



Volume 9: Consultation Report

A Study of the Optimization of the Blue Box Material Processing System in Ontario *Final Report*

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Prepared for Waste Diversion Ontario by:



Resource Recycling Systems
Sustainable Systems for a Waste-Free Future

STEWARDEDGE

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1. Introduction

The project team was asked to present information about the project at the Ontario Recycler Workshop on April 18, 2011. The project team sought the feedback of workshop participants on the study material presented, specifically about the methodology and the assumptions made. A discussion was facilitated through the use of breakout sessions and an online survey was posted on the CIF website for participants to provide further feedback.

The webcast was attended by approximately 60 people and approximately 50 people registered for the webcast. The presentation is archived on the CIF website (<http://www.wdo.ca/cif/initiatives/orw.html>) as well as an information package on the data and assumptions used. The survey questions are presented in Appendix 1.

Thirty-four breakout session worksheets (includes those filled out in-person and those submitted online via the webinar) were completed:

- Breakout #1: 17 responses
- Breakout #2: 15 responses
- Breakout #3: 2 responses

The online survey was completed and submitted by 16 participants and 2 responses were received via email. In addition, VisionQuest provided the project team with a study undertaken in 2010 that provides a detailed assessment of a best management practice comparison for the collection of residential recyclables.

Participant comments and questions have been compiled by topic and aggregated where they are similar in the table below. The project team has carefully considered each of them and provided a response in turn.

2. Summary of Comments

| TOPIC | QUESTION/COMMENT | RESPONSE |
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| Consultation | Will stakeholders be able to comment on the draft report? | This is a decision of the CIF Board. |
| | <p><i>Suggestions were received to enhance participation in consultation sessions including:</i></p> <ul style="list-style-type: none"> • Providing background materials and handouts • Giving prior notice to participants that they will be expected to provide input in breakout sessions | Noted. |
| Co-Utilization/ Co-Collection | Some facilities and collection systems are co-utilized for different types of waste (e.g. MSW). Is this being considered? <i>*This was noted by a number of participants.</i> | Noted. The requirement to use transfer or processing facilities for multiple waste streams will be considered as part of CofA review within the decision process for the transition to an optimized system. See volumes 4-7 and volume 8. |
| | Does this study consider that some existing transfer stations also double as depots? This is a value to smaller municipalities that should be taken into account. | Depot locations are part of the collection system and outside the scope of this analysis. Possible changes to the location of depots should be part of an analysis of the impact on collection that would build on this study and form a more local-specific transition plan. |
| Common Suite of Materials | What is the consistent list of province-wide recyclables? | See volume 2. |
| General | In communities that accept more materials than what is included in the study list, a common suite of materials would mean eliminating some of materials currently collected. It may also limit municipalities from adding new materials as they come on the market. | The list is broad and captures the range of materials managed by most programs today. |
| | Without accessibility to markets, it is an undue hardship on municipalities to force them to recycle items which are cost-prohibitive. | Agreed. The common suite of materials identified by the CIF and addressed by the project team includes only those materials for which there typically are markets. The recovery rates for the materials have assumed increased availability of markets for some materials such as polycoat paper materials and plastics. |
| | <p>A common suite of materials will help:</p> <ul style="list-style-type: none"> • Promotion and education messages • Processing and marketing <p><i>*This was noted by a number of participants.</i></p> | Noted. |
| | Does not account for implications on the MRF or downstream markets. | The implication of the suite of materials is considered in the design of MRFs for this |

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| | | analysis, but it is recognized that decisions on sorting and marketing (i.e. what materials will be managed) will be made by operators depending on global market conditions and technology. |
| | Assumptions of a standard list of material and single stream recycling will fail as implementing these assumptions will prove to be very difficult (e.g. MSHW). | Some of the considerations to implementation are addressed in the transition plans presented in Volume 8 and addressing leadership in Volumes 4 through 7. |
| Common Suite of Materials Impact on Recovery Rates | <p><i>Mixed responses were received:</i></p> <ul style="list-style-type: none"> • Yes, it would increase recovery. • It will have a minor impact on recovery rates. • Not according to recovery rates shown. For example, aluminum cans are currently accepted in all programs but recovery is low. <p>Does not achieve higher recovery because what makes sense to collect in dense urban population of GTA may be inappropriate to collect in remote rural communities.</p> | <p>Participants submitted mixed comments with respect to the impact of a common suite of materials on recovery rates. They have been noted.</p> <p>Noted. Targeting different materials according to demographic conditions and the corresponding impact on recovery rates has not been considered. This would need to be balanced against the benefits of common P&E, etc. However, all materials can be reasonably collected everywhere. The challenge is that small-scale processing is inefficient with a number of materials. If all materials are processed in larger facilities designed to efficiently process the full range of materials, this should not be an issue.</p> |
| Common Suite of Materials Impact on Collection | <p><i>Mixed responses were received:</i></p> <ul style="list-style-type: none"> • It will not help to simplify or streamline collection. • It is only helpful if there is two-stream collection. • Yes, it would simplify and streamline collection. • It should result in less contamination of blue boxes/carts and save time. • Unknown. Collection needs to be considered in the context of the integrated waste management system operated by the municipality and will need to be reviewed in context with other materials collected. Single and two-stream processing also affects the design of the collection system. • It only matters where residential owners have second homes in a different area whose recycling program | Noted. |

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| | differs from their own. | |
| | Common suite of materials will make collection more difficult if one collects expanded polystyrene (EPS) together with other recyclables. Addition of EPS actually makes Blue Box collection more difficult because EPS has low density and does not compact gracefully. | The challenge of collecting and processing polystyrene with other materials is noted. The impact of managing EPS with other materials is addressed in Volume 3. |
| | Individual pieces of plastic film are a major potential source of litter as they blow out of open Blue Box bins. This then requires that residents stuff plastic film into a bag, which makes it less streamlined from resident's point of view. | Agreed, but bagging the film could be a minor inconvenience compared to other options for collection. |
| Household Generation | It is difficult to project generation accurately given the pace of market changes. | Noted. This is an area of significant uncertainty. |
| | Disagree that generation of telephone books will be as low as study projects unless Bell Canada stops sending them every year. | We anticipate all publishers of printed directories to reduce or eliminate distribution, as evidenced by discussion with some major stewards. |
| | <i>Participants questioned the reduction in fibres:</i> <ul style="list-style-type: none"> How did the model predict a significant reduction in fibres and some plastics where others have large increases? Fibre will not decrease as much as the study assumes. | See Volume 2. |
| | Do changes in generation levels factor in density of packaging (i.e. thinner and lighter over time)? | Yes, potential changes are considered, noting that specific detailed and comprehensive data are not available. |
| | A quick context piece explaining how the generation and recovery assumptions were developed would be helpful. | See Volume 2. |
| | PET thermoform is increasing rapidly and could increase 500% - 1000%. <i>*PET thermoform increase noted by more than one participant</i> | Noted. A significant increase has been assumed within the "other plastics" category. |
| Recovery Rates | Growth rates will vary across the province. Was this considered? | These recovery rates are considered average and applied uniformly across the province. The enhanced recovery scenario considers best practices in promotion and incentives. This also is addressed by the range covered by the natural growth and high recovery scenarios. |
| | Both generation and recovery rate should be modelled to vary significantly geographically between urban and rural | Noted. Generation estimates are based on data from Stewardship Ontario that addresses differences between urban and rural |

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| | areas and between North and South. Both purchasing patterns and alternative uses for recyclables are expected to vary. | household consumption. It is recognized there are limitations to those data. As noted above, the recovery rates are average and it is noted that volumes may differ because of recovery rates. This can be addressed in more detailed transition analysis in future. |
| | Recovery rates are based on ill-defined generation rates and don't reflect participation rates. Recovery rates for programs that collect the materials should be used. | Noted. Data from waste audits and WDO data from programs that collect materials today have been combined with assumptions about possible developments and trends in markets for many materials. |
| | How can current recovery be more than natural growth? | Assumed changes to composition of materials put onto the market. |
| | The recovery rates for polystyrene, film, foil and other aluminum are aggressive. | Noted. The estimates are intended to provide a conservative possible cost estimate (i.e. what if a lot of lighter weight material were recovered). |
| | Some rates seem too high (e.g. paper) and some seem too low (e.g. aluminum cans). | Noted. See Volume 2. |
| | The recovery rate for gable top/aseptic is likely too high. <i>*Noted by more than one participant.</i> | Noted. The project team has assumed a growing demand for fibre and the need to manage the composite paper packaging materials. |
| | The recovery rates assume that curbside collection for polystyrene is desirable and assumes that there is a market for all materials which may not be the case. Material recovery rates in some cases depend on promotion and MRF recovery abilities. | Noted. |
| | Rates seem unreasonable for municipalities with high % of population living in non-owned multi-family units. The rates not take into consideration demographics of areas (i.e. Toronto, which has more newspapers per capita). In addition, the volume of these materials may not be as prevalent in other areas, which would contribute to them not recovering as much as other areas. | Noted. The high recovery scenario assumed best practices in promotion and incentives and that many of the challenges for multi-family households would be addressed. This would also be addressed by the range between natural growth and high recovery scenarios. |
| | <p><i>Questions received regarding the methodology included:</i></p> <ul style="list-style-type: none"> • How was this data derived? Is it curbside audits on all waste streams in all municipalities in Ontario? • When was the data for the recovery rate assumptions collected? • Is the percentage weighted to allow for differences in population? | See Volume 2. |

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| | The recovery rate depends on both the participation rate and the loss to other outlets. One really needs to consider the combination of residential single-family and multi-family, public space collection, IC&I and deposit return streams to make sense of recovery numbers. | Noted. |
| | Fibre is widely used in rural areas as kindling for fireplaces and wood stoves. Households, using wood stoves, during heating season are likely to have 0% fibre recovery. Hence fibre recovery will vary widely seasonally, and geographically. Since fibre represents 70% of total Blue Box weight, this variation in fibre is significant to the calculations. | Noted. This level of detail could be considered in a future sensitivity analysis or transition analysis. |
| Haul Time Assumptions | <i>We received mixed responses regarding haul times in rural and seasonal areas. Some respondents stated they were too high, others indicated they were too low. Example: Haul times are inaccurate for Northern municipalities and First Nations.</i> | If suggested assumptions are provided they could be modelled in future sensitivity analyses. |
| | The study does not take into consideration the trade-off between depot and curbside collection. | Correct. Collection is outside the scope of this analysis and is not anticipated to affect the results. However, it could be considered in a future analysis. |
| | Are fuel costs taken into consideration? | Yes. See Volume 3. |
| | Does direct haul time mean from the curbside/depot collection route? | Yes. See Volume 2. |
| | Are haul distances stated in the study return trip? | Haul distances are one way. |
| | The difference between existing program costs/revenues and proposed program costs/revenues could be a factor on acceptable haul distances. | Noted. This would be considered in a more focused transition and implementation stage and would be addressed in the decision process where actual local cost data and more precise engineering estimates are used for final system implementation decision making. See Volume 8. |
| | The model shows one-way haul; no company costs on one-way regardless of whether there is anything to back-haul. | While one-way haul distance is noted, the model calculates transfer time based return trip. |
| | The model should consider the availability of service providers with appropriate equipment especially in rural and northern communities. | Noted. The availability of capable service providers in each region and local area will be a consideration during the identification of the preferred approach and transition in the future. |
| Transfer and Hauling Considerations | <i>We received many responses addressing considerations that come to mind regarding</i> | The challenges of municipal cooperation are noted. These and many other suggestions that |

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| | <p><i>transfer or haul of material across municipal boundaries and the distance which material can be hauled economically including:</i></p> <p>Municipal willingness and ability to cooperate, for example:</p> <ul style="list-style-type: none"> • NIMBY: Municipalities may not want to accept “waste” (recyclables) that are not generated within their boundaries • Existing contracts (and cost of amendments) • Procurement processes • Material ownership and revenue splitting <p>International and provincial and other boundaries and regulations, for example:</p> <ul style="list-style-type: none"> • Border closures and delays • Jurisdictional issues: Department of National Defence (DND), First Nations <p>Road and driving restrictions, for example:</p> <ul style="list-style-type: none"> • Load limits • Approved hauling routes • Distance: Limit on hours that drivers can work without a shift break (Ministry of Labour) • Weather/seasonal implications and traffic <p>Performance indicators, for example:</p> <ul style="list-style-type: none"> • Lifecycle environmental impacts: Greenhouse gas emissions, energy use, etc. <p><i>Note: Many issues were raised by a number of participants.</i></p> | <p>were provided have been valuable in the development of our decision processes for the high level transition plans. They also will be useful in potential future more detailed transition planning and allocation of responsibilities and costs.</p> <p>Some of the factors can be directly studied in more detail by the modification of model parameters such as traffic speeds, etc. to account for weather, traffic, border crossing time. The models will be available for such sensitivity analyses and testing of options.</p> <p>Also, other criteria and performance measures can be added to the model, including greenhouse gas emissions changes.</p> <p>The net result is that all of these factors are part of the real world implementation process where the processing optimization model as well as the transition plan decision trees and support analysis steps can take these factors under consideration in a very local context on how specific hub and spoke components of an optimized system can be developed.</p> |
| Material Flow | Does the study accommodate multiple methods of material delivery? | Single-stream is general assumption. We are expecting curbside collection in all urban and semi-urban areas, but depots would serve most areas currently served by depots. Therefore, delivery may be from curb collection vehicles or bulk bins. |
| | Study does not account for direct deliveries. | For this study, collection is not addressed specifically. Direct delivery (by residents) is no different than direct delivery by curbside collection vehicles or vehicles with bulk bins |
| Design of Transfer and Processing Facilities | Does the study analyze cost efficiency of single-stream vs. dual-stream? | No. Collection is not addressed specifically. Single-stream can deliver collection efficiencies, it is recognized that processing is |

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| | | generally more expensive. Therefore, the assumption of single-stream provides a conservative result, potentially offset entirely or in part by savings in collection. |
| | Are facilities scalable to reflect changes in the waste stream? | Excess capacity is built into the estimates, in part to accommodate changes to the waste stream. |
| | Does the study account for MRF upgrades/shutdown contingency plans? | See Volume 3 and redundancy is addressed through options for each region that add additional MRFs and transfer stations. See volumes 4 through 7. |
| Approach | To implement a region by region approach, information needs to be provided to address what savings there will be to municipalities, how a competitive environment will be maintained, and how transition issues will be addressed (existing contracts, facilities in integrated sites, launch costs to move to single stream recycling). If these things are not addressed, it can result in increased costs to the rest of the waste management systems operated by municipality. Analysis needs to be done to ensure that there is a net benefit to taxpayers. | Noted. See Volumes 4-7 regarding transition. |
| | This approach will only work where there is a single waste authority managing all streams and processes. | Some of the considerations to implementation are addressed in the transition plans presented in Volume 8 and addressing leadership in Volumes 4 through 7. |
| | The existing waste system must be analysed in a more detailed nature to ensure existing well-designed systems are not dismantled due to lack of analysis. | Noted. This should be assessed in a more detailed transition planning phase. Following the transition process at the local and regional level should address this concern. |
| | Analysis of existing system with grouping of adjacent area system would help with the cost benefit analysis. | Noted. As above. |
| | By consolidating the Province to 7 MRFs there would be no competition to keep costs in check - need to maintain an open market. | Noted. This is addressed through consideration of options with increasing numbers of MRFs and considering excess capacity. See Volumes 4-7. |
| | Excluding IC&I tonnes in the analysis puts some MRF's and transfer stations at a disadvantage and may result in the recommendation for them to be closed, when in fact they have enough tonnage to make them viable. | At this stage IC&I material is not collected. It is acknowledged that managing IC&I materials by either private sector or public operations may provide economies of scale that could be passed on. By the same token, if it is economically feasible to transfer the municipal material it may also be feasible to transfer the IC&I material. |

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| | <p>The study doesn't take into account job losses in areas where MRF's and transfer stations may be recommended to close for optimization of a province-wide system.</p> | <p>Noted. This could be addressed more fully considering all regional and local impacts in a future analysis.</p> |
| | <p>A by material approach would capture the full range of options. The original problem definition has already excluded a number of attractive options. This exercise needs to be regarded as optimization of the transfer-station and conventional regional MRF scenario applied to curbside collected common slate of materials and hauled over the road system.</p> | <p>Noted. This is a standard hub and spoke model. An initial assessment of the possibility of other options could be undertaken as an initial step to evaluate whether such options might be worth further analysis</p> |
| Option Evaluation | <p><i>Additional criteria/metrics noted by participants to consider include:</i></p> <ul style="list-style-type: none"> • Greenhouse gas emissions • Co-utilization and impact on facilities within integrated waste management system • Case studies from other jurisdictions who have done a project similar to this one • Existing MRFs • Current costs • Current operating performance • Ability to increase throughput and accept materials from other municipalities • Overall net system cost • Costs associated with transition to different collection system • Ability of different service providers to provide the same level of service • Transfer collection points: The current situation is multiple stream collection; using carts, roll offs, compaction and front end bins. It is unclear what the model has considered as the end state process. • Timeframe for implementation needs to be factored into the analysis to ensure that the full savings are captured. • Ease of implementation • Site selection criteria • IC&I tonnages *Noted by more than one participant • Triple Bottom Line: Financial, Social and Environmental impacts | <p>The study will summarize the costs both regionally and province-wide and compare those to the projected existing system cost. See Volume 3.</p> <p>The study will incorporate some of these considerations, such as the timeframes for the analysis, into the decision processes as part of the high-level transition plans. See Volumes 4-7 and Volume 8.</p> <p>However many of these criteria, such as the ease of implementation, the effect on integrated waste facilities and systems collecting multiple waste streams, consideration of the most appropriate collection systems, and of IC&I tonnages, could and should be incorporated into future analyses and transition planning. We believe the suggestions will be useful in designing the scope of such assessments.</p> |

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| Flexibility of Options | For larger municipalities, can two different MRF or Transfer Stations be used? | Yes, the model will consider this, for instance in the case of Toronto (See Volume 6) or a municipality with a large area in which material from some dissemination areas is delivered to one location while material from other dissemination areas is delivered to a different location. Generally though material that is concentrated in one dense urban area will be directed to the same facility. |
| Information for Municipal Council | Will this be provincially mandated? If not mandated, municipalities may not be able to gain acceptance of this approach by residents. | Noted. The study does not presume any legislated flow control. The trade-offs among each option must be considered. It is likely that each municipality will undertake its own assessment through a decision process similar to those articulated in Volumes 4-7 and Volume 8 and a more detailed transition planning process likely would be required. |
| | The approach Stewardship Ontario intends to implement to make all provincial systems compliant with the model assumptions should be front and center so there are no illusions. | This study is undertaken on behalf of the Continuous Improvement Fund for the benefit of all stakeholders. The analysis and results and the model is presented for consideration and use by all stakeholders. |
| | Impact on potential funding increases or decreases based on study results. | The source and amount of funding to municipalities is not included in the scope of this study. This could be considered within future transition planning processes |
| | Costs <ul style="list-style-type: none"> • Long term cost savings in labour and capital • Transition costs • Cost comparisons would be useful (study vs. tenders) | Noted. This analysis evaluates the cost implications of each option, including estimates of the cost to convert or upgrade existing facilities to accommodate the projected material quantities within the planning timeframe. The high level transition plans identify how tendered costs should be obtained to enable implementation decisions. Additional planning stages should be undertaken to address the impacts on collection and the allocation of costs. |
| | Financial responsibilities: who pays for what? | This could be addressed in future planning studies, as noted above. |
| | How the proposed plan affects the community's existing integrated waste management system. | Noted. See Volumes 4-7 and Volume 8. |
| | How facilities will be selected and what will happen to the residual waste that requires disposal. | Selection of facilities is covered by the different options evaluated (see Volume 2 and Volumes 4-7). The specific locations for disposal of residue are not addressed. Average disposal costs are assumed. The specific location of facilities and for the |

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| | | disposal of residue would be established through the decision processes, outlined in Volume 8 at a high level. |
| | How transition issues will be addressed for existing facilities and contracts for collection systems and processing facilities. | See Volume 8 for high level transition plans. |
| | Timeframe for implementation | See Volumes 4-7 and 8 for high level transition plans. However, implementation likely will require further analyses, e.g. collection and more detailed transition planning. |
| | Concerns about municipalities handling waste within their borders (would be good to present as a commodity) | Noted. |
| MRF Study Data and Assumptions | <i>Contradictory responses were received from participants:</i> | The team sought information from multiple sources. \$15/hr is a balance between arguments for higher and lower. |
| Wage Rates | <ul style="list-style-type: none"> Labour wage rates are too low for municipal facilities. <i>*Noted by more than one participant</i> Sorter labour rate is too high. Maximum \$15 per hour with all benefits. | |
| | Maintenance of single stream MRF equipment is highly skilled work. A wage of 17.50/hour is not competitive. | Agreed, depending on the area, \$22.00 to \$24.00/hr might be realistic for skilled labour for maintenance. The only exception would be repairing an optical sorter which is usually done by the manufacturer's qualified contractors. Also, the budget includes allowance for contracted services for more sophisticated work. |
| MRF Study Data and Assumptions | Number of sorters /sorting productivity is somewhat understated. <i>*Noted by more than one participant</i> | Staffing/productivity is based on observations of facilities that reflect the level of mechanization accounted for in capital budget. The numbers used in the model are conservative compared to actual operations of reference facilities. See volume 3 for description of sensitivity analysis. |
| Sorting Productivity | | |
| MRF Study Data and Assumptions | The costs of a single stream MRF cannot be compared to a dual stream MRF. Costs are lower in dual stream facilities however collection costs are higher. | Noted. See Volume 3. |
| MRF Equipment/Design | For the optical sorting circuit illustrated on pg. 19, only the first sorter can run fully loaded. This type of design is notorious for poor utilization of the optical sorter capacity and in this case the low utilization does not provide any safety back-up. | Noted. While alternative arrangements may be feasible and strategies developed in the future, this assumption allows for a conservative cost estimate. |
| | Picking overall equipment cost based on analogy to current MRF infrastructure is | Noted. The design assumptions are not based on existing infrastructure. This analysis is |

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| | not adequate. Proper equipment sizing and costing should be used. | intended to be based on representative design and cost estimates. See volume 3. |
| | Equipment needs to be properly sized and selected for the mass balanced stream flows of the particular plant flow sheet. | |
| | Equipment numbers in the table do not seem to match the flow sheet diagram on pg 19. | Flow sheet addresses large and medium facilities. Need to look at equipment assumptions list for other facilities. |
| | Flow sheet on pg 19 show 23 streams that are hand sorted or require inspection. That is not doable with 24 sorters/shift people per shift, as fibre sorting, and major plastic streams will take more than one sorter per stream. The illustrated flow sheet does not handle film and EPS foam. | Sorter numbers are based on real facility implementations where a sorter is not required for some materials. EPS and plastic film would add to needed staff and are not addressed in the baseline model. See Volume 3. |
| MRF Study Data and Assumptions | Transfer load limits are too high at 24 tonnes. Needs to be less than 20 tonnes to avoid compaction problems at MRF. | Many curbside collection programs collect at 2.7-3.0 compaction ratios in curbside trucks without problems at MRF. Model assumes compaction ratio of 2.0 which is less than most modern curbside collection. |
| Transfer Assumptions | Load Limit Transfer Truck: For 400 series highways, there is a load limit per axel but no overall load limit. The large garbage transport trailers hauling Toronto garbage along 401 have multitude of axels, and I believe they haul more than 25 net tonnes. There is no need to assume anything smaller for this model. | The 25 Tonne limit results from the volume of the vehicle and limiting compaction to a level that won't be considered unacceptable by MRF operators, not legal weight limit. |
| | <i>Comments regarding haul rates/costs included:</i> <ul style="list-style-type: none"> Transfer haul rate is low. Should be \$105 per hour plus fuel surcharge. Haul costs are low. The transportation costs should be costed directly and not based on hourly contracts. In short term, existing transport companies can leverage their existing vehicles and low-bid the contracts, However in a sustainable system all costs need to be properly accounted for. | Noted. Cost estimates consider full cost, recognizing that cost efficiencies may be passed on when available. Changes to fuel costs are addressed in the sensitivity analysis in volume 3. |
| | Transfer Loading Fuel Costs should be expressed per hour rather than per tonne. This would give advantage to larger transfer stations. | Fuel cost depends on the hours equipment is running and how hard it is working. Facilities need to be designed so equipment does not need to be running when not loading. |
| MRF Study Data and Assumptions | Operating and maintenance costs are understated <i>*Noted by more than one participant</i> | Numbers used reflect input by experts in field with experience in well-run facilities. See volume 3. |

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| Operating & Maintenance | The process flow diagram does not allow for human QC after each machine sort (OST, eddy, magnet, etc), which is always needed. | Where two stages of optical sort are indicated for a material, quality is expected to be better than manual sort without QC. In other locations, manual QC is generally covered in staff count. |
| | Plant operating strategy will impact number of sorters and material revenue and this is not addressed. | Noted. It is acknowledged that decisions on design and day to day sorting and marketing will be made by operators depending on global market conditions and technology. |
| | Baling wire costs appear quite low. | A higher rate would not affect the model conclusions other than raise costs across the board. |
| | Capacity utilization of 95% is too high. For system robustness and security, it should be built with parallel lines so that on a single shift operation it can handle normal peak loads, whereas in case of either scheduled maintenance or equipment breakdown in one line, or in neighbouring plant the other one can handle the load by running around the clock. This implies that safe assumption for normal capacity utilization is 50%. | Noted. A good preventative maintenance program, qualified maintenance staff and a good supply of spare parts can offset risk of extensive downtime. 80% utilization should be achievable. There are a lot of variables that can affect this number such as system design, management skills, effectiveness and knowledge. The effect on cost of different levels of excess capacity will be addressed through a sensitivity analysis. |
| | Need more maintenance staff as 2 would only mean 1 for each shift for a 104,000T MRF which is a lot of machinery. | Noted. It will require one full-time person just to perform a good preventative maintenance inspection with required follow-ups in larger facilities. Depending on the facilities preventative maintenance plan and the skills and efficiencies of the maintenance staff, 2 to 3 people should be sufficient. This also assumes that these people are not doing cleaning and general housekeeping. |
| MRF Study Data and Assumptions | No mention of capital depreciation cost. | Capital costs are included. See Volume 3. |
| | Overhead costs: 4% interest rate is low. | Noted. This will be tested in the sensitivity analysis but is expected to increase system cost overall. |
| Interest/Profit | Management Profit Allowance: In 4% interest environment plant operators should not expect 20% profit, 10-15% is more reasonable range. How do you define profit for plant in which costs invariably exceed material revenues? | Noted. We have assumed 20% profit based on data and discussions about current system in Ontario. Profit refers to that charged by service providers for provision of transfer and processing services. |
| MRF Study Data and Assumptions | Why is there not a process flow diagram for the dual-stream system? Residue rates will depend on whether or not processing facility is single or dual-stream. | The modelling is based on single-stream collection and processing. See volume 3. The 7% residue rate applies to single-stream, operating at best practices. |
| | Residue rate of 7% is too low for single-stream facilities with high tonnage and | While rates up to 33% have been recorded, 7% is a reasonable target for a well-operated |

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| | varying types of collection. <i>*Noted by more than one participant</i> | single-stream facility as long as the residents have received a good education on what is acceptable and the message is consistent. Well-designed and well-run single-stream facilities are able to sort materials with as few recyclables in the residue as dual-stream facilities. Accordingly, similar residue rates should be expected if best practices are employed. |
| | Residue disposal cost of \$80 per tonne is low. | A higher rate would not affect the model conclusions other than raise costs across the board. |
| | Curbside enforcement practices, community demographics, housing density (horizontal multi-family), other materials collected in the collection system (e.g. organics) and container limits will factor into actual residue rates. | Noted. |
| MRF Study Data and Assumptions | What may be effective on a system-wide basis may generate significantly higher costs for an individual municipality. | Noted. Further study is likely required, e.g. collection and more detailed transition planning for the allocation of costs, etc. |
| General | Safety Office Phone Supplies: \$2.50/t? That is \$¼ million for a 100,000 t/y MRF? Is this accurate? | Plant operators came up with this figure. Much of this goes to keeping staff equipped with appropriate PPE. |
| Aggregation Point Determination | Why place aggregation points in Windsor and Sarnia, St. Catharines, Cornwall, Ottawa, and Renfrew which puts half of the area covered by 30/60/90 min radius in to Michigan / New York / Quebec. By placing these aggregation points up to 40 min from the border, their number could be further reduced by 2 or 3. | The model determines the minimum notwithstanding proximity to the borders, accounting for population density and haul distance. |
| | There are 8 aggregation points close together in GTA. The existing transfer stations were taken as ends of collection routes, but are they all needed as optimum aggregation points? Would the optimum aggregation points not be located equally spaced around the periphery of GTA? | The existing Toronto transfer sites were fixed in the project terms of reference. Other potential aggregation points are determined by the model. Alternative locations could be tested in future more specific transition/implementation studies. |
| | There are more closely spaced pairs of aggregation points, one south of Bruce peninsula one east of Georgian Bay, and one in the center (Lindsay and Peterborough). Could each of these pairs be collapsed into one? Would they be better spaced further apart? | Aggregation points are established based on population density and the assumed haul distances. Different numbers and locations could be tested in future, more specific transition/implementation studies. |
| | Are you minimizing km travelled by collection vehicles, or km*tonnes? Since collection vehicle travels mostly empty | Noted. Neither km nor km* tonnes are minimized. The total haul km is determined based on the assumed maximum haul times |

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| | even at the end of its route, the location of the aggregation points should minimize the total km traveled by direct haul vehicles without worrying that the full ones should travel less. | for each dissemination area and the quantities that need to be managed overall. See volume 2. |
| | What should happen at the depots: Single-stream recyclable? Dual-stream recyclables? Or separate bins for Fibre, Glass, Plastics? | This analysis is based on single-stream transfer and processing. The study does not address how material should be sorted at depots. Generally, if the expectation is that the materials will end up at a SS facility, combining the materials will always save on collection costs and will not add to processing costs. The exception is where IC&I materials such as OCC and office paper might be collected clean and baled locally. This could be addressed in a future analysis of optimal collection. |
| | What should happen at the aggregation point: Compact by 2.5 volumes into transfer trailer for shipment to a regional MRF? Mechanically separate into Fibre, Plastic, Foam+Film, Steel, Aluminum and Glass. Fully densify each of these semi-product streams into a transfer trailers and ship these semi-products directly to the reprocessors or export ports. What is the optimum mix of simple transfer stations and these mechanical separation stations? Can the semi-products be sold at the price that recovers the collection, coarse mechanical separation and the shipping costs and you will have a sustainable system with no net cost to municipalities? | An initial assessment of the possibility of other options to handling or separating material at transfer locations could be undertaken as an initial step to evaluate whether such options might be worth further analysis. |
| Other | Stewardship Ontario will use this report to negotiate lower funding to municipalities and CIF will use this report as a basis for not funding MRFs that are not in the 2025 year plan. | This study is undertaken on behalf of the Continuous Improvement Fund for the benefit of all stakeholders. The analysis and results and the model is presented for the consideration and use by all stakeholders. |
| | This model directly affects the collection routes and existing collection contracts. Will there be a subsequent study for collection issues? | The analysis does not attempt to optimize collection as it is beyond the scope of this analysis. However, it is acknowledged that the results of this analysis would affect collection. Subsequent analysis of collection or of transition planning would need to be addressed by the Continuous Improvement Fund and other stakeholders. |
| | Who originally commissioned this report? Do the stewards believe there are too many MRF's? | The report was commissioned by the Municipal Industry Program Committee (MIPC) of the WDO to provide information about an |

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| | | optimized system designed for 2025. As such it is to suggest options regarding the optimum number of MRFs and transfer stations. |
| | VisionQuest (on behalf of Clorox) provided a copy of The Blue Bag Case Study – a study undertaken in 2010 that provides a detailed assessment of a best management practice comparison for the collection of residential recyclables with blue box(es), blue bag and automated carts. | Noted. Thank you. While a single-stream collection system has been assumed for this analysis, the specific design of the collection system is beyond the scope of this study. It should be noted that consideration of Blue Bags in this study would tend to increase the estimated cost of the processing system, without consideration of the impact on collection. This could be addressed in a future analysis of collection and transition planning. |

Appendix 1

Ontario Recycler Workshop Online Survey Questions

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|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Referring to the table of generation rates within the MRF study data and assumptions file posted on the CIF website, are the assumptions about the changing composition reasonable? |
| 2 | Referring to table of recovery rates within the MRF study data and assumptions file posted on the CIF website, are assumptions about recovery rates reasonable (natural growth and high recovery)? |
| | a) Does a common suite of materials help to achieve higher recovery? |
| | b) Does the common suite of materials help to simplify or streamline collection? |
| 3 | Referring to the table of Ontario Blue Box System Material Flow within the MRF study data and assumptions file posted on the CIF website, please indicate if any of the information for your program is incorrect. |
| 4 | Referring to the table of Ontario Blue Box System Transfer Stations and MRFs within the MRF study data and assumptions file posted on the CIF website, please indicate if any of the information for facilities used by your program is incorrect. |
| 5 | Referring to the maps of the current Ontario Blue Box System infrastructure and material flow within the MRF study data and assumptions file posted on the CIF website, please indicate if any of the information is incorrect. |
| 6 | Referring to the tables of costing assumptions and MRF schematic within the MRF study data and assumptions file posted on the CIF website, please comment on the following, noting the size of facility where applicable. |
| | a) Labour wage rates and benefits |
| | b) Building costs |
| | c) Equipment capital costs |
| | d) Operating and maintenance costs |
| | e) Number of sorters or sorting productivity |
| | f) Other staff levels |
| | g) Overhead costs, e.g. interest rates, profit, management levels |
| | h) Residue rates |
| | i) Transfer vehicle hourly rates |
| | j) Transfer load limits |
| | k) Other comments |
| 7 | What issues come to mind in considering transfer or haul of material across municipal boundaries? |
| 8 | What other factors (besides fuel consumption and compaction) could have a strong impact on how far material could be hauled economically? |
| 9 | Is the region-by-region approach capturing the full range of attractive options? |
| 10 | Are there any additional criteria or metrics you would like considered in evaluating options? |
| 11 | What should be addressed in the study that will help you in reporting to your senior staff and Councils? |