Trincomali Improvement District

Water System
Operations Manual
June 2023

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1. Introduction

a) TID Water System Objectives and Background

At Trincomali Improvement District, our goal is to provide safe, clean, sparkling water to all of our residents! The Trincomali Improvement District, TID, was formed in 1983 to take over management of the water system from Pender Utilities that was established by the Sub-Division who installed the original water system. The TID's purpose is the acquisition, maintenance and operation of the works for waterworks purposes.

b) Regulatory Framework

The Improvement District has all the powers of a Municipality for the limited purposes for which it was formed. The property owners elect the Districts Five Trustees for a 3 year term and are volunteers not paid for their services. Community volunteers undertake the Operation and Maintenance of the Improvement District and the Water Works. The Trincomali Improvement District is not for profit and all of its revenue goes into maintaining the water supply. The trustees levy taxes and water tolls, and establish restrictions on the use of water by implementing and passing by-laws which must be approved by the Ministry of Municipal Affairs and Housing.

c) Physical System Overview and Usage Guidelines

The Southern Gulf Islands for part of the year are very dry, semi desert. Our water system is divided into 2 parts:

Part 1, source and storage. Our water comes from 6 deep wells that capture rainwater as there is no shallow water table. These wells produce enough water during the rainy season to fill the two concrete reservoirs (2,273 m^3) that maintain water supply during the dry summer months.

Part 2, processing and distribution. Water is filtered, purified (ultraviolet radiation) and distributed to homes via a pressurized distribution system. At the same time and in the same piping system, water is pumped to elevated header tanks that can supply the distribution system via gravity, when the pressure pump is turned off.

Conservation is key to ensuring a stable water supply. To aid in conservations efforts, the Trustees established rules for water use under By Law #11. TID Standards of Water Use only provide for essential domestic purposes. Any outside use of water is not permitted except for fire suppression. Guidelines established for acceptable use of domestic water are:

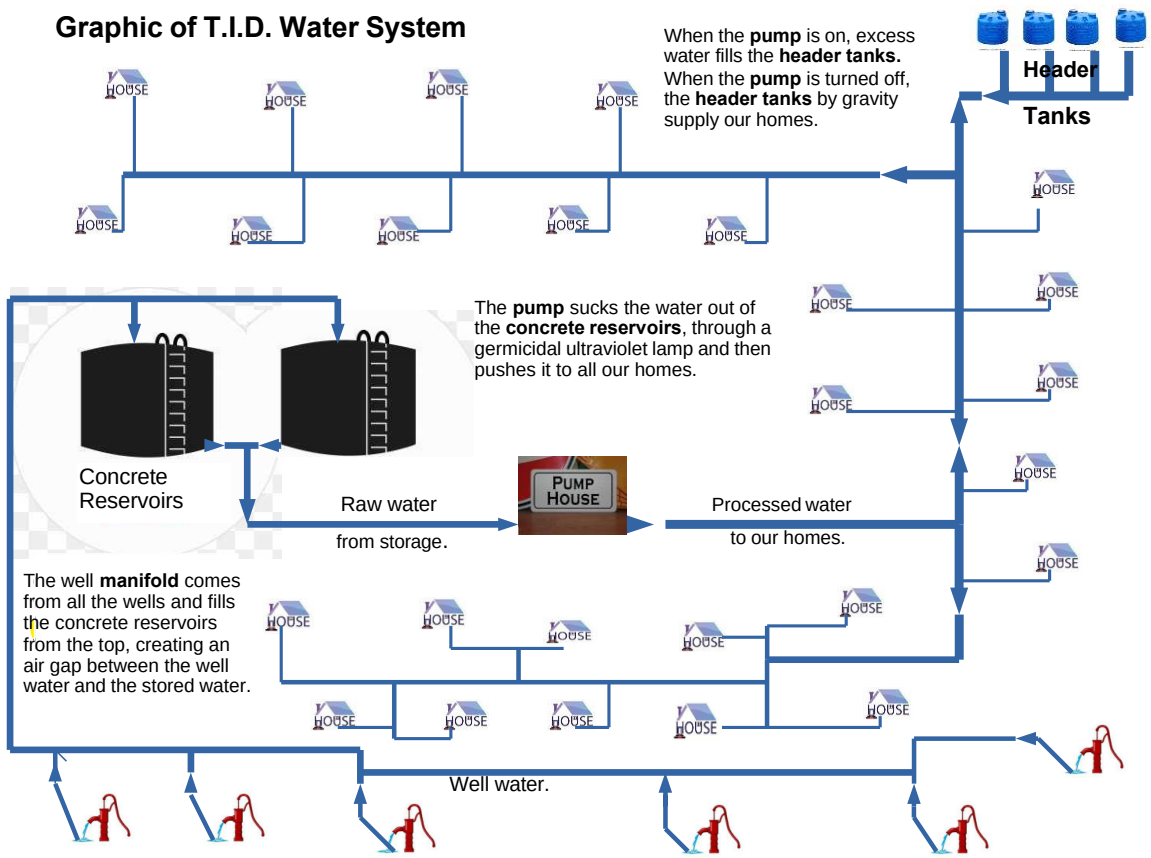
2 person household 60-70 Imperial Gallons per day (272-318 litres per day)

4 person household 110-130 Imperial Gallons per day (500-590 litres per day)

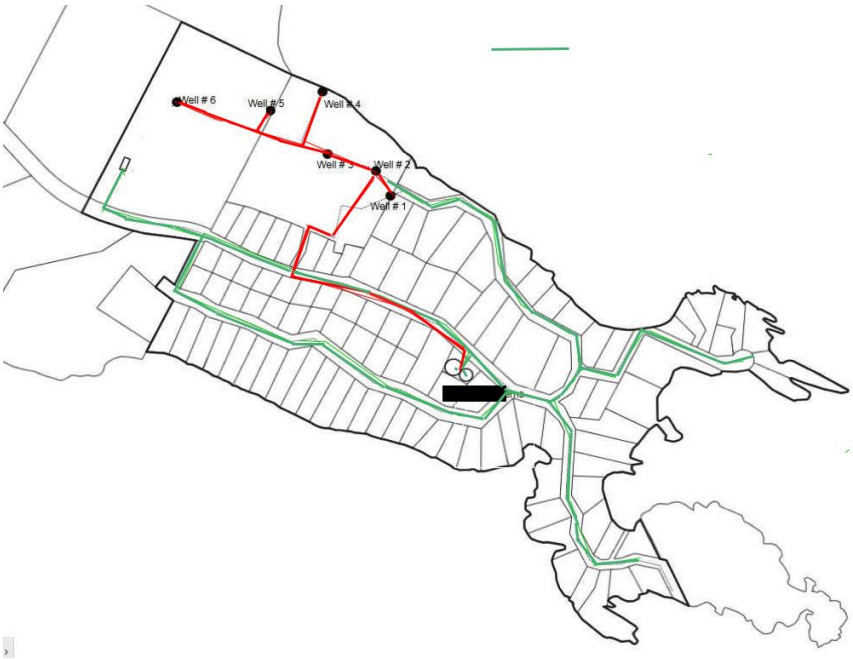
This usage is for days in residence, part-time residence usage should be lower.

Each lot has a Shut Off valve which must be turned off if the property will be vacant for 72 hours (3 days) or longer. This helps to prevent water loss due to undetected leaks.

d) Water System Schematic



e) Piping Diagram



2. Infrastructure Description and Principles of Operation

a) System Management

The water system is currently managed, operated and run by two part time positions:
Water Master (Currently Rick McMullen – Paid Position) and **Maintenance and Repairs Coordinator** (Mike McManus – Volunteer Position). The Maintenance and Repairs Coordinator is also a member of the TID Board of Trustees.

The Water Master is required to have taken and passed the necessary courses approved by the British Columbia Environmental Operators Certification Program to be certified as a Small Water System Operator. (Both Rick and Mike have acquired this certification).

Water Master - Main Duties

- Monitor amount of water in header tank(s) daily and start and stop the reservoir pump when necessary to keep the levels between 75 and 90%
- Monitor well water production and shut some off when there is excess water and optimise flow during the dry season (prevent wells from pumping off)
- Activate electric heaters in well pump houses as weather dictates to prevent freezing
- Report any operational issues to Maintenance and Repairs Coordinator
- Assume Maintenance and Repair Coordinator duties as required (periods of absence or unavailability)
- Record keeping and reporting to the Board of Trustees monthly or as required

Maintenance and Repairs Coordinator - Main Duties

- Regular checks on the water system for leaks or equipment malfunctions
- Routine maintenance and repairs of wells, flow lines, pump house, header tanks, storage tanks and distribution system (flush out the water distribution system annually (chlorination))
- Define and purchase appropriate spare parts in consultation with the Mater Master and Board of Trustees (keep a record of spare parts inventory)
- Maintain daily operating and maintenance log book including records on volumes pumped from each well and from storage tanks. Also record the pump house pump operating times
- Monitor and record water quality daily
- Coordinate monthly water metre readings
- Routine maintenance and repairs of water treatment system (UV lights and cartridge filters)
- Coordinate non-routing repairs and maintenance in consultation with Water Master and Board of Trustees. (Record when maintenance, repairs, modifications or any anomalies occur in the bound logbook in the pump house).
- Complete new property hook-ups and disconnects as directed by the Board of Trustees
- Assume responsibilities of Water Master as required (periods of absence or unavailability)
- Record keeping and reporting to the Board of Trustees monthly or as required

b) Wells

There are 6 wells in operation, #1 is just outside the "Holy Gate" at the end of Bedwell Dr (7912 Bedwell Drive); #2, #3 and #4 are in the Holy Gate property while #5 and #6 are on the adjacent property (7956 Pirates Rd.). Wells #1 and #2 are the most productive. Driving to well #5 without a 4x4 isn't recommended in the wet weather.

Wells are to be monitored regularly (depending on the season). They are all on electronic timers, which can be adjusted or turned off and on when needed. During the latter part of the winter/wet season, several of the well pumps will be completely off as there is too much water and the storage tanks are full.

The Holy Gate

Well #2 Pump House

Well #2

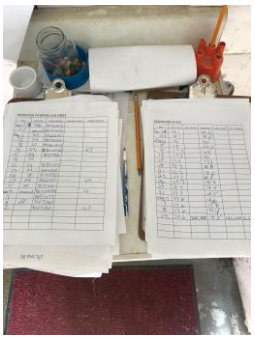
Typical Property Line Shutoff and Meter

c) Well Manifold and Storage Tanks

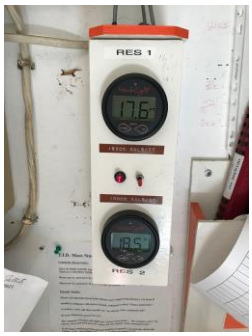
As each well timer activates its submersible multi-staged pump, water flows into a system of pipes referred to as the well manifold. At well pump house #2, a 2 inch pipeline takes the raw water up the hill to Plumper Way, then downhill to the concrete reservoirs located at 7925. Either or both reservoirs can be valve selected and the water enters, free flowing from the top creating an air gap. The air gap prevents any backflow from the reservoir back to the wells. If the wells continue to pump and the reservoirs are full, there is an overflow on the back (south) side that puts excessive water onto the ground. If the excess continues for some time, it will drain into a depression behind reservoir #2 and flow near the property line between 7927 plumper Way and 7901 Swanson View and into the Swanson View ditch. Every effort must be made to adjust the well pump timers so that there is no water wasted.

There is a log sheet in the distribution pump house for logging the volume in both reservoirs. There are depth sounders that can be turned on to show the height of the water in reservoirs 1 & 2. #1 (300,000 Imperial gallons or 1364m^3), on the right as you enter the site approximately 18,800 gallons/foot with 16' being full, reservoir #2 (200,000 Imperial gallons or 910 m^3) is 10,000 gallons/foot with 20' being full, a quick glance at the numbers will indicate current storage amounts.

Reservoir Tanks



Log Sheets



Depth Sounders

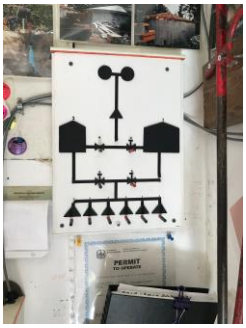
Reservoir 1 is typically used for the bulk of our drinking water since reservoir 2 is where our main hydrant draws from for fire protection. Pender Fire, if they attend Trincomali will attach their pumper truck to the draughting hydrant that only draws from #2 and run hoses to the fire. Our protocol is to keep reservoir #2 as full as possible at all times.

The reservoirs are alternated so that neither goes stale, and for operations management it is prudent to have water flowing in and out of both regularly. Late summer is the only time when #2 is used because of demand. 4 different valves; 2 in the red box just outside the pump house door and 2 on separate pipes just behind the pump house accomplishes this. Valves 3 & 5 are for Tank 1 and Valves 4 & 6 are for Tank 2. There's a small chart in the pump house showing what each valve does.

Pump House

Inside Pump House

Operating and Standby Pumps



Valve Diagram

Although it has never been exercised, it is possible by opening and closing specific valves to pump untreated well water directly into the distribution system and up to the header tanks. All the well pumps capacities have been upsized to make this possible. This would only be done in case of emergency (e.g. complete storage tank pump failure or restricted access to the storage tanks for some reason). In this scenario, residents would need to be advised about potential poor water quality (and possibly a boil water advisory).

d) Pump House

(i) Pumps

There are 2 pumps in the pump house. A primary 1 1/2 HP Goulds multi-stage pump, installed in 2019, normal output, 6.5 Imperial gallons per minute which will deliver approximately 8000 gallons in 24 hours, over and above non-summer residential consumption. The backup pump installed in 1987, Worthington centrifugal design with a 5 hp motor can move approximately 12 Imperial

gallons per minute. This was the primary pump at one time, but is not as efficient as newer multi-stage design.

(ii) Water Quality and Purification System

The pumps draw well water from the reservoir(s) and pump it through a fine media filter, rated at 1 micron nominal, past a germicidal ultraviolet lamp, putting out a dose of 30 millijoules per square centimetre (mJ/cm²) and then directly to the Trincomali residents with excess to top up the header tanks.

The filter is changed out and the filter housing cleaned 4 times per year based on volume pumped rather than the calendar. The two ultraviolet lamps are changed out at 8600 hours (1 year) of run time, (there is an hour meter attached) which in our operation takes about 3 years.


Media Filter Housing


UV Sterilizer Housing

Fire Water Connection

(iii) Record Keeping

There are two log sheets in the pump house, one for logging the approximate volume the pump has pumped and two for logging the volume in each reservoir. There is also a logbook for recording maintenance and repairs.

e) Distribution System and Water Meters

The PVC water distribution system is as shown on the diagrams in the Appendix.

All lots that are hooked up (have a service) have a meter installed between the curb stop (our shutoff) and the property line shutoff (property owner's shutoff). The meter is read and recorded at the end of each month. The most important reason to read the meters and record the data is to detect leaks.

f) Header Tank Building, Tanks and Telemetry Apparatus

(i) Header Tank Building

Access to the header tank building is via a private driveway onto 7956 Pirates Road, located approximately 70 metres northwest of the sign, indicating that Pirates Road has become Plumper

Way. The pipeline right-of-way is up the steep incline, although, the property owner has given permission to use the driveway.

Access to Header Tanks

Header Tank Building (side)

Header Tank Building (front)

(ii) Tanks

There are 4 header tanks each with a 10,000 U.S. gallon capacity, for a total of 40,000 U.S. gallons or 151.5 m^3. The principle of operation is to monitor amount of water in header tank(s) and start and stop the pump(s) when necessary to keep the levels between 75 and 90%.

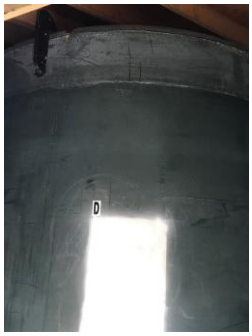
(iii) Telemetric Apparatus

The water in the header tanks is monitored by telemetric equipment, provided by Barrett Engineering of Calgary, called 'ProTalk CV3', designed for 'off the grid', so It is power by a large 12 volt battery, kept charged by a photovoltaic cell (solar panel) regulated by a small controller. Two of the tanks have pressure sensitive devices at their bottom that measure the amount of water in the tanks. As all four tanks are on the same level, each of these devices can account for the amount of water in the header tanks.

The ProTalk CV3 has an integrated cell phone, with a SIM card and an antenna mounted on the roof fascia board. It has the capacity to phone or text out as well as answer phone or text calls. It has pre-recorded voice or text messages.

Access to Telemetry

Telemetry System



Header Tank "D"

Header Tank Manifold

(iv) Communication Process.

This is accomplished by calling the telemetric apparatus in the Header Tank building. The number to call is 778.584.3832 and pressing 1-2-3 to determine the amount in the header tanks and 1-1-1 to acknowledge any alarms that are triggered when the tanks go below 75% or above 95%. The Water Master's cell # (currently Rick McMullen at 250-686-4896) is texted when the tank levels fall below or above these pre-programmed percentages. If no action is taken after 2 texts then 2 phone calls are generated to this cell.

If there is still no acknowledgement after the 2 phone calls then the Maintenance and Repairs Coordinator (Mike McManus) is texted and the process repeats itself until the alarm is acknowledged by either calling the number back and entering 1-1-1 or by answering the call and pressing 1-1-1. The pumps (ref subsection d. Pump House, (ii) Pumps (ii)), can either be turned on and off manually or by a 24-hour timer in the pump house. Both low and high alarms are important, as we do not want to loose water pressure or waste water through the overflow on the header tanks.

g) Fire Water Connection

As mentioned, the Pender Fire Department, if they attend Trincomali, will attach their pumper truck to the draughting hydrant at the reservoir location and run hoses to the fire (this is the only hydrant that has been certified by the PIFD). Our protocol is to keep reservoir #2 as full as possible at all times (ref picture above) as this is connected to the firewater system. The hydrant is piped with a 6" line and the separate shutoff valve is always open. Open the valve on the hydrant and water is accessible.

There are also 5 fire hydrants on the 4" main (not certified by the PIFD) which are located adjacent to 7921 Swanson View, 7907 Swanson View, 7906 Plumper Way, 7920 Plumper Way and at the corner of Swanson View and Plumper Way.

3. Routine System Operations, Monitoring, Maintenance and Responsibilities Schedule

(Responsibilities split between Water Master and Maintenance and Repairs Coordinator as per Main Duties in 2.a)

a) Daily

- Monitor amount of water in header tanks (by calling the telemetric apparatus in the Header Tank building) and start and stop the reservoir pump when necessary to keep the levels between 75 and 90%
- Maintain operating and maintenance log book including records on volumes pumped from each well and from reservoir tanks and the volume in each reservoir tank. Also record the pump house pump operating times
- Monitor and record water quality

Monthly

- Water Results Review, Meter Readings Anomalies and General Report to the Board of Trustees
- Coordinate monthly water metre readings

Annually

- Water System Report (Which covers Ground Water Licenses for our wells)
- Flush system with 50ppm chlorine solution to control residual bacteria

- Sample wells for saltwater intrusion between July 15-Aug 31 under supervision of qualified Hydrogeology professional

Need be Basis

- Monitor well water production and shut some off when there is excess water and optimise flow during the dry season (prevent wells from pumping off)
- Activate electric heaters in well pump houses as weather dictates to prevent freezing
- Report any operational issues to Maintenance and Repairs Coordinator
- Record maintenance and repairs
- Alternate reservoir tanks so that neither goes stale
- Regular checks on the water system for leaks or equipment malfunctions
- Changed out the media filter and clean the filter housing 4 times per year based on volume pumped rather than the calendar.
- Change out the two ultraviolet lamps are changed out at 8600 hours of run time, which in our operation takes about 3 years.

4. Contacts June 2023

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5. Emergency Response Plan

Ref www.Trincomaliwater.com for link to ERP