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File: 0360-20
Solid Waste Advisory Committee
Agendas

SOLID WASTE ADVISORY COMMITTEE

Notice of Meeting on **Friday, March 3, 2023 at 12:30 pm**
Board Room, 6th floor, 625 Fisgard Street, Victoria, BC

Baker, Frank	Latta, Elizabeth	Rintoul, Jordan
Blanchard, Cathie	Macdonald, Nikki	Shaw, Jeff
Coburn, Michelle	McCullough, Margaret	Siefried, Kayla
Collins, James	Monsour, Don	Stevens, Wendy
Desjardins, Barb (Chair)	Newlove, Rebecca	Thran, Dennis
Gose, Sarah	Oakley, Julie	Tooke, Rory (Vice-Chair)
Kurschner, Mark	Pirie, Robyn	Young Jr., Stew

LUNCH WILL BE SERVED

AGENDA

1. Territorial Acknowledgement
2. Introductions
3. Approval of Agenda
4. Adoption of Minutes of February 3, 2023
5. Chair's Remarks
6. Committee Business
   a. Update on Coast Waste Management Association *Simple in Theory: Preservation, Recycling and Reuse in the Built Environment*
   b. 2022 Solid Waste Stream Composition Study
   c. Actual and Projected Monthly Refuse Tonnages at Hartland Landfill (standing item)
7. Correspondence – none
8. Other Business
9. Next Meeting: April 21, 2023
10. Closing Comments
11. Adjournment

Capital Regional District
2022 Solid Waste Stream Composition Study

PRESENTED TO
Capital Regional District

DECEMBER 19, 2022
ISSUED FOR USE
FILE: 704-SWM.PLAN03248-01

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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Capital Regional District (CRD) to undertake the 2022 waste composition study to determine the characteristics of municipal solid waste disposed at Hartland Landfill. The study was undertaken from September 5 to September 22, 2022 (inclusive).

The CRD is a regional entity that consists of 13 member municipalities and three electoral areas, covering an area of 2,341 square kilometres and servicing more than 425,000 citizens. In the regional district, waste diversion and disposal services and programs continue to evolve with the current recycling markets, changes in the provincial regulations, and community needs which are reflected in the current landfill bans (e.g., materials such as drywall, cardboard, large appliances, tires, scrap metal, fill, aggregate, concrete, asphalt, rubble and clean soil, paper fibres, yard and garden waste, extended producer responsibility materials, and kitchen food scraps).

This study allows the CRD to determine where resources should be directed in the future to achieve their waste diversion goals as per their updated 2021 Solid Waste Management Plan.

This study collected sector-specific data for the following sectors:

- Single-family (SF);
- Multi-family (MF);
- Industrial, Commercial, and Institutional (ICI);
- Public Drop Off (DO); and
- Construction and Demolition (C&D).

Waste Composition Results

A total of 82 garbage samples were characterized for this study. Waste materials were classified into 14 primary categories, which were further broken down into 94 secondary categories. Samples were characterized by manual sorting and/or visual estimation.

Table E-1 presents the composition from each sector's garbage stream, as well as the overall composition. The overall waste composition is a weighted average that was calculated based on the relative proportions of waste disposed for each sector. The diversion potential of materials from each sector was calculated based on the theoretical percentage of materials that could be diverted through composting programs, recycling programs, or depots.

Table E-2 summarizes the diversion potential for each sector as well as the overall diversion potential.

Table E-1: Waste Composition Results by Sector

Primary Category	Waste Composition (%)					
	SF	MF	ICI	DO	C&D	Overall
Paper and Paperboard	17.5%	20.1%	18.7%	0.9%	2.3%	14.2%
Glass	2.5%	3.1%	1.2%	1.2%	0.3%	1.6%
Metals	3.2%	3.6%	3.7%	1.1%	1.4%	3.0%
Plastics	17.5%	15.0%	15.5%	2.8%	3.3%	12.6%
Organics	25.1%	23.1%	20.3%	0.6%	1.2%	16.7%
Wood and Wood Products	1.2%	2.3%	15.2%	45.6%	48.9%	18.9%
C&D (non-wood)	2.6%	3.6%	7.2%	21.1%	38.5%	13.3%
Textiles	8.5%	7.5%	4.4%	1.1%	1.6%	5.1%
Tires	0.9%	5.8%	1.4%	0.0%	0.0%	1.5%
Bulky Objects	0.1%	0.0%	0.4%	10.1%	0.8%	0.7%
Household Hygiene	14.2%	10.7%	5.5%	0.3%	0.0%	6.8%
Hazardous Wastes	3.3%	2.3%	1.2%	0.3%	0.4%	1.6%
Electronics	1.5%	1.6%	1.4%	0.3%	0.0%	1.1%
Other	1.9%	1.3%	3.9%	14.6%	1.3%	2.9%

Table E-2: Diversion Potential by Sector

Primary Category	Diversion Potential					
	SF	MF	ICI	DO	C&D	Overall
Compost/Organics	34%	33%	27%	1%	1%	23%
Recycling	10%	12%	12%	1%	2%	9%
Depot/Drop Off	18%	19%	14%	15%	11%	15%
Garbage	38%	36%	47%	84%	86%	53%

Six types of plastic Single-Use items (SUIs) were identified in the SF, MF, and ICI waste samples. The types of SUIs were weighed and individually counted. SUIs comprised of 1% to 2% by weight and between 83 to 249 items per 100 kg sample. In general, the number and weight of SUIs in the SF and MF streams are less than in the ICI stream. However, the number of SUIs varied between each sample.

Waste Generation Per Capita and Historical Comparisons

Based on the reported waste disposal tonnage in 2021 (172,886 tonnes) and estimated population (432,062), the 2021 waste generation rate was calculated to be 400 kg/capita/year. Using the waste composition data, the amount of waste generated in 2021 was estimated to be 76 kg/capita of wood and wood products, followed by 67 kg of organics, 57 kg of paper and paperboard, 53 kg of non-wood C&D material, and 50 kg of plastics.

The CRD commissions a waste composition study approximately every five years to determine the sources and composition (by weight) of municipal solid waste disposed at the regional district's landfill(s). Previous studies were completed in 1990, 1996, 2001, 2004, 2009/2010, and 2016. Figure E-1 shows a comparison of the waste generation rates from 2001 to 2022.

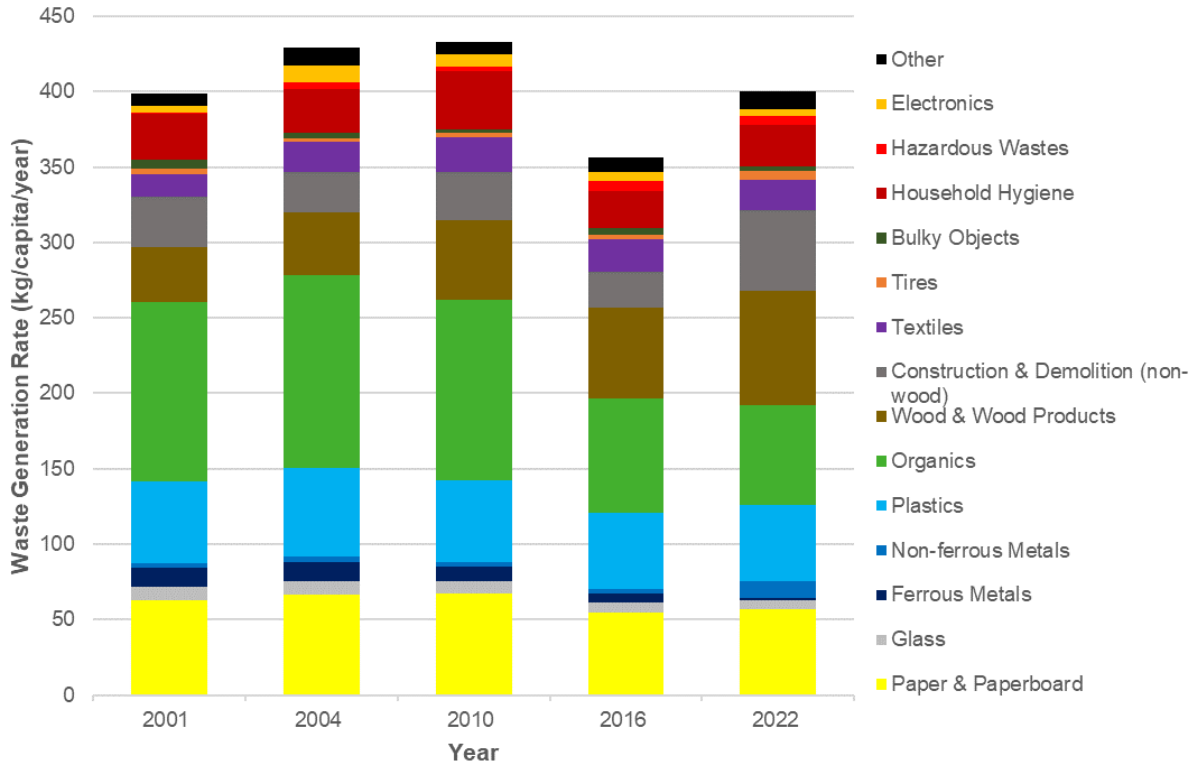

Figure E-1: Comparison of Historic Waste Generation Rates Per Capita

Trends observed in the waste generation rates per capita include:

- From 2016 to 2022, C&D materials (non-wood) in the waste composition increased by 29 kg/capita (6.6%) and wood and wood products increased by 15 kg/capita (1.9%). This could be indicative of the real estate market in the early part of 2022. The closure of Highwest Landfill in 2021 may have also led to an increase in the amount of C&D materials received at Hartland Landfill.
- From 2016 to 2022, organics in the waste composition decreased by 8 kg/capita (4.4%). This change is likely due to the implementation and uptake of organics diversion programs in the region. This is a continuation of the trend that was observed from 2010 to 2016, where the percentage of organics in the waste composition decreased by 6.6%.
- The total amount of all other materials is relatively consistent comparted to previous years and is within the expected variation for the results of the study from year to year.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
C&D	Construction and Demolition
CRD	Capital Regional District
DO	Public Drop Off
EPR	Extended Producer Responsibility
ICI	Industrial, Commercial, and Institutional
MF	Multi-Family
SF	Single-Family
SUI	Single-Use Item
Tetra Tech	Tetra Tech Canada Inc.

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Capital Regional District and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Capital Regional District, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

NOTE TO THE READER

The samples collected and audited for this study are “snapshots” in time, meaning the reported quantities are estimates and only represent the conditions for the period of time in which they were collected. Seasonal and annual variability, weather, and other factors can affect the amount and composition of waste and recyclables generated by the various sectors at any given time. Even with combined educational, regulatory and financial initiatives the reader should not assume that it is necessarily easy, practical, or economical to recover a substantial portion of a disposed material from a mixed waste stream or at its source.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Capital Regional District (CRD) to undertake the 2022 waste composition study to determine the characteristics of municipal solid waste disposed at Hartland Landfill.

1.1 Scope of Work

The 2022 waste composition study establishes current data to help the region measure progress on its four goals in the updated 2021 Solid Waste Management Plan, these goals include:

1. Surpassing the provincial per capita waste disposal target of 350 kg/person/year and aspiring to achieve a disposal rate of 125 kg/person/year;
2. Extending the life of Hartland Landfill to the year of 2100;
3. Informing citizens that participate effectively in proper waste management practices; and
4. Demonstrating that the CRD's solid waste services are financially sustainable.

The objectives of the study included the following:

- Collect sector specific data for the following:
  - **Single-family (SF),** typically curbside collected waste streams from SF households, row houses, townhouses, and duplexes.
  - **Multi-family (MF)**, typically waste from MF buildings. Waste from these sources is typically collected by private sector service providers from communal disposal receptacles, such as dumpsters.
  - **Industrial, Commercial, and Institutional (ICI)**, typically waste from light industrial, commercial, and institutional sources. Waste from these sources is typically collected by private sector service providers from dumpsters and compactors.
  - **Public Drop Off (DO),** waste from residents and/or small businesses that would self-haul and drop off materials that are not typically collected from the curbside collection program. The waste material is commonly deposited into large roll-off bins and aggregated together.
  - **Construction and Demolition (C&D),** materials and waste from construction, renovation, and demolition activities and includes waste generated from new construction, renovation, and demolition projects.
- Compare the 2022 data against data from the previous waste composition studies;
- Establish a baseline for new program initiatives;
- Identify materials that may be targeted for potential new program initiatives;
- Provide data for Single-Use items (SUI) and Extended Producer Responsibility (EPR) items in the waste stream; and
- Provide data to inform future strategies or initiatives.

The sorting event for Fall 2022 was undertaken from September 5 to 22, 2022 (inclusive). A sampling plan was developed in conjunction with CRD staff. Efforts were made to obtain samples from a representative sample in the regional district. The total number of samples collected and characterized during this sorting event is summarized by sector in Table 1-1.

Table 1-1: Number of Samples Characterized by Sector

Sector	Number of Samples	
	2016	2022
SF	27	20
MF	10	10
ICI	12	22
DO	38	10
C&D	20	20
Total	**107**	**82**

1.2 Background

The CRD is a regional entity that consists of 13 member municipalities and three electoral areas, covering an area of 2,341 square kilometres and servicing more than 425,000 citizens. There were two landfills in the region, Hartland Landfill and Highwest Landfill. Highwest Landfill closed in August 2021. In the regional district, waste diversion and disposal services and policies continue to evolve with the current recycling markets, changes in the provincial regulations, and community needs which are reflected in the current landfill bans (for materials such as drywall, cardboard, large appliances, tires, scrap metal, fill, aggregate, concrete, asphalt, rubble and clean soil, paper fibres, yard, and garden, EPR materials, and kitchen scraps).

The CRD commissions a waste composition study approximately every five years to determine the sources and composition (by weight) of municipal solid waste disposed at the regional district's landfill(s). Previous studies were completed in 1990, 1996, 2001, 2004, 2009/2010, and 2016. Due to the likely impact of COVID-19 on the composition and amount of waste generated in the region, the study that was scheduled for 2021 was delayed by a year to obtain a more accurate representation of typical waste disposal trends. Compared to previous studies, the current study has added analyses of the estimated diversion potential for each sector. The diversion potential of materials in the waste stream is calculated based on the percentage of materials that can be diverted from the landfill using programs such as composting, recycling programs, and drop off at depots.

The 2022 solid waste stream composition study will enable the CRD to determine where resources should be directed in the future to achieve their waste diversion goals as per their updated 2021 Solid Waste Management Plan.

2.0 METHODOLOGY

Sampling and sorting were conducted in accordance with the methodology set out in the Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada that was prepared by the Canadian Council of Ministers of the Environment.

Samples were collected and sorted by Tetra Tech staff who were trained on safety and waste sorting procedures. Personal protective equipment such as safety glasses, steel-toe boots, gloves, and hi-vis vests were used by all staff as per Tetra Tech's Health and Safety Plan. Tailgate meetings were conducted daily at the start of each day to discuss safety concerns including how to handle material hazards such as sharps and hazardous materials, safe lifting practices, and working around large moving equipment. Prior to the start of the sorting event, all Tetra Tech sorting staff completed a site-specific safety orientation given by CRD staff.

2.1 Sample Collection Methodology

The following describes the collection approach for the various waste streams characterized. Tetra Tech's field lead worked closely with CRD staff to identify loads for sampling that were representative of each waste sector. As selected sampling loads arrived at Hartland Landfill, Tetra Tech's field lead would communicate with CRD staff to ensure the target load was emptied at the designated area for sampling. For each load, sample information, including origin of waste and photograph of sample(s), were collected.

2.1.1 Single-Family

SF residential curbside collection loads were selected with input from CRD staff. Efforts were made to select trucks from different municipalities and electoral areas in the Capital Region. Trucks were redirected to a designated tip face area (Figure 2-1) where the entire load was tipped (as typical operations). Tetra Tech staff would collect a sample that is approximately 100 kg. The collected material would be taken to a designated sorting area where the Tetra Tech sorting team would sort the sample into its respective categories and weigh the categories.

Figure 2-1: SF Load Tipped on Designated Tip Face Area

2.1.2 Multi-Family

MF loads were identified by Tetra Tech and CRD staff and were directed to unload their contents at the designated tip face area (Figure 2-2). At the area, trucks would tip their entire load (as typical operations). Tetra Tech staff would then collect a sample that consists of approximately 100 kg and transport that material to the designated sorting area where the sorting team would sort the sample into its respective categories and weigh the categories.

Figure 2-2: MF Load Tipped on Designated Tip Face Area

2.1.3 Industrial, Commercial, and Institutional

ICI loads were delivered in front-load trucks. Target loads were identified by Tetra Tech and CRD staff and then were directed to unload their contents at the designated tip face area (Figure 2-3). At the area, trucks would tip their entire load (as typical operations). Tetra Tech field lead would determine if the load would be visually assessed or hand sorted. If the field lead determined the load would be hand sorted, staff would then collect a sample that consists of approximately 100 kg and transport that material to the designated sorting area. At the sorting area, the Tetra Tech sorting team would sort the sample into its respective categories and weigh the categories. If the load would be visually estimated, Tetra Tech staff would characterize the contents from the truck using a volume-based visual estimate procedure.

Figure 2-3: ICI Load Tipped on Designated Tip Face Area

2.1.4 Public Drop Off

Residents can dispose of their bulky and excess materials into designated roll-off bins (Figure 2-4) located at the public drop off area at Hartland Landfill. CRD staff would identify incoming public drop off bins and the driver would tip the entire load (as typical operations) at the designated sorting area. Tetra Tech staff would characterize the contents in the roll-off bins using a volume-based visual estimate procedure.

Figure 2-4: Public Drop Off Load Tipped on Designated Tip Face Area

2.1.5 C&D Loads

Commercial and residential C&D loads identified as C&D materials were directed by CRD staff to unload their contents at the designated tip face area (Figure 2-5). At the area, trucks would tip their entire load (as typical operations). Tetra Tech staff conducted visual estimates of the entire load to identify the composition of each load.

Figure 2-5: C&D Load Tipped on Designated Tip Face Area

2.2 Waste Characterization Approach

An initial visual analysis was conducted on each load to determine which of the following methods would be used:

- **Hand Sort (Manual Sort)** – A random sample of about 100 kg was pulled from the load and sorted by hand. This method was used for loads that were roughly two-thirds or more, composed of bagged garbage.
- **Visual Estimation** – The entire load was visually estimated for loads that were composed of one-third or less of bagged garbage.

2.2.1 Hand Sort

As selected SF, MF, and ICI loads arrived at Hartland Landfill, Tetra Tech's field lead would communicate directly with the driver to determine the origin of the material. Once selected for the study, landfill staff would direct the driver to empty their load at the designated location on the landfill face for sample collection. The skid steer operator would then collect one loader bucket from the ends and middle of the load (approximately 200 kg to 300 kg in weight) and delivered it to the sample collection area.

The field team would collect a waste sample that was approximately 100 kg using a rough grid pattern to minimize potential bias. Tetra Tech field staff then transported collected samples to be hand sorted at the designated sorting area (Figure 2-6). Each categorized item was placed into respective bins. The contents of each bin were then weighed and recorded to determine the weight for each secondary category. In addition, six types of plastic SUIs were also individually counted and recorded.

Figure 2-6: Field Staff Hand Sorting a Sample at the Designated Sorting Area

2.2.2 Visual Estimates

For ICI, C&D, and DO loads that entered Hartland Landfill, the entire load would first be visually assessed. When the amount of bagged garbage was less than 30% of the load, the samples were visually estimated and characterized by two Tetra Tech field staff who walked around the load (independently) to visually estimate composition by volume, first by primary categories, then by secondary categories. Once each staff member completed their estimates, they would compare and average out their results. Results were then recorded electronically.

2.3 Material Categories

A comprehensive list of material categories along with their descriptions is included in Appendix B. These categories were used in both the visual estimated and hand sorted materials. For samples where visual estimates were conducted, the category densities used to convert the volume-based percentages into weight-based percentages is also included in Appendix B. During the sorting event, waste materials were classified into 14 primary categories, which were further broken down into 94 secondary categories. These sorting categories were selected and approved by CRD staff.

The 14 primary categories include the following:

- Paper and Paperboard
- Plastics
- C&D Material (non-wood)
- Bulky Objects
- Electronics
- Glass
- Organic Waste
- Textiles
- Household Hygiene
- Other
- Metal
- Wood and Wood Products
- Tires and Rubber Products
- Hazardous Waste

3.0 WASTE COMPOSITION RESULTS

The following summarizes the waste composition results for the various sectors investigated. Results are presented by primary category. Primary category percentages were calculated by aggregating all sample data for each sector. An average percentage by weight was determined for each sector. Waste composition results for all sample results by material categories are presented in Appendix C. Selected photographs of the samples are shown in Appendix D.

For samples where visual estimates were conducted, the volume-based percentages were converted into weight-based percentages using specific densities for material categories (Appendix B lists the specific densities for each material category).

Diversion potential of materials in the waste stream were divided into four general categories: (1) organics/compostables (collected in the kitchen scraps and yard/garden waste programs); (2) recyclables (typical recyclables, such as cardboard and newsprint that can be collected in recycling programs); (3) depot/drop off materials (divertible materials that can be dropped off at a depot, donation, or registered collection site or a transfer station); and (4) garbage (residuals that are landfilled/disposed). Classifications for what can be diverted through composting, recycling, or depot/drop off are included in Appendix A. The diversion potential is calculated based on an ideal scenario where residents and/or businesses are correctly utilizing all waste diversion options that were available at the time of the study. This is the theoretical diversion limit of what is possible given the current waste composition. This is a hypothetical analysis and does not consider different diversion potentials for specific materials and seasonal differences in compositions for different sectors.

It should be noted that the diversion potential is calculated based on existing current waste diversion programs. As the CRD's waste system evolves and matures, new processing and diversion opportunities will emerge and thereby the diversion potential will likely increase.

3.1 Overall Waste Composition

The following summarizes the overall waste composition of materials disposed at Hartland Landfill and diversion potential based on the overall waste composition. This overall waste composition was calculated based on the total tonnage disposed at Hartland Landfill in 2021 (172,886 tonnes) and relative proportions of waste disposed for each sector. Table 3-1 summarizes the estimated amount of waste received at Hartland Landfill in 2021.

Table 3-1: Amount of Waste Received at Hartland Landfill in 2021

Sector	Estimated Amount (tonnes)	Proportion of Waste Disposed
SF	41,838	24.2%
MF	23,167	13.4%
ICI	61,893	35.8%
DO	6,743	3.9%
C&D	39,245	22.7%
Total	**172,886**	**100.0%**

3.1.1 Overall Waste Composition Results

Figure 3-1 represents the average waste composition of the garbage stream from all sectors received at Hartland Landfill in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents and businesses at this time of the year.

The garbage stream was primarily composed of wood and wood products (18.9%), organic waste (16.7%), paper and paperboard (14.2%), C&D materials – non-wood (13.3%), and plastics (12.6%). These five primary categories represent 75.7% of the waste stream.

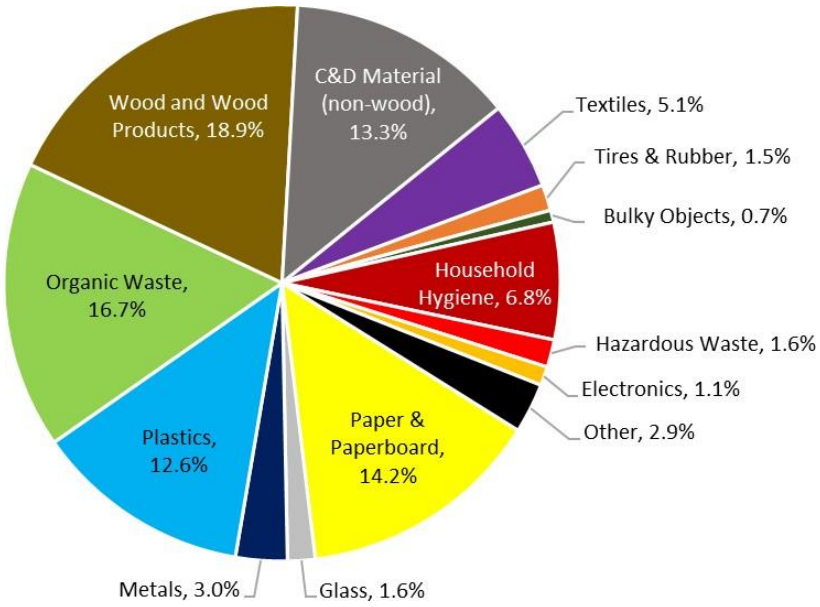


Figure 3-1: Composition of the Overall Garbage Stream

Wood and wood products were mostly composed of plywood/particle board (6.5%), treated wood (4.9%), and painted wood (2.2%).

The largest components of organic waste were avoidable or donatable food waste (10.6%), followed by yard and garden waste (3.1%), and unavoidable food waste (2.8%). Yard and garden waste includes grass, leaves, and branches that are less than 3 inches in diameter.

The largest components of paper products were compostable soiled paper (5.8%), followed by non-recyclable paper (2.6%), printed paper (1.8%), and paper packaging – dry goods (1.7%).

For non-wood C&D materials, the largest components were asphalt shingles (7.0%), flooring – carpet and underlay (2.1%), and other C&D waste (1.8%). Other C&D waste includes ceiling tiles, pipes, toilets, and doors.

Plastic was mostly composed of durable plastic products (3.0%), other flexible plastic packaging (2.7%), film product (2.0%), rigid plastic containers (1.7%), and film packaging – other bags and overwrap (1.6%).

3.1.2 Overall Diversion Potential

Figure 3-2 summarizes the diversion potential of the overall garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, other diversion programs in the regional district, such as C&D recycling (e.g., drywall, concrete, asphalt) or donation of reusable items (e.g., clothing, tools, furniture), and product stewardship programs. The product stewardship programs are diversion options available in the regional district, including materials accepted at Recycle BC depots (e.g., recyclable plastic film, expanded polystyrene) and materials managed by EPR programs (e.g., Encorp Return-It for beverage containers, Product Care, Call2Recycle).

As shown on Figure 3-2, the total diversion potential is 47% and that consists of 23% compost/organics, 15% depot/drop off recycling material, and 9% recycling.

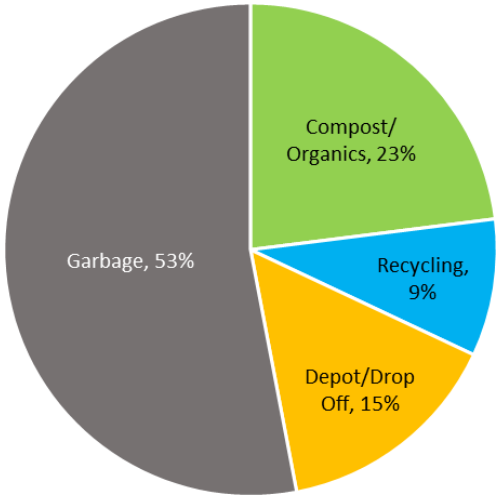


Figure 3-2: Diversion Potential of the Overall Garbage Stream

The main materials that could be diverted in compost/organics are food waste – avoidable or donatable (11%) and compostable soiled paper (6%).

The main materials that could be diverted through depot/drop off are plastics that are only accepted at depots (5%). Plastics accepted only at depots include film packaging – other bags and overwrap, other flexible plastic packaging, and rigid plastic containers – expanded polystyrene.

The main materials that could be diverted in recycling are printed paper (2%), paper packaging – dry goods (2%), rigid plastic containers (2%), and corrugated cardboard (1%).

3.2 Single-Family

The following summarizes the waste composition results and diversion potential for SF garbage. Samples were obtained from municipalities in the regional district that offer municipal garbage collection (e.g., Oak Bay, Saanich, Sidney, Victoria, View Royal), as well as municipalities and electoral areas that rely on private service collection (e.g., Central Saanich, Colwood, Langford, North Saanich, Pender Island, Sooke, Salt Spring Island).

3.2.1 Single-Family Waste Composition Results

Figure 3-3 represents the average waste composition of the garbage stream from SF households in the regional district in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents at this time of the year.

SF garbage was primarily composed of organic waste (25.1%), paper products (17.5%), plastic products (17.5%), household hygiene (14.2%), and textiles (8.5%). These five primary categories represent 82.8% of the waste stream.

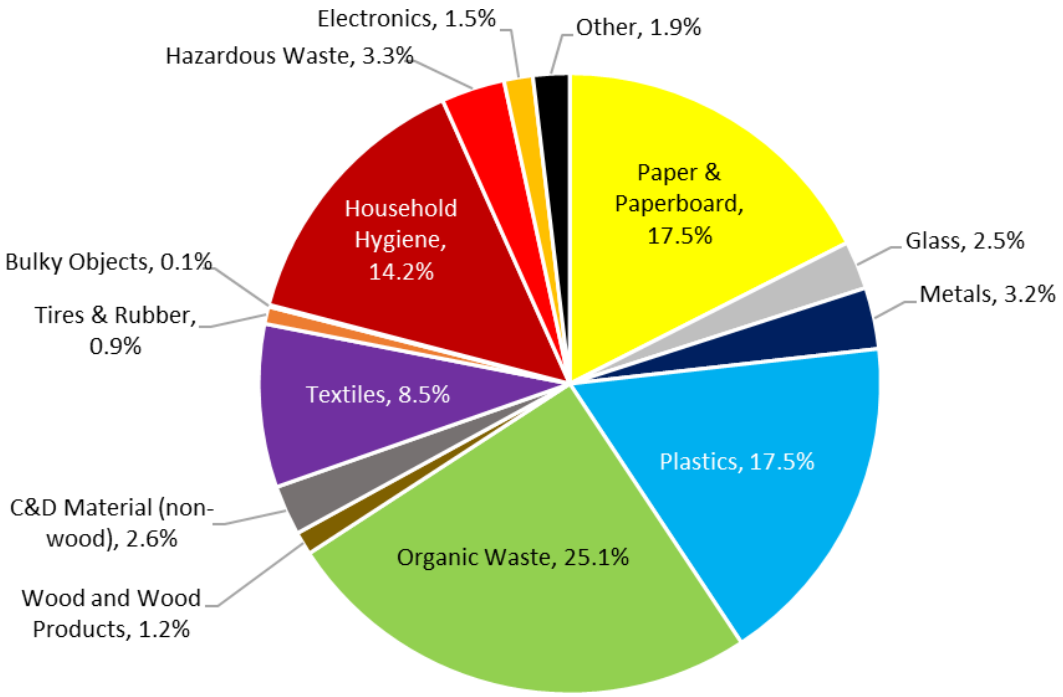


Figure 3-3: Composition of the SF Garbage Stream

The largest components of organic waste were avoidable or donatable food waste (17.4%), followed by unavoidable food waste (5.1%), and yard and garden waste (2.1%). Yard and garden waste includes grass, leaves, and branches that are less than 3 inches in diameter.

The largest components of paper products were food soiled paper (8.8%), followed by non-recyclable paper (3.1%), and paper packaging – dry goods (2.6%).

Plastic was mostly composed of other flexible plastic packaging (5.2%), durable plastic products (2.9%), film product (2.4%), film packaging – other bags and overwrap (2.4%).

For household hygiene, the largest components were disposable diapers (6.4%) and cat litter (4.6%). Other household hygiene typically consists of items such as hygiene products and animal feces.

Textiles consisted of other textiles such as towels, fabric scraps, etc. (4.8%), clothing (3%), and footwear (0.7%).

3.2.2 Single-Family Diversion Potential

Figure 3-4 summarizes the diversion potential in the SF garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, diversion at depots and drop off sites, other diversion programs in the regional district, such as C&D recycling or donation of reusable items, and product stewardship programs. The product stewardship programs are diversion options available in the regional district, including materials accepted at Recycle BC depots and materials managed by EPR programs.

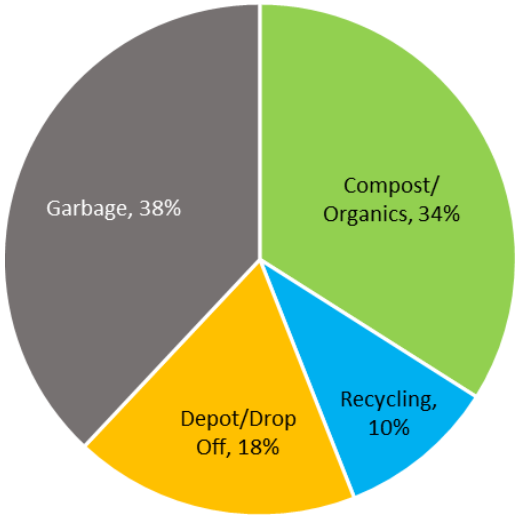


Figure 3-4: Diversion Potential of the SF Garbage Stream

As shown on Figure 3-4, the total diversion potential is 62% and consists of 34% compost/organics, 18% depot/drop off, and 10% recycling materials.

The main materials that could be diverted in compost/organics programs are food waste – avoidable or donatable (17%), compostable soiled paper (9%), and food waste – unavoidable (5%).

The main materials that could be diverted through depot/drop off are primarily plastics that are only accepted at depots (8%).

The materials that could be diverted better in the recycling programs are paper packaging – dry goods (3%) and rigid plastic containers (2%).

3.3 Multi-Family

The following summarizes the waste composition results and diversion potential for MF garbage.

3.3.1 Multi-Family Waste Composition Results

Figure 3-5 represents the average waste composition of the garbage stream from MF households in the regional district in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents at this time of the year.

MF garbage was primarily composed of organic waste (23.1%), paper products (20.1%), plastic products (15.0%), household hygiene (10.7%), textiles (7.5%), and tires and rubber (5.8%). These six primary categories represent 82.2% of the waste stream.

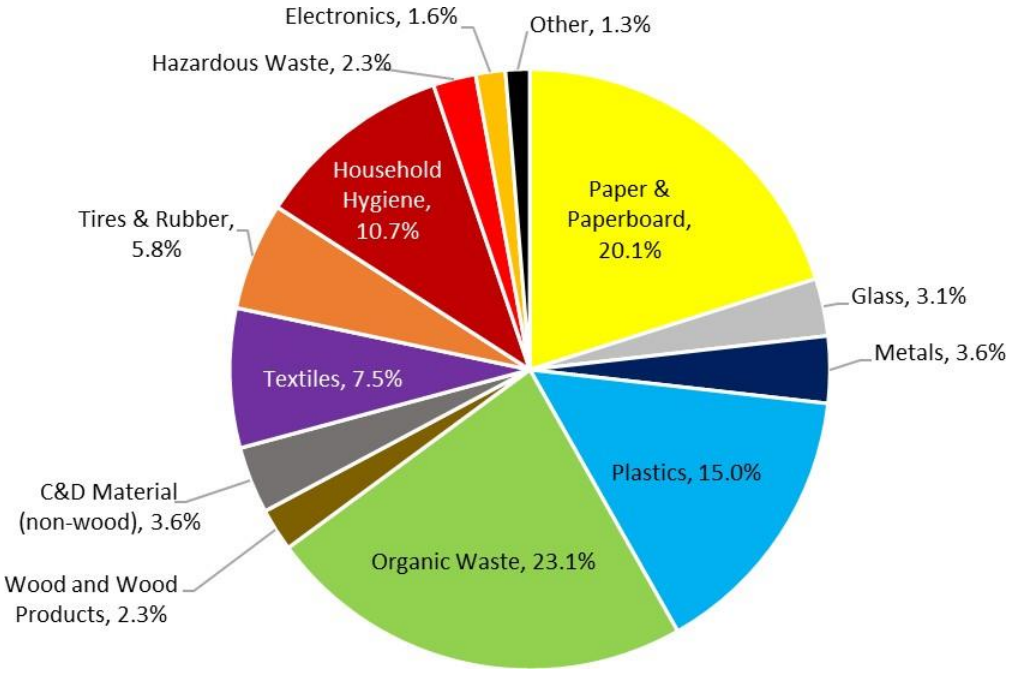


Figure 3-5: Composition of the MF Garbage Stream

For organic waste, the largest components were avoidable or donatable food waste (14.2%), unavoidable food waste (5.5%), and yard and garden waste (3.1%). Yard and garden waste includes cut flowers, yard trimmings and pine needles.

The largest component for paper and paperboard products were compostable food soiled paper (9.6%) and paper packaging – dry goods (3.0%).

Plastic was mostly composed of other flexible plastic packaging (3.3%), durable plastic products (3.1%), and film product (2.7%).

Household hygiene was mostly composed of disposal diapers (3.7%) and cat litter (3.6%).

Textiles consisted of other textiles such as towels, fabric scraps, bags etc. (4.2%) and clothing (2.7%).

Tires and rubber products consisted of vehicle tires (3.7%) and other rubber products (2.1%).

3.3.2 Multi-Family Diversion Potential

Figure 3-6 summarizes the diversion potential in the MF garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, diversion at depots and drop off sites, other diversion programs in the regional district, such as C&D recycling or donation of reusable items, and product stewardship programs. The product stewardship programs are diversion options available in the regional district, including materials accepted at Recycle BC depots and materials managed by EPR programs.

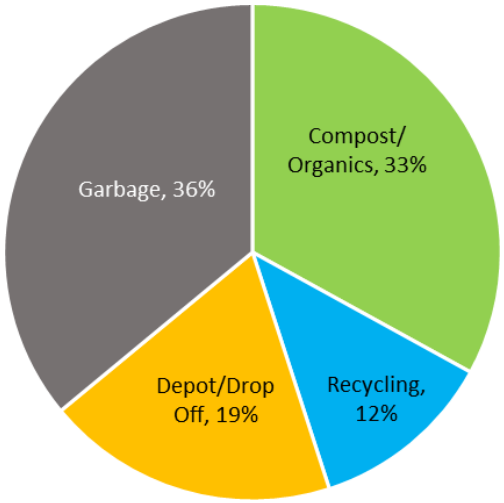


Figure 3-6: Diversion Potential of the MF garbage stream

As shown on Figure 3-6, the total diversion potential is 64% and consists of 33% compost/organics, 19% depot/drop off, and 12% recycling.

The main materials that could be diverted in compost/organics programs are food waste – avoidable or donatable (14%), compostable food soiled paper (10%), and food waste – unavoidable (6%).

The main materials that could be diverted through depot/drop off diversion programs are vehicle tires (4%) and plastics that are only accepted at depots (8%).

The main materials that could be diverted in recycling are paper packaging – dry goods (3%), printed paper (2%), and rigid plastic containers (2%).

3.4 Industrial, Commercial, and Institutional

The following summarizes the waste composition results and diversion potential for the ICI sector.

3.4.1 ICI Waste Composition Results

Figure 3-7 represents the average waste composition of the garbage stream from the ICI sector in the regional district in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by commercial and institutional organizations this time of the year.

ICI garbage was primarily composed of organic waste (20.3%), paper products (18.7%), plastic products (15.5%), wood and wood products (15.2%), and C&D materials (7.2%). These five primary categories represent 76.9% of the waste stream.

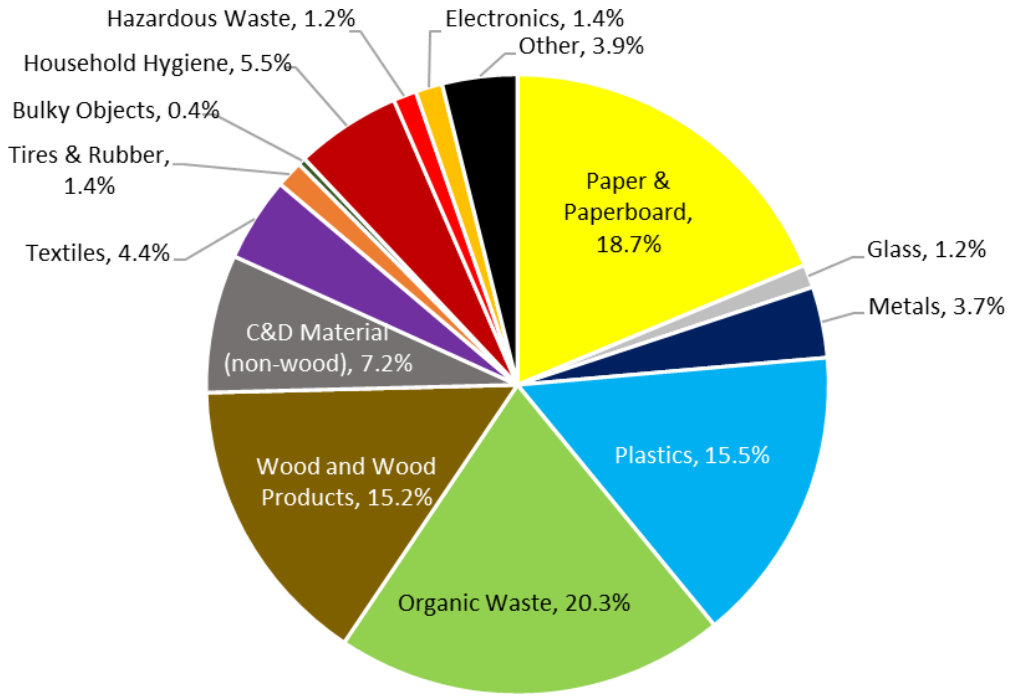


Figure 3-7: Composition of the ICI Garbage Stream

For organic waste, the largest components were avoidable or donatable food waste (12.4%) and yard and garden waste (5.4%).

The largest components of paper and paperboard were compostable soiled paper (6.7%), followed by non-recyclable paper (4.0%), and printed paper (2.4%). Examples of non-recyclable paper are waxed cardboard, waxed paper from bakery and butcher, and laminated signage.

Plastic was mostly composed of durable plastic products (3.2%), other flexible plastic packaging (2.9%), film product (2.7%), rigid plastic containers (2.2%), and film packaging – other bags and overwrap (2.0%).

Wood and wood products mostly consisted of plywood and particle board (6.1%), wood furniture (3.9%), and pallets and skids (2.7%).

Non-wood C&D materials included flooring – carpet and underlay (4.6%), flooring – tile (0.7%), and drywall (0.6%).

3.4.2 ICI Diversion Potential

Figure 3-8 illustrates the diversion potential in the ICI garbage stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, diversion at depots and drop off sites, other diversion programs in the regional district, such as C&D recycling or donation of reusable items, and product stewardship programs. The product stewardship programs are diversion options available in the regional district, including materials accepted at Recycle BC depots and materials managed by EPR programs. It should be noted that some EPR programs do not apply to the ICI sector. The diversion potential for the ICI sector has been calculated in the same way as for other sectors to allow for comparisons and to show the theoretical diversion potential of this waste stream.

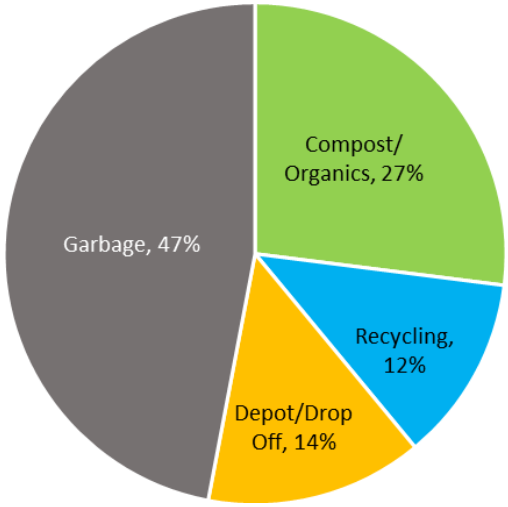


Figure 3-8: Diversion Potential of the ICI Garbage Stream

As shown on Figure 3-8, the total diversion potential for the ICI waste stream is 53% and consists of 27% compost/organics material, 14% depot/drop off, and 12% recycling.

The main materials that could be diverted in compost/organics are food waste – avoidable or donatable (12%), compostable food soiled paper (7%), and yard and garden waste (5%).

The main materials that could be diverted through depot/drop off include pallets/skids (3%) and plastics that are accepted at depots – which include other flexible plastic packaging (3%), film packaging – other bags and overwrap (2%), and plastic deposit beverage containers (1%). It should be noted that the soft plastics such as other flexible plastic packaging and film packaging are not currently accepted from ICI sources.

The main materials that could be diverted in typical recycling programs are various paper materials such as corrugated cardboard, printed paper, and paper packaging (8%) and rigid plastic containers (2%).

3.5 Public Drop Off

The following summarizes the waste composition results and diversion potential for public drop off materials.

3.5.1 Public Drop Off Waste Composition Results

Figure 3-9 represents the average waste composition of the garbage stream from public drop off in the regional district in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by residents and/or small businesses at this time of the year.

Public drop off garbage was primarily composed of wood and wood products (45.6%), construction and demolition materials (21.1%), other (14.6%), and bulky objects (10.1%). These four primary categories represent 91.4% of the waste stream. The waste stream appears to be indicative of small-scale C&D projects.

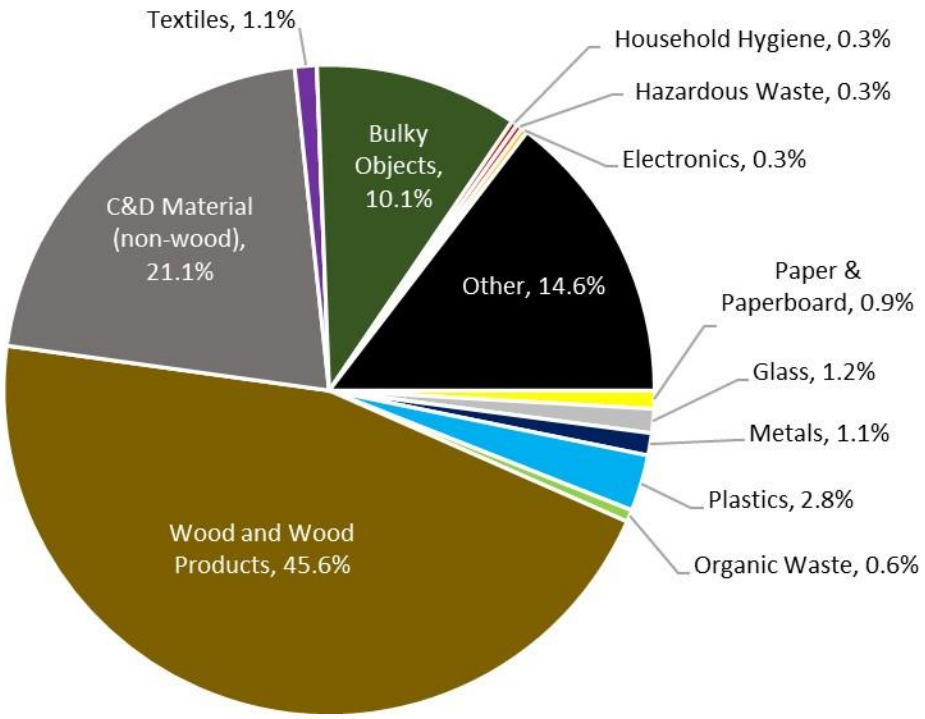


Figure 3-9: Composition of the Public Drop Off Garbage Stream

For wood and wood products, the largest components were painted wood (10.5%), treated wood (9.4%), plywood/particle board (7.2%), wood furniture (7.0%), clean wood (6.5%), and pallets/skids (5.1%).

The largest components for non-wood C&D material were asphalt shingles (11.1%) and other C&D waste (6.2%), such as ceiling tiles, toilets, and doors.

The other primary category was composed solely of bagged garbage which were not sorted due to safety considerations.

Bulky objects were found to be mainly furniture (9.2%).

3.5.2 Public Drop Off Diversion Potential

Figure 3-10 summarizes the diversion potential for the garbage stream from public drop off. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, other diversion programs in the regional district, such as C&D recycling (e.g., drywall, concrete, asphalt, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and EPR programs.

As shown on Figure 3-10, the total diversion potential is 16% and consists of 15% depot/drop off, 1% recycling, and less than 1% compost/organics.

The main materials that could be diverted through depot/drop off include clean wood (6%) and pallets/skids (5%).

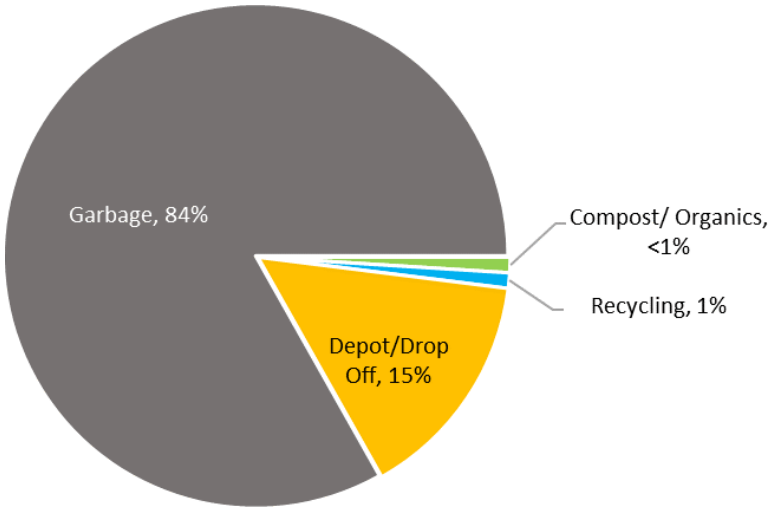


Figure 3-10: Diversion Potential of the Public Drop Off Garbage Stream

3.6 Construction and Demolition

The following summarizes the waste composition results and diversion potential for the C&D sector.

3.6.1 C&D Waste Composition Results

Figure 3-11 represents the average waste composition of the garbage stream from C&D in the regional district in September 2022. This is a snapshot of the types and relative quantities of materials that were discarded by this sector at this time of the year.

C&D waste was primarily composed of wood and wood products (48.9%) and C&D materials (38.5%). These two primary categories represent 87.4% of the waste stream.

The largest components for wood and wood products were treated wood (16.8%). and plywood/particle board (16.5%)

C&D materials was mostly composed of asphalt shingles (28.0%) and other C&D waste (5.1%), such as PVC pipes, insulation, vapour guard paper, and tar paper.

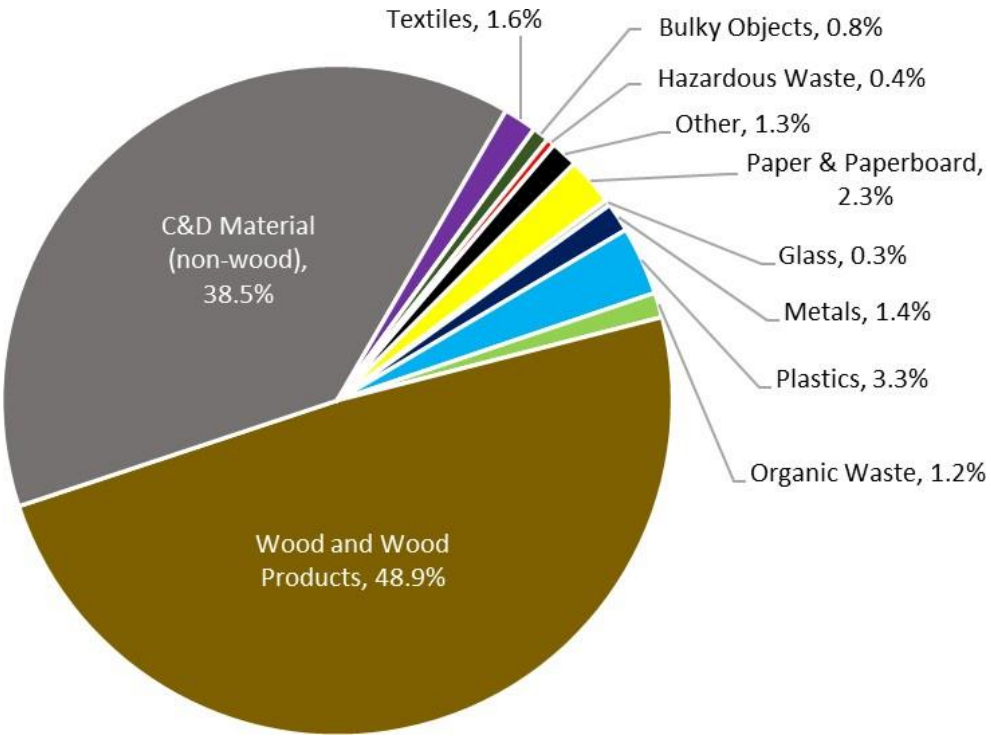


Figure 3-11: Composition of the C&D Garbage Stream

3.6.2 C&D Diversion Potential

Figure 3-12 summarizes the diversion potential in the C&D waste stream. The diversion potential represents the percentage of materials that could be diverted through composting, recycling, other diversion programs in the regional district, such as C&D recycling (e.g., drywall, concrete, asphalt, insulation, and carpet) or donation of reusable items (e.g., clothing, tools, furniture), and EPR programs.

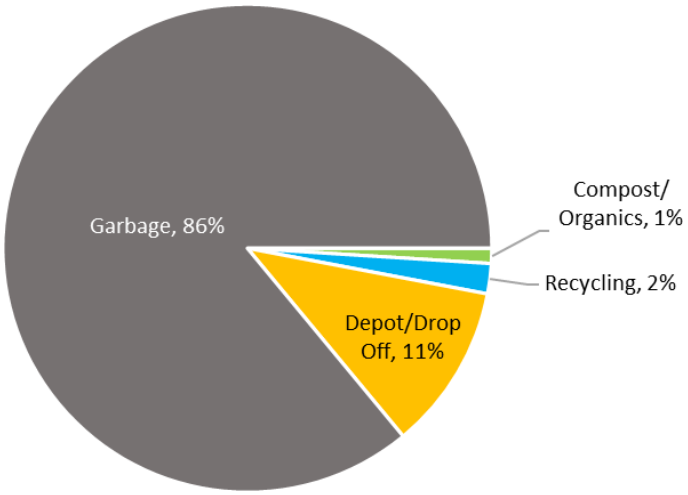


Figure 3-12: Diversion Potential of the C&D Garbage Stream

As shown on Figure 3-12, the total diversion potential is 14% and consists of 11% depot/drop off materials, 2% recycling material, and 1% compost/organics.

The main materials that could be diverted through depot/drop off include clean wood (6%) and pallets/skids (2%).

4.0 WASTE DISPOSAL PER CAPITA

In 2021, CRD reported 172,886 tonnes of waste was landfilled. The population in the regional district (according to BC Stats) was 432,062.[1] Based on those statistics, the waste generation rate per capita and the waste disposal rate for each category were calculated and summarized in Table 4-1. For the calculations, the overall waste composition from the 2022 study was assumed to be similar to the composition of waste disposed in 2021 and used to estimate the per capita waste generation rates and waste disposal rate in 2021.

Based on the reported waste disposal tonnage in 2021 (172,886 tonnes) and estimated population (432,062), the 2021 waste generation rate was calculated to be 400 kg/capita/year. Using the waste composition data, the amount of waste generated in 2021 was estimated at 76 kg/capita of wood and wood products, followed by 67 kg of organics, 57 kg of paper and paperboard, 53 kg of non-wood C&D material, and 50 kg of plastics. These five primary categories represent 303 kg per capita per year (76%) of the estimated waste generation rate from all sectors.

Table 4-1: Overall Waste Composition Generation at Hartland Landfill

Primary Category	Overall Waste Composition		
	Composition (%)	2021 Estimated Waste Generation (kg/capita/year)	2021 Estimated Waste Disposal Rate (tonnes/year to landfill)
Paper and Paperboard	14.2%	57	24,547
Glass	1.6%	6	2,766
Ferrous Metals	0.3%	1	519
Non-ferrous Metals	2.7%	11	4,667
Plastics	12.6%	50	21,781
Organics	16.7%	67	28,869
Wood and Wood Products	18.9%	76	32,672
C&D (non-wood)	13.3%	53	22,991
Textiles	5.1%	20	8,816
Tires	1.5%	6	2,593
Bulky Objects	0.7%	3	1,210
Household Hygiene	6.8%	27	11,755
Hazardous Wastes	1.6%	6	2,766
Electronics	1.1%	4	1,902
Other	2.9%	12	5,013
Total (Estimated) 2021		**400**	**172,886**

[1] https://bcstats.shinyapps.io/popApp/

5.0 COMPARISON TO PREVIOUS RESULTS

The following compares the composition and amount of materials disposed at Hartland Landfill to previous studies. Table 5-1 summarizes the estimated amount of waste received at Hartland Landfill in 2016 and 2021. The estimated population of the CRD was 378,232 in 2016 and 432,062 in 2021. The proportion of waste disposed by each sector remained relatively consistent between 2016 and 2022. Compared to 2016, the proportion of ICI waste in 2022 decreased by 5% while the proportion of C&D waste increased by 7%. The increase in C&D waste may be due to the closure of Highwest Landfill in 2021, which redirected more C&D waste to Hartland Landfill.

Table 5-1: Comparison of the Amount of Waste Received at Hartland Landfill in 2016 and 2021

Sector	2016		2021	
	Estimated Amount (tonnes)	Proportion of Waste Disposed	Estimated Amount (tonnes)	Proportion of Waste Disposed
SF	33,750	25%	41,838	24%
MF	17,550	13%	23,167	13%
ICI	55,350	41%	61,893	36%
DO	6,750	5%	6,743	4%
C&D	21,600	16%	39,245	23%
Total	**135,000**	**100%**	**172,886**	**100%**

A historical comparison of the waste composition results and calculated waste disposal per capita by primary material category from 2016 to 2022 are provided in the following tables and graphs. This information can be used to help evaluate how waste reduction and diversion programs are affecting the quantity and proportion of materials disposed at Hartland Landfill. Historical data was obtained from the previous waste composition reports and the historic data from 2001, 2004, 2010, and 2016 was reorganized to reflect the new category alignments used in the 2022 waste composition study.

Waste composition results are presented as the relative percentages of each material in the garbage, with all categories adding up to a total of 100%. Waste composition studies reveal one moment in time (a snapshot). One study does not directly indicate progress in reduction or re-use or recycling of materials. Comparison to repeated studies over several years using the same approach is used to determine the changing patterns or trends in the waste composition. Table 5-2 compares the overall composition from the 2009/2010 and 2016 studies to this study.

The most significant difference in the waste composition from 2016 to 2022, was an increase of 6.6% in C&D (non-wood) and a decrease of 4.4% in organics waste. Also of note was non-ferrous metals that went up by 2.0%. All other changes were +/- 2.0% or less. There have been some minor changes in categories for each study, and some items that would have been classified as other, are now separated into bulky objects.

Table 5-2: Comparison to Historic Waste Composition at Hartland Landfill

Primary Category	2009/2010[1]	2016	2022	Change (2016 to 2022)
	Weighted Average Composition (%)			
Paper and Paperboard	15.5%	15.4%	14.2%	-1.2%
Glass	1.9%	1.7%	1.6%	-0.1%
Ferrous Metals	2.3%	1.8%	0.3%	-1.5%
Non-ferrous Metals	0.6%	0.7%	2.7%	2.0%
Plastics	12.5%	14.3%	12.6%	-1.7%
Organics	27.7%	21.1%	16.7%	-4.4%
Wood and Wood Products	12.2%	17.0%	18.9%	1.9%
C&D (non-wood)	7.4%	6.7%	13.3%	6.6%
Textiles	5.3%	5.9%	5.1%	-0.8%
Tires	0.7%	0.8%	1.5%	0.7%
Bulky Objects	0.6%	1.3%	0.7%	-0.6%
Household Hygiene	8.9%	6.9%	6.8%	-0.1%
Hazardous Wastes	0.7%	1.8%	1.6%	-0.2%
Electronics	1.8%	1.8%	1.1%	-0.7%
Other	1.9%	2.7%	2.9%	0.2%

[1]The categories from the 2009/2010 waste composition study were reorganized and recalculated to allow for direct comparison with the 2016 and 2022 results

To further evaluate the change in the waste arriving at Hartland Landfill, the waste composition results were used to calculate the waste generation rates by primary material category and are outlined in Table 5-3. The annual waste generation rate is the total quantity of waste landfilled at Hartland Landfill each year. The analysis combining both the quantity and composition allows for detailed analysis of changes in the quantities of certain material categories that are being disposed over time and can be visually represented with bar charts showing both the changing composition and waste generation rate simultaneously (Figure 5-1).

Table 5-3: Comparison to Historic Waste Generation Rates at Hartland Landfill

Primary Category	Annual Waste Generation Rate (kg/capita)				
	2001[1]	2004[1]	2009/2010[1,2]	2016	2021
Paper and Paperboard	62	67	67	55	57
Glass	9	9	8	6	6
Ferrous Metals	13	12	10	6	1
Non-ferrous Metals	3	4	3	2	11
Plastics	54	59	54	51	51
Organics	119	128	120	75	67
Wood and Wood Products	37	41	53	61	76
C&D (non-wood)	33	27	32	24	53
Textiles	15	20	23	21	20
Tires	3	2	3	3	6
Bulky Objects	6	4	3	4	3
Household Hygiene	30	29	38	25	27
Hazardous Wastes	1	5	3	6	7
Electronics	4	11	8	6	4
Other	8	12	8	10	12
Total	**399**	**429**	**433**	**357**	**400**

[1]The categories from the 2001, 2004, and 2009/2010 waste composition study were reorganized and recalculated to allow for direct comparison with the 2016 results.

[2]The 2009/2010 kg/capita was recalculated to include the tonnage of waste that arrived at the Highwest Landfill. No tonnage data is available for Highest Landfill in 2001 and 2004.

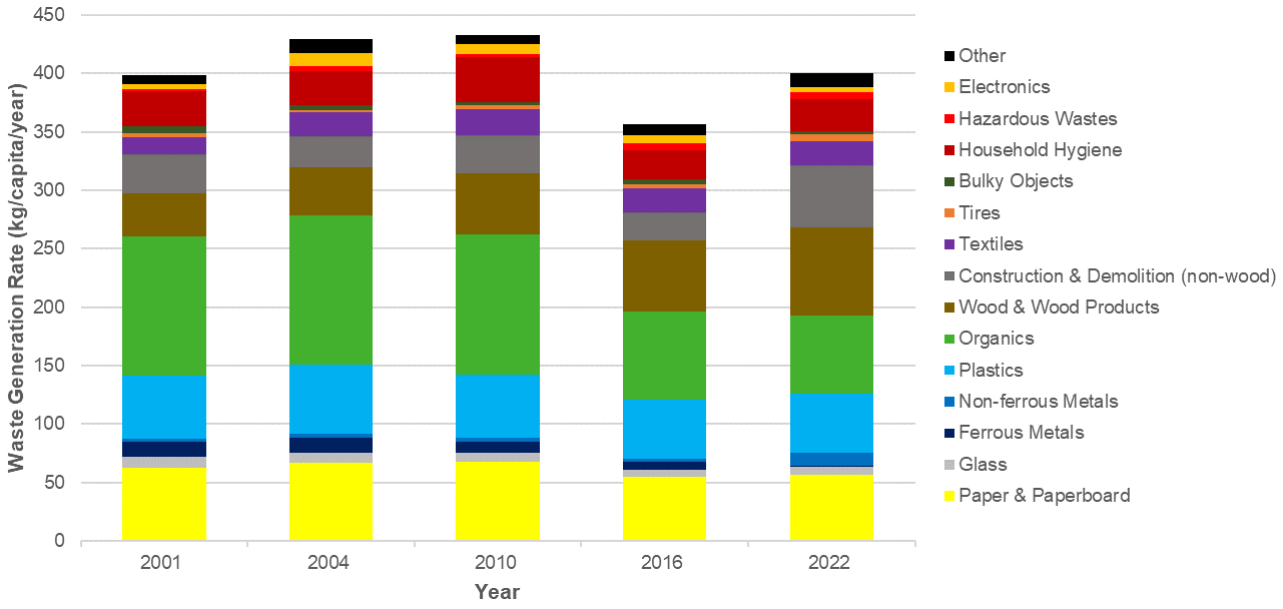


Figure 5-1: Comparison of Historic Waste Generation Rates at Hartland Landfill

Trends observed in the per capita waste generation include:

- From 2016 to 2022, C&D materials (non-wood) in the waste composition increased by 29 kg/capita (6.6%) and wood and wood products increased by 15 kg/capita (1.9%). This could be indicative of the real estate market in the early part of 2022. The closure of Highwest Landfill in 2021 may have also led to an increase in the amount of C&D materials received at Hartland Landfill.
- From 2016 to 2022, organics in the waste composition decreased by 8 kg/capita (4.4%). This change is likely due to the implementation and uptake of organics diversion programs in the region. This is a continuation of the trend that was observed from 2010 to 2016, where the percentage of organics in the waste composition decreased by 6.6%.
- The total amount of metals (i.e., ferrous and non-ferrous metals) has been relatively consistent; however, in 2022, the percentage of ferrous metals decreased while the percentage of non-ferrous metals increased compared to historic trends. In the 2022 study, the primary categories of ferrous metals and non-ferrous metals were combined into one primary category (i.e., metals). As a result, there was only one secondary category for other metals, which was designated as part of the non-ferrous metals for the purposes of the historical comparisons. This change in the categorization of ferrous and non-ferrous metals may have led to the observed difference.
- The total amount of textiles has been relatively consistent since 2001, fluctuating between 15 and 23 kg/capita and a total of 21 kg/capita calculated in 2022.
- The total amount of all other materials is relatively consistent comparted to previous years and is within the expected variation for the results of the study from year to year.

6.0 SINGLE-USE ITEMS

SUIs were assessed in the SF, MF, and ICI waste samples. The types of SUIs were weighed and individually counted. Descriptions of all SUIs analyzed is included in Appendix B.

SUIs comprised 1% to 2% of the waste steam – depending on the sector. Total percentages by sector are presented in Table 6-1.

Table 6-1: Percent Weight of SUIs By Sector

SUI Item	SF	MF	ICI
Plastic Checkout Bags	0.24%	0.13%	0.10%
Plastic Cutlery	0.08%	0.12%	0.21%
Plastic Ring Carriers	0.11%	0.05%	0.06%
Plastic Stir Sticks	0.00%	0.01%	0.02%
Plastic Straws	0.06%	0.05%	0.07%
Plastic Food Service Ware	0.57%	0.68%	1.48%
Total	**1.05%**	**1.04%**	**1.94%**

Table 6-2 represents the average count of SUIs per category per 100 kg sample. The number of each SUI varied between samples. In general, the number SUIs per sample were less in SF stream than in the ICI stream; however, the number of SUI varied greatly between samples and sector. For example, Tetra Tech counted between 26 to 607 plastic food service wares in individual samples in the ICI sector compared to 12 to 66 in the SF sector.

Table 6-2: Average Count of SUI per 100 kg of Sample

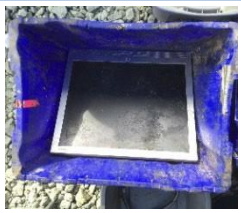
SUI Item	SF	MF	ICI
Plastic Checkout Bags	15.2	8.9	7.8
Plastic Cutlery	13.6	24.0	58.3
Plastic Ring Carriers	7.8	3.2	2.2
Plastic Stir Sticks	0.4	0.1	5.0
Plastic Straws	7.9	14.2	18.9
Plastic Food Service Ware	38.5	66.8	156.4
Total	**83.4**	**117.1**	**248.6**

7.0 INTERESTING FINDS

Table 7-1 lists some of the notable, unexpected, and unusual materials found during the waste composition study. These materials may not necessarily skew the results as it is not atypical to have these types of materials present in the various waste sectors and streams.

Table 7-1: List of Uncommon Materials Found During This Study

Sector (Generator)	Sample ID	Description	Photo
ICI	FA22-ICI-G-01	Food service ware	
ICI	FA22-ICI-G-15	Oil and antifreeze	
ICI	FA22-ICI-G-16	Pharmaceuticals	

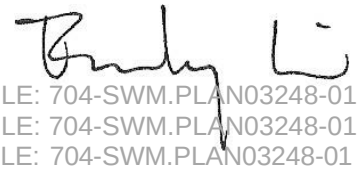
Sector (Generator)	Sample ID	Description	Photo
ICI	FA22-ICI-G-19	Vacuum	
ICI	FA22-ICI-G-20	Warming trays	
ICI	FA22-ICI-G-22	Fish slider	
MF	FA22-MF-G-06	Computer monitor	
MF	FA22-MF-G-07	Truck tires	
MF	FA22-MF-G-09	Drywall	
MF	FA22-MF-G-09	Paint	

Sector (Generator)	Sample ID	Description	Photo
SF	FA22-SF-G-03	Syringes	
SF	FA22-SF-G-05	Unopened beverages	
SF	FA22-SF-G-08	Pharmaceuticals	
SF	FA22-SF-G-17	Insulation	

8.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.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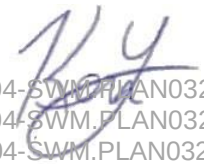
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APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

MATERIAL CATEGORIES

Table B-1: Material Category

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
1	**Paper and Paperboard**			
01	Newsprint	▪ Newsprint	Recycling	146.82
02	Printed paper	▪ Magazines and mixed recyclable paper ▪ Fine paper	Recycling	146.82
03	Corrugated cardboard	▪ Corrugated cardboard ▪ Pizza boxes	Recycling	33.88
04	Paper packaging – dry goods	▪ Boxboard ▪ Brown Kraft paper, including bags	Recycling	33.88
05	Paper packaging - liquids	▪ Paper cups ▪ Gabletop cartons – non-beverage/deposit (e.g., cream, half, and half, etc.) ▪ Aseptic boxes – non-beverage/deposit	Recycling	22.73
06	Paper beverage containers – deposit	▪ Gabletop cartons – juice, pop, milk, and plant-based substitutes, etc. ▪ Aseptic boxes – juice, pop, milk, and plant-based substitutes, etc.	Depot/Drop Off	22.73
07	Non-recyclable paper	▪ Other paper (non-recyclable and non-compost/organics) ▪ Waxed corrugated cardboard	Garbage	146.82
08	Compost/organics soiled paper	▪ Tissue paper, paper towels, napkins ▪ Paper straws ▪ Unlined paper takeout containers	Compost/Organics	210.45
2	**Glass**			
09	Glass beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	172.73
10	Glass containers	▪ Food containers ▪ Other glass containers	Recycling	172.73
11	Other glass	▪ Plates, cups, mirrors, window glass	Garbage	172.73
3	**Metals**			
12	Ferrous metal beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	20.91
13	Non-ferrous metal beverage containers – deposit	▪ Beverage containers – alcoholic ▪ Beverage containers – non-alcoholic	Depot/Drop Off	20.91
14	Ferrous metal food containers	▪ Steel, iron containers	Recycling	102.27
15	Non-ferrous metal food containers	▪ Aluminum containers ▪ Aluminum foil	Recycling	102.27
16	Other metal	▪ Other ferrous and non-ferrous metals	Garbage	102.27
4	**Plastics**			
17	Plastic beverage containers – deposit	▪ #1 – deposit bottles/jugs ▪ #2 HDPE – milk jugs ▪ Other bottles/jugs – deposit	Depot/Drop Off	18.36
18	NULL (combined with #17)			
19	Rigid plastic containers	▪ #1 other food containers (non-SUI), dish soap, cooking oil	Recycling	18.36

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
		▪ #2 – shampoo, etc. ▪ #3 – lotions, soap, etc. ▪ #4,5,7 – ketchup, etc. ▪ #6 rigid packaging – seed trays ▪ Other rigid containers and lids – ice cream, yogurt ▪ All other (blister package, plant pots, deodorant) ▪ Large pails and lids		
20	Rigid plastic containers – expanded polystyrene (white)	▪ #6 foam packaging – meat trays etc.	Depot/Drop Off	14.55
21	Packaging – expanded polystyrene	▪ Foam cushion packaging ▪ Expanded foam	Garbage	14.55
22	Film packaging – other bags and overwrap	▪ Non-carry out bags (bread, produce bags) ▪ Overwrap, cling wraps ▪ Commercial wraps	Depot/Drop Off	15.91
23	Other flexible plastic packaging	▪ Stand-up and sipper lock pouches (e.g., fruit, grated cheese, baby food) ▪ Crinkly wrappers and bags (e.g., chip bags, cereal bags, snack/chocolate bar wrapper) ▪ Woven and net plastic bags (e.g., avocadoes, oranges, rice) ▪ Flexible packaging with plastic seal (e.g., fresh pasta, deli meat) ▪ Non-food protective packaging (e.g., shipping envelopes, bubble wrap)	Depot/Drop Off	15.91
24	Film product	▪ Garbage bags ▪ Tarps	Garbage	15.91
25	Durable plastic products	▪ Non-packaging plastic products (e.g., CDs, toys, lawn chairs)	Garbage	15.91
26	Compost/organics plastics	▪ Non-SUI plastics, marked compost/organics	Garbage	15.91
27	Single-use plastics – checkout bags		Depot/Drop Off	15.91
28	Single-use plastics – cutlery		Garbage	11.68
29	Single-use plastics – ring carriers	▪ Six-pack rings	Garbage	11.68
30	Single-use plastics – stir sticks		Garbage	11.68
31	Single-use plastics – straws		Garbage	11.68
32	Single-use plastics – food service ware	▪ Any clamshell container; lidded container; box; cup; plate; bowl designed for serving or transporting food or beverage that is ready to be consumed without any further preparation	Recycling	18.36
5	**Organic Waste**			
33	Food waste – unavoidable	▪ Waste from food/drink preparation that is not edible (bones, cartilage, etc.)	Compost/Organics	210.45

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
34	Food waste – avoidable or donatable	▪ Leftovers, plate scrapings, industrial, commercial, and institutional food waste that is not past the expiration date ▪ Unused ready-made, whole meats/fish, baked goods, deli, liquids	Compost/Organics	210.45
35	Food waste – fats, oils, and grease	▪ Brown and yellow fats, oils, and grease	Compost/Organics	210.45
36	Yard and garden waste	▪ Grass, leaves, branches < 3 inches diameter	Compost/Organics	113.64
37	Other organic waste	▪ Chopsticks, wooden utensils ▪ Wax ▪ Animal carcasses	Compost/Organics	113.64
6	**Wood and Wood Products**			
38	Pallets/skids		Depot/Drop Off	76.82
39	Wood shingles		Garbage	76.82
40	Wood furniture	▪ >80% wood	Garbage	76.82
41	Clean wood	▪ Unpainted or untreated (dimensional lumber)	Depot/Drop Off	76.82
42	Treated wood	▪ Stained and/or treated (creosote or CCA)	Garbage	76.82
43	Painted wood	▪ Painted only – opaque paint	Garbage	76.82
44	Plywood/particle board		Garbage	76.82
7	**Construction and Demolition Material (C&D) (non-wood)**			
45	Drywall		Depot/Drop Off	212.27
46	Asphalt shingles		Garbage	332.27
47	Flooring – carpet and underlay		Garbage	66.82
48	Flooring – vinyl		Garbage	189.55
49	Flooring – tile		Garbage	390.91
50	Flooring – other		Garbage	189.55
51	Insulation	▪ Fiberglass insulation	Garbage	66.82
52	Insulation – other	▪ Foam insulation ▪ Vermiculite insulation	Garbage	66.82
53	Masonry		Garbage	390.91
54	Stucco/plaster		Garbage	390.91
55	Rock/sand/dirt		Garbage	390.91
56	Other C&D waste		Garbage	189.55
8	**Textiles**			
57	Clothing		Depot/Drop Off	68.18
58	Footwear		Depot/Drop Off	68.18
59	Other textiles	▪ Blankets, sheets, etc.	Garbage	68.18
9	**Tires and Rubber Products**			
60	Vehicle tires		Depot/Drop Off	125.00
61	Other rubber products	▪ Gloves	Garbage	125.00
10	**Bulky Objects**			
62	Furniture	▪ Furniture – composite	Garbage	65.91

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
63	Mattresses and box springs		Depot/Drop Off	65.91
64	Large appliances	▪ Refrigerator, washing machine, ovens, etc.	Depot/Drop Off	65.91
11	**Household Hygiene**			
65	Disposable diapers	▪ Child, adult diapers	Garbage	125.00
66	Feminine hygiene products		Garbage	125.00
67	Cat litter		Garbage	125.00
68	Animal feces		Garbage	125.00
69	Other household hygiene	▪ Wipes, dental floss, Q-tips, face masks, etc.	Garbage	125.00
12	**Hazardous Waste**			
70	Light bulbs and light fixtures	▪ Fluorescent lighting – CFL bulbs, tubes, ballasts ▪ Light bulbs – Incandescent, halogen, LEDs ▪ Light fixtures	Depot/Drop Off	199.09
71	Batteries – automotive	▪ Lead acid batteries	Depot/Drop Off	125.00
72	Batteries – household	▪ Rechargeable and non-rechargeable	Depot/Drop Off	125.00
73	Oil and antifreeze	▪ Lubricating oil, including containers ▪ Empty oil containers ▪ Oil filters ▪ Empty oil or antifreeze containers	Depot/Drop Off	775.76
74	Extended Producer Responsibility (EPR) paints (latex and oil based)	▪ Paints and containers under Product Care, including: – Latex paint, including containers – Empty latex paint containers – Oil based paint, including containers – Empty oil-based paint containers – Paint in aerosol cans – Paint – empty aerosol cans	Depot/Drop Off	775.76
75	EPR solvents and pesticides	▪ Solvents/pesticides and containers under Product Care, including: – Solvents including containers (<10 L) (e.g., gasoline, paint thinners, other flammable solvents) – Solvents – empty containers – Pesticides including containers – Pesticides – empty containers	Depot/Drop Off	775.76
76	Non-EPR paints	▪ Paints and containers NOT under Product Care, including – Paint and containers (e.g., craft paint, automotive paint) – Paint – empty containers – Paint – aerosol cans – Paint – empty aerosol cans	Depot/Drop Off	775.76
77	Non-EPR solvents and pesticides	▪ Solvents/pesticides NOT under Product Care, including: – Solvents and containers – Solvents – empty containers – Pesticides and containers – Pesticides – empty containers	Depot/Drop Off	775.76

#	Category	Description and/or Examples	Diversion Potential	Density (kg/yd^3)
78	Pharmaceuticals	▪ Including containers	Depot/Drop Off	125.00
79	Needles and sharps		Depot/Drop Off	125.00
80	Other empty aerosol cans	▪ Excluding aerosol cans for paints, pesticides, solvents	Depot/Drop Off	102.27
81	Household hazardous waste – non-hazardous / non-EPR	▪ Personal care products (e.g., shampoo, makeup, soap)	Garbage	125.00
82	Other hazardous waste	▪ Windex, Drano, Armorall ▪ Fertilizers ▪ Other relatively benign household cleaners / products (e.g., glowsticks, COVID tests, silica packs)	Depot/Drop Off	125.00
13	**Electronics**			
83	TV and audio/video equipment	▪ Display devices (monitors/TVs) ▪ Vehicle audio/video ▪ Home audio/video ▪ Personal/portable audio/video	Depot/Drop Off	155.91
84	Computers and peripherals	▪ Computers (desktop, laptop, netbook, notebook, tablet) ▪ Desktop computer printers, copiers, faxes ▪ Computer scanners ▪ Computer peripherals (keyboards, mice)	Depot/Drop Off	160.91
85	Telephones and answering machines	▪ Non-cell phones and answering machines	Depot/Drop Off	199.09
86	Cell phones	▪ Cell phones, PDAs, pagers	Depot/Drop Off	199.09
87	Electronic or electrical instruments/equipment	▪ Includes toys	Depot/Drop Off	199.09
88	Alarms and thermostats	▪ Alarms – smoke, carbon monoxide ▪ Thermostats - mercury-containing, electronic and mechanical	Depot/Drop Off	199.09
89	Heating and cooling products	▪ Commercial	Depot/Drop Off	199.09
90	Small appliances and power tools		Depot/Drop Off	199.09
91	Outdoor power equipment	▪ Hand-held (e.g., chain saws, garden shears, lawn blowers) ▪ Walk-behind (e.g., lawn mowers, snow blowers, tiller) ▪ Free-standing (e.g., power washers, mulchers, wood splitters)	Depot/Drop Off	199.09
92	Other electronics	▪ Other electronics that do not fit into the categories above ▪ Charging cables	Garbage	199.09
14	**Other**			
93	Non-distinct fines		Garbage	125.00
94	Soot/ash		Garbage	125.00
95	Bagged garbage	(For visual estimates only)	Garbage	125.00

APPENDIX C

WASTE COMPOSITION RESULTS

Table C-1: 2022 Waste Composition Results by Sector

#	Category	SF	MF	ICI	DO	C&D	Overall
1	**Paper and Paperboard**	**17.5%**	**20.1%**	**18.7%**	**0.9%**	**2.2%**	**14.2%**
01	Newsprint	0.2%	0.5%	0.2%	0.0%	0.0%	0.2%
02	Printed paper	1.2%	1.8%	2.4%	0.1%	2.0%	1.8%
03	Corrugated cardboard	0.8%	1.4%	1.9%	0.3%	0.1%	1.1%
04	Paper packaging – dry goods	2.6%	3.0%	1.8%	0.5%	0.0%	1.7%
05	Paper packaging – liquids	0.5%	0.9%	1.5%	0.0%	0.0%	0.8%
06	Paper beverage containers – deposit	0.1%	0.2%	0.2%	0.0%	0.0%	0.1%
07	Non-recyclable paper	3.1%	2.7%	4.0%	0.0%	0.1%	2.6%
08	Compostable soiled paper	8.8%	9.6%	6.7%	0.0%	0.0%	5.8%
2	**Glass**	**2.5%**	**3.1%**	**1.2%**	**1.2%**	**0.3%**	**1.6%**
09	Glass beverage containers – deposit	0.6%	1.2%	0.5%	0.0%	0.0%	0.5%
10	Glass containers	0.7%	0.6%	0.4%	0.0%	0.0%	0.4%
11	Other glass	1.2%	1.4%	0.4%	1.2%	0.3%	0.7%
3	**Metals**	**3.2%**	**3.6%**	**3.7%**	**1.1%**	**1.4%**	**3.0%**
12	Ferrous metal beverage containers – deposit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
13	Non-ferrous metal beverage containers – deposit	0.3%	0.3%	0.3%	0.0%	0.0%	0.2%
14	Ferrous metal food containers	0.4%	0.4%	0.3%	0.0%	0.0%	0.3%
15	Non-ferrous metal food containers	0.7%	0.5%	0.3%	0.0%	0.0%	0.3%
16	Other metal	1.8%	2.4%	2.8%	1.1%	1.4%	2.1%
4	**Plastics**	**17.5%**	**15.0%**	**15.5%**	**2.8%**	**3.3%**	**12.7%**
17	Plastic beverage containers – deposit	0.3%	0.3%	0.6%	0.0%	0.0%	0.3%
19	Rigid plastic containers	2.3%	2.3%	2.2%	0.0%	0.0%	1.7%
20	Rigid plastic containers – expanded polystyrene (white)	0.6%	0.3%	0.3%	0.0%	0.0%	0.3%
21	Packaging – expanded polystyrene	0.2%	0.1%	0.2%	0.0%	0.3%	0.2%
22	Film packaging – other bags and overwrap	2.4%	1.7%	2.0%	0.0%	0.0%	1.6%
23	Other flexible plastic packaging	5.2%	3.3%	2.9%	0.1%	0.0%	2.7%
24	Film product	2.4%	2.7%	2.7%	0.2%	0.1%	2.0%
25	Durable plastic products	2.9%	3.1%	3.2%	2.4%	2.9%	3.0%
26	Compostable plastics	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
27	Single-use plastics – checkout bags	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%
28	Single-use plastics – cutlery	0.1%	0.1%	0.2%	0.0%	0.0%	0.1%

#	Category	SF	MF	ICI	DO	C&D	Overall
29	Single-use plastics – ring carriers	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
30	Single-use plastics – stir sticks	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31	Single-use plastics – straws	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
32	Single-use plastics – food service ware	0.6%	0.7%	1.1%	0.0%	0.0%	0.6%
5	**Organic Waste**	**25.1%**	**23.1%**	**20.3%**	**0.6%**	**1.2%**	**16.7%**
33	Food waste – unavoidable	5.1%	5.5%	2.4%	0.0%	0.0%	2.8%
34	Food waste – avoidable or donatable	17.4%	14.2%	12.4%	0.0%	0.0%	10.6%
35	Food waste – fats, oils, and grease	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
36	Yard and garden waste	2.1%	3.1%	5.4%	0.6%	1.2%	3.1%
37	Other organic waste	0.4%	0.2%	0.1%	0.0%	0.0%	0.2%
6	**Wood and Wood Products**	**1.2%**	**2.3%**	**15.2%**	**45.6%**	**48.9%**	**18.9%**
38	Pallets/skids	0.0%	0.0%	2.7%	5.1%	2.4%	1.7%
39	Wood shingles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40	Wood furniture	0.0%	0.0%	3.9%	7.0%	0.0%	1.7%
41	Clean wood	0.2%	0.2%	0.4%	6.5%	6.5%	1.9%
42	Treated wood	0.3%	0.5%	1.6%	9.4%	16.8%	4.9%
43	Painted wood	0.2%	0.7%	0.5%	10.5%	6.7%	2.2%
44	Plywood/particle board	0.5%	1.0%	6.1%	7.2%	16.5%	6.5%
7	**Construction and Demolition Material (non-wood)**	**2.6%**	**3.6%**	**7.2%**	**21.1%**	**38.5%**	**13.3%**
45	Drywall	0.2%	1.2%	0.6%	1.2%	1.2%	0.7%
46	Asphalt shingles	0.1%	0.1%	0.4%	11.1%	28.0%	7.0%
47	Flooring – carpet and underlay	0.3%	1.3%	4.6%	1.7%	0.8%	2.1%
48	Flooring – vinyl	0.2%	0.0%	0.4%	0.0%	0.0%	0.2%
49	Flooring – tile	0.0%	0.0%	0.7%	0.0%	0.0%	0.3%
50	Flooring – other	0.0%	0.0%	0.3%	0.0%	0.5%	0.2%
51	Insulation	0.3%	0.3%	0.0%	0.1%	1.5%	0.5%
52	Insulation – other	0.1%	0.0%	0.0%	0.7%	1.3%	0.3%
53	Masonry	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%
54	Stucco/plaster	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
55	Rock/sand/dirt	0.5%	0.0%	0.0%	0.0%	0.0%	0.1%
56	Other C&D waste	0.9%	0.6%	0.2%	6.2%	5.1%	1.8%
8	**Textiles**	**8.5%**	**7.5%**	**4.4%**	**1.1%**	**1.6%**	**5.1%**
57	Clothing	3.0%	2.7%	1.2%	0.3%	0.0%	1.5%
58	Footwear	0.7%	0.6%	0.4%	0.0%	0.0%	0.4%
59	Other textiles	4.8%	4.2%	2.9%	0.8%	1.6%	3.1%

#	Category	SF	MF	ICI	DO	C&D	Overall
9	**Tires and Rubber Products**	**0.9%**	**5.8%**	**1.4%**	**0.0%**	**0.0%**	**1.5%**
60	Vehicle tires	0.1%	3.7%	0.0%	0.0%	0.0%	0.5%
61	Other rubber products	0.9%	2.1%	1.4%	0.0%	0.0%	1.0%
10	**Bulky Objects**	**0.1%**	**0.0%**	**0.4%**	**10.1%**	**0.8%**	**0.7%**
62	Furniture	0.0%	0.0%	0.4%	9.2%	0.5%	0.6%
63	Mattresses and box springs	0.1%	0.0%	0.0%	0.9%	0.3%	0.1%
64	Large appliances	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	**Household Hygiene**	**14.2%**	**10.7%**	**5.4%**	**0.3%**	**0.0%**	**6.8%**
65	Disposable diapers	6.4%	3.7%	3.7%	0.3%	0.0%	3.4%
66	Feminine hygiene products	0.9%	0.9%	0.3%	0.0%	0.0%	0.4%
67	Cat litter	4.6%	3.6%	0.4%	0.0%	0.0%	1.7%
68	Animal feces	1.4%	1.1%	0.5%	0.0%	0.0%	0.7%
69	Other household hygiene	0.9%	1.4%	0.6%	0.0%	0.0%	0.6%
12	**Hazardous Waste**	**3.3%**	**2.3%**	**1.2%**	**0.4%**	**0.4%**	**1.7%**
70	Light bulbs and light fixtures	0.2%	0.2%	0.2%	0.4%	0.2%	0.2%
71	Batteries – automotive	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
72	Batteries – household	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%
73	Oil and antifreeze	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
74	Extended Producer Responsibility (EPR) paints (latex and oil based)	0.3%	0.1%	0.1%	0.0%	0.0%	0.1%
75	EPR solvents and pesticides	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%
76	Non-EPR paints	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
77	Non-EPR solvents and pesticides	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%
78	Pharmaceuticals	0.5%	0.2%	0.1%	0.0%	0.0%	0.2%
79	Needles and sharps	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%
80	Other empty aerosol cans	0.2%	0.1%	0.1%	0.0%	0.0%	0.1%
81	Household hazardous waste – non-hazardous / non-EPR	0.6%	0.4%	0.1%	0.0%	0.0%	0.2%
82	Other hazardous waste	1.0%	0.9%	0.4%	0.0%	0.2%	0.5%
13	**Electronics**	**1.5%**	**1.6%**	**1.4%**	**0.3%**	**0.0%**	**1.1%**
83	TV and audio/video equipment	0.2%	0.0%	0.4%	0.3%	0.0%	0.2%
84	Computers and peripherals	0.0%	0.6%	0.5%	0.0%	0.0%	0.3%
85	Telephones and answering machines	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	Cell phones	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	Electronic or electrical instruments/equipment (including toys)	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%
88	Alarms and thermostats	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

#	Category	SF	MF	ICI	DO	C&D	Overall
89	Heating and cooling products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90	Small appliances and power tools	0.7%	0.4%	0.3%	0.0%	0.0%	0.3%
91	Outdoor power equipment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
92	Other electronics	0.4%	0.5%	0.2%	0.0%	0.0%	0.2%
14	**Other**	**1.9%**	**1.2%**	**3.8%**	**14.6%**	**1.3%**	**2.9%**
93	Non-distinct fines	1.7%	1.1%	0.8%	0.0%	0.2%	0.9%
94	Soot/ash	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%
95	Bagged garbage	n/a	n/a	3.0%	14.6%	1.1%	1.9%

SF – Single family
MF – Multi family
ICI – Industrial, Commercial, and Institutional
DO – Public Drop Off
C&D – Construction and Demolition

APPENDIX D

SELECTED PHOTOGRAPHS

Photo 1: Skid steer operator collecting a sample from a tipped load

Photo 2: Field staff manually sorting a sample

Photo 3: Example of a 100 kg sample from the single family (SF) sector

Photo 4: Example of a 100 kg sample from the multi-family (MF) sector

Photo 5: Example of a 100 kg sample from the industrial, commercial, and institutional (ICI) sector

Photo 6: Example of a load from the public drop-off (DO) sector

Photo 7: Example of a load from the construction and demolition (C&D) sector

Photo 8: Example of printed paper

Photo 9: Example of paper packaging – dry goods

Photo 10: Example of non-recyclable paper

Photo 11: Example of compostable soiled paper

Photo 12: Example of glass deposit beverage containers

Photo 13: Example of non-ferrous metal food containers

Photo 14: Example of other metal

Photo 15: Example of rigid plastic containers

Photo 16: Example of other flexible plastic packaging

Photo 17: Example of durable plastics products

Photo 18: Example of single-use plastics – food service ware

Photo 19: Example of unavoidable food waste

Photo 20: Example of avoidable food waste

Photo 21: Example of yard and garden waste

Photo 22: Example of clean wood

Photo 23: Example of drywall

Photo 24: Example of clothing

Photo 25: Example of other textiles

Photo 26: Example of other rubber products

Photo 27: Example of diapers

Photo 28: Example of other household hygiene

Photo 29: Example of batteries

Photo 30: Example of oil and antifreeze

Photo 31: Example of pharmaceuticals

Photo 32: Example of TV and audio/video equipment