

ENVIRONMENTAL ENGINEERING AND SCIENCE MAGAZINE

Muskoka wastewater treatment plant is sensitive to wildlife

To eliminate failing septic systems within the Community of MacTier, the District Municipality of Muskoka constructed the MacTier Sewage Works. This project included a sewage collection system within the Community, several sewage pumping stations and the new Conger Marsh Wastewater Treatment Plant. The District of Muskoka has a philosophy of protecting and, where possible, enhancing the natural environment of Muskoka; the design and construction of the Conger Marsh Wastewater Treatment Plant demonstrates that philosophy. The Plant is a model of environmental sustainability - compatible with a provincially significant area which includes habitat for endangered species and a sensitive natural environment. Through innovative treatment and energy management, this facility discharges high quality effluent into an environmentally sensitive wetland fen, protecting nearby Stewart Lake from failing septic systems and allowing for future economic growth.

The site for the Conger Marsh Wastewater Treatment Plant is located on Crown Land which includes a Provincially Significant Wetland as well as habitat for Eastern Massasauga and Hognose rattlesnakes. The Massasauga Rattler is the only venomous snake still found in Ontario; however, due to its small size, it is a minor risk to humans. To mitigate the effects of the Plant on the natural environment and to ensure protection of sensitive snake habitat, a detailed environmental survey was conducted during the pre-design phase. As part of this survey, existing snake habitat was identified and mapped. In addition, several Eastern Massasauga and Hognose rattlesnakes were captured and tagged with radio transmitters. Over the course of two years, the movements of the snakes were tracked to determine where on the property the most sensitive habitat is located so that impacts on nesting and hibernating areas could be minimized. The results of the survey led to the selection of a Plant site that minimizes interaction between the snakes and municipal operations. The 800 metre long access road to the Plant has also been located and configured to avoid known snake habitat. In addition, to prevent accidental injury to the snakes without restricting their movements, the access road was constructed with a series of culverts to allow the snakes to cross the road safely.

The outfall for the new Plant discharges into a Provincially Significant Wetland fen area. During the pre-design phase, detailed water quality surveys were undertaken at six locations on the site and for several potential discharge points. During these investigations, bird and aquatic life were extensively assessed and investigated. These investigations identified the preferred outfall location which had the least impact to the existing aquatic environment.

The Conger Marsh Wastewater Treatment Plant process consists of raw sewage screening followed by a Sequencing Batch Reactor (SBR), tertiary filtration, disinfection using ultraviolet (UV) light and an outfall. Waste activated sludge produced from the process is stabilized using aerobic digestion and facilities are provided for the storage and management of biosolids.

The SBR chosen for this project utilizes the Intermittent Cycle Extended Aeration System (ICEAS). The SBR process design was carefully chosen to optimize the main effluent quality parameters (biological oxygen demand, suspended solids, total phosphorous and ammonia), while providing a high degree of flexibility to produce a very high quality effluent. The treatment of raw sewage was reviewed with respect to the normal parameters, as well as other raw sewage constituents including metals and other compounds to produce as high a quality an effluent as possible without incurring excessive capital costs. The ICEAS process is a continuous flow type SBR which incorporates an anoxic/anaerobic pre-reaction zone followed by an aeration/settling/decanting basin. The pre-reaction zone acts as a biological section to improve sludge settleability. The process design was selected to provide nitrification in the main reaction zone. Using the pre-reaction zone along with on/off aeration provides a benefit for denitrification.

The denitrification feature of the SBR will reduce nitrates in the effluent to protect amphibians which are sensitive to nitrates. A high degree of redundancy has been incorporated into the Plant to ensure that the effluent quality is not compromised by equipment failures or process upsets. The tertiary filtration area was chosen conservatively using relatively low filtration rates to provide improved effluent quality and system security. As well, the Plant includes four UV disinfection banks to accommodate 100% redundancy at peak flow.

Energy efficiency has been incorporated into the Plant through the use of dissolved oxygen blower control, as well as the design of a sophisticated heating, ventilation and air conditioning system to regulate building temperatures during attended and unattended operation. LEED (Leadership In Energy and Environmental Design) building principles were used to mitigate the environmental effects of the Plant construction and to improve energy efficiency.

Even though the Plant is located approximately 1 km from the nearest residential properties, there are several recreational trails in the area around the site. Noise and odour controls were built into the facility to minimize the effect of the Plant on the neighbouring residents as well as to preserve existing recreational uses within the area.

The architectural elements of the Plant building are sensitive to the history of the local community. The building's facade reflects traditional Muskoka architecture and the colour scheme was chosen to represent the cranberry harvesting heritage of the area.

To protect the endangered species during construction and operation of the Plant, all staff working on the site have received snake awareness training. An expert from the Ministry of Natural Resources' Reptile Awareness Program provided training sessions for the construction personnel and operations staff. Also, whenever blasting adjacent to critical habitat areas was necessary, pre and post-blast inspections were made by a biologist. To ensure the effectiveness of these measures, an extensive monitoring program will continue for one year past the Plant's completion date.

The Conger Marsh Wastewater Treatment Plant is truly a good neighbour. The Plant reflects Muskoka's heritage while minimizing odour, light and noise pollution. Most importantly, the facility was designed to minimize impacts to sensitive, endangered Eastern Massasauga and Hognose rattlesnake populations, while protecting the surrounding aquatic, terrestrial and recreational environments.