December 2022 / Rev February 2023

Volume 1

Environmental Assessment of the Township of North Dundas Waste Management Plan

GOLDER
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TOWNSHIP OF
North Dundas

10.0 Description of and Rationale for the 'Alternative Methods' of Landfill Expansion

This section describes the 'Alternative Methods' for expansion of the Boyne Road Landfill site. 'Alternative Methods' are the different ways that the proposed expansion of the Boyne Road Landfill could be implemented to gain an additional 25 years of disposal capacity. As described in the approved ToR Supporting Document #1 Waste Management Alternatives Evaluation (Golder, 2015), two conceptual design options were considered in that preliminary assessment for the location of a landfill expansion. The first was on the existing landfill site property on the south side of Boyne Road; a landfill footprint expansion at this location would be adjacent to the south side of the existing disposal area. The second was to establish a new landfill footprint within a portion of the large property on the north side of Boyne Road that is used for snow disposal and is part of the landfill buffer zone.

The subsurface conditions and groundwater flow system associated with the existing landfill had been investigated and were relatively well understood, whereas investigation work had not been done at the time and would have had to be initiated to understand the potential for developing a landfill on the property north of Boyne Road.

The subsurface information available on the north side of Boyne Road suggests that this area may be underlain by compressible peat soils, which would present a challenge and add costs to construction of a landfill to satisfy the *O.Reg.* 232/98 Landfill Standards requirements. Lastly, the Raisin-South Nation Source Water Protection Plan identifies a portion of the Township-owned property north of Boyne Road as within an area of the predicted groundwater capture zone of the Chesterville municipal wells and subject to the Source Protection policies.

For these reasons, it was proposed in the preliminary assessment of waste management alternatives that the landfill expansion be considered only on the existing landfill property on the south side of Boyne Road. This rationale is still valid for the evaluation of the 'Alternative Methods' as part of this Environmental Assessment.

Due to the physical constraints associated with the configuration of the existing waste footprint and its location on the existing landfill site property, the 'Alternative Methods' are limited to vertical expansion above the existing waste footprint and/or lateral expansion to the south within the landfill property and the Site Study Area (see Figure 8-1).

As described in Section 7.0 of this EASR, the updated projected residual waste from the existing service area from the end of 2020 to the end of the 25-year planning period has been confirmed. The corresponding airspace is 450,000 m^3beyond 2020, slightly more than described in the ToR. The design of the 'Alternative Methods' of expansion will therefore consider 450,000 m^3 of additional airspace beyond 2020, which corresponds to 417,700 m^3 for waste and daily cover beyond 2023.

In the development of the landfill expansion alternatives, site-specific factors were considered, consisting of: 1) site design requirements as set out in *O.Reg.* 232/98 Landfill Standards; 2) existing perimeter ditching; 3) conceptual mitigation measures for the landfill expansion; 4) anticipated stormwater management system requirements; and 5) potential visual impact from off-site. These are discussed further in Section 10.1.

10.1 Design of Expansion Alternatives

The following factors were considered in designing the expansion alternatives:

- The geometry of the landfill expansion is to follow the requirements of *O.Reg*. 232/98, i.e. landfill sideslopes of 4 Horizontal : 1 Vertical (4H:1V, 25 %) or flatter and landfill top area slopes not flatter than 20H:1V (5 %). It is noted that existing landfill conditions have some steeper portions on the south sideslopes at approximately 50 %. However, for all 'Alternative Methods', these sections would be covered by a vertical expansion. The final design would therefore follow the *O.Reg.* 232/98 requirements for minimum and maximum slopes.

- The existing landfill footprint of 8.1 hectares is not large enough to accommodate the required landfill airspace of 417,700 m^3 for waste and daily cover above the existing footprint while complying with the *O.Reg*. 232/98 requirements for minimum and maximum slopes. Therefore, all 'Alternative Methods' will require some amount of horizontal expansion of the waste footprint.

- The existing landfill has a narrow buffer along the east and west sides of the existing waste footprint between the existing approved limit of waste and the landfill site property boundary. For the expansion alternatives, the existing buffer width on the east and west side of the waste footprint will be increased for the horizontal expansion portion with a minimum buffer of 30 m. Since the Township owns land to the east and southeast that is not yet part of the landfill property, the minimum buffer width of 100 m recommended in *O.Reg.* 232/98 can be achieved for all 'Alternative Methods' to the east and southeast, if required (to accommodate perimeter landfill-related infrastructure, i.e., perimeter road, stormwater management system components, contingency measures, etc.).

- The existing Boyne Road Landfill operates as a natural attenuation site, where leachate generated by the landfill is allowed to enter into the groundwater below the disposal area and the leachate-impacted groundwater then moves in the direction of groundwater flow. The MECP Reasonable Use Guideline (RUG) B-7 (MOE, 1994) and *O.Reg.* 232/98 Landfill Standards define the allowable effects of leachate on off-site groundwater quality. At the Boyne Road Landfill, RUG compliance is achieved by having a large enough landfill site property and CAZ groundwater easements on adjacent lands that the leachate effects on groundwater quality are reduced to the allowable concentrations before the impacted groundwater reaches the boundaries of these properties. Nearby groundwater discharge to surface water in municipal drains can be mitigated if required. Due to high capital and operating costs associated with an engineered leachate collection and treatment system; constraints on the available capacity of Winchester and Chesterville communal sewage treatment systems in the Township, particularly in the

winter months to accept landfill leachate; and the presence of a receiving watercourse for treated effluent from an on-site leachate treatment facility that does not have year round flow (i.e., would be considered dry ditch discharge), the only economically viable approach for the Township is to continue operating an expanded Boyne Road Landfill as a natural attenuation site, recognizing that it may be necessary for the Township to acquire additional property and/or CAZ easement agreements and monitor municipal drains.

- As described in Section 9.2, the subsurface conditions generally consist of surficial topsoil/peat overlying a silty sand/sandy silt glacial till and then limestone bedrock at depths ranging from about 1.5 to 9 mbgs. The groundwater table is quite flat, and groundwater flow from the landfill area is to both the north/northwest and south/southwest at a slow rate estimated at about 4 m/yr. The seasonally high groundwater table in the Site Study Area (see Figure 8-1) is essentially at ground surface. The MECP Landfill Standards require a minimum separation of 1 m between the high groundwater table and the base of the waste. Therefore, the different 'Alternative Methods' need to include the construction of an approximately 1 m thick pad of imported permeable fill material (for example, sandy material) above the ground surface (stripped of its thin layer of topsoil) to provide a base for waste disposal. The use of permeable fill will also allow the leachate to infiltrate into the groundwater system while minimizing the potential for both the development of a leachate mound within the waste and lateral leachate seeps at the perimeter of the expanded disposal area footprint.

- It is noted that the current landfill property is located within an area of the Chesterville WHPA currently identified as vulnerable. The Chesterville Water Supply is obtained from a high-capacity overburden well located some 3 km southeast from the Boyne Road Landfill. This portion of the WHPA has been assigned a vulnerability score of 4. Landfills licensed for municipal and IC&I waste are only considered a significant threat in the Chesterville WHPA for scores of 8 or higher. As such, the area south of the current waste footprint considered for the different 'Alternative Methods' is not listed as a significant drinking water threat in the Raisin-South Nation Source Water Protection (SWP) Plan (SNC, 2016a), or considered as such under the application of the SWP policies. The issue of source water protection will be assessed for the preferred expansion alternative as related to potential groundwater impacts (see Section 13.2).

- To reduce the contaminating lifespan of the landfill, it is anticipated that a permeable final cover design approach will be used for the preferred 'Alternative Method'. This final cover would consist of 600 mm of soil and 150 mm of topsoil or other material suitable to support vegetation, as set out in *O.Reg.* 232/98.

- Stormwater runoff from the expanded landfill will be managed by a stormwater management system. Drainage off the north part of the existing landfill site is currently directed towards Boyne Road while the remainder of the landfill site drains to the constructed perimeter ditch around the west, south and east sides of the disposal area. The perimeter ditch outlets directly (without any quality or quantity control) via an existing culvert at the northeast corner of the landfill property to the roadside ditch on the north

side of Boyne Road. During the continuing operations phase of the expanded landfill and post-closure, it is proposed that stormwater runoff from the landfill will continue to be collected by grass-lined ditches, but will be directed to a stormwater management facility (pond or wetland) located at the northeast corner of the landfill. The depth of the pond or wetland excavation will be limited to the existing grades in the area, to limit the possibility of interception of groundwater potentially impacted by leachate. The stormwater run-off from the pond or wetland will discharge via the existing culvert into the roadside ditch on the north side of Boyne Road into Volks Municipal Drain. This municipal drainage ditch flows east and discharges into Black Creek, approximately 1.5 km east of the landfill. The stormwater management system will be designed to handle the design storms as per *O.Reg*. 232/98 and to remove total suspended solids (TSS) as per the MECP Guidelines; sizing will consider potential effects of climate change. Consideration will be given to a raised perimeter conveyance ditch around the expanded landfill footprint (leading to the pond or wetland) to limit the potential for impact from leachate-impacted groundwater discharge into the ditch, and so that collected runoff is from the landfill cover only and does not intercept stormwater runoff from adjacent areas.

- It is proposed to install a culvert in the roadside ditch along the north side of Boyne Road (Volks Municipal Drain) opposite the landfill site frontage. This measure would isolate and convey surface water past the landfill site from upstream (west) to downstream (east) and prevent leachate-impacted groundwater from seeping into the surface water in the ditch. With the culvert installed and provided with periodic seepage collars to prevent water movement along the granular bedding and backfill, the groundwater would continue northward as groundwater flow into the landfill buffer zone located north of Boyne Road and the approved CAZ easement, and site compliance would be evaluated by the groundwater RUG rather than effects on ditch surface water quality. This culvert replacement of the existing open ditch is illustrated on Figures 10-1, 10-3 and 10-5.

- With the capacity being pursued for the landfill expansion of 417,700 m^3 to accommodate landfilling operations until the end of the planning period in 2048, the estimated total site capacity for waste and daily cover is 1,060,750 m^3. As per *O.Reg.* 232/98, there is no requirement for a landfill site of this capacity to include a landfill gas collection and control system and it is not proposed to be included in the preferred 'Alternative Method'. Considering the high water table that is almost at ground surface in the Site Study Area, no significant off-site migration of landfill gas is expected and the majority of landfill gas generated at the site is expected to vent through the landfill cover soils. Methane detectors are in place at on-site buildings and are expected to be maintained throughout the operating period. In addition, there are no existing structures in the Site-vicinity Study Area (refer to Figure 8-1).

- Waste diversion activities related to recycling, WEEE and HHW are expected to continue operating at their current location near the site entrance, in the north central part of the site.

10.2 'Alternative Methods' for Landfill Expansion

Based on the above factors, three 'Alternative Methods' for expansion of the Boyne Road Landfill were developed. These alternatives are referred to as:

- Alternative 1 – Combined Horizontal and Vertical Expansion with Larger East and West Buffers
- Alternative 2 – Combined Horizontal and Vertical Expansion with Larger South Buffer
- Alternative 3 – Primarily Horizontal Expansion

The names for the expansion alternatives generally describe the configuration of the expansion and the way in which the expansion achieves the majority of additional airspace.

The subsections below describe each of the landfill expansion alternatives, and each provides the required 417,700 m^3 of airspace for waste and daily cover. Unless stated otherwise, the elevations referred to are with regards to the top of waste and do not include the final cover (which as described previously is expected to be 0.75 m thick). Site plans and cross sections for each of Alternatives 1, 2 and 3 are shown on Figures 10-1 through 10-6. Table 10-1 provides a comparative summary of the 'Alternative Methods' of landfill expansion, as well as information on the currently approved landfill.

10.2.1 Alternative 1 – Combined Horizontal and Vertical Expansion with Larger East and West Buffers

An additional waste disposal capacity of approximately 417,700 m^3 could be achieved by a combination of raising the elevation over the current disposal area and tying this into the capacity achievable above the expanded footprint to the south, with the geometry satisfying the slope angle requirements of *O.Reg.* 232/98. The height of Alternative 1 is about 15 m above typical ground level on the southern part of the property.

For this 'Alternative Method', the horizontal expansion to the south provides a 100 m buffer to the east (in accordance with the buffer requirements of *O.Reg.* 232/98), 50 m to the west (a substantial increase from the current west buffer), approximately 44 m to the southeast end of the property and approximately 300 m to the southwestern end of the property. Refer to Figures 10-1 and 10-2.

As indicated earlier, the Landfill Standards also require a minimum separation of 1 m between the high groundwater table and the base of the waste. The high groundwater table in the area south of the existing disposal area is essentially at ground surface. Therefore, the design includes the construction of an approximately 1 m thick pad of imported permeable fill material (for example, sandy material) above the ground surface to provide a base for waste disposal. The lateral expansion footprint of this constructed base for this Alternative is approximately 3.9 ha.

10.2.2 Alternative 2 – Combined Horizontal and Vertical Expansion with Larger South Buffer

For this 'Alternative Method', an additional waste disposal capacity of slightly more than approximately 417,700 m^3 could be achieved by a combination of raising the elevation over the current disposal area and tying this into the capacity achievable above the expanded footprint to the south, with the geometry satisfying the slope angle requirements of O.Reg. 232/98. The buffer to the south was increased compared to Alternative 1 at the expense of the east buffer for the horizontal expansion. The horizontal expansion to the south still provides a 71 m buffer to the east, 34 m to the west, approximately 52 m to the southeast end of the property and approximately 309 m to the southwestern end of the property. Refer to Figures 10-3 and 10-4.

The lateral expansion footprint of the constructed base for this Alternative is approximately 4.5 ha. An approximately 1 m thick pad of imported permeable fill material above the ground surface will be required to provide a base for waste disposal.

The height of Alternative 2 is about 15 m above typical ground level on the southern part of the property.

10.2.3 Alternative 3 – Primarily Horizontal Expansion

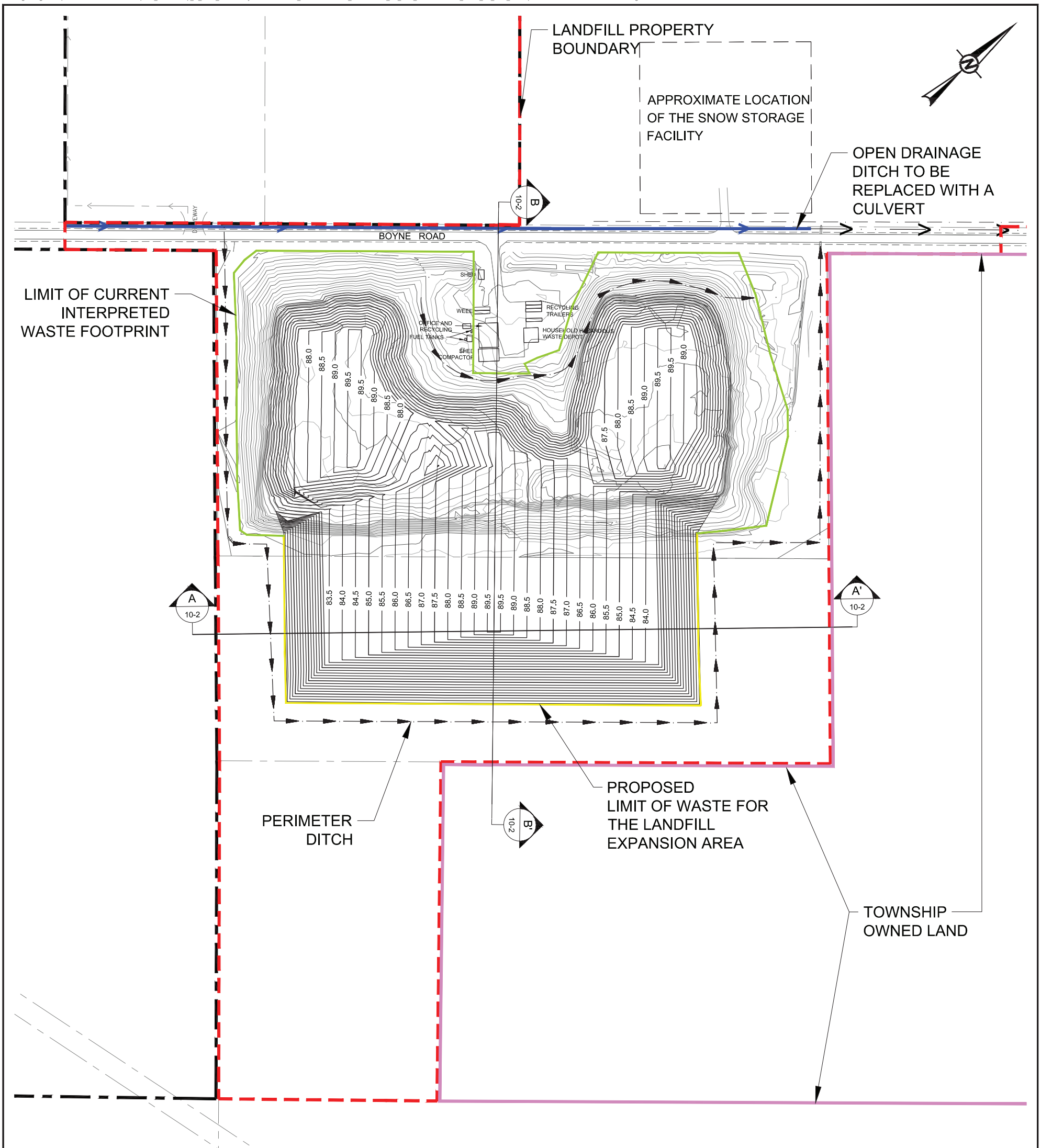
For this 'Alternative Method', the vertical expansion above the approved top of waste contours is limited to the southern half of the current footprint, tying it with the horizontal expansion to the south and its more elevated crest (the maximum height) is reached approximately 220 m south of Boyne Road (compared to less than 70 m for Alternatives 1 and 2). The geometry satisfies the slope angle requirements of O.Reg. 232/98. The horizontal expansion to the south provides a 100 m buffer to the east (in accordance with the buffer requirements of *O.Reg.* 232/98), 30 m to the west, approximately 57 m to the southeast end of the property and approximately 314 m to the southwestern end of the property. Refer to Figures 10-5 and 10-6.

The lateral expansion footprint of the constructed base for this Alternative is approximately 3.8 ha. An approximately 1 m thick pad of imported permeable fill material above the ground surface will be required to provide a base for waste disposal.

The height of Alternative 3 is about 15 m above typical ground level on the southern part of the property.

10.2.4 Alternative 4 – Do-Nothing

In EAs, the Do-Nothing alternative is considered as a benchmark against which the potential environmental impacts and the advantages and disadvantages of the alternatives being considered can be measured and compared. For the Township of North Dundas, the Do-Nothing alternative would be to close the Boyne Road Landfill when it reaches its approved capacity and not pursue any other solution for waste management for the Township. It is noted that one of the Township's basic requirements as a municipality is to provide municipal services and infrastructure for its ratepayers. As such, the Do-Nothing alternative is not an 'Alternative Method' that could be considered to resolve the long-term waste management problem; rather, as stated above, it provides a basis of comparison as part of the EA process.



CLIENT
TOWNSHIP OF NORTH DUNDAS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2021-03-08
DESIGNED	YJM
PREPARED	ABD
REVIEWED	YJM
APPROVED	PAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
ALTERNATIVE 1 - COMBINED HORIZONTAL AND VERTICAL EXPANSION WITH LARGER EAST AND WEST BUFFERS SITE PLAN

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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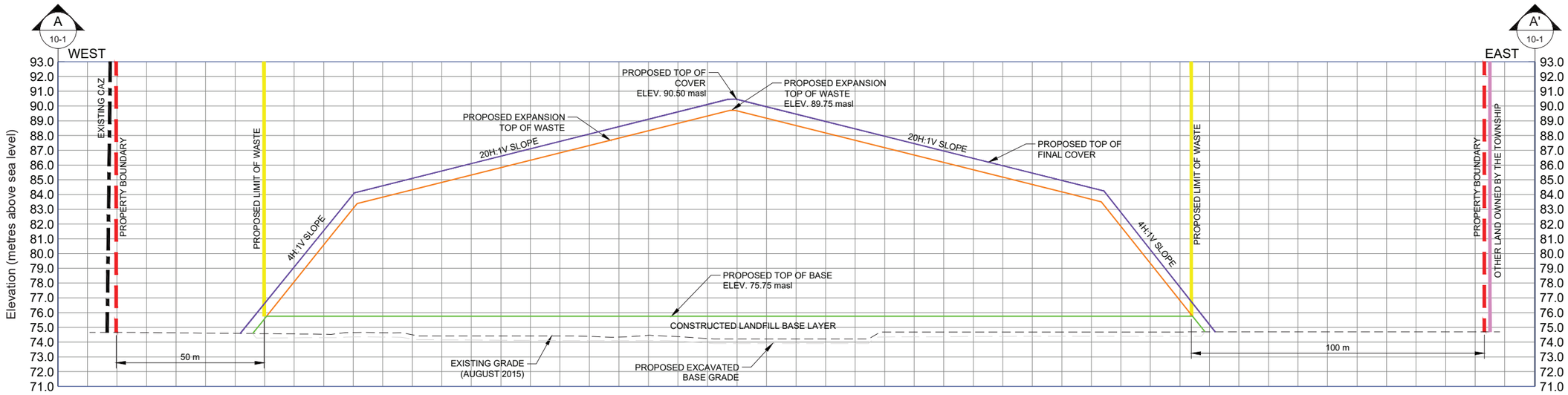

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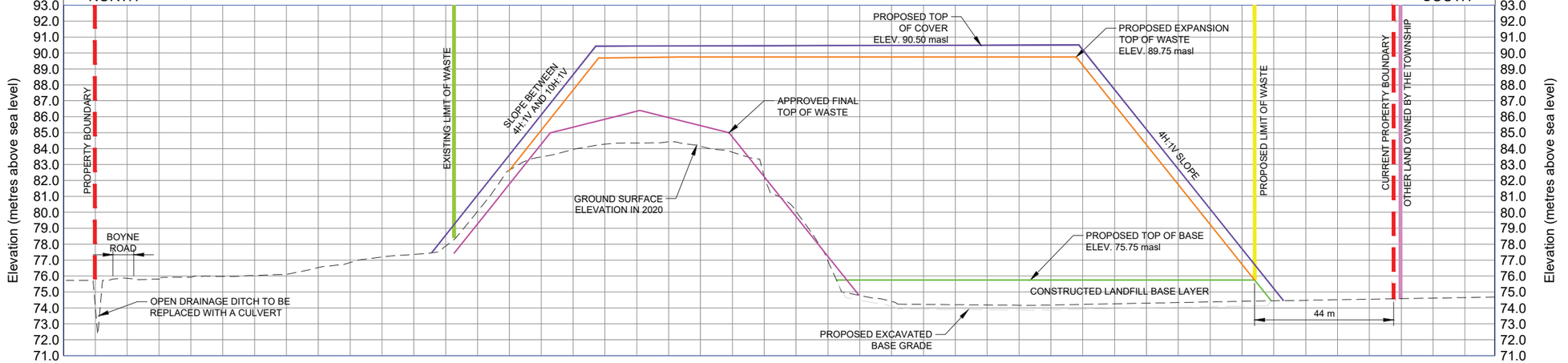

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REVIEWED	YJM
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TITLE
ALTERNATIVE 1 - COMBINED HORIZONTAL AND VERTICAL EXPANSION WITH LARGER EAST AND WEST BUFFERS CROSS-SECTIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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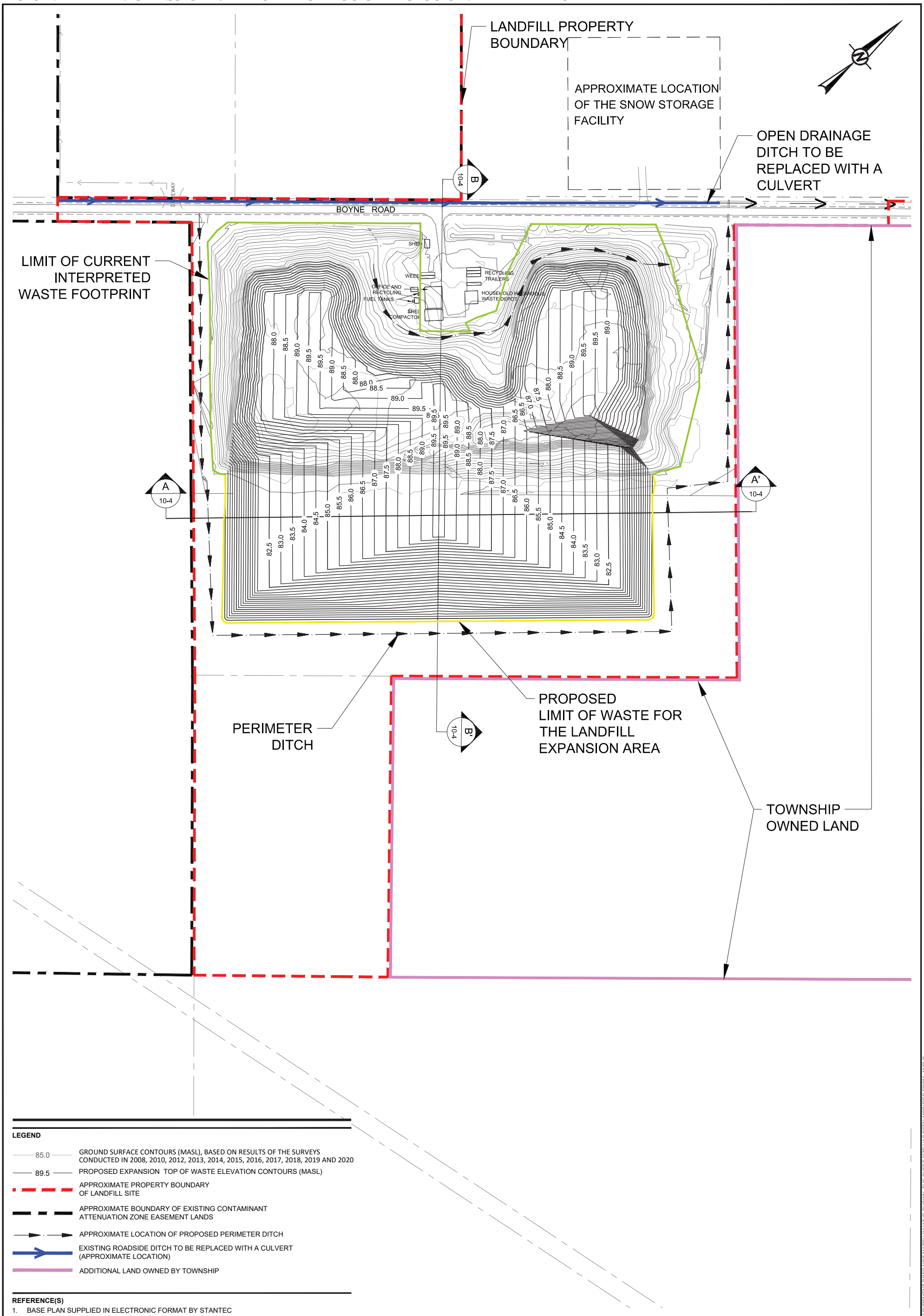

LEGEND

- 85.0 — GROUND SURFACE CONTOURS (MASL), BASED ON RESULTS OF THE SURVEYS CONDUCTED IN 2008, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020
- 89.5 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (MASL)
- APPROXIMATE PROPERTY BOUNDARY OF LANDFILL SITE
- APPROXIMATE BOUNDARY OF EXISTING CONTAMINANT ATTENUATION ZONE EASEMENT LANDS
- APPROXIMATE LOCATION OF PROPOSED PERIMETER DITCH
- EXISTING ROADSIDE DITCH TO BE REPLACED WITH A CULVERT (APPROXIMATE LOCATION)
- ADDITIONAL LAND OWNED BY TOWNSHIP

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, NOVEMBER 2014, DECEMBER 2015, NOVEMBER 2016, DECEMBER 2017, DECEMBER 2018 AND NOVEMBER 2019, APRIL 2020 AND DECEMBER 2020 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.
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PREPARED	ABD
REVIEWED	YJM
APPROVED	PAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
ALTERNATIVE 2 - COMBINED HORIZONTAL AND VERTICAL EXPANSION WITH LARGER SOUTH BUFFER SITE PLAN

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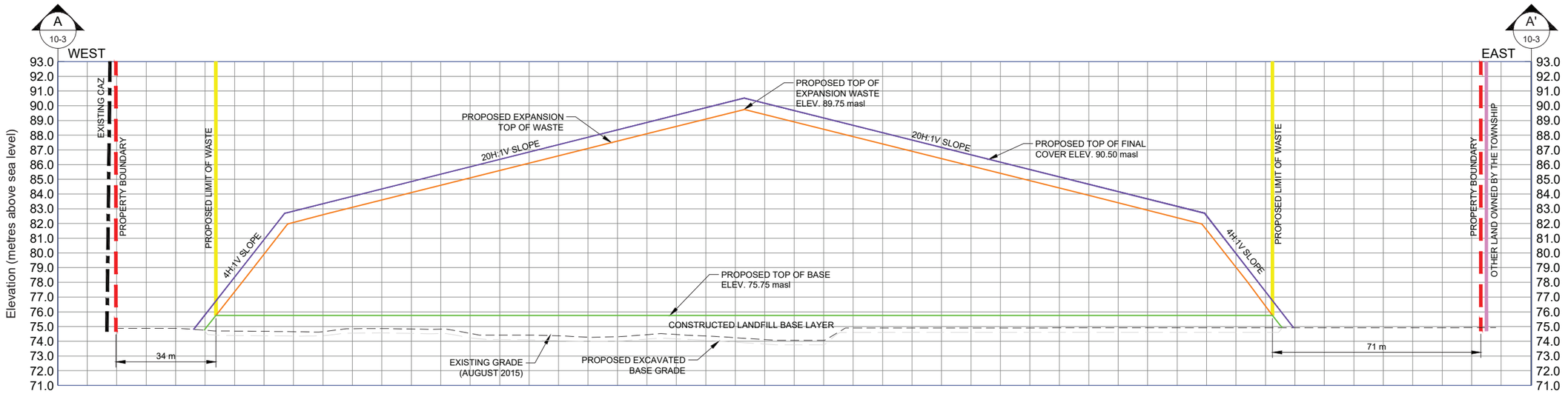

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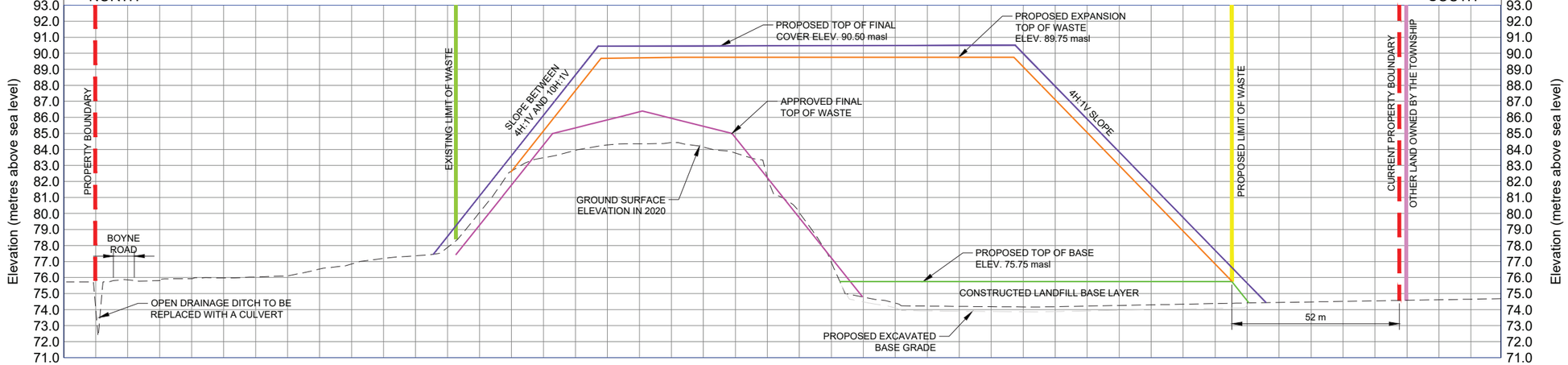

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APPROVED	PAS

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INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
ALTERNATIVE 2 - COMBINED HORIZONTAL AND VERTICAL EXPANSION WITH LARGER SOUTH BUFFER CROSS-SECTIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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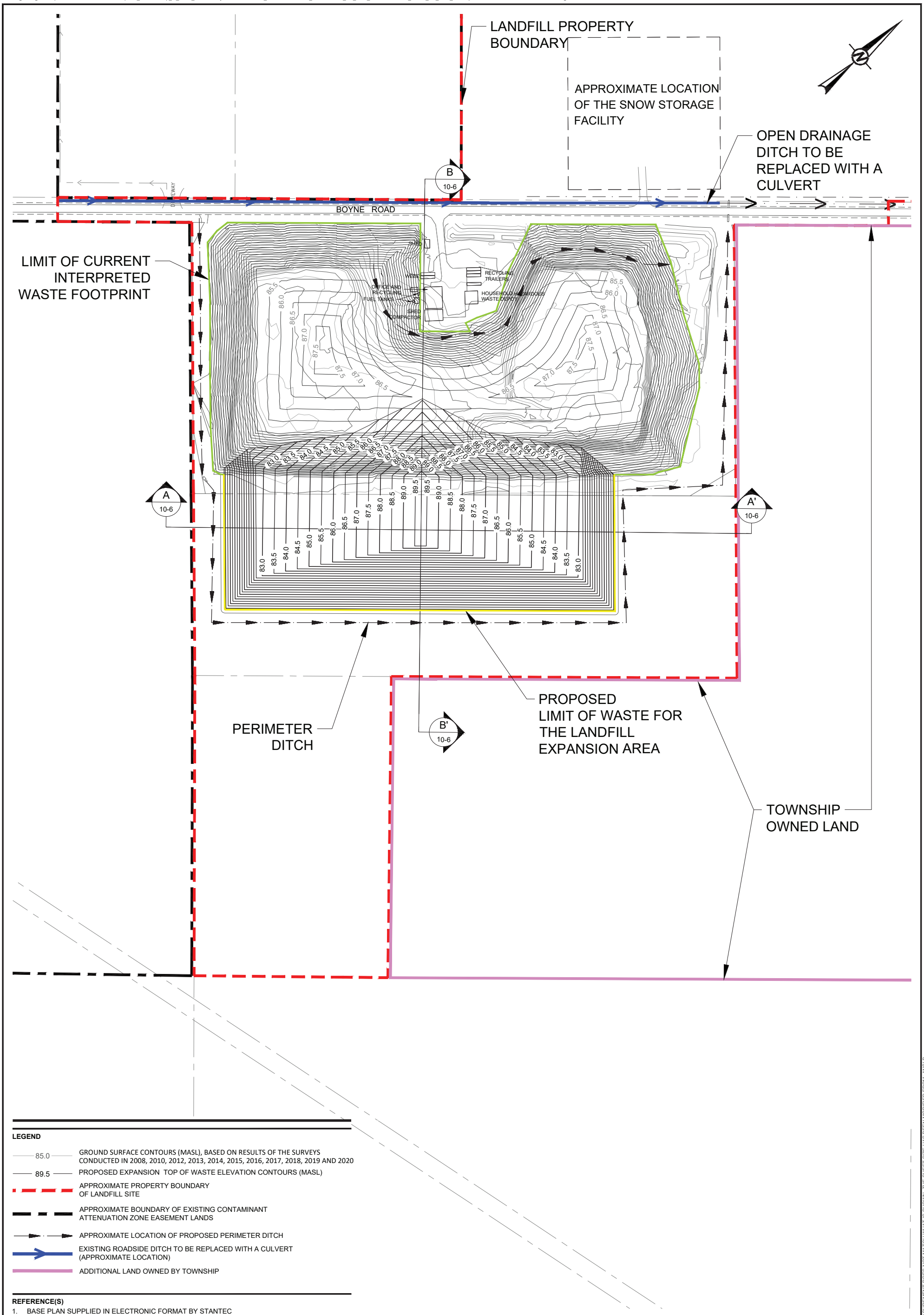

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- 85.0 — GROUND SURFACE CONTOURS (MASL), BASED ON RESULTS OF THE SURVEYS CONDUCTED IN 2008, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020
- 89.5 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (MASL)
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REVIEWED	YJM
APPROVED	PAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
ALTERNATIVE 3 - PRIMARILY HORIZONTAL EXPANSION SITE PLAN

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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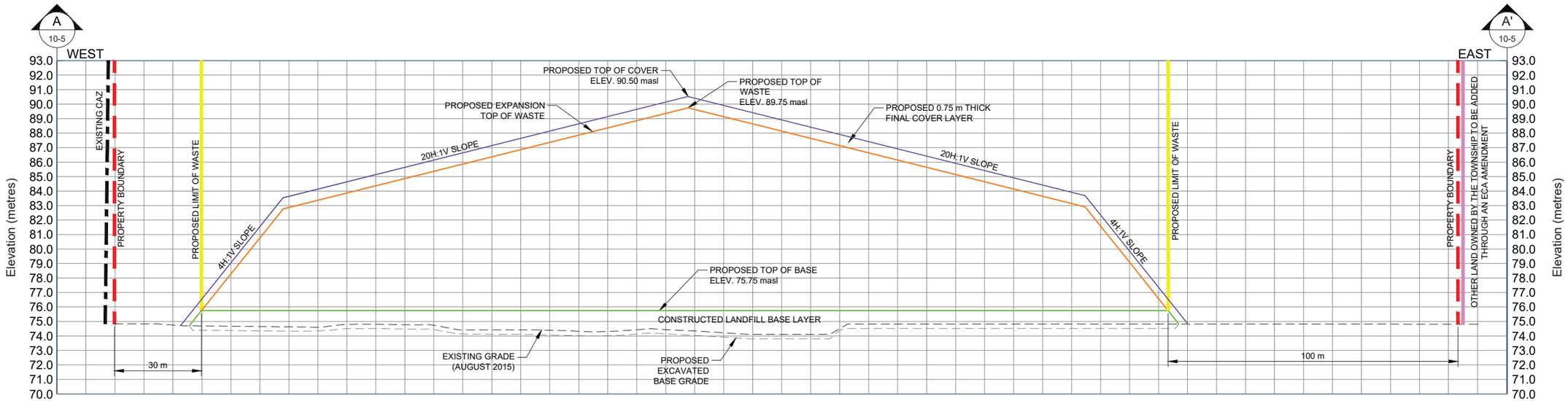

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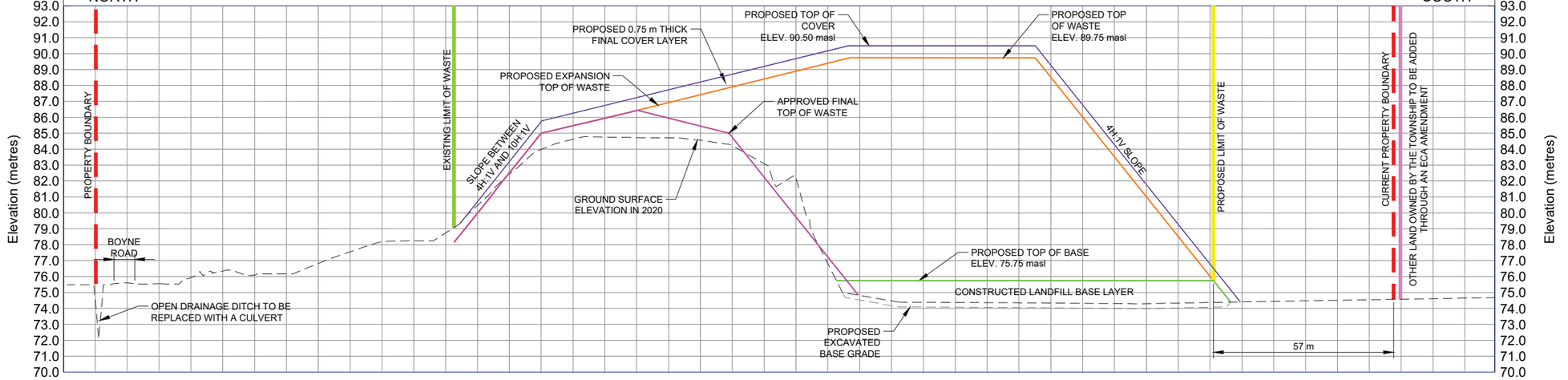

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APPROVED	PAS

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TITLE
ALTERNATIVE 3 - PRIMARILY HORIZONTAL EXPANSION CROSS-SECTIONS

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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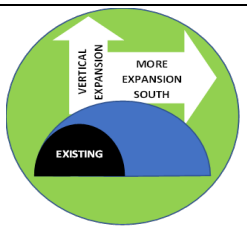
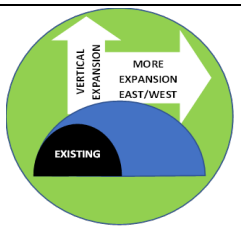
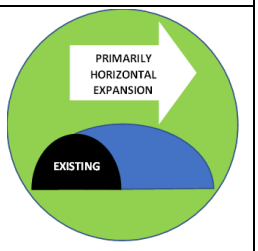
10.2.5 Summary of Alternative Methods

A summary of the 3 Alternative Methods is presented in Table 10-1 below.

Table 10-1: Summary of Boyne Road Landfill Expansion Alternative Methods Excluding Do-Nothing

Design Concept	Existing Landfill	Alternative 1	Alternative 2	Alternative 3
Description		 Combined Horizontal and Vertical Expansion with Larger East and West Buffers	 Combined Horizontal and Vertical Expansion with Larger South Buffer	 Primarily Horizontal Expansion
Site/Property Area (ha)	97.1	97.1	97.1	97.1
Existing CAZ (ha)	71.25	71.25	71.25	71.25
Total Waste Footprint Area (ha)	8.1	12.0	12.6	11.9
Peak Waste Elevation (masl)	87.75	89.75	89.75	89.75
Height of Peak above Average Ground Elevation (m)	12.5	15	15	15
Horizontal Expansion Area Bottom of Waste Elevation (masl)	-	75.75	75.75	75.75
Volume of Excavation (m^3)	-	12,650	14,150	12,100
Total Additional Airspace beyond 2023 (m^3)	-	417,700	426,000	417,700

10.3 Geotechnical Considerations for Expansion Alternatives

The area of the current Boyne Road landfill and the proposed expansion area on its south side are underlain by a variable but relatively thin layer of silty clay and glacial till overlying limestone bedrock. From a geotechnical perspective, these are competent subgrade materials that do not pose geotechnical constraints in terms of design of the expansion geometry, i.e., side slope stability at typical landfill side slope inclinations of 4H:1V, landfill height or compression under the weight of the landfilled material. It is also noted that there is no landfill infrastructure beneath the existing landfill or proposed vertical and horizontal expansion that could be adversely affected by compression of subgrade soils under the weight of the waste. Geotechnical confirmatory stability analysis will be carried out for the preferred expansion alternative.

11.0 Comparison and Evaluation of Landfill Expansion Alternatives

11.1 Methodology

In this section, the predicted potential effects for each 'Alternative Method' are described, and the 'Alternative Methods' compared.

As described in Section 10.0 of this EASR, three 'Alternative Methods' for expansion of the Boyne Road Landfill were developed. These alternatives are referred to as:

- Alternative 1 – Combined Horizontal and Vertical Expansion with Larger East and West Buffers (Figure 10-1)
- Alternative 2 – Combined Horizontal and Vertical Expansion with Larger South Buffer (Figure 10-3)
- Alternative 3 – Primarily Horizontal Expansion (Figure 10-5)

During the EA a total of 10 components (e.g., atmosphere, surface water, biology, etc.) and 17 sub-components (e.g., air quality, noise, surface water quality, etc.) have been identified, which have been confirmed to be appropriate during this EA during consultation and considered in the assessment. For further clarification, the components represent a high-level aspect of the environment, each of the sub-components represents a specific aspect of the environment, and the indicators represent a potential effect of the undertaking. A detailed description of the components, sub-components and indicators used for this assessment are provided in Table 8-1 of Section 8.0 of this EASR.

Section 11.2 of this EASR discusses the predicted or expected potential effects for each 'Alternative Method' in the context of each component and sub-component using the indicators. The indicators that represent a potential effect of the undertaking were further described by identifying factors that might differentiate between the 'Alternative Methods'. Subsequently, each expansion alternative was comparatively evaluated using either qualitative, quantitative or a combination of each method; as well, an assessment of advantages and disadvantages was completed.

The next step in the EA process was to compile the individual component and sub-component comparative evaluations of 'Alternative Methods' and select the overall preferred method of landfill expansion (refer to Section 11.4 of this EASR).

11.2 Assessment of Net Environmental Effects for 'Alternative Methods' and Component Comparison of 'Alternative Methods'

The assessment of net environmental effects for the 'Alternatives Methods' is provided below for each component and sub-component. It is noted that this assessment did not identify any additional mitigation measures as required, but indicated if additional mitigation measures beyond those included in the proposed expansion design or normal operating practices at the landfill site are expected to be required to achieve site compliance with provincial standards.

Additionally, during this assessment all the 'Alternative Methods' were found to be fundamentally approvable under the EPA and hence no changes were proposed to the 'Alternative Methods'.

During various consultation activities conducted during this EA, stakeholders did not identify any additional 'Alternative Methods' for consideration.

Following assessment of net environmental effects of the 'Alternative Methods' based on the components and sub-components, the component level comparison of the 'Alternative Methods' was completed.

11.2.1 Atmosphere

11.2.1.1 Air Quality

The indicators to be considered for air quality are:

- Expected concentrations of air quality indicator compounds (selected regulated air contaminants to represent this type of project), including dust, at the property area boundary.
- Expected site-related odour at off-site sensitive receptors.
- Expected GHG emissions.

The factors considered to differentiate between the 'Alternative Methods' for landfill expansion from the perspective of air quality were selected because they are most likely to have the potential to result in an adverse effect. The evaluation of each alternative considered the following factors and were assessed qualitatively:

- Identify the differences in potential air and odour concentrations from emission sources based on their distance and direction to nearest receptors, the property boundary, and site characteristics such as height of the expanded landfill that will influence dispersion.
- Identify differences in the alternatives that will impact GHG generation, such as the landfill configuration.

These factors were then evaluated qualitatively, ranked and the advantages and disadvantages further described.

This Alternative Methods assessment has been carried out as described in Section 8.2. The methodology used to describe the factors that may cause an adverse impact on air quality are described in the following sections.

11.2.1.1.1 Qualitative Assessment Methodology

A qualitative assessment of the 'Alternative Methods' was completed to evaluate potential impacts on air quality based on the proximity of the expanded waste footprint area to the landfill property boundary and the closest sensitive receptors. This has been assessed by considering the following:

- Reviewing the predominant wind direction
- Identification of the closest sensitive receptors
- Reviewing the landfill design characteristics of each expansion alternative
- Reviewing the greenhouse gas emissions

It should be noted that the air quality and odour emissions from each of the 'Alternative Methods' is not expected to vary between them and has not been compared in this assessment. This is due to equal waste landfilling rates among the three expansion alternatives, which represents the largest driver of these emissions.

11.2.1.1.2 Review of Predominant Wind Direction

A pre-processed five-year meteorological data set was provided by the MECP for the Boyne Road Landfill and approved for use through a Request for Approval Under s. 13 (1) of Local Air Quality Regulation for Use of Site-Specific Meteorological Data.

A wind rose was created using the five-year MECP pre-processed site specific meteorological hourly data to identify the frequency of winds blowing from each direction.

As shown in Figure 11-1 below, the predominant wind direction is from the west-southwest to the east.

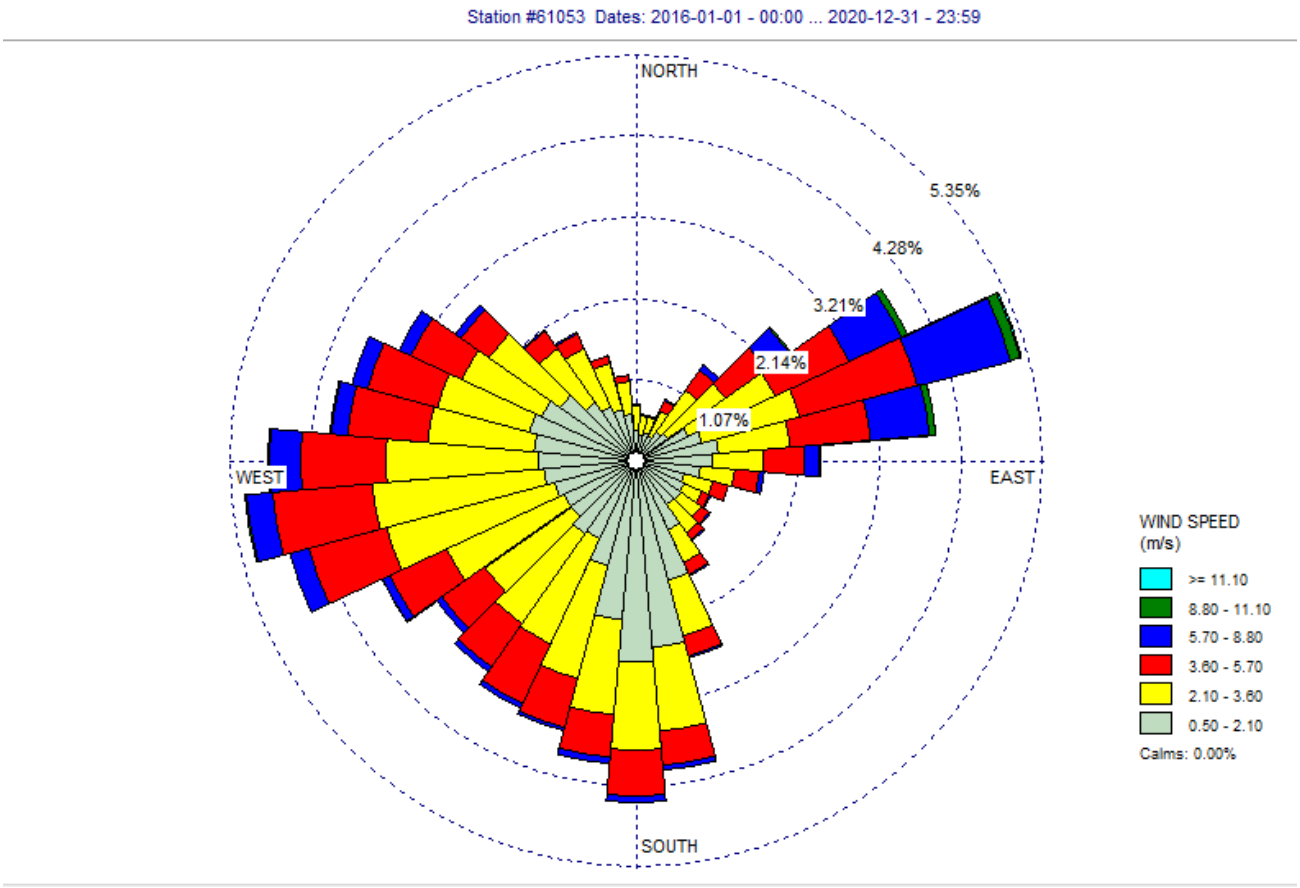


Figure 11-1: Wind Rose for the Site Specific MECP Meteorological Data Set for Boyne Road Landfill

11.2.1.1.3 Identification of Closest Sensitive Receptors

The distance between emissions sources and neighbouring sensitive receptors will be used to evaluate each alternative. Sensitive receptors were identified as residences. The sensitive receptors that will be assessed in terms of potential effects related to air quality and noise are shown on Figure 9-1.

The closest sensitive receptors in each wind direction are identified in Table 11-1.

Review of Characteristics for Each Landfill Expansion Alternative Method

The key characteristics of each expansion alternative are presented in Table 11-1. Landfill footprint, landfill height and distance from the landfill boundary to receptors are factors in the dispersion of emissions from the landfill and their potential impacts at the property boundary and at sensitive receptors.

Table 11-1: Summary of Boyne Road Landfill Expansion Alternative Methods

Design Concept	Existing Landfill	Alternative 1	Alternative 2	Alternative 3
Description	-	Combined Horizontal and Vertical Expansion with Larger East and West Buffers	Combined Horizontal and Vertical Expansion with Larger South Buffer	Primarily Horizontal Expansion
Site/Property Area (ha)	89.03	89.03	89.03	89.03
Total Waste Footprint Area (ha)	8.1	12.0	12.6	11.9
Expansion Waste Footprint Area (ha)	—	3.9	4.5	3.8
Peak Waste Elevation (masl)	87.75	89.75	89.75	89.75
Height of Peak above Average Ground Elevation (m)	12.5	15	15	15
Total Additional Airspace (m^3)**	-	417,700	426,000	417,700
Minimum Distance from Expansion Waste Extents to Property Boundary (m)	-	44	34	30
Distance from landfill to nearest Sensitive Receptor (m) *	North: ~1800 East: ~900 South: ~1100 **West: ~ 700**	North: ~1800 East: ~900 South: ~1100 **West: ~ 700**	North: ~1800 East: ~900 South: ~1100 **West: ~ 700**	North: ~1800 East: ~900 South: ~1100 **West: ~ 700**

Notes: *Closest receptor in each direction in bolded font
** Airspace for waste and daily cover beyond 2023

11.2.1.1.4 Greenhouse Gas Emissions Assessment

There are several factors that can be considered when qualitatively evaluating potential GHG emissions from a project. The following are examples of the main activities that may generate GHG emissions from a landfill expansion, but are not an exhaustive list:

- Waste volumes per alternative
- Vehicles operating and their length of travel
- Whether or not LFG is collected and flared or consumed as fuel in a power generation
- Surface area of the landfill cap and configuration that can lead to greater fugitive LFG (i.e., assumption is that a larger cap area will lead to greater fugitive LFG emissions)

For the Boyne Road Landfill, it has been assumed that the largest source of GHG emissions will be fugitive LFG from the landfilled waste. Since the annual waste volumes are not expected to vary between the 'Alternative Methods', the GHG emissions are likely to be similar for the three 'Alternative Methods'. Additionally, due to the size of the landfill, other GHG emitting activities are not expected to have a large impact relative to the fugitive LFGs for any of the three 'Alternative Methods'.

11.2.1.1.5 Air Assessment Results

Receptors and off-property impacts

The shortest distance between the expanded waste placement (considering both the expansion footprint area and vertical expansion area components) and the property boundary is very similar, ranging from approximately 30 to 40 m to west. As the closest separation distance for all three alternatives is very similar, it is not expected that there would be a significant difference in each alternative when considering the potential air quality impacts at the property boundary.

The shortest distance between the expanded waste footprint area and a sensitive receptor is approximately 700 m for all of the three 'Alternative Methods' This sensitive receptor is a residence located west along Boyne Road, which is not in the predominant wind direction. The nearest sensitive receptor that is downwind of the predominant wind direction is approximately 900 m.

As a result, there is no apparent preference between the alternatives.

Height of vertical expansion and landfill footprint

With atmospheric dispersion modelling, lower emission release heights are typically expected to result in less dispersion and consequently higher concentrations of air quality indicator compounds and dust at and beyond the property area boundary and odour at sensitive receptors, in comparison to higher emission release heights.

Comparatively, the surface area of the landfill cap for each alternative will impact dilution of emissions (i.e., larger surface area will have greater initial dilution in comparison to a smaller surface area with similar mass emission rates).

All three 'Alternative Methods' are very similar from a footprint and vertical expansion perspective, so it is unlikely that there would be any preference between them from a dispersion and potential impacts at receptors perspective.

Alternative 3 has a marginally smaller expansion waste footprint and could be considered as the least preferred, but the difference is expected to be marginal.

Greenhouse gas – fugitive LFG considerations

For the purposes of evaluating the potential greenhouse gas emissions from the 'Alternative Methods', it was assumed that the alternative with the largest surface area within the waste footprint area for placement of expansion waste will contribute to the largest GHGs, and would be the least preferred alternative. As shown in Table 11-1, since the footprints of each alternative do not differ significantly, the three expansion alternatives are considered to be equally preferred from a GHG emissions perspective.

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-2.

Based on the above, there is no clear preferred alternative from an air quality perspective as the factors that impact air quality dispersion do not differ significantly among expansion alternatives.

Table 11-2: Air Quality Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Predicted concentrations of air quality indicators at the property boundary.	The footprint area and height of the landfill, as well as the distance from the expansion waste placement to the nearest property boundary, for each of the 'Alternative Methods'.	Equally Preferred	Equally Preferred	Equally Preferred
Expected site-related odour at off-site sensitive receptors.	Distance from landfill expansion area to closest sensitive off-site receptor.	Equally Preferred	Equally Preferred	Equally Preferred
Expected GHG emissions.	Surface Area for placement of waste in the expansion	Equally Preferred	Equally Preferred	Equally Preferred
Preferred Alternative for Air Quality		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

In view of the above ranking, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion from an air quality perspective. This is because from the perspective of the air quality sub-component the landfill expansion 'Alternative Methods' are quite similar, and hence no distinct advantages or disadvantages can be discerned.

Under Do-Nothing conditions, the landfill would close and air quality indicators, odour and GHG would reduce over time from current conditions as the site would not be operational. The site will still have the potential for air quality, odour and GHG impacts, just at lower levels.

A disadvantage of unorganized waste disposal in the Township associated with a Do-Nothing alternative is the risk to propagate air quality, odour and GHG in other locations; whereas an advantage of the Do-Nothing alternative over any landfill expansion 'Alternative Method' is that the air quality indicators, odour and GHG potential impacts would not increase at the existing landfill as a result of expansion A disadvantage of any landfill expansion 'Alternative Method' is the landfill would see continued air quality indicators, odour and GHG from the operational site at levels greater than Do-Nothing, but in compliance with regulatory limits. An advantage of any landfill expansion alternative method is any air quality indicator, odour or GHG impact is contained at the site of the existing landfill and not spread throughout the Township by inappropriate waste disposal.

11.2.1.2 Noise

The indicator for Noise is:

- Noise Levels at neighbouring noise sensitive existing receptors or vacant lots (with appropriate zoning that may accommodate the future construction of sensitive noise receptors).

A qualitative assessment of the three 'Alternative Methods' was completed to evaluate the potential impacts on noise levels. Note the Site-vicinity Study Area defined for noise includes the Haul Route along Boyne Road. For the purposes of this comparison of 'Alternative Methods', the Haul Route was not further assessed since it is the same for any alternative.

The factors considered to differentiate between the 'Alternative Methods' for the landfill expansion, from the perspective of noise, were selected because they have the greatest potential to result in an adverse effect. These consist of the potential acoustic exposure and the proximity of the landfilling activities to the POR(s), the potential change in noise levels in relation to the existing landfill activities, and compliance of the alternatives in relation to applicable noise limits.

The comparative evaluation of the 'Alternative Methods' using the identified factors is presented in Table 11-3.

Table 11-3: Noise Evaluation of the 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Noise Levels and Change in Noise Levels at PORs	Increase of maximum height of the landfill above grade elevation	15 m	15 m	15 m
	Shortest potential distance of landfill activities to any Existing POR	~ 700 m	~ 700 m	~ 700 m
	Direction of the nearest Existing POR from the landfill	West	West	West
	Shortest potential distance of landfill activities to any Vacant POR	~ 500 m	~ 500 m	~ 500 m
	Direction of the nearest Vacant POR from the landfill	East	East/West	East/West
	Compliance with Noise Level Limits	Can be designed and operated to comply	Can be designed and operated to comply	Can be designed and operated to comply
Preferred Alternative for Noise [1]		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

Notes: [1] As further discussed below, it is expected each 'Alternative Method' could be designed and operated in a manner to comply with MECP noise limits.

Although these 'Alternative Methods' could result in a potential increase in the maximum noise levels at a POR, based on previous experience with similar sites across Ontario, it is expected each 'Alternative Method' could be operated, with administrative and/or physical noise controls (if required) in a manner to allow the Boyne Road Landfill to operate in compliance with MECP noise limits.

Based on the above, there is no clear preferred alternative from an environmental noise perspective as the factors that impact noise do not differ significantly among the expansion alternatives. In view of the above ranking, there are no unique advantages or disadvantages when comparing the three alternatives for the proposed landfill expansion from an environmental noise perspective. This is because from the perspective of the noise sub-component the 'Alternative Methods' of landfill expansion are quite similar and hence no distinct advantages or disadvantages can be discerned.

The closure of the existing landfill under the Do-Nothing scenario would see noise from the site activities reduce to zero. There would still be noise in the area due to other activities, as well as the recycling activities. A disadvantage of any landfill expansion 'Alternative Method' versus Do-Nothing is continued noise, noting that it is anticipated the site can be designed

and operated to meet the MECP noise limits. For noise there are likely no advantages to any landfill expansion 'Alternative Method' versus Do-Nothing. An advantage of the Do-Nothing scenario is there would likely be no additional noise in the Township associated with unorganized waste management. There are no disadvantages to Do-Nothing from the noise perspective.

11.2.2 Geology and Hydrogeology

The indicator for groundwater quality is:

- Expected effect on groundwater quality at the landfill site property boundary and/or compliance boundaries.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the groundwater quality indicator, were selected because they are most likely to potentially result in an adverse effect. These factors are:

- The position of the landfill expansion footprint in the groundwater flow system and relative to the compliance boundaries.
- Waste footprint area configuration for placement of expansion waste relative to groundwater flow direction.
- Maximum thickness of waste.

The factors were selected for the reasons described below.

The position of the landfill expansion footprint in the groundwater flow system and relative to the compliance boundaries – Groundwater compliance is assessed relative to the Reasonable Use Guideline at the boundaries of the landfill site property or CAZ(s). For natural attenuation landfills, it is desirable to place the waste footprint on the landfill site as far upgradient in the groundwater flow system as possible, to maximize the potential for attenuation of leachate impacts in groundwater prior to it reaching the compliance boundaries.

Waste footprint area configuration relative to groundwater flow direction – It is known that the direction of groundwater flow beyond the immediate vicinity of the waste disposal area is generally to both the north and south in both the overburden and bedrock. To minimize potential magnitude of leachate effects on groundwater, it is preferable to orient the long dimension of the waste footprint area perpendicular to the direction of groundwater flow.

Maximum thickness of waste – the greater the total thickness of waste, the greater the potential leachate source strength and the longer the contaminating lifespan of the landfill (which is defined as the length of time for the contaminant concentrations in the leachate to decline over time to the allowable Reasonable Use Guideline concentration in the groundwater). For the proposed natural attenuation landfill expansion, a higher leachate source strength will potentially result in an increased magnitude of effects on groundwater quality in the leachate plume in the overburden.

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-4.

Table 11-4: Groundwater Quality Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected effect on groundwater quality at the landfill site property boundary and/or compliance boundaries.	The position of the landfill expansion footprint in the groundwater flow system and relative to the compliance boundaries.	All expansion alternatives are positioned essentially the same in the groundwater flow system and relative to the compliance boundaries. Equally Preferred	All expansion alternatives are positioned essentially the same in the groundwater flow system and relative to the compliance boundaries. Equally Preferred	All expansion alternatives are positioned essentially the same in the groundwater flow system and relative to the compliance boundaries. Equally Preferred
	Waste footprint area configuration relative to groundwater flow direction	All expansion alternatives have the same configuration and essentially the same dimensions relative to the groundwater flow direction. Equally Preferred	All expansion alternatives have the same configuration and essentially the same dimensions relative to the groundwater flow direction. Equally Preferred	All expansion alternatives have the same configuration and essentially the same dimensions relative to the groundwater flow direction. Equally Preferred
	Maximum thickness of waste	14 m Equally Preferred	14 m Equally Preferred	14 m Equally Preferred
Preferred Alternative for Groundwater Quality		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

In view of the above ranking, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion from a groundwater perspective. This is because from the perspective of the geology and hydrogeology component the landfill expansion ‘Alternative Methods’ are quite similar and hence no distinct advantages or disadvantages can be discerned.

The existing landfill, if closed in a Do-Nothing scenario, would continue to have impacts to groundwater quality at the property boundary for 100s of years, at concentrations below regulatory limits. A disadvantage of any landfill expansion ‘Alternative Method’ is the increase of the potential impacts to groundwater quality at the property boundary beyond the Do-Nothing scenario, but with concentrations below regulatory limits. An advantage to any landfill expansion ‘Alternative Method’ is groundwater impacts are all in one known and monitored

location. A disadvantage of the Do-Nothing scenario is it could generate groundwater impacts at other potentially unmonitored locations in the Township. An advantage of the Do-Nothing scenario is that any groundwater impacts at the existing landfill, or elsewhere, are likely to be at levels below what would be expected at an expanded landfill.

11.2.3 Surface Water

The Surface Water environment component comprises two sub-components:

- Surface water quality
- Surface water quantity

Contaminants associated with the landfill expansion and associated operations could seep or runoff into surface water and potentially adversely affect water quality and aquatic life. Operations associated with the landfill expansion could alter runoff and peak flows. The surface water assessment for each of the environmental sub-components is summarized in the following sections.

11.2.3.1 Surface Water Quality

The indicator to be considered for surface water quality is:

- Expected effect on surface water quality in the drainage ditch along Boyne Road (Volks Drain) and within the Site-vicinity Study Area.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the surface water quality indicator, were selected because they are most likely to result in an adverse effect. These factors are:

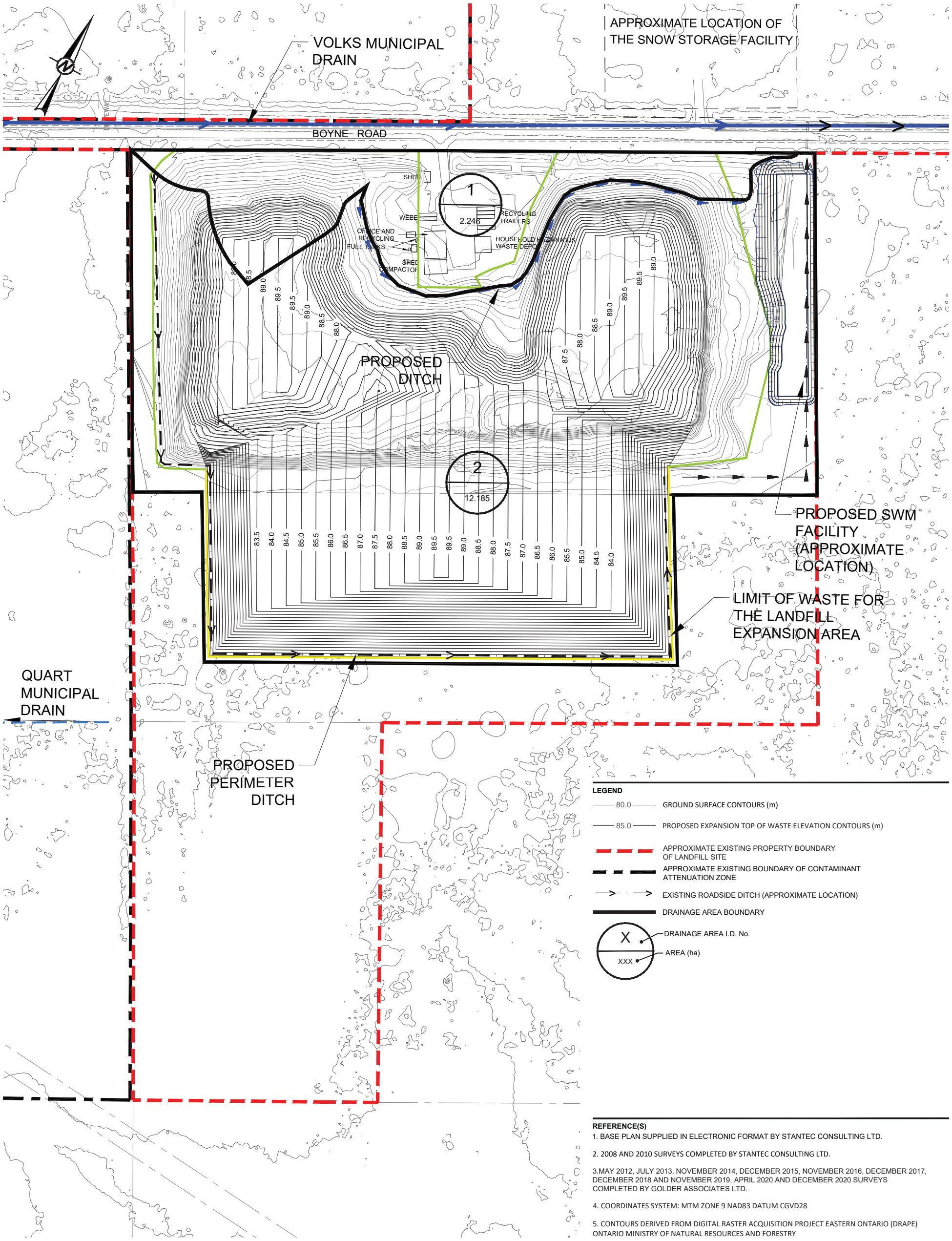
- Expected changes in waste footprint and therefore the total drainage area directly connected to the roadside ditch
- Sediment loading on proposed stormwater mitigation

The factors were selected for the reasons described below.

Expected Changes in total drainage area to stormwater management (SWM) mitigation facility – An increase or decrease in the proposed waste footprint area and total landfill site development area discharging to the roadside ditch and the Volks Drain will impact the sizing of treatment volumes in the facility required as mitigation measures. The existing landfill drainage area and the approximate drainage area corresponding to each of the expansion alternatives is shown on Figures 9-9 and 11-2 through 11-4.

Sediment loading on stormwater mitigation – The expected sediment loading to proposed mitigation measures will impact the required treatment volumes within the facility such that the stormwater treatment objectives are met. Each of the alternative proposed landfill expansion designs were compared to the existing landfill design to compare the changes in expected sediment loading to the SWM mitigation, which will be designed as follows:

- Enhanced (80%) long-term TSS removal is the assumed quality design criteria for the stormwater mitigation to provide the “highest level” of quality control of stormwater.
- Water quality storage requirements will be determined based on Table 3.2 of the Ontario Stormwater Management Planning and Design Manual (MECP, 2003).



LEGEND

- 80.0 — GROUND SURFACE CONTOURS (m)
- 85.0 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (m)
- APPROXIMATE EXISTING PROPERTY BOUNDARY OF LANDFILL SITE
- APPROXIMATE EXISTING BOUNDARY OF CONTAMINANT ATTENUATION ZONE
- EXISTING ROADSIDE DITCH (APPROXIMATE LOCATION)
- DRAINAGE AREA BOUNDARY
- X — DRAINAGE AREA I.D. No.
- XXX — AREA (ha)

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, NOVEMBER 2014, DECEMBER 2015, NOVEMBER 2016, DECEMBER 2017, DECEMBER 2018 AND NOVEMBER 2019, APRIL 2020 AND DECEMBER 2020 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.
4. COORDINATES SYSTEM: MTM ZONE 9 NAD83 DATUM CGVD28
5. CONTOURS DERIVED FROM DIGITAL RASTER ACQUISITION PROJECT EASTERN ONTARIO (DRAPE) ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY

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REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2021-10-29	ISSUED FOR REVIEW	----	ZS	YJM	PLE

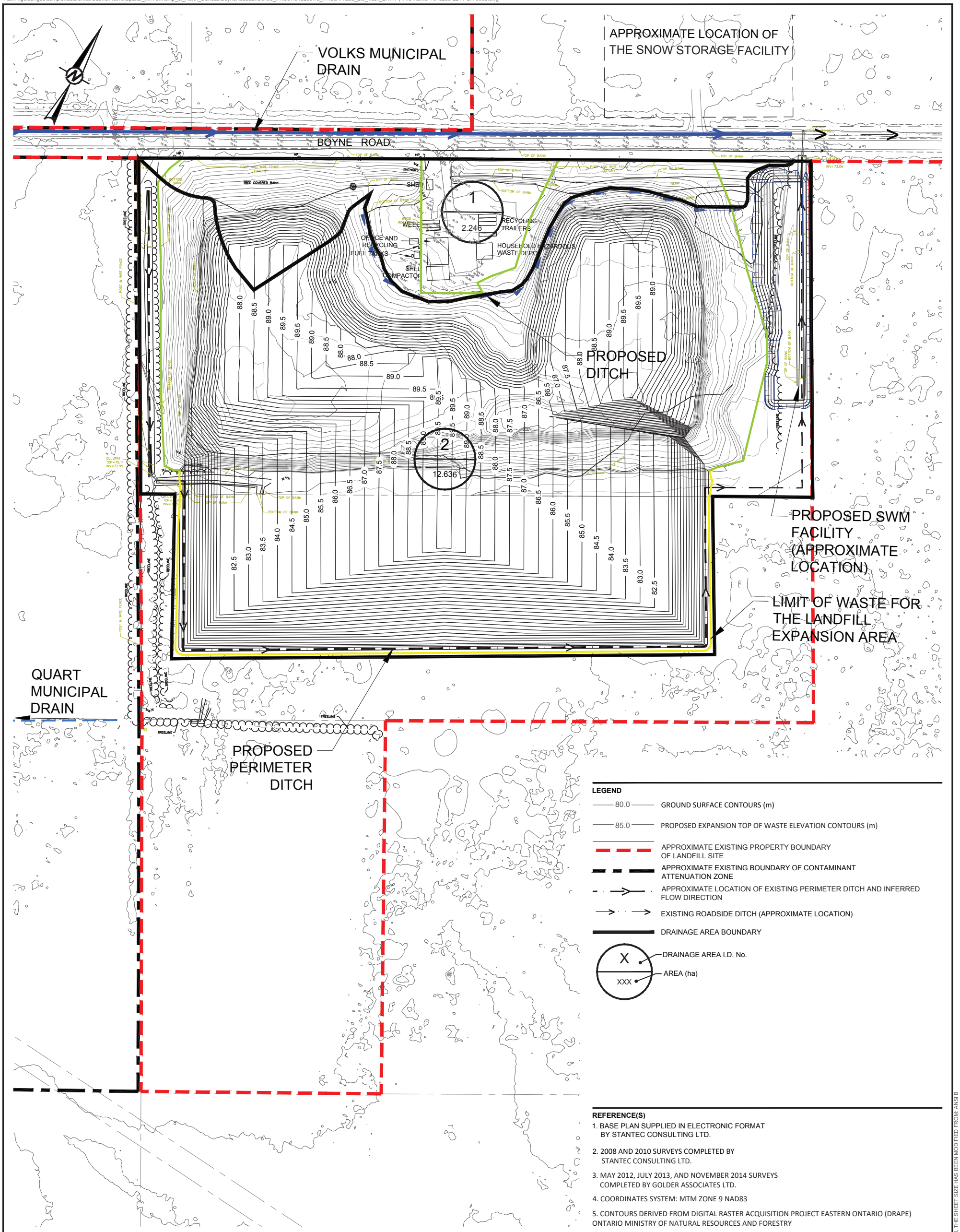
CLIENT
TOWNSHIP OF NORTH DUNDAS

CONSULTANT
OTTAWA
1931 ROBERTSON ROAD
OTTAWA, ONTARIO
CANADA
[+1] (613) 592 9600
www.golder.com

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
ALTERNATIVE 1: POST-CLOSURE DRAINAGE AREA PLAN

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	11-2



LEGEND

- 80.0 — GROUND SURFACE CONTOURS (m)
- 85.0 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (m)
- APPROXIMATE EXISTING PROPERTY BOUNDARY OF LANDFILL SITE
- APPROXIMATE EXISTING BOUNDARY OF CONTAMINANT ATTENUATION ZONE
- APPROXIMATE LOCATION OF EXISTING PERIMETER DITCH AND INFERRED FLOW DIRECTION
- EXISTING ROADSIDE DITCH (APPROXIMATE LOCATION)
- DRAINAGE AREA BOUNDARY
- X — DRAINAGE AREA I.D. No.
- XXX — AREA (ha)

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, AND NOVEMBER 2014 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.
4. COORDINATES SYSTEM: MTM ZONE 9 NAD83
5. CONTOURS DERIVED FROM DIGITAL RASTER ACQUISITION PROJECT EASTERN ONTARIO (DRAPE) ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2021-10-13	ISSUED FOR REVIEW	----	ZS	YJM	PLE

CLIENT
TOWNSHIP OF NORTH DUNDAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

CONSULTANT
WSP GOLDER
OTTAWA
1931 ROBERTSON ROAD
OTTAWA, ONTARIO
CANADA
[+1] (613) 592 9600
www.golder.com

TITLE
ALTERNATIVE 2: POST-CLOSURE DRAINAGE AREA PLAN

PROJECT NO.	PHASE/TASK	REV.	of	FIGURE
1648253	2.0/2.2.0	0		11-3

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25 mm
0

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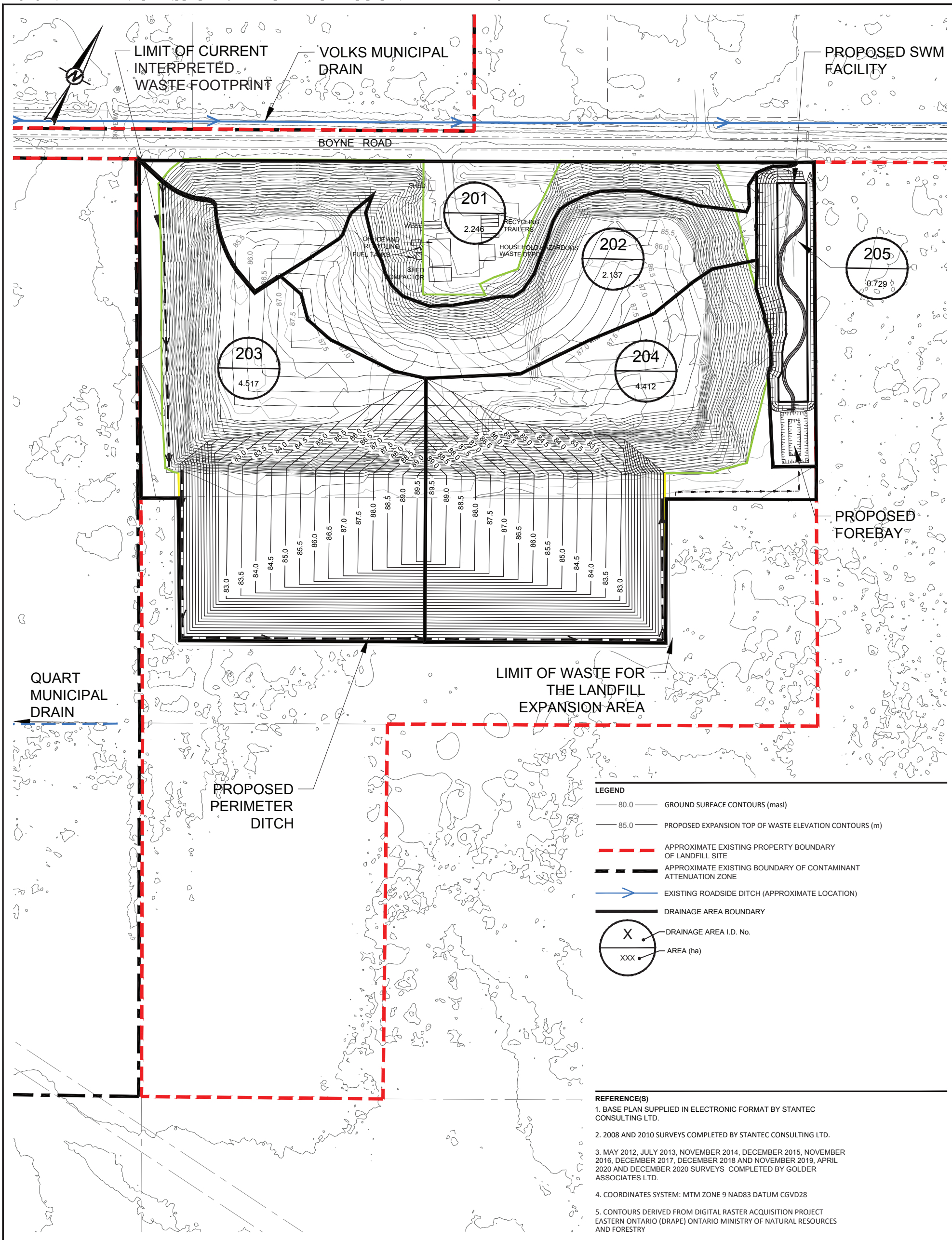

LEGEND

- 80.0 — GROUND SURFACE CONTOURS (masl)
- 85.0 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (m)
- APPROXIMATE EXISTING PROPERTY BOUNDARY OF LANDFILL SITE
- APPROXIMATE EXISTING BOUNDARY OF CONTAMINANT ATTENUATION ZONE
- EXISTING ROADSIDE DITCH (APPROXIMATE LOCATION)
- DRAINAGE AREA BOUNDARY
- X — DRAINAGE AREA I.D. No.
- XXX — AREA (ha)

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, NOVEMBER 2014, DECEMBER 2015, NOVEMBER 2016, DECEMBER 2017, DECEMBER 2018 AND NOVEMBER 2019, APRIL 2020 AND DECEMBER 2020 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.
4. COORDINATES SYSTEM: MTM ZONE 9 NAD83 DATUM CGVD28
5. CONTOURS DERIVED FROM DIGITAL RASTER ACQUISITION PROJECT EASTERN ONTARIO (DRAPE) ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY

0 50 100
1:2,500 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
A	2022-01-11	ISSUED FOR CLIENT REVIEW	MHK	ZS/ABD	MHK	DVK

CLIENT
TOWNSHIP OF NORTH DUNDAS

CONSULTANT
WSP GOLDER
OTTAWA
1931 ROBERTSON ROAD
OTTAWA, ONTARIO
CANADA
[+1] (613) 592 9600
www.golder.com

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
PROPOSED EXPANSION POST-CLOSURE AREA DRAINAGE PLAN

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	11-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25 mm
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The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-5.

Since there is currently no quality or quantity control system for stormwater management currently in place except for the existing perimeter ditch that collects and conveys runoff to the Boyne Road ditch, it has been assumed that a wetland type stormwater facility will be constructed near the outlet of the existing perimeter ditch. This wetland will be sized based on the MECP criteria noted above. A ditch is also proposed on the north face of the existing landfill to help capture the majority of the existing mound area that currently drains directly to the roadside ditch and is not first collected by the perimeter ditch. Since the proposed expansion alternatives all include expansion to the south and not the north, this additional ditch is assumed to be applicable for each alternative such that the north extents of the drainage area to be directed to the proposed wetland is consistent among alternatives.

Similarly, the existing perimeter ditch is proposed to be reconfigured and extended as necessary around the perimeter of each expansion alternative. As described in Section 10.1, the proposed location of this ditch is near the toe of the landfill sideslope but elevated in relation to adjacent grades around the expansion such that collected runoff is from the landfill cover only and does not intercept adjacent stormwater or leachate impacted groundwater.

Based on the evaluation, it is considered all three expansion alternatives are equally preferred from a surface water quality perspective.

Table 11-5: Surface Water Quality Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected effect on surface water quality in the receiving water-course	Waste footprint area and expected total drainage area	Increase in footprint of landfill (~2.6 ha) Equally Preferred	Increase in footprint of landfill (~3.0 ha) Equally Preferred	Increase in footprint of landfill (~2.4 ha) Equally Preferred
	Sediment loading on wetland	Increase in footprint and no reworking existing landfill side slopes Equally Preferred	Increase in footprint and no reworking of existing landfill side slopes Equally Preferred	Increase in footprint and no reworking existing landfill side slopes Equally Preferred
Preferred Alternative for Surface Water Quality		Equally Preferred	Equally Preferred	Equally Preferred

Note: ~ means approximately

As a result, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion from a surface water quality perspective. This is because from the perspective of the surface water quality sub-component the landfill expansion 'Alternative Methods' are quite similar and hence no distinct advantages or disadvantages can be discerned.

The closure of the existing landfill will still allow for potential leachate-impacted groundwater to discharge to the municipal drain along Boyne Road. With the proposed expansion of the landfill for any 'Alternative Method', the possibility of impacts to the SWMS and other water bodies is very limited as a result of operational practices. Therefore, an advantage of any landfill expansion 'Alternative Method' is that it will decrease the potential impacts to surface water quality compared to Do-Nothing. In addition, any landfill expansion will include construction of a stormwater management wetland pond that will also improve surface water quality and is an advantage. There are no disadvantages to any landfill expansion 'Alternative Method' compared to the Do-Nothing scenario. Conversely there are no advantages to the Do-Nothing scenario, but two disadvantages related to surface water quality. Firstly, leachate-impacted groundwater will continue to discharge to the municipal drain along the north side of Boyne Road and, secondly, stormwater from the covered areas of the landfill will continue to proceed directly to nearby ditching without sediment control afforded by a stormwater management pond.

11.2.3.2 Surface Water Quantity

The indicators to be considered for surface water quantity are:

- Expected change in runoff and peak flows in drainage features
- Expected degree of change to off-site effects on surface water quantity within the Site Study Area and off-site within the Site-vicinity Study Area

11.2.3.2.1 Surface Water Quantity – On-site

For the on-site effects, the factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the surface water quantity indicators, were selected because they are most likely to result in an adverse effect. These factors are:

- Maximum slope angle
- Estimated total stormwater catchment/landfill footprint

The factors were selected for the reasons described below

Maximum slope angle: Increased slope angle will have an overall effect on the peak flow entering the proposed perimeter ditch and SWM wetland facility.

Estimated total stormwater catchment: The total stormwater catchment area will impact the total runoff expected from the landfill. It will be captured and attenuated for flow control. The proposed wetland will not only be designed to provide quality treatment, but it will also be designed to attenuate peak flow rates to existing or pre-development conditions for design storm events from 1:2 year through 1:100 year return periods, as required by *O.Reg.* 232/98 Landfill Standards.

11.2.3.2.2 Surface Water Quantity – Off-site

The off-site effects (the factors considered to differentiate between 'Alternative Methods' for landfill expansion) from the perspective of the surface water quantity indicators, were selected because they are most likely to result in an adverse effect. These factors are:

- Off-site volume
- Peak flow at Site Study Area boundary

The factors were selected for the reasons described below.

Off-site volume: SWM controls within the Site Study Area are proposed to control the peak flow of stormwater runoff. However, the overall volume of discharge from the landfill area will increase as a result of any new development (expansion) as infiltration to the subsurface is not available on the site (pre- and post-development ground conditions are not favourable to stormwater infiltration). A comparison of the likely overall increase in volume of stormwater runoff from each of the proposed expansion alternatives was undertaken to compare the potential effect of each on the surrounding area and downstream catchment.

Peak flow at Site Study Area boundary: As the slopes are increased within a catchment area, this change will cause an earlier and higher peak flow of stormwater runoff. The proposed SWM wetland at the landfill will provide peak flow attenuation to meet pre development peak flows.

11.2.3.2.3 Comparative Evaluation

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-6.

Based on the evaluation, it is considered that Alternatives 1 and 3 are the most preferred options from a surface water quantity perspective.

Table 11-6: Surface Water Quantity Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected change in peak flows within on-site drainage features	Maximum slope angle	~25% (4H:1V) Decrease in time of concentration, increase in peak runoff from waste footprint area Equally Preferred	~25% (4H:1V) Decrease in time of concentration, increase in peak runoff from waste footprint area Equally Preferred	~25% (4H:1V) Decrease in time of concentration, increase in peak runoff from waste footprint area Equally Preferred
	Estimated total landfill stormwater catchment area (ha)	Small increase. Most Preferred	Largest increase. Less Preferred	Small increase. Most Preferred
	Ranking	Most Preferred	Less Preferred	Most Preferred
Expected degree of off-site effects on surface water quantity within the Site Study Area and off-site within the Site-vicinity Study Area	Off-site volume	Increase in total volume of runoff leaving the Site Study Area. Decrease in infiltration. Most Preferred	Larger increase in total volume of runoff leaving the Site Study Area. Decrease in infiltration. Less Preferred	Increase in total volume of runoff leaving the Site Study Area. Decrease in infiltration. Most Preferred
	Peak flows at Site Study Area boundary	Peak flow rates off-site will be mitigated. Duration of off-site release will be extended from current conditions. Equally Preferred	Peak flow rates off-site will be mitigated. Duration of off-site release will be extended from current conditions. Equally Preferred	Peak flow rates off-site will be mitigated. Duration of off-site release will be extended from current conditions. Equally Preferred
	Ranking	Most Preferred	Less Preferred	Most Preferred
Preferred Alternative for Surface Water Quantity		**Most Preferred**	**Less Preferred**	**Most Preferred**

In addition to the comparative evaluation using the indicators and factors of differentiation, an assessment based on advantages and disadvantages identified by the comparative evaluation was also possible and completed (refer to Table 11-7).

Table 11-7: Evaluation of Advantages and Disadvantages for Surface Water Quantity

Surface Water Quantity	Advantages	Disadvantages
Alternative 1	Small footprint increase and therefore less reduction in site infiltration and small increase in off-site discharge volume.	none
Alternative 2	None	Larger footprint increase and therefore greater reduction in site infiltration and greater increase in off-site volume.
Alternative 3	Small footprint increase and therefore less reduction in site infiltration and small increase in off-site discharge volume.	none
Do-Nothing	-	-

Table 11-7 clearly shows that Alternatives 1 and 3 are more advantageous than Alternative 2.

Surface water quantity peak flows are based on landfill final design parameters (e.g., slope steepness, length, etc.). Under the Do-Nothing scenario a pre-existing peak flow is anticipated for the closed landfill. The regulatory requirements for landfill expansion require the matching of peak flow by using stormwater management tools (e.g., ponds, orifices, etc.). As such, the peak flow in Do-Nothing and landfill expansion scenarios are quite similar. The only difference is the peak flow may be sustained for a longer duration with the landfill expansion in some drainage areas, and for a shorter duration in other areas, compared to the Do-Nothing scenario.

It is not possible to say whether the change in the peak flow is sustained for a shorter or longer duration is a distinct advantage or disadvantage of any landfill expansion ‘Alternative Method’, and it is possible it could be both depending on the differences in the receiving ditches. Therefore, no distinct advantages or disadvantages are identified for either the Do-Nothing scenario or any landfill expansion ‘Alternative Method’ as it pertains to surface water quality.

11.2.4 Biology

The biology component comprises two sub-components:

- Aquatic ecosystems
- Terrestrial ecosystems

The comparison of the expansion alternatives for each of the biology sub-components is provided in the following sections.

11.2.4.1 Aquatic Ecosystems

The indicators for aquatic ecosystems are:

- Expected change in surface water quality and/or quantity within the Site Study Area and Site-vicinity Study Area
- Expected impact on aquatic habitat and biota, including rare, threatened or endangered species within the Site Study Area and Site-vicinity Study Area

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the aquatic ecosystems indicators, were selected because they are most likely to result in an adverse effect. The factors considered were:

- Change in the waste footprint area of the landfill
- Change in discharge rate from site
- Change in discharge volume from site
- Change in water quality to receiving watercourse
- Change in drainage area to receiving watercourse
- Impact to aquatic SAR or sensitive species
- Loss of potential fish habitat

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-8. Impacts to aquatic habitat and biota were determined using the constraints identified and the proposed waste footprints for each of the three alternatives. Figure 11-5 to Figure 11-7 display both the constraints mapping and the location of the three alternatives.

All aquatic habitat that falls within the proposed waste footprint for each alternative was included in the area totals provided in Table 11-8. Additionally, 30 m around each of the Alternatives, including the proposed perimeter ditch, was considered as an impact area to account for possible temporary impacts of construction activities related to the landfill expansion or the location of landfill infrastructure. Impacts related to changes in surface water quality and quantity derived from the factors and impacts presented in the comparison of alternatives tables for surface water, Section 11.2.3, were also considered.

Table 11-8: Aquatic Ecosystem Evaluation of 'Alternative Methods'

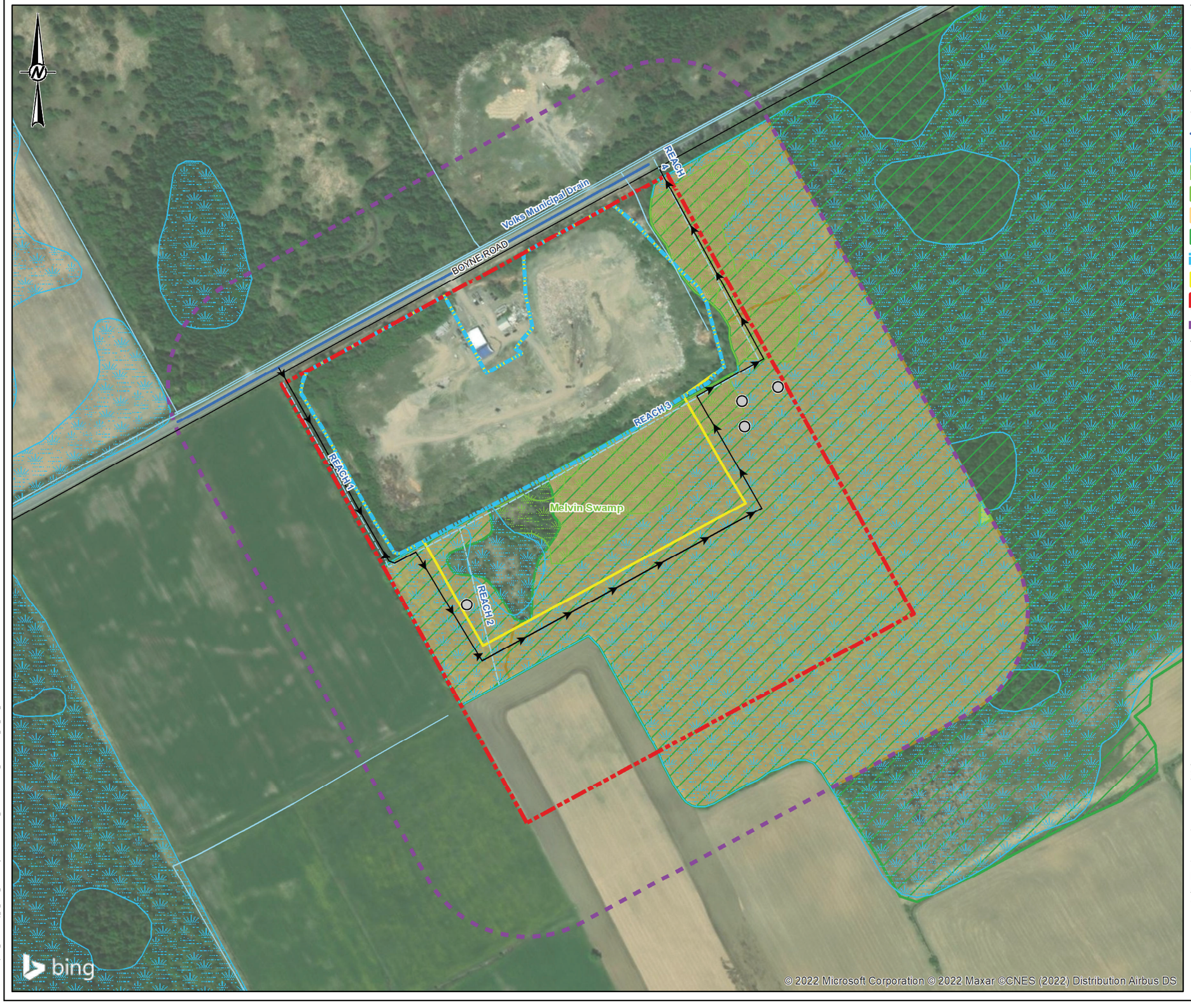
Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected change in surface water quality and/or quantity within the Site Study Area and Site-vicinity Study Area	Change in the waste footprint area of the landfill	12 ha Less Preferred	12.6 ha Least Preferred	11.9 ha Most Preferred
	Change in discharge rate from site	Peak flow increase in on-site ditches from current condition. Stormwater management pond (SWMP) will be implemented to reduce peak flows off site. Duration of off-site release of event-based flows will be extended from current conditions. Most Preferred	Largest peak flow increase in on-site ditches from current condition. SWMP will be implemented to reduce peak flows off-site. Duration of off-site release of event-based flows will be extended from current conditions. Least Preferred	Larger increase in peak flow in on-site ditches from current condition. SWMP will be implemented to reduce peak flows off site. Duration of off-site release of event-based flows will be extended from current conditions. Less Preferred
	Change in discharge volume from site	Increase in total volume of runoff leaving the site. Decrease in site infiltration. Most Preferred	Largest increase in total volume of runoff leaving the site. Decrease in site infiltration. Least Preferred	Larger increase in total volume of runoff leaving the site. Decrease in site infiltration. Less Preferred
	Change in water quality to receiving watercourse	SWMP will be implemented to achieve 80% TSS removal. Equally Preferred	SWMP will be implemented to achieve 80% TSS removal. Equally Preferred	SWMP will be implemented to achieve 80% TSS removal. Equally Preferred
	Change in drainage area to receiving watercourse	Remains same. Equally Preferred	Remains same. Equally Preferred	Remains same. Equally Preferred
	Ranking	Most Preferred	Least Preferred	Less Preferred

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected impact on aquatic habitat and biota, including rare, threatened or endangered species within the Site Study Area and Site-vicinity Study Area	Impact to aquatic SAR or sensitive species	No habitat for aquatic SAR or sensitive species was observed within the Site or Site-vicinity Study Areas Equally preferred	No habitat for aquatic SAR or sensitive species was observed within the Site or Site-vicinity Study Areas Equally preferred	No habitat for aquatic SAR or sensitive species was observed within the Site or Site-vicinity Study Areas Equally preferred
	Loss of potential fish habitat*	1,649 m (10,146 m^2) ** Least Preferred	1,645 m (10,125 m^2) ** Less Preferred	1,633 m (10,068 m^2) ** Most Preferred
	Ranking	Least Preferred	Less Preferred	Most Preferred
Preferred Alternative for Aquatic Ecosystems		**Less Preferred**	**Least Preferred**	**Most Preferred**

Notes:

* Based on the average observed bankfull widths of watercourses on the Site and in the Site-vicinity Study Areas.

** The proposed perimeter ditch will have a longer total length than the existing perimeter ditch, resulting in more fish habitat on-site post-construction.



LEGEND

- SUITABLE MATERNITY ROOST TREES FOR LITTLE BROWN MYOTIS
- FISH HABITAT - PERMANENT
- FISH HABITAT - INTERMITTENT
- ROADWAY
- PROPOSED PERMIETER DITCH
- OPEN DRAINAGE DITCH TO BE REPLACED WITH A CULVERT
- UNEVALUATED WETLAND
- EVALUATED NON-PSW WETLAND
- SIGNIFICANT WILDLIFE HABITAT - INTERIOR FOREST
- SIGNIFICANT WILDLIFE HABITAT - WOOD THRUSH AND EASTERN WOOD-PEWEE
- SIGNIFICANT WOODLAND
- LIMIT OF CURRENT INTERPRETED WASTE FOOTPRINT
- PROPOSED LIMIT OF WASTE FOR THE LANDFILL EXPANSION AREA
- SITE STUDY AREA
- 120 m STUDY AREA

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9 VERTICAL DATUM: CGVD28

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CLIENT
TOWNSHIP OF NORTH DUNDAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
BIOLOGY COMPARISON OF ALTERNATIVE METHODS: ALTERNATIVE 1

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-01-28
DESIGNED	----
PREPARED	JEM
REVIEWED	YJM
APPROVED	PLE

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	**11-5**

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LEGEND

- SUITABLE MATERNITY ROOST TREES FOR LITTLE BROWN MYOTIS
- FISH HABITAT - PERMANENT
- FISH HABITAT - INTERMITTENT
- ROADWAY
- PROPOSED PERMIETER DITCH
- OPEN DRAINAGE DITCH TO BE REPLACED WITH A CULVERT
- UNEVALUATED WETLAND
- EVALUATED NON-PSW WETLAND
- SIGNIFICANT WILDLIFE HABITAT - WOOD THRUSH AND EASTERN WOOD-PEWEE
- SIGNIFICANT WOODLAND
- LIMIT OF CURRENT INTERPRETED WASTE FOOTPRINT
- PROPOSED LIMIT OF WASTE FOR THE LANDFILL EXPANSION AREA
- SITE STUDY AREA
- 120 m STUDY AREA

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9 VERTICAL DATUM: CGVD28

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1:4,000 METRES

CLIENT
TOWNSHIP OF NORTH DUNDAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
BIOLOGY COMPARISON OF ALTERNATIVE METHODS: ALTERNATIVE 2

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-01-28
DESIGNED	----
PREPARED	JEM
REVIEWED	YJM
APPROVED	PLE

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	**11-6**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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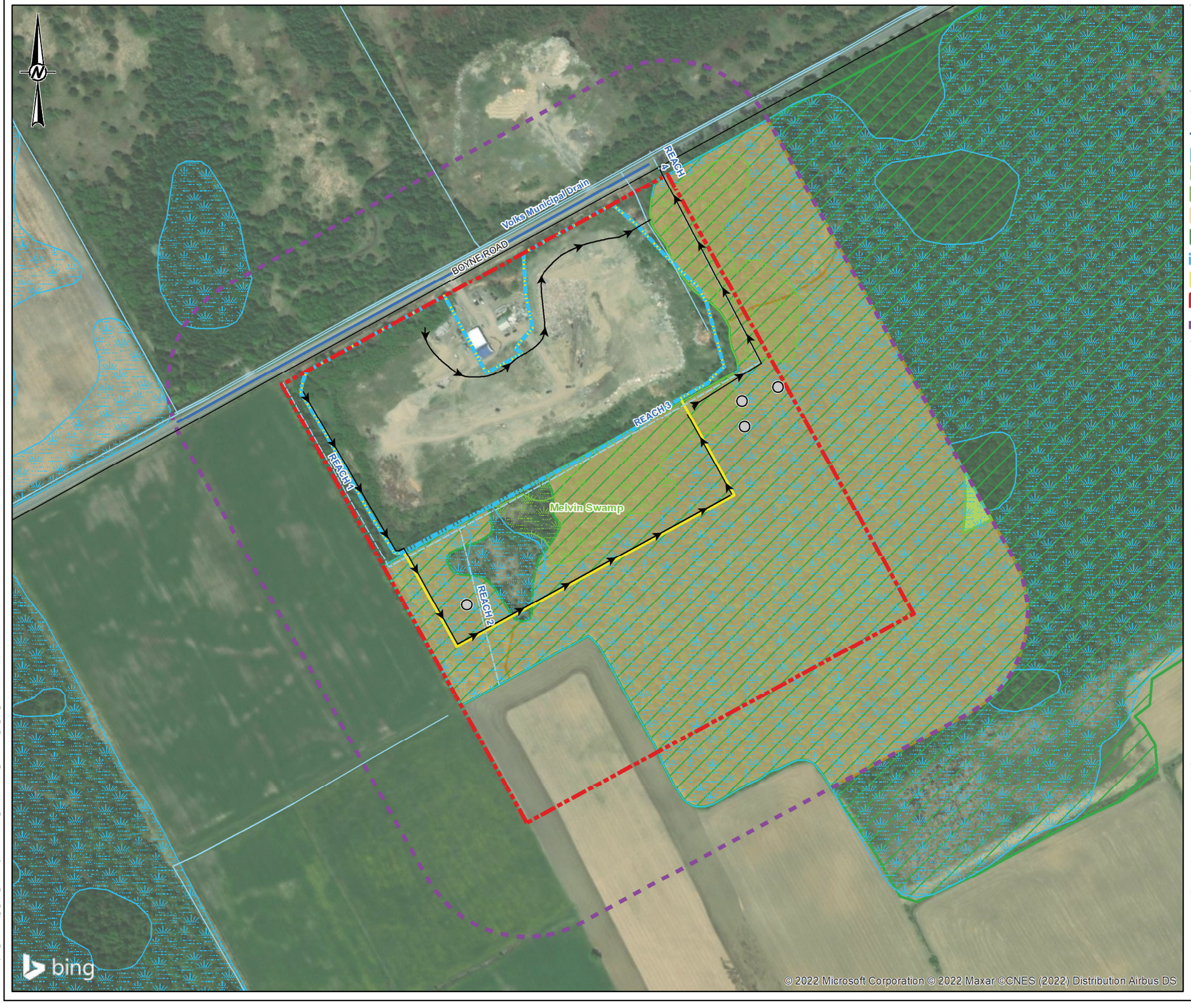

LEGEND

- SUITABLE MATERNITY ROOST TREES FOR LITTLE BROWN MYOTIS
- FISH HABITAT - PERMANENT
- FISH HABITAT - INTERMITTENT
- ROADWAY
- PROPOSED PERMIETER DITCH
- OPEN DRAINAGE DITCH TO BE REPLACED WITH A CULVERT
- UNEVALUATED WETLAND
- EVALUATED NON-PSW WETLAND
- SIGNIFICANT WILDLIFE HABITAT - INTERIOR FOREST
- SIGNIFICANT WILDLIFE HABITAT - WOOD THRUSH AND EASTERN WOOD-PEWEE
- SIGNIFICANT WOODLAND
- LIMIT OF CURRENT INTERPRETED WASTE FOOTPRINT
- PROPOSED LIMIT OF WASTE FOR THE LANDFILL EXPANSION AREA
- SITE STUDY AREA
- 120 m STUDY AREA

REFERENCE(S)

1. LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2014
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: MTM ZONE 9 VERTICAL DATUM: CGVD28

0 40 80 160

1:4,000 METRES

CLIENT
TOWNSHIP OF NORTH DUNDAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
BIOLOGY COMPARISON OF ALTERNATIVE METHODS: ALTERNATIVE 3

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-01-28
DESIGNED	----
PREPARED	JEM
REVIEWED	YJM
APPROVED	PLE

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	**11-7**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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In addition to the comparative evaluation using the indicators and factors of differentiation, an assessment based on advantages and disadvantages identified by the comparative evaluation is shown in Table 11-9. Only those advantages or disadvantages that are unique to each alternative have been presented in Figures 11-5 to 11-7 (e.g., potential impacts to SAR or sensitive species are not listed as they are the same across the alternatives).

Table 11-9: Evaluation of Advantages and Disadvantages for Aquatic Ecosystems

Aquatic Ecosystems	Advantages	Disadvantages
Alternative 1	Least increase in duration of off-site release of event-based flows entering Volks Municipal Drain. Improved aquatic habitat.	Greatest area of fish habitat removal.
Alternative 2	Improved aquatic habitat.	Longest duration of off-site release of event-based flows entering Volks Municipal Drain.
Alternative 3	Least area of fish habitat removal. Improved aquatic habitat.	Longer duration of off-site release of event-based flows entering Volks Municipal Drain.
Do-Nothing	No change in duration of off-site release of event-based flows entering Volks Municipal Drain. No fish habitat removal.	Aquatic habitat continues to be compromised by existing landfill. Potential for disturbance of other and unknown habitat throughout the Township.

After reviewing the impacts of the three alternatives, it was determined that Alternative 3 was the most preferred option from an aquatic ecosystem perspective while Alternative 1 was a less preferred option and Alternative 2 was the least preferred option.

Alternative 3 was chosen as the most preferred option as its advantages include the least potential impact with respect to fish habitat loss, and less increase in duration of off-site release of event-based flows entering the Volks Municipal Drain.

Although a disadvantage of Alternative 1 is that it has the greatest potential impact with respect to fish habitat loss, it has the least increase in duration of off-site release of event-based flows entering Volks Municipal Drain. For this reason, it was chosen as the less preferred option. Alternative 2 was chosen as the least preferred option as it accounts for the greatest increase in duration of off-site release of event-based flows entering the Volks Municipal Drain and has a similar potential impact with respect to fish habitat loss as Alternative 1.

Under any landfill expansion ‘Alternative Method’ there may be a longer or shorter duration of peak flow that could impact aquatic habit (although there are no rare, threatened or endangered species). The works associated with any landfill expansion ‘Alternative Method’ are expected to result in a loss of aquatic habitat, which may require compensation.

Conversely, any landfill expansion 'Alternative Method' will also result in improvement to some components of the aquatic habitat.

Under the Do-Nothing scenario a disadvantage is that aquatic habitat will continue to be compromised by the existing landfill. Another disadvantage is that potential unorganized dumping could occur in the Township as a result of the Do-Nothing scenario, causing harm to aquatic habitat elsewhere. An advantage of the Do-Nothing scenario is that there is no change in duration of peak flow discharge and hence no change in aquatic habitat. There will be no loss of aquatic habitat with the Do-Nothing scenario and that is an advantage. Any landfill expansion 'Alternative Method' includes some improvements to aquatic habitat in the Volks Municipal Drain and that is an advantage to landfill expansion. However, the construction of the improvements as well as the landfill expansion itself will result in a loss of aquatic habitat which is a disadvantage. The change in duration of peak flows off-site as a result of landfill expansion is considered more of a disadvantage, with the magnitude of the differences being a result of the different landfill expansion 'Alternative Methods'.

11.2.4.2 Terrestrial Ecosystems

The indicator for terrestrial ecosystems is:

- Expected impact on terrestrial vegetation communities, wildlife habitat, and wildlife, including rare, threatened or endangered species within the Site or Site-vicinity Study Areas

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the terrestrial ecosystems indicator, were selected because they are most likely to result in an adverse effect. These consist of:

- Change in the site development area of the landfill
- Change in the waste footprint area of the landfill
- Impact to SAR
- Impact to SWH
- Removal of natural vegetation including wetlands and significant woodlands
- Potential for off-site impacts to wildlife habitat (e.g., noise)

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-10. Impacts were determined using the constraints identified and the proposed footprints for each of the three expansion alternatives. Figure 11-5 to Figure 11-7 display both the constraints mapping and the location of the three expansion alternatives.

All vegetation communities, habitat and natural features that fall within the proposed Waste Footprint Area for each alternative were included in the area totals provided in Table 11-10. Additionally, 30 m around each of the Alternatives, including the proposed perimeter ditch, was considered as an impact area to account for possible temporary impacts of construction

activities related to the landfill expansion or the location of landfill infrastructure. This area is referred to as the site development area.

Table 11-10: Terrestrial Ecosystems Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected impact on terrestrial vegetation communities, wildlife habitat, and wildlife, including rare, threatened or endangered species within the Site or Site-vicinity Study Areas	Change in the site development area of the landfill	18.44 ha Less Preferred	18.74 ha Least Preferred	17.83 ha Most Preferred
	Change in the waste footprint area of the landfill	12 ha Less Preferred	12.6 ha Least Preferred	11.9 ha Most Preferred
	Impact to SAR Habitat – Little Brown Myotis	Removal of 3 potential roost trees and 6.3 ha of contiguous ecosite habitat (plus additional foraging habitat) Less Preferred	Removal of 3 potential roost trees and 6.6 ha of contiguous ecosite habitat (plus additional foraging habitat) Least Preferred	Removal of 3 potential roost tree and 5.7 ha of contiguous ecosite habitat (plus additional foraging habitat) Most Preferred
	Impact to SWH – Interior Forest Habitat	1.46 ha Less Preferred	1.48 ha Least Preferred	1.39 ha Most Preferred
	Impact to SWH – Habitat for Wood Thrush and Eastern Wood-pewee	7.3 ha Less Preferred	7.6 ha Least Preferred	6.7 ha Most Preferred

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
	Impact to Unevaluated Wetlands and Evaluated Non-PSW Wetlands	8.1 ha Less Preferred	8.4 ha Least Preferred	7.5 ha Most Preferred
	Impact to Significant Woodlands	7.3 ha Less Preferred	7.6 ha Least Preferred	6.7 ha Most Preferred
	Potential for off-site impacts to wildlife habitat (e.g., noise)	Impact to off-site wildlife habitat will be mitigated through the implementation of 30 m buffer areas around the proposed limits of waste. Equally Preferred	Impact to off-site wildlife habitat will be mitigated through the implementation of 30 m buffer areas around the proposed limits of waste. Equally Preferred	Impact to off-site wildlife habitat will be mitigated through the implementation of 30 m buffer areas around the proposed limits of waste. Equally Preferred
Preferred Alternative for Terrestrial Ecosystems		**Less Preferred**	**Least Preferred**	**Most Preferred**

In addition to the comparative evaluation using the indicators and factors of differentiation, an assessment based on advantages and disadvantages identified by the comparative evaluation is shown in Table 11-11.

Table 11-11: Evaluation of Advantages and Disadvantages for Terrestrial Ecosystems

Terrestrial Ecosystems	Advantages	Disadvantages
Alternative 1	Moderate disturbance footprint and a configuration that allows for preservation of portions of each significant natural feature identified within the Site Study Area.	Loss of some portion of each of the significant natural features identified in the Site Study Area.
Alternative 2	None	Loss of some portion of each of the significant natural features identified in the Site Study Area, including total loss of Significant Wildlife Habitat - Interior Forest Habitat. Greatest impact on SAR habitat (little brown myotis)
Alternative 3	Smallest disturbance footprint and a configuration that allows for the greatest preservation of each significant natural feature identified within the Site and Site-vicinity Study Areas, including the best protection for SAR (little brown bat) habitat.	Loss of some portion of each of the significant natural features identified in the Site Study Area.
Do-Nothing	Preservation of all identified habitat at the existing landfill.	Potential for disturbance of other and unknown habitat throughout the Township.

After reviewing the impacts of the three alternatives it was determined that Alternative 3 was the most preferred option from a terrestrial ecosystem perspective while Alternative 1 was the less preferred option and Alternative 2 was the least preferred option.

While all three Alternatives have a similar potential impact with respect to the terrestrial ecosystem, Alternative 3 retained some portion of each of the significant terrestrial natural features identified within the Site Study Area and had the least potential impact on SAR habitat (little brown myotis), which is an advantage. It is anticipated that Alternative 3 will not have an impact to any of the surrounding significant terrestrial natural features.

Alternative 1 also protects a portion of each of the significant terrestrial natural features identified within the Site Study Area to a similar extent as Alternative 3; however, it has a greater potential impact on SAR habitat (little brown myotis). It is anticipated that Alternative 1 will not have an impact to any of the surrounding significant terrestrial natural features.

Again, although all three Alternatives have a similar potential impact on significant terrestrial natural features, Alternative 2 was the only Alternative that removed one of the features in its entirety (Significant Wildlife Habitat – Interior Forest) from the Site Study Area, and also had

the greatest potential impact on SAR habitat (little brown myotis). For these reasons, it was chosen as the least preferred option. It is anticipated that Alternative 2 will not have an impact to any of the surrounding significant terrestrial natural heritage features.

The closure of the landfill under the Do-Nothing scenario is not likely to affect habitat for SAR bats (little brown myotis). Any landfill expansion 'Alternative Method' will directly negatively impact the habitat of little brown myotis through the construction process. Compensation for habitat loss will be developed in consultation with the MECP for little brown myotis. Therefore, an advantage of the Do-Nothing scenario is that the SAR bats habitat is protected. A disadvantage of the Do-Nothing scenario is that unorganized waste disposal could occur throughout the Township and potentially cause damage to other or unknown terrestrial ecosystems. A disadvantage of any landfill expansion 'Alternative Method' is the loss of that SAR bat habitat.

11.2.5 Land Use

The indicator for land use, which includes both current land use and planned future land use, is:

- Expected incompatibility with existing or known future land use.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the land use, were selected because they are most likely to potentially result in an adverse effect. These factors are:

- Compatibility with municipal land use policy framework
- Proximity to sensitive land use (and type), and potential impact on sensitive land uses

Compatibility with municipal land use policy framework: This factor examines the compatibility of the landfill expansion with County Official Plan designations (2018) and the Township of Winchester Zoning By-law 12-93 designations within the Site-vicinity Study Area. It was selected as the proposed landfill expansion may not be consistent with certain land use permissions, resulting in the need for approvals under the Planning Act (e.g., Official Plan amendment and/or Zoning By-law amendment).

As described in Section 9.5, the existing Boyne Road Landfill site is located within the Rural District designation of the SDG Official Plan. The landfill itself is represented by an Active Landfill identification per Schedule A1 of the Official Plan. At the Boyne Road Landfill site, an area on the south side of Boyne Road that includes both the existing disposal area and much of the area proposed for expansion, is zoned Special Rural – Waste Disposal (SRD) under the Township of Winchester Zoning By-Law No. 12-93. Allowable forms of development within the SRD designation includes waste disposal.

Under all three alternative landfill expansion scenarios, the area proposed for waste disposal is located within the SRD zoning. As such, a Zoning By-law Amendment would not be required to implement the proposed expansion, since the waste disposal area will be enlarged within the current limits of the designated SRD zone. As such, one expansion alternative does not provide a benefit over another from a zoning perspective.

Based on the evaluation, it is expected that none of the landfill expansion alternatives provides a significant advantage, relative to the other, resulting in the equal ranking of each alternative from the perspective of compatibility with municipal land use policy framework.

Proximity to sensitive land use (and type), and potential impact on sensitive land uses: This factor was selected as waste disposal facilities can potentially affect the use and enjoyment of sensitive uses in the Site-vicinity Study Area. This factor is evaluated through an assessment of potential nuisances that are identified under the provincial land use Guideline D-4 (Land Use On or Near Landfills and Dumps) and Guideline D-6 (Compatibility between Industrial Facilities). Adverse effects on sensitive uses can potentially include noise and vibration; visual impact; odours and air emissions; litter, dust and other particulates; and other contaminants.

As described in Section 9.5, the location of the Boyne Road Landfill is well removed from any other land uses (the separation distance to the nearest sensitive receptor is 700 m). In addition, the County Official Plan establishes a 500 m holding zone (the distance within which adverse effects from landfills are generally expected to potentially extend) around the Boyne Road Landfill and requires, for municipal planning approvals purposes the proponent of a proposed development within this zone to demonstrate that the proposed development will not be subject to unacceptable adverse effects (as listed above) from ongoing operation of the landfill. As such, the municipal approvals process contains provision to control development within 500 m of both the existing and expanded landfill. As such, one expansion alternative does not provide a benefit over another in terms of proximity to and potential impact on sensitive land uses.

Based on the evaluation, it is expected that none of the landfill expansion alternatives provides a significant advantage, relative to the other, resulting in the equal ranking of each alternative from the perspective of proximity to and potential impact on sensitive land uses.

The comparative evaluation of ‘Alternative Methods’ using these factors is presented in Table 11-12.

Table 11-12: Current and Planned Future Land Use Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected incompatibility with existing or known future land use	Compatibility with municipal land use policy framework	Equally Preferred	Equally Preferred	Equally Preferred
	Proximity to sensitive land use (and type) and potential impacts on sensitive land uses	Equally Preferred	Equally Preferred	Equally Preferred
Preferred Alternative for Current and Planned Future Land Uses		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from a land use perspective, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the perspective of the land component the landfill expansion 'Alternative Methods' are quite similar.

The landfill expansion is consistent with the Provincial Policy Statement and conforms with the Official Plan. However, unorganized waste disposal potentially associated with a Do-Nothing scenario could be inconsistent with the Provincial Policy Statement. Therefore, when considering any landfill expansion 'Alternative Method', there are no disadvantages. However, a disadvantage of Do-Nothing is the potential for inconsistencies with land use planning policy associated with unorganized dumping.

11.2.6 Agriculture

The indicator for agriculture, which includes both current land use and planned future land use, is:

- Potential effects on existing agriculture.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of agriculture, were selected because they are most likely to potentially result in an adverse effect. These factors were selected to assess potential effects of the proposed landfill expansion alternatives on the existing and potential agricultural use of on-site and off-site lands.

These factors are:

- Degree of investment and agricultural infrastructure (e.g., tile drainage and fencing)
- Soil capability
- Potential impacts on agricultural land within the Site Study Area
- Potential impacts on agricultural land within the Site-vicinity Study Area
- Potential Impact on agricultural system (e.g., fragmentation)

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-13.

Table 11-13: Agriculture Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Potential effects on existing agriculture	Degree of investment / infrastructure	There has been no agricultural investment in the area of the proposed landfill expansion and its components. Equally Preferred	There has been no agricultural investment in the area of the proposed landfill expansion and its components. Equally Preferred	There has been no agricultural investment in the area of the proposed landfill expansion and its components. Equally Preferred
	Soil Capability (Canada Land Inventory rating)	The horizontal expansion area is underlain by Muck (organic) soils. Equally Preferred	The horizontal expansion area is underlain by Muck (organic) soils. Equally Preferred	The horizontal expansion area is underlain by Muck (organic) soils. Equally Preferred
	Potential impacts on agricultural land within the Site Study Area	A small area of cropland will be removed by the proposed expansion in the southeast corner. Equally Preferred	A small area of cropland will be removed by the proposed expansion in the southeast corner. Equally Preferred	A small area of cropland will be removed by the proposed expansion in the southeast corner. Equally Preferred

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
	Potential impacts on agricultural land within the Site-vicinity Study Area	Croplands to the northwest and south; no impact expected. Equally Preferred	Croplands to the northwest and south; no impact expected. Equally Preferred	Croplands to the northwest and south; no impact expected. Equally Preferred
	Potential Impact on agricultural system (e.g., fragmentation	No potential impacts on broader agricultural system as the expansion land does not include agricultural amenities or assets that support the agri-food network. Equally Preferred	No potential impacts on broader agricultural system as the expansion land does not include agricultural amenities or assets that support the agri-food network. Equally Preferred	No potential impacts on broader agricultural system as the expansion land does not include agricultural amenities or assets that support the agri-food network. Equally Preferred
Preferred Alternative for Agriculture		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from an agriculture, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the perspective of the agriculture component the landfill expansion 'Alternative Methods' are quite similar.

The Do-Nothing scenario would see no change or effect regarding agricultural operations in the area of the existing landfill but could see random unorganized waste disposal in other agricultural areas. Any landfill expansion 'Alternative Method' requires some land to the south of the existing landfill that will reduce some existing agricultural operations on Township-owned lands. Therefore, an advantage of the Do-Nothing scenario is no loss of agricultural operations or lands near the existing landfill, although a disadvantage could be random loss of agricultural lands as a result of unorganized dumping. A disadvantage of any landfill expansion 'Alternative Method' is a small loss of agricultural lands on Township-owned property, although an advantage is no additional random loss of agricultural lands in other areas of the Township.

11.2.7 Cultural Heritage Resources

The cultural heritage resources environmental component has been divided into three sub-components: archaeology, cultural heritage landscapes and built heritage resources. The comparison of the expansion alternatives under each of these sub-components is provided in the following sub-sections.

11.2.7.1 Archaeology

The indicator associated with archaeology is:

- Expected archaeological resources potentially affected on-site.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the archaeology component, were selected because they are most likely to result in an adverse effect. These factors are.

- Archaeological sites within the horizontal extent of the proposed landfill expansion
- Proximity to known areas of archaeological significance or potential in the adjacent site development area

The factors were selected for the reasons described below.

Archaeological sites within the horizontal extent of the proposed landfill expansion – if there are archaeological sites located within the expansion footprint of the 'Alternative Methods', then they could be affected by the landfill expansion.

Proximity to known areas of archaeological significance or potential in the adjacent site development area – If these areas are known to be present, then they could be affected by the landfill expansion.

The archaeological information used to complete this comparative assessment was the findings of the Stage 1 archaeological study carried out in the Site Study Area, which concluded that the study area was identified as having low archaeological potential and no further archaeological assessments are required (Volume 2 Appendix G-2).

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-14.

Table 11-14: Archaeology Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected archaeological resources potentially affected on-site.	Archaeological sites within the horizontal extent of the proposed landfill expansion	There were no archaeological sites identified within the proposed horizontal expansion area. Equally Preferred	There were no archaeological sites identified within the proposed horizontal expansion area. Equally Preferred	There were no archaeological sites identified within the proposed horizontal expansion area. Equally Preferred
	Proximity to known areas of archaeological significance or potential in the adjacent site development area	There were no known areas of archaeological significance or potential identified within the site development area. Equally Preferred	There were no known areas of archaeological significance or potential identified within the site development area. Equally Preferred	There were no known areas of archaeological significance or potential identified within the site development area. Equally Preferred
Preferred Alternative for Archaeology		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from an archaeology perspective, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the perspective of the archaeology sub-component the landfill expansion 'Alternative Methods' are quite similar.

The closure of the existing landfill under the Do-Nothing scenario will have no effect on expected archaeological resources in the area of the landfill but could result in disturbance of resources in other areas as a result of unorganized landfilling. Any landfill expansion 'Alternative Method' lands required will have no effect on expected archaeological resources. Therefore, a disadvantage of the Do-Nothing scenario is the potential for disturbance of archaeological resources elsewhere. An advantage of any landfill expansion 'Alternative Method' is no loss or disturbance of archaeological resources in the Township.

11.2.7.2 Cultural Heritage Landscapes

This indicator for cultural heritage landscapes is:

- Expected impact on identified cultural heritage landscapes within the Site-vicinity Study Area.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the cultural heritage landscapes component, were selected because they are most likely to result in an adverse direct or indirect effect. These are:

- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance (direct impact)
- Destruction of any, or part of any, significant heritage attribute or feature (direct impact)
- Shadow impacts on the appearance of a heritage attribute or an associated natural feature (indirect impact)
- Impact on significant views or vistas within, from, or of built and natural features (indirect impact)
- A change in land use where the change in use may impact the cultural heritage value or interest of the property area (indirect impact)

The factors to be evaluated for expected impact on identified cultural heritage landscapes within the Site-vicinity Study Area would be based on the following successive considerations:

- Whether there is an expected impact to identified cultural heritage landscapes
- The likely degree of expected impact to identified cultural heritage landscapes
- The potential to ameliorate or mitigate the expected impact to identified cultural heritage landscapes

Background research and desktop analysis of the study area based on the MHSTCI Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes (2016) checklist identified no potential cultural heritage landscapes (Volume 2 Appendix G-1).

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-15.

Table 11-15: Cultural Heritage Landscapes Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected impact on identified cultural heritage landscapes within the Site-vicinity Study Area	Direct Impact - Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance	No expected impacts	No expected impacts	No expected impacts
	Direct Impact - Destruction of any, or part of any, significant heritage attribute or feature	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - Shadow impacts on the appearance of a heritage attribute or an associated natural feature	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - Impact on significant views or vistas within, from, or of built and natural features	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - A change in land use where the change in use may impact the cultural heritage value or interest of the property area	No expected impacts	No expected impacts	No expected impacts
Preferred Alternative for Cultural Heritage Landscapes		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from a cultural heritage landscapes perspective, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the

perspective of the cultural heritage landscapes sub-component the landfill expansion 'Alternative Methods' are quite similar.

Any landfill expansion 'Alternative Method' will not impact cultural heritage landscapes. It is possible that unorganized landfilling that could result from the Do-Nothing scenario could impact cultural heritage landscapes, although that possibility seems remote. Therefore, there are no distinct advantages or disadvantages when comparing any landfill expansion 'Alternative Method' and the Do-Nothing scenario considering cultural heritage landscapes.

11.2.7.3 Built Heritage Resources

The indicator for built heritage resources is:

- Expected impact on identified built heritage resources within the Site-vicinity Study Area.

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the built heritage resources component, were selected because they are most likely to result in an adverse direct or indirect effect. These are:

- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance (direct impact)
- Destruction of any, or part of any, significant heritage attribute or feature (direct impact)
- Shadow impacts on the appearance of a heritage attribute or an associated natural feature (indirect impact)
- Isolation of a heritage attribute from its surrounding environment, context, or a significant relationship (indirect impact)
- Impact on significant views or vistas within, from, or of built and natural features (indirect impact)
- A change in land use where the change in use may impact the cultural heritage value or interest of the property area (indirect impact)
- Land disturbances such as a change in grades that alters soils and drainage patterns that may affect a built heritage resource (indirect impact)

Each of these factors was evaluated for expected impact on identified built heritage resources within the Site-vicinity Study Area based on the following successive considerations:

- Whether there is an expected impact to identified built heritage resources
- The likely degree of expected impact to identified built heritage resources
- The potential to ameliorate or mitigate the expected impact to identified built heritage resources

Background research and desktop analysis of the study area based on the MHSTCI Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes (2016) checklist identified:

- No listed or designated built heritage resources or cultural heritage landscapes
- No properties with buildings or structures 40 or more years old of potential CHVI

The checklist is provided in Volume 2 Appendix G-1

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-16.

Table 11-16: Built Heritage Resources Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected impact on identified built heritage resources within the Site-vicinity Study Area	Direct Impact - Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance	No expected impacts	No expected impacts	No expected impacts
	Direct Impact - Destruction of any, or part of any, significant heritage attribute or feature	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - Shadow impacts on the appearance of a heritage attribute or an associated natural feature	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - Isolation of a heritage attribute from its surrounding environment, context, or a significant relationship	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact - Impact on significant views or vistas within, from, or of built and natural features	No expected impacts	No expected impacts	No expected impacts

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
	Indirect Impact - A change in land use where the change in use may impact the cultural heritage value or interest of the property area	No expected impacts	No expected impacts	No expected impacts
	Indirect Impact Land disturbances such as a change in grades that alters soils and drainage patterns that may affect a built heritage resource	No expected impacts	No expected impacts	No expected impacts
Preferred Alternative for Built Heritage Resources		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from a built heritage resources perspective, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the perspective of the built heritage resources sub-component the landfill expansion 'Alternative Methods' are quite similar.

No landfill expansion 'Alternative Method' will impact built heritage resources. Although there is a small possibility that built heritage resources could be impacted as a result of the Do-Nothing scenario related to unregulated landfill, this possibility seems remote. Therefore, there are no distinct advantages or disadvantages when comparing any landfill expansion 'Alternative Method' and the Do-Nothing scenario.

11.2.8 Socio-economic

The socio-economic environmental component has been divided into three sub-components: local economy, residents and community, and visual. The comparison of the expansion alternatives under each of these sub-components is provided in the following sub-sections.

11.2.8.1 Local Economy

The indicators associated with the local economy are:

- Expected effect on local employment
- Expected effects on local businesses and commercial activity
- Expected effects on municipal finances

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the local economy indicators were selected because they are most likely to result in an adverse effect. These consist of:

- Employment opportunities during landfill expansion construction and operation
- Potential impacts to local commercial businesses in the Site-vicinity Study Area (excludes agriculture, which is evaluated in Section 11.2.6 of this EASR
- Capital costs associated with construction and operational costs

The comparative evaluation of 'Alternative Methods' of expansion using these factors is presented in Table 11-17. Landfill expansion can provide economic benefits to the local community in the form of new employment opportunities during expansion activities and day-to-day operation. This also has the potential for increased employment opportunities for local firms supplying products or services directly, or as secondary suppliers, during expansion activities. Although a similar potential for employment positions is predicted to be required at the landfill site for ongoing operations regardless of the alternative selected, there is expected to be additional employment opportunities during construction associated with each of the expansion alternatives. There will be a number of capital costs associated with each of the expansion alternatives, with the main differentiator in costs among the alternatives related to the area of the expansion and the corresponding volume of excavation and quantity of fill material to be imported and placed for the constructed landfill base layer.

Table 11-17: Local Economy Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected effect on local employment.	Consideration of temporary employment positions generated during construction.	Similar potential for employment positions generated during construction of expansion components. Equally Preferred	Similar potential for employment positions generated during construction of expansion components. Equally Preferred	Similar potential for employment positions generated during construction of expansion components. Equally Preferred
	Consideration of new permanent employment positions generated during operation.	No expected change to existing employment numbers. Equally Preferred	No expected change to existing employment numbers. Equally Preferred	No expected change to existing employment numbers. Equally Preferred
	Ranking	**Equally Preferred**	**Equally Preferred**	**Equally Preferred**
Expected effects on local businesses and commercial activity.	Consideration of businesses in the area who may experience disruption.	No impacts to local business operations, as there are no local businesses or commercial activities in the area of the proposed expansion or in proximity to the landfill site. Equally Preferred	No impacts to local business operations, as there are no local businesses or commercial activities in the area of the proposed expansion or in proximity to the landfill site. Equally Preferred	No impacts to local business operations, as there are no local businesses or commercial activities in the area of the proposed expansion or in proximity to the landfill site. Equally Preferred

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
	Consideration of potential revenue to businesses whose services may be required during landfill construction.	Second largest expansion footprint (3.9 ha); therefore, less potential revenue to businesses whose services may be required during expansion construction compared to Alternative 2 but similar to Alternative 3. Less Preferred	Largest expansion footprint area (4.5 ha); therefore, greatest potential revenue to businesses whose services may be required during expansion construction. Most Preferred	Smallest expansion footprint (3.8 ha); therefore, less potential revenue to businesses whose services may be required during expansion construction compared to Alternative 2 but similar to Alternative 1. Less Preferred
	Ranking	**Less Preferred**	**Most Preferred**	**Less Preferred**
Expected effects on municipal finances.	Relative cost of facility expansion.	Second largest cost to implement expansion, but similar to Alternative 3. Most Preferred	Largest capital cost to implement expansion. Less Preferred	Lowest capital cost to implement expansion, but similar to Alternative 1. Most Preferred
	Anticipated increase in revenue.	All alternatives will receive the same amount of incoming waste. Equally Preferred	All alternatives will receive the same amount of incoming waste. Equally Preferred	All alternatives will receive the same amount of incoming waste. Equally Preferred
	Ranking	**Most Preferred**	**Less Preferred**	**Most Preferred**
Preferred Alternative for Local Economy		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

In terms of effects on the local economy, the expansion alternative that has the largest capital cost to implement is most preferred in terms of potential revenue to local businesses, but less preferred in terms of capital costs to the municipality. It is considered that both perspectives are of equal importance. As a result of the comparison, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion from a local economy perspective. There are no advantages or disadvantages to describe

because from the perspective of the local economy sub-component the landfill expansion 'Alternative Methods' are quite similar.

The Do-Nothing scenario causes a negative effect with regard to local employment, while any landfill expansion 'Alternative Method' should have a positive effect on local employment during construction and continued operation. Neither the Do-Nothing nor any landfill expansion 'Alternative Method' are expected to cause effects to local businesses or commercial activity. The Do-Nothing scenario will cost the Township less than expanding the site, although there could be unaccounted-for costs resulting from unregulated landfilling. Therefore, an advantage of Do-Nothing is no construction or on-going operational costs for the Township, while a disadvantage is loss of local employment. An advantage of any landfill expansion 'Alternative Method' is continued and on-going local employment, while a disadvantage of any landfill expansion 'Alternative Method' is cost of construction and operation of the expanded landfill.

11.2.8.2 Residents and Community

The indicators associated with the residents and community are:

- Displacement of residents
- Expected interference with use and enjoyment of residential properties (nuisance effects)

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the residents and community indicators were selected because they are most likely to result in an adverse effect. These consist of:

- Proximity to nearby residences.
- Biophysical and social interactions with nearby residential PORs (i.e., air quality, noise, litter, odour, nuisance wildlife/pests and traffic). Potential visual impacts are considered in Section 11.2.8.3 of this EASR.

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-18. As previously described in Section 9.8.2.1, there are no existing residences within 500 m of the Site Study Area or the proposed expansion alternatives; the closest existing residence is on Boyne Road and is approximately 0.7 km east of the landfill site. There are 6 existing residences found between 700 m and 1 km of the Site Study Area. The proposed expansion alternatives 1) do not change the separation distances from the closest residences along Boyne Road, and 2) slightly decrease, but by the same amount, the separation distances from the closest residences to the south.

Table 11-18: Residents and Community Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Displacement of residents.	Displacement of residents during landfill expansion, construction and/or operation.	In view of the separation distance between the landfill site and the closest residences, no displacement anticipated. Equally Preferred	In view of the separation distance between the landfill site and the closest residences, no displacement anticipated. Equally Preferred	In view of the separation distance between the landfill site and the closest residences, no displacement anticipated. Equally Preferred
Expected interference with use and enjoyment of residential properties (nuisance effects).	Potential nuisance effects from air quality, noise, litter, odour, nuisance wildlife species and pests and traffic on nearby residential PORs.	With the proposed expansion alternatives, the distance to residential PORs does not change meaningfully from existing conditions and is similar among expansion alternatives. Landfill-related traffic will also be the same for all expansion alternatives. Equally Preferred	With the proposed expansion alternatives, the distance to residential PORs does not change meaningfully from existing conditions and is similar among expansion alternatives. Landfill-related traffic will also be the same for all expansion alternatives. Equally Preferred	With the proposed expansion alternatives, the distance to residential PORs does not change meaningfully from existing conditions and is similar among expansion alternatives. Landfill-related traffic will also be the same for all expansion alternatives. Equally Preferred
Preferred Alternative for Residents and Community		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result of the above comparison from a residents and community perspective, which concluded that the expansion alternatives are equally preferred, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion. There are no advantages or disadvantages to describe because from the perspective of the residents and community sub-component the ‘Alternative Methods’ are quite similar.

Under Do-Nothing conditions there is no expected displacement of residents, although nuisance from unregulated landfilling could happen. As noted from other components (noise, air quality, visual and traffic), the expectation is that neither the landfill expansion nor the Do-Nothing scenario will interfere with the use and enjoyment of residential properties. Therefore, there are no advantages or disadvantages when comparing any landfill expansion 'Alternative Method' or Do-Nothing when considering residents and community.

11.2.8.3 Visual

The indicators associated with visual are:

- Expected changes in landscape views from off-site

There is one factor that can be considered to assess potential visual impacts, as follows:

- Number of landscape views potentially impacted

As previously described, the terrain in the area of the Boyne Road Landfill site is flat lying with little topographic relief. The ground cover in the intervening area between the closest residences and the landfill site is a mixture of cleared agricultural fields and treed areas, whether they be rows along fence lines or remaining stands of forest. The southern and eastern portions of the Site Study Area are covered in semi-mature to early successional forest. The separation distance between residential PORs does not change meaningfully from existing conditions and is similar among expansion alternatives. The height of all three landfill expansion alternatives is approximately 15 m above existing grade, and only 2.5 m higher than the existing approved landfill.

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-19.

Table 11-19:Visual Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected changes in landscape views from off-site.	Number of landscape views potentially impacted.	In view of the large and essentially unchanging separation distances, the nature of the intervening terrain, and the equivalent height of the expansion alternatives, the number of landscape views potentially affected is expected to be small (if any) and the degree of visual effect is expected to be minor (if at all). Equally Preferred	In view of the large and essentially unchanging separation distances, the nature of the intervening terrain, and the equivalent height of the expansion alternatives, the number of landscape views potentially affected is expected to be small (if any) and the degree of visual effect is expected to be minor (if at all). Equally Preferred	In view of the large and essentially unchanging separation distances, the nature of the intervening terrain, and the equivalent height of the expansion alternatives, the number of landscape views potentially affected is expected to be small (if any) and the degree of visual effect is expected to be minor (if at all). Equally Preferred
Preferred Alternative for Visual		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

The expansion alternatives are equally preferred from a visual perspective. As a result, there are no unique advantages or disadvantages when comparing the three alternatives for the landfill expansion from a visual perspective. There are no advantages or disadvantages to describe because from the perspective of the visual sub-component the landfill expansion 'Alternative Methods' are quite similar.

The closure of the existing landfill under the Do-Nothing scenario will continue to have areas where the landfill is visible from off-site. Under the Do-Nothing scenario waste could be landfilled in an unregulated area of the Township causing unsightly visual impacts. With any proposed landfill expansion 'Alternative Method', it is expected that the landfill will have slightly greater visibility from off-site locations to the South, although mitigation could be effective. A small advantage of Do-Nothing is slightly less visibility of the landfill from the south and a disadvantage is potential for visual impact from unregulated waste placement in other parts of the Township. A small disadvantage of any landfill expansion 'Alternative

Method' is slightly more visibility of the landfill to the south, noting that mitigation is expected to be helpful and an advantage is no visual impacts in other parts of the Township.

11.2.9 Transportation

The indicator for transportation is:

- Expected effect on traffic along haul routes

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the perspective of the traffic indicator, were selected because they would be the most likely to result in an adverse effect, from a future traffic operation and safety perspective. These factors are:

- Changes in traffic volume
- Changes in required haul routes
- Changes in type of vehicle expected

From a traffic/transportation standpoint, all three alternatives are preferred equally. This is largely because additional vehicles and vehicle trips associated with the landfill expansion are expected to be the same no matter what alternative is selected as preferred. In addition, the landfill site access location and operations are expected to be the same as existing for all three expansion alternatives.

The comparative evaluation of 'Alternative Methods' using this traffic factor is presented in Table 11-20.

Table 11-20: Traffic Evaluation of 'Alternative Methods'

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Expected effect on traffic along haul routes.	Changes in traffic volume.	Same for each alternative. Equally Preferred	Same for each alternative. Equally Preferred	Same for each alternative. Equally Preferred
	Changes in required haul routes.	Same for each alternative (expected to remain the same). Equally Preferred	Same for each alternative (expected to remain the same). Equally Preferred	Same for each alternative (expected to remain the same). Equally Preferred
	Changes in type of vehicle expected.	Same for each alternative. Equally Preferred	Same for each alternative. Equally Preferred	Same for each alternative. Equally Preferred
Preferred Alternative		**Equally Preferred**	**Equally Preferred**	**Equally Preferred**

As a result, there are no unique advantages or disadvantages when comparing the three alternatives for the Boyne Road Landfill expansion from a transportation perspective. There are no advantages or disadvantages to describe because from the perspective of the traffic component the landfill expansion 'Alternative Methods' are quite similar.

No landfill expansion 'Alternative Methods' are expected to have an impact to traffic that will require the upgrade of any intersection over the life of the landfill. If the landfill were to close (Do-Nothing), this would also have no impact to traffic requiring upgrades to any intersections. Therefore, there are no distinct advantages or disadvantages of Do-Nothing versus any landfill expansion 'Alternative Method'.

11.2.10 Design and Operations

The indicator for design and operations is:

- Estimated costs associated with implementation of expansion alternatives

The factors considered to differentiate between 'Alternative Methods' for landfill expansion, from the financial perspective of the estimated costs for construction and operations, were selected because they are most likely to result in an adverse effect. These factors are:

- Capital costs for establishing the additional disposal capacity
- Additional ongoing operational and maintenance requirements and costs associated with the expansion

Capital Costs – The main components that will have different capital costs between the three expansion alternatives are: 1) the volume of excavation and 2) the supply and placement of material for the constructed landfill base layer.

The factual information relevant to this factor is provided below in Table 11-21.

Table 11-21: Capital Cost Information for Evaluation of 'Alternative Methods'

	Alternative 1	Alternative 2	Alternative 3
Total Additional Waste Footprint Area (ha)	3.9	4.5	3.8
Volume of Excavation (m^3)	12,650	14,150	12,100
Volume of Material for Constructed Landfill Base Layer (m^3)	39,000	45,000	38,000

Ongoing Additional Operational and Maintenance Costs – The approach to operations of the landfill expansion will be a continuation of current operations. The proposed expansion is as a natural attenuation landfill. As such, there is not expected to be a significant change in operational or maintenance requirements between the existing landfill and the proposed expansion, nor is there expected to be a difference between the three expansion alternatives.

The comparative evaluation of 'Alternative Methods' using these factors is presented in Table 11-22.

Table 11-22: Design and Operations Evaluation of 'Alternative Methods

Indicator	Differentiating Factors	Alternative 1	Alternative 2	Alternative 3
Costs associated with implementation of expansion alternatives.	Estimated capital costs for the additional disposal capacity.	Lower costs to construct the expansion than Alternative 2, and similar to Alternative 3. Most Preferred	Highest costs to construct the expansion. Less Preferred	Lowest costs to construct the expansion, but similar to Alternative 1. Most Preferred
	Additional ongoing operational and maintenance requirements and costs associated with the expansion.	No additional costs associated with the expansion. Equally Preferred	No additional costs associated with the expansion. Equally Preferred	No additional costs associated with the expansion. Equally Preferred
Preferred Alternative for Financial		**Most Preferred**	**Less Preferred**	**Most Preferred**

Based on this evaluation, Alternatives 1 and 3 are most preferred and considered equal, while Alternative 2 is less preferred.

In addition to the comparative evaluation using the indicator and factors of differentiation, the advantages and disadvantages identified by the comparative evaluation are shown in Table 11-23.

Table 11-23: Evaluation of Advantages and Disadvantages for Design and Operations

Design and Operations	Advantages	Disadvantages
Alternative 1	Lower overall capital costs at existing landfill (similar to Alternative 3). No capital costs at other unorganized landfill locations in the Township.	Higher capital cost to implement than Do-Nothing.
Alternative 2	None. No capital costs at other unorganized landfill locations in the Township.	Highest capital cost to implement expansion.
Alternative 3	Lowest overall capital costs at existing landfill (similar to Alternative 1). No capital costs at other unorganized landfill locations in the Township.	Higher capital cost to implement than Do-Nothing
Do-Nothing	No capital cost at existing landfill.	Potential for capital costs at other unorganized landfilling locations in the Township.

As outlined in Table 11.23, Alternative 3 has the advantage of having the lowest overall capital costs with Alternative 2 the next lowest. Alternative 2 has the disadvantage of having the highest capital cost to implement landfill expansion.

The costs for the Do-Nothing scenario are not zero, as on-going monitoring and maintenance will be required for decades post-closure of the existing landfill. Also, the Do-Nothing scenario could encourage unorganized landfilling in other areas of the Township that could incur costs to clean up. To expand the landfill, any 'Alternative Method' will incur some capital costs, although these will be relatively lower because a natural attenuation expansion design is proposed, and affordable for the Township as they are spread over time as the expansion is progressively developed. During operation of the landfill and post-closure, on-going monitoring will be required. Therefore, the Do-Nothing scenario has the advantage of less capital cost and a shorter duration of on-going monitoring and maintenance than any landfill expansion 'Alternative Method, with potential for clean-up costs resulting from unorganized landfilling as a disadvantage. Any landfill expansion 'Alternative Method' has the disadvantage of more capital cost and longer duration of on-going monitoring and maintenance than Do-Nothing, and only a slight advantage with no unorganized landfill costs expected.

11.3 Public Input Regarding the Ranking of Alternatives

As described in Sections 4.6.3 and 4.7 of this EASR, throughout the consultation period for the EA process, by way of meetings with the public, the technical bulletins and the project website, feedback was solicited from the public. Among other things, feedback regarding the preferential ranking of components and sub-components was solicited from the public. The public was asked to consider if any component or sub-component was more or less important than another. The public was also provided an opportunity to comment on the individual

component assessments or the identification of the preferred alternative, and whether they agreed or disagreed.

No feedback was received that conflicted with any of the analysis and ranking of individual components presented in Section 11.2. The opportunity for ranking of components and sub-components from stakeholders was provided mostly during Open House #1 during the ToR and Technical Bulletin #3. The rankings of the relative importance of the components by the stakeholders was considered in the overall identification of the preferred alternative, as described in Section 11.4.

11.4 Comparative Evaluation

The ranking of the 'Alternative Methods' for each of the components and sub-components and identification of the overall preferred alternative is presented in Table 11-24. The public ranking of the relative importance of the components and sub-components is also provided in Table 11-24. The comparative evaluation of 'Alternative Methods' of expanding the Boyne Road Landfill identified Alternative 3 as the preferred method of expanding the landfill.

Table 11-24: Summary of the Components and Sub-components Comparative Evaluation of 'Alternative Methods'

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Public Ranking Group[1]
Atmosphere	Air Quality (dust, odour and GHG)	Equally Preferred	Equally Preferred	Equally Preferred	Important
Atmosphere	Noise	Equally Preferred	Equally Preferred	Equally Preferred	Less Important
Geology and Hydrogeology	Groundwater quality	Equally Preferred	Equally Preferred	Equally Preferred	Very Important
Surface Water	Surface water quality	Equally Preferred	Equally Preferred	Equally Preferred	Very Important
Surface Water	Surface water quantity	Most Preferred	Less Preferred	Most Preferred	Less Important
Biology	Aquatic ecosystems	Less Preferred	Least Preferred	Most Preferred	Less Important
Biology	Terrestrial ecosystems	Less Preferred	Least Preferred	Most Preferred	Less Important
Agriculture	Agriculture	Equally Preferred	Equally Preferred	Equally Preferred	Important
Land Use	Current and planned future land uses	Equally Preferred	Equally Preferred	Equally Preferred	Important
Cultural Heritage Resources	Archaeology	Equally Preferred	Equally Preferred	Equally Preferred	Less Important

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Public Ranking Group[1]
Cultural Heritage Resources	Cultural Heritage Landscapes	Equally Preferred	Equally Preferred	Equally Preferred	Less Important
Cultural Heritage Resources	Built Heritage Resources	Equally Preferred	Equally Preferred	Equally Preferred	Less Important
Socio-economic	Local Economy	Equally Preferred	Equally Preferred	Equally Preferred	Not in survey at the time
Socio-economic	Residents and Community	Equally Preferred	Equally Preferred	Equally Preferred	Not in survey at the time
Socio-economic	Visual	Equally Preferred	Equally Preferred	Equally Preferred	Important
Transportation	Traffic	Equally Preferred	Equally Preferred	Equally Preferred	Not in survey at the time
Design and Operations	Financial	Most Preferred	Less Preferred	Most Preferred	Less Important
Overall Evaluation of Alternatives		**Less Preferred**	**Least Preferred**	**Most Preferred**	

Notes: [1] Only one member of the public commented on this during the ToR Open House #1 when components and sub-components were slightly different.

As shown in Table 11-24, there are 10 components and 17 sub-components.

Of the 17 sub-components that were comparatively assessed, 13 were ranked as equally preferred for the three expansion alternatives. These included components or sub-components that are often considered to be most important such as geology and hydrogeology and surface water quality. The high number of equally preferred rankings reflect the similarity among the available expansion alternative designs in terms of location on the landfill property, physical dimensions to provide the required airspace and considerable distance from potential off-site sensitive receptors.

Of the four sub-components where there are differences in preference, Alternative 3 was most preferred for all four. Alternative 1 was most preferred for two sub-components (ranked the same as Alternative 3) and less preferred for the other two. Alternative 2 was ranked as less preferred for two of the sub-components and least preferred for the other two.

The advantages and disadvantages for each of the components and sub-components and Do-Nothing scenario are presented in Table 11-25.

Table 11-25: Summary of the Components and Sub-components Advantages and Disadvantages

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Do-Nothing
Atmosphere	Air Quality (dust, odour and GHG)	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable air quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable air quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable air quality impacts with landfill expansion.	Advantage of less air quality impacts at landfill location. Disadvantage of potential air quality impacts at other locations.
Atmosphere	Noise	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable noise impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable noise impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable noise impacts with landfill expansion.	Advantage of no noise impacts at landfill location.
Geology and Hydrogeology	Groundwater quality	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable groundwater quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable groundwater quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Disadvantage of greater but mitigable groundwater quality impacts with landfill expansion.	Advantage of less groundwater quality impacts at landfill location. Disadvantage of potential groundwater quality impacts at other locations.

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Do-Nothing
Surface Water	Surface water quality	No advantages or disadvantages between 'Alternative Methods'. Advantage of improved surface water quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Advantage of improved surface water quality impacts with landfill expansion.	No advantages or disadvantages between 'Alternative Methods'. Advantage of improved surface water quality impacts with landfill expansion.	Disadvantage of greater surface water quality impacts at landfill location.
Surface Water	Surface water quantity	Advantage of less reduction in site infiltration and small increase in off-site discharge volume. No advantages or disadvantages over Do-Nothing.	Disadvantage of greater reduction in site infiltration and greater increase in off-site discharge volume. No advantages or disadvantages over Do-Nothing.	Advantage of less reduction in site infiltration and small increase in off-site discharge volume. No advantages or disadvantages over Do-Nothing.	No advantages of disadvantages over other 'Alternative Methods'.
Biology	Aquatic ecosystems	Advantage of least increase in duration of off-site flows. Advantage of improved aquatic habitat over Do-Nothing. Disadvantage of greatest area of fish habitat removal.	Advantage of Improved aquatic habitat over Do-Nothing. Disadvantage of greatest increase in duration of off-site flows.	Advantage of least area of fish habitat remove. Advantage of improved aquatic habitat over Do-Nothing. Disadvantage of greatest increase in duration of off-site flows.	Advantage of no change in duration of off-site flows. Advantage of no fish habitat removal. Disadvantage of no improved aquatic habitat over 'Alternative Methods'. Disadvantage of potential aquatic habitat impacts at other locations.

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Do-Nothing
Biology	Terrestrial ecosystems	Advantage of moderate disturbance footprint. Disadvantage of loss of some portion of each of the significant natural features identified. Advantage of no disturbance of additional natural habitat in the Township.	Disadvantage of loss of some portion of each of the significant natural features identified including Significant Wildlife Habitat Interior Forest. Disadvantage of greatest impact on bat habitat. Advantage of no disturbance of additional natural habitat in the Township.	Advantage of smallest disturbance footprint. Advantage of best protection for bat habitat. Disadvantage of loss of some portion of each of the significant natural features identified. Advantage of no disturbance of additional natural habitat in the Township.	Advantage of preservation of all identified habitat at the existing landfill. Disadvantage of potential for disturbance of other and unknown habitat throughout the Township.
Agriculture	Agriculture	Advantage of no random loss of agricultural land in the Township. Disadvantage of small loss of agricultural land south of the existing landfill.	Advantage of no random loss of agricultural land in the Township. Disadvantage of small loss of agricultural land south of the existing landfill.	Advantage of no random loss of agricultural land in the Township. Disadvantage of small loss of agricultural land south of the existing landfill.	Advantage of no loss of agricultural land near the landfill. Disadvantage of possible random loss of agricultural land in the Township.
Land Use	Current and planned future land uses	Advantage of being compatible with land use policy.	Advantage of being compatible with land use policy.	Advantage of being compatible with land use policy.	Disadvantage of possible incompatibility with land use policy.
Cultural Heritage Resources	Archaeology	Advantage of no archaeology resource losses.	Advantage of no archaeology resource losses.	Advantage of no archaeology resource losses.	Disadvantage of possible archaeology resource losses.

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Do-Nothing
Cultural Heritage Resources	Cultural Heritage Landscapes	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.
Cultural Heritage Resources	Built Heritage Resources	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.
Socio-economic	Local Economy	Advantage of ongoing employment at the landfill. Disadvantage of capital and operating cost.	Advantage of ongoing employment at the landfill. Disadvantage of capital and operating cost.	Advantage of ongoing employment at the landfill. Disadvantage of capital and operating cost.	Advantage of no capital cost and lower, shorter duration operating cost. Disadvantage of no employment at the landfill.
Socio-economic	Residents and Community	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.
Socio-economic	Visual	Advantage of no other visual impacts in the Township. Disadvantage of a mitigable slight increase in visibility from the south.	Advantage of no other visual impacts in the Township. Disadvantage of a mitigable slight increase in visibility from the south.	Advantage of no other visual impacts in the Township. Disadvantage of a mitigable slight increase in visibility from the south.	Advantage of no change in visibility at the existing landfill. Disadvantage of other potential visual impacts in the Township.
Transportation	Traffic	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.	No advantages or disadvantages.

Component	Sub-component	Alternative 1	Alternative 2	Alternative 3	Do-Nothing
Design and Operations	Financial	Advantage of potential for clean-up costs throughout the Township. Disadvantage of capital costs and longer duration of operational costs.	Advantage of potential for clean-up costs throughout the Township. Disadvantage of capital costs and longer duration of operational costs.	Advantage of potential for clean-up costs throughout the Township. Disadvantage of capital costs and longer duration of operational costs.	Advantage of no capital costs and shorter duration of operational costs. Disadvantage of potential for clean-up costs throughout the Township.

Alternative 3 was identified as the preferred expansion alternative for the Boyne Road landfill. The advantages of Alternative 3 are that it has the least potential for disruption/adverse effects on the natural environment (both aquatic and terrestrial), the least potential for impacts on surface water quantity and the lowest capital cost for implementation of the expansion as compared to the other 'Alternative Methods'.

The Do-Nothing scenario provides a benchmark against which the consequences of the alternatives can be measured, to determine, among other things, the extent to which other alternatives address the problem or opportunity. In terms of waste management within the Township of North Dundas, the Do-Nothing scenario does not address the problem as it does not provide a long term residual waste management strategy for the Township. There are some advantages but likely more disadvantages with respect to any of the 'Alternative Methods' of landfill expansion when assessed against the Do-Nothing alternative; however, all identified potential disadvantages are considered small and mitigable.

12.0 Description of the Preferred Undertaking

This section presents a description of the preferred method of expansion of the Boyne Road Landfill site. The comparative evaluation presented in Section 11.0 of this document identified Alternative 3 - primarily horizontal expansion on the south side of the existing footprint- as the overall preferred landfill expansion alternative. The factors considered in the development of Alternative 3, as described in Section 10.0, have been further refined at an EA conceptual level of design and detail to prepare this description of undertaking to serve as the basis for detailed impact assessment (Section 13.0). This refinement and modifications do not change Alternative 3 as it was considered in the comparative evaluation; rather it simply updates it and provides some additional details for consideration in the detailed impact assessment.

12.1 Description of the Landfill Expansion

For Alternative 3, the vertical expansion above the approved top of waste contours is limited to the southern half of the current footprint, tying it with the horizontal expansion to the south where the majority of the additional disposal airspace will be achieved.

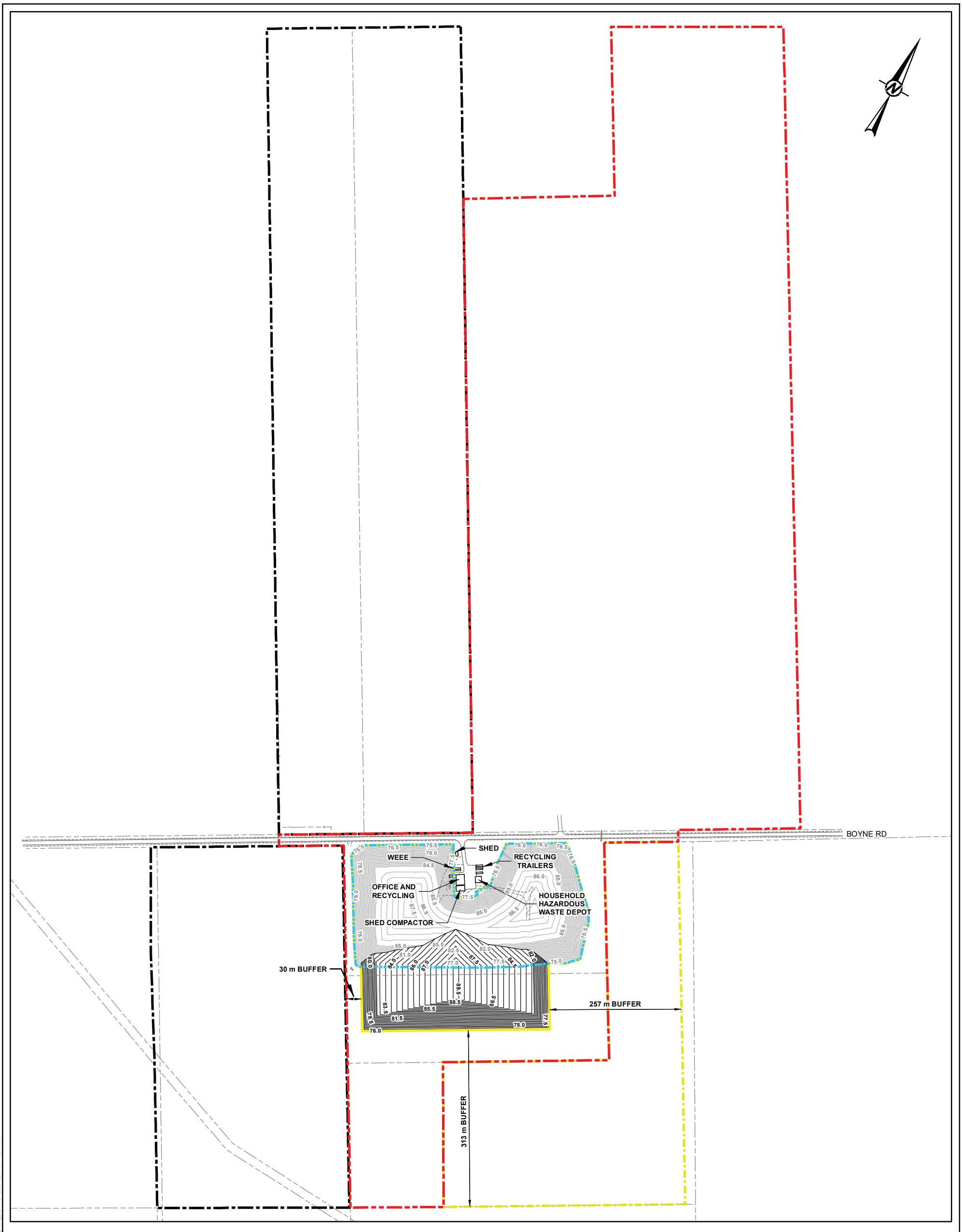
The horizontal expansion adds an additional 3.8 ha of footprint, for a total landfill footprint of 11.9 ha. The total expanded landfill capacity for waste and daily cover (excluding final cover), including the additional 417,700 m^3 beyond 2023 provided by the expansion, is 1,060,750 m^3. Including the proposed 0.75 m thick final cover, the total airspace will be approximately 1,089,250 m^3. The maximum elevation of the landfill will be along its peak at elevation 89.75 masl, which is approximately 15 m above the average ground surface elevation in the vicinity of the landfill expansion and approximately 2.5 m higher than the existing approved landfill.

The landfill site property is currently 97.13 ha. It is proposed to add the 16.21 ha of Township-owned property to the east and southeast to the landfill property, resulting in a proposed total landfill property area of 113.3 ha. The proposed landfill property and expanded landfill footprint are shown on Figure 12-1.

The landfill expansion footprint will have a 30 m buffer within the landfill property on the west side (followed by the CAZ lands), and with the addition of the Township-owned lands to the east and southeast a 257 m wide buffer on the east side and a 313 m wide buffer on the south side.

Associated with the existing landfill is 71.25 ha of CAZ lands to the north and west of the landfill property. Determination of the need for additional CAZ lands and their location is discussed in Section 12.2.

The geometry of Alternative 3 follows the requirements of *O.Reg.* 232/98, i.e., landfill sideslopes of 4H:1V, 25 % or flatter and landfill top area slopes not flatter than 20H:1V (5 %). The configuration of the proposed landfill expansion is shown in plan view on Figure 12-2, with cross-sections provided on Figure 12-3.



LEGEND

- EXISTING LANDFILL FILL AREA
- PROPOSED LIMIT OF WASTE FOR THE LANDFILL EXPANSION AREA
- APPROXIMATE BOUNDARY OF CONTAMINATION ATTENUATION ZONE
- PROPOSED NEW LANDFILL PROPERTY BOUNDARY TO BE ADDED THROUGH AN ECA AMENDMENT
- APPROXIMATE LANDFILL SITE PROPERTY BOUNDARY
- GROUND SURFACE CONTOURS (mASL), BASED ON RESULTS OF THE SURVEYS CONDUCTED IN 2008, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020
- PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (mASL)

REFERENCES

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, NOVEMBER 2014, DECEMBER 2015, NOVEMBER 2016, AND DECEMBER 2017 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.

0 60 120 180 240 300

1:6,500 METRES

CLIENT
TOWNSHIP OF NORTH DUNDAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-11-16
PREPARED	JEM
DESIGN	PLE
REVIEW	YJM
APPROVED	PLE

TITLE
PROPOSED LANDFILL PROPERTY AND EXPANDED LANDFILL FOOTPRINT

PROJECT NO.	PHASE/TASK	REV.	FIGURE
1648253	2.0/2.2.0	0	**12-1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

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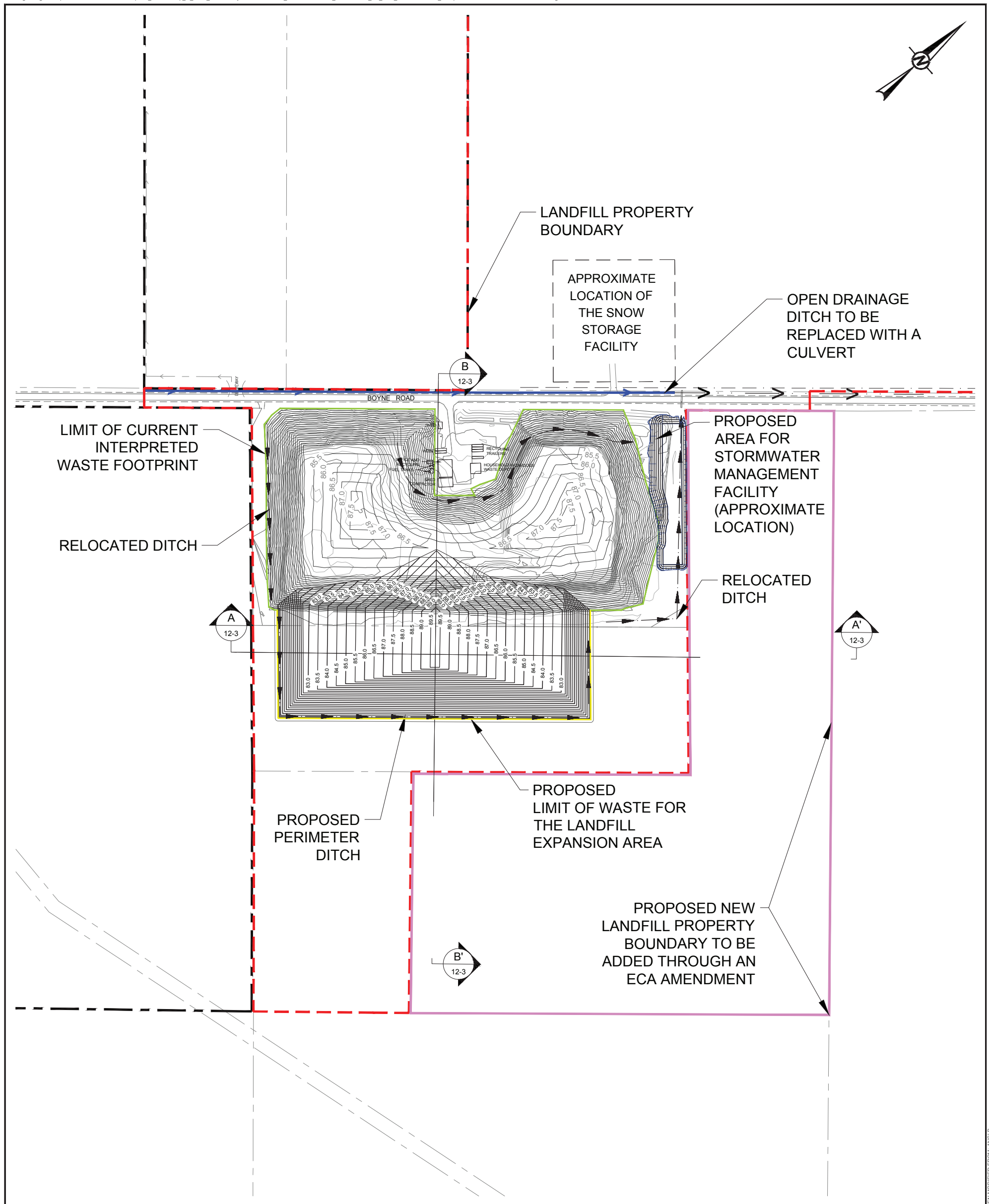

LEGEND

- 85.0 — GROUND SURFACE CONTOURS (MASL), BASED ON RESULTS OF THE SURVEYS CONDUCTED IN 2008, 2010, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 AND 2020
- 89.5 — PROPOSED EXPANSION TOP OF WASTE ELEVATION CONTOURS (MASL)
- APPROXIMATE PROPERTY BOUNDARY OF LANDFILL SITE
- APPROXIMATE BOUNDARY OF EXISTING CONTAMINANT ATTENUATION ZONE EASEMENT LANDS
- PROPOSED PERIMETER DITCH
- EXISTING ROADSIDE DITCH TO BE REPLACED WITH A CULVERT (APPROXIMATE LOCATION)
- PROPOSED NEW LANDFILL PROPERTY BOUNDARY TO BE ADDED THROUGH AN ECA AMENDMENT

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY STANTEC CONSULTING LTD.
2. 2008 AND 2010 SURVEYS COMPLETED BY STANTEC CONSULTING LTD.
3. MAY 2012, JULY 2013, NOVEMBER 2014, DECEMBER 2015, NOVEMBER 2016, DECEMBER 2017, DECEMBER 2018 AND NOVEMBER 2019, APRIL 2020 AND DECEMBER 2020 SURVEYS COMPLETED BY GOLDER ASSOCIATES LTD.
4. COORDINATES SYSTEM: MTM ZONE 9 NAD83 DATUM CGVD28

0 100 200
1:4,000 METRES

CLIENT
TOWNSHIP OF NORTH DUNDAS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2021-11-16
DESIGNED	YJM
PREPARED	ABD
REVIEWED	PLE
APPROVED	PAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
SITE PLAN OF PROPOSED EXPANSION

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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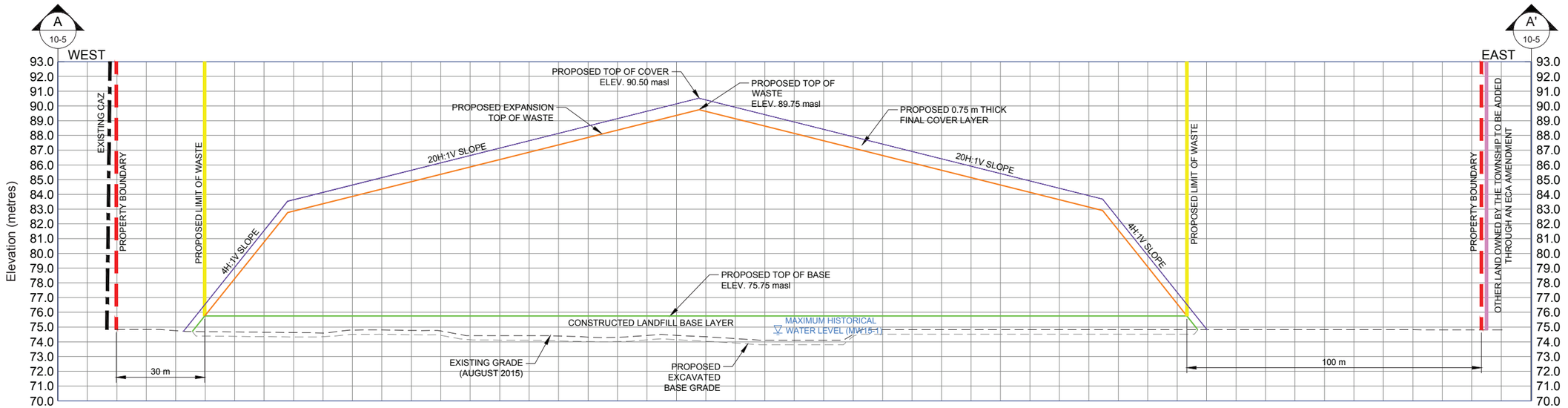
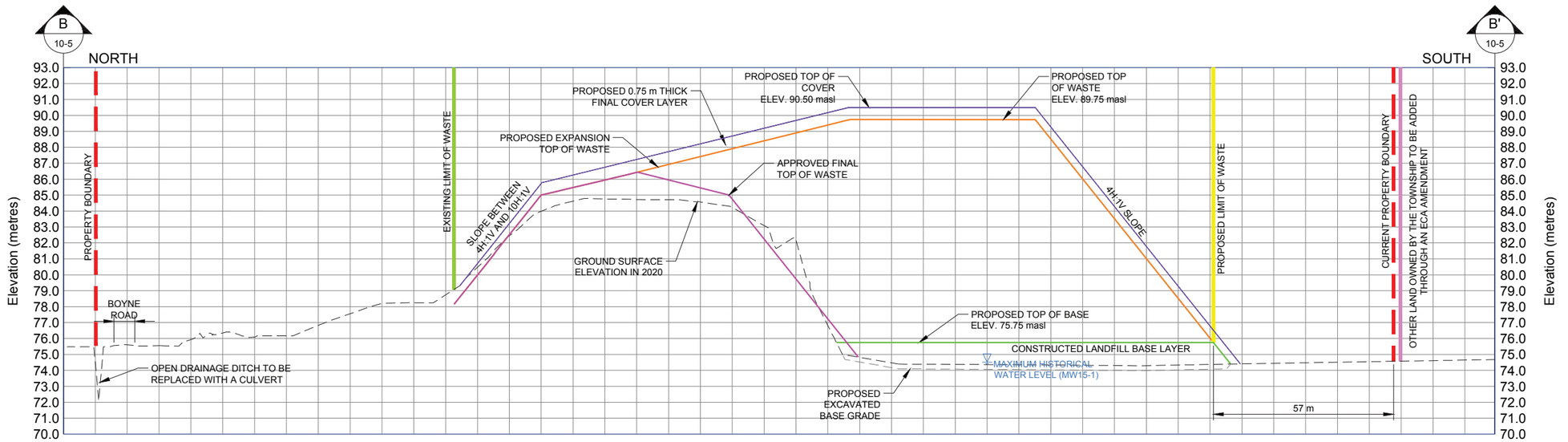


HORIZ. SCALE 1:1,500 m
VERT. SCALE 1:300 m
A-A' 10-5 SECTION



HORIZ. SCALE 1:1,500 m
VERT. SCALE 1:300 m
B-B' 10-5 SECTION

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1:1,500 HORIZONTAL SCALE METRES

0 5 10
1:300 VERTICAL SCALE METRES

CLIENT
TOWNSHIP OF NORTH DUNDAS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2021-11-16
DESIGNED	YJM
PREPARED	ABD
REVIEWED	PLE
APPROVED	PAS

PROJECT
INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE
TOWNSHIP OF NORTH DUNDAS WASTE MANAGEMENT PLAN

TITLE
CROSS-SECTIONS OF PROPOSED EXPANSION

PROJECT NO.	PHASE/TASK	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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12.2 Leachate Management and Groundwater Protection

As discussed in Section 10.1, it is proposed that the expanded Boyne Road Landfill will continue to operate as a natural attenuation site, noting that it may be necessary for the Township to acquire additional property and/or CAZ easement agreements to protect off-site groundwater quality in compliance with the Reasonable Use Guideline. The need for any additional CAZ lands and their location will be determined from the results of predictive modelling to be carried out as part of the detailed groundwater impact assessment for the proposed expansion (as described in Section 13.2).

The seasonally high groundwater table in the area of the proposed expansion is close to the existing ground surface. The MECP Landfill Standards require a minimum separation of 1 m between the high groundwater table and the base of the waste. Therefore, the design of the expansion will include an approximately 1 m thick pad of imported permeable fill material (for example, sandy material) above the existing ground surface (stripped of its thin layer of topsoil) to provide a base for waste disposal. As shown on the cross-sections on Figure 12-3, the proposed elevation of the top of the base pad is 75.75 masl. The base will be constructed in sections prior to waste placement in accordance with the site development plan for the expanded landfill cells/phases to be developed during detailed design prepared during the ECA application process. The use of permeable fill will also allow the leachate to infiltrate into the groundwater system while minimizing the potential for both the development of a leachate mound within the waste and lateral leachate seeps at the perimeter of the expanded disposal area footprint.

12.3 Geotechnical Assessment

A geotechnical assessment was carried out to confirm the stability of the proposed landfill configuration and the results are provided in Volume 2 Appendix D-2. The landfill expansion area is underlain by a layer of competent glacial till followed by bedrock. The proposed 4H:1V landfill sideslopes have an acceptable factor of safety in terms of slope stability.

The glacial till is a granular soil type that will undergo limited compression under the applied load of the landfilled waste. It is also noted that there is no landfill infrastructure beneath the existing landfill or proposed vertical and horizontal expansion that could be adversely affected by compression of subgrade soils under the weight of the waste.

12.4 Landfill Gas (LFG) Management

As per *O.Reg.* 232/98, there is no requirement for a landfill site with a total capacity of less than 1.5 million m^3 to include a landfill gas collection and control system. A landfill gas collection and flaring system is therefore not proposed for the Boyne Road landfill expansion (total capacity of 1,060,750 m^3; also, the detailed air quality impact assessment carried out for the proposed expansion (Section 13.1.1) indicates that a collection system is not needed to achieve compliance with provincial requirements related to allowable air quality at off-site receptors).

Also, considering the high water table that is almost at ground surface on and in the area of the landfill site, off-site lateral migration of landfill gas through the subsurface is not expected.

Rather, the landfill gas generated at the site is expected to vent to atmosphere through the landfill cover soils. Methane detectors are in place at on-site buildings and are proposed to be maintained throughout the operating period. In addition, there are no existing structures in the 500 m Site-vicinity Study Area (refer to Figure 9-1).

12.5 Stormwater Management and Surface Water Protection

As described in Section 11.2.3, there is currently no quality or quantity control system for stormwater management in place for the existing landfill except for the existing perimeter ditch that collects and conveys runoff to the Volks Municipal Drain ditch along the north side of Boyne Road. For the expansion, it is proposed that a wetland type stormwater facility will be constructed at the northeast corner area of the landfill site on the south side of Boyne Road and outlet at the same as outlet as for the existing perimeter ditch. This wetland will be sized based on the following MECP criteria:

- Enhanced (80%) long-term TSS removal to provide the “highest level” of quality control of stormwater
- Water quality storage requirements will be determined based on Table 3.2 of the Ontario Stormwater Management Planning and Design Manual (MECP, 2003)

The general location of this stormwater management facility is shown on Figure 12-2. The required sizing and other features of this facility will be determined as part of the detailed impact assessment on surface water (Section 13.3). A ditch is also proposed on the north face of the existing landfill to help capture the majority of the existing disposal area that currently drains directly to the Boyne Road roadside ditch and is not first collected by an on-site perimeter ditch (see Figure 12-2); this north side ditch will connect to the proposed stormwater management facility.

Similarly, the existing perimeter ditch is proposed to be reconfigured and extended around the perimeter of the expansion footprint. As described in Section 10.1, the proposed location of this ditch is near the toe of the landfill sideslope but elevated in relation to adjacent grades around the expansion such that collected runoff is from the landfill cover only and does not intercept adjacent stormwater or leachate-impacted groundwater. Off site flows that flow onto the proposed expansion area will be directed around (not towards or through) the proposed expansion area/waste mound. This is shown in plan view on Figure 12-2.

As described in Section 10.1, it is also proposed as a component of the expansion design to install a culvert in the roadside ditch along the north side of Boyne Road (Volks Municipal Drain) opposite the landfill site frontage. This measure would isolate and convey surface water past the landfill site from upstream (west) to downstream (east) and prevent potential seepage of leachate-impacted groundwater into the surface water in the ditch. With the culvert installed and provided with periodic seepage collars to prevent water movement along the granular bedding and backfill, the groundwater would continue northward as groundwater flow into the landfill buffer zone located north of Boyne Road and the approved CAZ easement, with the intent that site compliance would be evaluated by the groundwater RUG rather than effects on ditch surface water quality. This culvert replacement of the existing

open ditch is illustrated on Figure 12-2. The proposed work along the section of Volks Municipal Drain opposite the landfill site will involve the removal of the existing vegetation.

12.6 Site Operations

The expanded landfill will continue to operate from 8 a.m. to 4 p.m., Monday through Friday plus one hour before, i.e., 7 a.m. to 8 a.m., for site preparations and one hour after, i.e., 4 p.m. to 5 p.m. to complete placement of daily cover. The site will continue Saturday operations from 8 a.m. to 12 p.m. May through November and only one Saturday a month from 8 a.m. to 12 p.m. November through May. The site will be closed on Sunday.

The existing waste diversion facilities will continue to operate in the central portion of the landfill area. These facilities include preparation of recyclables in the material recycling building for transfer off-site; and acceptance of WEEE, HHW, tires, fluorescent bulbs, scrap metal and refrigerant appliances for temporary storage in the appropriate facilities/areas and/or preparation for transfer off-site. Wood and brush will also be accepted with planned grinding for use as alternative daily cover.

12.7 Maintenance and Monitoring

A program for operational and environmental monitoring will continue to be carried out at the expanded Boyne Road Landfill site. Operational monitoring includes ongoing inspections and recording of site conditions, maintenance, and repairs. Environmental monitoring is carried out as part of site operations to check for potential releases from the landfill and, if required, trigger investigation and mitigation measures before adverse effects occur off-site. The current environmental monitoring program consists of leachate, groundwater and surface water; it is expected that monitoring of the performance of the proposed stormwater management pond will be added to the program. The environmental monitoring programs are generally described in Section 16.0. Operational and environmental monitoring programs will continue in the post-closure period.

12.8 Closure and Post-closure

The landfill will be progressively closed in phases after the final waste contours have been reached and landfill operations have proceeded into the next Phase. The final cover on the landfill will consist of 600 mm of soil, which is expected to consist of imported materials from off-site sources. This is intended to be a permeable final cover design, to allow infiltrating precipitation to enter the waste and remove the contaminants from the waste as leachate, and thereby reduce the contaminating lifespan of the landfill site. This will be topped with 150 mm of soil capable of sustaining vegetation. This final cover design approach is in accordance with *O. Reg.* 232/98.

Post-closure activities will involve continued operation and maintenance of the stormwater management system. In addition to general inspection of the site, there will be inspection of the landfill cover for evidence of erosion, leachate seeps or instability, and maintenance / repair as required.