TETRA TECH EBA

OQM | Organizational Quality Management Program

2015 WASTE COMPOSITION STUDY

PRESENTED TO

Cowichan Valley Regional District

JUNE 2015
ISSUED FOR USE
FILE: ENVSWM03618-01

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
Bings Creek	Bings Creek Solid Waste Management Complex
CCME	Canadian Council of Ministers of Environment
CVRD	Cowichan Valley Regional District
EPR	Extended Producer Responsibility
ICI	Industrial, Commercial & Institutional
kg	Kilogram
L	Litre
MF	Multi-family Residential
Ministry	British Columbia Ministry of Environment
N	Number of Samples
PPE	Personal Protective Equipment
SF	Single Family Residential
Tetra Tech EBA	Tetra Tech EBA Inc.

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Cowichan Valley Regional District and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) 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 Cowichan Valley 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 report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by the Cowichan Valley Regional District (CVRD) to complete a waste composition study. The purpose of this study was to conduct a waste composition study that determined the composition of garbage collected at the curbside in the Electoral Areas and Municipalities in the CVRD and delivered to the Bings Creek Recycling Centre (Bings Creek). Additional garbage samples were completed from the Multi-family (MF) and Industrial, Commercial, and Institutional (ICI) sector.

The CVRD provides recycling collection services to all nine Electoral Areas, and provides garbage collection services to homes in electoral areas D, E, F, G, and I. Garbage collection service in Electoral Areas A, B, C, and H is optional and provided by private haulers. Member municipalities including the City of Duncan, Municipality of North Cowichan (North Cowichan), Town of Ladysmith (Ladysmith), and Town of Lake Cowichan (Lake Cowichan) provide their own garbage, source-separated organics, and recycling collection services for their residents.

The garbage collection and waste sorting took place from March 4 to March 13, 2015 at Bings Creek in Duncan, British Columbia (BC). It included a total of twenty-three (23) samples from the Electoral Areas, Municipalities, Multi-family and ICI sector. This study was conducted in conjunction with a British Columbia Ministry of Environment (Ministry) garbage and organics composition study that is focused on determining the quantity of avoidable and edible food waste being disposed from the residential sector in small and medium sized communities.

2.0 METHODOLOGY

Tetra Tech EBA prepared a sampling framework and protocol customized for this study, from data completeness, scheduling, safety, and budgetary perspectives. Sampling and sorting was conducted in a statistically defensible manner in accordance with the methodology set out in the Recommended Waste Characterization Methodology for Direct Waste Analysis Studies in Canada (Canadian Council of Ministers of Environment 1999).

Material categories that the garbage was sorted into were chosen based on the Ministry Waste Composition Spreadsheet Tool with input from the CVRD. There were a total of twelve (12) primary categories (Paper, Plastic, Metal, Glass, Compostable Organics, etc.) that were further broken into a total of seventy (70) secondary categories. Additional material categories were developed by Tetra Tech EBA for detailed analysis of the food waste portion of the garbage. Food waste was separated into 10 categories including unavoidable food waste and the main categories of avoidable food waste. A full list of categories is presented in Appendix B.

The transfer station method for sample collection was used. This method relies on identifying specific collection routes in an area and collecting samples from collection vehicles associated with the selected routes when they arrive at Bings Creek. Consideration went into confirming that the load sources were representative of the region at large. The Tetra Tech EBA team coordinated with CVRD staff to develop a collection schedule for the two weeks of the study that determined how many samples were needed from each Municipality or Electoral Area each day to ensure that all samples were collected on the appropriate days. The CVRD made an effort to receive garbage samples from all municipalities and electoral areas, where feasible. Number of samples received and completed for the study are shown in Table 1.

Sorting was overseen by the Tetra Tech EBA site supervisor and conducted by two to three waste sorters who were trained on safety and material sorting procedures prior to the fieldwork. Personal protective equipment was used by all staff to the specifications of Tetra Tech EBA's Health and Safety Plan, which factored in requirements for the facility. Safety meetings were conducted daily prior to the start of each sorting event to emphasize key concerns including how to handle material hazards such as sharp or hazardous materials, and working safely around vehicles. Workers were required to have up to date tetanus and hepatitis vaccinations.

The Tetra Tech EBA site supervisor worked closely with the Bings Creek facility site supervisor and the scale operator to coordinate identification and selection of the load samples with minimal interruption of daily operations. Scale tickets were retrieved from operations staff to verify load sources and weights of the trucks that were sampled. Table 1 outlines the samples that were completed for this study.

Table 1: Samples Completed

Community/Sector	Number of Garbage Samples Completed
Electoral Areas	
Area D – Cowichan Bay	**1**
Area E – Cowichan Station/Sahtlam/Glenora	**3**
Area F – Cowichan Lake South/Skutz Falls	**1**
Area G – Saltair	**1**
Area I – Youbou/Meade Creek	**1**
Municipalities	
Municipality of North Cowichan	**4**
Town of Lake Cowichan	**1**
City of Duncan	**1**
Town of Ladysmith	**2**
Other Sectors	
Multi-Family (Duncan, North Cowichan)	**2**
Industrial, Commercial, and Institutional	**6**
Total	**23**

Despite of its efforts, the CVRD was not able to receive Electoral Areas A, B, C and H samples at Bings Creek. Three (3) samples were collected from Electoral Area E. This was not originally in the sampling plan, but the field team had additional time to complete extra samples and the garbage truck from this area arrived when the field team had the additional time. At least one sample was collected from the rest of the Electoral Area for a total of seven (7) samples.

A total of eight (8) samples were collected from the four municipalities. Due to population distribution, four (4) samples were collected from North Cowichan, two (2) from Ladysmith and one (1) each from Lake Cowichan and Duncan. Two (2) samples were collected for multi-family residential; one (1) each from Duncan and North Cowichan. Six (6) samples were completed from the IC&I sector. For this study, seven (7) samples from the Electoral Areas, eight (8) samples from the four municipalities and eight (8) samples from other sectors is considered representative of the regional waste currently being hauled to the landfill.

To collect a sample for waste characterization analysis, the waste sort team would be notified when trucks identified in the sampling plan for the day passed through the scales. The waste sort team would then contact the Bings Creek staff, who would use a front end loader to collect approximately 200 to 500 kg of garbage from the unloaded waste collection truck and deliver it to the sorting area. Loads would be visually inspected by a sort supervisor to confirm the load source and confirm there was no observable contamination from other waste sources in mixed source loads. One sample (typically 100 kg of garbage) would then be randomly collected in a grid pattern from the material delivered by the loader operator. This sample was then sorted into bins representing each sort category and weighed using a bench scale.

During waste sorting, the sorting team does not manipulate the waste in a significant way, such as remove food from packaging. Food within packaging and containers was placed into the category of the material with the highest content or significance. For example a container that was half full of sauce or a bottle that was one-quarter full of liquid would be placed into the compostable organics food waste category as a majority of the weight of the item is compostable organics. If a container was almost empty, then it would be placed in the appropriate material category such as rigid plastics, or beverage containers. Photos of the sorting set-up, samples and material categories are presented in Appendix C.

Data collection logs and scale tickets were reviewed daily to confirm accuracy, and then scanned and compiled manually throughout the course of the fieldwork. The Tetra Tech EBA team used basic statistical methods to analyze the data to determine the weighted mean composition for each material category and to calculate standard deviation for each category.

3.0 COMPOSITION AUDIT RESULTS

This section presents the waste composition results by primary material. Outcomes are tabulated for each Electoral Area and Municipality. The weighted mean and standard deviation for the Municipalities and Electoral Areas is also provided with a corresponding pie chart. Weighted mean percentages and garbage composition by secondary categories can be found in the table immediately following the report.

3.1 Garbage Composition Results

Table 2 presents the overall composition in each of the three sectors with the Single Family Municipality and Electoral Area data presented separately. All percentages were calculated using a weighted mean combining all sample data for each sector. The corresponding pie charts are included as Figures 1, 2, 3, and 4.

Table 2: Garbage Composition Results by Sector

Primary Category	Single Family Municipalities (N = 8 Samples)		Single Family Electoral Areas (N = 7 Samples)		Multi-Family (N = 2 samples)		ICI (N = 6 samples)	
	Avg (%)	Std.Dev (+/-)	**Avg (%)**	Std.Dev (+/-)	**Avg (%)**	Std.Dev (+/-)	**Avg (%)**	Std.Dev (+/-)
Paper	**10%**	2%	**11%**	2%	**20%**	4%	**15%**	6%
Plastic	**20%**	5%	**19%**	6%	**12%**	2%	**18%**	15%
Compostable Organics	**19%**	5%	**36%**	10%	**39%**	13%	**38%**	11%
Non-Compostable Organics	**5%**	5%	**3%**	2%	**2%**	2%	**7%**	8%
Metal	**3%**	1%	**3%**	1%	**2%**	1%	**3%**	2%
Glass	**3%**	2%	**2%**	2%	**2%**	1%	**2%**	1%
Building Material	**3%**	4%	**3%**	5%	**3%**	4%	**2%**	5%
Electronic	**2%**	2%	**1%**	1%	**<1%**	1%	**1%**	2%
Household Hazardous	**1%**	1%	**1%**	1%	**3%**	2%	**1%**	1%
Household Hygiene	**30%**	13%	**18%**	9%	**15%**	7%	**9%**	7%
Bulky Objects	**1%**	2%	**<1%**	<1%	**<1%**	<1%	**2%**	3%
Fines	**3%**	2%	**3%**	2%	**2%**	1%	**2%**	2%
Total	**100%**		**100%**		**100%**		**100%**	

N = Number of samples sorted
Avg = Weighted average of the samples sorted
Std.Dev = Standard deviation of the samples sorted

There is a significant difference in the quantity of compostable organics in the garbage between the Single Family Municipalities which have a curbside source-separated organics collection program, and the single family Electoral Areas which do not have a curbside source-separated organics collection program. There is approximately twice the amount of organics in the Electoral Areas compared to the Municipalities. Household hygiene was the largest component of the garbage within Municipalities and third largest within Electoral Areas. This commonly included items such as diapers and pet waste including kitty litter, animal bedding, and dog feces.

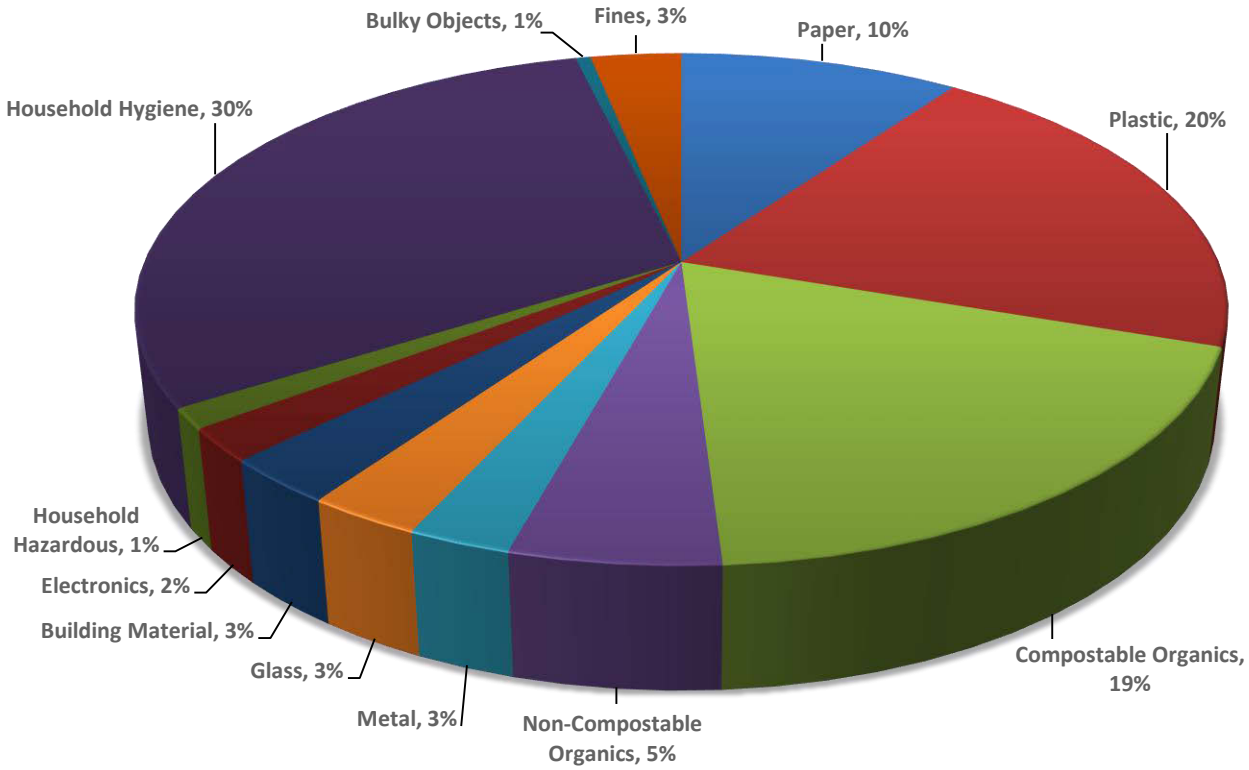

Figure 1: Single Family Municipalities Garbage Composition

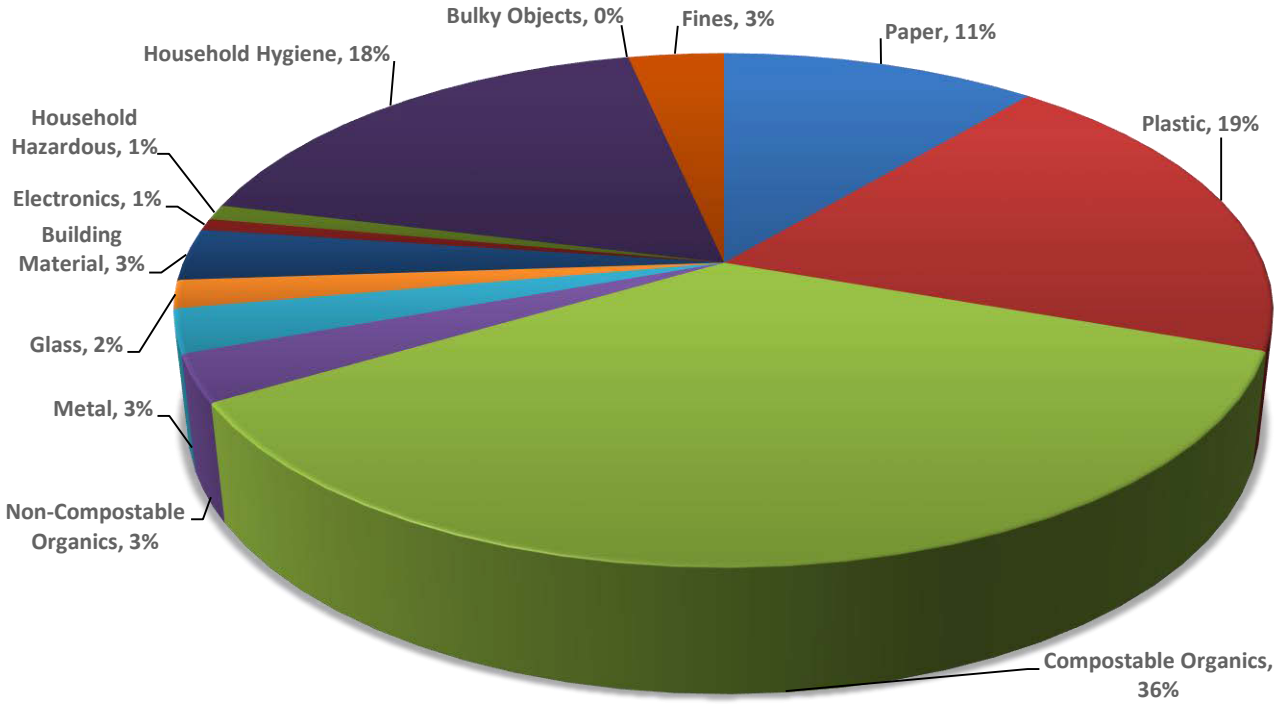

Figure 2: Single Family Electoral Areas Garbage Composition

Organics primarily were comprised of food scraps, with small amounts of clean wood and yard waste. All sectors had a similar amount of food waste such as baked goods, leftovers, processed food, meats, and other items that were disposed of in their original packaging. For sectors with high amounts of organics in the garbage, food scraps included a larger percentage of fruit and vegetable waste. Residents with curbside source-separated organics programs had very little fruit and vegetable waste as this material was placed into the green bin, whereas sectors without a curbside source-separated organics programs had a larger amount of fruit and vegetable waste in the garbage. Multi-family and ICI sectors had the highest amount of organics identified.

Paper and plastic were commonly the third and fourth largest portions of the waste stream. The largest portion of the paper stream, averaging 7%, was compostable paper which included items such as paper towels, napkins, paper plates, and food soiled items such as pizza boxes or paper restaurant takeout containers. Printed paper such as flyers, and other junk mail averaged 3% of the garbage. This included a number of flyers and magazines that were in their original plastic wrap from mailing, indicating that residents were disposing of the junk mail that was in plastic bags or plastic wrap instead of removing the plastic wrap and putting the material into the recycling bin.

Plastic items included a large amount of plastic film averaging 6%. This included a variety of film and plastic wrap from multi-layer laminates such as chip bags, pet food bags and other film packaging. Textiles were the next larger portion of the plastic stream averaging 5%. Rigid plastics and recyclable film averaged 2% of the garbage stream respectively.

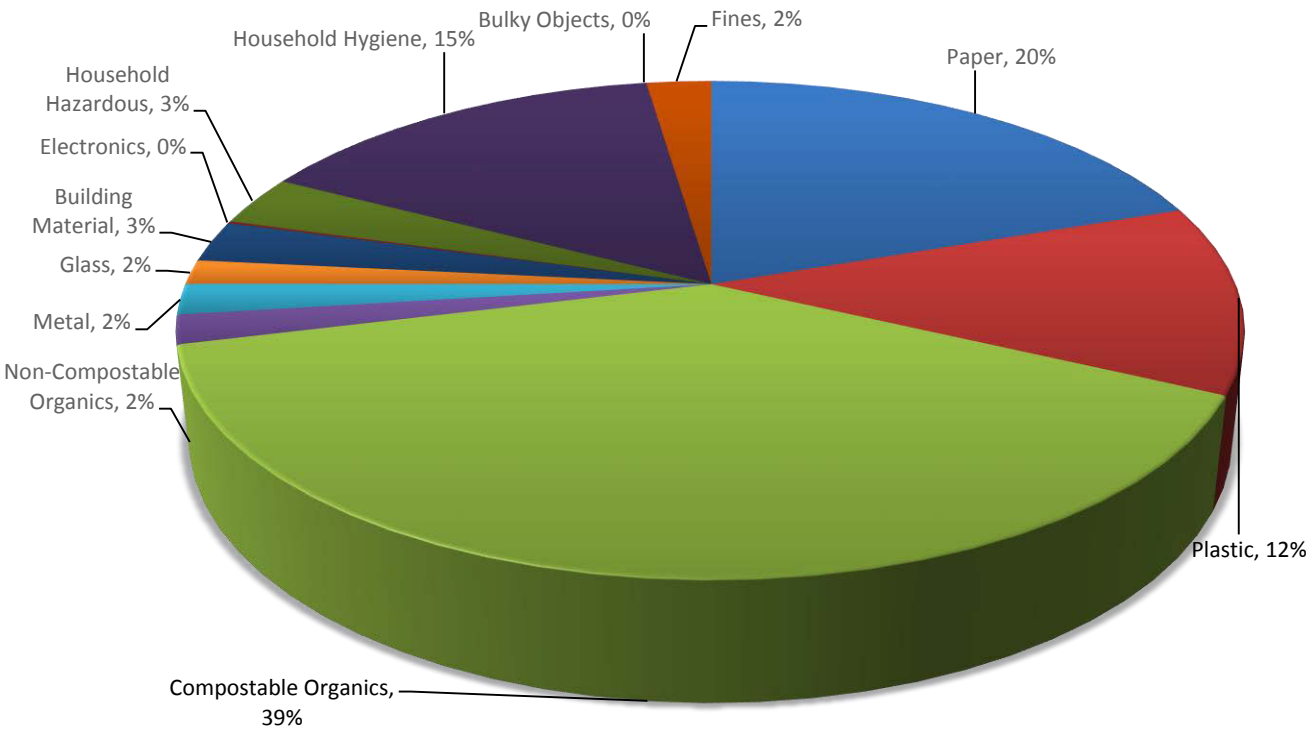

Figure 3: Multi-family Garbage Composition

The multi-family garbage composition was comparable to the single family sector without source-separated organics collection in terms of the quantity of organics. The multi-family sector had much larger amounts of paper which was primarily printed paper.

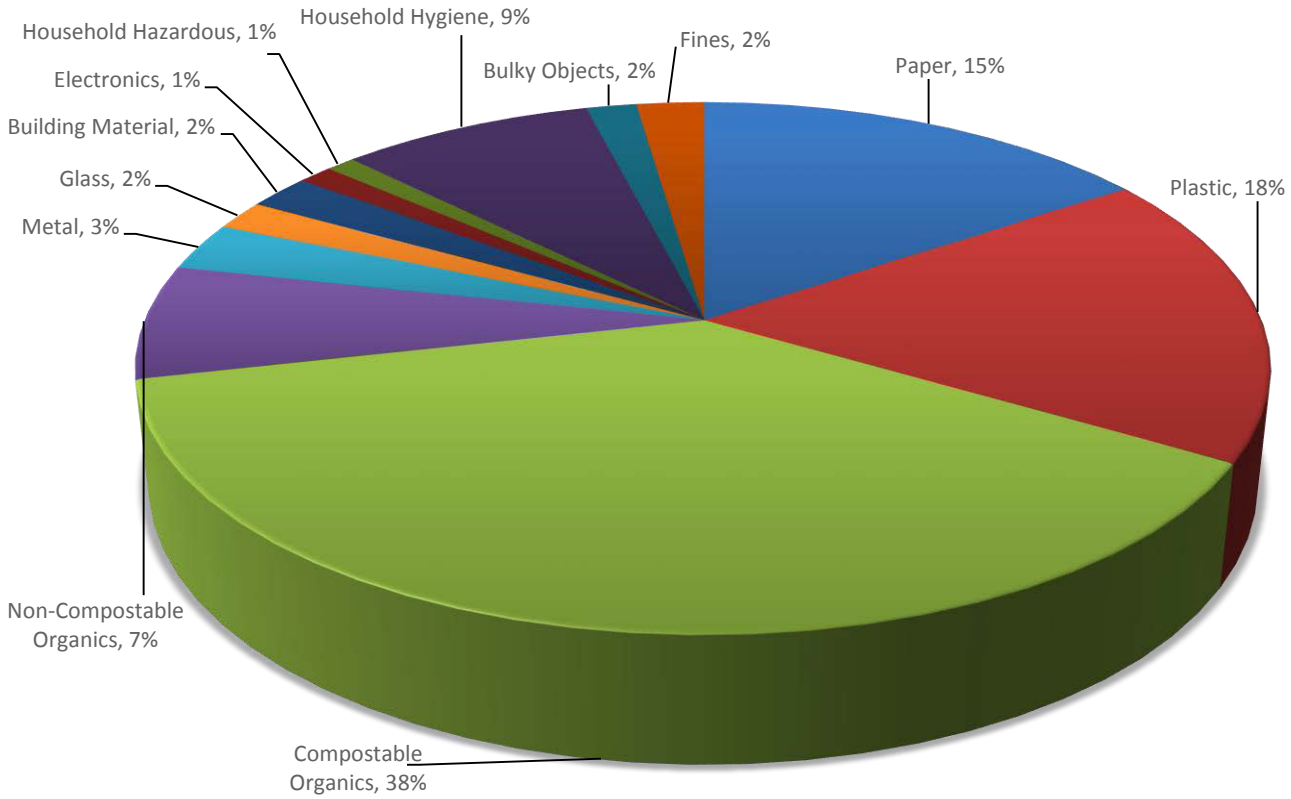

Figure 4: Industrial, Commercial, and Institutional Garbage Composition

The ICI garbage composition included samples from locations such as grocery stores, light industrial areas, daycares, and office spaces. Compostable organics primarily consisted of food scraps. Plastics was the second largest component of the ICI waste and over 11% of this was identified as plastic film such as stretch wrap, pallet wrap, and other bags and film packaging. Paper was the third largest category and included compostable paper such as paper towels and napkins, along with 5% printed paper which includes office paper, boxboard, and other scrap paper.

3.2 Single Family Garbage Composition by Municipality and Electoral Area

The breakdown of the single family garbage composition for each Municipality and Electoral Area that was sampled is included in Table 3. Each Municipality and Electoral Area had between one and four samples completed; therefore, the sample data is more variable as there is not a large enough number of samples to capture the natural variability that is found in the garbage stream. The overall average combining all the sample data is accurate as the data is based on a larger number of samples that takes into account the variability that can occur from sample to sample. The overall standard deviations presented are comparable to other waste composition data, and indicate a decent replicability to the data. As discussed previously, there is a significant difference the quantity of compostable organics in the garbage between the Municipalities, and Electoral Areas.

Table 3: Breakdown of Single Family Garbage Composition Results

	Municipalities				Electoral Areas				
	NC	LC	D	LS	D	E	F	G	I
Paper	10%	12%	5%	11%	12%	12%	9%	9%	13%
Plastic	21%	19%	16%	21%	27%	14%	19%	21%	29%
Compostable Organics	23%	12%	14%	16%	39%	38%	32%	38%	27%
Non-Compostable Organics	3%	2%	19%	6%	3%	3%	5%	2%	1%
Metal	3%	1%	4%	2%	3%	2%	5%	3%	3%
Glass	4%	1%	1%	1%	1%	2%	3%	2%	2%
Building Material	0%	2%	16%	3%	0%	1%	8%	10%	0%
Electronic	1%	0%	10%	2%	1%	0%	2%	1%	0%
Household Hazardous	1%	2%	2%	2%	3%	1%	2%	1%	3%
Household Hygiene	32%	44%	6%	32%	10%	25%	15%	9%	17%
Bulky Objects	0%	0%	4%	0%	0%	0%	0%	0%	0%
Fines	2%	7%	2%	4%	2%	3%	3%	5%	7%

NC = Municipality of North Cowichan
LC = Town of Lake Cowichan
D = City of Duncan
LS = Town of Ladysmith

3.3 Average Residential Garbage Composition

Table 4 and Figure 5 outline the overall average single family garbage composition in the CVRD. The standard deviations for most primary categories were low indicating good reproducibility and consistency between the various residential sources. The larger standard deviation for compostable organics is due to the Municipalities and Electoral Areas having different quantities of organics in the garbage which increases the standard deviation between the two groups when the overall average is calculated. Household hygiene also saw a higher standard deviation due the variability between samples. As this material is heavy it has a large effect on the overall waste composition. Some samples had larger amount of diapers or pet waste, while other samples had very little hygiene waste.

When all of the residential data is averaged together, compostable organics, which included food scraps as well as yard waste, represented the largest proportion of residential waste at 28%. The next largest category was household hygiene (23%), which represents most of what is considered “garbage” such as diapers (10%), pet waste (11%), and sanitary products (2%). The next most prevalent categories were plastic (19%) and paper (12%). All other categories represented approximately 15% of the residential waste stream.

Table 4: Overall Residential Average Garbage Composition

Primary Category	Residential Average	Standard Deviation
Paper	12%	3%
Plastic	19%	5%
Compostable Organics	28%	10%
Non-Compostable Organics	4%	4%
Metal	3%	1%
Glass	2%	2%
Building Material	3%	4%
Electronic	1%	2%
Household Hazardous	1%	1%
Household Hygiene	23%	12%
Bulky Objects	0%	1%
Fines	3%	2%

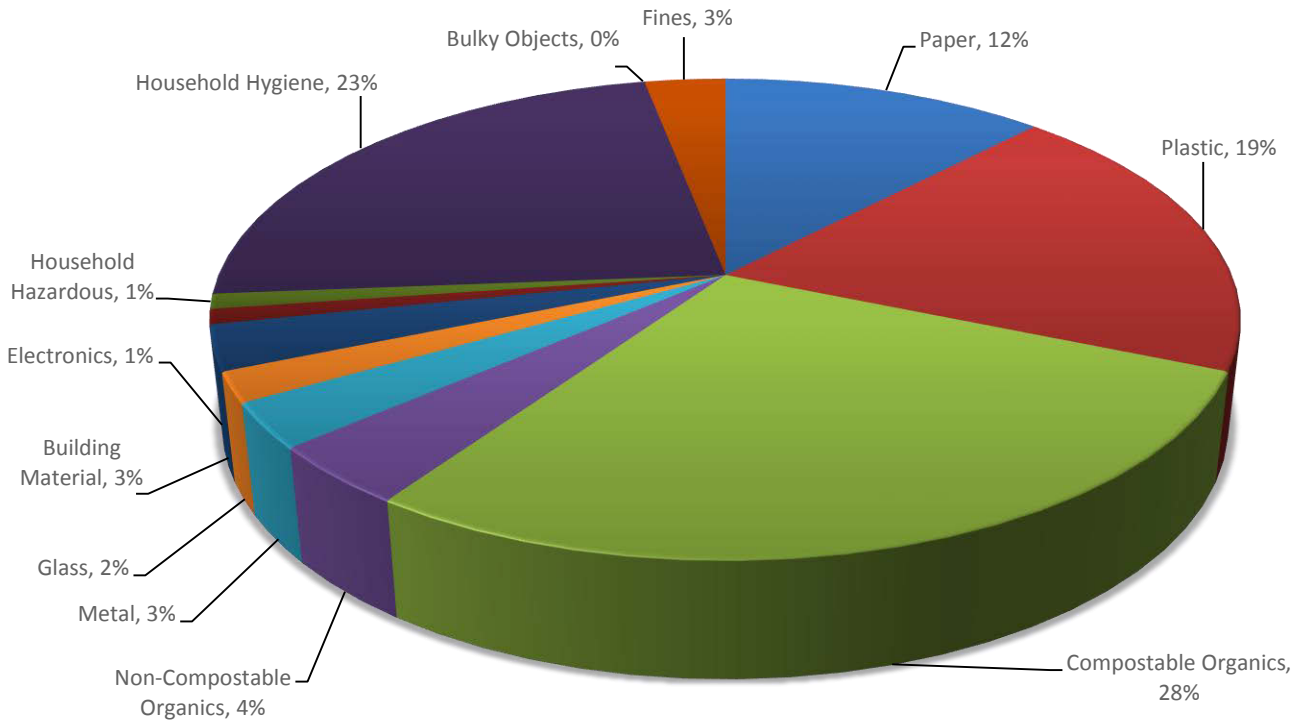

Figure 5: Average Residential Garbage Composition

3.4 Garbage Generation Rate

The total amount of solid waste disposed in the CVRD is summarize in Table 5. The total amount of garbage includes solid waste from the single family, multi-family and ICI sectors. The total disposal rate included all sources of solid waste is 286 kg/capita/year in 2013.

Table 5: Total CVRD Garbage Generation Rate (2013)

	CVRD Total
Tonnes Disposed at CVRD Facilities (2013)	20,238
Tonnes Disposed at Private Facilities (2013)	3,095
Total Tonnes Disposed (2013)	23,333
Population (2013)	81,704
Number of Households (2011)	34,883
Total kg/capita/year (2013)	**286**

An analysis was completed using the total solid waste disposed by single family households through the curbside collection program in 2014. Tetra Tech estimated the household curbside garbage generation rate as shown in Table 6. The curbside garbage generation rate per household is lower than the overall kg/capita garbage generation rate as it does not included the garbage generated from the ICI and other non-curbside based garbage generation such as self-hauling of garbage to Bings Creek. Additional data on the number of households collected from in each Municipality and Electoral Area was provided by the CVRD.

Table 6: Single Family Curbside Collected Garbage Generation Rate

	Single Family – Municipalities[1]	Single Family – Electoral Areas[2]
Tonnes Disposed Curbside (2014)	2,051	1,306
Number of homes collected (2014)	15,700	5,080
Total kg/household/year	**131**	**257**

[1]The Town of Lake Cowichan was omitted from calculations as its food waste collection program was not in place until early 2015.
[2] Includes Electoral Areas D,E,F,G, and I.

Using the waste composition data and the per household garbage generation rate, the single family garbage disposal rate for the primary categories was calculated as shown in Table 7.

Table 7: Single Family Primary Categories Generation Rate

	Single Family – Municipalities[1] (kg/household/year)	Single Family – Electoral Areas[2] (kg/household/year)
Paper	12.9	28.5
Plastic	26.6	49.8
Compostable Organics	24.5	92.6
Non-Compostable Organics	6.9	7.6

	Single Family – Municipalities[1] (kg/household/year)	Single Family – Electoral Areas[2] (kg/household/year)
Metal	3.4	7.0
Glass	3.7	4.6
Building Material	3.8	8.4
Electronic	2.7	1.9
Household Hazardous	1.7	2.4
Household Hygiene	39.5	45.7
Bulky Objects	0.7	0.0
Fines	4.2	8.6
Total	**131**	**257**

[1]The Town of Lake Cowichan was omitted from calculations as its food waste collection program was not in place until early 2015.
[2] Includes Electoral Areas D,E,F,G, and I.

The largest difference in the quantity of waste disposed is the amount of compostable organics in the garbage. The quantity of household hygiene products in the garbage is fairly similar on a kg/home basis, indicating that a similar amount of household hygiene products are thrown away throughout the CVRD.

To further characterize the difference in organics generation at the household level, the total amount of organics that is placed in the curbside organics bin was determined using data provided by the CVRD. Table 8 summarizes the garbage, organics, and overall compostable organics generated per household in the communities studied.

Table 8: Food Waste Generated Per Household

	Single Family – Municipalities[1] (kg/household/year)	Single Family – Electoral Areas[2] (kg/household/year)
Total Curbside Garbage (in 2014)	131	257
Compostable Organics in the Curbside Garbage	25	93
Total Curbside Organics (in 2014)	89	-
Total Organic Waste Generated for Curbside Collection	**114**	**93**

[1]The Town of Lake Cowichan was omitted from calculations as its food waste collection program was not in place until early 2015.
[2] Includes Electoral Areas D,E,F,G, and I.

On average, each household with source-separated organics collection sets out 89 kg of source-separated organics in the green bin over the period of one year. When this amount is added to the 25 kg of organics found in the garbage, it was determined that each household with an organics collection program is producing approximately 114 kg of organics per year. In comparison, a household with only garbage collection is producing 93 kg of organics per year, and all of this is put into the garbage bin. The lower amount of organics produced in total for collection by households with no organics collection could indicate that residents may be using backyard composting and/or feeding food scraps to livestock in the absence of a formalized source-separated curbside collection program.

4.0 CLOSURE

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

Respectfully submitted,
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TABLES

Table 1: Waste Composition – All Sectors – Detailed Secondary Categories

				Municipality				Electoral Area					MF	ICI
Primary	Secondary	Description	EPR Program	NC[1]	LC[2]	D[3]	LS[4]	D	E	F	G	I		
PAPER														
Paper	Beverage Container	Tetra Pak	Encorp Pacific	0.11%	0.00%	0.28%	0.00%	0.00%	0.10%	0.00%	0.09%	0.35%	0.03%	0.11%
Paper	Packaging	Aseptic and gable top - soup, broth, etc.	MMBC	0.24%	0.33%	0.28%	0.05%	0.20%	0.13%	0.15%	0.59%	0.35%	0.65%	0.45%
Paper	Printed Paper	Newspaper and other paper (office paper, magazines, telephone books, etc.), boxboard	MMBC	2.55%	2.50%	2.32%	2.11%	2.34%	1.72%	2.57%	0.81%	2.23%	7.52%	4.57%
Paper	Packaging	Old corrugated cardboard (OCC)	MMBC	0.34%	0.71%	0.45%	0.11%	0.00%	0.10%	0.00%	0.23%	0.00%	0.43%	0.79%
Paper	Packaging	Ice cream container, hot and cold takeout cups - coffee cups, fountain pop	MMBC	0.61%	0.98%	0.17%	0.38%	0.50%	0.51%	0.39%	0.41%	0.49%	1.00%	1.20%
Paper	Packaging	Composite cans - frozen juice containers, Pringles, hot chocolate, ice cream paper containers	MMBC	0.36%	0.05%	0.00%	0.74%	0.00%	0.13%	0.19%	0.09%	0.00%	0.16%	0.26%
Paper	Other Paper	Hardcover books		0.00%	0.00%	0.00%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%	0.04%
Paper	Compostable Paper	Paper towels, napkins, paper plates, pizza boxes, food contaminated paper etc.		5.83%	7.12%	1.70%	6.46%	8.72%	8.73%	5.09%	7.14%	9.53%	9.75%	7.98%
Paper	Packaging	Waxed OCC		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%
Paper	Other Paper	Other paper otherwise not included above - photos, laminates		0.07%	0.27%	0.00%	0.88%	0.25%	0.25%	0.10%	0.00%	0.07%	0.22%	0.10%
PLASTIC														
Plastic	Beverage Container		Encorp Pacific	0.12%	0.05%	0.28%	0.05%	0.00%	0.07%	0.44%	0.05%	0.28%	0.11%	0.32%
Plastic	Plastic Packaging	Rigid (non beverage) #1-7 including garden plant pots and trays	MMBC	1.81%	1.09%	1.64%	1.51%	1.94%	1.55%	0.82%	1.81%	1.95%	2.16%	2.01%
Plastic	Plastic Packaging	Styrofoam/Foam (#6)	MMBC	1.28%	0.87%	0.23%	0.95%	0.90%	0.63%	0.68%	1.13%	0.42%	0.49%	0.43%
Plastic	Plastic Packaging	Film #2 and #4 polyethylene film- (grocery bags, packing)	MMBC	2.05%	1.36%	1.36%	2.35%	1.15%	2.84%	0.68%	1.36%	4.31%	1.13%	0.70%
Plastic	Plastic Packaging	Film - all other film (PETE, PVC, LDPE Stretch and PP Films, multi-laminated packaging)		7.29%	10.65%	1.25%	6.08%	8.97%	5.01%	5.00%	10.71%	8.42%	3.61%	10.81%
Plastic	Other Plastics	Unmarked un-coded plastics - stir sticks, straws, etc.		0.69%	0.11%	0.11%	1.35%	0.45%	0.69%	0.53%	2.40%	1.04%	0.81%	0.74%
Plastic	Textiles (Plastic)	Clothing (blends, polyester, Gore-Tex, fleece, nylon, etc.)		6.90%	2.61%	7.65%	4.22%	12.06%	2.79%	9.55%	2.62%	6.54%	3.31%	1.94%
Plastic	Other Plastics	Durable plastic products		1.11%	2.01%	3.91%	4.70%	1.10%	0.69%	1.55%	0.63%	5.85%	0.73%	1.00%
COMPOSTABLE ORGANICS														
Comp. Organics	Yard and Garden	Small yard waste		3.01%	0.00%	2.04%	0.76%	4.73%	0.30%	0.00%	2.31%	0.21%	7.17%	0.32%
Comp. Organics	Avoidable food scraps	Produce (fresh ingredients)		2.14%	0.11%	1.76%	2.00%	8.07%	4.77%	6.79%	4.61%	6.96%	8.03%	6.11%
Comp. Organics	Avoidable food scraps	Meat and fish (fresh ingredients)		0.81%	0.00%	0.00%	2.24%	1.30%	0.54%	0.63%	1.99%	1.11%	1.78%	3.50%
Comp. Organics	Avoidable food scraps	Staple foods, cereal, grains and powders (dry foods)		0.45%	0.49%	0.68%	0.78%	0.60%	3.07%	11.25%	0.14%	1.39%	0.00%	0.62%
Comp. Organics	Avoidable food scraps	Dairy		0.70%	0.16%	0.17%	0.27%	0.20%	0.63%	0.10%	1.22%	0.07%	0.51%	2.05%
Comp. Organics	Avoidable food scraps	Baked goods		1.52%	1.63%	1.02%	1.57%	1.15%	1.72%	2.33%	2.94%	2.37%	1.89%	2.81%
Comp. Organics	Avoidable food scraps	Meals and mixed food (leftovers)		1.45%	0.11%	0.28%	0.78%	1.05%	4.27%	1.84%	2.67%	0.00%	1.62%	7.38%
Comp. Organics	Avoidable food scraps	Confectionary, processed snacks and desserts, condiments		2.29%	0.65%	1.02%	1.41%	1.64%	2.00%	2.81%	2.71%	2.30%	1.78%	1.70%
Comp. Organics	Avoidable food scraps	Beverages		0.12%	0.00%	0.00%	0.00%	0.00%	0.38%	0.00%	0.00%	0.00%	0.16%	1.16%
Comp. Organics	Avoidable food scraps	Unidentified, other		4.29%	3.86%	4.48%	3.11%	2.09%	11.35%	1.50%	3.30%	2.51%	0.81%	3.92%
Comp. Organics	Unavoidable food scraps	Peels, pits, shells, bones, husks		5.93%	3.64%	2.66%	3.35%	18.58%	8.26%	4.27%	15.96%	8.63%	14.55%	8.32%
Comp. Organics	Clean wood			0.00%	0.00%	0.00%	0.11%	0.00%	0.03%	0.00%	0.00%	0.97%	0.00%	0.12%
Comp. Organics	Other Comp. Organics			0.00%	0.87%	0.34%	0.00%	0.00%	0.59%	0.00%	0.00%	0.42%	0.92%	0.00%

Table 1: Waste Composition – All Sectors – Detailed Secondary Categories

				Municipality				Electoral Area					MF	ICI
Primary	Secondary	Description	EPR Program	NC[1]	LC[2]	D[3]	LS[4]	D	E	F	G	I		
NON-COMPOSTABLE ORGANICS														
Non-Comp. Organics	Rubber			0.48%	0.16%	0.17%	0.38%	0.15%	1.50%	1.31%	0.18%	0.42%	0.16%	0.72%
Non-Comp. Organics	Textiles			1.36%	1.20%	5.78%	3.78%	0.25%	1.25%	3.49%	0.14%	0.63%	0.70%	0.41%
Non-Comp. Organics	Contaminated Wood			0.78%	0.76%	13.04%	1.08%	1.69%	0.08%	0.29%	1.22%	0.14%	0.92%	5.66%
Non-Comp. Organics	Other Non-Compostable Organics			0.03%	0.00%	0.00%	0.51%	0.60%	0.41%	0.00%	0.00%	0.00%	0.11%	0.16%
METAL														
Metal	Beverage Container		BDL/Encorp	0.03%	0.00%	0.06%	0.00%	0.00%	0.12%	0.05%	0.05%	0.00%	0.13%	0.19%
Metal	Metal Packaging	Steel packaging (food containers including non-hazardous aerosol), aluminum foil and baking containers	MMBC	2.09%	1.20%	0.96%	1.00%	1.35%	1.50%	1.75%	0.95%	0.63%	1.56%	1.47%
Metal	Other Metal			0.83%	0.00%	2.95%	0.95%	1.74%	0.36%	2.81%	1.72%	2.16%	0.30%	1.29%
GLASS														
Glass	Beverage Container		BDL/Encorp	0.48%	0.38%	0.74%	0.00%	0.00%	0.12%	0.00%	0.00%	0.63%	0.40%	0.03%
Glass	Glass packaging (food containers)		MMBC	1.98%	0.27%	0.00%	0.54%	1.10%	0.35%	2.52%	1.94%	0.28%	0.19%	0.94%
Glass	Other glass			1.88%	0.27%	0.74%	0.95%	0.30%	1.12%	0.00%	0.00%	0.90%	1.00%	0.82%
BUILDING MATERIAL														
Building Material	Gypsum/drywall, plaster			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.95%	0.00%	0.00%	0.00%
Building Material	Rigid Asphalt Products			0.01%	0.00%	0.00%	0.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Building Material	Carpet Waste			0.00%	0.00%	7.65%	2.57%	0.00%	0.86%	0.00%	0.00%	0.00%	0.00%	2.14%
Building Material	Other Building Material			0.18%	1.58%	8.67%	0.03%	0.00%	0.16%	8.10%	0.00%	0.00%	2.69%	0.00%
ELECTRONIC														
Electronic	Computers and Entertainment	Computers and peripherals, TV & audio/video, telephones	EPRA	0.00%	0.22%	1.81%	1.65%	0.15%	0.05%	1.65%	0.00%	0.00%	0.00%	0.07%
Electronic	Lighting Equipment	Lighting fixtures: table lamp, chandelier, flashlight, wall fixture etc.	Light Recycle	0.17%	0.00%	0.00%	0.19%	0.60%	0.00%	0.00%	0.23%	0.00%	0.00%	0.07%
Electronic	Smoke/CO Alarms		Product Care	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electronic	Thermostats (Non-Mercury Containing)		Summerhill Impact	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electronic	Electronic Toys		CTA	0.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electronic	Outdoor Power Equipment		OPEIC	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electronic	Small Appliances and Power Tools		CESA	0.12%	0.00%	5.10%	0.00%	0.00%	0.12%	0.00%	1.08%	0.00%	0.13%	0.96%
Electronic	Major Household Appliances		MARR	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Electronic	Other Electronics			0.21%	0.22%	3.00%	0.35%	0.30%	0.10%	0.00%	0.09%	0.00%	0.00%	0.06%
HOUSEHOLD HAZARDOUS														
Household Hazardous	Batteries	Other battery types	RBRC	0.09%	0.71%	0.00%	0.05%	0.10%	0.08%	0.19%	0.14%	0.90%	0.11%	0.10%
Household Hazardous	Lighting Equipment	CFL's, light bulbs	Light Recycle	0.26%	1.09%	1.13%	0.54%	1.00%	0.33%	0.97%	0.90%	1.39%	0.54%	0.17%
Household Hazardous	Oil and Antifreeze		BCUOMA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Household Hazardous	Solvent and Flammable Liquids	Must have a flame symbol or phrase similar to "keep away from open spark or flame" on the label	Product Care	0.21%	0.00%	0.00%	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%
Household Hazardous	Paint	Paint containers	Product Care	0.00%	0.00%	0.00%	0.30%	1.74%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 1: Waste Composition – All Sectors – Detailed Secondary Categories

				Municipality				Electoral Area					MF	ICI
Primary	Secondary	Description	EPR Program	NC[1]	LC[2]	D[3]	LS[4]	D	E	F	G	I		
Household Hazardous	Pesticides	Domestic pesticides - consumer pesticides that have both the poisonous (skull & cross bones)	Product Care	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Household Hazardous	Fertilizers			0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%
Household Hazardous	Medications	Natural health products - product or container	PCPSA	0.07%	0.00%	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.14%	0.38%	0.00%
Household Hazardous	Cosmetics	Nail polish, make-up, health and beauty aids, sunscreen, bug spray		0.70%	0.11%	0.00%	0.70%	0.15%	0.25%	0.00%	0.14%	0.00%	2.24%	0.68%
Household Hazardous	Mercury Containing Items	Thermostats	Summerhill Impact	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Household Hazardous	Other Hazardous Waste			0.03%	0.00%	0.51%	0.46%	0.15%	0.00%	0.34%	0.00%	0.84%	0.00%	0.00%
HOUSEHOLD HYGIENE														
Household Hygiene	Biological	Diapers		11.93%	12.99%	6.18%	13.71%	4.98%	10.00%	11.01%	8.63%	3.41%	5.09%	5.04%
Household Hygiene	Biological	Pet waste		17.75%	25.71%	0.00%	14.71%	4.88%	10.09%	2.18%	0.00%	13.29%	7.03%	2.53%
Household Hygiene	Other Biological	Sanitary napkins, tampons, needles		2.11%	5.11%	0.00%	3.46%	0.25%	4.67%	1.36%	0.72%	0.00%	2.88%	0.99%
BULKY OBJECTS														
Bulky Objects	Other furniture	Composite furniture, etc.		0.00%	0.00%	4.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.70%
FINES														
Fines	Fines	Items too small to classify efficiently. (Ex bread tabs, twist ties, typically <1")		2.25%	6.90%	2.10%	3.89%	1.54%	2.56%	3.49%	4.79%	6.89%	2.34%	2.30%

NC[1] = Municipality of North Cowichan

LC[2] = Town of Lake Cowichan

D[3] = City of Duncan

LS[4] = Town of Ladysmith

APPENDIX A

TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA’s client. Tetra Tech EBA 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 Tetra Tech EBA’s Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Tetra Tech EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA’s instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

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 EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B
WASTE SORT CATEGORIES

Sample:	**Sampling location:**	**Weather:**	
Date:	**Time:**	**Sorting Team:**	
Hauler:	**Source:**	**Large bin tare weight**	Kg
Truck Number / Licence:		**Small bin tare weight**	Kg
Inbound hauler mass:	**Comments:**		
Outbound hauler mass:			
Load mass:			

Sample mass (kg): **With bins**

Without bins

	Primary	Secondary	Tertiary	# Big Bins	# Small Bins	Weight 1 (kg)	Weight 2 (kg)	Weight 3 (kg)	Weight 4 (kg)
	PAPER								
1	Paper	Beverage Container	Tetra Pak						
2	Paper	Packaging	Aseptic and gable top - Soup, broth, etc.						
3	Paper	Printed Paper	Newspaper and Other paper (office paper, magazines, telephone books, etc.), boxboard						
4	Paper	Packaging	Old Corrugated Cardboard (OCC)						
5	Paper	Packaging	Ice cream container, Hot and cold takeout cups - coffee cups, fountain pop						
6	Paper	Packaging	Composite cans - Frozen Juice Containers, Pringles, Hot Chocolate, Ice Cream Paper Containers						
7	Paper	Other Paper	Hardcover books						
8	Paper	Compostable Paper	Paper towels, napkins, paper plates, pizza boxes, food contaminated paper etc.						
9	Paper	Packaging	Waxed OCC						
10	Paper	Other Paper	Other Paper Otherwise not included above - photos, laminates						
	PLASTIC								
11	Plastic	Beverage Container							
12	Plastic	Plastic Packaging	Rigid (non beverage) #1-7 including garden plant pots and trays						
13	Plastic	Plastic Packaging	Styrofoam/Foam (#6)						
14	Plastic	Plastic Packaging	Film #2 and #4 polyethylene film- (grocery bags, packing)						
15	Plastic	Plastic Packaging	Film - all other film (PETE, PVC, LDPE Stretch and PP Films, Multi-laminated plastic packaging)						
16	Plastic	Other Plastics	Unmarked un-coded plastics - stir sticks, straws, etc.						
17	Plastic	Textiles (Plastic)	Clothing (blends, polyester, Gore-Tex, fleece, nylon, etc.)						
18	Plastic	Other Plastics	Durable plastic products						
	COMP. ORGANICS								
19	Comp. Organics	Yard and Garden	Small yard waste						
20	Comp. Organics	Avoidable food scraps	Produce (Fresh ingredients)						
21	Comp. Organics	Avoidable food scraps	Meat and Fish (Fresh ingredients)						
22	Comp. Organics	Avoidable food scraps	Staple foods, Cereal, Grains and Powders (Dry Foods)						
23	Comp. Organics	Avoidable food scraps	Dairy						
24	Comp. Organics	Avoidable food scraps	Baked Goods						
25	Comp. Organics	Avoidable food scraps	Meals and Mixed Food (Leftovers)						
26	Comp. Organics	Avoidable food scraps	Confectionary, Processed Snacks and Desserts, Condiments						
27	Comp. Organics	Avoidable food scraps	Beverages						
28	Comp. Organics	Avoidable food scraps	Unidentified, Other						
29	Comp. Organics	Unavoidable food scraps	Peels, Pits, Shells, Bones, Husks						
30	Comp. Organics	Clean wood							
31	Comp. Organics	Other Compostable Organics							

	NON-COMP. ORG			# Big	# Small	Weight 1 (kg)	Weight 2 (kg)	Weight 3 (kg)	Weight 4 (kg)
32	Non-Comp. Organics	Rubber							
33	Non-Comp. Organics	Textiles	Includes leather						
34	Non-Comp. Organics	Contaminated Wood	Composite wood, particle board, plywood						
35	Non-Comp. Organics	Other Non-Compostable Organics							
	METAL								
36	Metal	Beverage Container							
37	Metal	Metal Packaging	Steel packaging (Food Containers including non-hazardous aerosol), aluminum foil and baking containers						
38	Metal	Other Metal							
	GLASS								
39	Glass	Beverage Container							
40	Glass	Glass packaging (food containers)							
41	Glass	Other glass							
	BUILDING MATERIAL								
42	Building Material	Gypsum/drywall, plaster							
43	Building Material	Rigid Asphalt Products							
44	Building Material	Carpet Waste							
45	Building Material	Other Building Material							
	ELECTRONIC								
46	Electronic	Computers and Peripherals, TV & Audio/video equipment,							
47	Electronic	Lighting Equipment	Lighting Fixtures: table lamp, chandelier, flashlight, wall fixture etc.						
48	Electronic	Smoke/CO Alarms							
49	Electronic	Thermostats (Non-Mercury Containing)							
50	Electronic	Electronic Toys							
51	Electronic	Outdoor Power Equipment							
52	Electronic	Small Appliances and Power Tools							
53	Electronic	Major Household Appliances							
54	Electronic	Other Electronics							
	HOUSEHOLD HAZARDOUS								
55	Household Hazardous	Batteries	Other Battery Types						
56	Household Hazardous	Lighting Equipment	CFL's, light bulbs						
57	Household Hazardous	Oil and Antifreeze							
58	Household Hazardous	Solvent and Flammable Liquids	Must have a flame symbol or phrase similar to "keep away from open spark or flame" on the label						
59	Household Hazardous	Paint	fu						
60	Household Hazardous	Pesticides	Domestic Pesticides - Consumer pesticides that have both the poisonous (skull & cross bones)						
61	Household Hazardous	Fertilizers							
62	Household Hazardous	Medications	Natural Health Products - product or container						
63	Household Hazardous	Cosmetics	Nail Polish, Make-up, Health and beauty aids, Sunscreen, Bug Spray						
64	Household Hazardous	Mercury Containing Items	Thermostats						
65	Household Hazardous	Other Hazardous Waste							
	HOUSEHOLD HYGIENE								
66	Household Hygiene	Biological	Diapers						
67	Household Hygiene	Biological	Pet Waste						
68	Household Hygiene	Other Biological (sanitary napkins, tampons, needles)							
	BULKY OBJECTS								
69	Bulky Objects	Other furniture (e.g. composite furniture)							
	FINES								
70	Fines	Fines (items too small to classify efficiently. (Ex bread							

APPENDIX C
PHOTO LOG

Photo 1: Waste Sorting Area

Photo 2: Garbage Sample Sorting

Photo 3 Single Family Residential Garbage Sample—Town of Ladysmith

Photo 4: Single Family Residential Garbage Sample—Glenora

Photo 5: ICI Garbage Sample

Photo 6: Multi-Family Garbage Sample

Photo 7: Paper—Beverage Container—Tetra Pak (Category 1)

Photo 8: Paper—Packaging– Composite Cans (Category 6)

Photo 9: Printed Paper (Category 3)

Photo 10: Paper Packaging—Hot and cold takeout cups (Category 5)

Photo 11: Plastic Packaging—Film #2 and #4 (Category 14)

Photo 12: Plastic-Based Textiles (Category 17)

Photo 13: Plastic Packaging—Rigid #1-7

Photo 14: Compostable Organics—Backed Goods (Category 24)

Photo 15: Glass Packaging—Food Containers (Category 40)

Photo 16: Metal Packaging—Food Containers (Category 37)

Photo 17: Household Hazardous—Batteries (Category 55)

Photo 18: Electronic—Lighting Equipment (Category 47)