Figure 4.1 Option #1 Impact on Vegetation Communities
Assessment of Landfill Footprint Alternatives
West Carleton Environmental Centre

Figure 4.2  Option #1 Impact on Wildlife and Aquatic Features
Figure 4.3  Option #1 Impact to Tributaries
With respect to impacts on cultural and heritage resources for Option #1, there are three cultural landscape units that will be disturbed including, a farmhouse located in the north corner of the footprint, a farm house located south of the footprint; and to a portion of the William Mooney roadscape (see Figure 4.4). Mitigation for cultural heritage resources comes in the form of documentation. Therefore, the resultant net effect is that Option #1 will create a disturbance to three Cultural Landscape Units in the vicinity of the footprint. A completed documentation report for archival purposes will be prepared.

With respect to archaeology, the presence and significance of and potential for archaeological resources within the study area were determined based the Stage 1 Archaeological Assessment conducted by ASI in 2006. The Stage 1 Assessment relied on MTC site records forms, published and unpublished documentary sources, ASI files, and regional physiography to complete an inventory of the archaeological environment within the study area.

Nine registered archaeological sites were found to exist within 4 km of Option #1, none of which are located on-site. It was determined; however, that the location of Option #1 exhibits archaeological site potential, albeit low potential according to the MTC (see Figure 4.5). In order to identify and preserve any archaeological remains that may be present within the lands occupied by the alternative landfill footprints, Stage 2 Archaeological Assessments would be required for each of the footprints in advance of any construction activities.

A Stage 2 Archaeological Assessment for Option #1 is required (if selected) to determine if any potential archaeological resources are present, and any adverse effects on the resource(s) would be avoided or mitigated.

**Transportation**

With respect to the effects on airport operations, bird strike hazard is minimized by discouraging the presence of sea gulls in the vicinity of the landfill site. The existing gull management program includes harassment techniques (pyrotechnics, gas cannons) and lethal reinforcement. Additional mitigation will include an Integrated Gull Management Plan, which will include passive and active deterrents. Through these measures, the bird strike hazard to aircraft will be minimized from gulls originating from the WCEC.

With respect to the effects from truck transportation in the vicinity of the WCEC, a new entrance is proposed that will include a northbound left turn lane on Carp Road, designed and constructed in accordance with the standards and practices of the City of Ottawa and the Province of Ontario. This new left turn lane will improve safety by reducing conflicts between northbound left turning and through vehicles and also by reducing driver frustration.
Figure 4.4  Option #1 Impact on Cultural Heritage Resources
Figure 4.5  Option #1 Impact on Archaeological Resources
Northbound through drivers will not be forced to wait behind a turning truck until a suitable gap is available for the truck driver to complete the turn. This new left turn lane will similarly improve traffic operations by allowing through traffic to proceed around left turning vehicles, providing an improved level of service. Given the estimated northbound and southbound traffic volumes on Carp Road, the northbound left turn lane is warranted. The inconvenience to the public during the construction of the left turn lane will be temporary and similar to that experienced during other similar road construction projects. Staging of traffic during construction will be done in accordance with City and provincial standards for safety of construction workers, vulnerable road users and vehicular traffic as well as for reasonable traffic operations.

**Land Use**

With respect to current land use, the evaluation of current land uses utilized the City of Ottawa’s GIS land use mapping for the area. These maps were last updated on a city-wide scale in 2008; however changes in land use were incorporated into the City’s mapping following detailed site visits.

The applicable designations in the City of Ottawa Official Plan, the Carp Road Corridor CDP, and the City of Ottawa Comprehensive Zoning By-law were also consulted as a guide to determining the existing land uses in the area.

For Option #1, the net environmental effects with respect to current land uses are primarily the removal or loss of the existing land uses, (including Loss of Agriculture, Wooded Area, Idle and Shrub Land, and Low Density Residential lands) and their replacement with a waste management facility. Due to the rural character of the area, Option #1 would reduce the extent of agricultural and general rural uses, and some wooded/shrub lands.

With respect to planned future land use, the City’s approved planning documents (i.e., Official Plan, Carp Road Corridor CDP and the Zoning By-law) provide the greatest indication of the planned future land uses in the area. For Option #1, the General Rural designation in the Official Plan is the most indicative of future land uses. The presumed effects of building this Option would be the discontinuation of the rural uses on the lands that would be occupied by the landfill.

The 500 m site vicinity area for Option #1 also takes in a small portion of a rural residential subdivision on Wilbert Cox Drive. There are four vacant residential lots in the subdivision; the fact that they are vacant and designated for residential occupation essentially means that the future planned land use for these lots is residential. The Official Plan policies regarding Solid Waste Disposal Sites (Section 3.8) indicate that development proposals within 500 m of a solid waste disposal site are required to demonstrate that the landfill will not have an adverse effect.
on the proposed use, and that the proposed use will not impair future landfill operations. Development proposed within 500 m of a landfill site must also be consistent with the Official Plan policies regarding development on contaminated sites. The implication of these policies is that if Option #1 is selected as the future landfill footprint, the building permit applications for these remaining vacant lots could be subject to additional policies.

However, if BMPs are employed to mitigate any unwanted effects (e.g., noise, odour, visual impact), these vacant lots may be deemed to fall outside the influence area of the landfill. Since there are other residential properties within the 500 m influence area, it is presumed that mitigation measures would be put in place for Option #1, to manage any potential nuisance effects (e.g., noise, odour, visual impact, etc.). The mitigation measures would effectively reduce the extent of the influence area, and remove the requirement for additional studies if the vacant lots were to be developed.

With respect to off-site recreational resources, the type considered under this indicator are described in provincial land use Guideline D-1-3 (Land Use Compatibility: Definitions) issued by the Province of Ontario in July 1995. These include uses such as a trailer park or picnic area. During the evaluation, no such facilities were discovered within 500 m of Option #1. Consequently, there are no net effects for this indicator.

Similar to the above, off-site sensitive land uses are described in provincial land use Guideline D-1-3 (July 1995). These land uses generally include places where people sleep (i.e., dwellings), churches, cemeteries and parks. Within 500 m of Option #1, there are varying numbers of dwellings.

The construction of Option #1 would potentially affect the greatest number of existing residences (28), plus four vacant residential lots. Measures would need to be put in place to manage any potential nuisance (e.g., noise, odour, visual impact) resulting from the construction and operation of the landfill site in the 500 m vicinity of these residences.

With respect to Agricultural lands and uses, Option #1 would result in the loss of a dairy farm and 1 part-time beef farm (see Figure 4.6). Further, in terms of soil type, there would be a loss of mainly Class 4 agricultural capability soil. Area is generally low agricultural soil capability as evidenced by the “General Rural Area” designation.
Figure 4.6 Option #1 Impact on Agriculture
Agricultural land within 500 m of Option #1 was assessed to determine if there would be any predictable impact on the use of that land. There are three categories of present agricultural land use within this range. They are: hay, pasture and unused land. No potential effects were found and no mitigation measures are needed, hence there are no net effects on the surrounding agricultural land within 500 m of Option #1. WM will implement BMPs on the selected new landfill site in future to ensure nuisance related effects are mitigated in relation to surrounding agricultural operations.

**Socio-Economic**

The ratio of air space achieved to volume of soil handled has a ratio of 6.5 million m$^3$ to 1.9 million m$^3$. There are no mitigation measures required for this indicator.

The net effects with respect to continued service to customers, the optimized site life/ capacity is 6.5 million m$^3$ over 10 years. There is no mitigation required in relation to this indicator.

With respect to economic benefit to the local community, Option #1 will create jobs in waste diversion, disposal and green energy facilities over the next 10 years, which is estimated at approximately 75. The resulting net effects are deemed moderately positive. The opportunities to provide products or services will continue in relation to Option #1. This resulting net effect is considered to be high (positive).

In terms of effects on residential and commercial development plans, no impacts are anticipated in relation to either residential or commercial development plans as the landfill will operate in accordance with O. Reg. 232/98.

With respect to effects on property tax revenue to the City of Ottawa and Municipal Property Assessment Corporation (MPAC), Option #1 would result in the transition of tax rates from agricultural property (low) to industrial property (high), thus having a positive net effect on property tax revenue. Option #1 also results in the loss of a dairy farm and a part-time beef farm, which slightly reduces the net positive effect on property tax revenue.

In regard to visual impacts, through the installation of extensive berm/vegetation buffer treatment along the north and northwest edges and short lengths of berm/vegetation buffer treatment along the south edges of Option #1, the visual impacts resulting from the four alternative landfill footprint options will be largely obscured. In short, the installation of visual screening elements as mitigation measures will significantly reduce the view of the landfill footprint from surrounding areas. As such, there will be low net effects associated with the visual impact of the facility for Option #1.
There are approximately 6,100 residences located within 3 km of the on-site study area site perimeter. The number of residences present within 500 m of Option #1 would include 28 residences within the 500 m buffer. Mitigation measures will be put in place to manage nuisance related effects during construction and operation in order to minimize the effects on these properties.

No recreational resources are located within 500 m of Option #1.

**Aboriginal**

With respect to Aboriginal interests, WM developed an indicator to evaluate the potential effects on use of lands for traditional purposes. Initial information from Aboriginal groups and the OMAA and Aboriginal Affairs and Northern Development Canada indicates that the WM property, upon which this alternative is proposed, is not subject to any current land claims. Consultation with Aboriginal groups will continue throughout the EA process.

**Site Design & Operations**

All footprint alternatives will require leachate, gas, and stormwater controls in compliance with O. Reg. 232/98. The leachate generation rate for closed footprint Option #1 is estimated to be between 1.8 to 2.9 L/s. Base grading design will likely require at least two low points/ leachate pumping stations. The leachate collection system (LCS) cleanouts will need to be located around perimeter and in centre of site. The site will require design and construction of two SWM pond.

The longest leachate forcemain length is approx. 2,350 m and the longest gas forcemain length is approx. 3,200 m. The minimum haul road length to reach footprint from Carp Road is 1,375 m. Option #1 necessitates closure and WM acquisition of William Mooney Road. This option requires the importation of approximately 1,481,000 m$^3$ of soil and granular material for base liner, LCS, and final cover construction and importation of approximately 374,000 m$^3$ for base grading earthwork. This equals up to 198 loads per day.

In terms of operational flexibility, the base grading design with two low points affords flexibility to commence filling in two locations without temporary leachate collection measures.
4.2 Landfill Footprint Option #2

4.2.1 Net Effects Analysis

The following provides the key net effects for landfill footprint Option #2 as illustrated in Figure 3.2. Please refer to Attachment B for the overall net effects tables and Attachment C for the discipline specific memos.

Atmospheric

With respect to the Odour criteria, the assessment of Option #2 resulted in predicted concentrations less than 1 Odour Unit (OU) over a 10-minute averaging period, at 99.5% of the time (provided the assumptions detailed in Attachment C). The net effects are based on implementing the following key mitigation measures:

- the landfill gas collection and utilization system is incorporated and implemented progressively over the lifespan of Option #2; and,
- BMPs are incorporated to reduce the potential for odour to occur during the normal operation of the landfill.

The net effects determination considered all 24 receptors identified in the Odour existing conditions report. Based on the modelling completed, no off-site receptors are affected. Odours are more likely to impact receptor areas closer to the landfill based on the nature of the sources.

With respect to Air Quality, landfill gas emissions were modelled for vinyl chloride, benzene and hydrogen sulphide. These compounds were evaluated to determine the potential to exceed any air quality standards or guidelines at the property line and at all sensitive receptors (24) identified in the Odour existing conditions report. All receptors are expected to be within compliance (provided the assumptions detailed in Attachment C). The net effects are based on implementing the following key mitigation measures:

- the landfill gas collection and utilization system is incorporated and implemented progressively over the lifespan of Option #2; and,
- BMPs are incorporated to reduce the potential for landfill gas releases to occur during the normal operation of the landfill.

Also reviewed as part of the Air Quality criteria were combustion emissions, including oxides of nitrogen and carbon monoxide and particulate emissions. For Option #2, the predicted concentrations for combustion emissions were predicted to be within compliance at all 24
receptors identified in the Air Quality existing conditions report for both nitrogen and oxides and carbon monoxide. This estimate is based on all assumptions provided in Attachment C and that mitigation measures allowing for the efficient traffic flow on-site (no holder periods or prolonged idling) and BMPs are put in place to control emissions for the vehicles allowed to enter the site.

For dust emissions, TSP, PM10 and PM2.5 were considered. Predicted concentrations for 24-hour periods for each type of particulate were assessed at all 24 receptors. For Option #1, the results assumed all of the assumptions provided in Attachment C and that each alternative would incorporate efficient traffic flow movements on-site (no holding periods or prolonged idling periods) and that BMPs for dust would be incorporated. For Option #2, all predicted concentrations were in compliance with applicable standards, guidelines, ambient air quality criteria and Canadian Wide Standards applicable for this assessment. Additional mitigation measures/strategies focused on dust reduction will be outlined to minimize dust to all receptors, should Option #2 be identified as the preferred alternative.

With respect to the Noise criteria, the predicted sound levels for Option #2 at each of the 24 receptors were assessed to determine if the predicted noise levels were be less than 55 dBA (MOE Noise Guideline for Landfills) or within 3 dB of the background noise levels. As an example, a 3 dB change in noise levels is the level where the human ear can detect a change in the sound levels. One receptor is predicted to be in excess of 55 dBA or greater than 3 dB above background levels. Results are provided in Appendix C.

All results were based on the assumptions provided in Attachment C and the proposed mitigation measures that each alternative would include the following:

- maintenance to keep haul trucks and construction trucks in good working conditions,
- screening berms to provide noise reduction for specific operations,
- noise BMPs to minimize the potential for noise levels in excess during normal operations and
- efficient traffic flow of on-site vehicles to ensure that vehicles are moving and are not sitting idle for prolonged periods of time.

Once a preferred option is selected, specific details regarding berming and noise reduction strategies will be outlined to minimize noise to all receptors.
**Geology & Hydrogeology**

With respect to Groundwater Quality, various considerations were reviewed when considering the net effects, including leachate generation rates at closure, existing groundwater quality, monitorability of the site, and number and type of downgradient receptors. In regard to Groundwater Flow, considerations included overburden type, depth to groundwater table, hydraulic characteristics and modelled results of groundwater flow change. These considerations assisted in framing what mitigation measures would be required and the resultant net effects.

At closure, leachate generated from Option #2 is expected to be 1.7 to 2.7 L/s, which is the lowest of all alternatives. The existing groundwater quality of the northern part of the footprint is within expected background conditions, while the southern half of the footprint is slightly impacted by the existing landfill operations. The elevated concentrations of dissolved constituents can be expected to migrate toward the eastern property boundary. The existing groundwater flow regime is well understood and monitorable, which is a key component of ensuring that the mitigation measures related to the design of the landfill and liner system are operating as intended. Further, the area between the existing landfill and Option #2 is available for monitoring. Future monitoring will need to distinguish impacts between the existing landfill and the new landfill along the downgradient side of the new landfill. In terms of receptors, there are 4 residential properties and 6 commercial/industrial properties within 500 m downgradient of Option #2. These properties utilize private wells for their water supplies.

The surficial geology in the Option #2 area is largely sand and sand-gravel, with overburden thickness ranging from 4.3 to 15.6 m. The overburden thickens toward the southeast corner of the footprint. The underlying bedrock is the Bobcaygeon Formation, which has a gradual slope to the northeast in this area.

The depth to the water table ranges from very shallow (1 m or less) in the southwest to 4 m or more along the east side of the footprint. The water table is even deeper (>10 m) in the east buffer. The overburden-shallow bedrock is the primary groundwater flow zone, with moderate connection to the deeper bedrock. The flow is northward on the west side of the footprint, becoming northeastward along the east side of the footprint.

The results of the numerical flow modelling revealed that the simulated drawdown is predicted to be ≤0.21 m at downgradient property boundaries, with no effects to off-site groundwater flow directions.

For the purpose of the Net Effects Analysis, it is important to recognize that the generic design options for groundwater protection as developed by the MOE and specified in *O. Reg. 232/98*
are considered to be protective of the groundwater environment. That is, the generic design options have been developed to ensure that the Groundwater Protection Standards (Reasonable Use Limits) are met at the base of the leachate containment system. Further contaminant attenuation in the buffer area is not required (MOE Landfill Standards Guideline, May 1998; revised June 2010). A Generic Design Option II – Double Composite Liner System will be used for the West Carleton Environmental Centre regardless of the landfill footprint alternative selected.

The existing conditions for groundwater flow and groundwater quality have been determined and are predictable. The existing hydrogeologic conditions are suitable for effectively monitoring groundwater flow and quality around landfill footprint Option #2.

It is noted that development of a landfill with a Generic Design Option II leachate containment and collection system will eliminate recharge to the aquifer from any precipitation within the area of the footprint. This will result in a minor amount of localized drawdown of the water table in the area. Numerical modelling of groundwater flow indicates that the predicted drawdowns at the property boundaries are on the order of 0.1 to 0.2 m (at full landfill development). This amount is an order of magnitude less than the natural seasonal variations in the water table, and is not expected to affect off-site groundwater supplies.

With the use of a Generic Design Option II leachate containment and collection system, no mitigation measures are required beyond the implementation of an Environmental Monitoring Plan (EMP) that is appropriate to the landfill footprint option.

The result of the Net Effects Analysis is that no off-site groundwater receptors are anticipated to be affected by landfill footprint Option #2. The key factors leading to this result are:

- the use of the Generic Design Option II leachate containment and collection system, which is protective of the groundwater environment; and
- the hydrogeologic conditions are suitable for effectively monitoring groundwater flow and quality around the landfill footprint.

**Surface Water Resources**

With respect to surface water quality, Option #2 has the potential for water quality impacts due to accidental leachate seeps to the surface and/or increases in TSS concentration due to runoff from the internal gravelled access roadways. These water quality impacts would be mitigated by a two staged SWM facility to remove larger particle size TSS loading and provide for emergency leachate containment in a Stage 1 sediment forebay with a Stage 2 providing extended control for additional TSS removal. SWM facility outflow would be as groundwater recharge
(infiltration), with the SWM facility incorporating existing local excavation as previously practised at the existing site. Therefore, the resultant net effect for Option #2 is discharge to groundwater with no increase in TSS and related parameter concentrations at the compliance point.

From a water quantity perspective, the local drainage pattern would be affected by the proposed landfill as there would have to be a drainage diversion of the landfill site away from swale to the north that drains across privately owned lands. This would result in the following net effects:

- Reduce flows to the swale which would be maintained only by adjacent surface and groundwater flow.
- Reduce flows to South Huntley Creek tributary along Richardson Side Road: but by less than 5%.
- Increase flows along the west ditch of the Carp Road. This impact could be mitigated by Stage 1 and Stage 2 of the SWM facility providing attenuation of post-development flows to pre-development levels. SWM facility outflow would be as groundwater discharge (infiltration), with the SWM facility incorporating existing local excavation that would contain the 1:100 Year runoff.
- Existing SWM Facility #1 would have to be relocated as a new two stage SWM facility to the east.

Due to the change in local topography provided by the relatively steep-sloped (from a hydrologic perspective) landfill configuration, a reduction in travel time (as a result of increased flow velocities) would create an increase in peak flows with potential to increase downstream water levels and flood damages. This impact would be mitigated by Stage 1 and Stage 2 of the SWM facility providing attenuation of post-development flows to pre-development levels SWM facility outflow would be as groundwater recharge (infiltration), with the SWM facility incorporating existing local excavation that would contain the 1:100 Year runoff. The resultant net effect would therefore be a reduced flow in South Branch of Huntley Creek.

**Terrestrial Environment**

With respect to impacts on vegetation communities, Option #2 results in a loss of 17.1 ha of vegetation, including 7.4 ha of meadow communities, 6.0 ha of forest communities, and 3.7 ha of wetland communities (see Figure 4.7). The meadow habitat loss in the Option #2 does not provide habitat for other area sensitive species other than the ubiquitous Savannah Sparrow. BMPs will be implemented on-site during construction (i.e., installation of protective fencing, access restrictions, use of dust suppressants, etc.) to reduce the overall net effect. Further, compensation for the loss of vegetation communities will occur elsewhere on-site where there
are areas that could be revegetated. A Compensation and Restoration Plan will be developed during detailed design to address the exact location of these areas.

With respect to impacts on wildlife habitat, Option #2 results in the removal of 3.7 ha of amphibian habitat for species such as, green frog, grey tree frog, northern leopard frog, spring peeper, and American toad (see Figure 4.8). Option #2 results in the removal of 6.0 ha of habitat for observed area sensitive bird species (2 territories) such as black and white warbler, northern Waterthrush, and American redstart. Option #2 also results in a minimal disturbance to an active bank swallow colony. Option #2 leaves a band of forest along the east side of the road which facilities continued wildlife movement between core woodlots.

Similar to mitigation measures proposed for effects on vegetation communities, revegetation in adjacent areas could compensate for the loss of bird habitat. Although there is a loss of 3.7 ha of amphibian habitat, this type of habitat does exist in other areas on-site and could be compensated for in these locations. The removal of vegetation should occur outside of breeding bird season (May-July). A Compensation and Restoration Plan will be developed during detailed design to address the exact location of these areas. Installation of a fence along the perimeter will deter species from entering the landfill. By implementing buffers between footprint and existing vegetation, Construction disturbance to breeding birds and wildlife will be minimized.

There are no impacts on rare, threatened or endangered species within the area.

**Aquatic Environment**

With respect to impacts on water quality and impacts to aquatic habitat/biota, Option #2 does not include any watercourses, either permanent or intermittent, therefore there are no effects to aquatic habitat or biota.

**Archaeology & Cultural Heritage**

The evaluation of cultural and heritage resources relied on mapping produced by Archaeological Services Inc. (ASI) in 2006 of the study area. Built heritage features and cultural landscapes within the study area were identified using both the MTC guidelines and past experience, and informed through research into the history of the region. It should be noted that that no structures designated under Part IV of the Ontario Heritage Act are present within the study area.
Figure 4.7 Option #2 Impact on Vegetation Communities