Stephenville builds innovative engineered wetland and sewer system to treat its sewage

Town of Stephenville, Newfoundland and Labrador

water

Green Municipal Fund Case Study

Biological wastewater-treatment beds are prepared as part of a chemical-free system for treating Stephenville's sewage (Photo: Town of Stephenville).

Construction of a Sewer/Wetlands Treatment System (GMIF 5499)

Date project completed: January 2009
Total project value: $9,000,000
GMF grant: $4,430,000

- **Stephenville wanted to end the practice of piping its raw sewage into the sea**
- **It studied several systems to purify wastewater and stormwater from its sewers**
- **Two engineered, or artificial, wetlands were constructed — one to treat wastewater after initial screening and primary treatment, and a second to treat sludge**
- **Despite economic hard times, the town persevered in the face of $490,000 in unexpected costs**

OVERVIEW The Town of Stephenville built an engineered wetland to treat wastewater from its combined stormwater and sanitary sewer system. The new system also includes primary clarifiers and a second biological wetland to treat solid-sewage sludge. No chemicals are used in the treatment process, and the town no longer pipes raw sewage into the ocean. Fertilizer produced from waste by special plants in the treatments beds is removed every eight years, and the beds are replanted. The town has long-term plans to expand the project to treat sludge from septic tanks in the region.

PROJECT TEAM
Town of Stephenville
Newfoundland & Labrador Consulting Engineers
Abydoz Environmental

CONTEXT This hardy town of 7,765 people on the western coast of the island of Newfoundland has learned to persevere in the face of adversity. Unexpectedly, this perseverance was sharply tested during construction of the town's new wastewater treatment system.

The one-time fishing and farming community was hard hit in 1966 when the U.S. military closed the airbase it had built in 1941 for refuelling warplanes bound for Europe. It was hit harder still when its largest employer, Abitibi Consolidated, shut down its paper mill in December 2005, just as the town was about to start work on its $10.1-million sewage treatment project.

Despite that, plus a devastating flood and unanticipated problems with the treatment

site, the town completed the project — and now has a model of an environmentally sound wastewater disposal facility.

APPROACH After selecting a large, flat site on the northwest corner of its international airport, the town hired Newfoundland & Labrador Consulting Engineers to assess the cost, complexity and sludge-treatment capacity of three different wastewater treatment systems.

For several months in 2004, engineers monitored the amount of stormwater and wastewater discharged into the sea from the town's two waste pipes — including during wet weather, when heavy flow might test treatment capacity.

To help with design, engineers and town staff toured 10 facilities in Switzerland, Germany and Ontario to study sewage systems using components similar to the engineered wetland planned for the town.

The airport location meant some design constraints. Treatment facility structures had to meet federal transport department height restrictions for projects next to airports; and the system's primary clarifiers had to be covered so they would not attract birds that might be a hazard to aircraft.

Engineers studied whether the site was within the flood plain of the Blanche Brook river system. They also tested for soil contamination at and around the site.

RESULTS After rejecting a competing biological system and a traditional chemical-treatment lagoon, the town settled on Abydoz Environmental's Kickuth BioReactor process that included two engineered wetlands — large beds full of hybrid plants that help break down sewage and leave behind purified water and fertilized soil.

Plastic and non-biodegradable waste is skimmed off the top of sewage entering the treatment facility, trucked away and buried in the town's landfill. The remaining wastewater flows through the facility's clarifiers into one of the two treatment beds, where it nourishes plants and is purified before being piped to the sea. Solid waste, after settling to the bottom of the clarifiers as sludge, is pumped into the second treatment bed where plants convert it into fertilizer.

"It's all biological," said town manager Barry Coates. "It practically runs itself."

Measurements of the town's stormwater and wastewater found that wet-weather flow was 13 times the average daily flow (690 litres per second, compared with a daily average of 53.4 litres per second). To protect the new facility from flooding, engineers decided that excess flow from the town's sewers during heavy rain, spring run-off and floods would bypass the system. That already-diluted overflow would be further diluted with treated wastewater, making discharges into the sea clean enough to easily meet environment department anti-pollution standards.

"We needed a bypass for emergencies," Coates said. The diluted waste going into the ocean at such times "is still miles ahead of what we were doing."

The river-level study showed that the site was within the 100-year flood plain. To further protect the site from flooding, a 2.4-metre-high berm was built around it, at an extra cost of $250,000.

Underground pipes for the facility were routed around areas at the airport site that had been contaminated by jet fuel and hydrocarbons, delaying the project and adding $240,000 to its cost.

Although technologically advanced, the facility is simple, inexpensive to operate and maintain, and environmentally solid. "That's what sold me on this system," Coates said. "It's biological, and I think that's the way we have to go."

NEXT STEPS The town will keep monitoring the facility to determine the amount of waste it can handle, and to make sure its plants are healthy and well established. Monitoring is seen as particularly important in the winter, when the plants need wastewater not only for nourishment but also to keep them from freezing.

Currently, all septic systems in nearby communities have their solid-waste sludge collected and trucked away to remote locations for disposal. Coates says the town hopes one day to expand its sludge-treatment facility to handle septic-tank waste for all 25,000 citizens in the region that includes Stephenville, St. George's and the Port-au-Port Peninsula.

LESSONS LEARNED In its completion report, the town said the project is a prime example of the way municipalities can build environmentally sophisticated wastewater treatment plants when they have Green Municipal Fund financial support and a committed project team. It said the team gained valuable design insights by interviewing operators of similar installations elsewhere. It also recommended using suppliers with good local support and strong technical backgrounds; this way they can help treatment-facility operators in the early going.

If it were doing the project over again, the town would not spend time or money looking at other systems, Coates said. "We're quite happy with this. It is an important step in changing the way things in waste treatment are done."

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ADDITIONAL RESOURCES To read the full report or to learn about other GMF-funded initiatives, please visit the GMF website at <www.fcm.ca/gmf> or contact us at 613-907-6208 or at gmf@fcm.ca.

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