Landfill Redevelopment

2017 Excellence Award Entry

Landfill End Use Sites

Population: 431,346
Households: 184,160
Cost of Improvements: $0.83 CDN/household
Budget for Improvements: 154K CDN
(for all 3 sites)

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Executive Summary (150 words)

With the closure of landfill sites, Niagara Region explored options to return these sites to a combination of wooded grassland ecosystems through a variety of naturalization techniques. The plan incorporated compatible passive recreation uses including hiking trails, off-leash dog areas, viewing areas and interpretive signs. The key elements of the site restoration initiatives were designed to be sensitive to the natural environment and accommodate the existing mechanical/infrastructure environmental protection systems, and provide a naturally sustainable, attractive and safe environment. The success of Elm Street End Use Plan, garnered attention from other municipalities, and the implementation of passive recreation uses were included at two other landfill sites.
1.) **Planning, Design, and Construction**

- **When did you create your post-closure land use plan? What are the key elements of the plan?**

Niagara Region closed the Elm Street Landfill site for landfiling, December 21, 2008 with the intention to restore the property and make the site available for public use. A detailed site analysis was conducted which focused on a review of surrounding land uses and the physical characteristics of the site.

An End Use Master Plan was created in 2009 to provide a description of this design. The main goal of the Master Plan was to return the site to a combination of wooded grassland ecosystems through a variety of naturalization techniques. The plan incorporated compatible passive recreation uses including hiking trails, off-leash dog areas, viewing areas and interpretive signs. The key elements of the site restoration initiatives were designed to be sensitive to the natural environment and accommodate the existing mechanical/infrastructure environmental protection systems, and provide a naturally sustainable, attractive and safe environment.

Of the two (2) conceptual designs, the second concept was chosen providing approximately 80% of the non-landfill area being designed for naturalization, as opposed to 30% in concept one, see Figure 1.

The main elements of the End Use Plan include:

- A visitor access road and parking (40 vehicles)
- Recreation trails (3.4 kilometres)
- Off-leash dog area (2 fenced areas for large and small dogs)
- Visitor Orientation Centre
- Interpretive/viewing/amenity nodes (3 sites)
- Naturalization area (woodlands, grasslands, riparian vegetation zones)

There is no requirement in any regulation for End Use Development – several of Niagara Region’s closed sites are properly capped and seeded. The sites are then allowed to regenerate naturally and no end use is promoted or developed.
What site restriction was mandated by local/state/federal regulations? What permits did you need and from which agencies (local/state/federal)?

As per Condition 45 of the Waste Disposal Site Certificate of Approval (CofA), a Closure Plan was developed, with the closure works (capping, topsoil, and seeding) to be carried out in 2009.

Niagara Region initiated the development of this planning and design process to determine the most appropriate End Use for the site. The Plan has been developed in consultation with the Public Liaison Committee, local residents and businesses and the City of Port Colborne. The Plan allowed Niagara Region to apply to Ministry of the Environment (MOE, now Ministry of Environment and Climate Change (MOECC)) for approval of the selected end use.

Since the landfill site was closing and a Closure Plan was required, the End Use was included in the Closure Plan and submitted the End Use Plan as part of the CofA (now Environment Compliance
Approval) amendment. A Site Plan amendment was also required, although due to the close working relationship with the City of Port Colborne, the requirement was waived.

What modifications did you need to make to this site to allow for the new use?

The site is surrounded by growing industrial/business park to the south and east, agricultural land to the north and the Wainfleet Bog to the west. Mud Lake Conservation Area is located northeast of the site on the east side of Elm Street.

Existing Infrastructure

To implement the conceptual design, the following service/operation infrastructure needed to be modified.

- Monitoring/Mechanical Equipment
- Access Road System
- Asphalt Pads
- Stormwater Management Ponds
- Scale House (removed)

The service/operational infrastructure includes the leachate collection system, stormwater management system. The leachate collection system includes a series of underground pipes including pumping equipment and manholes. These pipes surround the waste disposal fill area and flows to an on-site pump station to a sanitary sewer system. This system will remain operational and accessible to service vehicles.

The exiting road system included the entrance road and a road that follows the perimeter of the landfill/compost area. There were also some secondary access roads that connected to the GVETS venting system at the top of the waste disposal fill area and a number of the monitoring wells and manholes. These access roads have a granular surface and the existing road system remained in place.

The asphalt pads cover a total area of 31,500 sq. m., to the south of the landfill area, separated by an access road that was used for compost operations. Both asphalt pads were removed.

There are four (4) storm management ponds located on the site. These ponds collect surface water runoff from the developed portion of the site. It was the intent of the End Use Plan to retain these ponds and the existing runoff collection system. The ponds remained undisturbed, but a riparian planting program was initiated around the perimeter of each of the ponds.

The scale house and scale were removed from the site.
Modified/Added Infrastructure

With the above modifications complete, the End Use Plan also included adding the following infrastructure to implement the conceptual design:

- Entrance treatment
- Access Road
- Parking
- Visitors Orientation Centre

Visitors access the site from Elm Street at the existing site entrance. The entrance was landscaped with a combination of armourstones, riverstones, shrubs, perennials and groundcover. The property was identified with signage integrated into the landscaping. Signage was constructed with natural looking material such as timbers and stone.

The access roadway crosses over the rail tracks before entering the property providing access to parking and the Visitor Orientation Centre. The access road divides into one-way system once it enters the property. The driveway and associated parking were constructed of granular material. Concrete pads were also provided to accommodate handicapped parking spaces. The parking area provides 40 parking spaces with easy access to the Visitor Orientation Centre and the off-leash dog compounds.

The site required formal final capping, seeding and in the areas not located within the landfill footprint, grading to accommodate trails, plantings and a leash free-dog park. In the case of the leash-free dog park, significant work was required in order to re-grade a formerly unused portion to promote drainage of surface water to accommodate the park and use by dogs and their owners.

Trails

It was included in the plan that the recreation trail system will radiate out from the Visitor Orientation Centre located beside the parking area. The trails will provide a network of opportunities for walking, viewing, cross country skiing, and nature appreciation. The trails include a series of main, primary, and secondary trails to provide a variety of route.

The primary trail allows for following the existing service road system. It is a wide trail, typically 4.0 meters wide, with a granular surface (existing). The secondary trails will be newly created, and less
intrusive than the primary trail. The visiting public was provided with a total of 3.4 kilometers of trails on the site after the secondary trails were constructed.

Off-leash Dog Area

The off-leash dog area consists of two separate compounds, one for large dogs and one for small dogs including gathering areas for the dog owners included a mud free surface treatment of crushed limestone. Each compound was also provided with garbage/recycling containers adjacent to the entrance of both sites and shade trees throughout the site for dogs and owners (see Figure 2).

Elements:

- Fencing
- Dog owners sitting/gathering area
- Shade trees
- Garbage/recycling containers
- Dog bag dispensers

The large dog area is located on the vacant section of the site along the south boundary, an area of 11,500 sq. m. and extends west as far as the service access road used for maintenance of the leachate collection system. The small dog area is located adjacent to, but separate from the large dog compound, is situated further to the east and along the south boundary of the site. This area was vacant with some scattered mature trees. The small dog area covers approximately 6,000 sq. m.
Visitor Orientation Centre

The Visitor Orientation Centre is located adjacent to the visitor parking area, centrally located on the site with easy access to the off-leash dog areas, the main pedestrian spine, and trail connections (Figure 3).

Figure 3: Visitor Orientation Centre

Elements:
- Pavilion structure
- Interpretation/Site map
- Casual sitting area
- Security Lighting
- Garbage/Recycling Containers

The focus of the Visitor Orientation Centre twin pavilion structure was to provide share/rain shelters for users. An outdoor gathering plaza located between the pavilions and the parking lot provides casual seating areas and some scattered trees for shade. Included in the plaza, are two (2) interpretive signs boards providing a site map, explanation of the site and naturalization restoration initiatives, see Figure 4.

Figure 4: Interpretive sign at Visitor Orientation Centre
Waste Disposal Fill Area Staging/Interpretive Area

The waste disposal fill area staging/interpretive area is located at the base of the waste disposal fill area slope at the terminus of the main pedestrian spine. The will be the site of an interpretive sign providing information about the history of the landfill site and ongoing monitoring requirements.

Naturalization Areas

Large areas of the site were returned to a natural state and populate the site with a variety of native plant species. The selection of plant material required consideration of the existing growing conditions including cover material, soil depth and quality, drainage, soil moisture, wind and sun exposure. The plantings add bio-diversity to the site, and provide cover and habitat for a variety of species.

The plantings were installed in the areas surrounding the four stormwater management ponds with the intent to prevent erosion, ‘slow down’ surface water flow, and provide shade to the pond, cooling water temperatures resulting in cooler discharge flows into the surrounding watercourses. This will have a positive impact on downstream fish habitat zones. In addition, there were a number of areas that were restored with upland woodland plantings, including most of the open, flat, areas of the site south of the water disposal fill area hill surrounding the ‘grass meadow’. Any area not designated for either riparian or upland woodland plantings were restored as native grasslands, specifically the large flat area located between the Visitor Orientation Centre and the waste disposal area hill.
• Describe the safety plan used for design and construction and any special concerns about the site that needed to be addressed to ensure worker safety (waste relocation, unique construction features).

Elm St and Station Road had significant buffer lands adjacent to the Site and Centre Street had been closed for many years. As a result, the designs made maximum use of the buffer lands so as to avoid any potential health and safety issues associated with working on the landfill. The only construction completed on Elm Street and Station Road were walking trails. Despite that, the contractors were still required to provide a health and safety plan in order to comply with the contract requirements.

• How did you ensure that the site is compatible with the surrounding community?

The Elm Street site is located on the edge of residential development but is located in a primarily industrial commercial area of Port Colborne. As part of the End Use Plan development, the Region had extensive involvement from local residents that not only reviewed the concepts but also provide significant feedback in regards other elements that should be incorporated into the design (i.e., leash-free dog park). With the entire End Use Plan being vetted by the local businesses, and
developed based on feedback from the public, the Region was assured that the design was not only compatible but reflected the needs of the local community. This allowed for development to capitalize on the physical opportunities of the site, while respecting the environmental and infrastructure constraints. With secondary consideration, public consultation established that the most appropriate end use is to naturalize the site with a focus on passive recreation opportunities.

- **What challenges did you incur and how did you address them?**

A challenge that arose during tender was that costs were higher than estimated. As a result, in order to maintain the integrity of the design concept, the Region had to strategically negotiate with the lowest bidder to modify the scope of work and reduce costs. The result was a site that still met the design objectives of the Region and surrounding community.

An additional challenge was the mortality of the plantings the area south of the landfill footprint. Since this area was formally used for composting operations and housed asphalt pads with a significant granular base, the underlying soil was very densely compacted. As a result, the contract was written with a warranty to cover the replacement of the vegetative plantings within a specified period. While mortality was still high, the sustainability of the indigenous plantings was much better.

- **What makes your site unique or state-of-the-art?**

This site is unique in that, restoration initiatives were designed to provide a naturally sustainable, attractive and safe environment given the location of the site.

The property is divided into two distinct areas, a ‘Wetland’ and ‘Landfill’, separated by the Biederman Drain which flows from south to north through the middle of the site. The ‘Wetland’ includes a undisturbed wetland ecosystem, that is part of the Wainfleet Bog, which dominated the area on the west side of the Biederman Drain. The area of the wetland is approximately 25 hectares with a mix of woody vegetation.

To the north east of the site (500 m) is Mud Lake Conservation Area which is run by our local Conservation Authority. The only disconnection between the two parcels is the Elm Street Naturalization Site. To ensure connectedness of the surrounding sites, restoration efforts took into account the indigenous species characteristic of the Wainfleet Bog and surrounding environment in an effort to help bridge the gap between the two areas.

- **How does your plan go ‘over and above’ what was required by regulation?**

Niagara Region has a two tier governance system, consisting of local area municipalities (LAMs) and the Region. The LAMs are responsible for the implementation and maintenance of elements related
to Parks and Recreation. Given the positive impact of the proposed site design on the environment, through naturalization and providing habitat, the Region proceeded with design knowing that it would be responsible for the long term operation and maintenance of this facility. In addition, the implementation of end use for the sites was not required, but the Region chose to implement the passive recreation features as a way of allowing the space to be utilized by the local residents.

In addition, the Region included the Public Liaison Committee, local residents, the City of Port Colborne and Humane Society in the consultation, and planning and design process.

- **What does your landfill site deserve an excellence award?**

The naturalization of the site was developed using sound environmental principals that take into account the inherent constraints of the site. The plan to remove hard surface paving materials, promote recharge of the local ground water systems, increase the shade canopy, and introduce a variety of ecosystem to improve the bio-diversity of the sites was something that other LAM were interested in. The End Use Plan for Elm Street garnered attention from other municipalities. Station Road in the Township of Wainfleet and Centre Street located in the Town of Pelham respectively, were also interested in the naturalized End Use approach.

The Town of Pelham approached Niagara Region regarding the establishment of a leash free dog park at the former Centre Street Landfill Site. The Town of Pelham has received several presentations by local residents regarding the need for a Leash-Free Dog Park. In fact, local residents initiated the request for the use of this Site and raised (through various fundraisers) over $25,000 help pay for the construction of the Park.

Elm Street, Station Road, and Centre Street were all redeveloped in working with local area municipalities (City of Port Colborne, Township of Wainfleet, and the Town of Pelham), and interested residents to redevelop a site that was formally a blight on the landscape, retuning it to the environment and public for future use, see Figure 6 and Figure 7.
2.) **Environmental Controls**

- **What design feature and controls (e.g., groundwater and leachate monitoring, air monitoring, odors, landfill gas) are in place to ensure that the landfill contributes to environmental protection? Include photographs and schematics as necessary**

These are several design features and control in place to ensure environmental protection:

*Leachate Collection System*
The leachate collection system (LCS) Phases I, II, III, and IV encompass the Waste Disposal Fill Area and consists of perimeter collectors that convey collected leachate to a pump station where it is discharged to the sanitary sewer and subsequently treated at the Seaway Wastewater Treatment Plant in Port Colborne. The LCS minimizes the off-Site migration of the leachate generated within the Waste Disposal Fill Area and controls the leachate mound within the waste, minimizing seeps and associated impacts to stormwater runoff.

**Surface Water Management System**

Surface water drainage from the Waste Disposal Fill Area is routed through a series of interior perimeter ditches and swales which direct collected stormwater to four on-Site stormwater management ponds. The surface water management system was designed and constructed based on approved final cover contours for the Landfill.

The ponds are designed to fully retain all runoff within the ponds (discharge valves closed) or to detain runoff (discharge valves open) in order to maintain approved and/or manageable discharge rates. As of early 2017, Niagara Region is now able to operate these ponds as open valve ponds based on the receipt of MOECC approval. As a result of naturalizing the Site, the water quality conveyed to the ponds is in general of better quality than the Bierderman and Skeleton drains to which they discharge.

Emergency overflow systems are provided in each pond to provide for controlled discharges from the ponds during emergency conditions when pond capacities are exceeded. The ponds are equipped with graduated staff gauges to permit visual monitoring of water levels and available storage volumes.

**Landfill Cover**

The as-built final cover contours are consistent with the maximum permitted waste volume and the proposed final contours as approved by the MOECC. Final cover consisting of a minimum of 0.85-metres of compacted clay and 0.15-metres of suitable planting material were placed in 2009 and 2010 to promote the growth of vegetative cover. The final cover system is designed to minimize infiltration and erosion. All surfaces and cover have a slope to promote surface water runoff while minimizing soil erosion and to facilitate equipment access for final cover construction and/or repair.

**Monitoring Network**

The environmental monitoring network consists of a groundwater monitoring wells, surface water and SWM pond sampling stations, and a leachate well monitoring network.
• What is the overall impact of the facility on human health and safety, environmental quality and resource conservation?

Continuous monitoring at the Site indicates it is operating within its current approvals. As previously noted, the quality of the surface has improved so significantly since the Site was closed, Niagara Region is now operating the stormwater ponds as open valves with direct discharge to the environment. The actual use of the site is great for the recreational use to improve human health.

• Emphasize what you have done that is ‘over and above’ what is required by law or regulation.

To mitigate potential impacts to environmental quality are mitigated, Niagara Region continually increases monitoring (primarily groundwater) to ensure all possible impacts are identified as soon as reasonably possible. Further, Niagara Region has added analytical parameters beyond what was required in order to better define the presence of contamination. At Station Rd., Niagara Region has employed the use of tritium as an analytical parameter as a leachate indicator parameters. Initial results are positive and when combined with routine analytical parameters the results show little to no impact to the surrounding groundwater despite the fact Station Rd., is a natural attenuation site.

3.) Sustainability

• How has sustainability been incorporated into the facility design?

Environmental sustainability was the very essence of the End Use Site Plan and the overall vision of the site design. Concept two (2) was chosen over concept one (1), which allowed for 80% of the non-landfill area being designed for naturalization, as opposed to 30% in concept one. In addition, passive recreational activities were favoured over additional proposed activities to allow native species to flourish, sustain wildlife, provide habitat, while being a part of the urban landscape.

The naturalization of Elm Street also allowed for extensive pollinator research to be completed by a Professor at Brock University, from the earliest stages of re-vegetation. Bee populations were monitored at this site, and two additional end use sites that involved the naturalization process for end use design. According to the researcher, until these studies began, there was no comprehensive list of bee species in Niagara, and the recovery rate of bee populations was unknown. Through this research at landfill end use sites, they discovered that there are at least 150 bee species at these sites, and bee populations and communities recover extremely rapidly, moving into newly re-vegetated sites more or less immediately. This research is important in understanding bee populations, and will help sustain these populations through re-vegetated sites.

• What makes re-use of the landfill financially and environmentally sustainable?
As addressed earlier, all three sites have been designed to be environmentally sustainable. Where possible, all materials are natural (cedar and stone from local quarries). In addition, all of the plantings were indigenous and native to the area in which the various project was completed. The site is also financially sustainable, as the construction of end use was completed in order to be everlasting and to tie into the surrounding natural environment using native plantings.

• **How will the facility generate revenue over the long term?**

The site will not generate any revenue. The intent of the end use was to give back to the community.

• **How is the facility’s new operation used to meet financial objectives?**

The new operation does not contribute to any financial objectives.

4.) **Public Acceptance, Appearance, and Aesthetics**

• **What do you do to help keep the overall site appearance neat and clean? Describe community concerns (e.g. landscaping, dust control, control of windblown materials) and how you responded to them.**

Upkeep of the site involves lawn and path maintenance, emptying garbage/recycling containers, and maintenance on the parking lot. For lawn maintenance, the grass along the pathways is trimmed as to not encroach on the primary and secondary trails. All areas other than along nearby pathways are left natural.

• **How has the facility improved land value in the surrounding area?**

There are many negative connotations associated with landfill sites. Redevelopment allows for residents to be able to make use of the site for recreational purposes. Additionally, the site now ties into the other environmental features surrounding the site, such as the Wainfleet Bog and Mud Lake Conservation Area.

• **What are your community outreach and engagement efforts?**

Prior to opening the site back in 2010, significant effort was invested in gaining media cover for the opening. Media releases, newspaper articles, and television interviews were conducted, all to raise awareness of the naturalization site that was soon to open. Shortly thereafter, information was added to Niagara Region’s website in order to allow residents to obtain additional information about the site.

Continued engagement efforts include a community board located at the off-leash dog area at the Centre Street site located in Pelham. Residents can send a request to have signage or event information posted to the board to raise awareness for related events within the community.
• **What is your customer service approach and how is it measured?**

When the Site was opened in 2010, a large sign was installed at the entrance to the leash-free dog parks. The sign included a contact number for residents should any issues arise. As of 2017, seven years after opening only a handful of calls have been received, mostly related to issues that were extraneous to the site. In addition, the Region has a Waste Info-Line where residents can call in for more information on any matter as it related to waste management. There is also a webpage devoted to each end use site, which explains the amenities/features, guidelines for visitors and photos of the sites. Since residents were considered in the planning phase of this project, the sites, particularly the leash-free dog area, continue to be well used by the public.

• **What results have you achieved with your community relations programs?**

The construction of the site (as well as Station Rd and Centre St), demonstrates Niagara Region’s commitment to invest in its communities. Niagara Region has taken sites that were formerly active operating landfills and returned them to nature for the use and benefit of all residents.

• **Have you received any awards or other third-party verification of your site’s acceptance in your community? Which ones?**

There were no awards or third-party verification of the site’s acceptance in the community.