account with Smith Cameron in Vancouver.)	1 hour
	• Summer/Fall – Arrange and assist in the annual servicing of the chlorination system and monitor the subsequent system run-up for several days. We contract Darren Scheuer in August/September for this work.)	4 hours
	• September/October – Conduct the annual reading of the service connection water meters. See SOP.	3 hours
	• September/October – Prepare and distribute the Water Meter Reading Report. See SOP.	3 hours

Frequency	Activity Description	Duration
	• November – Operators and Crew Members provide input to the Water Trustee to assist in preparing the water system operations budget for the following calendar year.	2 hours
Adhoc	• Drain and clean water tank every 2 or 3 years or more frequently as needed. • Undertake additional lab sampling as necessary or as directed by VIHA DWO. • Order Hach reagent pouches as needed to keep a supply in PH#2. See SOP • Check for leaks as necessary to account for consumption anomalies. • Attend Water Team Meetings and occasional strategy meetings with the PIVFD and Emergency Programme teams. • Check pump houses when it is cold and activate PH#1 bypass as necessary. Initiate use of auxiliary power at PH#1 and PH#2 as needed. See SOPs. • Respond to water system or fire department emergencies as necessary. (See Emergency Response Plan and Procedures.) • After power outages, reset float switch at PH#2 panel and check chlorination system for adjustments as necessary.	

Criteria for Visual Checks at Pump Houses and Tank

Pump House # 1 Visual Check

- Solenoid switch is set to Automatic which is the default
- Water meter is recording usage if water is running
- The filling sounds normal (not too slow or "different" from usual sound
- Room temp (in cold weather turn light or heater on to maintain 10C)

Pump House # 2 and Water Tank Visual Check

Pump Room:

- D1C Reading is relative to the set point
- The injection pump sounds regular and its speed is relative to the setpoint and current D1C reading.
- Circulation Pump is running – green light is lit
- Flow Meter is working to IGPM level required (marked at 30 IGPM)
- Pressure Gauge reading – approx. 9 psi on chlorine sensor loop gauge
- Flow sensor and probe sensor cylinders are clean with no bubbles
- UPS ready
- Room temp (in cold weather turn light or heater on to maintain 10C)
- Check lean-to manifold piping and valves for leaks and room temperature
- Float Switch panel – UPS battery lights are green when charged, and orange light is lit when tank is filling. Switch default position is "Auto". When power has been off, must reset switch from "Auto" to "Open" and back to "Auto" or the automatic function will not trigger properly when a fill is required if the automatic fill cycle was interrupted.

Chlorine Room:

- Injection pump (sounds normal, no tubing leaks). Display shows settings at 180 frequency rate and 85 % stroke length.
- Chlorine tank level – maintain around 10 inches or 18 gallons
- Room temp (in cold weather turn light or heater on to maintain 10C)

Tank:

- Water Level gauge indicates water levels within expected ranges depending on seasonal use. Tank is full at 7.03 metres (55,000 IG, 252 m3). A linear metre contains approximately 8,000 IG or 36 m3. The two float switches can be manually adjusted to vary the size of a fill cycle and the top water line. The ideal size of a fill cycle is about 5,500 IG, 25 m3, or about .7 of a linear metre on the gauge to ensure at least one refresh per day during the winter. In summer, multiple fill cycles occur.
- Monitor tank exterior for leaks, rust or physical damage

Piers Island Water Sampling Programme

Sampling Programme Scope and Elements

Microbacteriological Samples:

1. Bacteriological samples (Total Coliforms, E. Coli, and Fecal Coliforms) will be taken during the first week of each month.

2. At the Operator's discretion, samples can be drawn and delivered to MB Labs, on either Monday, Tuesday or Wednesday so that the samples can be processed before the following weekend.
3. Bacteriological samples should be taken only after the operator has sanitized their hands and disinfected the sample source by removing any screen or aerator, infusing with a bleach solution, and thoroughly flushing the tap orifice.
4. Samples will include one bottle from each of 3 locations: PH#1, PH#2 and a residence, and will be accompanied with a completed Requisition Form (Chain of Custody form).
5. All sampling activity will be recorded on the Operator Input logs kept in each pump house and at each Operator residence.
6. Samples must be kept cool until delivered to the lab to prevent bacteria growth in the samples.

Chlorine By Product Samples:

1. Every 3rd month (January/April/July/October) the chlorine by-product samples (Trihalomethanes – THM's) will be drawn and delivered to the lab in concert with the coliform samples.
2. THM samples will include two diaphragm vials from each of 3 locations: PH#1, PH#2 and a residence, and will be included on the coliform Requisition Form.
3. Samples must be kept cool until delivered to the lab to prevent chemical reactions in the samples.

Metal Scan: Sample drawn only from the Water Tank site

1. Every February the Metal Scan will be drawn from the 4"outlet sampling port in the new lean-to avoid the lead solder contaminant in the tap at PH#2. Metal scan sample bottles are stored in PH#2.

Replacement bottles:

1. Replacement coliform bottles and THM diaphragm vials should be requested from the lab when samples are delivered in order to keep a supply in stock.
2. Each Operator will keep a supply of at least 3 coliform bottles and 3 sets of THM sample vials in their personal kits.

Chlorine Residual Measuring & Visual Checks:

1. Operators conduct the regular monitoring and sampling programme on a monthly roster basis. At the Operator's discretion for timing (Monday, Tuesday or Wednesday), chlorine residuals will be checked every week at PH#1, PH#2 and a residence, and recorded in the Operator Input logs kept in each pump house and at each Operator's residence.
2. Visual checks will be also be done every week in concert with the chlorine residuals checks, and recorded in the Operator Input logs. The logs from all

locations will be made available to the person who prepares the "Water Sampling Log Report" during the calendar year.

Measuring Free and Total Chlorine Residuals

Piers Island uses 12% sodium hypochlorite (household bleach) as the disinfectant in our chlorination system. The goal is to keep the minimum level of chlorine in our water that will provide effective disinfection while minimizing the creation of harmful chlorine by-products such as trihalomethanes (THMs) and haloacetic acids (HAAs). The "standard" required is .2 mg/L (mg/L = parts per million) of free chlorine at the last user's tap. Our default dosage is 0.25 mg/L which we increase for specific purposes throughout the year.

To verify the performance of the automatic chlorination system, and to monitor the level of disinfection at our intake pump house and at least one residence, we manually measure both "Free" and "Total" chlorine residuals at weekly intervals using a HACH colorimeter.

Measuring Free Chlorine Residuals:

For low range dosages (0.02 to 2.00 mg/L), use the following reagent pillow procedure to test for free chlorine residuals:

1. Set the Hach to low range (LR).
2. Prepare the blank: Use a clean 10 ml glass sample cell and make sure there are no scratches where the light passes through the cell. (NB: the plastic sample cells are used only for high range dosage testing.) Fill the sample cell to the 10 ml mark and close the cell.
3. Wipe the blank sample cell clean of fingerprints and moisture, using a lint free cloth if possible. Condensation will interfere with the light measurement and can damage the instrument.
4. Insert the blank into the cell holder. Orient the diamond mark on the sample cell toward the front.
5. Install the instrument cap over the cell holder.
6. Push ZERO to create a chlorine neutral measurement base. The display shows "0.00".
7. Remove the blank sample cell from the cell holder.
8. Prepare the Sample: Rinse a second sample cell and cap three times before filling with sample. Fill the sample cell to the 10 ml mark.
9. Check that the reagent pillow is correct for free chlorine, and that the reagent date has not expired. Add one 10 ml DPD Free Chlorine Reagent powder pillow to the sample.
10. Close the sample cell and swirl or shake gently for 20 seconds to dissolve the reagent and remove air bubbles. Undissolved powder will not affect accuracy. A pink colour will show if free chlorine is in the sample.
11. Wipe the prepared sample cell to remove fingerprints and moisture.

12. **Free Chlorine measurement**: Within 1 minute of adding the reagent to the sample cell, insert the prepared sample into the cell holder. Orient the diamond mark on the sample cell toward the front. Install the instrument cap over the cell holder. Push READ. Results display in mg/L (parts per million). (If possible, push read two or three times during the first minute and record the most stable result.)
13. After the test, immediately empty and rinse the sample cell and cap three times.

Measuring Total Chlorine Residuals:

Important: Do not use the same sample cells for testing free and total chlorine residuals. If trace iodide from the total chlorine reagent is carried over into the free chlorine measurement, monochloramine will interfere with accurate measurement. It is best to use dedicated sample cells that are marked specific for free and total chlorine.

1. To measure total chlorine residuals repeat the full process above but use the reagent for total chlorine.

2. Once the total chlorine reagent is added, allow the sample to develop for 3 minutes.

3. **Total chlorine measurement:** After 3 minutes and within 6 minutes of the reagent addition, insert the prepared sample into the cell holder. Orient the diamond mark on the sample cell toward the front.

4. Install the instrument cap over the cell holder. Push READ. Results show in mg/L. Between 3 and 6 minutes, read the sample measurements several more times and record the most stable value.

Final Note: If anomalies occur during sampling, always retest until you are satisfied that the results are accurate.

Sampling for Coliforms

Total coliform bacteria occur naturally in the environment and are not generally harmful themselves. However, because their presence suggests that other more serious, disease causing organisms may exist in the drinking water supply, they have been selected as a reliable indicator for the bacterial quality of drinking water.

E. Coli (Escherichia coli) and fecal bacteria are found in the intestinal tracts of warm-blooded animals such as humans, dogs, and deer. Presence of these bacteria would indicate an extreme risk that the water supply could become (or is) contaminated with bacterial pathogens, enteric viruses or parasites harmful to humans.

Coliform sampling is performed by collecting samples, in containers provided by the laboratory, as follows:

- **Wash hands thoroughly and sanitize the working area with a weak bleach solution. (An adverse test result creates a lot of extra work to address so it is very important to never allow this to happen inadvertently through a lack of attention or carelessness while taking the samples.)**
- Keep the sample container closed until it is time to take the sample.
- Prepare the tap:
  - Remove any aerators or screens from the tap.
  - Clean thoroughly with bleach solution
  - Rinse thoroughly with water
  - Let the water run for 2-3 minutes.
- Restrict water flow to permit filling container without splashing.
- Remove sample container cap, taking care to avoid touching any surface of the cell or the cap.

NOTE: DO NOT touch the inside of the cap or neck of the container, and protect them from contamination. NEVER RINSE the bottle

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- Hold the container near the base and fill to at least the fill line as marked.
- Replace cap & tighten.
- Dry and place container in a plastic baggie to keep clean during transport.
- Keep the container out of sunlight and keep cool in the provided thermal bag with ice pack (DO NOT freeze)
- Label the container with sample location, date, and time collected.
- Fill out the laboratory requisition (see example).
- The sample must be kept cold and delivered to the laboratory within 24 hours of sampling.

Sampling for Trihalomethanes (THM's)

Disinfection by-products (DBPs) form when organic and mineral materials in water react with chemical treatment agents during the disinfection process. Trihalomethanes (THMs) and Haloacetic acids (HAAs) are the two major groups of chlorinated disinfection by-products found in drinking water. Together, these two groups can be used as indicators for the presence of all chlorinated disinfection by-products in drinking water and their control is expected to reduce the levels of all chlorinated disinfection by-products and the corresponding risks to health. Piers Island has been directed by our DWO to perform quarterly testing for Trihalomethanes only.

THM testing is performed by collecting two samples per location in diaphragm-lidded containers, provided by the laboratory, as follows:

- **Ensure hands and working area are sanitized**.
- Keep the sample containers closed until it is time to take the samples.
- Prepare the tap:
  - Remove any aerators or screens from the tap.

  - Clean thoroughly with chlorine
  - Rinse thoroughly with water
  - Let the water run for 2-3 minutes.
- Restrict water flow to permit filling containers without splashing.
- Remove sample container caps, taking care to avoid soiling

NOTE: DO NOT touch the inside of the caps or necks of the containers, and protect them from contamination. NEVER RINSE the bottle

- Hold the containers near the base and fill completely to the top. This is critical as any airspace will allow the DBP to continue to form after the sample has been taken)
- Replace caps & tighten.
- Keep the containers out of sunlight and keep cool in the provided thermal bag with ice pack (DO NOT freeze)
- Label the containers with sample location, date, and time collected.
- Fill out the laboratory requisition (see example).
- The samples must be kept cold and delivered to the laboratory within 24 hours of sampling.

The Disinfection By-Products (Trihalomethanes) Report includes the results of the disinfection by-products sampling programme, and calculates the Annual Locational Running Average which is the relevant value that is compared to the Maximum Acceptable Concentration value that is stipulated in the Regulations and Guidelines. The THM Report is included as a worksheet within the Water Sampling Log Report.
See SOP for preparation of the report.

Procedure to Record Data and Prepare the Calendar Year Water Sampling Log Report

The "Water Sampling Log Report" summarizes the implementation and sampling results of the Piers Island water system's sampling programme over a calendar year. All water testing and sampling routines are logged in real time and transcribed into the calendar year summary (using an Excel report format) at year end.

This fully inclusive report constitutes a piece of the regulatory documentation that is required by a drinking water supplier under the Safe Drinking Water Act and Regulation. It also provides a data base of collated information that is used to prepare the VIHA Annual Report. A copy of the "Water Sampling Report" is included in the submission of the "Annual VIHA Report" to our Drinking Water Officer each year.

Recording Data for the Report:

The report records are logged by the attending Operator as follows:

1. Date
2. Location – regular monitoring of the water system is conducted at 3 locations at least weekly, i.e, at Pump House #1 (PH#1), Pump House #2 (PH#2) and at a residence.
3. Time – specific to each location using the 24 hour format
4. Chlorine Testing results:
    a. Water Temperature (Centigrade)
    b. For PH#2 only, record the D1C Free Chlorine parts per million (mg/L) as displayed on the D1C console.
    c. Hach Free – record Free Chlorine Residuals measured with the Hach kit
    d. Hach Total – record Total Chlorine Residuals measured with the Hach kit
5. Confirm if samples are drawn for Coliforms, THM's and the Metal Scan.
6. Visual Checks – confirm that the pump house has been checked
7. Bypass/Pump – confirm when the bypass and/or pump are operated.
8. Sampler Initials – note the Operator's initials
9. Comments/Actions Taken: Note any actions or observations that are not covered in the column information.

NOTES:

1. In addition to the data provided by the Operators, the Water Sampling Report also documents the lab sample results, and the date that the results were received back from the lab.

2. The Piers Road Vault checks and PH#1 daily water meter reading are recorded manually in PH#1 and at this time are not produced in a digital report although the daily use records are used to complete the Annual Water System Return Report as well as providing useful information on the daily water intake.

References

BC Drinking Water Protection Act (DWPA)
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/01009_01

Drinking Water Protection Regulation (DWPR)
https://www.bclaws.gov.bc.ca/civix/document/id/crbc/crbc/200_2003

Canadian Drinking Water Guidelines
https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html