

# The City of Penticton Water Treatment Plant

The City of Penticton is located at the southern end of the Okanagan Valley close to the US border. It has Okanagan Lake to the north and Skaha Lake to the south. It is well known for its sunny beaches, friendly people, wineries, and as home to the Canadian Ironman Triathlon. The City's population is approx. 32,550 and the water system distribution system has 8,100 service connections. The idea for a water treatment plant was conceived in 1986 after several Giardiasis outbreaks and implemented in 1997.



Penticton Water Treatment Plant

## Overview

The original water system was built in the 1920's and consisted of one source, Penticton Creek. The water system was later updated to include pumping from Okanagan Lake during seasonal water quality changes. It has a main storage dam, Greyback, and separate domestic and irrigation systems. Because of the separate systems, construction of a smaller facility was feasible.

The \$20,000,000 project included the cost of the treatment plant, construction of pipelines, upgrading a pressure reducing station and Okanagan Lake pump station.

## Plant

Two primary sources, Penticton Creek and Okanagan Lake, feed the plant. This allows for the flexibility to choose which source is the best according to quality, supply capacity, pumping costs, and energy savings. The facility is a multi-barrier system that consists of intake structure, flash/rapid mix, coagulation, flocculation, sedimentation, filtration, and disinfection.



Sedimentation Basin

## Classification:

Level 4 Water Treatment Plant

## Specifications:

- Nominal Capacity: 60 ML/day
- Hydraulic Capacity: 100 ML/day
- Average Daily Flow: 21.4 ML/day
- Peak Flow: 52.4 ML/day
- Minimum Flow: 10.4 ML/day



Filter

**Intake:** Removal of large objects such as logs, leaves, fish and other large foreign

- Penticton Creek is fed to the plant by gravity from a reservoir.
- Okanagan lake water is pumped in a dedicated line directly to plant.

**Flash/Rapid Mixing Tanks:** The primary purpose of the flash mix process is to rapidly mix and equally distribute the coagulant chemical

### **Specifications**

- Tanks – 4 (2 per train)
  - Volume - 12.6 m<sup>3</sup>/train
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- Large propellers do the mechanical mixing. Coagulant mixing is achieved in approximately 20 seconds.
  - Raw water is pre-chlorinated (Cl<sub>2</sub>) here to help aid in coagulation and settling.
  - The coagulant, Polyhydroxy Aluminium Chloride, is added and mixed rapidly as the raw water enters the facility. The mixing process must be complete and uniform to achieve the proper results.

**Coagulation/Flocculation Tanks:** Coagulation is the process of clumping fine particles into larger particles, this increase in size and density will allow for removal by settling, skimming and filtering. Flocculation is the process

### **Specifications**

Tanks – 6 (3 per train)

Volume - 670 m<sup>3</sup>/train

- Flocculation tank is a continuation of the mixing process without the velocity.
- The mechanical flocculators are vertical propellers
- Flocculation basins are baffled to prevent short-circuiting of the water

**Sedimentation Tanks (Plate Settlers):** Removal of large particles that have densities higher than water by settling thus reducing the loading of filters. This is achieved by decreasing the velocity to almost zero so gravity can settle

### **Specifications**

Tanks - 1

Volume - 1355 m<sup>3</sup>

- The sedimentation basin uses plate settlers. These high rate settlers were developed to increase the efficiency of the sedimentation basin
- As water enters the basin, it travels up the plates, decreasing the velocity and increasing the surface area. Settling is achieved by gravity.

- Sludge is collected at the bottom of the settling tank and is removed and discharged to sanitary sewer. It can also be centrifuged.

**Filtration:** the removal of particulate impurities and floc by passing the water through a filter bed. The impurities can consist of suspended



Pipe Gallery

### Specifications

- Number of Filters 6
- Filtration Rate 18 m/hr
- Filter Size 4.5 m X 10 m
- Filter Depth 1.83 m
- Medium Type Anthracite
- Backwash Rate 650 L/sec or 300m<sup>3</sup>
- Air Scour Rate 46 m<sup>3</sup>/min

Water flows through 6 mono-medium (anthracite) gravity filters, which is one of the first installations of its type in Canada.

Filter run times vary from 48 to 100 hours depending on water source and quality.

Run time before backwashing a filter is determined by a combination of particle counts, turbidity, and head loss, and is done by mechanical means. This consists of blowers for air scour and vertical turbine pumps for backwash water

Disinfection: the

### Specifications

*Clearwell 6681m<sup>3</sup>*

*Pre & Post Cl<sub>2</sub>*

- Post chlorination is applied to meet distribution needs. Post chlorination allows for protection of the distribution system and reservoirs.

Full treatment of the water allows the chlorine dose to be significantly lower than it would be if chlorine disinfection were the only form of treatment.

## Lab Data

	Turbidity	Alkalinity	Hardness	pH	Color
	NTU	mg/l	mg/l	- Log H+	Apparent True
Raw Creek Water	Average 1.78	17	17	7.51	58.0 46.0
Raw Lake Water	Average 0.24	113	119	8.16	5.4 3.2

	Turbidity	Alkalinity	Hardness	pH	Chlorine Residual	Temperature
	NTU	mg/l	mg/l	- Log H+	mg/l	Celsius
Distribution System	Average 0.09	75	80	7.6	0.47	11.3

## Operation

The City of Penticton Water Treatment Plant and distribution system are operated and maintained by highly trained and certified operators. The plant contains a modern laboratory where water quality is monitored; which in turn assists the operators to adjust the plant performance to meet or exceed Canadian Drinking Water Standards.



Chemical Header

## Points of Interest

**Staff:** Dave Evanchu, WT III & WWT I, Greg Mealing, WT II\*/WWT II, Brent Edge, WTII\*/WWTIII, Brian Edge WT II\*/WWT II, Bruce Stickland, Electrician/WT I, Al Laidman, Water Mechanic, WD I \*, and Alistair Wardlaw Assistant Water Quality Supervisor. \* Greg, Brent, and Brian have recently written their WT III. \*Al recently wrote his WT I.

## Distribution System

160 Kilometers of water mains  
 900+ fire hydrants  
 5 reservoirs  
 8100+ service connections

- Treatment plant provides protection against Giardia Lamblia, Cryptosporidium, water borne bacteria, and viruses.
- Facility is primary run with blended water from Penticton Creek and Okanagan Lake.
- Blended water requires no pH adjustment.

- Modern SCADA system can control both water treatment facility and remote water supply system from a single location.
- A diesel generator provides backup power with the ability to run plant at full load capacity.
- All laboratory work is done internally, including microbiological tests of which there are approx. 1000/yr.

*Thanks to Kevin McLuskey*