Attachment 7 – Impact Assessment Criteria and Summary of Potential Effects

Ridge Landfill Environmental Assessment - Impact Assessment Criteria

NOTE: The initial draft impact assessment criteria were documented in a July 18, 2018 memo on evaluation criteria that was submitted to MECP. Changes have been made to reflect consistency with work plans, to address MECP comments on the July 2018 memo, to reflect consistency with the Alternative Methods evaluation criteria and to providing additional detail where possible.

Draft Impact Assessment Criteria				
Environment	**Criteria**	**Indicator**	**Rationale**	**Data Source**
Natural Environment				
Biological – Terrestrial Ecosystems	Assess potential impact on habitat of Endangered or Threatened species as well as medicinal or culturally sensitive species of importance to Indigenous Communities.	Displacement or disruption of features such as meadow, agricultural buildings and woodlots with the potential to provide habitat for Endangered or Threatened species (SAR bats, Eastern meadowlark or Barn swallow). Medicinal or culturally sensitive species of importance to Indigenous Communities subject to displacement by construction and operation of the landfill expansion or addition through restoration activities.	Habitat of Endangered and Threatened species is protected under the *Endangered Species Act*, 2007 while medicinal or cultural sensitive species are considered important to local Indigenous Communities. The expansion of the landfill may displace habitat for species at risk as well as medicinal or cultural species relied upon by local Indigenous Communities. It is noted that there is also opportunity for restoring traditional/native species through restoration/replanting of the woodlot and naturalization of the berm.	• Field observations. • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Natural Environment Existing Conditions Report. • Recent Aerial Photography. • MNRF Species at Risk in Ontario List (O. Reg. 230/08). • MNRF Significant Wildlife Technical Guide (2000). • Significant Wildlife Habitat Eco-region 7E Criterion Schedule. • Land Information Ontario (biodiversity explorer, rare species, Ontario Odonata Atlas). • Land Information Ontario Aquatic Area Resources Area database. • Official Plan and mapping schedules (2017). • Committee on the Status of Endangered Wildlife in Canada (COSEWIC) data on wildlife species. • ELC mapping (2015, 2016, 2017). • Communication with agencies (e.g., MNRF and Conservation Authority) and knowledgeable citizens. • Incorporate Indigenous Community knowledge by consulting with Indigenous peoples when implementing restoration and naturalization.
	Assess potential impact on terrestrial biological systems (e.g. vegetation, wildlife and wildlife habitat, significant woodlots).	Amount and quality of, and impact on terrestrial biological systems subject to removal or displacement by construction and operation of the landfill expansion.	On-site terrestrial features such as vegetation, wildlife habitat, significant woodlands, etc. subject to direct removal or displacement may experience total loss of character and function.	• Field observations. • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Natural Environment Existing Conditions Report. • Recent Aerial Photography. • Natural Heritage Reference Manual, Second Edition, March 2010. • Land Information Ontario (biodiversity explorer, rare species, Ontario Odonata Atlas). • Official Plan and mapping schedules (2017). • ELC mapping (2015, 2016, 2017). • Communication with agencies (e.g., MNRF and Conservation Authority).
		Amount and quality of and impact on terrestrial biological systems disrupted by construction and operation of the landfill and the haul route. Specifically, potential disruptive impacts on: Woodlands, ponds, selected noteworthy species or specimens.	Development and operation of the landfill and haul route may disrupt terrestrial features and systems without removing or displacing them causing some loss of character or function.	• Field observations. • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Natural Environment Existing Conditions Report. • Recent Aerial Photography. • Natural Heritage Reference Manual, Second Edition, March 2010. • MNRF Significant Wildlife Technical Guide (2000). • Significant Wildlife Habitat Eco-region 7E Criterion Schedule. • Land Information Ontario (biodiversity explorer, rare species, Ontario Odonata Atlas). • Land Information Ontario Aquatic Area Resources Area database.

Draft Impact Assessment Criteria				
Environment	**Criteria**	**Indicator**	**Rationale**	**Data Source**
				• Official Plan and mapping schedules (2017). • ELC mapping (2015, 2016, 2017). • Communication with agencies (e.g., MNRF and Conservation Authority).
Biological – Aquatic Ecosystems	Potential for impact on fish and fish habitat (e.g. ponds, drains and streams).	Amount and character of habitat removed.	On-site aquatic features such as ponds, drains and streams subject to direct removal or displacement may experience total loss of character and function.	• Field observations. • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Natural Environment Existing Conditions Report. • Fish habitat survey (2016: Oct. 12, 13). • On-site stream flow monitoring. • On-site water temperature monitoring. • Recent Aerial Photography. • Land Information Ontario Aquatic Area Resources Area database. • Natural Heritage Reference Manual, Second Edition, March 2010. • Official Plan and mapping schedules (2017). • ELC mapping (2015, 2016, 2017). Communication with agencies (e.g., MNRF and Conservation Authority).
		Potential for temporary disturbance or disruption resulting from construction and operation.	Development and operation of the landfill and haul route may disrupt aquatic features and systems without removing or displacing them causing some loss of character or function.	• Field observations. • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Natural Environment Existing Conditions Report. • Fish habitat survey (2016: Oct. 12, 13). • On-site stream flow monitoring. • On-site water temperature monitoring. • Recent Aerial Photography. • Natural Heritage Reference Manual, Second Edition, March 2010. • Land Information Ontario Aquatic Area Resources Area database. • Official Plan and mapping schedules (2017). • ELC mapping (2015, 2016, 2017). Communication with agencies (e.g., MNRF and Conservation Authority).
Physical – Ground water	Contaminating Lifespan.	Predicted reduction in leachate concentration over time (in years) based on tonnes of waste per hectare of footprint area and leachate generation rate during operation and closure.	This criterion serves as a measure of potential long term impact of the landfill.	• Three leachate generation rates: based on a natural cover, low permeability clay cover and a low permeability geosynthetic cover. • Leachate characteristics used in the contaminating life span estimates will be taken from Table 1, Section 10 of O.Reg. 232/98. • Estimated adapting the method used by Rowe et. al (2004).
	Potential impacts to groundwater quality.	Concentrations based on predictive contaminant transport modelling (i.e., POLLUTE™) (assessment of net effects) compared to the allowable concentrations derived from the Reasonable Use Guidelines.	Leachate from landfills has the potential to impact groundwater quality. This criterion will quantify the potential ground water quality impact associated with Ridge.	• Site data collected through intrusive investigations (1981 to present). • Leachate characteristics taken from Table 1, Section 10 of O.Reg. 232/98. • Leachate generation rates (HELP™ modelling). • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Annual Monitoring Reports.
	Potential impacts to groundwater quantity.	Reduction in infiltration rate to bedrock aquifer based on footprint area of new fill areas versus the amount of recharge that is presently occurring prior to landfill expansion.	This criterion will serve as a check to make sure that we are not displacing beneficial infiltration.	• Site data collected through intrusive investigations (1981 to present). • Landfill design input (Preliminary Design and Operations Report). • Annual Monitoring Reports.

Draft Impact Assessment Criteria				
Environment	**Criteria**	**Indicator**	**Rationale**	**Data Source**
	Potential impacts to water supply wells.	Predictive impact assessment using contaminant transport computer modelling to predict expected concentrations in the bedrock aquifer as well as travel times and flow direction.	Residents in the vicinity of the landfill are concerned about potential impact to their wells.	• Socio-Economic Interview data. • Historic well monitoring records. • Site data collected through intrusive investigations. • Leachate characteristics taken from Table 1, Section 10 of O.Reg. 232/98. • Leachate generation rates (HELP™ modelling). • Existing and proposed facility characteristics (Preliminary Design and Operations Report). • Annual Monitoring Reports.
Physical - Surface Water	Changes in surface water quality.	Change in temperature, water quality (i.e., suspended solids, metals, inorganics), and benthos.	Runoff from the landfill property has the potential to impact water quality. This criterion will examine the potential extent of impact for the Ridge.	• MECP published water quality data (e.g., Ontario Water Resources Act and Water Management Policies, Guidelines, Provincial Water Quality Objectives). • Benthic community inventory (Ontario's Benthos Bio-monitoring Network; Protocol Manual [MECP, 2007]). • Fish habitat survey (2016: Oct. 12, 13). • Annual Monitoring Reports. • *Provincial Water Quality Objectives* (MECP, 1994) • Canadian Water Quality Guidelines. • Historical stream flow data (Environment and Climate Change Canada, 1971 to present). • On-site stream flow monitoring. • On-site water temperature monitoring. • On-site surface water quality monitoring.
	Changes in surface water quantity.	Upstream and downstream flood levels. Hydrograph timing/duration. Changes in baseflows. Streambank erosion potential. Ability to release post-development peak flows to downstream watercourses at or below pre-expansion conditions.	Runoff from the landfill property has the potential to impact water quantity. This criterion will examine the potential extent of impact for the Ridge.	• Topographic mapping and aerial imagery. • Climate data (Environment and Climate Change Canada, 2006 to present). • On-site climate station data; active since December 2015. • Drainage Act, R.S.O. 1990. • Soils and land use mapping. • Previous drainage studies. • Existing and proposed facility characteristics. • Field observations. • HEC-RAS modeling. • Aerial photography & GIS mapping. • Annual Monitoring Reports.
Physical – Atmospheric	Potential impacts to air quality from the landfill based on indicator compounds (particulate [TSP, PM10, PM2.5], SO2/CO/NOx; H2S/Vinyl Chloride/Chloroform).	Comparison of predicted concentrations of air quality indicator compounds with baseline conditions at the landfill against MECP air quality criteria.	The landfill must meet criteria established by the MECP.	• MECP and ECCC background air quality monitoring data. • Local meteorological data. • Existing and proposed facility characteristics including working face location, waste receipt, material handling, on-site traffic, landfill gas collection, etc. • GIS mapping/Secondary sources. • US EPA AP-42 and MECP emission factors. • US EPA LandGEM modelling.
	Potential impacts on air quality (based on indicator compounds [TSP, PM10, PM2.5], SO2/CO/NOx) from	Comparison of predicted concentrations of indicator compounds from the haul route traffic sources associated with the potential changes to soil truck or background traffic levels.	Landfill haul route traffic has potential for air quality impacts.	• Transportation assessment results. • US EPA emission factors. • US EPA modelling guidance.

Draft Impact Assessment Criteria				
Environment	**Criteria**	**Indicator**	**Rationale**	**Data Source**
	haul route.			• GIS mapping/Secondary sources.
Physical - Climate Change	GHG emissions potential.	Quantitative assessment of GHG emissions (US EPA and Canadian National Inventory Report [NIR] emission factors).	A landfill has the potential to result in greenhouse gas emissions so it is necessary to characterize the emissions to be able to mitigate where possible.	• Existing and proposed facility characteristics including change in on-site woodlot, on-site vehicles, landfill gas management system. • US EPA AP-42. • Canada NIR. • US EPA LandGEM modelling.
Socio-Economic Environment				
Social	Potential for displacement of residences or residential properties.	Number of residences or residential properties that will be displaced.	There are two on-site residences that will be displaced as a result of the expansion.	• Socio-economic interviews. • Public consultation activities. • Preliminary Design and Operations Report.
	Potential for nuisance affects to off-site residents and businesses (e.g. fruit market and small equipment dealer).	Relative predicted odour levels at discrete receptors.	Landfill operations have the potential to generate odours. Odours can cause nuisance impacts on discrete receptors located near the site.	• Socio-economic interviews. • Public consultation activities. • Results of odour modeling using MECP emission factor for odour for landfill gas (US EPA LandGEM modelling).
		Predicted TSP (dust) levels relative to MECP criteria.	Activities such as on-site materials handling and vehicle traffic (road dust and tailpipe emissions) can generate a nuisance impact.	• MECP criteria (O.Reg. 419/05). • Results of air quality study (existing and proposed site characteristics based emission estimates and dispersion modelling results). • Interviews. • Public consultation activities.
		Predictions of potential for blowing litter occurrences.	Impact to residents and businesses will be assessed against blowing litter threshold wind speed criteria previously defined for the site.	• Proposed site characteristics (working face location). • 1 year of meteorological data.
		Predicted level of noise at receptors near site relative to established criteria.	On-site and landfill machinery/equipment operation create noise that propagates beyond the boundary of the landfill site and has the potential to be disruptive to residents and businesses.	• GIS mapping/secondary sources. • Noise modelling results. • MECP Noise criteria. • Preliminary Design and Operations Report.
		Degree of visual change for households and businesses with impacted views based on type and extent of change, proximity of receptor, and ability to screen.	The degree of disruption will depend on extent of visual impacts for each impacted household.	• Socio-economic interviews. • Civil 3D modelling. • GIS mapping. • Public consultation activities. • Results of visual assessment.
	Potential for impacts on residents and businesses from dust and noise along the haul route.	Predicted TSP (dust) levels at residences and businesses along the haul route.	The degree of disruption will depend on the characteristics of the affected households, and the proximity of the receptors to sources of nuisance.	• Socio-economic interviews. • Public consultation activities. • Transportation assessment results. • Results of noise/air quality studies.
		Predicted level of noise at receptors along the haul route relative to established criteria.	Transport trucks travelling along haul route create noise that has the potential to be disruptive to residents.	• GIS mapping/secondary sources. • Transportation assessment results. • Noise modelling results. • MECP Noise criteria.
	Potential for impacts and benefits to Indigenous Communities.	Opportunities for direct benefit (e.g. partnership; use of site; capacity building) or direct impacts (e.g. removal of woodlot on traditional territory)	The landfill is located on traditional lands. It is important to recognize both the benefits and the impacts that the site has on Indigenous lands and peoples in the EA.	• Preliminary Design and Operations Report. • Waste Connections agreements with Indigenous Communities.

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Economic	Potential for impacts to the wider economy in the Municipality of Chatham-Kent.	Changes in characteristics of local/municipal economy as a result of landfill such as jobs, investment, municipal revenue and expenditures.	Expansion may result in benefits to the local and broader economy of the Municipality.	• Waste Connections employment and spending estimates. • Agency consultation. • Secondary sources. • Financial information from the Municipality of Chatham-Kent. • Statistics Canada data.
	Potential impacts to property values.	Home and property value in local area and comparable jurisdictions.	Expansion may or may not affect property values in the local area or along the haul route.	• Preliminary Design and Operations Report. • Property value data. • General reports from private sector and academia.
	Capital and operating costs.	Change in capital and operating costs including closure costs.	The landfill expansion will require capital investment and will extend the cost of landfilling operations and closure.	• Preliminary Design and Operations Report.
Agriculture	Assess potential for impacts to agricultural resources.	Area (ha) of Canada Land inventory (CLI) Class 1-3 Lands removed.	Under the Planning Act, Class 1 to 3 soils that are designated agricultural are considered Prime Agricultural lands and should be preserved for future agricultural usage.	• Field observations. • Top Soil Maps. • Soil Capability mapping. • Official Plan and policies.
		Changes required to tile drainage/surface ditches.	Tiles and drainage ditches represent an investment in land improvements to improve soil productivity.	• Field observations. • Top Soil Maps. • OMAFRA drainage mapping. • Preliminary Design and Operations Report.
		Area of crop production lost on-site or disrupted within the off-site study area.	Identifies the amount of land in use for agricultural production (e.g., common field crops/orchards/fallow) that will be removed by the facility; and the potential for nuisance impacts to cause economic losses and frustration to off-site farmers.	• Field observations. • Agency and key contacts. • Transportation assessment.
		Number and type of farm infrastructure impacted.	Identifies the number of active farm infrastructure which shows long term capital investment.	• Field observations. • Cultural Heritage Assessment. • Agency and key contacts.
		Number of livestock infrastructure within the off-site study area.	Identifies the number of active farm infrastructure. Such infrastructure are used for animal housing are considered sensitive.	• Farm operator Interviews. • Field observations.
	Assess potential for impacts to farm operations along the haul route.	Number of farm building complexes with direct access to haul route.	Indicates the number of ingress/egress points to farm building complexes where interference is most likely for farm operations along the haul route.	• Roadside survey.
		Number of field entrances with direct access to haul route.	Indicates the number of ingress/ egress points to farm fields where conflict could occur between slow moving farm machinery and haul trucks.	• Field observations. • Farm operator Interviews.
	Loss of agricultural employment.	Number and extent of agricultural businesses impacted and number of employees at each.	The expansion will result in the permanent loss of agricultural lands.	• Socio-economic interviews. • GIS mapping. • Agricultural Assessment.
Cultural Environment				
Cultural Heritage	Potential for impact on cultural heritage resources.	Number of cultural heritage resources within the on and off-site study areas and the change in the use/experience of those resources.	Potential for the project to result in a change in the use/experience of cultural heritage resources.	• Cultural Heritage Assessment. • Site Specific Heritage Impact Assessment.
Archaeology	Potential for impact on archaeological resources.	Area of land with archaeological potential that will be affected by landfill development.	Potential to uncover archaeological resource(s) as part of expansion	• Stage 2 Archaeological Assessment.

Draft Impact Assessment Criteria				
Environment	**Criteria**	**Indicator**	**Rationale**	**Data Source**
Built Environment				
Land Use	Potential for changes to land use designations.	Extent and complexity of change in existing land use designations.	The expansion will result in the permanent change to the existing land use as designated in the municipal Official Plan.	• Official Plan Review. • Agency/municipal consultation. • GIS Mapping.
	Potential for additional approvals or permits (e.g., airport zoning).	Requirement for municipal and/or regional permitting or approvals as a result of landfill expansion.	The identification of permits or approvals required from the local municipality and/or Region to ensure that the landfill expansion is in conformity with municipal plans.	• Agency/municipal consultation. • Official Plan and Zoning-By-law Review. • Drainage Act, R.S.O. 1990. •
Transportation	Potential impact on transportation service along the waste haul route.	Expected change in Level of Service (travel times) – Volume to Capacity Assessment of in mid-block links and intersections (including Highway 40 and 401 interchange).	Levels of service and other performance metrics will provide the opportunity to assess and compare impacts of future traffic activity levels on- and off-site to current conditions.	• Observed traffic data. • Traffic modeling. • Agency consultation.
	Potential for change in traffic safety.	Expected change in collision rates and % of truck traffic.	Landfill truck traffic has the potential to result in safety concerns along the haul route.	• Baseline collision data.
Aviation Safety & Bird Hazard	Potential impact on the Chatham-Kent Airport.	Qualitative assessment of the potential aviation impacts cause by bird hazards resulting from the expanded landfill.	The landfill expansion has the potential to result in additional bird populations. An understanding of bird populations, flight patterns and operations will determine the need for any additional mitigation.	• On-site bird observation data. • Chatham-Kent Airport bird collision records. • Bird Hazard Assessment. • Facility Characteristics (Preliminary Design and Operations Report). • Discussions with Chatham-Kent Airport representatives. • Discussions with Transport Canada.
Design & Operation	Climate change resilience (vulnerability of systems).	Vulnerability and adaptive measures of engineered systems.	There is potential for extreme weather events to result in impacts to the landfill.	• Facility characteristics (vulnerable assets). • Engineers Canada Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol. • Climate analytics report.
	Changes in infrastructure required.	Need for changes to leachate collection, conveyance and treatment.	The preferred alternative for landfill expansion, leachate treatment and landfill gas management may result in changes to on-site infrastructure.	• Quality and quantity of leachate (historical data). • Leachate generation modelling. • Blenheim Wastewater Treatment Lagoon Annual Reports. • Chatham-Kent Master Plan.
		Need for changes to gas management infrastructure.	The preferred alternative for landfill expansion, leachate treatment and landfill gas management may result in changes to on-site infrastructure.	• Landfill gas generation model results (US EPA LandGEM modelling). • Annual Monitoring Reports.

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
Biological – Terrestrial Ecosystems				
Assess potential impact on habitat of Endangered or Threatened species as well as medicinal or culturally sensitive species of importance to Indigenous Communities and Organizations.	• Temporary removal of up to 53.5 ha of meadow habitat (approximately 50 ha [contiguous]acting as habitat for eastern meadowlark on the Old Landfill Mound as well as removal of 3.5 ha [non-contiguous] of meadow associated with the horizontal expansion of the West Landfill). • Removal of in-tact, healthy ecosystems is of concern to some Indigenous Communities and Organizations.	• Vegetation removal will be subject to appropriate timing windows so as to not disrupt nesting activity. • A permit will be submitted for temporary removal of eastern meadowlark habitat and monitoring of replacement habitat as required. • On-site berms will be naturalized potentially providing additional meadow and/or pollinator habitat. • Indigenous Communities and Organizations will be engaged in woodlot replacement planting and on-site berms. • On-site personnel will receive SAR training prior to the commencement of construction activities and a Contractor Information Manual will be prepared documenting the various SAR with the potential to be encountered during construction activities.	Habitat for the eastern meadowlark will be removed temporarily.	Not significant Direction = negative Extent = on-site Duration = expansion Magnitude = negligible Frequency = infrequent/temporary Likelihood = certain
	• Removal of an on-site agricultural building where barn swallow nests were observed in spring 2019.	• The agricultural building will be assessed for the presence of barn swallows before removal. If barn swallows are present, the barn removal will not occur during nesting season. Any nests present at the time of removal will be replaced at a 1:1 ratio. • If removal of barn swallow nests is required, the activities can be registered under s23.5 (barn swallow) so long as the conditions in the regulation are followed.	Potential to temporarily remove barn swallow nests	Not significant Direction = negative Extent = on-site Duration = expansion Magnitude = negligible Frequency = infrequent/temporary Likelihood = likely
Assess potential impact on terrestrial biological systems (e.g. vegetation, wildlife and wildlife habitat, significant woodlots).	• Permanent removal of 3.76 ha of southwest woodlot will occur as a result of construction. • Temporary removal of up to 53.5 ha of meadow habitat (approximately 50 ha [contiguous]acting as habitat for eastern meadowlark on the Old Landfill Mound as well as removal of 3.5 ha [non-contiguous] of meadow associated with the horizontal expansion of the West Landfill).	• Although the southwest woodlot does not provide SAR bat habitat, the removal will take place during non-active bat period (i.e. Oct. 1 to March 31 inclusive) which coincides with the restricted bird breeding period. • Planting of 11,000 trees representing a replacement of the woodlot at a 2:1 ratio. 3,000 trees to be planted at a location identified by Chippewas of the Thames and 8,000 to be planted across Erieau Road from the landfill adjacent to an existing woodlot. • Naturalization of the west, south and east proposed berms with native species. • Indigenous Communities and Organizations will be consulted during the seed and tree identification process and engaged in restoring woodlot and on-site berms. • Given the potential for construction works adjacent to the southeast woodlot (confirmed SAR bat habitat), a construction limit buffer will be demarcated to avoid encroachment within the woodlot.	Over time the woodlot replanting and berm restoration will balance the removal of on-site natural features. The involvement of Indigenous Community and Organization members in the replanting/restoration will provide valuable insights into appropriate native species.	Not significant Direction = negative Extent = on-site Duration = expansion & post closure Magnitude = low Frequency = infrequent/temporary Likelihood = certain

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
	• Indirect impacts could occur during construction and operation (e.g. habitat encroachment, soil compaction, etc.)	• Best management practices will continue to be in place to mitigate the potential for indirect impacts (e.g. staging of equipment and stockpiling away from wooded areas or wetlands). • A timing constraint of April 15 to August 15 will be applied for vegetation removal activities to avoid nesting birds in keeping with the *Migratory Birds Convention Act*, 1994. • Sediment and erosion control measures (i.e., silt fencing) will be put in place prior to construction to avoid impacts (e.g., sediment loading, garbage, etc.) on adjacent natural features, minimize potential for encroachment into natural areas, and prevent wildlife from entering construction areas. A wildlife sweep will be completed after fencing is put in place and before vegetation removal.	Some disruption to terrestrial ecosystems could occur during construction.	Not significant Direction = negative Extent = on-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = unlikely
Biological – Aquatic Ecosystems				
Potential for impact on fish and fish habitat (e.g. ponds, drains and streams).	• Temporary removal of approximately 1,330 m of the Howard Drain which will temporarily impact fish and fish habitat. Fish species observed included creek chub, pumpkinseed and emerald shiner. The drain will be relocated to accommodate the expansion with construction of approximately 1,600 m of the Howard Drain. The existing fish habitat is not considered sensitive. Furthermore, there are no known aquatic species at risk in the drains.	• Opportunity to design the drain with enhanced fish habitat features over a longer length (approximately 1,600 m). • In-water work will be scheduled to occur between July 1 and March 14 of any given year. • Prior to relocation the construction area will be isolated from flow (while maintaining flow to downstream) and fish salvage will be performed. • Best management practices will be in place including erosion and sediment control, keeping equipment clean, preventing materials from entering watercourses, etc.	Fish habitat will be temporarily impacted. The impact is considered temporary as the re-located drain can be designed to incorporate suitable fish habitat where possible providing an improvement over the existing condition. Potential for positive net effect in the longer term.	Not significant Direction = positive Extent = on-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = certain
	• Potential for temporary disturbance or disruption resulting from construction and operation.	• Best management practices will continue to be in place to mitigate the potential for temporary disturbance (e.g. staging of equipment should take place away from watercourses). • Prior to dewatering/removal of Pond 3, a Fish and Wildlife Salvage Plan will be implemented to avoid mortality of fish, amphibians and/or reptiles. • Capturing surface water in stormwater ponds and testing prior to release to municipal drains.	No net effect from temporary disturbance or disruption resulting from construction and operation anticipated.	
Physical – Hydrogeology				
Contaminating lifespan	• The leachate contaminating lifespan is predicted to be approximately 380 years.	• Engineering controls such as a clay liner and leachate collection system will be designed to manage leachate over the long term. • The groundwater monitoring plan will be expanded for the expanded site will be prepared. • Contingency plans to protect groundwater in the event of an unforeseen incident will be developed.	No net effect from contaminating lifespan anticipated.	

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
Potential impacts to groundwater quality.	• Contaminant transport modelling determined that all predicted concentrations of potential contaminants will be below the allowable concentrations identified in the Reasonable Use Guidelines.	• No mitigation required.	No net effect to groundwater quality anticipated.	
Potential impacts to groundwater quantity.	• There is limited potential for impact to groundwater recharge quantity from the site given that recharge in this area is very low due to the impermeable soils.	• No mitigation required.	No net effect to groundwater quantity anticipated.	
Potential impacts to water supply wells.	• The over 30 metres of clay till and engineered leachate collection system will protect the groundwater and water supply. • The approximate travel time to the groundwater aquifer should there be an operational upset, spill or leak of leachate is 3,000 years with an additional 400 years to travel laterally approximately 200 metres from the fill area.	• Design of the expansion will include a leachate collection system. • Residential well monitoring will continue and will expand as requested.	No net effect to water supply wells anticipated.	
Physical - Surface Water				
Changes in surface water quality.	• Potential for erosion and sediment transport during landfill construction. • Potential for impacted surface water due to leachate seeps. • No significant thermal impacts are expected. • Potential change in species composition due to changes in water quality (i.e., thermal impacts, increased sediment, leachate impacts). • As the realigned Howard Drain will continue to receive flows from its upstream reaches, the drain will recolonize over time with a benthic invertebrate community similar in composition to the existing community.	• Install and maintain erosion and sediment control measures during construction. • Continued implementation of best practices for dust control, spill response and maintenance.	Short term net effect on benthos due to relocation of Howard Drain which will recolonize over time. No other net effect to surface water quality anticipated.	Not significant Direction = negative Extent = on-site Duration = expansion Magnitude = negligible Frequency = temporary Likelihood = likely
Changes in surface water quantity.	• Hydrologic analysis results confirm that peak flows will remain at or below pre-expansion conditions for all storm events. • There will be no impacts to upstream or downstream flood levels. • Baseflow contributions to on-site drains are minimal and no impacts are anticipated. • Minimal increase in runoff volumes are predicted. Significant erosion impacts to receiving drains are not anticipated. • Hydrologic analysis results confirm that there will be no significant changes to hydrograph timing and duration.	• No mitigation required.	No net effect to surface water quantity anticipated.	

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Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
Physical – Atmospheric				
Potential impacts to air quality from the landfill based on indicator compounds (particulate [TSP, PM10, PM2.5], SO2/CO/NOx; H2S/Vinyl Chloride/Chloroform).	• Current and future predicted indicator compounds are anticipated to meet O.Reg. 419/05 regulatory compliance guidelines.	• Mitigative measures typical of normal landfill operations and consistent with industry best practices such as road cleaning, daily cover, expansion of the landfill gas collection system and continuation of flaring.	No net effect to air quality from the landfill anticipated.	
Potential impacts on air quality (based on indicator compounds [TSP, PM10, PM2.5], SO2/CO/NOx) from haul route.	• Air quality impacts associated with the haul route are expected to be the same or below relevant criteria. • It is noted that air quality along the haul route is not expected to change from the current condition and may improve with improvements to vehicle technology. • A landfill closure scenario with no expansion showed an improvement from the existing conditions due to the removal of the landfill-associated vehicles.	• No mitigation proposed.	No net effect to air quality from the haul route anticipated.	
Physical - Climate Change				
GHG emissions potential.	• Predicted emissions of GHGs are negligible compared to provincial emissions. The Ridge Landfill currently contributes 1.2% of GHG emissions in the landfill service area and in the future will contribute 1.7%.	• Expansion of the landfill gas collection system and continuation of flaring. • Removal of the southwest woodlot will be mitigated by a 2:1 ratio planting.	No net effect anticipated.	
Social				
Potential for displacement of residences or residential properties.	• Residents in two leased homes will be displaced.	• Waste Connections will terminate the leases consistent with the terms of the lease. • Appropriate notice will be given. • All landfill activities will be confined on-site.	Residents in two homes will be displaced.	Not significant Direction = negative Extent = on-site Duration = expansion & post closure Magnitude = negligible Frequency = continuous Likelihood = certain
Potential for nuisance affects to off-site residents and businesses (e.g. fruit market and small equipment dealer).	• The odour assessment identified a low potential impact on receptors within 1 km of the site.	• Expansion of landfill gas collection system to the landfill expansion areas and continued flaring. • Use of odour control when needed (e.g. misting systems). • Application of cover material at the end of each operating day. • Place waste with strong odours at the toe of the working face and immediately cover with other garbage or daily cover. • Waste Connections will continue regular communications with neighbours as site evolves. • Residents and businesses are encouraged to contact Waste Connections with specific concerns.	Some potential for off-site odour in certain conditions.	Not significant Direction = negative Extent = off-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = likely

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
		• Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.		
	• Current and future predicted indicator compounds related to dust are anticipated to meet O.Reg. 419/05 regulatory compliance criteria.	• Use of dust control measures (e.g. cleaning truck wheels, clean/water site roads when necessary). • Waste Connections will continue regular communications with neighbours as site evolves. • Residents and businesses are encouraged to contact Waste Connections with specific concerns. • Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	Some potential for off-site dust in certain conditions.	Not significant Direction = negative Extent = off-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = likely
	• The blowing litter assessment identified some limited potential for litter to migrate off-site during high wind conditions.	• The working face will be kept to a minimum and additional equipment will be used to compact waste if necessary during higher winds. To the extent possible the working face will be shielded during higher winds. • Permanent litter fences will be installed and temporary litter fences used when needed. The fences will be appropriately maintained. • Adjust operation as feasible during strong wind conditions to shield the working face and minimize working face size to reduce litter generation. • Carry out daily inspections and litter pickup as required. • Monitor wind conditions and pick up litter from surrounding fields after high wind events. • Waste Connections will continue regular communications with neighbours as site evolves. • Residents and businesses are encouraged to contact Waste Connections with specific concerns. • Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	Some potential for temporary disruption from blowing litter under certain conditions.	Not significant Direction = negative Extent = off-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = likely

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
	• Landfill activities have the potential to generate noise which 24 receptors within 1 km of the site could potentially hear. The predicted noise levels for all receptors are below the MECP's daytime and nighttime guidelines of 55 dBA and 45 dBA, respectively. • Some receptors may experience a change in noise level over what is currently being experienced as the working face of the landfill will move as the site develops.	• The berms and associated landscaping/naturalization will reduce noise. • On-site machinery will be operated to reduce noise where possible (e.g. noise abatement equipment on machinery will be properly maintained, the use of reverse gear will be minimized, impulsive noise (e.g. horns) will be minimized to the extent possible). • Waste Connections will continue regular communications with neighbours as site evolves. • Residents and businesses are encouraged to contact Waste Connections with specific concerns. • Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	Some potential for temporary noise under certain conditions.	Not significant Direction = positive or negative Extent = off-site Duration = expansion Magnitude = negligible Frequency = infrequent Likelihood = likely
	• 26 receptors will have a view of the expansion; 12 are located within 500 m of the site; 12 are located between 500 m and 1 km, and two are just beyond 1 km. • Three receptors within 1 km will have views of the facility where previously the waste fill area was not visible. • The expansion will be no higher than the existing landfill.	• Construction of proposed berms and naturalization with native species including shade trees, evergreen trees, shrubs, etc. • Consider localized plantings to minimize views. • Areas of the landfill areas that are not actively being filled will be restored to a seeded condition. • Waste Connections will continue regular communications with neighbours as site evolves. • Maintaining the height of the expansion to match the current fill area. • Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	The expanded landfill will be able to be seen by three new receptors who cannot see the fill area now.	Not significant Direction = negative Extent = off-site Duration = expansion & post closure Magnitude = negligible Frequency = continuous Likelihood = certain
Potential for impacts on residents and businesses from dust and noise along the haul route.	• Modelling results indicate no increased impact to local air quality compared to current conditions attributable to the haul route as a result of the proposed expansion.	• Residents and businesses are encouraged to contact Waste Connections with specific concerns. • Waste Connections is committed to maintaining compensation for affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	Trucks going to the landfill will lead to some dust along the haul route when compared to a do-nothing scenario. However the number of trucks and associated dust will not change over existing conditions.	Not significant Direction = negative Extent = haul route e Duration = expansion Magnitude = negligible Frequency = frequent Likelihood = likely
	• Noise levels along the haul route are expected to be consistent with current levels as the amount of waste received at the site will remain the same.	• Residents and businesses are encouraged to contact Waste Connections with specific concerns. • Waste Connections is committed to maintaining compensation for	Trucks going to the landfill will create some noise along the haul route when compared to a do-	Not significant Direction = negative Extent = haul route

Summary of Potential Effects of the Undertaking (the Preferred Alternative)				
Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
	• When compared to a scenario where there are no landfill trucks, the change in sound level for receptors along Drury Line is predicted to be greater than 10 dBA given the rural character of the road and limited background traffic. A change greater than 10 dBA is considered "very significant" in the MECP noise guidelines.	affected residential parties if the landfill expansion is approved and proceeds. Waste Connections will notify those residents who will continue to receive compensation as well as residents who will be newly compensated of their compensation level as the process continues.	nothing scenario. However the number of trucks and associated noise level will not change over existing conditions.	Duration = expansion Magnitude = negligible Frequency = frequent Likelihood = likely
Potential for impacts and benefits to Indigenous Communities and Organizations.	• Removal of in-tact, healthy ecosystems such as the southwest woodlot is of concern to some Indigenous Communities and Organizations. • Continued local, economical and safe waste disposal for some Indigenous Communities	• Involving Indigenous Communities and Organizations in replanting and naturalizing efforts. • Replant trees and a ratio of 2:1 to compensate for woodlot lost. • Hosting agreements will be developed as appropriate. • Indigenous Communities and Organizations have been involved as requested in archaeological investigations.	Potential for positive effect for Waste Connections and the Indigenous Communities and Organizations participating in replanting and naturalization efforts.	Not significant Direction = positive Extent = region Duration = expansion Magnitude = low Frequency = infrequent Likelihood = certain
Economic				
Potential for impacts to the wider economy in the Municipality of Chatham-Kent.	• The Ridge Landfill employs local residents and provides economic benefits including those outlined in the Ridge Landfill Commitments Report and Host Community Agreement. Contributions to the regional economy from the Waste Connections include operational spending, employment and discretionary community investment. This will continue with the proposed expansion to 2041. • Continuation of the Ridge Landfill to 2041 provides ongoing disposal service to the Municipality of Chatham-Kent.	• No mitigation required.	A continued positive net effect on the wider Chatham-Kent economy is anticipated.	Not significant Direction = positive Extent = region Duration = expansion Magnitude = low to moderate Frequency = continuous Likelihood = certain
Potential impacts to property values.	• It is unlikely the Ridge Landfill expansion will negatively impact property values as the current operations have not shown a significant suppression of property value appreciation relative to the region.	• Potential effects to property values are currently mitigated by the Property Value Protection Program which would continue with the proposed expansion.	No net effect on property values is anticipated.	
Capital and operating costs.	• The landfill expansion will require capital investment and will extend the cost of operation and closure. • The additional costs associated with the Ridge Landfill may have a positive effect on the regional economy as capital and labour will require employment or the procurement of goods and services.	• No mitigation required.	It is anticipated there will be a net positive effect due to continued employment and spending in the local community on goods and services associated with the Ridge Landfill site.	Not significant Direction = positive Extent = region Duration = expansion Magnitude = low Frequency = continuous Likelihood = certain
Agriculture				
Assess potential for impacts to agricultural resources.	• Approximately 94 ha of Class 1-3 lands will be removed by the expansion. It is noted that this represents a small amount of land within the Chatham-Kent context (approximately 0.04%).	• No mitigation proposed.	There will be some on-site lands that are removed from agricultural use during site operation.	Not significant Direction = negative Extent = on-site Duration = expansion & post closure Magnitude = negligible Frequency = continuous Likelihood = certain

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Environmental Components and Criteria	**Potential Effects of the Undertaking (the Preferred Alternative)**	**Proposed Mitigation**	**Net Effect**	**Significance of Net Effect**
	• Changes required to the Howard Drain on-site will not impact agriculture.	• No mitigation proposed.	No net effects to tile drainage/surface ditches anticipated.	
	• Approximately 88 ha of crop production area will be removed, plus a 6 ha orchard. • On-site farm operators that will be displaced are tenants with short-term leases. Affects on-site anticipated to be minimal given length of lease. • No crop production loss within the off-site study area. • Some potential for litter, dust and odour on neighbouring farm properties.	• Terminate the leases consistent with the lease terms. • Continuation of farming on-site for as long as possible until land needed for landfill development activities. • Continued implementation of site operating procedures (i.e., litter control, dust and odour controls).	There will be some on-site crop production area lost from tenants who have short term leases. Farming will continue on these lands as long as possible however, these on-site lands will eventually be removed from agricultural use due to landfill development activities.	Not significant Direction = negative Extent = on-site Duration = expansion & post closure Magnitude = negligible Frequency = continuous Likelihood = certain
	• On site farm infrastructure will be removed including 1 (one) barn, 2 (two) concrete silos and 3 (three) drivesheds along Allison Line and 1 (one) barn in the northwest corner on Charing Cross Road. These are not currently used for agriculture. • Farm infrastructure includes 14 barns, 12 grain storage bin silos, 2 greenhouses and 1 horse stable. This off site infrastructure will not be impacted.	• No mitigation proposed.	No net effect on farm infrastructure or operations in the site vicinity anticipated.	
	• Three small livestock farms are located within the off-site study area (beef feedlot, swine, horse). Some potential increase in litter, dust and odour on neighbouring farm properties.	• Continued implementation of site operating procedures (i.e., litter control, dust and odour controls).	No net effect on livestock infrastructure anticipated.	
Assess potential for impacts to farm operations along the haul route.	• No potential impact anticipated to the 15 farms that have direct access to the haul route. Most have good sight lines which allows the equipment operator to have a clear view of the road.	• Continued dialogue between Waste Connections, the public and third-party haulers who use the landfill.	No net effect to farm operations along the haul route anticipated.	
	• No potential impact anticipated to the 46 field entrances on the haul route. Most have good sightlines which allows the equipment operator to have a clear view of the road.	• Continued dialogue between Waste Connections, the public and third-party haulers who use the landfill.	No net effect to farm operations along the haul route anticipated.	
Loss of agricultural employment.	• There are 2 on-site farmers that are tenants.	• Continued implementation of site operating procedures (i.e., litter control action plan, dust and odour controls).	No net effect to agricultural employment anticipated.	
Cultural Heritage				
Potential for impact on cultural heritage resources.	• Direct and indirect impacts to the residence, barn and tenant house at the farmstead on 8765 and 8779 Allison Line and the barn at 20323 Charing Cross Road.	• Completion of the Heritage Impact Assessment. • Documentation and salvage of heritage features to be completed by a Cultural Heritage Specialist.	No net effect on cultural resources anticipated.	

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Archaeology				
Potential for impact on archaeological resources.	• Based on the Stage 1 & 2 that was completed it has been determined that the site represents a spatially discrete cluster of pre-contact Indigenous artifacts.	• A Stage 3 archaeological investigation will be required prior to construction. Any artifacts found will be documented and removed. • Construction will not begin until the site received archaeological clearance. • Indigenous Communities and Organizations who have expressed an interest will continue to be informed of archaeological activities and invited to participate and/or review the results.	Some potential for archaeological resources may remain. Should any artifacts be uncovered during construction, work will stop and the Ministry of Culture, Tourism and Sport will be contacted.	Not significant Direction = negative Extent = on-site Duration = expansion Magnitude = low Frequency = infrequent Likelihood = unlikely
Land Use				
Potential for changes to land use designations.	• The expansion will require changes to the Chatham-Kent Official Plan and Zoning By-law.	• Continue to work with Chatham-Kent planners to apply for an Official Plan and Zoning By-law amendment to change the land use designation and zoning for the expansion lands prior to construction. • Application process is being discussed simultaneously with the EA and is not anticipated to be complex.	No net effect anticipated for changes to land use designations.	
Potential for additional approvals or permits (e.g., airport zoning).	• *Drainage Act* approval will be required.	• No mitigation required.	No net effect anticipated for additional approvals or permits.	
Transportation				
Potential impact on transportation service along the waste haul route.	• The total number of daily trucks will remain stable through the revised horizon of the landfill. All growth in traffic would be the result of the 0.4% municipality's annual population growth rate, and not associated with the landfill expansion. • No changes to the haul route, entrance and number of trucks arriving at the landfill are proposed.	• Minimal changes are anticipated compared to current conditions.	No net effect on transportation service anticipated.	
Potential for change in traffic safety.	• Collisions that have occurred since 2013 have not involved waste trucks. • With no change in average daily truck traffic no change in traffic safety is anticipated.	• Continued dialogue between Waste Connections, the public and third-party haulers who use the landfill.	No net effect on transportation safety anticipated.	
Aviation Safety and Bird Hazard				
Potential impact on the Chatham-Kent Airport.	• The existing landfill operation has not had a negative impact on the airport. The proposed landfill expansion will be operated in the same way as the existing landfill is operated.	• Planned improvements to the existing bird control program are anticipated to effectively manage and potentially reduce residual risk of potential bird hazards to aircraft safety. • Continued coordination with Chatham-Kent Municipal Airport on on-site bird control operations and activities.	No net effect on the Chatham-Kent Municipal Airport anticipated.	

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Design and Operation				
Climate change resilience (vulnerability of systems).	• In the shorter term, extreme heat and cold could impact staff working outdoors and stronger than anticipated winds could result in an increase in potential for blowing litter. • In the longer term changes in precipitation and temperature could affect runoff of surface water from the landfill final cover and the performance of the components that comprise the stormwater management system.	• Higher or longer litter control fences will be installed if stronger than anticipated winds are encountered. • Staff working outdoors will use applicable standard operating procedures in periods of extreme heat or cold. • Surface water diversion berms are included in final cover design to reduce runoff velocity and minimize erosion. • Perimeter ditches, ponds and the Howard Drain relocation are designed to include allowance for increased storm intensity associated with climate change. • Geotechnical assessment considered the potential effect of a rapid increase in the leachate mound height in the landfill caused by an extreme precipitation event.	No net effect on the site desire as a result of climate change anticipated.	
Changes in infrastructure required.	• The leachate collection system will be extended to accommodate the proposed expansion with continued conveyance by existing forcemain to the BWTL. • The available future treatment capacity at the BWTL exceeds the potential gradual leachate generation volume.	• The effluent at the BWTL will continue to be monitored.	No net effect on leachate system infrastructure anticipated.	
	• The landfill gas management system will be extended to accommodate the proposed expansion with continued flaring.	• No mitigation proposed.	No net effect on landfill gas infrastructure anticipated.	