A Review of Household Hazardous Waste Management in Nova Scotia

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1. Executive Summary **4**
1.1 Purpose 4
1.2 Key Findings 4
2. Introduction **5**
3. Data **7**
3.1 Nova Scotia Jurisdictional Review 7
Table 1: Interviewees and the site visited, if applicable 7
3.2 HHW Costs 8
3.3 Case Studies 9
4. Nova Scotia HHW Landscape **9**
4.1 HHW Collection and Funding 9
Figure 1: Map showing locations of HHW collection, processing, and transfer facilities 10
Table 2: Permanent HHW collection facility locations and hours of operation 11
4.2 HHW Mobile Events 12
4.3 Community Engagement and Education 13
4.3.1 HRM 13
4.3.2 Annapolis Valley 14
4.4 Accepted HHW 15
4.5 Problematic Materials 16
4.6 Key Costs 17
Figure 2: Total Cost of the Ten Most Expensive HHW Categories for the Entire Province 18
Figure 3: Total Cost of the Ten Most Expensive HHW Categories for the Entire Province, Excluding HRM 19
Figure 4: Units Collected of the Eight Most Common HHW Materials for the Entire Province excluding mercury bulbs 20
Figure 5: Units Collected of the Eight Most Common HHW Materials for the Entire Province, Excluding HRM and mercury bulbs 21
5. Key HHW Categories **22**
5.1 Flammable and Caustic Materials 22
Table 3: Most Common Flammable and Caustic Materials Collected 22
5.2 Fire Extinguishers 23
5.3 Camping Propane Cylinders (1L) 23
5.4 Mercury Bulbs 24
5.5 Problematic Materials 24
6. Bulk Mercury **25**
7. Case Studies **26**
7.1 Calgary, Alberta 26
7.2 Langley Township, British Columbia 27
7.3 Northumberland County, Ontario 29
7.4 Montreal, Quebec 30
7.5 Special Considerations — Flammables and Fire Extinguishers 31
7.6 General Observations and Recommendations 31
8. Observations and Recommendations **32**

8.1 Best Practices 32
8.2 Policy 34
9. Conclusion **34**
Appendices **35**
Appendix 1: Interviewees and personal communication references, with their affiliated organizations and positions 35
Appendix 2: Cost Comparison and Ranking of All HHW Categories Included in the Data 36
Appendix 3: Problematic HHW Materials from Solid Waste Manager Interviews 37
Appendix 4: Sample HHW Funding Summary 42
Appendix 5: List of questions that were asked in the interviews with Solid Waste Managers in Nova Scotia and from other jurisdictions. 43
References **44**

1. Executive Summary

1.1 Purpose

The goal of this report is to inform the reader of the current household hazardous waste (HHW) landscape in Nova Scotia, identify best practices in the province and other jurisdictions, and to provide recommendations for Solid Waste Managers and policymakers.

This involved interviewing Solid Waste Managers from Nova Scotia and other Canadian jurisdictions, online research, and analyzing cost data. This led to a background of current HHW management in Nova Scotia, which is compared to practices from jurisdictions outside the province to determine which practices in Nova Scotia can be improved upon. The findings are backed up by a robust set of information that includes cost data.

1.2 Key Findings

- Mobile HHW events are a useful tool when budgeting allows for them.
- Increasing public awareness and understanding of what constitutes household hazardous waste and how to dispose of it properly is vital for the success of municipal programs.
- Further efforts to educate the public could minimize the inadvertent collection of non-HHW items.
- Fire extinguishers should continue to be classified as HHW due to the safety risks associated with alternative disposal methods.
- Managing mercury in mercury bulbs costs ten times more than managing bulk mercury.
- EPR regulations for HHW (mercury, flammables, sharps, pressurized containers, etc.) will increase capture of the targeted materials and significantly reduce costs to municipalities.
- Placing flammables and caustics under EPR programs should be considered.
- The methods for managing lithium batteries should be reviewed.

2. Introduction

HHW includes items such as paint, motor oil, batteries, pesticides, and cleaning products that can be harmful to human health and the environment if not disposed of properly. Many regions have specific programs for handling these materials.

In general, HHW management can include:

- Collection Programs: Many municipalities have special collection days where residents can drop off their HHW for safe disposal. Oftentimes these are funded by the municipality and run by private waste management companies who then dispose of the materials.

- Permanent Collection Facilities: Some municipalities may have permanent facilities where residents can drop off their HHW at any time. These are typically found at municipal solid waste disposal sites.

- Product Stewardship Programs: Some regions have programs where the manufacturers of certain products are responsible for their safe disposal. These are sometimes referred to as extended producer responsibility (EPR) programs.

EPR programs are policy measures designed to hold producers accountable for the end-of-life environmental impacts of their products. In the context of household hazardous waste, these programs require the producers of potentially harmful items like batteries, paint, electronics, and pesticides to take responsibility for the safe disposal, recycling, or treatment of these products once consumers no longer need them. These programs aim to minimize waste and protect the environment by shifting the burden of managing waste from local governments and taxpayers back to the producers themselves, thus incentivizing more sustainable product design and disposal strategies. This responsibility isn't just limited to the physical taking back of the product; it also includes financing the costs associated with its collection, recycling, treatment, or disposal. EPR programs often use financial incentives to encourage producers to design products that are easier to recycle, reduce the use of harmful substances, and create sustainable waste management solutions. EPR regulations/programs exist for many HHW materials across the country including paint, used motor oil, flammables, sharps, pharmaceuticals, pressurized containers including fire extinguishers, solvents, batteries, various mercury products (bulbs, barometers, thermometers, etc.) and a handful of other products (Robert Kenney, personal communication, August 2023).

The only EPR programs in the Atlantic provinces for HHW are the ProductCare program for paint and the Atlantic Used Oil Management Association program for automotive filters, lubricant aerosols, oil, glycol, and empty plastic containers previously containing those items (Savannah Hatheway, personal communication, June 2023). Recently, Nova Scotia has added programs for batteries and mercury bulbs, which are also covered in PEI. EPR programs in all three Atlantic provinces remove metals and other components from the collected products and divert these hazardous materials from disposal (Robert Kenney, personal communication, August 2023).

An article that stands out in the previous literature on HHW management was published in 2008 in the Journal of Industrial Ecology, where extended producer responsibility (EPR) programs are analyzed in British Columbia (Driedger, 2008). The author finds that they are an effective policy tool for addressing the environmental impacts of HHW. This is notable, as British Columbia is generally viewed as being at the forefront of environmental efforts in Canada, according to individuals within the waste management industry. However, these programs are heavily reliant on consumers being aware of the locations of collection depots for HHW. Multiple surveys were referenced in the paper, where less than half of the respondents knew the locations or processes required to return the hazardous materials properly (Driedger, 2008). This points to the need for proper public education on these processes, something which is discussed throughout the report.

The goal of this report is to inform the reader of the current HHW landscape in Nova Scotia, identify best practices in the province and other jurisdictions, and to provide recommendations for Solid Waste Managers and policymakers. This is accomplished through interviews with Solid Waste Managers from around the province and from other jurisdictions in Canada, online research, and by analyzing cost data from HHW collection within the province.

The research consisted of the following components:

- Documenting how HHW is managed in the province by waste regions and municipalities, including understanding key costs, location/accessibility of facilities, and existing public education programs.

- Identifying key HHW categories and whether any of those materials can be handled differently from an environmental and cost perspective.

- Identifying best practices in Nova Scotia that reduce costs and maximize customer convenience. This included interviewing HHW Service Providers, Managers of Solid Waste/ Public Works, and visiting municipal facilities and a service provider.

- Investigating how bulk mercury has been handled within the province.
- Providing case studies on the HHW program/best practices in four other Canadian jurisdictions.
- Based on the research, providing recommendations for implementing best practices in the province.

3. Data

3.1 Nova Scotia Jurisdictional Review

The jurisdictional review information came from site visits and interviews with relevant stakeholders, including Solid Waste Managers from around the province. These site visits sometimes involved observing the collection methods used at HHW events and interviewing the site supervisors or managers. Solid Waste Managers were interviewed by phone or email when site visits were not viable and asked the same questions posed to workers on-site. These interviews mainly aimed to collect information from regions on which HHW materials they deem the most problematic from a cost or labour standpoint, regular complaints they receive from residents, and whether they manage materials differently from other regions, among other topics. Appendix 5 contains a list of the questions asked during interviews. It should be noted that information provided across jurisdictions may differ due to the nature of the interviews. The interviewees' information is outlined in Table 1 below. The report also contains a standalone section summarizing the province's bulk mercury management.

Table 1: Interviewees and the site visited, if applicable

Area	Site Visited	Interviewees	Position
Annapolis Valley, NS	Valley Waste-Resource Management	Andrew Garrett	Communications Manager
Cape Breton Regional Municipality, NS	N/A	Roschell Clarke	Solid Waste Coordinator
Debert, NS	Clean Harbors and Safety-Kleen	Multiple	N/A
East Hants, NS	N/A	Andrea Trask	Manager, Solid Waste
Halifax, NS	HRM HSW Depot	Robyn Monk; Savannah Hatheway	Site Supervisor (GFL Environmental); Project Coordinator (GFL Environmental)

Inverness, NS	N/A	Nicole Latimer	Regional Coordinator
Vermont	N/A	Josh Kelly	Solid Waste Program Manager, Vermont Agency of Natural Resources
Yarmouth, NS	Yarmouth County Transfer Station	Glendon Ring	Manager, Yarmouth County Solid Waste Management Authority

The interviewees in Nova Scotia were asked the same set of questions when possible. These standard interview practices allowed for easier comparison between jurisdictions. Appendix 3 details the problematic materials identified during the interviews and any comments from the regional representative. The primary method was searching for common themes between regions and drawing conclusions from those. This will be discussed in the Recommendations sections.

3.2 HHW Costs

This consisted of funding claims submitted to Divert NS from all seven waste management regions in Nova Scotia from 2019 to 2023. When disposing of HHW, municipalities can submit claims to Divert NS to be reimbursed for part of the cost. These claims allowed data analysis to be carried out using quantities collected, the cost to region per product unit, and the total cost to the region for various HHW categories. The claims were first converted into spreadsheet format to allow for easier comparison. The data was then analyzed using Excel, which was also used to create the charts and table shown in Section 4.6.

The key points of interest from the available information include the total cost of the categories across the years, which allowed for the categories to be ranked by cost to the province. Another point of interest was the units collected per category and their unit costs, which led to more robust results when determining which categories should be the main focus of the recommendations.

It was determined that each of the visuals created should have a version with all regions and a version that excludes HRM due to many of HRM’s data points being significant outliers from the rest of the data; this presents a problem when determining which categories are most expensive when looking at all regions in the province, as HRM skews the data so heavily.

3.3 Case Studies

Case study information was gathered by interviewing relevant stakeholders from Calgary, Alberta; Langley, British Columbia; Northumberland County, Ontario; and Montreal, Quebec. These interviews aimed to collect information on the programs used in these jurisdictions to manage HHW; this included program overviews, accepted materials, and special considerations relevant to this project. Similar to the interviews conducted with Solid Waste Managers in Nova Scotia, the interviewees in the case study section were asked the same questions. However, some available data across jurisdictions varies due to the information which areas were willing to provide or in the case of non-responses. This information allows for a comparison between provinces, including Nova Scotia, which is used to support the recommendations outlined at the end of the report.

4. Nova Scotia HHW Landscape

4.1 HHW Collection and Funding

Since there is no curbside collection for HHW in Nova Scotia, many areas have permanent depots where specially-trained staff can receive HHW that residents bring in. In some areas that do not have these depots, and even some areas that do, there are designated days for mobile HHW drop-offs where a waste management company will set up an event in a central community area that allows residents to drop off their materials free of charge. This provides greater accessibility to residents not living near a facility that accepts HHW.

Once the materials have been collected, a waste management company capable of handling HHW is contracted to remove the waste. It is then typically sent to a transfer facility where workers will sort it for treatment, incineration, or landfilling, among other management methods. In the Maritimes, the processing and transfer facilities are operated by GFL Environmental or Clean Harbors.

When disposing of HHW, municipalities can submit claims to Divert NS based on the amount of funding allocated to be distributed equally amongst the seven waste management regions within Nova Scotia. To ensure that all municipalities within a region have an opportunity to participate in this program, Divert NS holds all requests for funding until March 1. Funds are then allocated within regions based on applications received as of the March 1 deadline. Only expenses incurred between April 1 and February 28 are eligible.

Eligible materials include acids, caustics; aerosols; corrosives; batteries;

flammables, organics, thinners; organic pallets 24 pails; oxidizers, organics; compressed gas cylinders; pesticides; mercury bulbs; propane; fire extinguishers; propane tanks; cfc gas (e.g. freon); propane drums. Divert NS may reimburse Event set-up fees on a 50/50 cost basis up to a maximum of $1,000 per region.

A sample funding summary can be seen in Appendix 4, where invoices from vendors such as GFL Environmental are to be included in the document along with the funding summary. This document is then submitted to Divert NS (Divert NS, 2023; Roschell Clarke, July 2023).

Table 2 shows permanent collection facility locations and their hours of operation. Typically, facilities are open Monday to Friday from approximately 9:00 am to 5:00 pm and Saturday mornings until mid-afternoon. There are seventeen total permanent facilities with fourteen of them being municipally owned.

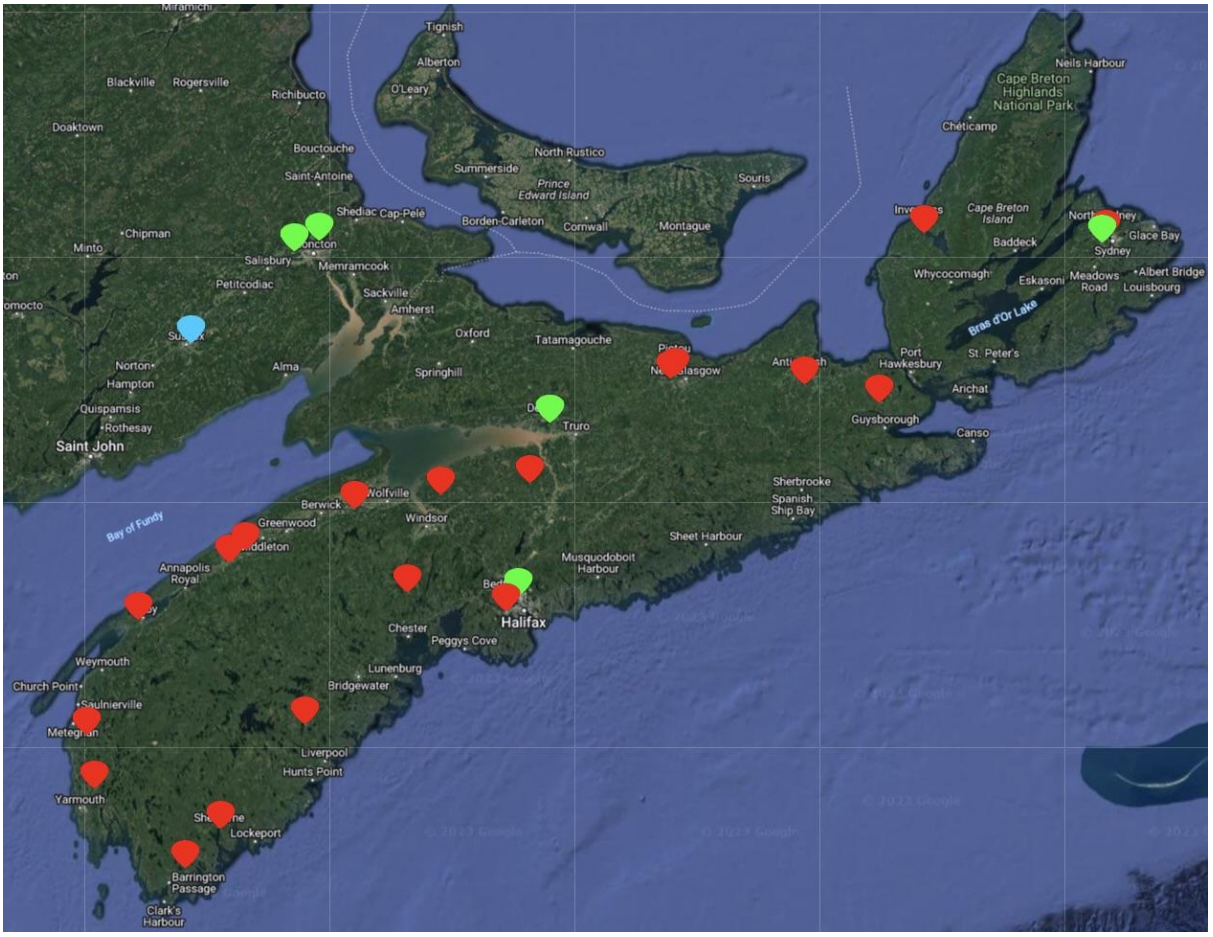


Figure 1: Map showing locations of HHW collection, processing, and transfer facilities

Note: Red - collection facility; green - processing facility; blue - transfer facility. The GFL Environmental processing facility icon in Debert also covers the Clean Harbors transfer station icon. Sourced from GFL (2023), Clean Harbors (2023), novascotia.ca (2023).

Table 2: Permanent HHW collection facility locations and hours of operation

Address	City	Waste Management Region	Facility Type	Hours
1932 Hardscratch Road	South Ohio	Yarmouth, Digby, Clare	Municipal	Monday - Friday: 8:00 am - 4:00 pm; Saturday: 9:00 am - 3:00 pm
919 Bonnie Rd	Meteghan Centre	Yarmouth, Digby, Clare	Municipal	Monday - Friday: 8:30 am - 5:00 pm; Saturday: 8:30 am - 12:30 pm
245 Upper Crossing Rd	Digby	Yarmouth, Digby, Clare	Private	Monday to Friday 9:00 am - 5:00 pm; Saturday 8:00 am - 12:00 pm
1138 NS-103	Goose Lake	Yarmouth, Digby, Clare	Municipal	Monday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 12:00 pm
1569 Walton Woods Road	Centre Burlington	Queen’s County	Private	Monday - Friday: 7:00 am - 5:00 pm; Saturday - Sunday: 8:00 am - 12:00 pm
450 Kaizer Meadow Road	Chester	Queen’s County	Municipal	Monday - Saturday: 8:00 am - 4:00 pm
908 Mullock Road	Whynott's Settlement	Queen’s County	Municipal	Monday to Friday 8:00 am - 4:30 pm; Saturday 8:00 am - 2:00 pm
3750 Nova Scotia Trunk 8	Caledonia	Queen’s County	Municipal	Monday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 2:00 pm
243 Sandy Point Rd	Shelburne	Queen’s County	Municipal	Monday to Friday 9:00 am - 4:30 pm
20 Horseshoe Lake Drive	Halifax	HRM	Municipal	Saturday 9:00 am - 4:00 pm
100 Donald E Hiltz Connector Rd	Kentville	Annapolis Valley	Municipal	Monday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 12:00 pm
343 Elliott Rd	Lawrencetown	Annapolis Valley	Municipal	Tuesday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 12:00 pm
1306 Georgefield Road	Hants County	Annapolis Valley	Municipal	Monday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 2:00 pm
151 Waste Management Rd E	Boylston	Pictou County	Private	Monday to Friday 7:00 am - 5:00 pm;

				Saturday 8:00 am - 12:00 pm
220 Mt William Rd	Westville	Pictou County	Municipal	Monday to Friday 8:00 am - 4:00 pm; Saturday 8:00 am - 12:00 pm
420 W Lake Ainslie Rd	Inverness	Cape Breton	Municipal	Monday to Friday 8:30 am - 4:30 pm; Saturday 8:30 am - 12:00 pm
345 Gulf Crescent	Edwardsville	Cape Breton	Municipal	Monday to Friday 8:00 am - 4:30 pm; Saturday 8:00 am - 4:00 pm

Source: novascotia.ca (2023).

4.2 HHW Mobile Events

HHW mobile events in the province are typically held between late April and early October. The exact number of mobile events changes depending on several factors. For example, the Municipality of Colchester hosts one collection event per year, while HRM hosts seventeen events throughout the season (Municipality of Colchester, 2023; HRM, 2023). When considering hosting mobile HHW events the following factors should be considered.

- If the existing permanent facilities are underused or overburdened, this might influence the decision on how often to host mobile events.

- For areas where HHW collection does not already exist at a permanent facility, the cost of setting up a collection area and staffing it will need to be weighed against the cost of hosting mobile events.

- Monitoring participation rates and seeking feedback from residents can provide insights into the effectiveness of the events and guide decisions on frequency and location.

- The costs of hosting mobile events will need to be balanced with the municipality's budget. More frequent events will require more resources.

While a permanent depot can be open for operation more than a mobile event, there are still possible accessibility concerns if the community is spread out and some residents cannot make it to the depot. A permanent depot with regular hours of operation, including a day when it is open on the weekend, supplemented by semi-regular mobile events, is a situation that will allow for the greatest accessibility

to residents. Ensuring there is a way for residents to drop off HHW on the weekend is vital, as some people cannot do so during regular business hours.

Mobile HHW depots are well-received by the public and elected officials, but these can be very expensive. If budget is not an issue, then hosting these events along with having a drop-off at a permanent depot is recommended. However, a drop-off option at a permanent depot should be prioritized. Having worked with smaller municipalities, Kirk Symonds believes that operating both types of collections may be difficult finanically. For a mobile HHW event, he referenced the cost of hiring a licensed operator who can collect, transport, and process the waste. As well as advertising for the event and securing appropriate locations, both of which require a large budget and staff time (Kirk Symonds, personal communication, August 2023).

4.3 Community Engagement and Education

The importance of customer convenience to the success of HHW programs is highlighted in the case study section and is evident through the site visits.

In terms of outreach to residents, multiple avenues should be considered. The first is a well-designed website. When searching online for something such as ‘X area hazardous waste’ residents should find a web page that provides them with the necessary information for HHW disposal in their area, including but not limited to: drop-off location and hours of operation, accepted materials and a sorting guide, and dangers of improper disposal.

4.3.1 HRM

In HRM there is one permanent municipal facility which accepts HHW. The facility is in Bayer’s Lake and is open Saturday 9:00 am - 4:00 pm. To supplement the limited availability of the site, the HRM will host seventeen mobile community HHW events in 2023 throughout the area. The schedule and locations are posted along with accepted materials and instructions for residents (HRM, 2023).

The location of HRM’s one permanent collection facility has been deemed the most appropriate due to HRM owning the property, and it being the only location in the area that can receive these materials (Kirk Symonds, personal communication, August 2023). However, the location is only open on Saturdays because they share it with REgroup who collect municipal recycling through the week and they can’t have public vehicles going through the facility at the same time as heavy machinery (Savannah Hatheway, personal communication, August 2023). Residents from outlying areas, such as Musquodoboit and Sambro, have complained about the

inconvenience of travelling to HRM to dispose of their HHW (Robyn Monk, personal communication, May 2023). To mitigate this, mobile depots are held throughout HRM, from which much positive feedback is received from the communities. The frequency and locations for the events are determined by multiple factors including:

- Electoral district division: They try to ensure there is an equal distribution among the districts.

- Population: They want to ensure the events will serve the greatest number of residents — this includes ensuring the venue is convenient to residents by hosting it somewhere such as a school or a mall.

- Consistency: They try to keep the dates as consistent as possible, meaning the same venue on the same date every year.

- Capacity of the venue: They need to ensure the venue will allow for safe traffic flow without disrupting general traffic. This requires a large parking lot.

- Dates: They have to arrange the dates so they do not interfere with other events.

- Consistent review: They review the results each fall and assess whether the events have been optimally run. This includes looking at car counts and feedback from event operators and residents (Kirk Symonds, personal communication, August 2023).

One additional concern expressed was the need for HRM to provide a more detailed list of materials not accepted at the depot on its website and what alternative disposal options are available for residents. The importance of clear instructions for residents is discussed throughout the report.

4.3.2 Annapolis Valley

In the Annapolis Valley Region, there are two permanent municipal facilities which accept HHW. The facility in Kentville is open Monday to Friday 8:00 am - 4:00 pm and Saturday 8:00 am - 12:00 pm. The facility in Lawrencetown is open Tuesday to Friday 8:00 am - 4:00 pm and Saturday 8:00 am - 12:00 pm. On the website, residents are instructed on which materials are accepted at the depots, and the locations and hours of operation (VWRM, 2023).

Complaints are still received from customers bringing in HHW from rural areas about the inconvenience of having to travel, but these are typically received from customers bringing in small amounts. The team stressed the importance of their site

hours, which provide more regular opportunities for residents to drop off materials (Andrew Garrett, personal communication, June 2023).

Based on reviewing various regions' websites and available information regarding HHW disposal, the Valley Waste Resource Management (VWRM) website is an example of a website with very clear and accessible resources to help residents determine how to identify and dispose of HHW properly. The website offers detailed descriptions of which materials are acceptable, how to handle them and where to bring them. They also provide address and contact information for all relevant drop-off locations. Additionally, their website provides detailed information regarding all community education and outreach programs they offer in a clear and accessible format (VWRM, 2023). Furthermore, the VWRM team emphasized the importance of their social media presence, mobile phone waste app, and active community engagement (Andrew Garrett, personal communication, June 2023).

4.4 Accepted HHW

Through interviews and reviewing the websites of several waste management areas, it has been determined that accepted HHW materials are fairly standard throughout the province. To improve upon this, municipalities may want to consider creating a standardized list of acceptable materials in Nova Scotia with the help of a consultant. Many regions have a list of accepted materials and unacceptable materials on their websites which are referenced at the end of the section; common materials between the five regions examined are:

<u>Commonly Accepted Materials</u>

- Batteries (including household batteries like AA, AAA, car batteries, rechargeable batteries, and button cell batteries)
- Pool chemicals
- Pesticides/herbicides/insecticides/fertilizers
- Household cleaners and corrosive cleaners
- Chemical solvents and thinners
- Propane items (including 1L propane, propane tanks and cylinders, propane torches, and BBQ propane tanks)
- Paint items (including paints, stains, spray paint, paint thinners, and empty paint cans)
- Gasoline and fuel oil
- Aerosol items (including aerosol sprays and aerosol cans containing hazardous substances)
- Kerosene
- Antifreeze and waste oil

- Fluorescent items (including mercury bulbs)
- Mercury-containing items
- Fire extinguishers

Commonly Unaccepted Materials

- Explosives (including ammunition and fireworks)
- Radioactive materials/waste
- PCBs and PCB-contaminated materials
- Medical and pathological waste (encompassing sharps and bio-medical waste)
- Waste from commercial, industrial, or institutional sources
- Unknown or unidentifiable materials

Most HHW materials are organic, accounting for 75-80% of the total in HRM and a large portion of material for the rest of the province. However, regions also accept a variety of other materials, including caustics, acids, oxidizers, pesticides, various gases, and products containing mercury. Additionally, items like BBQ propane tanks, helium tanks, spray foam insulation cylinders, fire extinguishers, batteries (alkaline, lithium, lead acid/car batteries), oil, gasoline, and antifreeze are accepted. The information from this section was compiled from the following websites: Waste Check (2023), CBRM (2023), Municipality of Colchester (2023), Inverness County (2023), and HRM (2023).

4.5 Problematic Materials

Generally, unacceptable HHW is rejected due to safety concerns (ammunition, flares, asbestos etc.) However, most areas believe there should be better flare programs, as the RCMP only sometimes accepts them, and they are the only option. Specifically in HRM, when customers are referred to 311 for these materials, they often become frustrated and are eventually redirected back to the depot.

Additionally, several products are technically classified as hazardous, even though they might not need to be. These include body lotions, shampoos, and cosmetics, particularly those without an active ingredient, like lice treatment or bug-repellent creams. VWRM tends to limit these products by only taking ones with an active ingredient. In addition, caulking is another item that may not need to be classified as HHW (Andrew Garrett, personal communication, June 2023). Some areas shared similar thoughts on cosmetics and medications (Andrea Trask, personal communication, May 2023).

Concerns were expressed over the current refusal of any materials containing Polychlorinated Biphenyls (PCBs). These are 'forever chemicals' requiring intense incineration for proper disposal, and given the limited and costly disposal options available to residents, it is suggested that PCB-containing items, particularly light ballasts, should be accepted in HHW depots/HHW collection. Additionally, items such as PCB light ballasts, flares, ammunition, and fireworks would benefit from additional disposal programs. It was noted that PCB light ballasts are part of the Environment Canada end-of-use program with a 2025 deadline for removal from service (Savannah Hatheway, personal communication, June 2023). These ballasts are a problem unique to HRM, as every other contacted region stated that they rarely or never receive these.

Another subject mentioned by a few regions was businesses attempting to bring waste into events. The absence of programs or adequate communication on disposal options for these groups raises concerns about improper material management. There was an instance where a business attempted to bring hazardous materials into an event and was turned away; Clean Harbors received a call in the days after the event to collect waste that had been illegally dumped, and they recognized it as being the waste from the business that was turned away at the event (Clean Harbors, personal communication, July 2023).

4.6 Key Costs

All the information used in this section was sourced from Divert NS (2023) and was used to create the dataset.

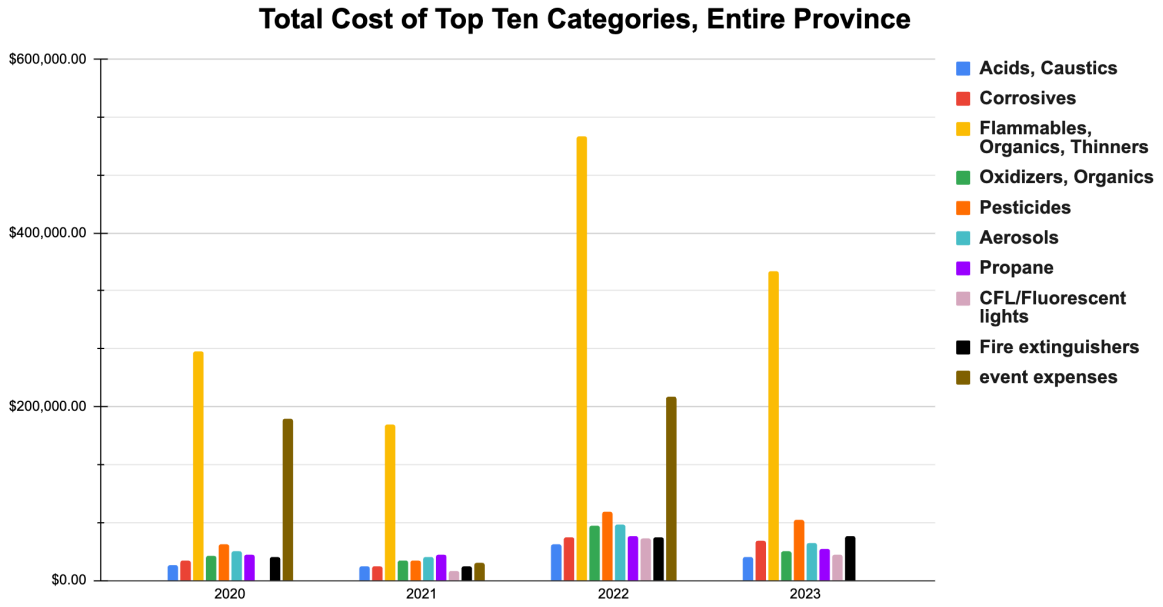


Figure 2: Total Cost of the Ten Most Expensive HHW Categories for the Entire Province

Source: Divert NS (2023)

Above is a bar graph showing the ten categories of HHW that were the costliest to manage across the entire province when summing their total costs across the whole dataset. The most expensive category is ‘Flammables, Organics, Thinners.’ Other categories of interest on this list are ‘Fire Extinguishers,’ ‘Acids, Caustics,’ and ‘mercury bulbs.’

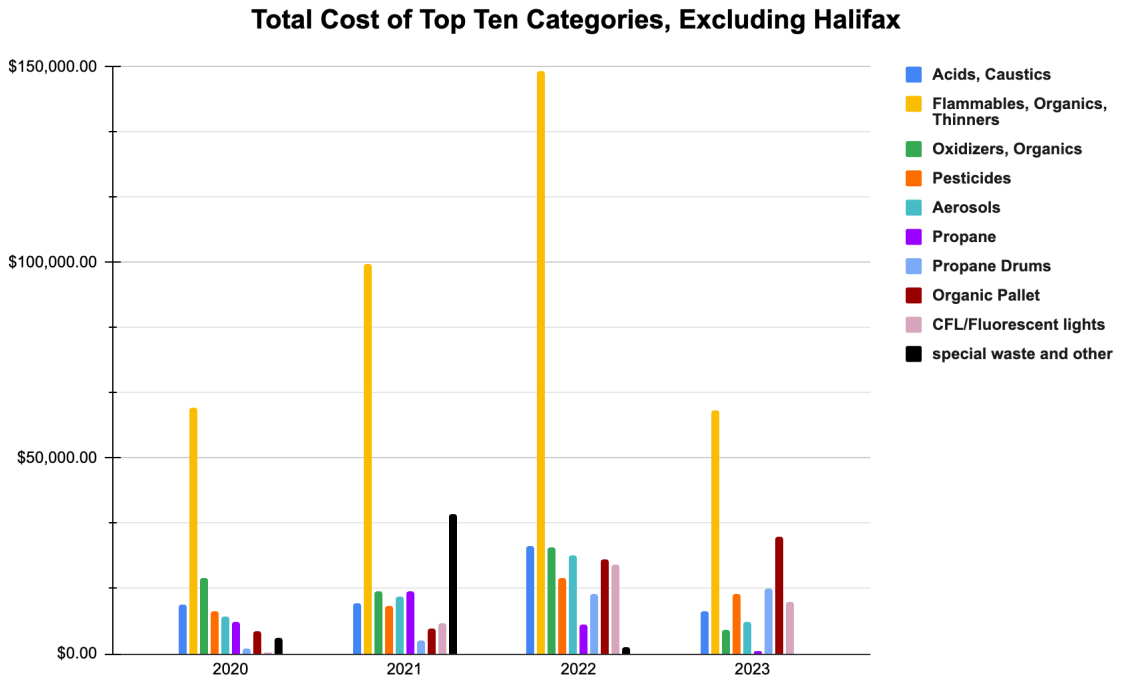


Figure 3: Total Cost of the Ten Most Expensive HHW Categories for the Entire Province, Excluding HRM

Source: Divert NS (2023)

When analyzing the data, it became apparent that the HRM's data was causing the results to be skewed. Therefore, the above chart was created to provide a view of the cost data across the rest of the province, excluding HRM. The graph shows that 'Flammables, Organics, Thinners' is still clearly the most expensive category of HHW across the province by a significant margin. Aside from that, the cost is distributed fairly evenly across the other categories, and we still see 'Acids, Caustics' and 'mercury bulbs' within the ten most expensive categories of HHW across the province.

Ensuring that the above results were not driven solely by high unit costs was important. Therefore, the average unit costs for each category in 2022 and 2023 were calculated. In 2023, this found that 'Organic Pallet' was the most expensive category, with 'Acids, Caustics,' 'Flammables, Organics, Thinners,' and 'mercury bulbs' being the fifth, seventh, and fifteenth most expensive categories, respectively. The results were nearly identical for 2022. This tells us that the categories' unit costs do not drive the results entirely.

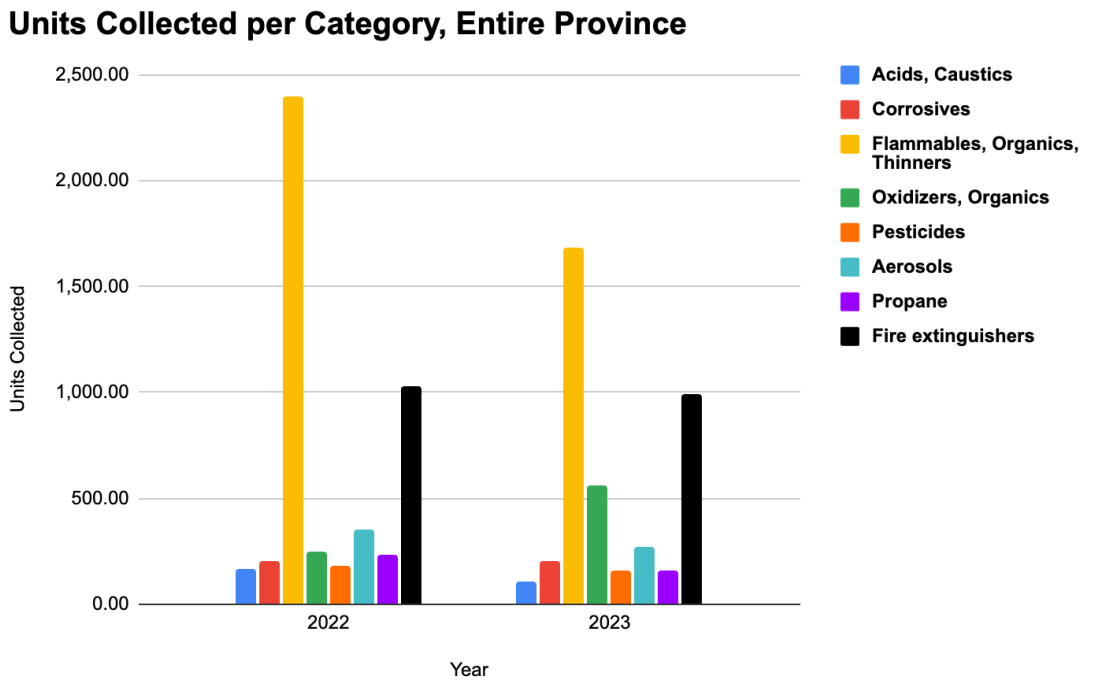


Figure 4: Units Collected of the Eight Most Common HHW Materials for the Entire Province excluding mercury bulbs

Source: Divert NS (2023)

Above, we can see the units collected from the categories of interest in Figure 4, excluding ‘mercury bulbs’ due to them massively outnumbering every category in the graph. Over two hundred thousand lights were collected across the two years, with the next nearest category being flammables, at just over four thousand. Otherwise, the graph above shows that flammables were the most common material collected in 2022, with fire extinguishers being second. Similar results are shown in 2023.

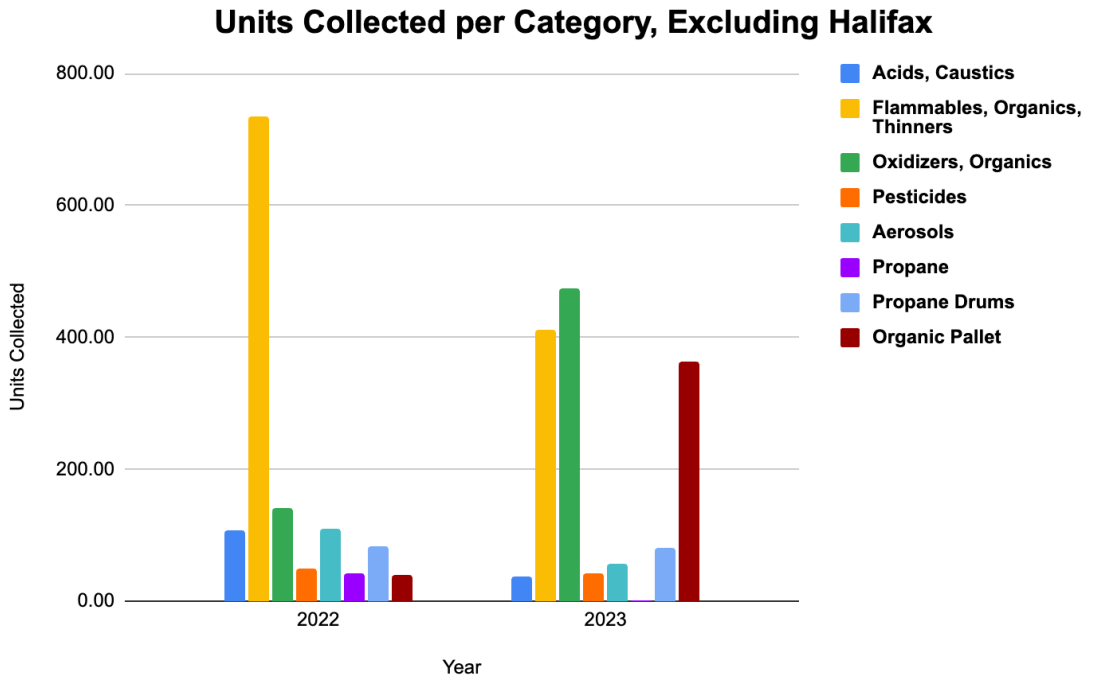


Figure 5: Units Collected of the Eight Most Common HHW Materials for the Entire Province, Excluding HRM and mercury bulbs

Source: Divert NS (2023)

When excluding HRM from the data, the above graph shows similar collection rates, with flammables outnumbering every category in 2022 and being the second most common category in 2023, behind 'Oxidizers, Organics.'

These graphs show that the province should consider an EPR program for flammable materials due to them being the costliest material to most regions and one of the most collected. Based on these results, implementing a similar program for caustic materials is something that should be considered further due to their high cost to manage relative to the number of materials collected. This is in addition to the environmental benefits mentioned in Section 5.1.

Appendix 2 contains a table containing total cost information for all categories found in the data, which is compared between the entire province and the entire province, excluding HRM. This provides a more detailed look than the graphs, allowing for an easier cost comparison when removing HRM from the data.

5. Key HHW Categories

5.1 Flammable and Caustic Materials

Flammable and caustic materials are of particular interest due to possible upcoming EPR programs for these materials through the province. According to the gathered information, the only EPR programs in the Maritimes are the ProductCare program for paint and the UOMA program for automotive filters, lubricant aerosols, oil, glycol, and empty plastic containers previously containing those items (Savannah Hatheway, personal communication, May 2023). There are also newly introduced programs which cover batteries and mercury bulbs (Robert Kenney, personal communication, August 2023).

Based on the interviews, Table 3 summarizes the most common flammable and caustic materials gathered in Nova Scotia.

Table 3: Most Common Flammable and Caustic Materials Collected

Flammable Liquids	Flammable Gases	Caustics
Adhesives	Butane	Caustic Soda
Antifreeze	Propane	Cement
Asphalt Topping	Aerosols (paint, lubricant, sunscreen, bug repellant, sealant)	Cleaners
Brake Fluid		Detergents
Fuel (Gasoline, Kerosene, Etc)		Drywall Compound
Grease		Drain Openers
Methyl Hydrate		Lime
Oil		Lye
Paint		Pool Chemicals (Ph Increasers)
Polishes		Window Cleaners
Windshield Washer Fluid		Water Hardener
Wood Stain		
Paint Thinner		
Water Seal		
Varnish		

Note: Data compiled from personal communications, including S. Hatheway, A. Garrett, A. Trask, and R. Clarke, in 2023.

A report published by the Product Stewardship Institute which examined results from EPR programs in British Columbia and Manitoba found that **EPR programs in the provinces led to significantly higher collection rates and significantly avoided costs**. The products covered under these programs included flammables and caustics. **They saw greater than 300% increases in collection volumes after the programs were implemented and the number of collection sites was increased** (Product Stewardship Institute, 2019).

Further, when analyzing the data provided by Divert NS, the results showed that the flammable and caustic categories were first and ninth, respectively, regarding the total cost to regions from 2019-2023. Breaking it down by region, flammables are the costliest category in all seven areas when summing costs across the past four years of data (Divert NS, 2023). The general consensus favours EPR programs for these categories when speaking with Solid Waste Managers.

5.2 Fire Extinguishers

Fire extinguishers classified as HHW are universally agreed upon by interviewees as necessary. Fire extinguishers pose a safety threat if disposed of improperly. These tanks are pressurized, making it unclear when they are empty. If landfill equipment were to run over them, it could cause an incident. Such incidents have occurred in various locations, resulting in a firefighter's death during a training activity in Truro, NS. As a result, the management processes for old extinguishers have changed at the fire training centre.

Valley Waste-Resource Management depressurizes these and removes the CO2 and carbon monoxide powders, which are sent to GFL as HHW. Clean Harbors mentioned that some fire departments will still take fire extinguishers that have been deemed uncompromised for use in training activities (Clean Harbors, personal communication, July 2023).

5.3 Camping Propane Cylinders (1L)

Through interviews with Solid Waste Managers, 1L propane cylinders were identified as another key HHW category due to their high cost to manage and the number of areas that identified them as problematic. They are not accepted in some areas but are still dropped off with other materials and are then the responsibility of the depot. These are almost $2 per unit to manage, leading to an interest in better stewardship programs for them.

One possible solution implemented in Yarmouth is puncturing the cylinders and flattening them to be placed in the scrap metal pile, which can be sold (Glendon Ring, personal communication, July 2023).

5.4 Mercury Bulbs

Mercury bulbs are another material with a high management cost for regions. They were excluded from the units collected charts in Section 3.5.2 due to there being approximately fifty times more units collected than the next largest category.

Some areas, such as Annapolis Valley and Yarmouth, utilized ‘bulb eaters’ as it was a cheaper method of disposal than paying a processor. However, these machines have high maintenance costs and are less preferable to municipalities than programs such as the NS Power bulb collection program, which was discontinued. It should be noted that PEI has a program, and Nova Scotia recently passed EPR regulations to have these materials collected and managed by producers.

5.5 Problematic Materials

Appendix 3 contains a table of problematic materials identified through interviews with HRM, VWRM, Yarmouth, CBRM, and Inverness, which are summarized in this section. Appendix 3 offers a more detailed look, but the main recurring categories are summarized below.

Mercury: This was identified as a material that is rarely received in large quantities on its own, but is very costly to dispose of when it is. Mercury is typically received in bulbs or other products that contain the material such as thermometers.

Lithium Batteries: These are a common issue in areas with or without HHW collection. If not properly handled by depot workers, they present a fire hazard and are labour-intensive as each unit must be taped or sealed to prevent fires. In areas without HHW management, they know that the batteries are disposed of in regular garbage and can present a fire hazard in certain cases, such as a loader driving over them. These are another material that waste workers would like to see more stewardship programs for.

Ballasts with PCBs: These are only a common issue in HRM, where sometimes residents threaten to dispose of them improperly if the workers do not accept them. However, these are extremely rare in all other areas that were interviewed.

6. Bulk Mercury

Bulk mercury is generally seen as any significant quantity of the material brought into a collection point; this could include someone bringing in a container full of the raw material. Bulk mercury in Nova Scotia was handled by Efficiency Nova Scotia and EfficiencyOne, who had implemented initiatives toward the safe collection, disposal, and recycling of mercury-containing products. The associated costs of these efforts were influenced by the volume of mercury and products collected. The reader should note that these programs no longer existed when this report was written. Since these initiatives were discontinued, the burden of disposal costs has fallen to the waste management regions (Robert Kenney, personal communication, July 2023).

Efficiency Nova Scotia had implemented over 50 mercury drop-off locations across the province. In 2018, over 58 kg of mercury was collected, including 47 kilograms from orphan products such as old blood pressure gauges and jars of liquid mercury. Notable recycling milestones include over 1,033 km of fluorescent tubes and 125,111 mercury bulbs (EfficiencyOne, 2018).

EPR could be instrumental in managing mercury in products sold in the future, but there's a need for a province-wide system for collecting and transporting orphan mercury for recycling. Orphan mercury is generally seen as mercury that has become separated from its original purpose, such as mercury extracted from a thermostat. During the writing of this report, NSECC passed EPR regulations for lighting, including mercury lighting, and has also discussed provincial bulk mercury management with Divert NS (Robert Kenney, personal communication, August 2023).

While a future EPR program may cover lighting ballasts, there's no estimate for the number of PCB-containing ballasts in service across Nova Scotia. Including large appliances and older thermostats containing mercury switches under EPR or an orphan mercury collection program is vital. The newly introduced program does not include ballasts; however, most lighting ballasts do not contain PCBs and are readily recyclable as scrap metal (Robert Kenney, personal communication, August 2023).

Additionally, based on the data provided by Divert NS, the management costs to the municipalities handling disposal for mercury bulbs were ten times greater than the cost of managing bulk mercury when HRM was not included in the data and twenty times larger when HRM was included (Divert NS, 2023). Therefore, it is clear that the cost concern lies in managing mercury-containing products and less so in bulk mercury. However, the main problem is still preventing mercury release into the environment (Robert Kenney, personal communication, August 2023).

7. Case Studies

7.1 Calgary, Alberta

The information in Section 7.1 was sourced from personal communications with a Waste Diversion Technologist from the City of Calgary (Cameron Low, personal communication, March 2023) and the City of Calgary's website (2023).

Program Overview

Calgary, Alberta, showcases a robust Household Hazardous Waste (HHW) management model. Previously, municipalities sent all types of HHW to the Swan Hills Treatment Centre, a practice funded entirely by taxpayers. However, with the closure of Swan Hills, waste collection has been decentralized, with each municipality shouldering the responsibility and cost of waste management. The government is transitioning towards an Extended Producer Responsibility (EPR) model to increase the budget surplus and promote community-based education for proper HHW disposal. Alberta's new EPR framework aims to diversify the economy by motivating companies to innovate in recycling more materials and producing less packaging waste. The EPR framework will be fully operational by April 2025, aligning with Alberta's polluter-pay principle and fostering local recycling markets (City of Calgary, 2023).

The City has contracts with several contractors to process and dispose of materials. The Alberta government is gradually moving various recycling operations, including paint, fibre, and cardboard, from tax-funded to producer-funded. Electronics and paint, among other items, operate under stewardship models. A crucial aspect of this shift involves increasing community-based education to reduce the amount of HHW that needs proper disposal (Cameron Low, personal communication, March 2023). This included ensuring there is an easily accessible website that clearly details the accepted materials, hours of operation, and location of depots. This can also include a greater social media presence.

For the drop-off locations, a map showing fire stations with drop-off sites as well as landfills in the City can be found on the website. The drop-off sites at the fire stations accept materials from 8:00 am to 6:00 pm every day of the week, and the landfills are open at a minimum from 8:00 am to 4:00 pm from Monday to Friday, with some sites being open on weekends as well. The website also shows residents how to sort their waste correctly and which materials are and are not accepted (City of Calgary, 2023).

Accepted HHW

HHW depots in the City accept various items, including automotive chemicals, batteries, healthcare products, garden and pest chemicals, cleaning chemicals, and home renovation materials. Items collected are recycled or treated and disposed of at specialized treatment facilities approved by Alberta Environment and ARMA. For recycling, items like used motor oil, propane tanks, and paint containers are sold to private companies (City of Calgary, 2023).

Community Engagement

The City of Calgary, Alberta, prioritizes convenience for residents, maintaining six HHW depots at select fire halls and three additional drop-off locations. They keep the program free for residents, incentivizing proper HHW disposal and preventing waste from ending in landfills. Their website allows easy access to any information residents need regarding HHW disposal in the city (City of Calgary, 2023).

Observations and Recommendations

The accessibility of HHW depots is one of the main pieces of information that stands out in this section. This allows residents to easily dispose of their HHW at a convenient time and location due to the range of options available. The ready availability of necessary information on the City's website is another crucial aspect that can be seen in this section, which includes a comprehensive list of accepted materials that will mitigate confusion when residents seek information on which materials they are allowed to dispose of.

7.2 Langley Township, British Columbia

The information in Section 7.2 was sourced from personal communications with an Environmental Sustainability Coordinator from the Township of Langley (Christopher Combe, personal communication, April 2023) and the Township of Langley’s website (2023).

Program Overview

Langley Township, BC's annual two-day event for Household Hazardous Waste (HHW) management leverages the collaboration of multiple stakeholders and the Extended Producer Responsibility (EPR) programs. Funded by property taxes, solid waste utility rates, and contributions from a local battery recycler, the event provides an accessible platform for safe HHW disposal. Residents are instructed on the Township's website of proper packing instructions for materials and how to proceed at the event, where staff receive the materials from the back of the resident's vehicle (Christopher Combe, personal communication, April 2023). As mentioned, the event

is held over two days annually and runs from 9:00 am to 3:00 pm (Township of Langley, 2023).

Accepted HHW

The event in Langley, BC, accepts a wide range of items, including but not limited to antifreeze*, automotive and residential batteries*, bleach, brake fluid, concentrated acids, darkroom chemicals, fire extinguishers, herbicides, light bulbs*, motor oil*, oven, cleaner, pesticides*, propane tanks (empty)*, swimming pool chemicals, toilet bowl cleaner, transmission fluid, turpentine, electronics*, thermostats*, small appliances*, and smoke detectors*. Product Care (EPR) also accepts flammable items such as gasoline, acetone, BBQ lighter fluid, camping fuel, flammable degreasers, and more, with specific container size limitations (Township of Langley, 2023). Occasionally, residents bring non-HHW items, like shampoo, for disposal. Although separating these from actual HHW at the event is challenging, they constitute less than 0.5% of total collections, suggesting residents are generally well-informed about what constitutes HHW (Christopher Combe, personal communication, April 2023).
Note: Items marked with an asterisk (*) are part of the EPR program.

Community Engagement

Langley, BC's event's enduring success lies in its accessibility and convenience, offering residents opportunities for potentially hazardous waste disposal. Over two decades, the event has ingrained itself into community life, offering much-needed convenience for residents. Despite cost constraints limiting the event's frequency, the community shows keen interest, and the support of Product Care Recycling remains a vital element. The webpage for the event also informs residents of year-round drop-off options for items covered by EPR, which are typically individual stewards such as BC Used Oil Management Association or Call2Recycle. The event provides residents with an opportunity to dispose of many different materials at once in a convenient manner (Christopher Combe, personal communication, April 2023).

Observations and Recommendations

With small amounts of collected items being non-HHW, it's evident that communities are well-educated about what constitutes HHW. Nevertheless, further efforts to educate the public could minimize the inadvertent collection of non-HHW items. Engaging the community in HHW disposal education is essential to ensure proper disposal practices. This, coupled with making HHW disposal facilities accessible and convenient, can significantly contribute to a successful waste management program. Given the high costs associated with organizing mobile events more frequently, exploring alternate funding sources or cost-sharing models could help expand the service.

7.3 Northumberland County, Ontario

The information in Section 7.3 was sourced from personal communications with a Manager of Waste Operations from Northumberland County (David Metcalfe, personal communication, April 2023) and the Northumberland County website (2023).

Program Overview

During special events in Northumberland County, Ontario, HHW is received at the Seymour Community Recycling Centre (CRC) and year-round at the Brighton and Bewdley CRCs. Drop-off events are held twice yearly, two days at a time. The events run from 8:30 am to 4:00 pm on the first day and from 8:30 am to 2:00 pm on the second day. The permanent depots are open year-round for three days per week, including Saturday, from 8:30 am to 5:00 pm (Northumberland County, 2023).

Products collected are either reused, recycled, or safely disposed of. In addition, the County collaborates with multiple stewardship organizations that provide either a percentage of cost recovery or complete recovery with incentives (David Metcalfe, personal communication, April 2023).

Accepted HHW

The HHW accepted at the CRCs in Northumberland County, Ontario, includes a wide range of items, from automotive products, batteries, and electronics to hobby supplies, paints, solvents, empty tanks, containers, household products, gardening and pest control items, personal care products, and reactive products (Northumberland County, 2023). The County also accepts all flammable waste (Waste Class 263B), funded by the Product Care Association (PCA) (David Metcalfe, personal communication, April 2023).

Community Engagement

In Northumberland County, Ontario, HHW workers educate residents at the drop-off area about non-conforming items and proper disposal methods. This involves a website with clear instructions for the residents, including which items are accepted. If a resident attempts to bring non-conforming materials to a drop-off, they are informed of the proper disposal method. Residents are advised to sort materials into categories before visiting a CRC, and specific guidelines are given for handling syringes, needles, liquid or powder waste, gas, oil, and non-hazardous medical waste. The program's effectiveness relies on awareness and EcoFees at purchase. However, these were also the main challenges faced when the program was implemented (David Metcalfe, personal communication, April 2023).

Observations and Recommendations

Notably, flammable waste is already under EPR for this area. However, transitioning to an EPR model can bring opportunities and challenges. While it can distribute the financial burden more equitably, it can also indirectly increase consumer prices. Community engagement is another critical aspect of this section, as a more educated population will lead to fewer unacceptable materials being brought in and greater rates of proper disposal.

7.4 Montreal, Quebec

The information in Section 7.4 was sourced from personal communications with a Director of Waste Management from the City of Montreal (Abderaouf Sekki, personal communication, May 2023) and the City of Montreal's website (2023).

Program Overview

Montreal, Quebec, hosts temporary drop-off sites six months a year, with sites hosted every weekend during those months at multiple locations across the City. There are also seven Ecocentres across the Island of Montreal, where residents can drop off HHW anytime while the Ecocentre is open. Most Ecocentres are open Monday to Sunday from 8:00 am to 6:00 pm between April 15 and October 14 (City of Montreal, 2023).

Accepted HHW

The events and Ecocentres in Montreal, Quebec, accept the following items but are not limited to these: cleaning and maintenance products, vegetable oil, fuel for fondue burners, drain cleaner, rubbing alcohol, hair dye, nail polish remover, hair spray, medication, toilet cleaner, nail polish, fabric softener, stain remover and detergent, bleach, adhesives, tar, epoxy, paint remover, aerosol sprays, intact fluorescent tubes and energy-efficient light bulbs, paint, varnish, lacquer, bait, anti-rust product, aluminum paint, sealant, linseed oil, car batteries (acid/lead), propane bottles, used motor oil, empty containers and filters, mercury (thermometers), pesticides and fertilizer, pool chemicals, terebinthine, varsol, gasoline, fuel, thinner, alcohol, and shellac (City of Montreal, 2023). While some items that are not accepted do end up slipping through, this is rare. Residents are educated at the events when employees find they have brought items that are not accepted (Abderaouf Sekki, personal communication, May 2023).

Community Engagement

The City of Montreal, Quebec, emphasizes its awareness and information campaigns on the City's website, social media accounts, and local newspapers to

ensure that residents are adequately informed about the HHW drop-off options (Abderaouf Sekki, personal communication, May 2023). The webpages for the individual Ecocentres provide directions, approximate wait times, and accepted materials at the sites.

Observations and Recommendations

Similarly to Calgary, Alberta, the accessibility of the Ecocentres in Montreal, Quebec, is something that regions should strive to emulate if their budget allows it. This increased accessibility will allow residents greater flexibility when disposing of their HHW.

The availability of approximate wait times is an interesting tool that busier areas could investigate implementing if there are complaints from residents about wait times at HHW depots or events.

7.5 Special Considerations — Flammables and Fire Extinguishers

Flammable liquids, such as gasoline, acetone, BBQ lighter fluid, and camping fuel, are covered by provincial EPR programs in Langley, BC, Calgary, AB, and Northumberland County, ON. Montreal, QC, accepts these materials, but they still need to be covered under a provincial EPR program; the goal is to include them by June 2024.

Fire extinguishers are classified as HHW due to the risks associated with pressurized containers. While empty extinguishers could be accepted at scrap metal facilities or landfills, pressurized extinguishers are a safety concern. They are accepted by all of the jurisdictions discussed in the case studies.

7.6 General Observations and Recommendations

- There is a common theme of community-based education across all case studies. Increasing awareness and understanding of what constitutes HHW and how to dispose of it properly is vital for the success of these programs. One possible idea is to work with an education or communications consultant to communicate these programs effectively.

- With small amounts of collected items being non-HHW, it's evident that communities are well-educated about what constitutes HHW. Nevertheless, further efforts to educate the public could minimize the accidental collection of non-HHW items.

- Most jurisdictions emphasize the importance of making HHW disposal sites easily accessible and convenient for residents, with extended hours and

information readily available online. This is a critical factor in promoting proper disposal practices.

- Fire extinguishers are classified as HHW due to the risks associated with pressurized containers. While empty extinguishers might be accepted at landfills, pressurized extinguishers pose a safety concern. All the mentioned jurisdictions accept fire extinguishers, signalling a universal recognition of their hazardous nature. A specific recommendation could be the development of standardized guidelines for handling, transporting, and disposing of fire extinguishers outside of EPR, considering their potential risks. One possible concern if pressurized containers are regulated under EPR is an increase in the cost of fire extinguishers (Robert Kenney, personal communication, August 2023).

- The inclusion of flammable liquids like gasoline, acetone, and BBQ lighter fluid into provincial EPR programs is noted in some jurisdictions. A recommendation could include accelerating efforts to include these materials in EPR programs within Nova Scotia.

8. Observations and Recommendations

8.1 Best Practices

- For municipalities without HHW collection currently in place, an HHW depot at a municipal facility should be prioritized due to the more significant resources required to operate a mobile event. Municipalities should utilize mobile events and permanent depots if the budget allows it. However, the costs need to be considered for hiring a licensed operator and the resources required to advertise and secure a location for a mobile event.

- Ideally, an HHW depot should be open for as many hours as possible throughout the week to create greater accessibility to residents. However, due to budget constraints, this is likely not possible. Municipalities should review when most materials are brought to the depot and prioritize being open during those times. This is likely to include being open at least one day during the weekend, which allows residents who work full-time during the week to bring their materials in.

- Websites and online presences like those of Valley Waste Resource Management or those seen in Section 7 are examples that all municipalities should strive to emulate. Increasing awareness and understanding of what

constitutes HHW and how to dispose of it properly is vital for the success of these programs. One possible idea for municipalities is to work with an education or communications consultant to effectively communicate these programs to residents through websites and social media.

- Municipalities may want to consider creating a standardized list of acceptable HHW materials throughout Nova Scotia; a consultant would be useful in this case.

- With small amounts of collected items being non-HHW, it's evident that communities are well-educated about what constitutes HHW. Nevertheless, further efforts to educate the public could minimize the inadvertent collection of non-HHW items. This includes publishing comprehensive lists of which materials are accepted at HHW drop-offs on municipal websites, as well as proper sorting methods. Additionally, making the operating hours and depot locations easily accessible can help to increase the collection rates.

- Fire extinguishers should continue to be classified as HHW due to the safety risks associated with alternative disposal methods. A specific recommendation could be the development of standardized guidelines for handling, transporting, and disposing of fire extinguishers, considering their potential risks.

- Cost data should be further standardized and stored to allow for more straightforward data analysis in the future.

- A possible alternative safety standard to managing 1L propane cylinders comes from Yarmouth, where they puncture the cylinders and flatten them so they can be placed in the scrap metal pile.

- The methods for managing lithium batteries should be reviewed due to their high cost and the labour required to deal with them. Solid Waste Managers expressed interest in more stewardship programs for batteries.

- Further to the previous point, municipalities should work with solid waste workers to create a priority list of items they want to see regulated under EPR programs.

8.2 Policy

- Programs such as the NS Power program to manage mercury bulbs should be reinstated, or the province should offer alternatives if the program is to be discontinued. Municipalities are left managing the programs at a higher cost; multiple regions mentioned this. Implementing an EPR program for mercury is likely to have environmental benefits through increased collection rates, as mentioned in Section 5.1. Divert NS and NSECC have discussed the possibility of a bulk mercury collection program.

- The cost to municipalities of managing mercury bulbs is ten times greater than managing bulk mercury and should be considered when implementing programs to manage mercury.

- Placing flammables and caustics under EPR programs should be considered due to the environmental benefits related to collection rate increases after program implementation mentioned in Section 5.1 and the costs to municipalities associated with these categories, shown in Section 4.5.2. The most common materials to be captured by this can be found in Table 3.

9. Conclusion

Overall, this report aims to inform the reader of the current HHW landscape in Nova Scotia through interviews with Solid Waste Managers and through online research. The findings from this research are supported by information collected from jurisdictions outside of Nova Scotia, which allows recommendations to be made regarding best practices and policy within the province.

Smaller municipalities should prioritize establishing permanent collection depots over mobile events for effective waste management, optimizing hours based on peak disposal periods. Emphasizing community education, reevaluating management practices for specific items, and considering policy adjustments can lead to more efficient and cost-effective waste management strategies.

Appendices

Appendix 1: Interviewees and personal communication references, with their affiliated organizations and positions

Name	Affiliate	Position
Abderaouf Sekki	The City of Montreal	Director of Waste Management
Andrea Trask	Municipality of East Hants	Manager of Solid Waste
Andrew Garrett	Valley Waste-Resrouce Management	Communications Manager
Cameron Low	The City of Calgary	Waste Diversion Technologist
Christopher Combe	The Township of Langley	Environmental Sustainability Coordinator
David Metcalfe	Northumberland County, Ontario	Manager of Waste Operations
Glendon Ring	Yarmouth County Solid Waste Management Authority	Manager
Josh Kelly	Vermont Agency of Natural Resources	Solid Waste Program Manager
Kirk Symonds	Halifax Regional Municipality	Manager - Education and Promotion
Nicole Latimer	Regional Coordinator	Inverness County
Robert Kenney	Nova Scotia Environment and Climate Change	Recycling Development Officer
Robyn Monk	GFL Environmental Services	Site Supervisor
Roschell Clarke	Cape Breton Regional Municipality	Solid Waste Coordinator
Savannah Hatheway	GFL Environmental Services	Project Coordinator, Waste

Appendix 2: Cost Comparison and Ranking of All HHW Categories Included in the Data

Category	Total Cost to All Regions	Rank	Total Cost to All Regions Excluding HRM	Rank
Flammables, Organics, Thinners	$1,310,406.48	1	$373,834.71	1
Event expenses	$417,363.63	2	$11,121.63	14
Pesticides	$213,102.27	3	$57,526.28	6
Aerosols	$166,722.16	4	$57,619.06	5
Oxidizers, Organics	$147,590.52	5	$69,063.85	2
Propane	$145,051.43	6	$32,335.36	10
Fire extinguishers	$144,043.56	7	$24,352.62	12
Corrosives	$134,664.65	8	$30,726.60	11
Acids, Caustics	$101,030.88	9	$64,005.31	4
mercury bulbs	$88,747.81	10	$44,138.39	7
Special waste and other	$86,948.18	11	$41,699.92	8
Organic Pallet	$66,126.51	12	$66,126.51	3
Propane Tanks	$52,889.21	13	$7,179.77	17
Compressed gas cylinders	$44,322.65	14	$12,770.56	13
Propane Drums	$36,558.53	15	$36,558.53	9
Diesel, gas, oil & filters	$18,077.07	16	$9,650.07	16
Lithium Batteries	$15,300.13	17	$1,318.00	25
Lead Acid Batteries	$12,518.64	18	$378.69	28
Alkaline Batteries	$11,959.13	19	$6,682.85	18
Liquids, lean low flash	$10,652.16	20	$10,652.16	15
Labpack - batteries	$9,572.66	21	$5,349.04	21
Non-program paint	$5,488.75	22	$5,488.75	19
Oxidizers, inorganic	$5,431.40	23	$5,431.40	20
Mercury	$4,253.50	24	$4,253.50	22
CFC gas	$2,683.50	25	$2,683.50	23
Oily materials	$1,740.00	26	$1,740.00	24
ProductCare Paint	$921.50	27	$921.50	26
Cyanide	$448.00	28	$448.00	27

Source: Divert NS (2023)

Appendix 3: Problematic HHW Materials from Solid Waste Manager Interviews

Problematic Materials	HRM	Annapolis Valley	Yarmouth	CBRM	Inverness
Mercury	They primarily receive mercury from manufactured products, not in large amounts. This mercury is sent to an Ontario facility in specially designed barrels filled with vermiculite for safe transportation. The HRM lacks a facility for large-scale mercury treatment or recycling. Large amounts of mercury are not commonly found in the Maritimes; smaller amounts typically come from labs and equipment.		This was identified as a costly material for the region to manage.	They receive mercury at the depot primarily from 4 ft and 8 ft light bulbs/tubes and CFL bulbs, as well as thermostats. The bulbs are categorized into separate boxes according to their lengths. The disposal cost is $1.75 per 4 ft bulb and $3.75 per 8 ft bulb. CFLs are stored in barrels, costing around $300 per barrel for disposal. They do not accept mercury products from the commercial sector.	Individuals often bring jars of mercury discovered in sheds to their drop-off events. They also receive mercury-containin g lights at these events. Inquiries from Industrial, Commercial, and Institutional (ICI) sectors are redirected to GFL Keltic Drive Sydney. Disposing of mercury, even in small quantities, is very expensive.
Gas Cans & Windshield Washer Fluid Containers	Although these items are made from Type 2 plastic, they are discarded rather than recycled. Observations revealed a waste bin containing a substantial amount of this material that should be recycled, but isn't currently accepted.			Empty windshield washer fluid containers are included in the mixed HDPE line after sorting. Full containers are processed through the Household Hazardous Waste (HHW) program. They do not accept gas or empty gas cans; residents are directed to bring these items to a local environmental company.	A new collection shed for these items was initiated at Kenloch. However, an unreliable pick-up schedule from the collector causes on-site issues. Gas jugs are not included in this program; residents are advised to bring these to Household Hazardous Waste (HHW) events.
Lithium Batteries	These pose a challenge for the depot. Each battery requires	Handling these batteries demands a lot of labor as each one	They are considered one of the most dangerous	They accept these batteries through their program, but it	These batteries are received at Strathlorne, Kenloch, and a

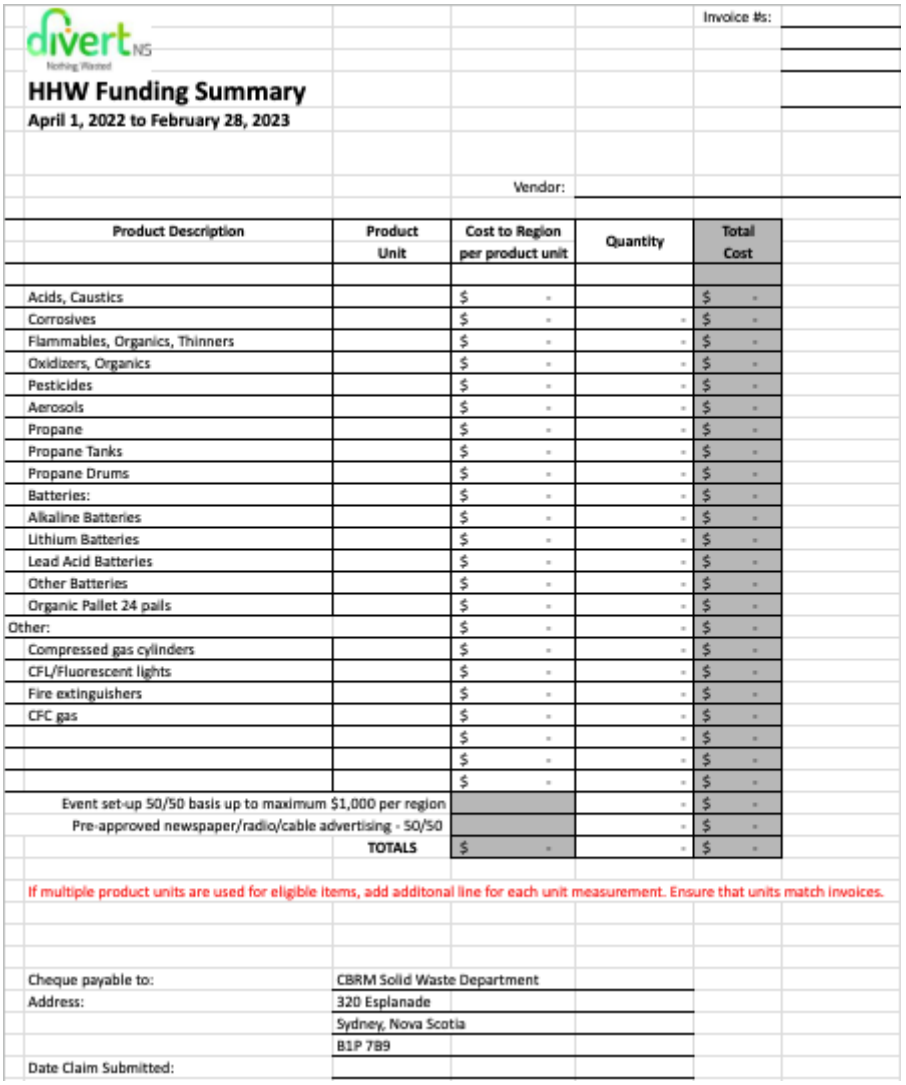
	taping or individual bagging and is stored in barrels with heat-absorbing material to mitigate the risk of explosions.	needs to be sorted, taped, or individually bagged. There is interest in developing more stewardship programs for these batteries to reduce handling costs.t.	materials handled at the depot due to the significant fire risk they pose.	becomes problematic when they receive them via the recycling sorting line. They're seen as a fire hazard and pose a danger if a loader accidentally runs over any loose batteries. There's a roughly $100 fee for the barrels used to store these batteries. These batteries are managed through the 'Recycle Your Battery' program.	few other county sites where they are collected in 'Call 2 Recycle' boxes. There is concern about the limited collection options. Some regions lack battery disposal services, leading to batteries being discarded in regular garbage, which poses a fire risk. 'Call 2 Recycle' services are currently only available to government or educational institutions.
Aerosols	The depot collects a significant quantity of aerosol paint cans. Despite previous assumptions, a recycling program exists for these items. The flammable liquids inside are drained and reclaimed, and the metal can is recycled. However, due to the depot's operations and the large volume of aerosols received, it's not practical to mix the aerosol paint cans with the regular paint cans.			Aerosols are accepted at the depot. They use lab packs/barrels for storage of all aerosol containers. Disposal typically costs about $200 per barrel. Aerosol containers that are eligible under the product care program are placed in the product care paint program tubs.	They collect paint and automotive aerosols through specific programs. Some items are captured at Household Hazardous Waste (HHW) events, but many are received in recycling through blue bags, which they divert. If aerosols end up in regular garbage bags, they go to the landfill.
Ballasts with PCBs	These pose a problem because they should ideally be rejected. However, refusal sometimes results in customers	These are seldom encountered. Only one of the depot workers recalls an instance of one being brought in.	These are rarely seen. Only one has been seen in the past two years.	The Cape Breton Regional Municipality does not accept these items. Despite attempts by individuals to drop them off, they are	These items are not accepted, and there have been no public requests regarding them. Inquiries from the Industrial, Commercial, and

	threatening improper disposal, such as leaving them in forested areas.			redirected to a local environmental company. Typically, these attempts are made by commercial companies, from which they do not accept materials. It is rare for residents to bring in these items.	Institutional (ICI) sectors are redirected to GFL Keltic Drive in Sydney.
Flares	These items pose a management challenge for the site. A program through the RCMP is known to allow the exchange of old flares for new ones, if the customer still requires them.			These items are not accepted. Residents are advised to contact a designated hotline for disposal options. In the Cape Breton Regional Municipality, the disposal option for flares is the RCMP.	These items are not accepted. They redirect individuals to the RCMP for disposal, although there have been no inquiries regarding this in the current year.
Leaky/Empty Paint Cans		Leaky Paint Cans: These contribute substantially to their Labpack D. Despite being unwanted by the steward, these cans still need to be managed, incurring high costs. Empty Paint Cans: These cans pose a significant inconvenience because they must be stored in the same Labpack as full paint cans. This takes up a lot of space that could otherwise be used for full paint cans.		Leaky Containers: These are not accepted. If a resident arrives with a leaky container, they're instructed to place the materials in a non-leaking container. This is then stored in a flammable lab pack. Empty Paint Cans: These go into the product care program for paint and are stored in the product care tub. Unlabelled containers are placed in the flammable lab pack. The depot bears the responsibility of disposing all	They have taken over the Paint Care Program from a local Enviro Depot. They often receive unlabelled or unacceptable items mixed with other materials. They are working on improving recycling program education and asking residents to set aside problematic items for Household Hazardous Waste (HHW) events.

				unlabelled paint cans (full and empty), which can be expensive and occupy space because they must be stored separately as a flammable lab pack. Rusty containers are also treated the same way.	
Unknown Powders		These are very difficult to identify.		The Household Hazardous Waste (HHW) depot does not accept any unidentified substances from residents. Individuals are redirected to an environmental company for disposal.	They do not accept this type of item as they lack Household Hazardous Waste (HHW) services. However, these items may be accepted at HHW events run by GFL.
Propane Camping Cylinders		Disposing these items is costly, nearly $2 per cylinder. The team has expressed an interest in improved stewardship programs for these items.	These are dealt with in Yarmouth by puncturing and flattening them, then placing them in the scrap metal pile, which can then be sold.	Small propane cylinders are accepted and are placed in a lab pack designated for propane. Larger propane tanks are not accepted at the Household Hazardous Waste (HHW) Depot and are directed to Supreme Propane.	One-pound cylinders pose a significant problem. They do not accept these at their facilities, but they often arrive mixed with other materials in recycling bags. These 1 lb propane cylinders are not recyclable, and without a permanent Household Hazardous Waste (HHW) depot, they present safety issues at their sites.
Fluorescent Lights		Valley Waste-Resource Management purchased its own 'bulb eater' to process these as it was cheaper than paying a	The Yarmouth County Transfer Station previously owned a 'bulb eater,' but due to high maintenance costs, it is no longer in use. A	CBRM's Household Hazardous Waste (HHW) depot accepts these lights. They do not have a 'bulb eater,' so these	These are not accepted at their facilities. They direct individuals to bring them to Household Hazardous Waste (HHW) events or

		processor.	replacement was not bought due to an NS Power program that collected these bulbs, which has since been cancelled. There is uncertainty about purchasing a new 'bulb eater' because of the potential introduction of a new program.	items are disposed of with other HHW materials. They are packed in 4ft and 8ft boxes. Both straight lights and CFLs are accepted. CFL bulbs are placed in a barrel, costing approximately $300 per barrel/drum for disposal. Disposal costs are $1.75 for each 4ft light and $3.75 for each 8ft light.	to GFL Keltic Drive for larger quantities.
Unidentifiable Compressed Gas Cylinders	These items pose significant challenges, especially during busy periods at the depot when they might be overlooked. They can be particularly difficult and unsafe to handle due to potential damage or compromise.			Any unidentifiable materials are not accepted at the Household Hazardous Waste (HHW) depot. Residents are redirected to an environmental company for these items.	These items are not accepted, and individuals are redirected to Household Hazardous Waste (HHW) events. However, helium and other gas tanks often arrive at their recycling facility in blue bags.
Chlorinated/brominated pool chemicals	These have become increasingly prevalent and complex to handle as home pools gain popularity.			These materials are disposed of in a lab pack. They typically receive these items during the spring and summer seasons.	These materials are not accepted at their facilities. Residents are redirected to their Household Hazardous Waste (HHW) drop-off event. However, some residents try to dispose of these by hiding them in the garbage.

Note: Data compiled from personal communications with A. Garrett, S. Hatheway, G. Ring, R. Clarke, and N. Latimer, 2023.



divert NS
Nothing Wasted

HHW Funding Summary

April 1, 2022 to February 28, 2023

Invoice #s:

Vendor:

Product Description	Product Unit	Cost to Region per product unit	Quantity	Total Cost
Acids, Caustics		$ -		$ -
Corrosives		$ -	-	$ -
Flammables, Organics, Thinners		$ -	-	$ -
Oxidizers, Organics		$ -	-	$ -
Pesticides		$ -	-	$ -
Aerosols		$ -	-	$ -
Propane		$ -	-	$ -
Propane Tanks		$ -	-	$ -
Propane Drums		$ -	-	$ -
Batteries:		$ -	-	$ -
Alkaline Batteries		$ -	-	$ -
Lithium Batteries		$ -	-	$ -
Lead Acid Batteries		$ -	-	$ -
Other Batteries		$ -	-	$ -
Organic Pallet 24 pails		$ -	-	$ -
Other:		$ -	-	$ -
Compressed gas cylinders		$ -	-	$ -
CFL/Fluorescent lights		$ -	-	$ -
Fire extinguishers		$ -	-	$ -
CFC gas		$ -	-	$ -
		$ -	-	$ -
		$ -	-	$ -
		$ -	-	$ -
Event set-up 50/50 basis up to maximum $1,000 per region			-	$ -
Pre-approved newspaper/radio/cable advertising - 50/50			-	$ -
	TOTALS	$ -	-	$ -

If multiple product units are used for eligible items, add additonal line for each unit measurement. Ensure that units match invoices.

Cheque payable to:	CBRM Solid Waste Department
Address:	320 Esplanade
	Sydney, Nova Scotia
	B1P 7B9
Date Claim Submitted:	

Appendix 4: Sample HHW Funding Summary

Source: CBRM (2023).

Appendix 5: List of questions that were asked in the interviews with Solid Waste Managers in Nova Scotia and from other jurisdictions.

Examples of Questions That Were Asked in the Interviews
Do you have a list of which items accepted as HHW by your programs are EPR?
To follow up on my last question, do you still collect items people mistake for HHW, such as shampoo?
Nova Scotia is looking at EPRing flammables; is this what 'X' does? If so, which materials are captured by this?
Do you know of any challenges or barriers faced when this program was implemented?
What are the key elements of this program that make it effective?
When shipping these materials to specialized treatment facilities, how are the facilities in 'X' reimbursed?
What does the funding breakdown of the facilities look like? Are they fully taxpayer funded?
If flammables are EPRed, which materials can be expected to be captured? Where are these sent currently?
Would you happen to have a list of the current HHW categories accepted? Further to this, which are EPR/not?
Do you know why fire extinguishers are HHW when they could likely be sent to landfills?
Which materials do you not accept, which you believe you should be taking? As well as the inverse of this question.
Which materials are the most problematic for you to manage?

Note: Due to the spoken interviews being conversational in nature, this list is not comprehensive.

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