DILLON CONSULTING

CITY OF VANCOUVER

Street Litter Audits

2021 Results

December 2021 – 20-3506

December 15, 2021

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Attention: Stephanie MacKinnon
Solid Waste Program Management

Street Litter Audits – 2021 Results

Dear Stephanie:

Dillon Consulting Limited is pleased to present the City of Vancouver with the 2021 street litter audit results. This report summarizes the information collected during the street litter audits that took place September 20 – 23, 2021. Through this report, we believe that we have efficiently provided an overview of the current accumulation and composition of litter at the City of Vancouver's 124 pre-selected litter site locations. These results have been compared to a rolling average of the audits completed from 2015 (baseline) to 2019, as well as directly to last year's audit from 2020.

Thank you for the opportunity to assist you once again with this important assignment. We look forward to discussing this report with you and supporting your ongoing litter and waste management initiatives.

Sincerely,

DILLON CONSULTING LIMITED

Klaryssa Lawrie, B.Sc, EP
Project Manager

Our file: 20-3506

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Executive Summary

The City of Vancouver (City) retained Dillon Consulting Limited (Dillon) to conduct the City's sixth round of street litter audits since the 2015 initiation (baseline), at 124 pre-selected locations within Vancouver. Since the baseline there have been a number of revisions to sites and categories. These revisions have been provided as an Appendix and are not discussed in detail within the body of this report.

This year's audits took place from September 20 - 23, 2021. The 124 sites were audited with the purpose of providing a 'snapshot' assessment of the composition and amount of accumulated litter present on the streets of Vancouver. Two types of litter were assessed:

- Large litter - any litter that is equal to or larger than four square inches; and
- Small litter - any litter that is smaller than four square inches.

Within each site, a site survey and assessments on large litter and small litter were completed. An additional assessment, referred to as a 'supersite' evaluation, was completed at 20 of the pre-selected sites (approximately 1 out of 6). The purpose of the supersite audit is to provide a comprehensive review of small litter accumulation and help the City expand its knowledge on small litter type and occurrences. As this process is quite time consuming and labour intensive, it is not completed at all of the sites.

Thirteen sites in 2021 were situated immediately adjacent to active construction. In the analysis, these thirteen sites were removed and analyzed separately.

The key findings of the large litter assessment were as follows:

- In 2021, the most common primary categories were paper/fibre materials (21%), 'other miscellaneous' (21%) and cups (12%). Photos of 'other miscellaneous materials are provided in Appendix C.
- Overall, there was a 6% decrease in the large litter observed in 2021 from the average results collected in 2015 through 2019, a 7% decrease from the 2020 audit.
- The largest material type observed was plastic (39%), followed by paper (32%) and 'other' (27%)
- The most common sub-category of large litter observed was non-brand towels/napkins. Non-brand towels and napkins represented 9% of all large litter surveyed in 2021.
- Of the 1,054.5 pieces of large litter audited, 9% were personal protective equipment (PPE) and other medical waste-related items (disposable masks, gloves, and disinfecting wipes).
- There were five sites that had no large litter accumulation at all.
- Within the thirteen sites that were immediately adjacent to construction, the average number of large litter items per site was 11.4 pieces of litter. This was, on average, 20% more large litter than the sites that did not have construction directly adjacent (at 9.5 pieces).

- SUIs targeted by Vancouver's bylaws to reduce SUIs (shopping bags, disposable cups, foam cups and take-out containers, plastic straws, and utensils) made up 17% of all observed large litter items in 2021.
- The largest observed SUI category was disposable cups (non-foam) which accounted for 12.8% of all observed large litter items, overall.

The key findings of the small litter assessment include the following:

- The most common categories of small litter observed were cigarette butts/debris (30%), paper (15%) and chewing gum (14%).
- Overall, there was a 20% decrease in the small litter observed in 2021 from the average results observed in 2015-2019 and a 31% decrease from the 2020 audit.
- Within the thirteen sites that were immediately adjacent to construction, the average number of small litter items per site was 3.1 pieces of litter. This was, on average, 81% less small litter than the sites that did not have construction directly adjacent (at 5.6 pieces).
- There were 17 sites that had no small litter accumulation whatsoever. One of the 17 sites was located adjacent to construction.

1.0 Introduction

The City of Vancouver (City) is home to over 630,000 residents across an area of 114 km^2. A bold initiative of Vancouver was to be recognized as the Greenest City in the world by the year 2020. The City's Greenest City Action Plan 2015-2020 (GCAP) was approved by City Council in 2011 along with high priority actions to work towards achieving the 10 goals and targets outlined in the GCAP. Of relevance to the street litter audits, Goal 4: Zero Waste of the GCAP aims to reduce solid waste going to landfill and incinerator by 50% from 2008 levels. More specifically, the litter audit is an important step towards achieving Action 4.3 of the GCAP which targets the reduction of street litter and abandoned garbage in public spaces. This includes illegal dumping, and increased diversion of these materials through implementation of a comprehensive litter management strategy. Specifically, the City would like to target commonly disposed and difficult to recycle materials which would be identified as a part of the street litter audits.

More recently, Vancouver's Single-Use Item (SUI) Reduction Strategy has been developed as a priority action within the City's Zero Waste 2040 Plan. The Strategy was created through consultation and input of over 8,000 people from October 2016 to April 2018, with actions to 2025. The objective of the Strategy is to reduce the use of plastic and paper shopping bags, expanded polystyrene foam take-out containers and cups, disposable hot and cold drink cups, take-out food containers, and single-use straws and utensils. Many of these SUIs are identified in this and previous litter audits. The Strategy has resulted in SUI bylaw adoption legislating bans, requirements for businesses, and additional actions that (among other priorities) are intended to minimize litter and garbage resulting from single-use items. Ongoing street litter audits are a valuable means to monitoring progress towards this goal.

The Cleanliness Index, developed by Dillon in partnership with the City, is a parallel project with similar objectives. To date, two Cleanliness Index surveys have been completed by the City. Methodology of the litter audit was amended slightly in 2020 to ensure consistent terminology regarding initial visual assessment/rankings of sites.

The City retained Dillon Consulting Limited (Dillon) to conduct street litter audits at 124 pre-selected locations within the public realm across the City. The audits took place from September 20 - 23, 2021. This is the sixth round of audits completed for the City. A baseline assessment was completed in the fall of 2015. The baseline sites were audited with the purpose of providing a 'snapshot' assessment of the composition of the accumulated litter present on the streets of Vancouver. Types of litter were classified into two categories:

- Large litter - equal to or larger than 4 square inches; and
- Small litter - smaller than 4 square inches.

Follow-up audits have been completed for years 2017 through 2021 for comparison. Since the 2015 baseline assessment, additional sites and material categories have been included in the follow-up audits. Details on the year to year changes are provided in Appendix A.

In 2021, a total of 124 sites were audited. The site distribution map is provided in Appendix B. Within each site, a site survey (relevant information about the litter site and the surrounding vicinity), a large litter assessment and a small litter assessment were completed. Within 20 of the pre-selected sites a supersite audit was also completed.

The main objectives of the street litter audits include:

- A detailed analysis of large litter items within the survey area;
- A detailed analysis of small litter items that fell within three small subsections of each survey area;
- A detailed analysis of small litter items in 'supersites' found within the entirety of 20 of the survey sites; and
- Analysis and reporting of results with a focus on a comparison to:
    - The baseline and previous years' results;
    - 2020 results; and
    - Results from other municipalities.

Dillon staff were asked to note if any sites had construction occurring immediately adjacent the pre-selected site. There were 13 sites noted where this was the case (Sites 22, 47, 48, 62, 64, 71, 72, 73, 81, 85, 86, 108 and 122). In the analysis, these 13 sites were removed and analyzed separately.

2.0 Methodology

In 2021, 124 were sites audited to provide a better representation of street litter throughout all Vancouver neighbourhoods and align more closely with the City's Cleanliness Index Program. This section of the report provides a brief overview of the street litter audit methodology. The detailed methodology is provided in Appendix C.

2.1 Conducting the Litter Audit

Dillon staff followed the same standard litter audit methodology used in the 2015, and 2017 through 2020 audits. Areas were measured to be 200 feet x 18 feet, whenever possible. When an audit area was full sized (i.e., 200 feet x 18 feet), it was termed a "fixed site". The site width may have been less than 18 feet in certain cases. This included scenarios such as when residential property lines exist or when a commercial storefront was less than the prescribed distance. In these cases, each site was 200 feet in length by the available width. These sites are termed "variable sites".

From the beginning of the pre-selected site, the team used a measuring device to measure 50 feet ahead of the start of the site. Using a temporary marking method (e.g., pylons), a mark was made on the pavement to denote the starting point of the pre-selected audit site. From this point the team used a measuring device to measure 100 feet, marking the roadway with another temporary identifier to show the mid-point of the site. A final measurement of an additional 100 feet denoted the end of the audit site.

The width measurements were taken at the start, midpoint and end of the site. The width of the site was measured 1.5 feet from inside the curb or the start of the pavement, towards the outer edge of the site. The maximum width was 18 feet and marked to indicate the boundary.

2.1.1 Site Survey

Before any litter audits were initiated, a site survey was completed. During the site survey Dillon staff recorded relevant information about the litter site and the surrounding vicinity. Information collected on these forms included:

- Date and time;
- Audit team;
- Site identification;
- Audit area size;
- Characteristics and type of adjacent road;
- General attributes of the area;
- If the site was immediately adjacent to construction; and
- Cleanliness Index Rating.

A detailed overview of the Cleanliness Index (CI) rankings is provided in Appendix C. Large litter material category examples are also provided pictographically in Appendix C.

2.1.2 Classification of Large Litter

To maintain consistency with the previous litter audits, large litter was defined as any litter that was greater than or equal to 4 square inches in size. In order to assist the team completing the audit, a template was created to illustrate what 4 square inches equated to in multiple shapes (Appendix C). Large litter audits took place throughout the entire site. A first and second pass was completed on the site and litter observed was recorded on a large litter data form (Appendix E). An average number of litter items for the first and second passes were used as the value for the amount of large litter observed on a site. There were a total of 125 large litter sub-categories. These categories are provided in Appendix E with the large litter data form.

2.1.3 Classification of Small Litter

Small litter was defined as observed litter that was less than 4 square inches in size. The small litter audit involved examining three sections within the audit site. Dillon staff constructed a small litter frame using PVC plastic tubing measuring one foot wide and six feet long to serve as the template. Up to three consecutive "flips" of the template frame were completed to cross the 18 foot boundary of the site. The litter auditor observed and counted all of the small litter contained within the template at three locations within each site: at the start, midpoint and end of the site. All data was recorded on the small litter form provided in Appendix E. This form also describes the 26 small litter categories used in the litter audits.

2.1.4 Supersite

The supersite audits involved having Dillon staff record all the small litter observed within the fixed or variable site for a more thorough assessment of small litter. This was accomplished by having one team member record data while the other is counting small litter within the site. Supersite audits were completed at 20 pre-determined sites as selected by the City. Supersite evaluation forms and categories are additionally provided in Appendix E.

2.1.5 Photographic Record of the Site

During the site survey, the litter audit team took photographs of the site from three points. The first photograph was taken from the beginning of the site looking towards the end of the site. The second photograph was taken from the mid-point of the site looking into the site (towards the boundary from the road) and the final photograph was taken from the end of the site looking towards the start. Photo 1 to Photo 4 provide an example of the photographs taken at each site.

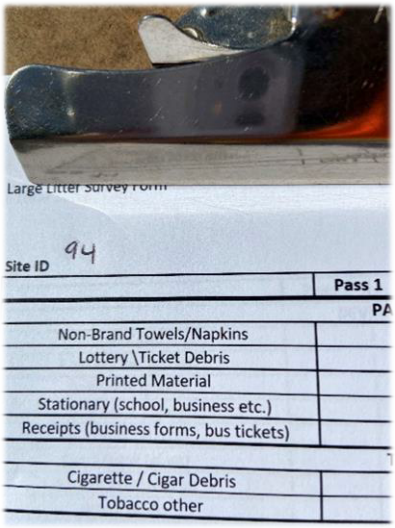

Photo 1: Site Location Photo

Photo 2: Beginning of Litter Site

Photo 3: Middle of Litter Site

Photo 4: End of Litter Site

3.0 Summary of Litter Results

This section of the report provides both the detailed results of the 2021 litter audit as well as a comparison of a rolling average of the audits completed from 2015 (baseline) to 2019, as well as directly to last year's audit from 2020. This section of the report also assesses Vancouver results against other municipalities. Visual Assessments of litter sites are provided in Section 3.1. Sections 3.2, 3.3 and 3.4 provide Large Litter Results, Small Litter and Supersite Results, respectively, for the 111 sites without immediately adjacent construction. Sites that were determined to be immediately adjacent to construction have results summarized in Section 3.5.

3.1 Visual Assessments of Litter Sites

As a part of the site survey, Dillon staff collected information about the area and adjacent roads of the audit sites. Dillon staff visually assessed the site and ranked it on a scale from 1 to 4 based on the Cleanliness Index Developed for the City. Sites were ranked using the following criteria:

- Ranking of 1 – No Noticeable Litter or Very Little;
- Ranking of 2 – Noticeable Litter in Certain Areas;
- Ranking of 3 – Consistent Noticeable Litter or Large Items or a Concentrated Pile of garbage/Litter; and
- Ranking of 4 – Requires More than One Person for Cleaning and Required City Attention.

Overall, 63% of sites were given the cleanest ranking of 1. An additional 29% were ranked as a 2, 7% were ranked as a 3 and 1% were ranked as having a Cleanliness Index Ranking of 4. Table 1 provides a breakdown by site type and the average visual rating observed. The sites where construction was observed were given a ranking of 1 (sites 52, 64, 73, 122), 2 (sites 22, 71, 72, 81, 85, 86, 108) and 3 (sites 47, 48)

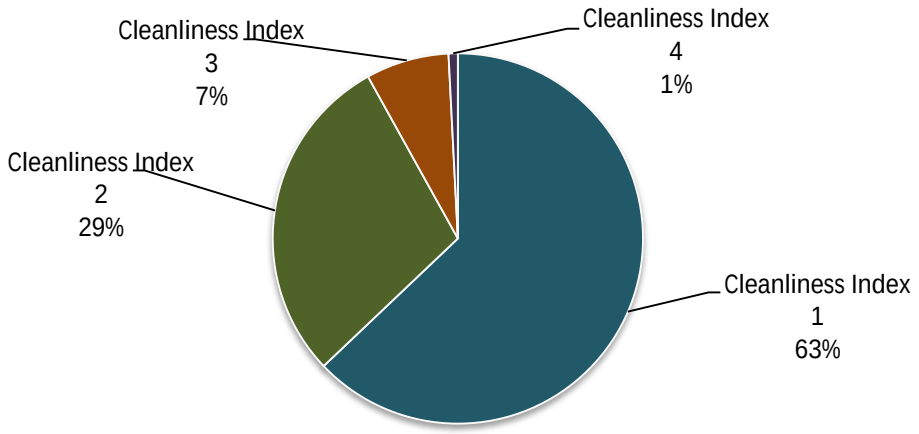

Figure 1: Visual Assessment Ranking of All Litter Sites

Table 1: Average Visual Ranking by Site Type

Site Type	Average Visual Rating
Commercial	1.7
Industrial	1.3
Institutional	1.7
Multi-Family	1.3
Single- Family	1.3
Mixed Use	2.2

3.2 Large Litter Results

Large litter is any piece of litter that is equal or greater than 4 square inches. This section of the report provides results for large litter by material type, category and subcategory. In 2021, the average number of large litter items per site was 9.5 pieces. The most common sub-category of large litter observed was Non-Brand Towels/Napkins. Non-Brand Towels/Napkins represented 9% of all large litter surveyed in 2021.

Table 2 illustrates the 20 most common large litter items observed (by sub-category) in the 2021 street litter audits. These 20 item types accounted for 77% of the total large litter items observed. The complete list of items is provided in Appendix F. As noted in Section 2.0 the large litter methodology requires two passes of an entire site. These passes are averaged for the total number of litter items observed. Due to this, there may be items that are observed on only one pass and therefore are averaged to 0.5 pieces of litter.

Table 2: Top 20 Large Litter Items

Number	Large Litter Item	Number Observed	% of Total Large Litter Items Observed	Cumulative Total (%)
1	Non-Brand Towels/Napkins	93	9%	9%
2	Misc. Plastic	71.5	7%	16%
3	Home Articles	66	6%	22%
4	Cup Lids, Pieces	62.5	6%	28%
5	Masks	62	6%	34%
6	Receipts (business forms, bus tickets)	62	6%	40%
7	Plastic Packaging Other	60	6%	45%
8	Printed Material	55	5%	50%
9	Snack Food Packaging	48.5	5%	55%
10	Plastic Wrap	38	4%	59%
11	Other Construction/ Demolition Debris	34.5	3%	62%
12	Paper Cups (hot)	24	2%	64%
13	Disinfecting Wipes	23.5	2%	66%
14	Plastic Drink Cups	22	2%	69%
15	Straws	22	2%	71%
16	Candy Bar Wrappers	16.5	2%	72%
17	Tobacco other	15	1%	74%
18	Food	14	1%	75%
19	Paper Bags - Fast Food	14	1%	76%
20	Paperboard (boxboard)	13	1%	77%
	Total Top 20	817	77%	-
	Total All Large Litter	1,054.5	100%	-

3.2.2 Large Litter by Material Type

Items within the large litter categories were composed of different material types (paper, plastic, glass, metal, composite and other). These items were classified based on their known composition. Figure 2 illustrates the breakdown by material type of all 1,054.5 pieces of large litter observed in 2021. The largest material type observed was plastic (39%), followed by paper (32%) and 'other' (27%). "Other" material types included rubber, electronics, pet waste, etc. Metal materials represented 2% and glass materials represented 1% of the materials observed. No composite material pieces were recorded in 2021.

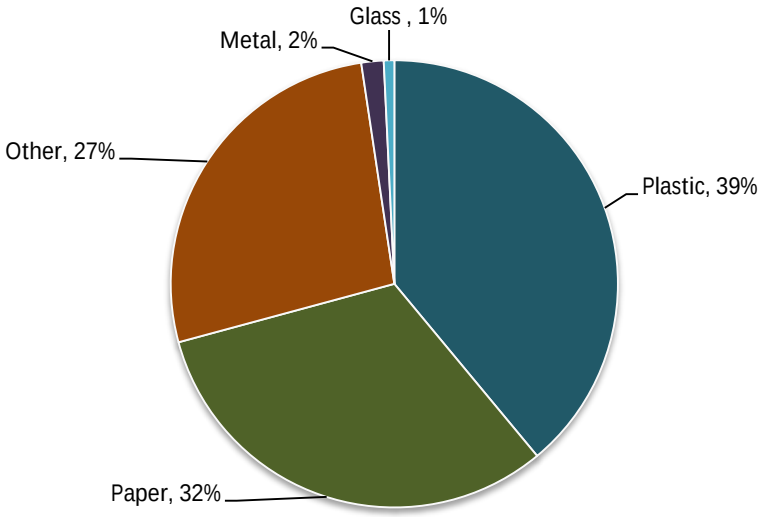

Figure 2: Large Litter by Material Type

3.2.3 Large Litter by Category (16)

Each of the large litter items were classified into 16 categories and 125 sub-categories for the 2021 litter audits. Table 3 provides a summary of the total amount of large litter observed for each of the 16 categories and Figure 3 presents the information graphically. Categories 'other miscellaneous' (21%) and paper/fibre material (21%) were the most common categories of litter observed. Miscellaneous litter included items such as miscellaneous paper, plastic, as well as household items. Cups (12%) were the next most common categories of litter recorded in 2021. Figure 4 compares the largest three sub-categories from 2021 to 2020, and the average of the 2015-2019 audits.

Table 3: Large Litter Result Totals by Category (16)

Category	Observed Number of Items	Percent of Large Litter Observed
Beverage Containers	29	3%
Other Packaging	4.5	0%
Cups	123	12%
Bags	45	4%
Other Packaging (Boxes)	37.5	4%
Other Containers	13	1%
Food Wraps/ Containers	49.5	5%
Take Out Extras	46	4%
Trays	0	0%
Confectionary/Snack	70	7%
Cloth	8	1%
Other Miscellaneous Packaging	75	7%
Paper/ Fibre Material	219	21%
Tobacco Products	16	2%
Other Miscellaneous	221.5	21%
Medical Waste	97.5	9%
Total	1054.5	100%

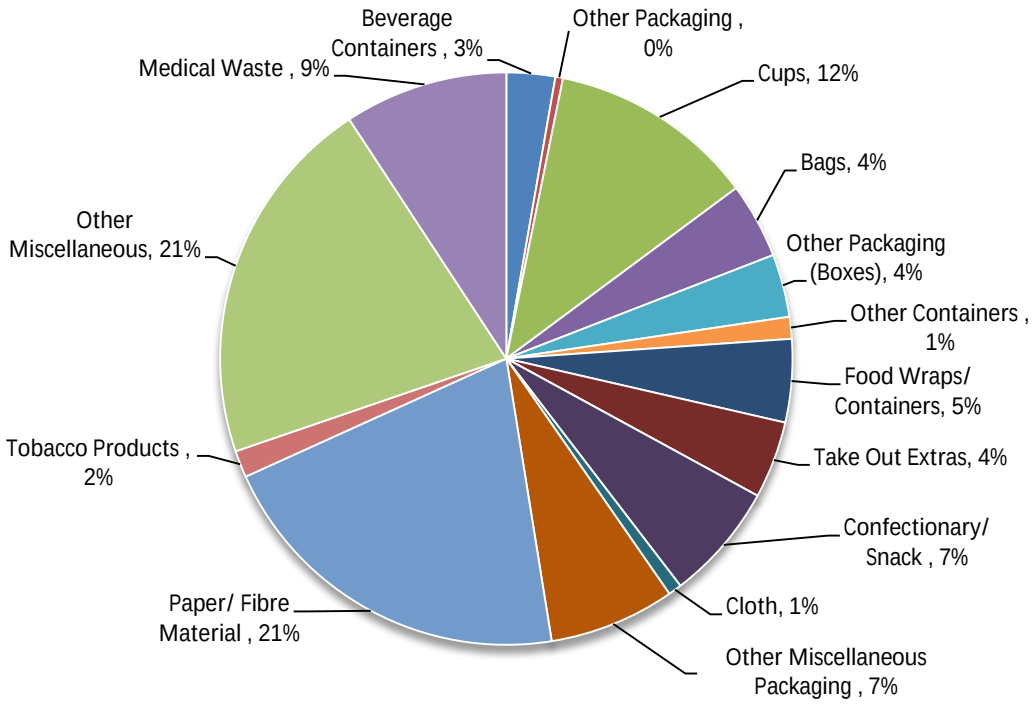

Figure 3: Large Litter Items by Category

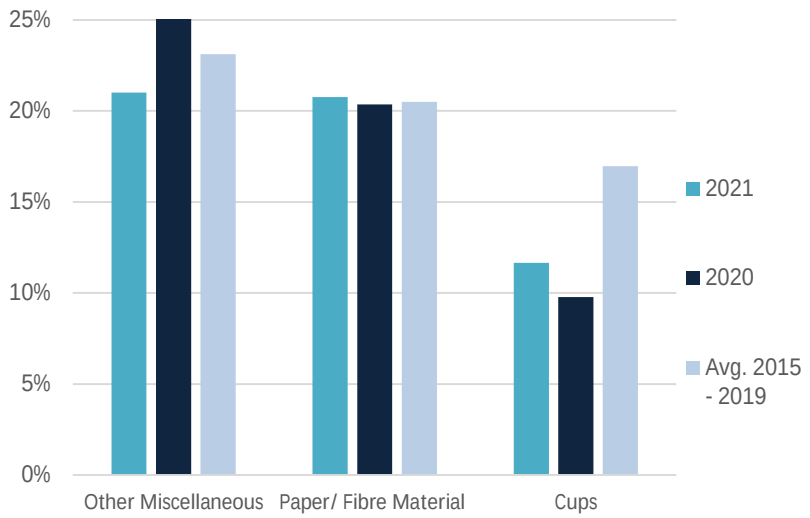

Figure 4: Large Litter Comparison

3.2.4 Large Litter Results by Sub-Category (125)

There are several sub-categories within each of the 16 major categories. The breakdown of litter by each of the 125 sub-categories is provided in the sub-sections below.

Beverage Containers

Beverage containers accounted for 3% (n=29) of all large litter observed in the 2021 audits. The largest sub-categories evaluated for beverage containers in 2021 were beer cans (31%) and soft drink (cans) (17%). Figure 5 illustrates the breakdown of the beverage container category. Figure 6 compares the highest five sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

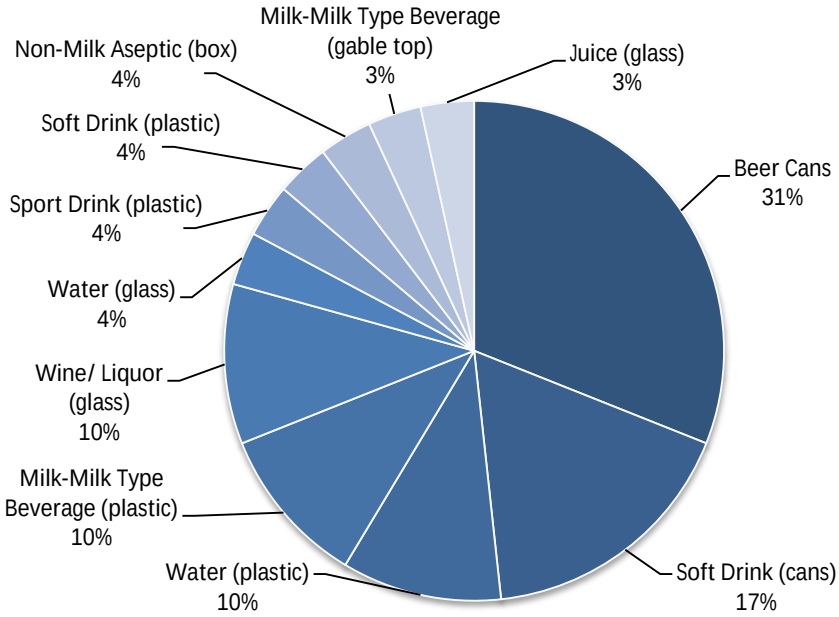

Figure 5: Beverage Containers Composition 2021

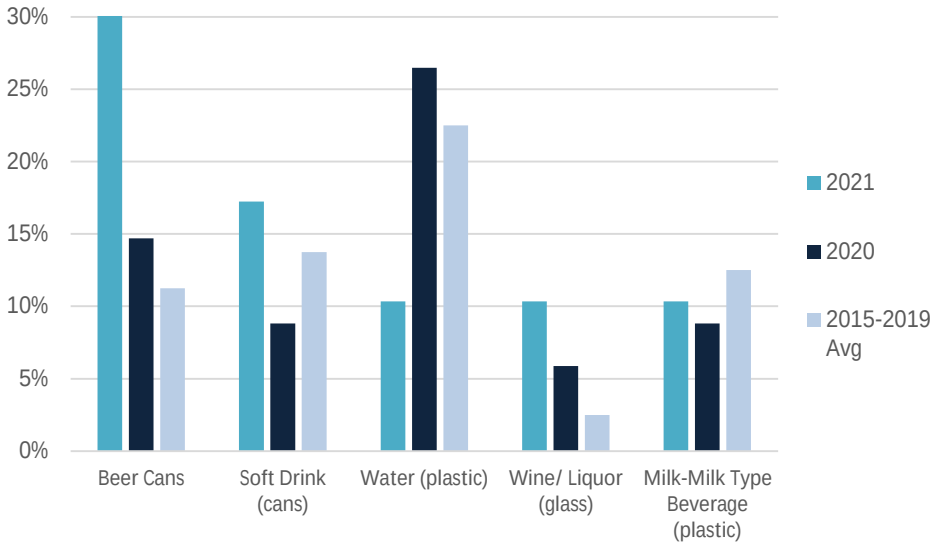

Figure 6: Beverage Containers Previous Audit Comparison

Other Packaging

'Other packaging' accounted for less than 1% (n=4.5) of the overall large litter observed for the City's 2021 audits. The largest sub-categories evaluated for other packaging in 2021 were six pack plastic rings (56%). Figure 7 illustrates the results of the other packaging category. Figure 8 compares the highest three sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

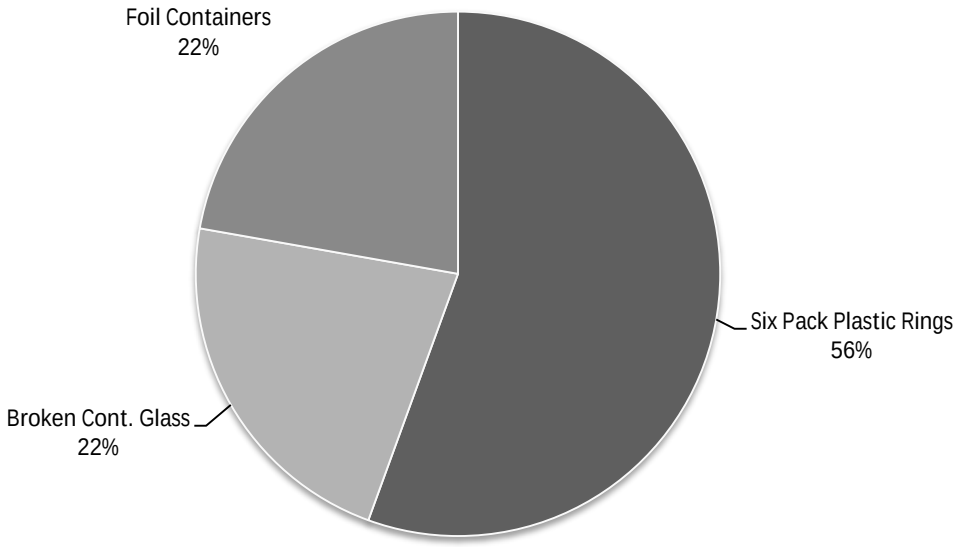

Figure 7: Other Packaging Composition 2021

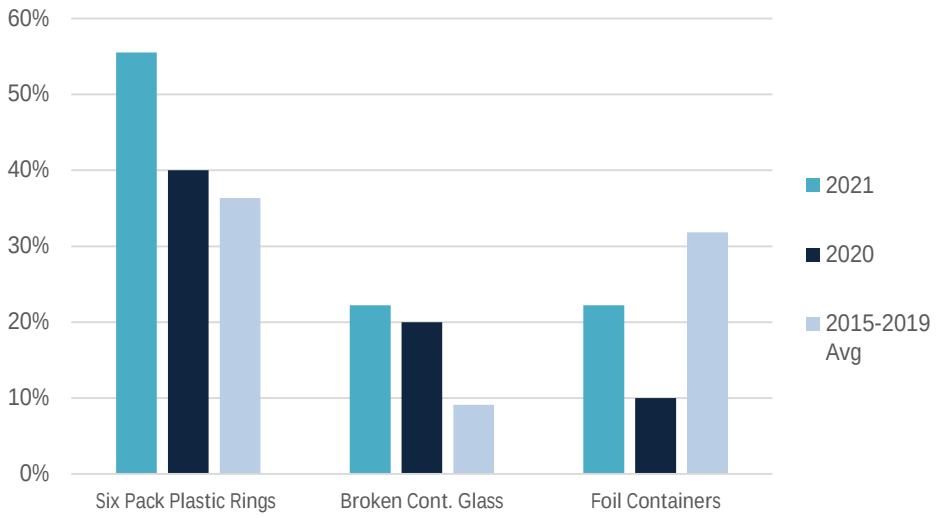

Figure 8: Other Packaging Previous Audit Comparison

Cups

Cups were the third largest category observed in the 2021 street litter audits and represented 12% (n=123) of all large litter observed. Cup lids and/or pieces were the largest subcategory (51%), followed by paper cups hot (19%), and plastic drink cups (18%). Figure 9 illustrates the breakdown of the cups category while Figure 10 compares the largest four sub-categories from 2021 to 2020, and the average of the 2015-2019 audits.

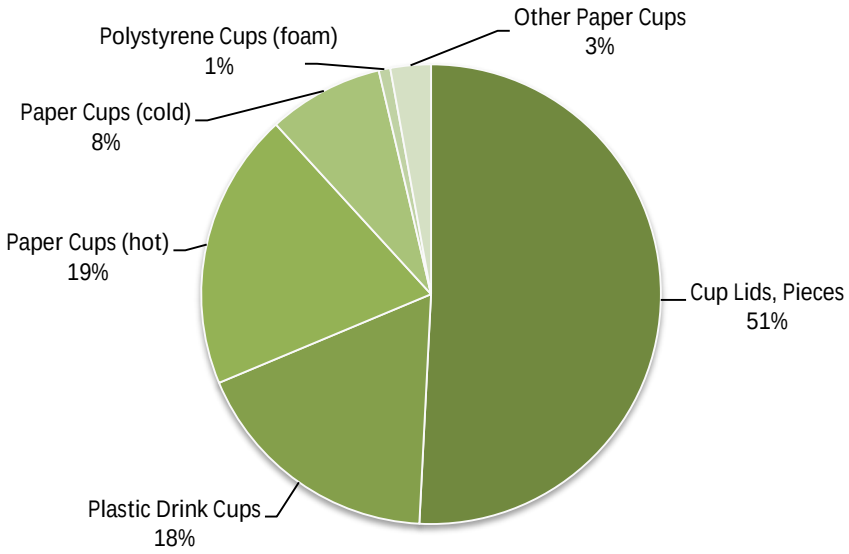

Figure 9: Cups Composition 2021

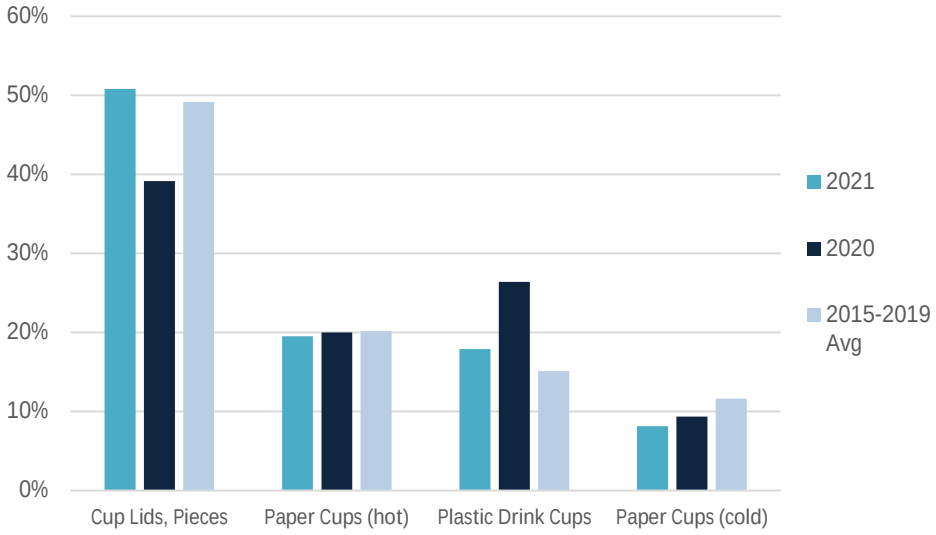

Figure 10: Cups Previous Audit Comparison

Bags

Bags represented 4% (n=45) of all large litter observed in 2021. This category predominantly consisted of paper bags – fast food (31%), plastic bags – consumable packaging (24%) and zipper bags/sandwich bags (18%). Figure 11 illustrates the 2021 composition of the bags category while Figure 12 compares the highest five sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

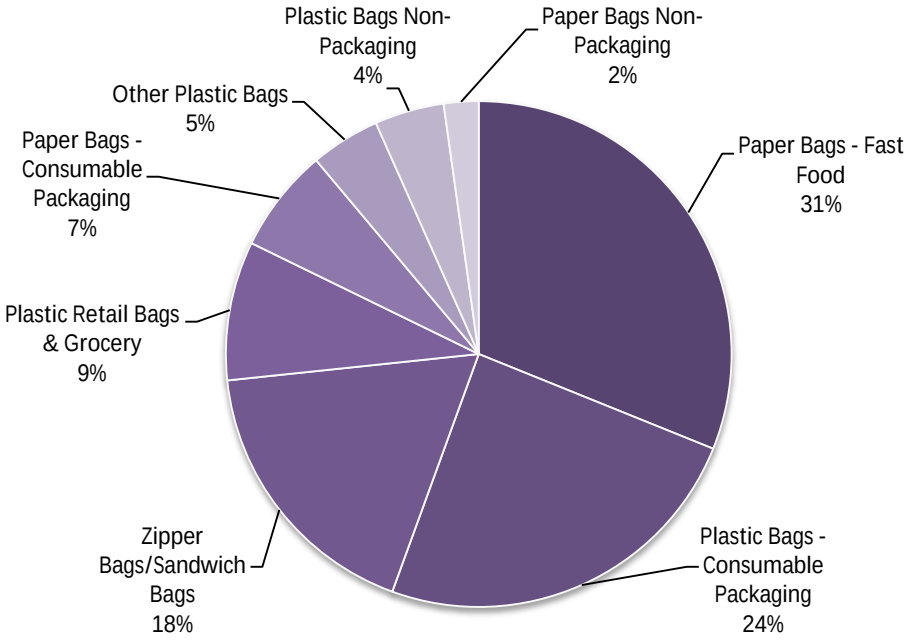

Figure 11: Bags Composition 2021

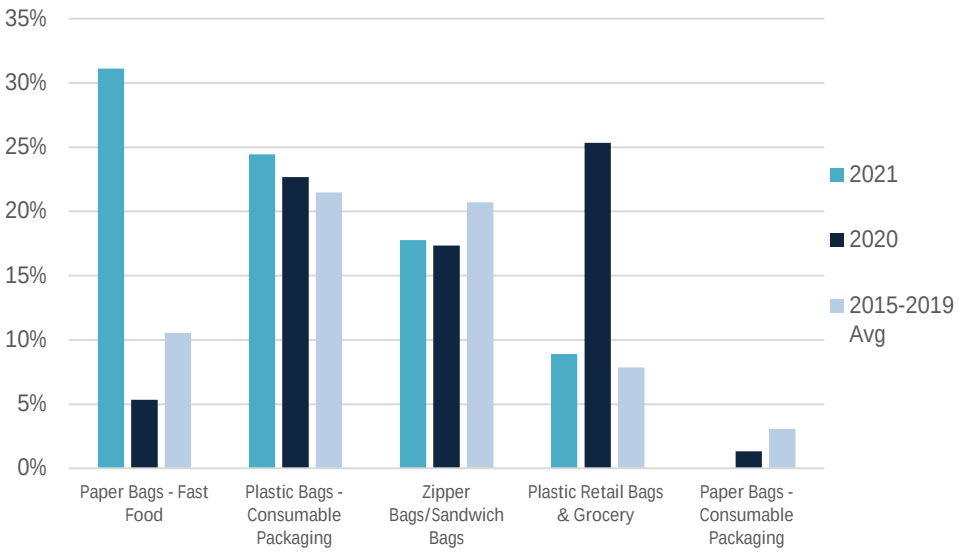

Figure 12: Bags Previous Audit Comparison

Other Packaging (Boxes)

Other packaging (boxes) represented 4% (n=37.5) of the accumulated large litter in the 2021 street litter audits. The largest sub-categories evaluated for other packaging (boxes) consisted of paperboard (boxboard) (34%), other plastic shells/boxes (27%) and cardboard boxes/box material (20%) as illustrated in Figure 13. The highest four sub-categories observed in 2021, 2020 and 2015-2019 rolling average are illustrated in Figure 14.

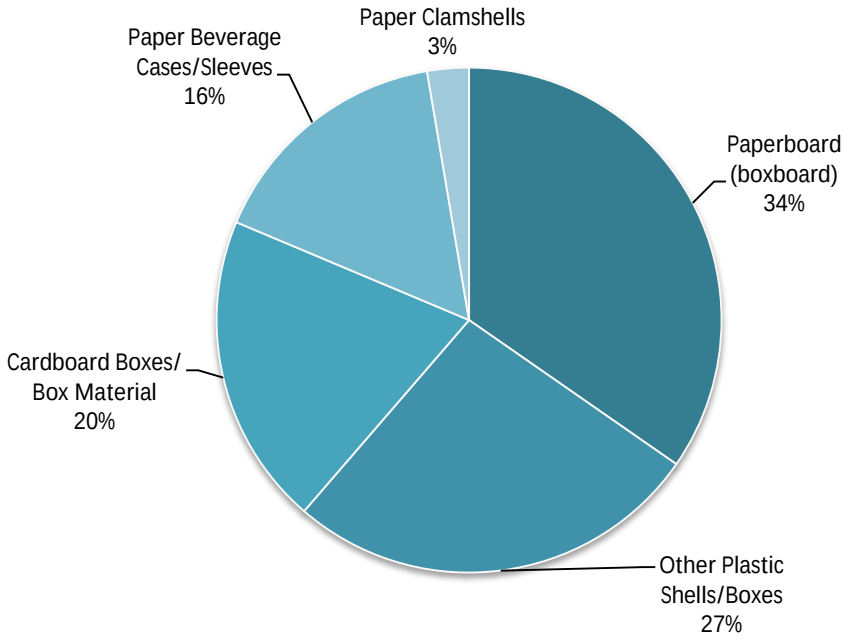

Figure 13: Other Packaging (Boxes) Composition 2021

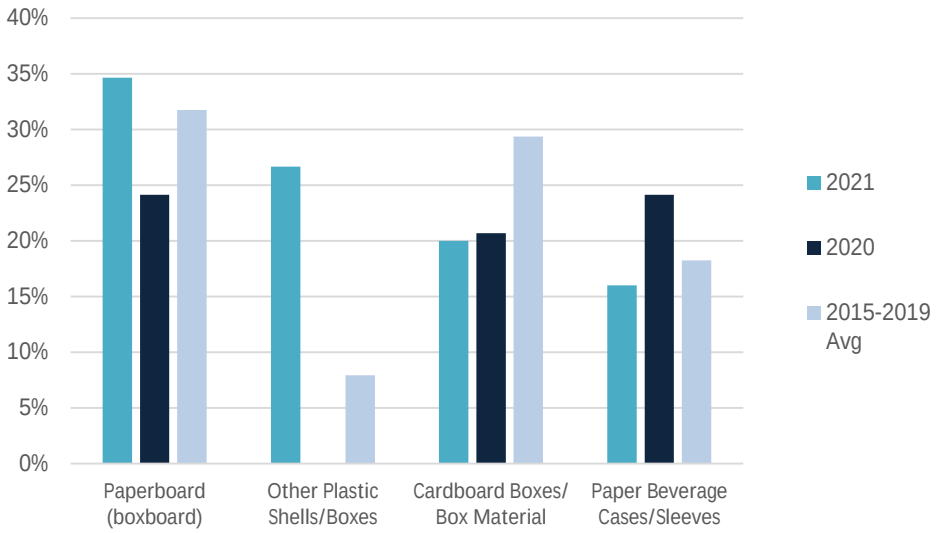

Figure 14: Other Packaging (Boxes) Previous Audit Comparison

Other Containers

In the 2021 audits, other containers represented 1% (n=13) of all large litter observed. The breakdown of this category was mostly plastic jars/bottles/lids (69%). The composition of other containers is illustrated in Figure 15 while a comparison of the largest four sub-categories from 2021, 2020 and the average 2015-2019 results is illustrated in Figure 16.

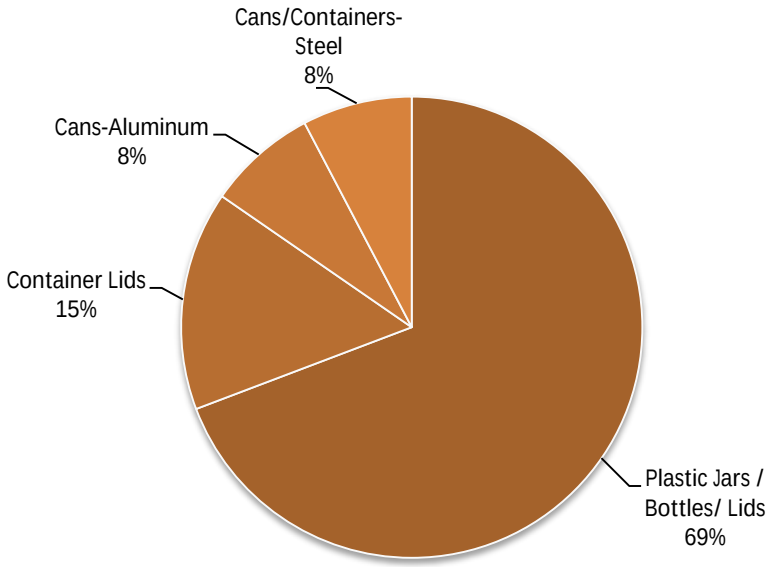

Figure 15: Other Containers Composition 2021

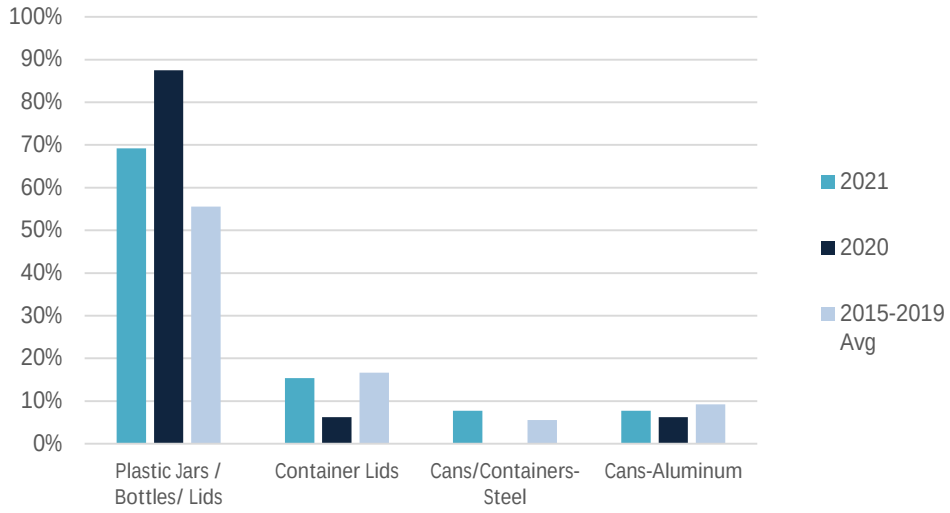

Figure 16: Other Containers Previous Audit Comparison

Food Wraps/Containers

Food wraps/containers represented 5% (n=49.5) of the litter observed in this audit. Figure 17 illustrates the breakdown of this category. The sub-categories that comprised of food wraps/containers were plastic wrap (77%) and paper food wrap (23%). Figure 18 compares all sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

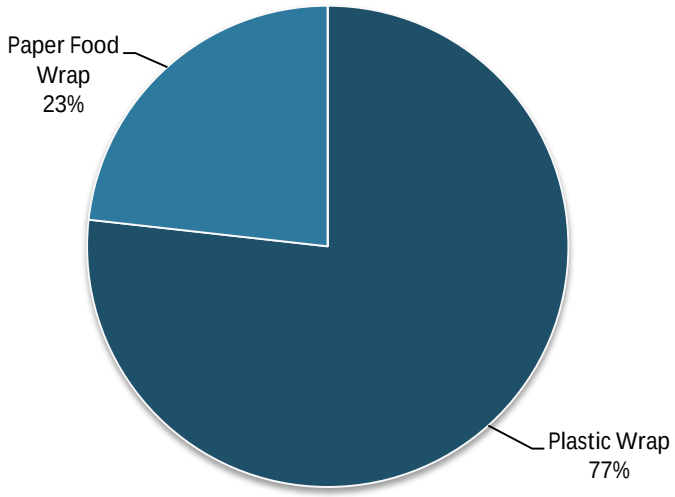

Figure 17: Food Wraps/Containers Composition 2021

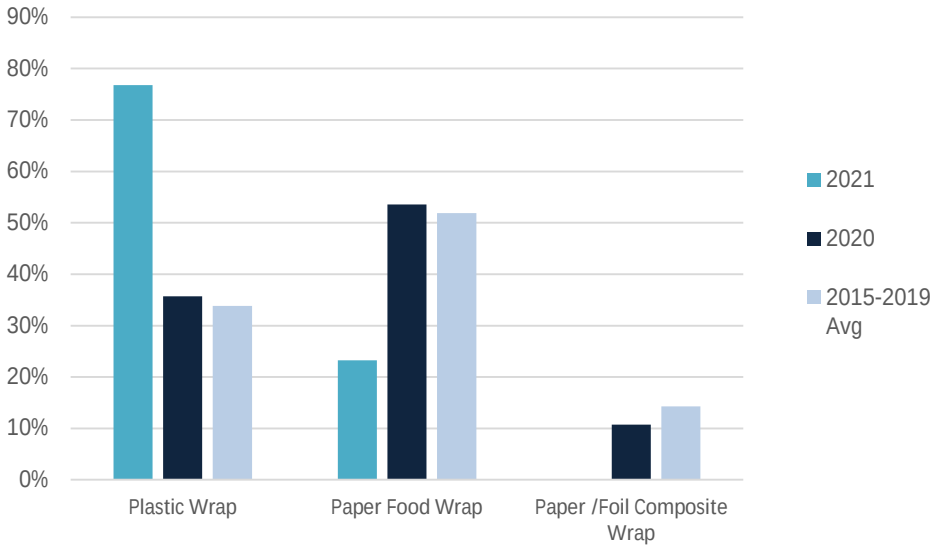

Figure 18: Food Wraps/Containers Previous Audit Comparison

Take out Extras

Take out extras accounted for 4% (n=46) of the large litter observed. Take out extras was largely comprised of straws (48%), branded napkins/serviettes (16%) and utensils (16%). Figure 19 illustrates the breakdown of this category while Figure 20 compares the highest four sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

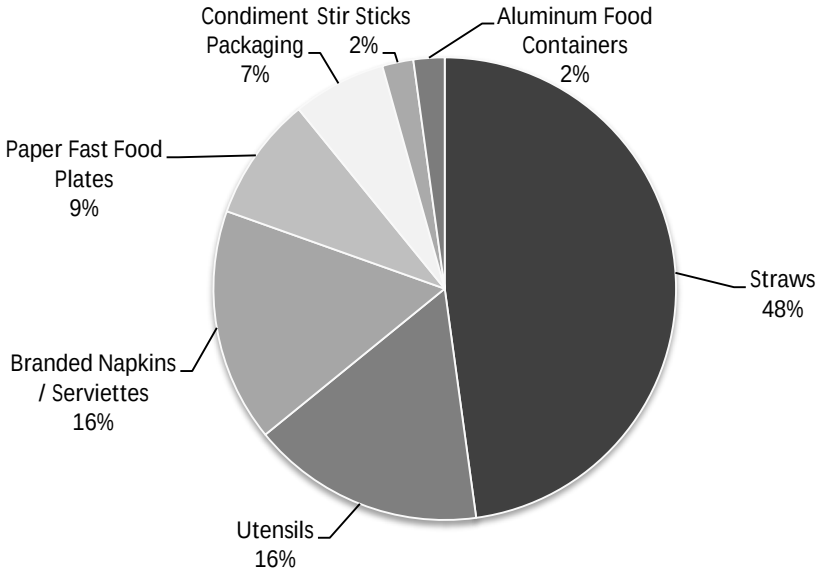

Figure 19: Take Out Extras Composition 2021

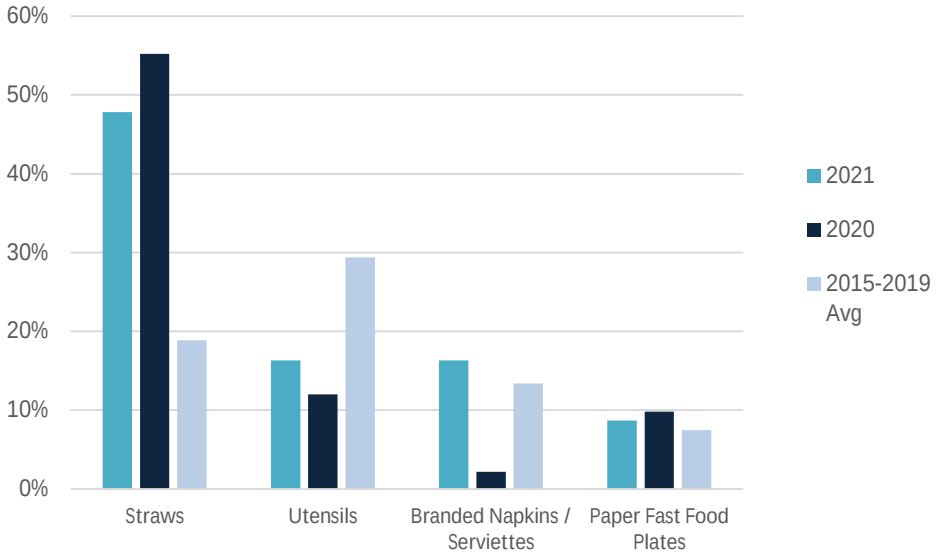

Figure 20: Take Out Extras Previous Audit Comparison

Trays

Zero trays were observed during the 2021. Figure 21 compares sub-categories from all previous City of Vancouver Litter Audits.

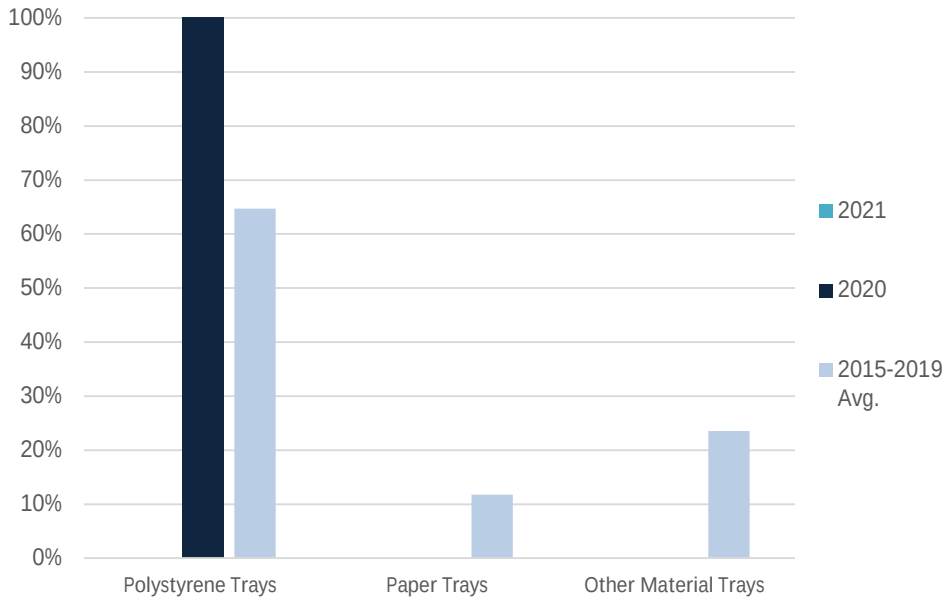

Figure 21: Trays Previous Audit Comparison

Confectionary/Snacks

This category represented 7% (n=70) of all large litter observed in 2021. The most frequently observed sub-categories for large litter were snack food packaging (69%) and candy bar wrappers (24%). Figure 22 illustrates the results of the confectionary/snacks category breakdown. Figure 23 compares the highest four sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

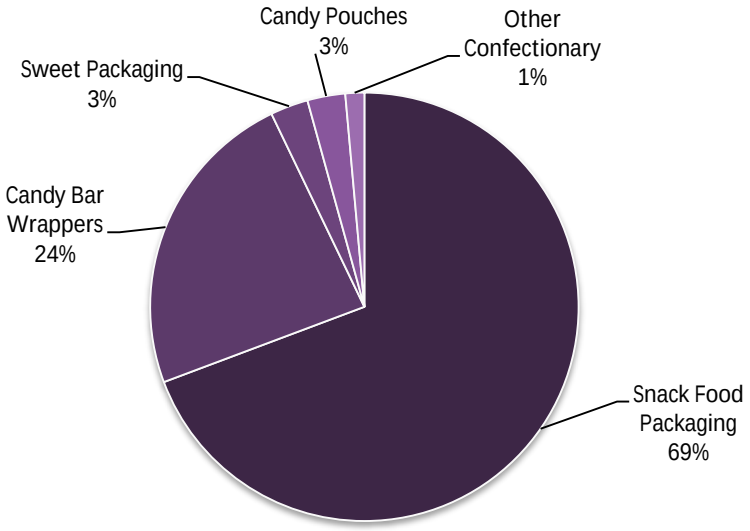

Figure 22: Confectionary/Snacks Composition 2021

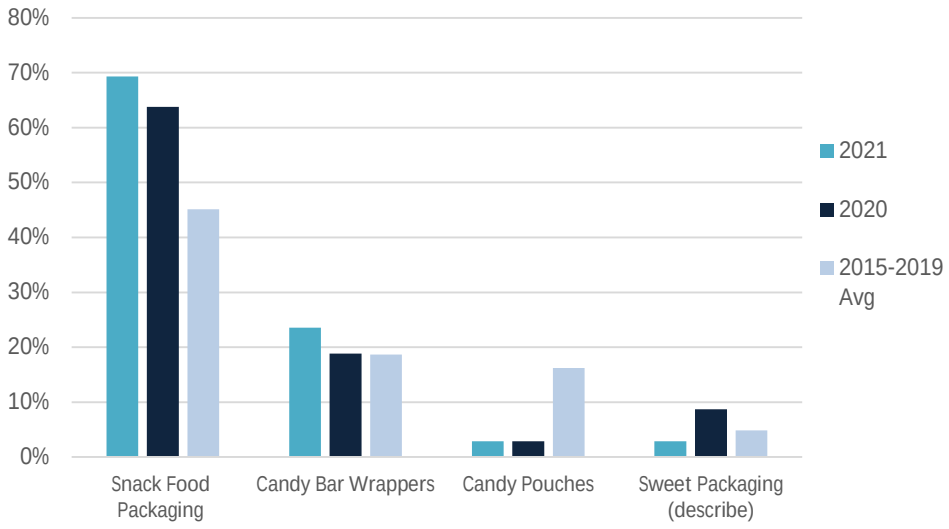

Figure 23: Confectionary/Snack Previous Audit Comparison

Cloth

The cloth category was split 37% for clothing or clothing pieces and 63% for other cloth. Cloth represented 1% (n=8) of all large litter observed in 2021 (Figure 24). Figure 25 compares the sub-categories observed in the most recent audit to the 2020, as well as the average of the 2015-2019 audits.

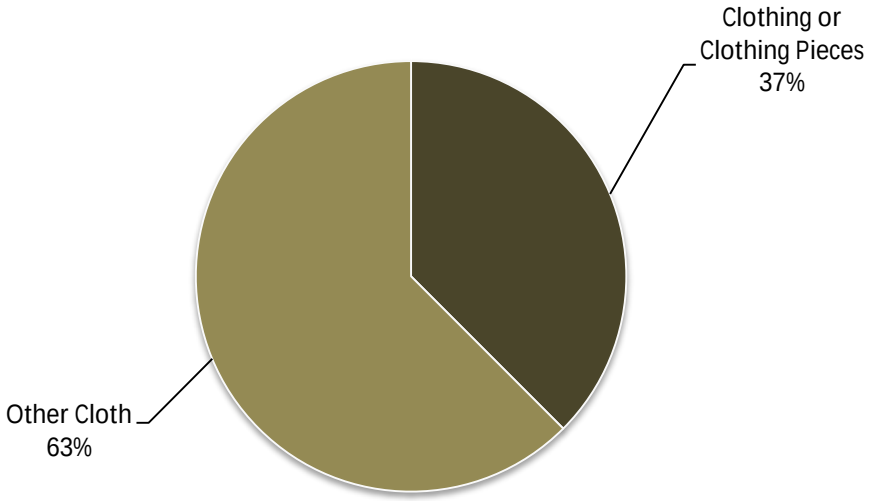

Figure 24: Cloth Composition, 2021

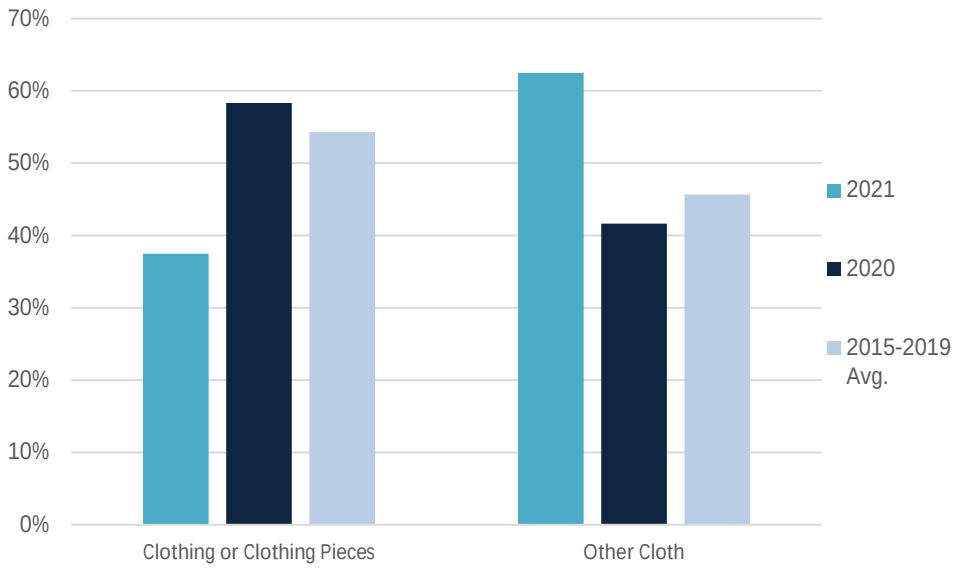

Figure 25: Cloth Previous Audit Comparison

Other Miscellaneous Packaging

Other miscellaneous packaging represented 7% (n=75) of the large litter observed in 2021. Plastic packaging other (80%) and foil materials/foil pieces (11%) comprised of the majority the 'other miscellaneous packaging' category, entirely. Figure 26 illustrates the breakdown of this category and Figure 27 compares the sub-categories observed in 2021 to 2020, as well as the average of the 2015-2019 audits.

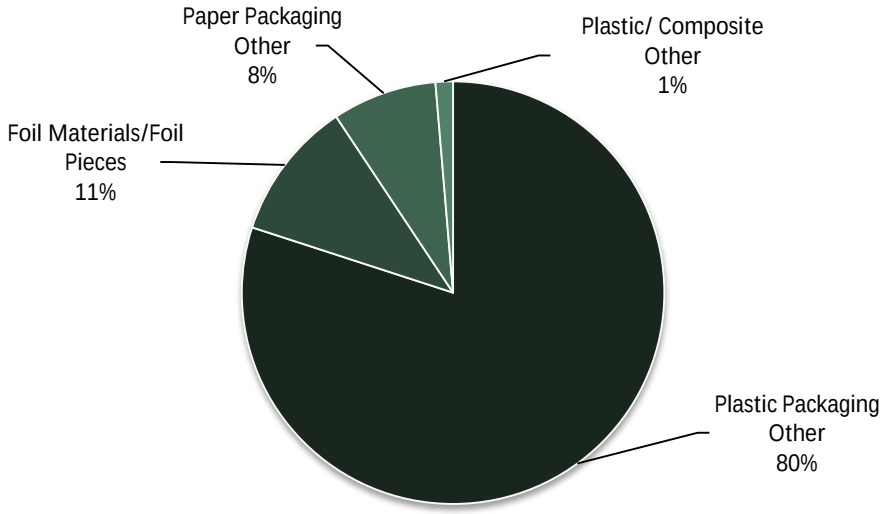

Figure 26: Other Miscellaneous Packaging Composition 2021

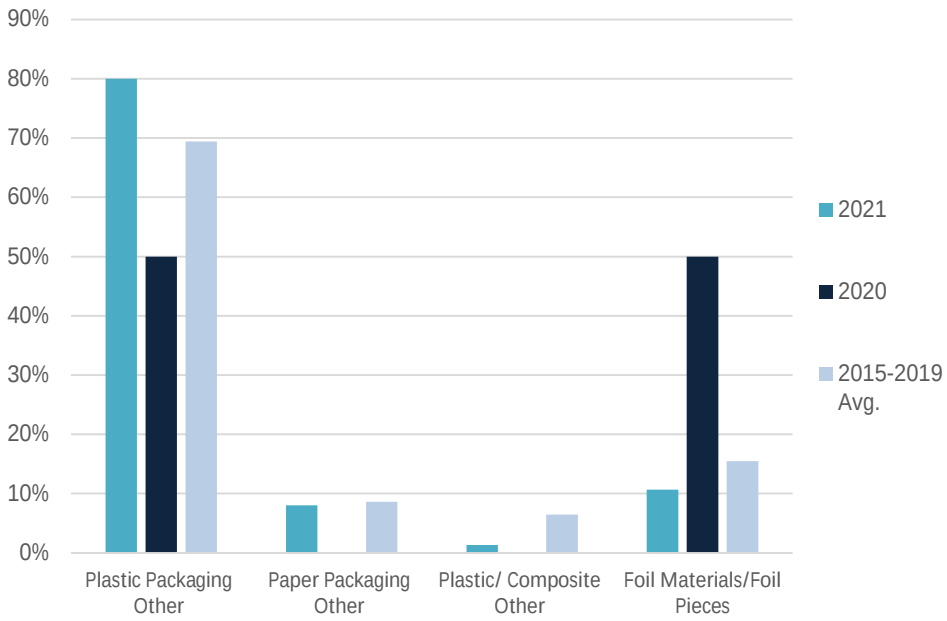

Figure 27: Other Miscellaneous Packaging Previous Audit Comparison

Paper/Fibre Materials

Paper/Fibre Materials were the highest category, alongside 'other miscellaneous', in terms of items most littered and represented 21% (n=219) of all large litter observed in the 2021 street litter audits. The majority of the paper/fibre materials category was non-brand name towels/napkins (43%), receipts (28%) and printed material (25%). Figure 28 provides the detailed breakdown of this category. Figure 29 compares the highest three sub categories from all the audits.

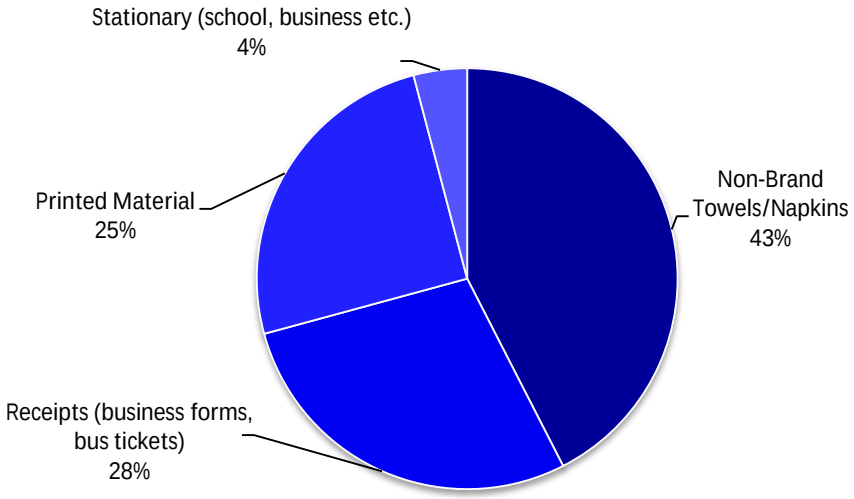

Figure 28: Paper/Fibre Composition 2021

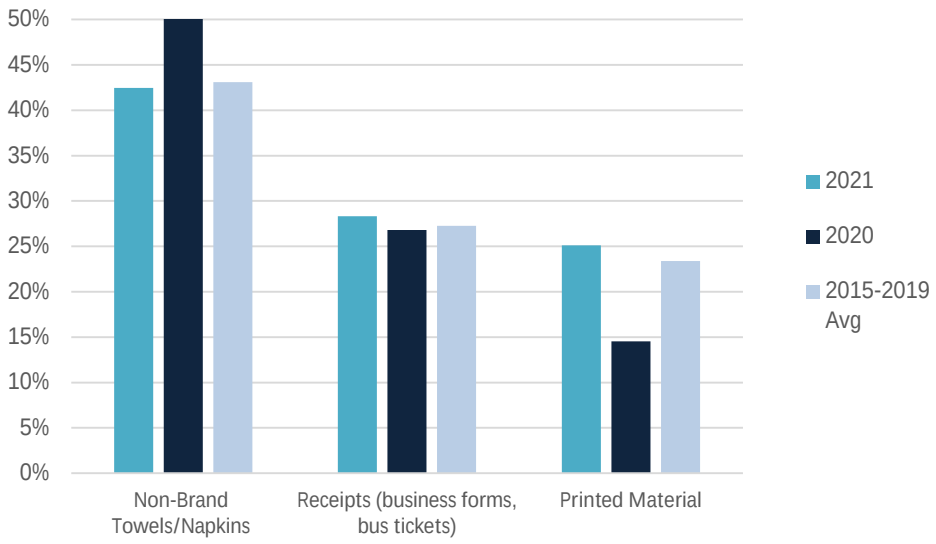

Figure 29: Paper/Fibre Material Previous Audit Comparison

Tobacco Products

In 2021, tobacco products were 2% (n=16) of the large litter items surveyed. Within this category, 94% was 'tobacco other' and 6% cigarette/cigar debris. Tobacco other includes cigarette packaging and cellophane wrapping (Figure 30). Figure 31 compares the two sub-categories from 2021 to 2020, as well as the average of the 2015-2019 audits.

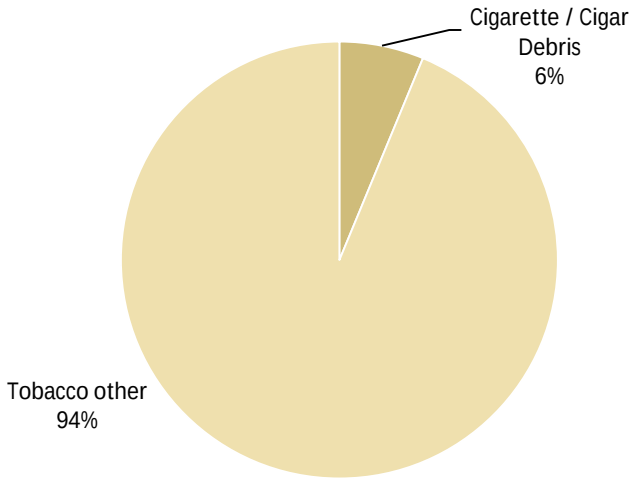

Figure 30: Tobacco Products Composition, 2021

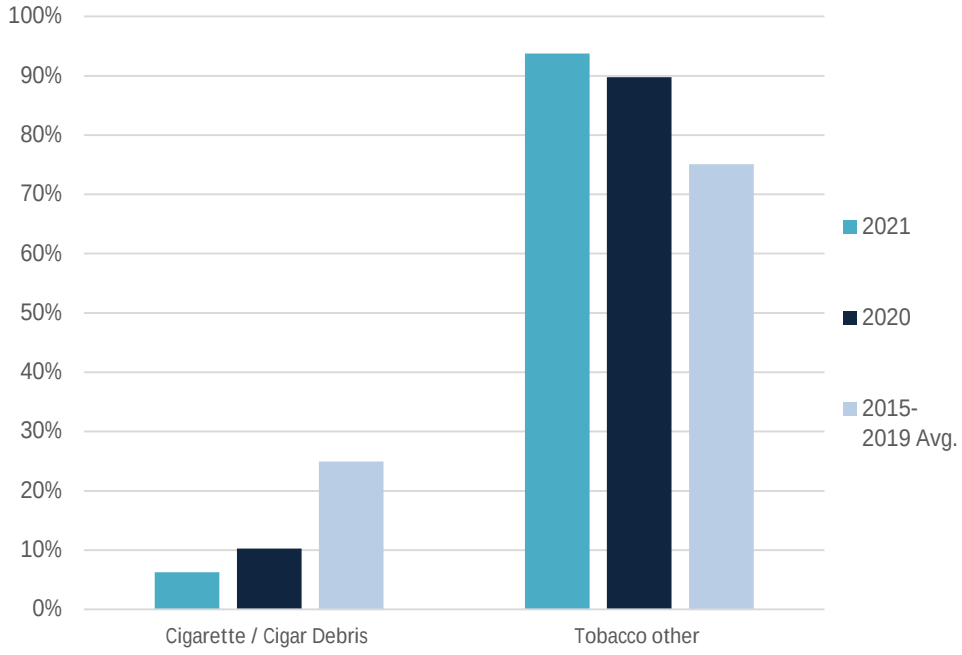

Figure 31: Tobacco Products Previous Audit Comparison

Other Miscellaneous

'Other miscellaneous' was the largest category observed in 2021, alongside paper/fibre material, both representing 21% (n=221.5) of all large litter. The primary sub-categories assessed in 2021 included: miscellaneous plastic (32%) and home articles (30%). It should be noted miscellaneous plastic are made of plastic that did not fit into any other category or could not be identified as such. Household items were items observed that did not fit into other categories such as composite hangers and pictures. Figure 32 illustrates the breakdown of this category while Figure 33 compares the highest four sub-categories observed in the 2021 audits to the previous studies.

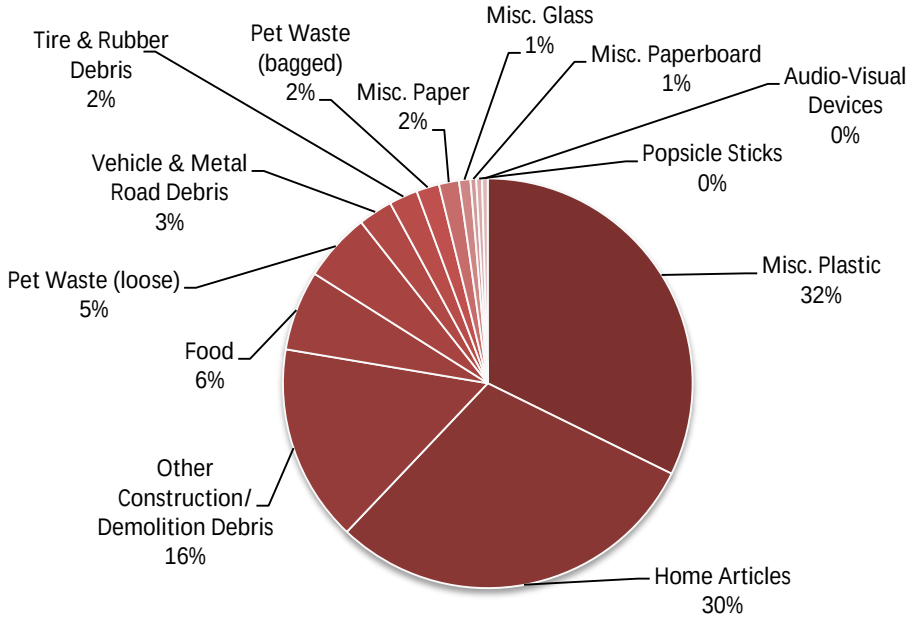

Figure 32: Other Miscellaneous Composition 2021

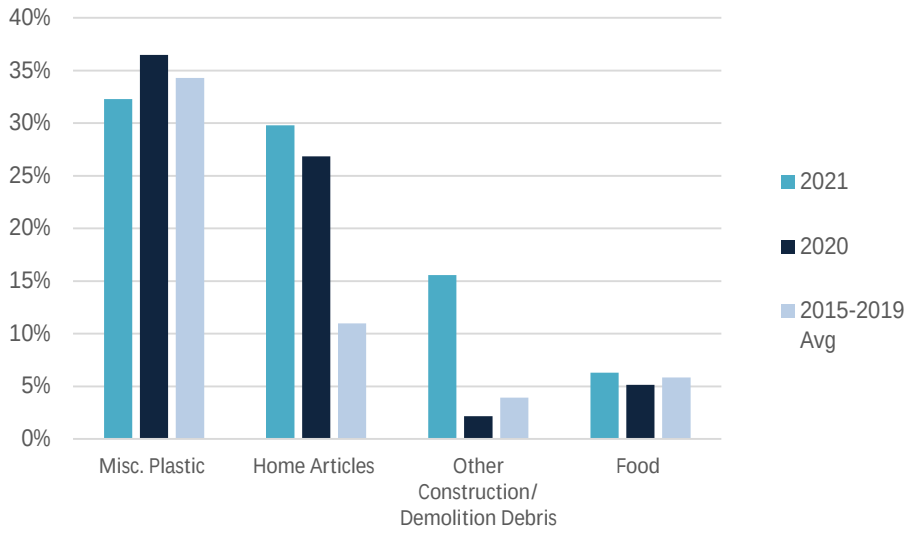

Figure 33: Other Miscellaneous Previous Audit Comparison

Medical Waste

Medical waste accounted for 9% (n=97.5) of the large litter observed. In 2020, medical waste was added as a new category to track litter related to the COVID-19 pandemic. This included disinfecting wipes, disposable gloves and masks. Figure 34 illustrates the breakdown of this category. Comparison to the 2020 audit is provided in Figure 35.

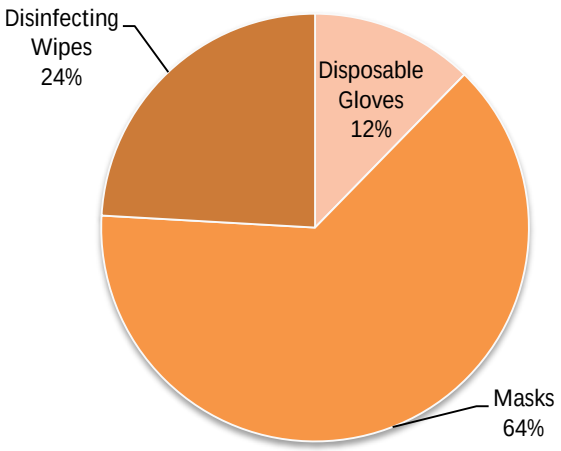

Figure 34: Medical Waste Composition 2021

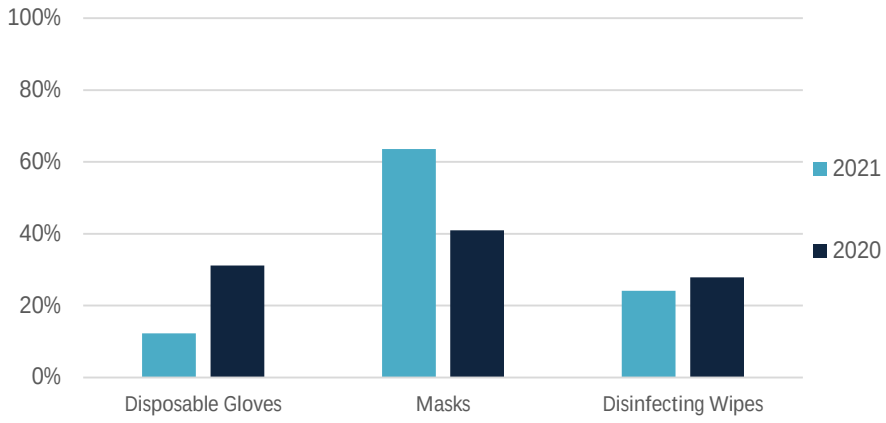

Figure 35: Medical Waste Previous Audit Comparison

Single-Use Items

Of the 1,054.5 pieces of large litter audited, 33% (350) of these items were considered single-use Items (SUIs). Figure 36 illustrates these results. Of the 350 SUIs, the majority were disposable cups (non-foam) (38%), medical waste (28%), other SUI's (plastic food wrap, paper and poly fast food plates, plastic stir sticks, etc.) (20%) and straws (6%). Figure 37 illustrates the breakdown of this category.

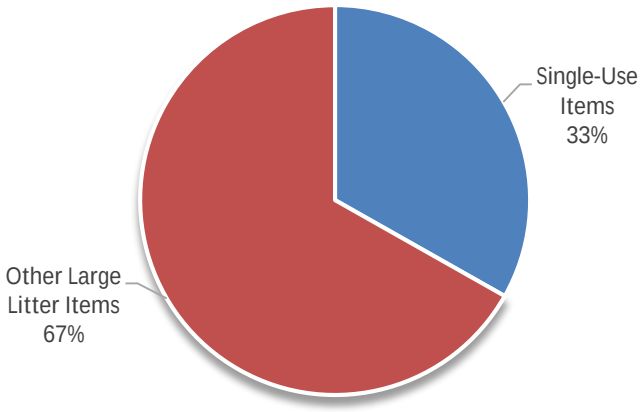

Figure 36: Single-Use Items Comparison

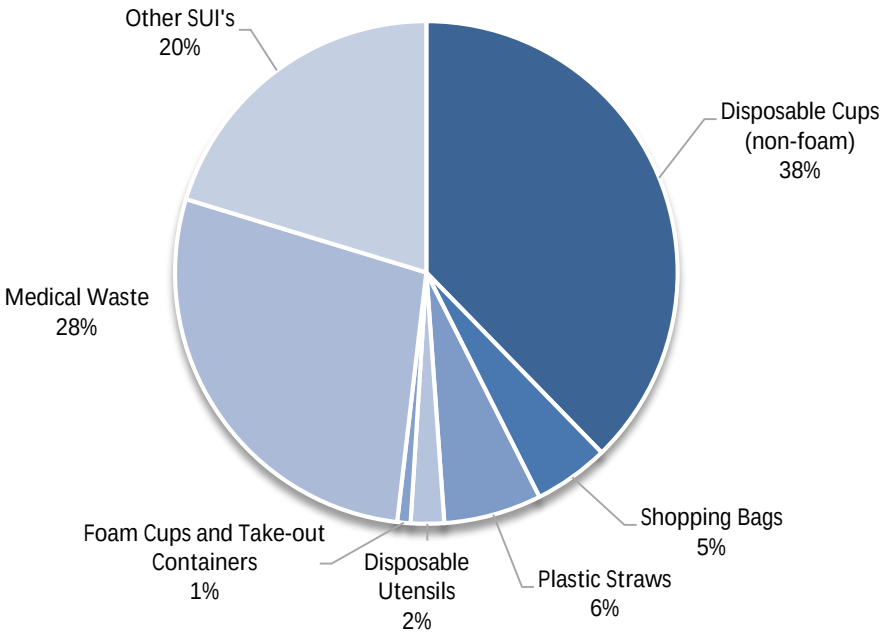

Figure 37: Single-Use Items by Category

3.2.5 Large Litter by Sites

The ten litter sites having the greatest number of large litter pieces are listed below in Table 4. The site with the most accumulated large litter in 2021 was Site 41 with 58.5 pieces of large litter observed, largely related to the fast food restaurant located in the area. This site is zoned commercial. In total, 40% of sites in the "top 10" were commercial (sites 41, 110, 114 and 117). An additional 10% were institutional (site 106), 20% were mixed use sites (sites 76 and 97), and 30% of sites were residential (sites 55, 68 and 60). A full ranking of sites is provided in Appendix G. Of note, 3 of the top 10 sites - Sites 60, 97 and 110 were also litter sites with the highest number of large litter pieces in the 2020 audits.

Table 4: Large Litter Site Rankings

Site Number	Number of Pieces of Large Litter	Hundred Block	Street Name
41	58.5	300	Terminal Ave.
117	56.5	3100	East 49th Ave.
55	54	3400	Vanness Ave.
110	47	400	Main St.
60	46	7200	Dumfries
76	40	700	East 30th Ave.
97	36	800	Commercial Dr.
114	26	4000	MacDonald St.
58	20	5700	Berkeley St.
106	20	1000	Burrard St.

3.2.6 Large Litter by Zoning

Sites were zoned by their typical land-use. Zones used to categorize sites included: Commercial, mixed-use, single-family, multi-family, institutional and industrial. A breakdown of the number of sites per zone is provided in Table 5.

Table 5: Number of Litter Sites per Zoning

Zoning Type	Number of Litter Sites	Avg. # of Large Litter Items per Site
Multi-Family	14	7.9
Single-Family	62	8.7
Institutional	2	8.8
Commercial	25	10.7
Industrial	3	11.8
Mixed Use	5	16.6

A breakdown of large litter composition per zoning type is provided in Table 6 and illustrated in Figure 38.

Table 6: Large Litter Composition by Zoning Type

Large Litter Category	Overall	Commercial	Mixed Use	Single-Family	Multi-Family	Institutional	Industrial
Avg. # of Large Litter per Site	9.5	10.7	16.6	8.7	7.9	8.8	11.8
Beverage Containers	3%	3%	4%	2%	2%	6%	3%
Other Packaging	0%	1%	0%	0%	0%	0%	0%
Cups	12%	16%	22%	9%	6%	0%	8%
Bags	4%	4%	10%	3%	6%	6%	8%
Other Packaging (Boxes)	4%	4%	0%	3%	6%	0%	6%
Other Containers	1%	1%	1%	1%	2%	0%	3%
Food Wraps/ Containers	5%	3%	13%	4%	8%	0%	0%
Take Out Extras	4%	4%	7%	5%	2%	0%	0%
Trays	0%	0%	0%	0%	0%	0%	0%
Confectionary/ Snack	7%	5%	12%	5%	13%	6%	6%
Cloth	1%	1%	0%	1%	0%	0%	1%
Other Miscellaneous Packaging	7%	7%	4%	9%	3%	0%	6%
Paper/ Fibre Material	21%	15%	10%	23%	27%	37%	30%
Tobacco Products	2%	0%	0%	2%	3%	0%	0%
Other Miscellaneous	21%	24%	12%	22%	13%	34%	27%
Medical Waste	9%	11%	6%	9%	10%	11%	3%
Total	100%	100%	100%	100%	100%	100%	100%

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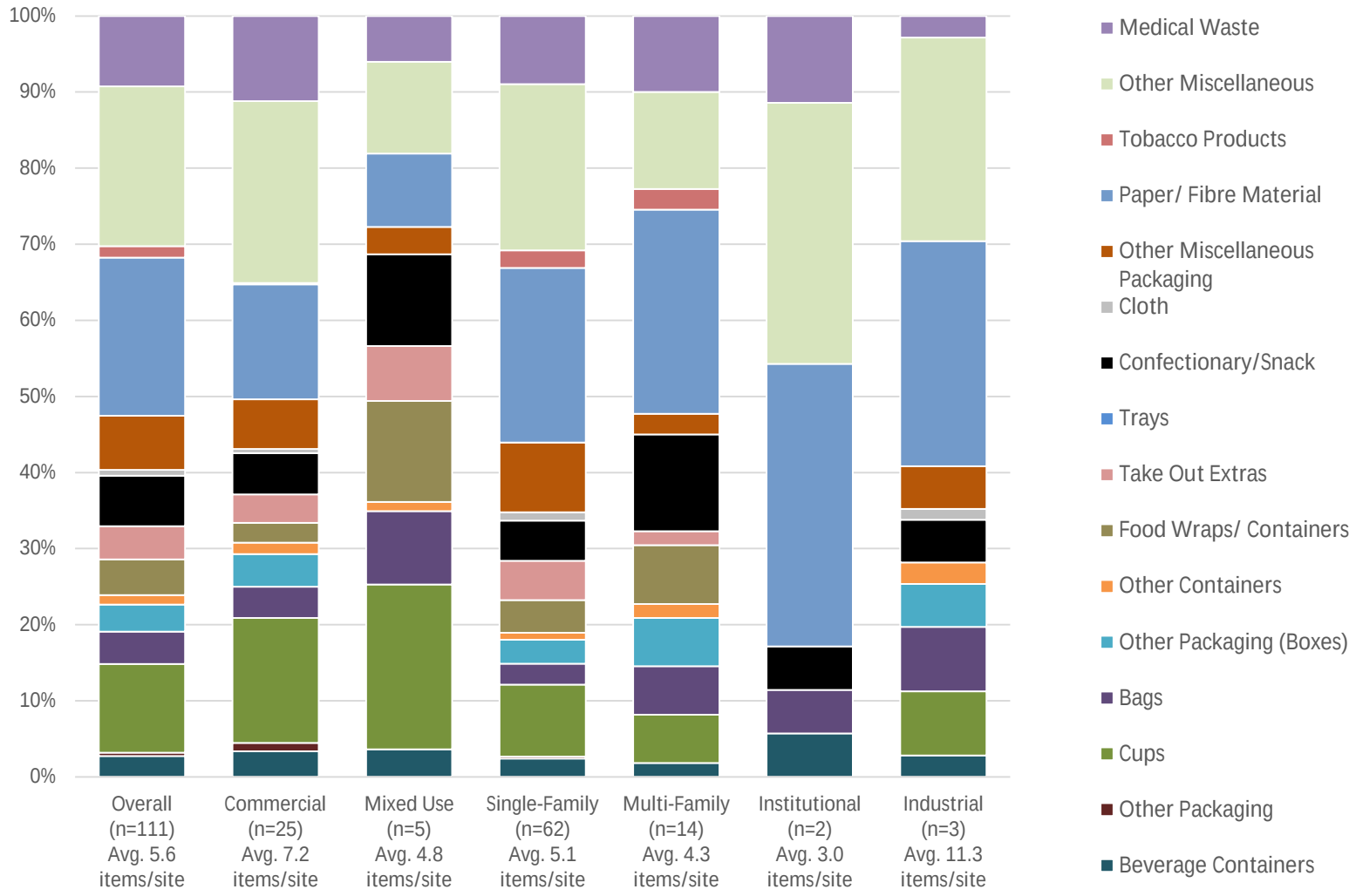

Figure 38: Large Litter Composition by Zone Type

3.2.7 Large Litter Results Compared to Previous Studies

The composition and average accumulation from 2021 are compared by category to the average number of items for audit years 2015-2019 in Table 7. The audit completed in 2020 is compared separately as it is considered an anomalous year due to the influence of COVID-19 on litter accumulation and consumer habits. It should be noted medical waste was not assessed as a separate category in the baseline audit study, having only been added in 2020.

Overall, there was a 6% decrease in the average amount of large litter observed in 2021 from the average amount observed in years 2015 through 2019. It should be noted these values do not include the thirteen sites that were immediately adjacent to construction activity. All categories with the exception of beverage containers, other packaging (boxes), food wraps/containers and other miscellaneous packaging decreased from the 2015-2019 assessment average. Other miscellaneous packaging had the largest increase of 106% (an average of 0.33 pieces per site in the 2015 to 2019 average compared to 0.69 in 2021) followed by food wraps/containers, with an increase of 42% (an average of 0.31 pieces in the 2015 to 2019 average compared to 0.45 in 2021).

Table 7: 2021 vs. 2015-2019 Average Results Large Litter Comparison

Category	2021 Results (111 Sites)		2015-2019 Average Results (Average of 106 Sites)	
	Avg. # Litter Items per Site	% of Total	Avg. # Litter Items per Site	% of Total
Beverage Containers	0.3	3%	0.2	2%
Other Packaging	0.0	0%	0.1	1%
Cups	1.1	12%	1.7	17%
Bags	0.4	4%	0.6	6%
Other Packaging (Boxes)	0.3	4%	0.3	3%
Other Containers	0.1	1%	0.1	1%
Food Wraps/ Containers	0.4	5%	0.3	3%
Take Out Extras	0.4	4%	0.5	5%
Trays	0.0	0%	0.0	0%
Confectionary/Snack	0.6	7%	0.8	8%
Cloth	0.1	1%	0.2	2%
Other Miscellaneous Packaging	0.7	7%	0.3	3%
Paper/ Fibre Material	2.0	21%	2.1	20%
Tobacco Products	0.1	2%	0.5	5%
Other Miscellaneous	2.0	21%	2.3	23%
Medical Waste	0.9	9%	-	-
Total	9.5	100%	10.1	100%

The composition and accumulation from the 2020 audit to the 2021 results by category are compared in Table 8. There was a 7% decrease in the amount of large litter observed in 2021 from 2020. It should be noted that these values do not include the six sites that were immediately adjacent to construction activity in 2020 or the thirteen sites in 2021. Compared to 2020, cups, other packaging (boxes), food wraps/containers, confectionary/snack, other miscellaneous packaging and medical waste, increased in 2021. There was an increase of 1876% in other miscellaneous packaging and an increase of 86% in food wraps/containers.

Table 8: 2021 vs. 2020 Large Litter Comparison

Category	2021 Results (111 Sites)		2020 Follow-Up (117 Sites)	
	Avg. # Litter Items per Site	% of Total	Avg. # Litter Items per Site	% of Total
Beverage Containers	0.3	3%	0.3	3%
Other Packaging	0.0	0%	0.1	1%
Cups	1.1	12%	1.0	10%
Bags	0.4	4%	0.6	6%
Other Packaging (Boxes)	0.3	4%	0.2	2%
Other Containers	0.1	1%	0.1	1%
Food Wraps/ Containers	0.4	5%	0.2	2%
Take Out Extras	0.4	4%	0.8	8%
Trays	0.0	0%	0.0	0%
Confectionary/Snack	0.6	7%	0.6	6%
Cloth	0.1	1%	0.1	1%
Other Miscellaneous Packaging	0.7	7%	0.0	0%
Paper/ Fibre Material	2.0	21%	2.1	20%
Tobacco Products	0.1	2%	0.3	3%
Other Miscellaneous	2.0	21%	3.1	31%
Medical Waste	0.9	9%	0.5	5%
Total	9.5	100%	10.3	100%

The average number of litter items per year and the composition of those materials has changed throughout each year of the audit. Figure 39 illustrates the annual results of litter composition throughout each audit year based on average number of litter items per site.

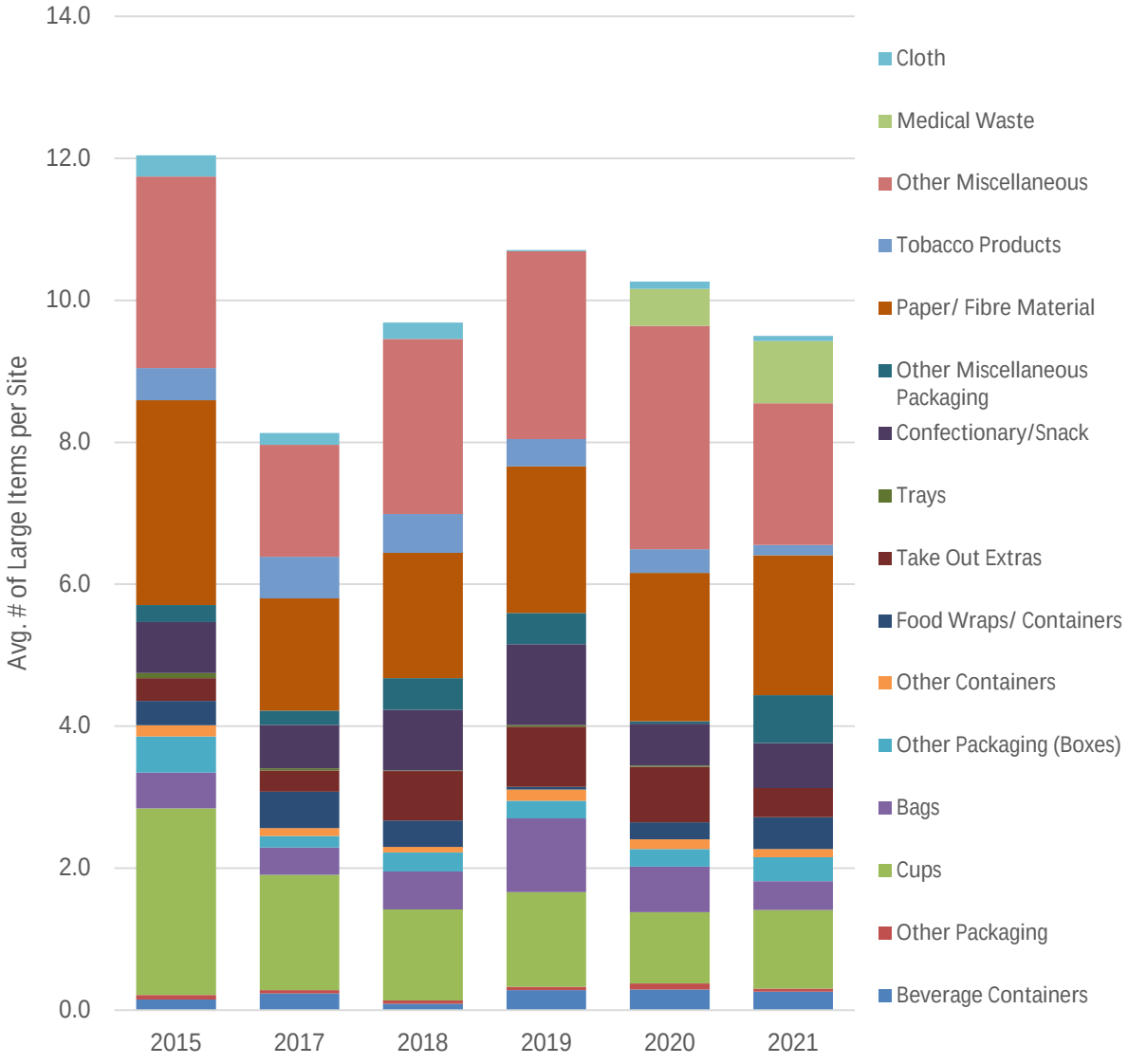

Figure 39: Comparison of Large Litter Categories by Year

3.2.8 Large Litter Results Compared to Other North American Municipalities

Large litter audits are completed in several North American municipalities. These assessments audit large litter in similar categories using the same methodology as this study. Table 9 illustrates the percentage breakdown per large litter item category for each municipality. Figure 40 illustrates the top three large litter categories observed in the 2021 Vancouver street litter audits to the results for each municipality (as well as Vancouver in 2020 and the average results for 2015 through 2019).

Table 10 illustrates the average number of items counted per site based on category. Figure 41 illustrates these results graphically.

Table 9: Vancouver Large Litter Audit Results Compared with Audit Results of Other Cities (by Percent Breakdown)

Category	San Francisco 2009	Winnipeg 2014	Edmonton 2016	Toronto 2016	Edmonton 2017	Edmonton 2019	Toronto 2020	Vancouver 2015 - 2019	Vancouver 2020	Vancouver 2021
Beverage Containers	3%	10%	2%	6%	1%	1%	7%	2%	3%	3%
Other Packaging	3%	5%	0%	1%	0%	1%	1%	1%	1%	0%
Cups	6%	6%	13%	11%	18%	11%	10%	17%	10%	12%
Bags	6%	6%	2%	4%	3%	4%	5%	6%	6%	4%
Other Packaging (Boxes)	3%	2%	3%	9%	4%	4%	3%	3%	2%	4%
Other Containers	2%	1%	5%	1%	8%	1%	1%	1%	1%	1%
Food Wraps/ Containers	4%	1%	4%	3%	4%	3%	4%	3%	2%	5%
Take Out Extras	4%	13%	8%	2%	9%	7%	6%	5%	8%	4%
Trays	0%	n/a	0%	0%	n/a	0%	0%	0%	0%	0%
Confectionary/ Snack	8%	6%	4%	5%	6%	7%	5%	8%	6%	7%
Cloth	1%	1%	0%	2%	n/a	3%	3%	2%	1%	1%
Other Miscellaneous Packaging	n/a	n/a	0%	0%	n/a	n/a	5%	3%	0%	7%
Paper/ Fibre Material	32%	7%	8%	29%	7%	21%	19%	20%	20%	21%
Tobacco Products	4%	8%	3%	6%	5%	5%	5%	5%	3%	2%
Other Miscellaneous	24%	31%	33%	20%	19%	22%	23%	23%	31%	21%
Medical Waste	n/a	n/a	n/a	n/a	n/a	n/a	4%	n/a	5%	9%
Additional Categories	n/a	n/a	1%	0%	1%	0%	0%	n/a	n/a	n/a
Household Articles	n/a	n/a	16%	0%	15%	10%	0%	n/a	n/a	n/a
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

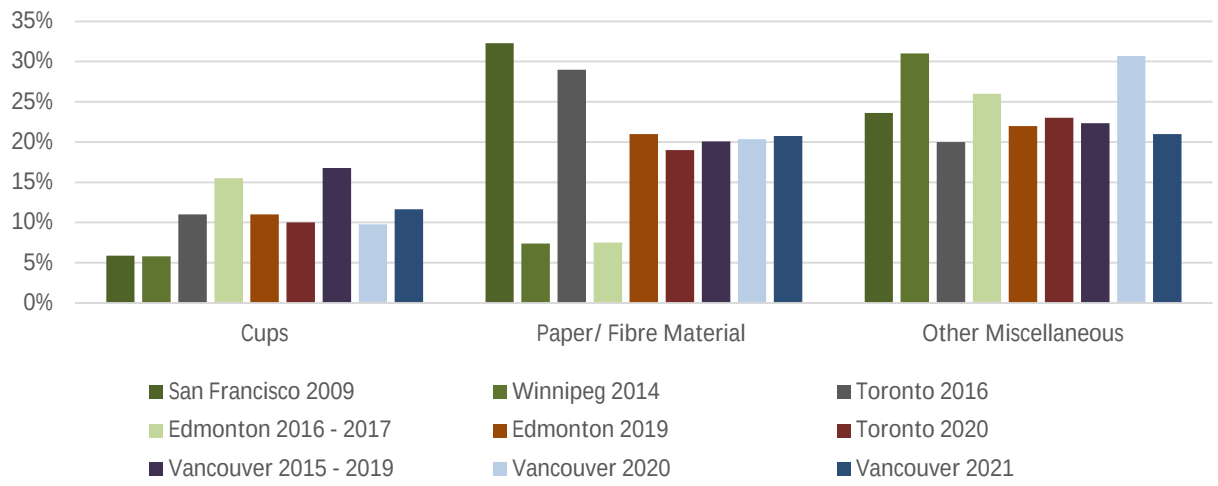

Figure 40: Comparison of Top Large Litter Categories by Municipality

Table 10: Vancouver Large Litter Audit Results Compared with Audit Results of Other Cities (Average Number of Items per Site)

Category	San Francisco 2009	Winnipeg 2014	Toronto 2016	Edmonton 2016-2017	Edmonton 2019	Toronto 2020	San Francisco 2009	Vancouver 2015 -2019	Vancouver 2020	Vancouver 2021
Beverage Containers	1.3	1.5	0.7	0.1	0.1	0.7	1.3	0.2	0.3	0.3
Other Packaging	1.9	0.8	1.2	0.0	0.0	0.1	1.9	0.1	0.1	0.0
Cups	3.0	1.0	1.4	1.3	0.8	1.0	3.0	1.7	1.0	1.1
Bags	1.4	0.8	0.6	0.2	0.3	0.5	1.4	0.6	0.6	0.4
Other Packaging (Boxes)	0.7	0.3	0.1	0.3	0.3	0.3	0.7	0.3	0.2	0.3
Other Containers	0.7	0.1	0.1	0.6	0.1	0.1	0.7	0.1	0.1	0.1
Food Wraps/ Containers	1.2	1.8	0.4	0.3	0.2	0.4	1.2	0.3	0.2	0.4
Take Out Extras	1.4	0.0	0.3	0.7	0.5	0.6	1.4	0.5	0.8	0.4
Trays	0.2		0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Confectionary/Snack	3.2	0.9	0.7	0.5	0.5	0.5	3.2	0.8	0.6	0.6
Cloth	0.4	0.2	0.2	0.0	0.2	0.3	0.4	0.2	0.1	0.1
Other Miscellaneous Packaging			0.0	0.0	0.7	0.5		0.3	0.0	0.7
Paper/ Fibre Material	7.8	1.0	3.7	0.7	1.5	1.9	7.8	2.1	2.1	2.0
Tobacco Products	1.4	1.1	0.7	0.3	0.4	0.5	1.4	0.5	0.3	0.1
Other Miscellaneous	9.5	4.1	2.6	2.5	0.7	2.4	9.5	2.3	3.1	2.0
Medical Waste				0.0	0.0	0.4		n/a	0.5	0.9
Additional Categories			0.0	0.1	0.0	0.0		n/a	n/a	n/a
Household Articles			0.0	1.4	0.0	0.0		n/a	n/a	n/a
Total	34.0	13.3	12.8	9.1	6.4	10.1	34.0	10.1	10.3	9.5

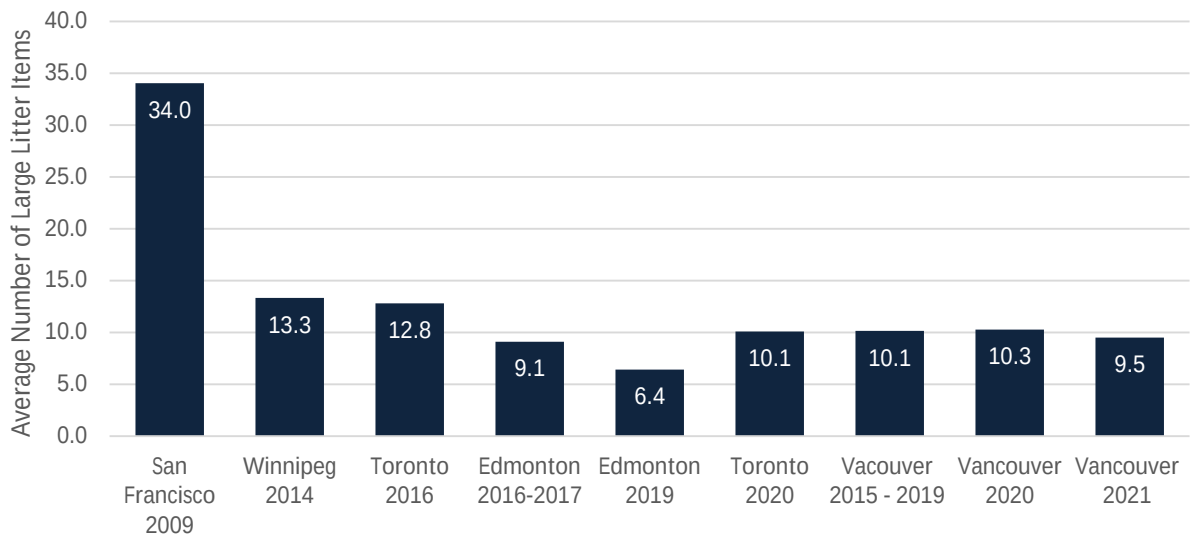

Figure 41: Average Large Litter Count

3.2.9 Large Litter Statistical Analysis

The average number of large litter items per site in the 2021 audits was 9.5 pieces. There were five sites that had no large litter accumulation whatsoever. Of the 124 sites surveyed, two sites had an average of 10 pieces of large litter within the site, 81 sites had fewer than 10 pieces and 28 sites had more than 10 pieces of large litter.

3.3 Small Litter Results

Small litter is any piece of litter that is less than 4 square inches. Small litter was divided into 26 categories for the baseline audit and follow-up audits for 2017 through 2020. In 2021, vapes and vaping equipment categories were added to the small litter audit.

As noted previously, the small litter audit involved examining three sections within the audit site, not the entire site (Supersite audit). This section reviews small litter by category, site and as compared to the rolling average of the baseline (2015) to 2019 and 2020 results. In 2021, the average number of small litter items per site with no construction adjacent was 5.6 pieces. The most common categories of small litter observed were cigarette butts/debris (30%), paper (15%) and chewing gum (14%). Table 11 provides these results (illustrated graphically in Figure 42.

Table 11: Small Litter Data 2021

Category	Total Number of Items	% of Total
Cigarette Butts/Debris	185	30%
Other Tobacco	1	0%
Bottle Caps	7	1%
Straws	4	1%
Candy Packaging and Wrappers	20	3%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	9	1%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	7	1%
Glass	37	6%
Paper	92	15%
Cup Sleeves	0	0%
Plastic Film	48	8%
Hard Plastic	51	8%
Aluminum/Foil Debris	23	4%
Rubber	4	1%
Metal (not aluminum)	33	5%
Chewing Gum (stuck on pavement)	87	14%
Food and Food Scraps	8	1%
Pet Waste (bagged)	0	0%
Pet Waste (loose)	1	0%
Needles/Syringes	0	0%
Medications	0	0%
Cell Phones	0	0%
Audio-Visual Devices	0	0%
Batteries	0	0%
Other Electronic Waste	0	0%
Other Material	6	1%
Vapes	0	0%
Vaping Equipment	0	0%
Total Site Small Litter	623	100%

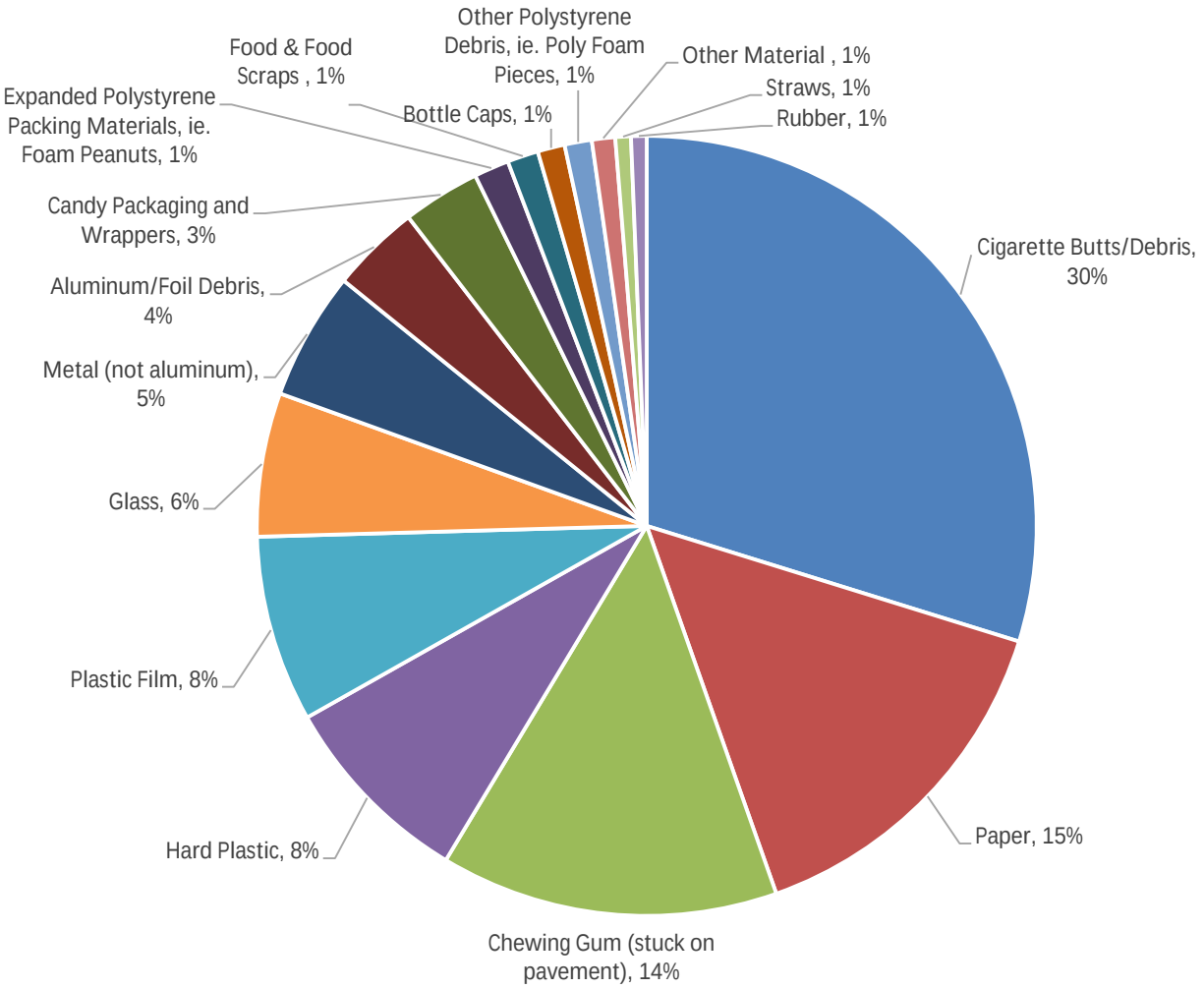

Figure 42: Small Litter Composition, 2021

3.3.1 Small Litter by Sites

The ten small litter sites with the most observed small litter are listed below in Table 12. The site with the most accumulated small litter in 2021 was Site 97 with 42 pieces of small litter observed. This site is zoned mixed use. In total, 40% of sites are zoned commercial, 20% single-family residential, 20% mixed use and 10% industrial. A full ranking of sites is provided in Appendix G. Of note, 4 of the top 10 sites - Sites 107, 110, 106 and 55 were also litter sites with the highest number of large litter pieces in the 2020 audits.

Table 12: Small Litter Site Rankings

Site Number	Number of Pieces of Small Litter	Zoning	Hundred Block	Street Name
97	42	Mixed-Use	800	Commercial Dr
107	37	Multi-Family	600	Powell St
54	28	Industrial	1100	Clark Dr
104	27	Commercial	2400	Main St
96	22	Mixed-Use	1700	East Pender St.
110	22	Commercial	400	Main St
18	16	Commercial	800	Hornby St
106	16	Institutional	1000	Burrard St
31	15	Commercial	2700	E Hastings St
55	15	Multi-Family	3400	Vanness St

3.3.2 Small Litter by Zoning

Sites were zoned by their typical land-use. Zones used to categorize sites included: Commercial, mixed-use, single-family, multi-family, institutional and industrial. A breakdown of the number of sites per zone is provided in Table 13.

Table 13: Number of Litter Sites per Zoning

Zoning Type	Number of Litter Sites	Avg. # of Small Litter Items per Site
Institutional	2	3.0
Multi-Family	14	4.3
Mixed Use	5	4.8
Single-Family	62	5.1
Commercial	25	7.2
Industrial	3	11.3

A breakdown of small litter composition per zoning type is provided in Table 14 and illustrated in Figure 43.

Table 14: Small Litter Composition by Zoning Type

Small Litter Category	Overall	Commercial	Mixed Use	Single-Family	Multi-Family	Institutional	Industrial
Avg. # of Small Litter per Site	5.6	7.2	4.8	5.1	4.3	3.0	11.3
Cigarette Butts/Debris	30%	22%	17%	34%	27%	50%	44%
Other Tobacco	0%	0%	0%	0%	2%	0%	0%
Bottle Caps	1%	2%	0%	0%	5%	0%	0%
Straws	1%	0%	0%	1%	0%	33%	0%
Candy Packaging and Wrappers	3%	1%	4%	4%	5%	0%	3%
Expanded Polystyrene Packing Materials, i.e. Foam Peanuts	1%	1%	4%	2%	0%	0%	0%
Other Polystyrene Debris, i.e. Poly Foam Pieces	1%	2%	0%	1%	0%	0%	0%
Glass	6%	3%	0%	8%	5%	0%	9%
Paper	15%	14%	38%	14%	18%	0%	9%
Cup Sleeves	0%	0%	0%	0%	0%	0%	0%
Plastic Film	8%	11%	25%	6%	0%	0%	6%
Hard Plastic	8%	7%	13%	8%	13%	0%	9%
Aluminum/Foil Debris	4%	6%	0%	3%	5%	0%	0%
Rubber	1%	1%	0%	0%	2%	0%	0%
Metal (not aluminum)	5%	7%	0%	6%	2%	17%	0%
Chewing Gum (stuck on pavement)	14%	22%	0%	10%	15%	0%	21%
Food & Food Scraps	1%	1%	0%	2%	0%	0%	0%
Pet Waste (bagged)	0%	0%	0%	0%	0%	0%	0%
Pet Waste (loose)	0%	0%	0%	0%	0%	0%	0%
Needles/Syringes	0%	0%	0%	0%	0%	0%	0%
Medications	0%	0%	0%	0%	0%	0%	0%
Cell Phones	0%	0%	0%	0%	0%	0%	0%
Audio-Visual devices	0%	0%	0%	0%	0%	0%	0%
Batteries	0%	0%	0%	0%	0%	0%	0%
Other Electronic Waste	0%	0%	0%	0%	0%	0%	0%
Other Material	1%	1%	0%	1%	2%	0%	0%
Vapes	0%	0%	0%	0%	0%	0%	0%
Vaping Equipment	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%

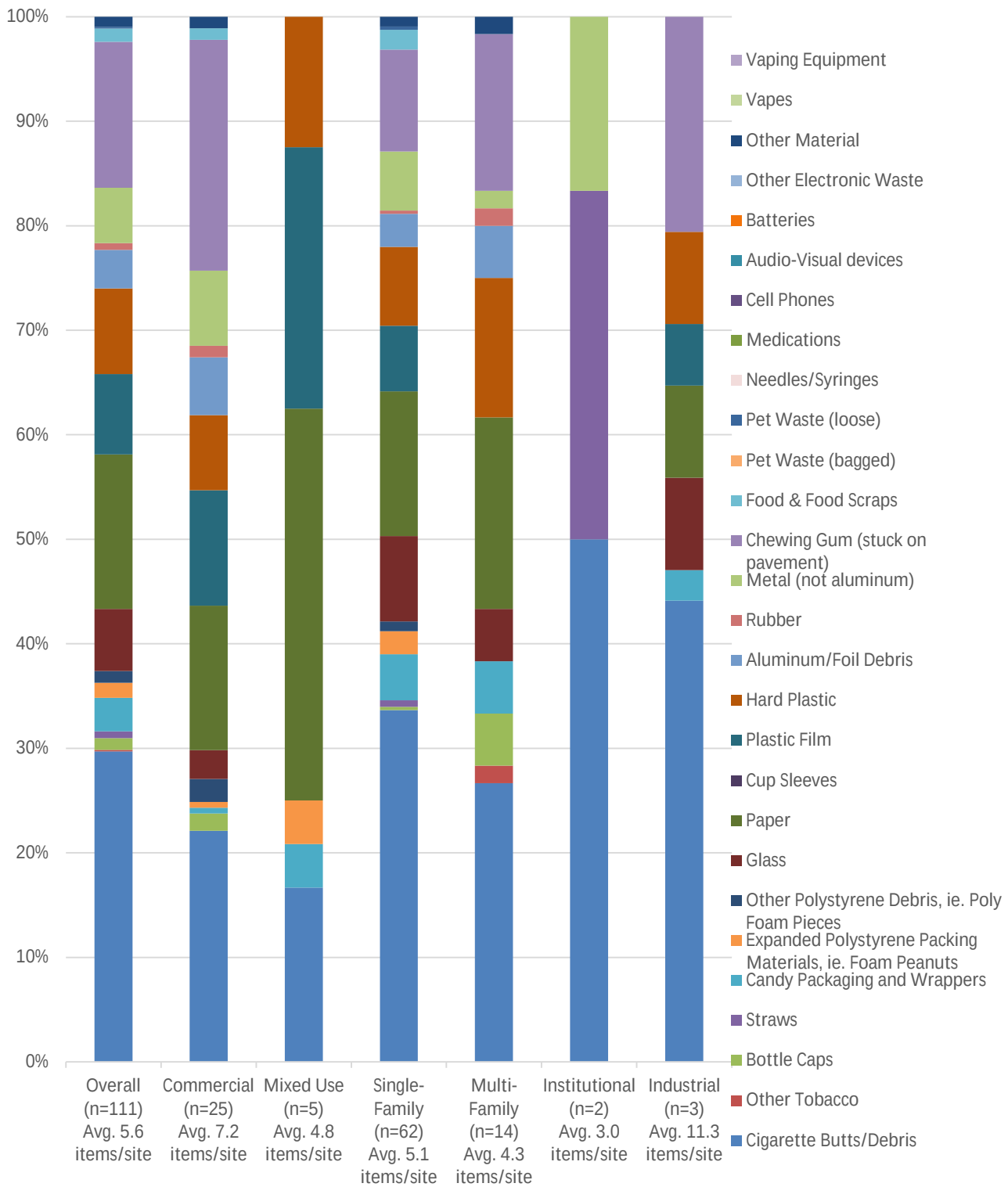

Figure 43: Smaller Litter Composition by Zone Type

3.3.3 Small Litter Results Compared to Previous Studies

The composition and average accumulation from 2021 are compared by category to the average number of items for audit years 2015-2019 in Table 15. Table 16 compares the composition of average accumulated small litter to the 2020 audit. The audit completed in 2020 is compared separately as it is considered an anomalous year due to the influence of COVID-19. A comparison of the average accumulated small litter by year is presented in Figure 44. It should be noted vapes and vaping equipment waste was not assessed as a separate category in the audit studies conducted previously, having only been added in 2021.

Overall, there was a 20% decrease in the average number of small litter per site observed in 2021 compared to the average of 2015 through 2019, and a 31% decrease from the 2020 audit. It should be noted these values do not include the thirteen sites that were immediately adjacent to construction in 2021, the six sites in 2020, or the average number of sites immediately adjacent to construction for the 2015 through 2019 audits.

Of note, compared to the 2015 to 2019 average results, small litter increases were seen in nine of the categories, predominately in the bottle caps (282%), metal (not aluminum) (260%), straws (118%) and glass (79%) categories. Small litter increases compared to 2020 results were observed in bottle caps (638%), metal (not aluminum) (168%), plastic film (153%) and rubber (5%).

Table 15: 2021 vs 2015-2019 Average Results Small Litter Comparison

Category	2021 Results (111 Sites)		2015-2019 Average Results (Average of 106 Sites)	
	Avg. # Small Litter Items per Site	% of Total	Avg. # Small Litter Items per Site	% of Total
Cigarette Butts/Debris	1.7	30%	2.1	30%
Other Tobacco	0.0	0%	0.0	0%
Bottle Caps	0.1	1%	0.0	0%
Straws	0.0	1%	0.0	0%
Candy Packaging and Wrappers	0.2	3%	0.2	3%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0.1	1%	0.1	2%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	0.1	1%	0.0	1%
Glass	0.3	6%	0.2	3%
Paper	0.8	15%	1.2	17%
Cup Sleeves	0.0	0%	0.0	0%
Plastic Film	0.4	8%	0.4	6%
Hard Plastic	0.5	8%	0.4	5%
Aluminum/Foil Debris	0.2	4%	0.2	3%
Rubber	0.0	1%	0.0	1%
Metal (not aluminum)	0.3	5%	0.1	1%
Chewing Gum (stuck on pavement)	0.8	14%	1.7	25%
Food and Food Scraps	0.1	1%	0.1	1%
Pet Waste (bagged)	0.0	0%	0.0	0%
Pet Waste (loose)	0.0	0%	0.0	0%
Needles/Syringes	0.0	0%	0.0	0%
Medications	0.0	0%	0.0	0%
Cell Phones	0.0	0%	0.0	0%
Audio-Visual Devices	0.0	0%	0.0	0%
Batteries	0.0	0%	0.0	0%
Other Electronic Waste	0.0	0%	0.0	0%
Other Materials	0.1	1%	0.1	2%
Vapes	0.0	0%	-	-
Vaping Equipment	0.0	0%	-	-
Total Site Small Litter	5.6	100%	7.0	100%

Table 16: 2021 vs. 2020 Small Litter Comparison

Category	2021 Results (111 Sites)		2020 Results (117 Sites)	
	Avg. # Small Litter Items per Site	% of Total	Avg. # Small Litter Items per Site	% of Total
Cigarette Butts/Debris	1.7	30%	2.0	24%
Other Tobacco	0.0	0%	0.0	0%
Bottle Caps	0.1	1%	0.0	0%
Straws	0.0	1%	0.0	0%
Candy Packaging and Wrappers	0.2	3%	0.3	3%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0.1	1%	0.2	2%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	0.1	1%	0.1	1%
Glass	0.3	6%	0.9	11%
Paper	0.8	15%	1.4	17%
Cup Sleeves	0.0	0%	0.0	0%
Plastic Film	0.4	8%	0.2	2%
Hard Plastic	0.5	8%	0.7	8%
Aluminum/Foil Debris	0.2	4%	0.3	4%
Rubber	0.0	1%	0.0	0%
Metal (not aluminum)	0.3	5%	0.1	1%
Chewing Gum (stuck on pavement)	0.8	14%	1.6	19%
Food and Food Scraps	0.1	1%	0.1	1%
Pet Waste (bagged)	0.0	0%	0.0	0%
Pet Waste (loose)	0.0	0%	0.0	0%
Needles/Syringes	0.0	0%	0.0	0%
Medications	0.0	0%	0.0	0%
Cell Phones	0.0	0%	0.0	0%
Audio-Visual Devices	0.0	0%	0.0	0%
Batteries	0.0	0%	0.0	0%
Other Electronic Waste	0.0	0%	0.0	0%
Other Materials	0.1	1%	0.2	3%
Vaping	0.0	0%	--	--
Vaping Equipment	0.0	0%	--	--
Total Site Small Litter	5.6	100%	8.2	100%

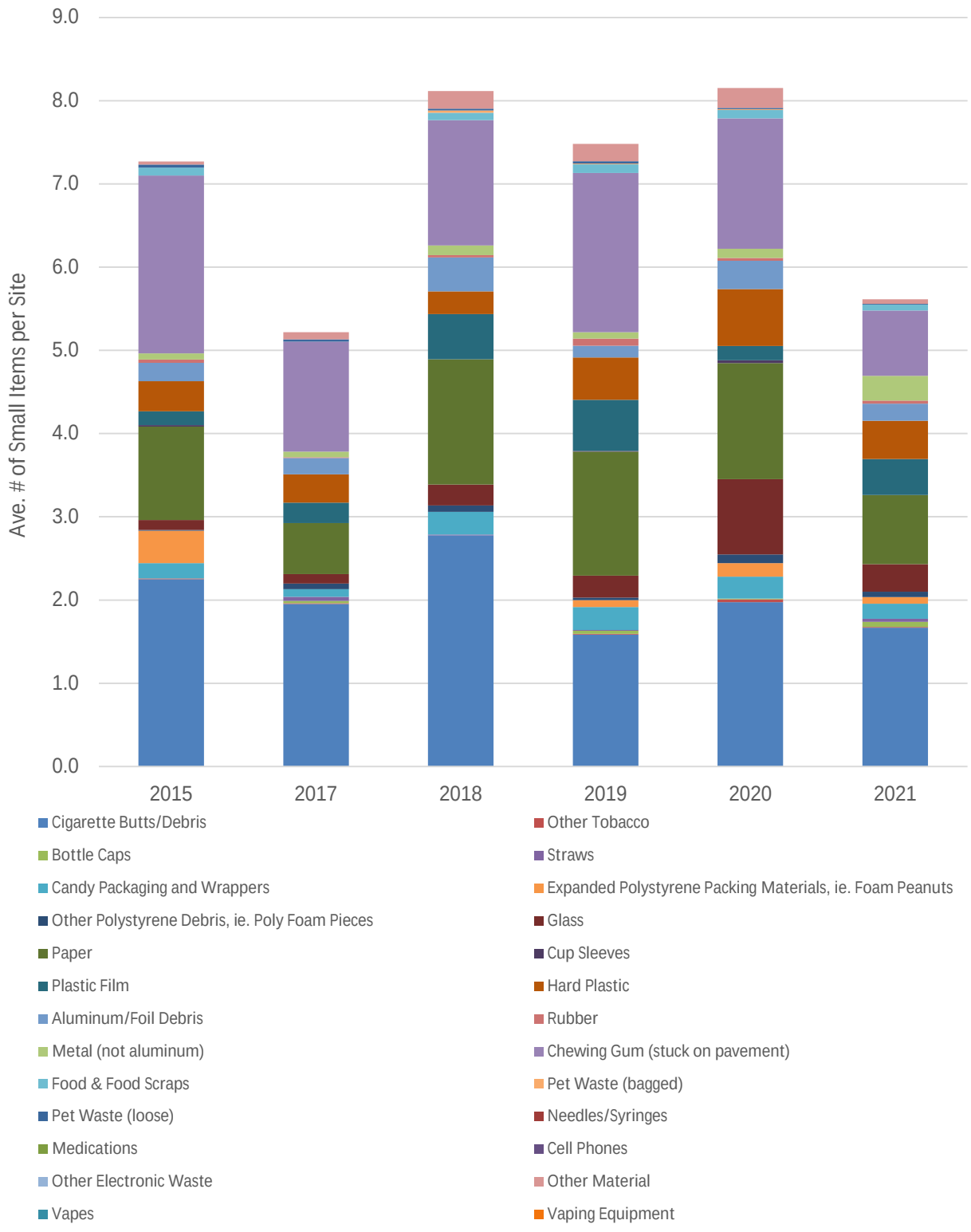

Figure 44: Comparison of Small Litter Categories by Year

3.3.4 Small Litter Results Compared to Other North American Municipalities

Small litter audits are completed in several North American municipalities. These audits record small litter in similar categories using the same methodology used for the City of Vancouver audits. Table 17 illustrates the percentage breakdown per small litter item category for each municipality (as well as Vancouver in previous years). Figure 45 illustrates a comparison of the top three small litter categories observed in the 2021 Vancouver street litter audits to the results for each municipality.

Table 18 illustrates the average number of items counted per site based on category. Figure 46 illustrates these results graphically.

Table 17: Vancouver Small Litter Audit Results Compared to Other Cities

Category	San Francisco 2009	Winnipeg 2014	Edmonton 2016	Toronto 2016	Edmonton 2017	Edmonton 2019	Toronto 2020	Vancouver 2015 - 2019	Vancouver 2020	Vancouver 2021
Cigarette Butts/Debris	13%	43%	28%	22%	34%	31%	18%	29%	24%	30%
Other Tobacco	2%	1%	0%	1%	0%	0%	0%	0%	0%	0%
Bottle Caps	0%	1%	0%	1%	1%	0%	1%	0%	0%	1%
Straws	0%	1%	0%	0%	1%	1%	0%	0%	0%	1%
Candy Packaging and Wrappers	2%	0%	3%	3%	6%	3%	3%	3%	3%	3%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	2%	0%	1%	1%	2%	0%	0%	1%	2%	1%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	1%	3%	7%	1%	6%	2%	3%	1%	1%	1%
Glass	23%	8%	12%	7%	6%	3%	13%	5%	11%	6%
Paper	8%	15%	23%	21%	18%	23%	12%	17%	17%	15%
Cup Sleeves	n/a	n/a	n/a	n/a	n/a			0%	0%	0%
Plastic Film	3%	8%	5%	3%	3%	7%	4%	5%	2%	8%
Hard Plastic	6%	11%	7%	7%	9%	7%	7%	6%	8%	8%
Aluminum/Foil Debris	1%	4%	3%	2%	1%	4%	3%	4%	4%	4%
Rubber	1%	1%	1%	0%	1%	1%	0%	0%	0%	1%
Metal (not aluminum)	2%	1%	0%	2%	0%	2%	1%	1%	1%	5%
Chewing Gum (stuck on pavement)	32%	4%	6%	25%	11%	7%	23%	22%	19%	14%
Food and Food Scraps	0%	0%	1%	1%	0%	6%	1%	1%	1%	1%
Pet Waste (bagged)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pet Waste (loose)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Needles/Syringes	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Medications	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cell Phones	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Audio-Visual Devices	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Batteries	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Electronic Waste	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Material	5%	1%	2%	5%	1%	3%	11%	3%	3%	1%
Vaping	n/a	n/a	n/a	n/a	n/a	0%	0%	n/a	n/a	0%
Vaping Equipment	n/a	n/a	n/a	n/a	n/a	0%	0%	n/a	n/a	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

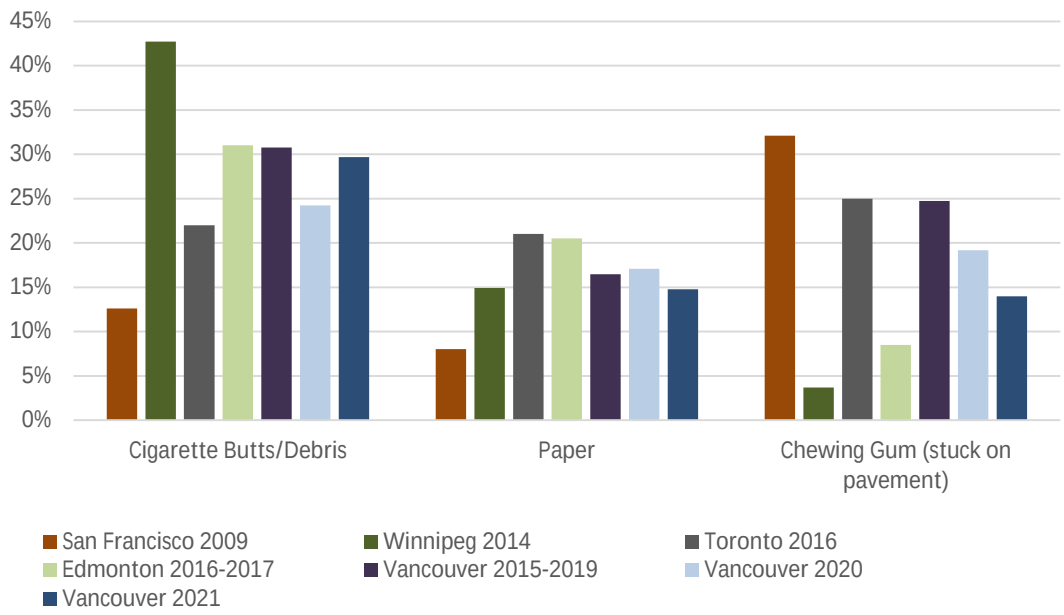

Figure 45: Comparison of Top Small Litter Categories by Municipality

Table 18: Vancouver Small Litter Results Compared to Other Cities (Average Number of Items per Site)

Category	San Francisco 2009	Winnipeg 2014	Toronto 2016	Edmonton 2016 -2017	Edmonton 2019	Toronto 2020	San Francisco 2009	Vancouver 2015 - 2019	Vancouver 2020	Vancouver 2021
Cigarette Butts/Debris	3.2	3.5	2.6	2.5	2.0	2.3	3.2	2.2	2.0	1.7
Other Tobacco	0.5	0.0	0.1	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Bottle Caps	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Straws	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Candy Packaging and Wrappers	0.4	0.0	0.3	0.4	0.2	0.4	0.4	0.2	0.3	0.2
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0.2	0.2	0.1	0.1	0.0	0.0	0.2	0.1	0.2	0.1
Other Polystyrene Debris (i.e., Poly Foam Pieces)	0.4	0.0	0.1	0.6	0.2	0.3	0.4	0.1	0.1	0.1
Glass	6.0	0.6	0.8	0.8	0.2	1.6	6.0	0.2	0.9	0.3
Paper	2.1	1.2	2.4	1.7	1.5	1.5	2.1	1.2	1.4	0.8
Cup Sleeves	n/a	n/a		0.0			n/a	0.0	0.0	0.0
Plastic Film	0.6	0.6	0.4	0.3	0.4	0.5	0.6	0.4	0.2	0.4
Hard Plastic	1.5	0.9	0.8	0.6	0.5	0.9	1.5	0.4	0.7	0.5
Aluminum/Foil Debris	0.3	0.3	0.2	0.2	0.2	0.4	0.3	0.2	0.3	0.2
Rubber	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Metal (not aluminum)	0.6	0.1	0.2	0.0	0.1	0.2	0.6	0.1	0.1	0.3
Chewing Gum (stuck on pavement)	8.2	0.3	3.0	0.7	0.4	2.8	8.2	1.7	1.6	0.8
Food and Food Scraps	n/a	n/a	0.2	0.1	0.4	0.1	n/a	0.1	0.1	0.1
Pet Waste (bagged)	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Pet Waste (loose)	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Needles/Syringes	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Medications	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Cell Phones	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Audio-Visual Devices	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Batteries	n/a	n/a	0.0	0.0			n/a	0.0	0.0	0.0
Other Electronic Waste	n/a	n/a	0.0	0.0		0.0	n/a	0.0	0.0	0.0
Other Material	1.2	0.1	0.0	0.1	0.2	1.4	1.2	0.1	0.2	0.1
Vaping	n/a	n/a	n/a	n/a			n/a	n/a	n/a	0.0
Vaping Equipment	n/a	n/a	n/a	n/a			n/a	n/a	n/a	0.0
Total	25.5	8.1	11.3	8.2	6.4	12.6	25.5	7.0	8.2	5.6

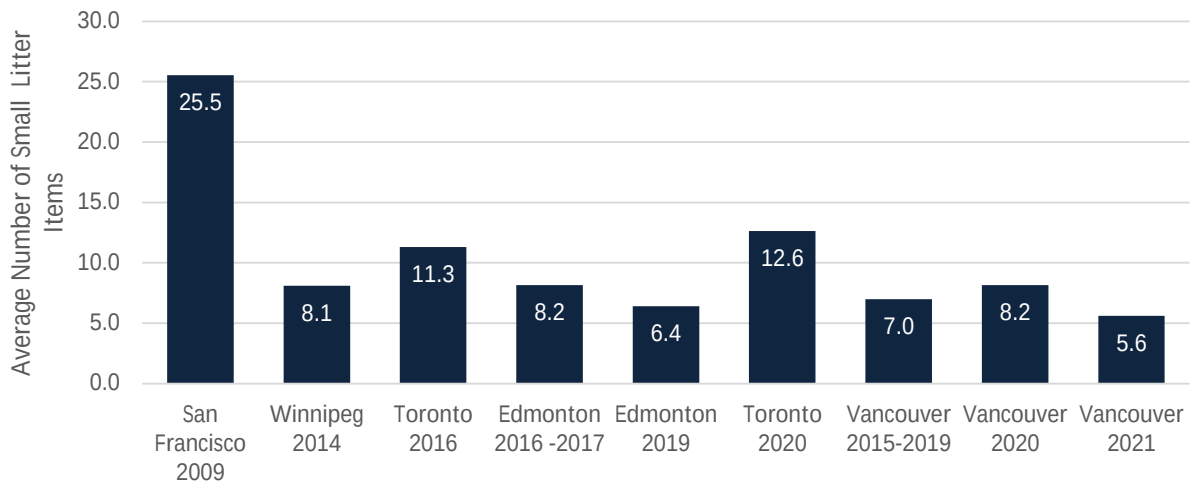

Figure 46: Average Small Litter Items per Site

3.3.5 Small Litter Statistical Analysis

The average number of small litter items per site in the 2021 audits was observed at 5.6 pieces with no construction adjacent. There were 16 sites that had no small litter accumulation whatsoever. Of the 111 sites surveyed with no construction adjacent, four sites had an average of six pieces of small litter within the site, 76 sites had fewer than six pieces and 31 sites had more than six pieces of small litter.

3.4 Small Litter Supersite Results

A site is considered a supersite is when all small litter within the site is observed and counted, not only the three segmented portions of the site (beginning, end and mid-point). This assessment was completed at 20 pre-determined sites (same 19 sites for all previous audits done for the City and one additional site in 2020).

In 2021, the average number of small litter items per supersite was 213.35 pieces. The most common categories of small litter observed were cigarette butts/debris (33%) and chewing gum (27%), which accounted for a combined 60% of all small litter observed on the supersites. Table 19 provides these results.

Table 19: Supersite Litter Data 2021

Category	Total Number of Items	% of Total
Cigarette Butts/Debris	1,389	33%
Other Tobacco	0	0%
Bottle Caps	16	0%
Straws	10	0%
Candy Packaging and Wrappers	62	1%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	13	0%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	18	0%
Glass	514	12%
Paper	435	10%
Cup Sleeves	3	0%
Plastic Film	190	4%
Hard Plastic	173	4%
Aluminum/Foil Debris	130	3%
Rubber	22	1%
Metal (not aluminum)	74	2%
Chewing Gum (stuck on pavement)	1,144	27%
Food and Food Scraps	15	0%
Pet Waste (bagged)	0	0%
Pet Waste (loose)	0	0%
Needles/Syringes	2	0%
Medications	1	0%
Cell Phones	0	0%
Audio-Visual Devices	2	0%
Batteries	2	0%
Other Electronic Waste	1	0%
Other Material	45	1%
Vaping	4	0%
Vaping Equipment	2	0%
Total Supersite Small Litter	4,267	100%

All 20 supersites are ranked from highest amount of litter to least in Table 20. The site with the most accumulated litter in 2021 was Site 38 with 737 pieces of small litter observed.

Table 20: Supersite Rankings 2021

Site Number	Number of Pieces of Small Litter	Hundred Block	Street Name
38	737	1000	W Georgia St.
106	472	1000	Burrard St.
54	442	1100	Clark Dr.
41	350	300	Terminal Ave.
97	349	800	Commercial Dr.
31	301	2700	E Hastings St.
18	273	800	Hornby St.
104	252	1100	Denman St.
101	248	1700	W Broadway
108	245	2400	Main St.
32	136	1800	Yew St.
109	115	1045	Kingsway
42	101	1700	W 3 Ave.
56	71	2900	Horley St.
77	68	5500	Main St.
52	46	600	Evans St.
26	32	2300	Wall St.
82	17	900	E 24 Ave.
21	11	300	E 39 Ave.
65	1	7500	Selkirk St.

3.4.1 2021 Supersite Small Litter Results Compared to Other Audits

Results from the 2021 supersite small litter audits were compared to the 2015 – 2019 average results and also to the 2020results. Table 21 provides the comparison of the 2021 composition and accumulation results to the 2015 - 2019 average results; Table 22 compares the 2021 supersite audit small litter accumulation to the 2020 supersite audit.

Overall, there was a 21% decrease in the litter accumulated at the supersites in 2021 compared to the average 2015 - 2019 results. There was a 9% decrease compared to the 2020 audit. Table 23 compares the average 2015-2019 and 2020 results to the most recent audit based on site.

Table 21: 2021 vs. 2015-2019 Average Supersite Litter Comparison

Category	2021 Results (20 Sites)		2015-2019 Average Results (Average of 19 Sites)	
	Avg. # Small Litter Items per Site	%	Avg. # Small Litter Items per Site	%
Cigarette Butts/Debris	69.5	33%	96.7	38%
Other Tobacco	0	0%	0.1	0%
Bottle Caps	0.8	0%	0.7	0%
Straws	0.5	0%	0.3	0%
Candy Packaging and Wrappers	3.1	1%	3.5	2%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0.7	0%	0.0	0%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	0.9	0%	0.3	0%
Glass	25.7	12%	4.5	1%
Paper	21.8	10%	17.5	7%
Cup Sleeves	0.15	0%	0.0	0%
Plastic Film	9.5	4%	4.2	2%
Hard Plastic	8.7	4%	6.7	3%
Aluminum/Foil Debris	6.5	3%	3.8	2%
Rubber	1.1	1%	0.5	0%
Metal (not aluminum)	3.7	2%	1.1	1%
Chewing Gum (stuck on pavement)	57.2	27%	126.5	42%
Food and Food Scraps	0.8	0%	1.8	0%
Pet Waste (bagged)	0	0%	0.1	0%
Pet Waste (loose)	0	0%	0.1	0%
Needles/Syringes	0.1	0%	0.0	0%
Medications	0.1	0%	0.0	0%
Cell Phones	0	0%	0.0	0%
Audio-Visual Devices	0.1	0%	0.0	0%
Batteries	0.1	0%	0.1	0%
Other Electronic Waste	0.1	0%	0.0	0%
Other Materials	2.3	1%	2.2	1%
Vaping	0.2	0%	-	-
Vaping Equipment	0.1	0%	-	-
Total Site Small Litter	213.4	100%	270.7	100%

Table 22: 2021 vs. 2020 Supersite Litter Comparison

Category	2021 Results (20 Sites)		2020 Results (20 Sites)	
	Avg. # Small Litter Items per Site	%	Avg. # Small Litter Items per Site	%
Cigarette Butts/Debris	69.5	33%	88.1	37%
Other Tobacco	0	0%	0.2	0%
Bottle Caps	0.8	0%	0.4	0%
Straws	0.5	0%	0.1	0%
Candy Packaging and Wrappers	3.1	1%	3.6	2%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0.7	0%	3.3	1%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	0.9	0%	0.4	0%
Glass	25.7	12%	6.8	3%
Paper	21.8	10%	23.8	10%
Cup Sleeves	0.2	0%	0.1	0%
Plastic Film	9.5	4%	3.5	1%
Hard Plastic	8.7	4%	11.1	5%
Aluminum/Foil Debris	6.5	3%	4.0	2%
Rubber	1.1	1%	0.6	0%
Metal (not aluminum)	3.7	2%	1.7	1%
Chewing Gum (stuck on pavement)	57.2	27%	82.2	35%
Food and Food Scraps	0.8	0%	3.5	1%
Pet Waste (bagged)	0.0	0%	0.0	0%
Pet Waste (loose)	0.0	0%	0.1	0%
Needles/Syringes	0.1	0%	0.1	0%
Medications	0.1	0%	0.0	0%
Cell Phones	0.0	0%	0.0	0%
Audio-Visual Devices	0.1	0%	0.0	0%
Batteries	0.1	0%	0.0	0%
Other Electronic Waste	0.1	0%	0.0	0%
Other Materials	2.3	1%	1.9	1%
Vaping	0.2	0%	-	-
Vaping Equipment	0.1	0%	-	-
Total Site Small Litter	213.4	100%	234.9	100%

Table 23: Supersite Audit Results by Site and Year

Site Number	2021 Number of Pieces of Small Litter	2020 Number of Pieces of Small Litter	2019-2015 Ave. Number of Pieces of Small Litter
38	737	423	589
106	472	594	585
54	442	500	363
41	350	240	497
97	349	524	285
31	301	438	363
18	273	117	303
104	252	341	352
101	248	243	280
108	245	435	471
32	136	132	120
109	115	214	329
42	101	49	83
56	71	66	78
77	68	98	161
52	46	154	121
26	32	77	99
82	17	30	44
21	11	15	23
65	1	7	-
Total Small Litter	4,267	4,697	5,144

3.4.2 Supersite Results Compared to Other North American Municipalities

Supersite assessments are only completed in a few North American municipalities. These assessments audit small litter throughout the entire site in similar categories using the same methodology. Table 24 illustrates the percentage breakdown per small litter item category for each municipality. Figure 47 compares the top four supersite categories in the 2021 Vancouver street litter audits to other municipalities that complete supersite audits. Table 25 illustrates the average number of items counted per site based on category. Figure 48 illustrates these results graphically.

Table 24: Vancouver Supersite Small Litter Comparison to Other Cities

Category	Toronto 2006	San Francisco 2009	Vancouver 2015-2019	Vancouver 2020	Vancouver 2021
Cigarette Butts/Debris	14%	25%	36%	37%	33%
Other Tobacco	1%	0%	0%	0%	0%
Bottle Caps	1%	1%	0%	0%	0%
Straws	0%	1%	0%	0%	0%
Candy Packaging and Wrappers	1%	4%	1%	2%	1%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	1%	1%	0%	1%	0%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	3%	0%	0%	0%	0%
Glass	17%	38%	2%	3%	12%
Paper	12%	17%	6%	10%	10%
Cup Sleeves	n/a	n/a	0%	0%	0%
Plastic Film	3%	3%	1%	1%	4%
Hard Plastic	3%	7%	2%	5%	4%
Aluminum/Foil Debris	2%	2%	1%	2%	3%
Rubber	0%	1%	0%	0%	1%
Metal (not aluminum)	1%	2%	0%	1%	2%
Chewing Gum (stuck on pavement)	40%	n/a	47%	35%	27%
Food and Food Scraps	0%	0%	1%	1%	0%
Pet Waste (bagged)	0%	0%	0%	0%	0%
Pet Waste (loose)	0%	0%	0%	0%	0%
Needles/Syringes	0%	0%	0%	0%	0%
Medications	0%	0%	0%	0%	0%
Cell Phones	0%	0%	0%	0%	0%
Audio-Visual Devices	0%	0%	0%	0%	0%
Batteries	0%	0%	0%	0%	0%
Other Electronic Waste	0%	0%	0%	0%	0%
Other Material	1%	1%	1%	1%	1%
Vaping	n/a	n/a	n/a	n/a	0%
Vaping Equipment	n/a	n/a	n/a	n/a	0%
Total	100%	100%	100%	100%	100%

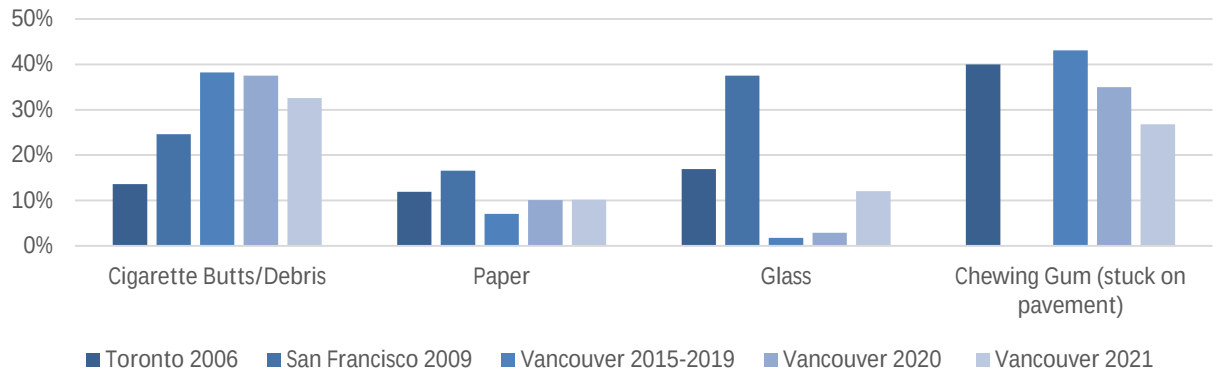

Figure 47: Comparison of Top Supersite Litter Categories by Municipality

Table 25: Vancouver Supersite Small Litter Comparison to Other Cities (Average Number of Items per Site)

Category	Toronto 2006	San Francisco 2009	Vancouver 2015-2019	Vancouver 2020	Vancouver 2021
Cigarette Butts/Debris	176.6	83.8	103.1	88.1	69.5
Other Tobacco	14.6	0.0	0.1	0.2	0.0
Bottle Caps	8.6	2.0	0.6	0.4	0.8
Straws	4.7	1.7	0.2	0.1	0.5
Candy Packaging and Wrappers	16.9	12.2	4.2	3.6	3.1
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	39.2	3.3	0.1	3.3	0.7
Other Polystyrene Debris, (i.e., Poly Foam Pieces)	14.5	0.5	0.4	0.4	0.9
Glass	218.7	128.1	5.7	6.8	25.7
Paper	154.3	56.8	20.2	23.8	21.8
Cup Sleeves	n/a	n/a	0.0	0.1	0.2
Plastic Film	35.7	10.3	4.8	3.5	9.5
Hard Plastic	34.1	22.5	7.3	11.1	8.7
Aluminum/Foil Debris	24.9	6.2	4.0	4.0	6.5
Rubber	5.4	1.8	0.6	0.6	1.1
Metal (not aluminum)	15.3	8.2	1.3	1.7	3.7
Chewing Gum (stuck on pavement)	518.5	0.0	138.6	82.2	57.2
Food and Food Scraps	0.0	0.0	2.2	3.5	0.8
Pet Waste (bagged)	0.0	0.0	0.1	0.0	0.0
Pet Waste (loose)	0.0	0.0	0.1	0.1	0.0
Needles/Syringes	0.0	0.0	0.0	0.1	0.1
Medications	0.0	0.0	0.0	0.0	0.1
Cell Phones	0.0	0.0	0.0	0.0	0.0
Audio-Visual Devices	0.0	0.0	0.0	0.0	0.1
Batteries	0.0	0.0	0.1	0.0	0.1
Other Electronic Waste	0.0	0.0	0.0	0.0	0.1
Other Material	13.0	4.0	2.6	1.9	2.3
Vaping	n/a	n/a	n/a	n/a	0.2
Vaping Equipment	n/a	n/a	n/a	n/a	0.1
Total	1,294.8	341.5	296.3	234.9	213.4

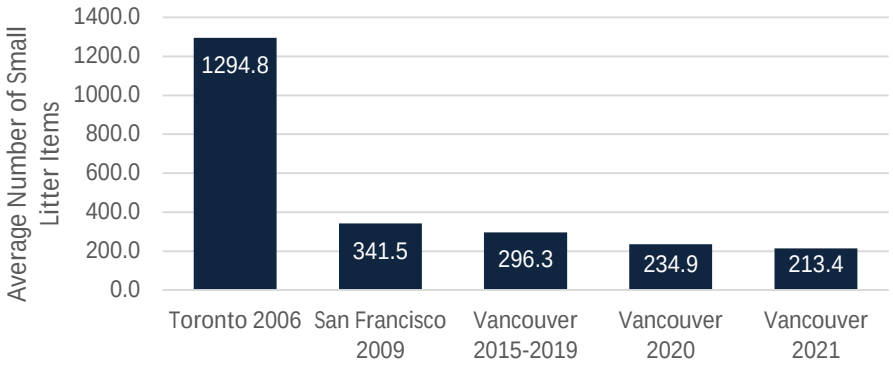

Figure 48: Average Supersite Small Litter Items per Site

3.4.3 Supersite Small Litter Statistical Analysis

The average number of small litter items per supersite in the 2021 audits was 213.4 pieces. All sites observed had some amount of small litter accumulated. Of the 20 sites surveyed, 11 sites had less than 235 pieces of small litter and nine sites had more than 235 pieces of small litter.

3.4.4 Overall Litter Accumulation on Supersites

When a site is observed as a supersite every piece of litter is recorded. Table 26 illustrates the combined results of small and large litter for each site. Of all the supersites, Site 38 had the most accumulated litter with 742 pieces of litter counted.

Table 26: Overall Combined Small and Large Litter for Supersites

Site Number	Number of Pieces of Small Litter	Number of Pieces of Large Litter	Total Litter
38	737	5	742
106	472	20	492
54	442	15.5	457.5
41	350	58.5	408.5
97	349	36	385
31	301	5.5	306.5
18	273	5	278
104	252	12	264
101	248	16	264
108	245	4	249
32	136	11	147
109	115	7	122
42	101	5	106
77	68	19	87
56	71	8	79
52	46	9	55
26	32	2	34
82	17	9	26
21	11	3	14
65	1	1	2

3.5 Sites Immediately Adjacent to Construction

Dillon staff were asked to note if any sites had construction occurring immediately adjacent to the site being studied. There were 13 sites where this occurred in 2021 (Sites 22, 41, 48, 52, 54, 71, 72, 73, 81, 85, 86, 108 and 122). These 13 sites were analyzed separately as the construction activities were expected to increase accumulation of litter.

3.5.1 Large Litter Results

Within the 13 sites immediately adjacent to construction, the average number of large litter items per site was 11.4 pieces of litter. This was, on average 20% more litter than the sites that did not have construction directly adjacent. Overall, the breakdown by material was 35% of material was plastic, 34% other, 27% paper, 3% metal and 1% glass.

The general composition of material did not drastically differ between the sites that had construction adjacent and the sites that did not. Figure 49 illustrates the composition of litter found within the construction-adjacent sites. Table 27 provides a comparison of large litter observed on sites with and without construction adjacent, based on category.

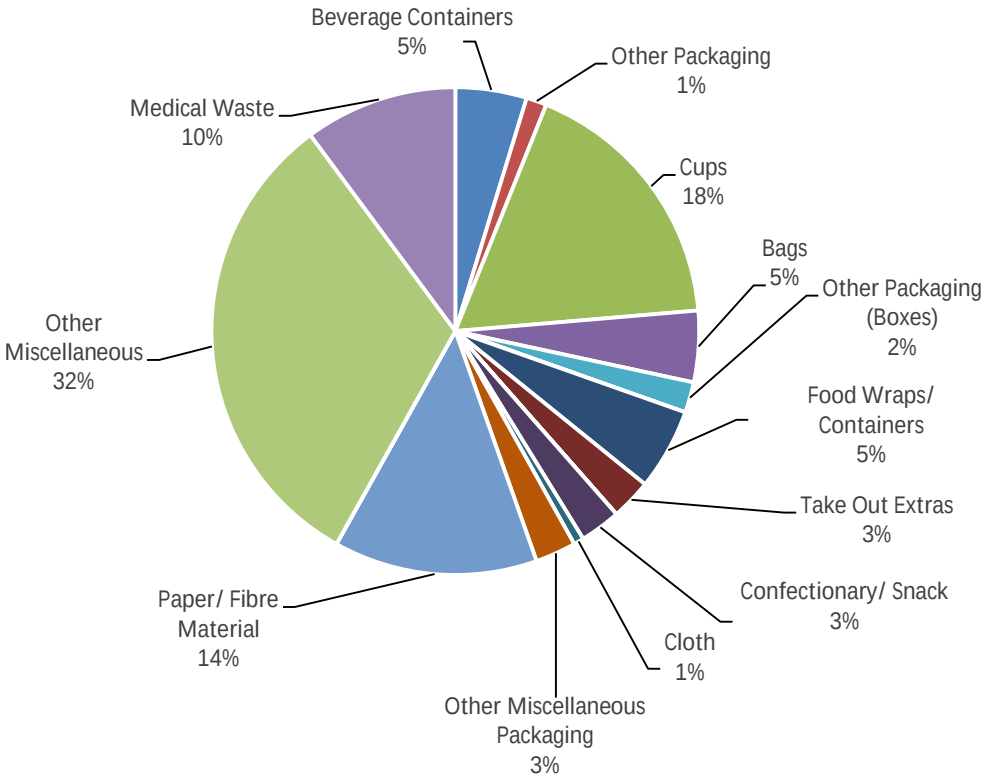

Figure 49: Litter Sites with Immediately Adjacent Construction - Large Litter by Category

Table 27: Large Litter Categories Comparison for Sites with and without Construction Adjacent

Category	Sites with Construction	Sites without Construction
Avg. Items per Site	11.4	9.5
Beverage Containers	5%	3%
Other Packaging	1%	0%
Cups	18%	12%
Bags	5%	4%
Other Packaging (Boxes)	2%	4%
Other Containers	0%	1%
Food Wraps/ Containers	5%	5%
Take Out Extras	3%	4%
Trays	0%	0%
Confectionary/ Snack	3%	7%
Cloth	1%	1%
Other Miscellaneous Packaging	3%	7%
Paper/ Fibre Material	14%	21%
Tobacco Products	0%	2%
Other Miscellaneous	32%	21%
Total	100%	100%

3.5.2 Small Litter Results

Within the thirteen sites that were immediately adjacent to construction, the average number of small litter items per site was 3.1 pieces of litter. This was, on average, 81% less than small litter accumulated at the sites that did not have construction (at 5.6 pieces). Table 28 provides a comparison of small litter observed on sites with and without construction adjacent, based on category.

Overall, the comparison is quite similar from one category to the next. The most significant difference is the decrease in paper on sites with construction nearby (8% with construction adjacent, 15% without construction) and an increase in hard plastic (15% on construction sites and 8% on sites without construction).

Table 28: Small Litter Comparison for Sites with and without Construction Adjacent

Category	Sites with Construction	Sites without Construction
Avg. Items per Site	3.1	5.6
Cigarette Butts/Debris	30%	30%
Other Tobacco	0%	0%
Bottle Caps	0%	1%
Straws	0%	1%
Candy Packaging and Wrappers	5%	3%
Expanded Polystyrene Packing Materials (i.e., Foam Peanuts)	0%	1%
Other Polystyrene Debris (i.e., Poly Foam Pieces)	8%	1%
Glass	5%	6%
Paper	8%	15%
Cup Sleeves	0%	0%
Plastic Film	8%	8%
Hard Plastic	15%	8%
Aluminum/Foil Debris	0%	4%
Rubber	0%	1%
Metal (not aluminum)	3%	5%
Chewing Gum (stuck on pavement)	13%	14%
Food and Food Scraps	5%	1%
Pet Waste (bagged)	0%	0%
Pet Waste (loose)	0%	0%
Needles/Syringes	0%	0%
Medications	0%	0%
Cell Phones	0%	0%
Audio-Visual Devices	0%	0%
Batteries	0%	0%
Other Electronic Waste	0%	0%
Other Material	3%	1%
Vaping	0%	0%
Vaping Equipment	0%	0%
Total Site Small Litter	100%	100%

4.0 Additional Observations

Within the City of Vancouver there are a variety of ongoing public spaces programs promoting waste diversion in the public realm. These programs support the GCAP and are a part of ongoing zero waste initiatives that aim to promote diversion and reduce litter (particularly of SUIs).

During the litter audits, Dillon staff would note if there were any City waste receptacles within 50 m of the site. There were several different types of receptacles noticed within and around the litter sites as illustrated in Figure 50 - Figure 53.

The downtown on-street recycling project started in the summer of 2017 with 15 new three stream waste receptacles being installed in the downtown core. In 2018 there were 28 more receptacles installed, 10 in the summer and 18 in the winter. It is our current understanding that there has not been any analysis done to determine if the installation of these receptacles has assisted in reducing curbside littering. However, more public spaces receptacles have been installed as required in high need areas.

Figure 50: Single Stream Garbage Receptacle

Figure 51: Single Stream Receptacle and Recyclable Beverage Container

Figure 52: Downtown Core Three Stream Receptacles

Figure 53: Cigarette Receptacle

There were 98 sites (79%) where City litter bins were not within 50m of the site being audited and 26 sites (21%) where there were City litter receptacles within 50m. Sites in proximity to waste receptacles had on average 12.6 pieces of large litter while sites without had an average of 8.9 pieces of large litter. Small litter also, was on average higher where there were waste receptacles (9.7 pieces) versus when there were no waste receptacles (4.2 pieces). These results are illustrated in Figure 54. It should be noted that the City installs waste receptacles in high-traffic areas, and in some instances, waste receptacles are installed because of litter issues in specific areas. Thus, the fact that there typically is more litter accumulation near waste receptacles is not necessarily due to the presence of the receptacle itself. The increase in litter accumulation near waste receptacles may simply be due to the nature of the area where receptacles are installed.

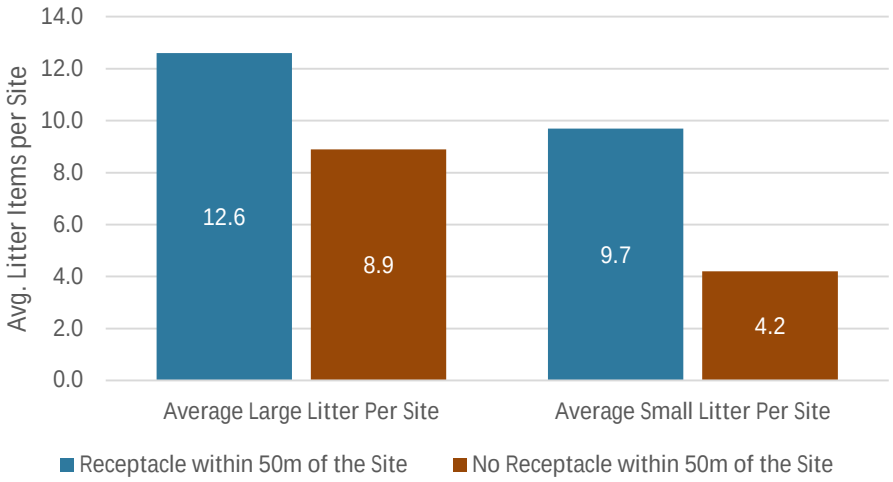

Figure 54: Average Large and Small Litter Pieces per Site (2021) based on the Presence of Waste Receptacle

5.0 Site Ranking and Attributes

Dillon staff ranked each of the 124 audited sites in three different ways, as follows:

1. Total number of large litter items audited within each site;
2. Total number of small litter items audited within each site; and
3. Total number of combined large and small litter items within each site.

Table 29 indicates the top ten sites, demonstrating the greatest accumulation of large and small litter combined. A full list of all sites is provided in Appendix G.

In an effort to examine the audit results further, various attributes which may contribute to litter levels were examined. Attributes potentially associated with the ten sites having the highest amount of combined litter are provided in Table 29. Of these sites 50% had a fast food restaurant within sight. A convenience store was noted within sight in 40% of the sites. There was a bus stop within the survey area of 50% of the sites and City litter receptacles were within 50 m of 50% of the sites.

Table 29: Combined Ranking for Large and Small Litter

Site #	All Litter	Hundred Block	Street Name	Fast Food	Conv. Store	Bus Stop	Litter Bin
97	78	800	Commercial	Y	N	Y	N
55	69	3400	Vanness	Y	Y	Y	Y
110	69	400	Main	N	Y	N	N
117	68.5	3100	East 49th	N	Y	Y	Y
41	65.5	300	Terminal	Y	N	N	N
107	54.5	700	Powell	N	N	N	Y
60	51	7200	Dumfries	N	N	N	N
54	43.5	1100	Clark	Y	N	Y	Y
76	43	700	East 30th	N	N	N	N
104	39	1100	Denman	Y	Y	Y	Y

6.0 Conclusions

It is important to note the information contained within this report, detailing the 2021 litter audit results, is a "snapshot" in time. These results only reflect the conditions of the period of time in which they were collected. Seasonal variability and weather, among other factors, can affect the amount of accumulated litter within an area. The litter audit results for the assessments that took place September 20 - 23, 2021 are those reflected in this report.

6.1 Key Findings of the Large Litter Audits

Large litter was observed at 119 of 124 sites. Thirteen of these audits are analyzed separately as they were immediately adjacent to construction sites. The key findings of the large litter audits were:

- In 2021, the most common primary categories for large litter observed were 'other miscellaneous' (21%) – see examples in Appendix C, paper/fibre materials (21%) and cups (12%).
- Overall, there was a 6% decrease in the large litter observed in 2021 from the average results collected in 2015 through 2019 and, a 7% decrease from the 2020 audit.
- The largest material type observed was plastic (39%), followed by paper (32%), 'other' (27%), metal (2%) and glass (1%).
- The most common sub-category of large litter observed was non-brand towels/napkins. Non-brand towels/napkins represented 9% of all large litter surveyed in 2021.
- Of the 1,054.5 pieces of large litter audited, 9% were PPE and other medical waste items (disposable masks, gloves, and disinfecting wipes). This is an increase from the 2020 audits (5%).
- Within the thirteen sites that were immediately adjacent to construction, the average number of large litter items per site was 11.4 pieces of litter. This was, on average, 20% more large litter than the sites that did not have construction directly adjacent (at 9.5 pieces).

6.2 Key Findings of the Small Litter Audits

Small litter was observed at 107 of the 124 sites. One of these assessments are analyzed separately as they were immediately adjacent to construction. The key findings of the small litter audits were:

- The most common categories of small litter observed were cigarette butts/debris (30%), paper (15%) and chewing gum (14%).
- Overall, there was a 20% decrease in the small litter observed in 2021 from the average results observed in 2015-2019 and a 31% decrease from the 2020 audit.
- Within the thirteen sites that were immediately adjacent to construction, the average number of small litter items per site was 3.1 pieces of litter. This was, on average, 81% less small litter than the sites that did not have construction directly adjacent (at 5.6 pieces).

6.3 Key Findings of Supersite Audits

Supersite audits were completed within 20 sites. The key findings of the supersite assessments were:

- The most common categories of small litter observed were cigarette butts/debris (33%) and chewing gum (27%), which accounted for a combined 60% of all small litter observed on the supersites.
- The average number of small litter items per site was 213.35 pieces of small litter. This was less than the average pieces for the 2015 - 2019 audits (270.7) and the 2020 follow-up audits (234.9).
- The total small litter audited in the 2021 supersites was 4,267 pieces.

7.0 Recommendations

Dillon has completed reviews of jurisdictional litter abatement practices and policies for previous litter and illegal dumping work. Our team understands the best practices to combat litter and illegal waste. These practices include:

- Bylaw Enforcement;
- Staffing;
- Reporting;
- Education;
- Community Engagement;
- Responsibility;
- Campaigns; and
- Infrastructure.

Success in combating litter and illegal waste is not an easy task for municipalities. It is recommended that follow-up litter audits be completed to assess the success of litter abatement practices and City-wide litter and SUI diversion programs, as well as the influence of COVID-19 over time on litter composition and quantities.

7.1 Focus for Campaigns and Education

The City has several programs and initiatives in place to reduce litter. Currently, the City is implementing a Single Use-Item Reduction Strategy with bylaws legislating bans on certain SUIs, as approved by Council in 2019. This strategy was designed to explore ways in which residents can reduce single-use items from going to landfill. During the 2017 street litter audits it was determined that 20% of large litter observed was cups. Progressive reduction has been noted in this category as 13% of the large litter was observed in 2018, 12% in 2019 and 10% in 2020. However, an increase in cups was observed in 2021 (12%). Continuing to target key litter groups, such as single-use items should positively impact litter abatement within the City and/or endorse the SUI Reduction Strategy.

Should the City create more of a targeted approach to litter abatement it is recommended that the campaigns focus on these small litter categories:

- Chewing gum; and
- Cigarette butts/debris.

We noted in 2021 of the 1,054.5 pieces of large litter audits, 9% were PPE and other medical waste items (disposal masks, gloves and disinfecting wipes. This is an increase from the percentage of PPE and other medical waste items observed in the 2020 audit (5%). Medical waste continues to be an unfortunate result of the pandemic and continued proper disposal should be encouraged and advertised. Single-use items accounted for 33% of the total large litter observed in 2021, slightly higher

than in 2020 (27%). Targeted litter campaigns on large litter items (including all SUIs) are also recommended that focus on:

- Cups;
- Straws; and
- Take out extras with a focus on straws and utensils.

The City notes it costs taxpayers $2.5 million a year for the City to collect disposable cups and takeout containers from public waste bins and litter. Focusing campaigns and educational outreach on targeted items, and possibly in specific areas of the City noted for high litter accumulation, could decrease the requirement for litter management within these areas.