



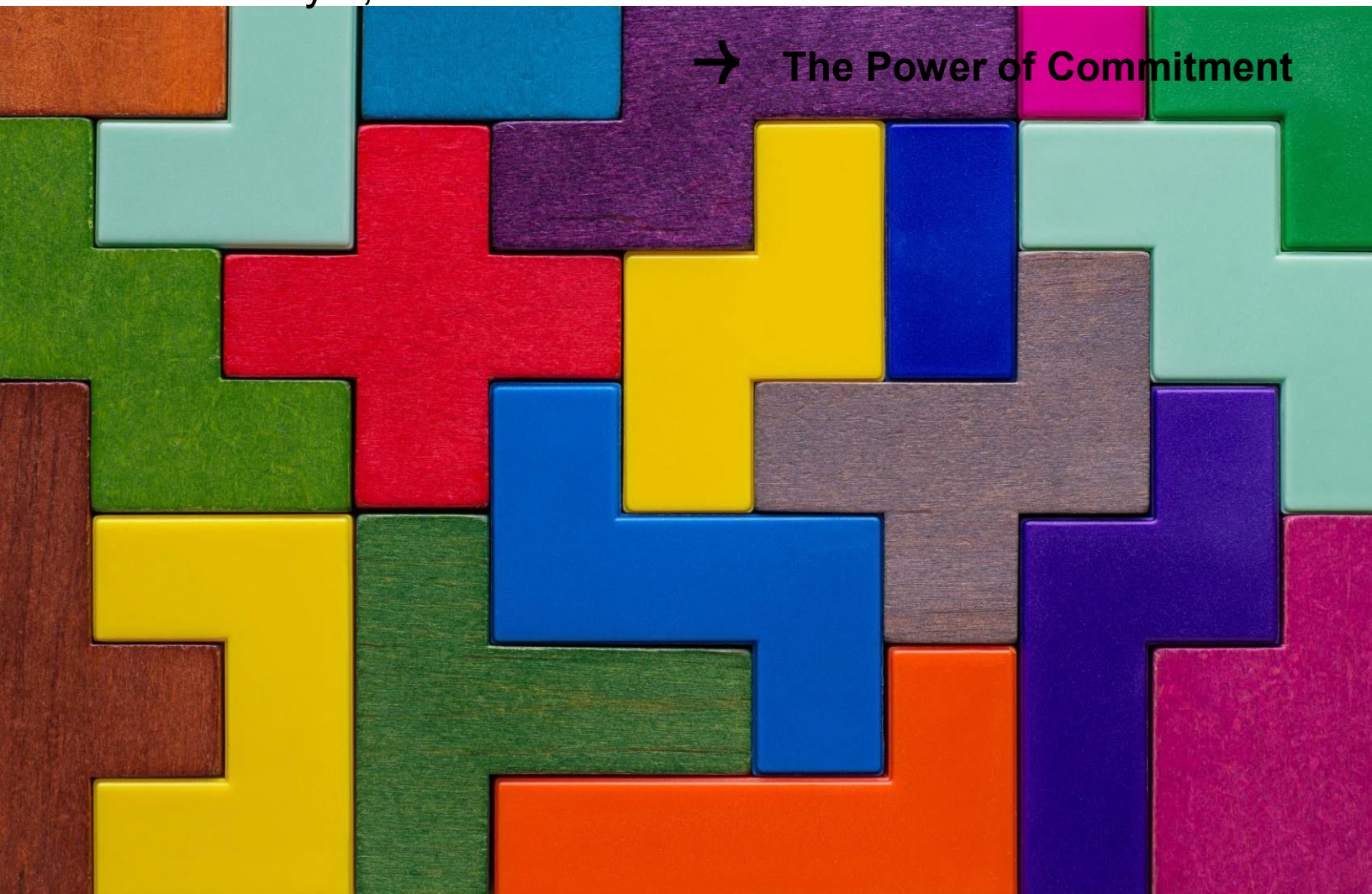
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Final Integrated Waste Diversion Technology Concepts Report

Report 6

Oxford County

February 9, 2023



The Power of Commitment

| Project name | | Oxford Organics Resource Recovery Technology Review | | | | | |
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| S4 | 01 | Amelia Soutar, Tanya Bogoslawski | Michael Cant | | Michael Cant | | 02/09/2023 |

GHD

455 Phillip Street, Unit 100A

Waterloo, Ontario N2L 3X2, Canada

T +1 519 884 0510 | **F** +1 519 884 0525 | **E** info-northamerica@ghd.com | **ghd.com**

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Executive Summary

The County of Oxford (the County) is looking to develop an organic waste management strategy that will make lasting contributions to sustainability in the County, creating opportunities to benefit both the environment and the community. The County is required to develop an organic waste management and processing system that follows the frameworks laid out by the Resource Recovery and Circular Economy Act, 2016 and the Ontario Food and Organic Waste Policy Statement (OPPS or Policy Statement). Under the Policy Statement, as the City of Woodstock will be legislatively required to divert organic waste from single family dwellings based on population and it is highly likely that the Town of Tillsonburg will also be required to divert organic waste based on its population growth projections. The target for both municipalities will be 50% waste reduction and resource recovery. Further to this legislative requirement, the County's Zero Waste Plan (2018) commits to achieving 90 percent overall waste diversion by 2025 to extend the service life of the County's landfill to the year 2100.

Methodology

This Organics Resource Recovery Technology (ORRT) Review project evaluates organic waste processing strategies to help the County achieve these targets, while also considering synergistic benefits of integrating existing wastewater/biosolids, solid waste, and potential other operations that intersect with the waste/water/energy nexus. The ORRT Review evaluated these technologies in the context of the County's existing waste management systems, existing infrastructure, and considered the differing needs of the municipalities within the County. Only by considering the County's specific situation and needs can the best ORRT and waste management scenarios be developed.

Five reports were completed as part of this project and have been summarized in this Final Report. Each report was a separate task for the project as outlined below:

- Task 1 Waste Management Background Review, Waste Generation Forecast, and Legislative Review
- Task 2 Identification of Integrated Waste Diversion Technology Concepts (ORRT Scenarios)
- Task 3 Financial Analysis of Short-Listed Integrated Waste Diversion Technology Concepts (ORRT Scenarios)
- Task 4 Preferred Integrated Waste Diversion Technology Concepts (ORRT Scenarios)
- Task 5 Funding Opportunities

Task 1

Task 1 looked to define the County's current waste management systems, current and impending policies and regulations that will affect waste management, and current and emerging organic waste processing technologies.

It was estimated that between 5,200 and 9,500 tpy organic materials could be collected for processing over the next 20 years. With this quantity of organic waste, the more complex waste processing technologies (i.e., in-vessel composting, stand-alone anaerobic digestion, advanced thermal treatment) become less economically viable without the consideration of importing waste from out of County. The technologies that remained potentially economically viable are a covered aerated static pile composting system or co-digestion in an existing WWTP digester tank such as the Ingersoll WWTP. By diverting SSO from the OCWMF, the County estimated that landfill life could potentially be extended from 2050-2055 to between 2059-2066.

The Task 1 report also presented evaluation criteria that best suits the County's vision of growing stronger together. The criteria were used later in the project to evaluate ORRT scenarios. The evaluation criteria were developed with stakeholders within the County, considering the goals and objectives for organics resource recovery, and using the evaluation criteria developed through the waste recovery and reduction technologies (WRRT) works in 2018.

Task 2

Eight long-listed scenarios were identified, from which four short-listed scenarios were ultimately chosen for further consideration. The short list of four ORRT scenarios are a combination of the best technology options with the best site options. These options were determined through a combination of GHD’s technical knowledge and the County’s local knowledge, with deference to the evaluation criteria and project goal established during Task 1.

The four short-listed ORRT site scenarios as determined during Task 2 are:

- Scenario 1: Third-party wet Anaerobic Digestion (AD)
- Scenario 2: Third-party composting
- Scenario 3: Anaerobic (co-)digestion at the Ingersoll WWTP
- Scenario 4: Aerated static pile composting at OCWMF

A fifth scenario (Scenario 1.1) was added to assess the direct haul of organics to an in-County third-party AD pre-processing facility (and hauled to out-of-County AD processing facility), where the transfer station would not be needed.

Task 3

The above five scenarios were carried forward into Task 3 Financial Analysis of Short-Listed ORRT Scenarios, for further development and financial analysis. Conceptual facility site configurations and detailed financial analyses were prepared for each scenario. The site configurations and financial analyses provided a deeper understanding of the ORRT scenarios, providing insight to help select which scenario may best fit the County’s specific needs.

The Extended Producer Responsibility (EPR) transition for the County is set for January 1, 2026. At that time, the County’s split waste trucks could be repurposed to collect garbage and food waste, from garbage and recyclables. The Policy Statement notes that an SSO collection program is to be in place if there is not one in place by 2025.

In discussions with the County, the financial model assumed a timeline from 2026-2046 when an SSO program will be operational. Construction of new infrastructure would occur in 2029, with operations in 2030. Third-party processing has been assumed for the first 4 years of the SSO collections program. Results are presented in 2023 dollars.

The following table provides a summary of the financial model.

Table ES.1 Financial Analysis Summary

| | Scenario 1 – Third-party wet AD | Scenario 1.1 – Direct haul third-party wet AD | Scenario 2 – Third-party composting | Scenario 3 – Co-Digestion at Ingersoll WWTP | Scenario 4 – Aerated static pile composting at OCWMF | Baseline (Status quo landfilling organics) |
|----------------------------|--|--|--|--|---|---|
| CAPEX (upfront) | \$2.8 - \$5.2 million | \$0 | \$2.8 - \$5.2 million | \$33.9 - \$62.9 million | \$4.1 - \$7.6 million | \$0 |
| CAPEX (sustaining) | \$7.6 million | \$7.6 million | \$7.6 million | \$7.6 million | \$12.9 million | \$0 |
| OPEX (annual) ¹ | \$1.7 million | \$1.3 million | \$1.4 million | \$700,000 | \$830,000 | \$625,000 |

¹ Operating costs include County infrastructure operational costs for the transfer station, co-digestion facility and compost facility that are above the status quo costs and have been reduced by the anticipated revenue. Third party scenarios include processing and transportation costs. Electricity savings, digestate land disposal costs, and operational costs for pre-processing and combined heat and power operations are included in the overall operating costs for the co-digestion scenario. The compost scenario includes leaf and yard waste processing savings, compost revenue, and composting operating costs such as shredder operations, trommel screen operations and general operations. The baseline status quo scenario accounts for landfill tip fees associated with the organic material estimated that could be diverted with an organics collection green bin program (\$89 per tonne at an estimated 7,000 tonnes per year, rounded to nearest \$5,000). All scenarios would reduce some real costs on the baseline landfill scenario. All values are in 2023 dollars.

| | Scenario 1 – Third-party wet AD | Scenario 1.1 – Direct haul third-party wet AD | Scenario 2 – Third-party composting | Scenario 3 – Co-Digestion at Ingersoll WWTP | Scenario 4 – Aerated static pile composting at OCWMF | Baseline (Status quo landfilling organics) |
|---|---------------------------------|---|-------------------------------------|---|--|--|
| Net Present Value | -\$28.4 million | -\$21.3 million | -\$26.3 million | -\$57.4 million | -\$26.3 million | N/A |
| Lifecycle Cost (2023 \$/tonne) ² | \$210 | \$160 | \$190 | \$410 | \$190 | \$100 |
| Nominal Cost (avg \$/tonne) ² | \$430 | \$330 | \$390 | \$670 | \$390 | \$120 |

The results indicated that any organics management solution will require an increase in cost by at least double the current landfilling costs.

The third-party options include transfer station capital and operating costs within the lifecycle and nominal costs per tonne except for scenario 1.1; for third party wet AD, the contracted assumption was \$176 per tonne and for third party composting, the contracted assumption was \$140 per tonne. For in-County third-party wet AD, the contracted assumption was \$220 per tonne. Each of these scenarios assumes an inflation rate of 2% per year.

As the cost estimates are similar for third party processing and a County-owned composting facility, other criteria were considered in Task 4 of the project based on the County’s Multi-Criteria Tool tailored for use during this project.

Task 4

Task 4 quantitatively evaluated the five selected ORRT scenarios, applying the evaluation criteria and scoring matrix from the Tool, and the results of the financial modelling developed during Task 3. The report summarized and documented the evaluation of the ORRT scenarios to demonstrate the integrity of the evaluation process used to identify the preferred organic waste management strategy to be considered by County Council.

The MCA Tool ranked the overall performance of the scenarios as shown in the following figure. The maximum score for any scenario is 400 points.

² Nominal total lifecycle cost per tonne represents the sum of the annual free cash flow over the analysis period (20 years) divided by the sum of organic waste tonnage over the same period. Lifecycle cost represents the net present value of the annual free cash flow over the analysis period divided by the sum of organic waste tonnage over the same period. The main difference between the nominal and lifecycle costs is that the latter is adjusted, by being discounted, to account for the time value of money. For the purposes of this study, costs per tonne have been rounded up to the nearest \$10. The baseline of landfilling organics can be compared to the 2023 tipping fee of \$89 per tonne, which translates to \$120 for the nominal total cost per tonne and \$100 per tonne for the lifecycle cost.

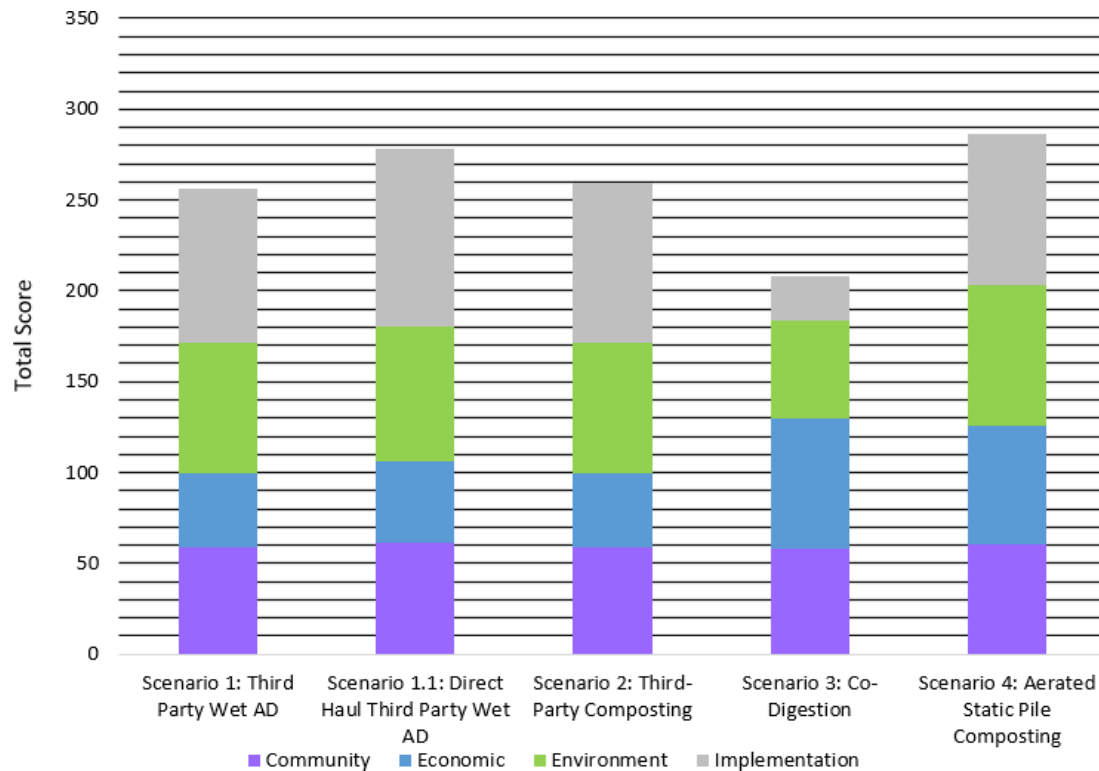


Figure ES.1 MCA Tool Results for Shortlisted Scenarios

The scenarios are ranked below based on highest score to lowest score. The percentage represents the overall score for the scenario out of the total available 400 points.

1. Scenario 4: Aerated static pile composting at OCWMF (72%)
2. Scenario 1.1: Direct haul to third-party wet AD (70%)
3. Scenario 2: Third-party composting (65%)
4. Scenario 1: Third-party wet AD (64%)
5. Scenario 3: Co-digestion at Ingersoll WWTP (52%)

The County-owned aerated static pile composting scenario scored the highest using the MCA Tool, followed closely by the direct haul to an in-county third party wet AD facility.

The benefits to the County-owned composting scenario include its ability to produce compost for beneficial reuse and sale locally, supporting local systems and Oxford’s green economy, with a relatively simple and timely construction process with no complex approval processes. Composting technology is widely used throughout Ontario, Canada and North America with proven success.

The direct haul to third-party wet AD scenario has lower capital costs, as there is no construction or implementation of technology or infrastructure required. The other third-party scenarios ranked lower than the direct haul scenario mainly due to the increased costs and reduced ease of implementation due to the need for the transfer station.

The co-digestion scenario ranked lowest largely due to the high procurement risks, costs, inability to easily handle fluctuating volume and composition of SSO, and potential challenges with the process of approvals and implementation.

Task 5

Task 5 reviewed funding opportunities that could be available to help implement the short-listed scenarios. Refer to the summary table below.

| Funding Program | | Program Details and Applicability | Deadlines / Timeframes |
|--|---|---|---|
| Federation of Canadian Municipalities (FCM) Green Municipal Fund | Capital Project: Signature Initiative | Highly innovative and impactful projects. | No deadlines |
| | Capital Project: Waste Reduction and Diversion | For organics collection program and processing facility if County can reach >60% municipal solid waste diversion from landfill; will require organics from IC&I sector. Grants and loans, depending on application. Low-interest loan maximum \$5-10 million depending on project ranking and grant maximum 15% of loan. Not applicable to transfer station only. | No deadlines |
| Government of Canada | Clean Fuels Fund: Establishing Biomass Supply Chains | Minimum 50% processed feedstock must be directed to a clean fuel production facility; only applicable if the County will accept IC&I and/or organics outside County to pre-process and feed AD facility(ies). | Call for proposals ended November 23, 2022. |
| | Clean Fuels Fund: Building New Domestic Production Capacity | New or expanded clean fuel production capacity. Applicable to co-digestion or AD. | Currently closed. Could potentially offer funding in the future through another open call for proposals. |
| | Investing in Canada Infrastructure Program | Organic compost and AD facilities have been funded through this program. Grants up to 40% of eligible expenses on municipal projects available with cost-sharing by the province. | No deadlines |
| | Low Carbon Economy Fund (LCEF) | Low-Carbon Economy Leadership Fund and Low Carbon Economy Challenge. Applicable to co-digestion or AD. | Currently closed. Could potentially offer funding in the future through another open call for proposals. |

The key funding opportunities for capital projects (such as a County-owned organics processing facility) that have been identified are through:

- FCM Green Municipal Fund (Waste Reduction and Diversion) (loan and grant)
- Government of Canada (Investing in Canada Infrastructure) (grant)

Funding sources are not guaranteed – some may not be applicable for the County’s future project endeavours, or a portion of funding may not be available. The County should review the list provided once a path forward is developed.

ORRT Recommendations

Based on the results of the study, a path forward was developed for the County. The first recommended step is to develop an SSO collection program which would require the following actions:

- Confirm SSO program details and if leaf and yard waste and pet waste will be permitted into the green bin.
- Review SSO pickup schedule and truck fleet.
- Prepare for public education (educational materials, open houses or information sessions).
- Consider a short-term direct haul organics processing contract, similar to what other municipalities have established recently. Contact other municipalities for lessons learned in developing their contracts.

Once the SSO collection program is in place, the County can gather SSO collections data to understand how much material is being diverted from the landfill. This could focus on the urban centres (Woodstock, Tillsonburg and Ingersoll) initially before considering a County-wide program. Third party processors are all located out of County with the exception of one facility, therefore the County should assess the need for a transfer station at the onset of an SSO collection program.

After three to four years of collections, a County-owned organic waste processing facility could be reassessed based on an established quantity of organic waste from the SSO green bin program. The organics processing market and the construction industry should be reviewed again at this time for construction costs and inflation and private industry interest in constructing/operating/financing etc. a municipal organics facility (depending on contractual arrangement).

The County should also consider:

- If there is interest from the County in developing and owning their own SSO composting facility:
 - Review the FCM capital project waste reduction and diversion program. Consider further study into the IC&I organics sector to increase landfill diversion above 60% for this FCM program to apply (combination of loan and grant program).
 - Review Investing in Canada Infrastructure to support the development of a compost facility (grant program).
 - Scan for new funding opportunities.
 - Discuss with other municipalities who have built their own composting facility for any lessons learned, etc.
 - Consult with neighbouring municipalities to seek potential interest in importing organics into Oxford County which may afford greater economies of scale associated with higher organics feedstock tonnages.
 - There are benefits to the County developing and operating a compost facility such as the ability to produce compost for beneficial reuse and sale locally, and the relatively simple and timely construction process with no complex approval processes when compared to anaerobic co-digestion with sludge. In addition, the covered aerated static pile compost technology is widely used throughout Ontario, Canada and North America to process food waste with proven success.
- If there is interest from the County in continuing with third-party organics processing:
 - Re-assess the collections system to determine the need/benefit of a transfer station to amalgamate material for third-party for processing, if one has not been developed at the onset of the SSO collections program.
 - Scan for new funding opportunities.
 - Review the OCWMF for opportunities to optimize site operations.