

A visit to three sites of innovation for water management on the North Shore

Field Trip Leaders: Ken Ashley, Derek Bonin, Laurie Fretz and David Siu, Greater Vancouver Regional District; Richard Boase, District of North Vancouver; Troy Vassos, NovaTech Consultants Inc.; Howard Dallimore, Dayton and Knight Ltd.



Capilano and Seymour Reservoirs

The Greater Vancouver Regional District (GVRD) supplies drinking water to 2.2 million people and associated business in the Greater Vancouver area. The current sources of water supply are the mountainous Capilano, Seymour and Coquitlam watersheds. The Capilano and Seymour reservoirs supply up to 70% of the Lower Mainland's drinking water. The watersheds are closed to the public as part of a multi-barrier approach to protecting the quality and safety of the drinking water.

Participants will visit the Capilano and Seymour watersheds, and learn how the watersheds are being managed to supply safe drinking water to the residents of the GVRD. GVRD is currently building Canada's largest water filtration plant using state of the art sustainable practices including the use of Ecosmart Concrete, green roof technologies, ground source heating, and is protecting sensitive wildlife habitat. Participants will view some of the construction projects and learn about GVRD's Drinking Water Management Plan and some of the sustainability issues faced by GVRD.

District of North Vancouver – Stormwater Management

North Vancouver is an urban/suburban area built mostly on the slopes of the coastal mountains. The area is composed of the District and City of North Vancouver, with a total population of approximately 126,000 people. Many parks and recreational areas also exist, although urban developments have been expanding in recent years.

In order to deal with the corresponding stormwater management problems, several innovative techniques have been employed in both the City and the District of North Vancouver. Both detention ponds and constructed wetlands have been used and participants will have the opportunity to visit and learn about several of these including the Griffin Park Constructed Wetland which was built to remediate stormwater from a medium density single family and commercial land use area. The wetland consists of a pool and meandering stream design, which drains into an artificial salmon spawning channel.

Quayside Village

Participants will visit a co-housing community where a grey-water recycling system was created in cooperation with the North Shore Board of Health and the City of North Vancouver. The project was selected and driven by the Quayside Village community and, in part, financially supported by Canada Mortgage and Housing Corporation (CMHC). It includes a wastewater treatment and reuse system that consists of: a septic tank to remove coarse solids and grease/oil, a biofilter with recirculation back to the septic tank inlet, slow sand filter to remove solids, ozone generator and contact tank. Participants will hear about some of the lessons learned in moving forward with this innovative project.

Itinerary:

- 8:30 Depart from SFU/Delta downtown Vancouver
- 9:00 Arrive at Capilano Watershed gate
- 9:15 - 9:30 Capilano Reservoir - Derek Bonin
- 9:45 - 10:00 Capilano River Delta - Ken Ashley
- 10:00 - 10:15 Old Water Intake - Laurie Fretz
- 10:15 - 10:30 Capilano River Hydrometric Station - Derek Bonin
- 10:45 - 11:00 Capilano River Regional Park - Walk to Cleveland Dam
- 11:00 - 11:15 Cleveland Dam, Seymour - Capilano Pumping Station and Energy Recovery Facility - Marilyn Towill
- 11:15 - 11:45 Lunch at Cleveland Dam
- 11:45 - 11:55 Travel to Mosquito Creek
- 11:55 - 12:25 District of North Vancouver, Storm Water Project - Richard Boase
- 12:25 - 12:35 Travel to Quayside project
- 12:35 - 13:00 Quayside project - Troy Vassos
- 13:00 - 13:15 Travel to Seymour Watershed
- 13:15 - 13:30 Seymour - Capilano Filtration Plant - Howard Dallimore
- 13:45 - 14:00 Seismic Upgrade of Seymour Falls Dam - David Siu
- 14:00 - 14:15 Seymour Reservoir Water Quality - Ken Ashley
- 14:15 - 14:45 Travel to Rice Lake Learning Lodge
- 14:45 - 15:00 Welcome to Rice Lake Learning Lodge - Laurie Fretz
- 15:00 - 15:15 Watershed Management Plan Presentation - Derek Bonin
- 15:15 - 15:30 Drinking Water Management Plan Presentation - Stan Woods
- 15:30 - 16:00 Discussion
- 16:30 Arrive at SFU

QUAYSIDE VILLAGE – GREYWATER TREATMENT SYSTEM

Project Background

The Quayside Village (QV) co-housing community created a grey-water recycling system in cooperation with the North Shore Board of Health and the City of North Vancouver. The project was selected and driven by the Quayside Village community and, in part, financially supported by Canada Mortgage and Housing Corporation.

The QV water reuse system was originally designed to recycle grey-water for toilets, bathtubs, and gardening. However, the municipality had concerns about the accidental ingestion of any recycled water and only allowed the greywater reuse water to be applied to flush toilets. The black water discharge from the toilets enters the municipal sewage system.

The original system was designed to process both greywater and black water. However, the question of what type of water the municipality would allow to be recycled was not resolved until after the equipment was purchased for QV. With restrictions and limitations on what the system was allowed to do, the system and its equipment had to be redesigned.

As a multi-agency supported demonstration project, Quayside's greywater system had to be reviewed and discussed with a number of government agencies including the municipality. The support of CMHC and the North Shore Board of Health has provided some degree of liability shelter for the City of North Vancouver in approving the project. However, municipal staff remained concerned about possible liability for water-related sickness. For this reason, only a very conservative system with many backup features was allowed.

Treatment Process Description

The wastewater treatment and reuse system is illustrated in Figure 4, and consists of the following components:

1. Septic tank to remove coarse solids and grease/oil.
2. Biofilter (Waterloo™) with recirculation back to the septic tank inlet.
3. Slow sand filter to remove solids.
4. Ozone generator and contact tank.
5. Slow sand filter (automatically back-washed).
6. Storage tank

Process Performance

The supplier signed the system over to the Quayside Village co-housing owners with one year of monitoring service in order to satisfy the requirements of the District health inspectors. After one year, monitoring responsibilities were handed back to the Quayside Village Strata Council.

There are ongoing concerns about the (liability) risks involved in greywater recycling, although the system has been in operation for three years. The municipal health inspector has not yet “signed off” the final approval until sufficient time has passed to evaluate the system. The Quayside Strata Council

contracted an operations contractor to sample the water on a weekly basis to ensure that it is safe. However, fabric hung within the septic tank by the supplier to trap colloidal particles eventually collapsed and the system had to be shut down. Modifications were subsequently made, and the system was placed back in service and is the subject of an ongoing detailed monitoring program

While monitoring to date indicates the water reuse system can meet the target water quality objectives (identical to those shown in Table 4), there have been a number of equipment failures which have interfered with being able to meet the regulatory operational criteria of meeting the criteria for six continuous months. One of the key problems was in relying on ozone as the sole means of disinfection, compounded by the lack of adequate ventilation of the ozone off-gas.

Municipal staff feel some frustration that the entire process took significantly longer than expected from system construction and operation to approval from municipal health inspectors. Not all municipal staff were receptive to the project, doubting the validity of an urban grey-water system “where buildings are already serviced with municipal infrastructure.” One staff person sees this project as a curiosity for engineers and technicians to study, but not a replicable system that has any real potential at this time for water conservation.

Despite being operated for over three years, the municipal plumbing inspector reports that greywater recycling equipment and systems design in general are as yet imperfect, and various technical issues need to be resolved.

Changes to Improve Performance

As a result of an independent process review, the following remedial measures were recommended to improve system performance and address the problems observed with the Quayside Village reuse water treatment system:

- Remove the ozone generator and contact tank, replacing it with a chlorination system. This eliminates the problems with the ozone off-gas and provides a chlorine residual to control re-growth of bacteria. As the system is no longer intended to treat blackwater, colour removal by ozone is no longer important.
- Remove cloth fabric from the septic tank. The supplier intended the fabric to assist in removing colloidal particles; however, the structure supporting the fabric in the tank collapsed and blocked the outlet.
- Remove oversized (over-capacity) process components from the treatment system.

Lessons Learned

System design and function should be resolved with municipality and authorities before equipment purchase and system setup, as conservative municipal response to risk can lead to minimal allowances and overbuilt systems. In the case of Quayside Village, the municipality and the local health authorities required the system to be overbuilt to compensate for perceived risk. The irony is that a number of the equipment failures and operational problems have resulted from using an over-engineered system.

Before choosing any water reuse treatment equipment, project managers are advised to talk extensively to suppliers about the technical issues. Realistic timelines should be negotiated and understood by project managers, residents, and municipal staff

