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7.2.1.2 Potential Supply
7.2.2 Processing and Infrastructure
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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Anaerobic Digestion</td>
</tr>
<tr>
<td>ALC</td>
<td>Agricultural Land Commission</td>
</tr>
<tr>
<td>ALR</td>
<td>Agricultural Land Reserve</td>
</tr>
<tr>
<td>APPR</td>
<td>Association of Postconsumer Plastic Recyclers</td>
</tr>
<tr>
<td>BDL</td>
<td>Brewers Distributor Ltd.</td>
</tr>
<tr>
<td>BPA</td>
<td>Bisphenol-A</td>
</tr>
<tr>
<td>CARE</td>
<td>Carpet America Recovery Effort</td>
</tr>
<tr>
<td>CCME</td>
<td>Canadian Council of Ministers of the Environment</td>
</tr>
<tr>
<td>CESA</td>
<td>Canadian Electrical Stewardship Association</td>
</tr>
<tr>
<td>CRT</td>
<td>Cathode Ray Tube</td>
</tr>
<tr>
<td>DLC</td>
<td>Demolition, Land Clearing and Construction</td>
</tr>
<tr>
<td>EFRA</td>
<td>European Flame Retardants Association</td>
</tr>
<tr>
<td>EPR</td>
<td>Extended Producer Responsibility</td>
</tr>
<tr>
<td>e.g.</td>
<td>Exempli gratia (for example)</td>
</tr>
<tr>
<td>EPS</td>
<td>Expanded Polystyrene</td>
</tr>
<tr>
<td>ESABC</td>
<td>Electronics Stewardship Association of BC</td>
</tr>
<tr>
<td>FVRD</td>
<td>Fraser Valley Regional District</td>
</tr>
<tr>
<td>GEEP</td>
<td>Global Electric Electronic Processing</td>
</tr>
<tr>
<td>GTA</td>
<td>Greater Toronto Area</td>
</tr>
<tr>
<td>GVRD</td>
<td>Greater Vancouver Regional District</td>
</tr>
<tr>
<td>HDPE</td>
<td>High Density Polyethylene</td>
</tr>
<tr>
<td>HHGV</td>
<td>Habitat for Humanity of Greater Vancouver</td>
</tr>
<tr>
<td>ICI</td>
<td>Industrial, Commercial and Institutional</td>
</tr>
<tr>
<td>i.e.</td>
<td>Id est. (that is to say)</td>
</tr>
<tr>
<td>ISWRM</td>
<td>Integrated solid Waste and Resource Management, a Solid Waste Management Plan</td>
</tr>
<tr>
<td>Kg</td>
<td>Kilogram</td>
</tr>
<tr>
<td>LCA</td>
<td>Life Cycle Analysis</td>
</tr>
<tr>
<td>LDPE</td>
<td>Low-density Polyethylene</td>
</tr>
<tr>
<td>MF RES</td>
<td>Multi-family residential</td>
</tr>
<tr>
<td>MMBC</td>
<td>Multi-Materials British Columbia</td>
</tr>
<tr>
<td>MRF</td>
<td>Material Recovery Facility</td>
</tr>
<tr>
<td>MSW</td>
<td>Municipal Solid Waste</td>
</tr>
<tr>
<td>MV</td>
<td>Metro Vancouver</td>
</tr>
<tr>
<td>MWP</td>
<td>Mixed Waste Paper</td>
</tr>
<tr>
<td>N.A.</td>
<td>Not Available</td>
</tr>
<tr>
<td>N6 or N6,6</td>
<td>Nylon</td>
</tr>
<tr>
<td>OCC</td>
<td>Old Corrugated Cardboard</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>OMRR</td>
<td>Organic Matter Recycling Regulation</td>
</tr>
<tr>
<td>ONP</td>
<td>Old Newspaper</td>
</tr>
<tr>
<td>OP</td>
<td>Office Pack</td>
</tr>
<tr>
<td>PET</td>
<td>Polyethylene Terephthalate</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>PPP</td>
<td>Packaging and Printed Papers</td>
</tr>
<tr>
<td>RES</td>
<td>Residential</td>
</tr>
<tr>
<td>RISI</td>
<td>Resources Information Systems Inc.</td>
</tr>
<tr>
<td>RMRS</td>
<td>Ridge Meadows Recycling Society</td>
</tr>
<tr>
<td>rPET</td>
<td>Recycled Polyethylene Terephthalate</td>
</tr>
<tr>
<td>SF RES</td>
<td>Single Family Residential</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strength, Weaknesses, Opportunities, Threats</td>
</tr>
<tr>
<td>US EPA</td>
<td>United States Environmental Protection Agency</td>
</tr>
<tr>
<td>WRN</td>
<td>Waste and Recycling News</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 Project Scope

Metro Vancouver (MV) retained EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA) to conduct a comprehensive study on recycling markets in Metro Vancouver. EBA partnered with Cascadia Consulting Group (Cascadia) to execute the study. The objective of this study was to gather information on regional recycling markets and identify opportunities for Metro Vancouver to stimulate recycling market development. This study is intended to support progress towards achieving diversion goals within Metro Vancouver's Integrated Solid Waste and Resource Management Plan (ISWRM). The ISWRM has a target of increasing the region's waste diversion rate from 55% to 70% by the year 2015.

1.2 Target Recyclable Materials

Target materials, or commodities, were divided into the following categories: carpet, glass, electronics, organics, paper, and plastic. Materials included with each category and section numbers are provided in the table below.

Table 1-1: Target Material Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Section</th>
<th>Target Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet</td>
<td>3.0</td>
<td>Carpet</td>
</tr>
<tr>
<td>Glass</td>
<td>4.0</td>
<td>Clear glass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed glass</td>
</tr>
<tr>
<td>Electronics</td>
<td>5.0</td>
<td>E-waste, (Phase 1-4 of the BC Recycling Regulation)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small appliances</td>
</tr>
<tr>
<td>Organics</td>
<td>6.0</td>
<td>Yard and garden</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food scraps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compostable paper</td>
</tr>
<tr>
<td>Paper</td>
<td>7.0</td>
<td>Old Newspaper (ONP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Old Corrugated Cardboard (OCC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed Waste Paper (MWP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Office Paper (OP)</td>
</tr>
<tr>
<td>Plastic</td>
<td>8.0</td>
<td>Polyethylene Terephthalate (PET) (mixed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High Density Polyethylene (HDPE) (mixed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Film Plastic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polystyrene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plastic Tubs and Lids</td>
</tr>
</tbody>
</table>
Each target material section provide an overview of: market conditions including supply trends, current and future supply, and an overview of processing and infrastructure; end markets and pricing including current and future demand and effects of policies; and perceived barriers and opportunities with a preliminary list of public sector options. A comprehensive list of public sector opportunities is provided in the Section 9.0 SWOT Analysis.

In addition to the material-specific section, the study also includes:

- **Section 2.0 Market Overview** - provides an overview of current supply, value of recyclable materials, future supply, and target material highlights

- **Section 9.0 SWOT Analysis** - introduces the analysis of strengths, weaknesses, opportunities, and threats (SWOT) analysis for each target material at each stage of the recycling process that can be found in Appendix B. The SWOT provides an in depth review of public sector options within the opportunities section for each target material.

- **Section 10.0 Conclusions** – summarizes how the study findings can be used and what can be further explored to increase understanding of recycling markets within the context of global resource management.

Additionally, in light of the packaging and printed paper legislation underway through the BC Recycling Regulation, this study was expanded to explore the quantity of packaging and printed paper (PPP) in the industrial, commercial and institutional (ICI) sector that is currently disposed and recovered, its end destination, and barriers to diverting this material from the ICI sector. An ICI PPP technical memo can be found in Appendix C.

### 1.3 Methodology

Information was obtained on each of the target materials through publications and interviews with key market players. The research on published information included literature such as industry-focused journals, previous recycling market studies, reports from regional districts and municipalities, and market indices. Key market players who were surveyed or interviewed for this study included haulers, processors, stewardship organizations, brokers, recyclers, end users, industry experts, and municipal staff. This study provides aggregated data and information intended to explain market trends while protecting proprietary information.

To facilitate analysis of material flows and commodity markets, we organized the data according to the phases in the recycling loop (Figure 1-1).
Definitions for the market experts interviewed are as follows:

- **Collector/Hauler/Drop-off**: A firm that collects, hauls, or receives recyclable materials. These activities include, for example, collecting curbside materials from residential customers, hauling commercial recyclables, or operating a drop-off site or buy-back centre.

- **Material Recovery Facility (MRF)**: A firm that cleans, sorts and bales recyclable materials, but does not transform the materials.

- **Processor**: A firm that transforms recyclable materials into feedstocks for manufacturers/end-users. These firms change the material’s form, such as flaking or grinding plastics, shredding carpet, disassembling electronics, or chipping wood waste. For this survey, processing does not include simply sorting or baling material.

- **Re-manufacturer**: A firm that utilizes recyclable materials to create new commodities or products such as paper, plastic pellets, glass containers, or compost. Examples of such firms include paper mills, reclaimers, and composters.

- **Reuse**: A firm that specializes in material reuse, such as used computer retailers and thrift stores.

- **Other**: Non-governmental organizations, trade associations, etc.
2.0 MARKET OVERVIEW

This section provides a general overview of the recycling markets in Metro Vancouver. It describes the quantities and market value of target materials generated in Metro Vancouver, as well as potential supply estimates for the future.

2.1 Current Supply and Value of Recyclable Materials

As shown in Figure 2-1, Metro Vancouver generates approximately 1.3 million tonnes of potentially recyclable materials in the six target material categories studied. Of this, 630,000 tonnes are recycled and 650,000 tonnes are disposed. These tonnages are based on the Metro Vancouver 2010 waste composition and recycling data. Compostable organics are a dominant target material category, with approximately 390,000 tonnes disposed and 240,000 tonnes recycled. The potential cost savings from avoided disposal is calculated below for all six target materials. The value of the disposed material for plastics, glass, and paper were calculated based on average market prices from 2009-2011. Due to fluctuating market prices, a three-year average price is considered to be reflective of the average value of the material.

The value of disposed carpet is an average based on industry estimates for component material prices and average proportions of component materials in discarded carpet.

For organics, the value of the material is presented as potential cost savings only because collected organics do not have a market value and there is a cost associated with sending them to a compost facility or a landfill. In this case, we present the money saved from diverting organics to a composting facility rather than disposing at a landfill as the tipping fees for organics are lower than municipal solid waste being disposed.

Similarly for electronics and small appliances, the value of the material is presented only as cost savings from avoided disposal. This is in part because electronics are a diverse group of products, made up of varying types and proportions of materials, making it difficult to calculate a market value of the quantities remaining in disposed waste. In addition, even though certain components of electronics have market values, overall it costs more to collect and process electronics for recycling than the combined market value of components recovered.

Not including organics and electronics, the disposed material in Metro Vancouver is worth approximately $53 million. The potential cost savings of disposed recyclables in Metro Vancouver is $28.5 million.
The following table provides estimates of the disposed value and potential cost savings from avoided disposal of the materials addressed in this report. Estimated market values were established using market indicator prices.

<table>
<thead>
<tr>
<th>Category</th>
<th>Disposed 2010 (tonnes)</th>
<th>Price Range (per tonne)</th>
<th>Estimated Gross Market Value²</th>
<th>Disposal Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpet</td>
<td>34,280 (carpet) 6,500 (carpet pad)</td>
<td>$699 (carpet) - (carpet pad)</td>
<td>$23,961,720</td>
<td>$3,343,981</td>
</tr>
<tr>
<td>Electronics</td>
<td>13,495</td>
<td>N.A.</td>
<td>N.A.</td>
<td>$1,106,624</td>
</tr>
<tr>
<td>Glass</td>
<td>10,669</td>
<td>$12.63-35.32</td>
<td>$285,940</td>
<td>$874,853</td>
</tr>
<tr>
<td>Organics</td>
<td>389,771</td>
<td>N.A.</td>
<td>N.A.</td>
<td>$9,000,000º</td>
</tr>
<tr>
<td>Paper</td>
<td>120,852</td>
<td>$74.30-119.60</td>
<td>$14,334,748</td>
<td>$9,909,826</td>
</tr>
<tr>
<td>Plastic</td>
<td>52,468</td>
<td>$22.05-480.60</td>
<td>$14,456,955</td>
<td>$4,302,385</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53,039,363</strong></td>
<td><strong>$3,039,363</strong></td>
<td><strong>$28,502,403</strong></td>
<td></td>
</tr>
</tbody>
</table>

¹ More information on prices can be found in each commodity's End Market and Price subsection. Market values were calculated based on estimated values from materials broken out in MV's waste composition study.

² Value estimates do not factor in costs of transporting, preparing, sorting, or delivering to buyers, which may exceed the market value.

³ Since organics has a tipping fee, the difference between the garbage ($82) and organics ($63) was used to determine the potential disposal cost savings.
2.2 Future Supply

Estimates of potential future supply of target materials are based on waste generation projections from Metro Vancouver (assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020. Other potential influences are not factored into these estimates. Some of these potential influences include changes in material use (e.g. switching from glass to plastic, more electronic media versus printed media) and the effect of upcoming product stewardship programs (e.g. PPP, carpets). The potential supply of all target materials combined is estimated to increase by 17% from 2010 to 2020, from 1.3 million tonnes to 1.5 million tonnes, based on Metro Vancouver calculations.

Figure 2-2: Current and Potential Supply for Combined Target Materials
2.3  **Target Recyclable Material Highlights**

A brief summary of each target material outlined in the study is provided below.

### 2.3.1  Carpet

Carpet recycling is an emerging industry worldwide and one that has been slower to develop in Canada than in the US. At this time, there is almost no carpet recycling underway in Metro Vancouver, and only a small amount of post-consumer carpet being discarded in the region is collected for recycling. Post-consumer carpet that is collected is currently exported for processing, and component materials are generally sold to end users in those markets.

However, several carpet recycling firms recently formed in Canada, and several others currently operating in the US have expressed interest in beginning operations in the Metro Vancouver region.

Given the fast-developing nature of the carpet recycling industry, it is likely that the collection and processing infrastructure and market conditions for carpet recycling in Metro Vancouver will change significantly in the next several years especially with the implementation of Extended Producer Responsibility (EPR) program as recommended through the “Canada-wide Action Plan for Extended Producer Responsibility”, as published by the Canadian Council for Ministers of Environment (CCME, 2009).

### 2.3.2  Electronics and Small Appliances

The EPR program, as legislated through the BC Recycling Regulation is the major driver of electronics and small appliance recycling in Metro Vancouver. Since its establishment in 2006, the regulation has required producer responsibility for the expanding realm of electronics and electrical equipment, beginning in 2007 with computers, desktop printers, and televisions; adding a wide range of home and personal portable audio/video equipment, home theater equipment, and non-cellular telephones in July 2010; and expanded to small electronics and appliances in October 2011. A final expansion to large electronics and appliances is planned for July 2012, at which time virtually every product with a cord or a battery will be regulated.

As a result of EPR programs, collection and recycling of electronics and small appliances has increased, and will continue to do so. The regulation requires Product Stewards to provide collection facilities and to manage the collected products according to the pollution prevention hierarchy, prioritizing reuse and recycling.

Stewardship organizations are playing an increasing role in the electronics and small appliance recycling industry. Between 2007 and 2010, the Electronics Stewardship Association of BC (ESABC), an electronics steward, emerged as a major player with the ability to shape business practices and processing infrastructure, to influence prices, and to stimulate end markets for electronics recycling in the region. The Canadian Electrical Stewardship Association (CESA), which was formed to manage the small appliance program, and its operational partner Product Care, are also poised to play similar roles. Additional stewardship organizations are likely to form to manage other electronics and appliance categories as they are phased in.
2.3.3 Glass Containers

Glass is one of the most easily recycled materials—it can be recycled endlessly into new glass, including in “closed loop” bottle-to-bottle manufacturing, reducing energy needs. Glass containers (including beverage, food, and other product containers) have the highest level of recycling and reuse among recyclable materials in the Metro Vancouver waste stream, achieving a combined estimated 88 percent recovery rate. Recycling infrastructure exists and is expected to remain relatively stable for Metro Vancouver’s two glass streams – refundable and non-refundable glass. Over 70 percent of glass containers generated in Metro Vancouver are managed through deposit-refund systems: refillable beer bottles managed by Brewer’s Distributor Ltd., and all other beverage containers (including for wine, spirits, and non-refillable beer) managed by Encorp Pacific. Non-refundable glass containers are typically collected through municipal curbside or drop-off recycling programs, and through some commercial recycling programs.

Non-refundable glass, largely collected through curbside programs, has much lower value than refundable glass, and fewer outlets for recycling. This material is generally “downcycled” (i.e. transformed into a product of lesser quality and reduced functionality) as sand blasting or construction aggregate. The upcoming PPP legislation will likely affect curbside glass recycling collection, although it is unclear how at this point. This material has a moderate to weak market for refundable and non-refundable/curbside glass respectively.

2.3.4 Organics

Building infrastructure for the collection and processing of compostable organics is a priority in the region. In 2010, compostable organics represented approximately 35 percent of the residential and ICI sector waste stream. Given the significant amount of organics still being disposed, targeting organics serves as a critical component for successfully achieving diversion goals set by the region.

There are two primary facilities that process compostable organics, including food scraps. Between current facility expansion and the development of new processing capacity, including anaerobic digestion and in-vessel composting, processing infrastructure is expected to increase as more organic feedstock is available. It is expected that more material will be recovered as garbage disposal fees increase and an organics disposal ban is phased in by 2015.

Organics collected in Metro Vancouver are transformed into a variety of products, including compost and soil mixes, which are sold predominantly to landscapers, residents and government. The market for compost in the region is considered moderate and some market experts expect it to weaken as more material enters the marketplace. While more can be done to promote compost use, it is generally recognized as having value for long-term soil building by adding nutrients, reducing run off, retaining moisture, and enhancing disease resistance. However, the region has a relatively limited land base with an increase in intensive farming and a growing population. Currently, there is an overabundance of nutrients in the form of agricultural manures and biosolids, in addition to food scraps and yard trimmings, which adds a layer of complexity to organics management in the region.
2.3.5 Paper

Paper continues to be a valuable material for collection in Metro Vancouver. Markets are expected to be moderate to strong over the next several years, given the ongoing demand for fibre overseas. However, there is concern that the rapid growth of export markets for paper over the last decade may taper off over the longer term. The strength of the export market, which has driven up prices for local mills, in conjunction with decreased demand for paper products, has contributed to the closure of the two primary regional re-manufacturers in the past two years and consolidation of several Northwest paper mills. Remaining Northwest mills are still willing to purchase higher grades of recycled paper and have strong relationships with Metro Vancouver brokers.

2.3.6 Plastics

Plastics represent a growing and dynamic market. Current demand for recycled plastic resins is generally strong and expected to remain so, especially as demand from overseas continues to surge. Generation is likely to increase, as high oil prices and efficiency considerations encourage product manufacturers to switch from heavier packaging materials to plastics. Frequently used and simple resin types, such as polyethylene terephthalate (PET) and high density polyethylene (HDPE), have high capture rates and strong markets, resulting in high levels of recycling and remanufacturing in Metro Vancouver and beyond. However, new types and combinations of plastics are being regularly introduced, making it difficult for recycling technology to keep up, and some types of resin remain difficult to recycle, either for technological or market reasons.

Overall, about one-third of all plastics in Metro Vancouver are recycled. Once implemented, the upcoming extended producer responsibility (EPR) program for printed paper and packaging (PPP) is likely to drive up recovery rates for plastics. In addition, new technologies for processing plastics into products as well as energy are emerging, which may also expand opportunities for plastics recovery within a few years.

2.4 Results Summary Table

The results summary table below was prepared to clearly convey priority recyclables and opportunities for Metro Vancouver to pursue. Materials were assessed based on criteria concerning the need or opportunity for market intervention and the ability of Metro Vancouver to affect the marketplace. These criteria are defined as follows:

- **Need/opportunity** is a measure of the market development needs (such as large or toxic quantities of materials being disposed) and opportunities (such as the potential to create new value or substantially increase supply or demand). For example, food scraps and yard and garden were considered to be higher need/opportunity because they represent a relatively large portion of the disposed waste stream and more opportunities exist to grow these markets locally. In contrast, given that it represents a much smaller fraction of disposed waste and it is non-toxic, recyclable glass was considered to be lower need/opportunity.

- **Ability to influence** is a measure of the degree to which Metro Vancouver and other levels of government can affect the markets or supply chain for a material. The primary considerations were Metro Vancouver-specific influences mentioned in study, market strength, and upcoming legislation.
For example, food scraps and yard and garden were considered as having a higher ability for Metro Vancouver to influence as they have highly local markets, while CRTs were considered to have a lower ability to influence as there are not local processors and a high capital investment is required for new entrants to that market.
3.0 CARPET

3.1 Introduction and Overview

This section addresses post-consumer carpet from commercial and residential sources; it does not include post-industrial or “pre-consumer” sources, because it is largely already re-incorporated into the manufacturing process, and because there are no carpet manufacturers in the Metro Vancouver region (so there is no post-industrial material generated).

Carpet recycling is an emerging industry worldwide and one that has been slower to develop in Canada than in the US. At this time, there is almost no carpet recycling in MV. Only a small amount of post-consumer carpet discarded in the region is collected for recycling. Post-consumer carpet that is collected is currently exported for processing, and component materials are generally sold to end users in those markets.

Several carpet recycling firms recently formed in Canada, and several others that are currently operating in the US, have expressed interest in beginning operations in the Metro Vancouver region.

Given the fast-developing nature of the carpet recycling industry, it is likely that the collection and processing infrastructure and market conditions for carpet recycling in Metro Vancouver will change significantly in the next several years especially with the implementation of the expected new EPR program through CCME.

Carpet has three major recyclable components: Face fibre, made of either nylon (N6 or N6,6), polypropylene (PP), or polyethylene terephthalate (PET); backing, primarily made of PP, and filler, usually made of calcium carbonate. Carpet composition varies by application type and style, such as commercial or residential, roll or tile. The estimated composition breakdown (by weight) of carpet is: 30 percent nylon fibre, 30 percent PP backing, and 40 percent calcium carbonate filler. Carpet fibres recycled in the US are broken out in Figure 3-1 below.

![Carpet Fibres Recycled in the US](CARE, 2010a)
3.2 Market Conditions

Some carpet recycling has begun in Eastern Canada, and an industry group dedicated to advancing carpet recycling—the Canadian Carpet Recovery Effort—has been formed. However, at this time, the US is the primary site of carpet recycling for material collected in Canada, including the Metro Vancouver region, and is also the largest market for recycled carpet components. As a result, most of the information available about carpet recycling and commodity markets for recycled carpet components is from the US.

3.2.1 Trends and Key Variables Affecting Supply

Key findings on the current supply chain for used carpet include the following:

- **Collection of used carpet for recycling in Metro Vancouver is very limited.** Used carpet collected by carpet installation companies when doing a new installation, by demolition, land clearing, and construction (DLC) debris haulers from job sites, or by home or small business owners removing carpet from their own premises is usually taken to transfer stations and landfilled or sent to the Burnaby waste-to-energy facility.

- **The supply of post-consumer carpet fluctuates with demolition and construction activity, and with trends in the overall economy.** According to an industry source in Canada, supply of post-consumer carpet had fallen slightly during the past few years, but was beginning to move upwards in the second half of 2011.

- **Nylon is still the dominant fibre-type in post-consumer carpet, but PET is growing in market share.** As shown in Figure 3-1, the majority of carpet is made with one of two types of nylon fibre (N6 and N6,6). However, carpet made with PET fibre, often derived in part from recycled beverage containers, is growing as a portion of installed residential carpet, and so it is likely to be a growing portion of discards soon (CARE, 2010b). This may be doing two things: First, removing prime PET from the bottle recycling industry; and, second, downgrading the material for carpet while using up supply markets for used PET carpet, which is less valuable, and more difficult to recycle back into new carpet.

3.2.1.1 Current Supply

- Approximately 40,800 tonnes of used carpet and carpet pad were generated in 2010 in Metro Vancouver, equivalent to 17.2 kg per person (Metro Vancouver, 2011a). However, generation varies from year to year, and is especially sensitive to fluctuations in the DLC industry.

Table 3-1: Carpet and Carpet Pad – Disposed and Recycled Quantities and Recycling Rate (2010)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>ICI</th>
<th>DLC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disposed (tonnes)</strong></td>
<td>15,204</td>
<td>21,903</td>
<td>3,673</td>
<td>40,780</td>
</tr>
<tr>
<td><strong>Recycled (tonnes)</strong></td>
<td>N.A.¹</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td><strong>Recycling Rate</strong></td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>

¹ Not Available (N.A.)
- Although the most recent Metro Vancouver waste composition study does not break down the “carpet and carpet pad” category, data from waste composition studies in King County suggest that approximately 16 percent, or about 6,500 tonnes, of carpet-related material disposed is carpet pad. Of the remaining 34,280 tonnes of carpet-related material disposed, not all may be recyclable. Carpet recycling industry experts estimate the generation of recyclable post-consumer carpet (not including carpet pad or rugs, or carpet that is too dirty or contaminated to recycle) at between 4 and 5 kg per person annually (White, 2011; Ragiel, 2011). For Metro Vancouver, with an estimated population of 2.4 million people in 2010, this would translate into 9,000 to 11,800 tonnes, or between 22 and 29 percent of all carpet and carpet pad generated.

- The majority of post-consumer carpet is generated by the residential sector. Carpet recycling industry sources agreed that 70-80 percent of all post-consumer carpet that is generated comes from the residential sector, while 20-30 percent is from the commercial sector.

- The characteristics of residential and commercial carpet differ, with consequences for recycling. There are differences between residential and commercial carpet, which affect the proportion and type of recoverable materials in the carpet. For example, as shown in Figure 3-2, residential carpet typically has a higher pile, and thus has more reclaimable fibre than commercial carpet, which has a lower pile. However, the logistics of collection are often easier for commercial carpet, so a relatively larger portion of it is recycled. As a result, carpet recyclers report that the proportional mix of material they receive is between 40 percent and 75 percent commercial, depending on the collectors’ client base in the area.

![Figure 3-2: Composition Profiles of Residential and Commercial Carpets](image)
3.2.1.2 Potential Supply

- Figure 3.3 below depicts the potential supply of waste carpet and underlay, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.

![Figure 3-3: Current and Potential Future Supply of Carpet and Carpet Pad in Metro Vancouver](image)

3.2.2 Processing and Infrastructure

- **Some used carpet is collected and resold for re-use.** Habitat for Humanity of Greater Vancouver (HHGV) operates two ReStores in the region that sell donated new and used building materials to the public. The ReStores accept donations of gently used carpet rolls and tiles from commercial buildings (it does not accept residential donations). HHGV does not currently keep records of the quantity of carpet it receives. All donations are resold at HHGV ReStores (Riessner, 2012).

- **Permanent infrastructure for collecting post-consumer carpet for recycling in Metro Vancouver is not yet established.** Several carpet companies that remove post-consumer carpet (e.g. carpet installers, DLC haulers) have explored or piloted recycling efforts, but most do not collect carpet for recycling on a regular basis, and cite three reasons for this:

  1. **There are no carpet collection or processing facilities in the region** and thus there is nowhere nearby for haulers or carpet installers to take the carpet they remove.

  2. **Transporting carpet to distant recycling facilities is expensive.** There are at least two carpet recyclers in the Western US that accept post-consumer carpet, but companies must pay for transport of the carpet to the recycling facilities, in addition to a tipping fee. Combined, these costs
are typically higher than tipping fees for disposal in the Metro Vancouver region, making carpet disposal the more cost-effective choice. Some carpet manufacturers will pay for the recycling of used carpet removed when new carpet from their company is installed, but even under these programs, only a handful of loads have been sent to recycling facilities.

3. **Collecting carpet for recycling requires collection and storage practices that add expense.** Currently, the technologies used in carpet recycling requires that care must be taken to keep waste carpet collected for recycling clean and dry, practices that can be challenging at construction or installation sites, adding costs to carpet removal. Carpet installers who have offered this service in the Metro Vancouver region report that most customers are unwilling to pay a premium for carpet recycling as long as a less expensive option for disposal is available.

- **Collection and processing infrastructure is just being established in Canada.** Two firms dedicated to carpet recycling have been recently established in Canada. Both are located in Toronto, and primarily serve the Greater Toronto Area (GTA), but at least one has collected a few truckloads of carpet from Metro Vancouver and is exploring options for establishing a permanent collection facility in the region within a few months. Both businesses currently collect post-consumer carpet, classify it by resin type, and ship it the US for processing. One of the collectors also began doing some processing of nylon-fibre post-consumer carpet at its Toronto facility in July 2011. The other collector plans to establish a processing facility in Toronto within a year. Combined, the facilities would have an annual processing capacity of 12,700 – 16,800 tonnes, which both companies anticipate will eventually be filled with material from the GTA.

- **Collection and processing facilities could be established in the Metro Vancouver region soon.** At least one of the Toronto-based companies is considering building a processing facility in the region, scaled to fit the region’s supply and their anticipated market share, which would need to be around 6,500 tonnes per year to be financially viable. Carpet recycling companies in the Western US have also expressed interest and at least two are in conversation with Canadian partners about establishing collection and/or processing facilities in Metro Vancouver.

- **Until there is processing capacity in Metro Vancouver, more material is likely to be trucked to Toronto or the US for recycling.** As carpet recyclers in Toronto and the Western US bring new processing capacity online and/or begin planning for operations in Metro Vancouver, they may begin to more actively seek material from the region, in part to establish market share. This means that, in the short term, more carpet may be collected and trucked to processing facilities. One carpet recycler suggested that it intended to collect and truck material from Metro Vancouver to Toronto until enough volume was being collected to support building a facility in the region.

- **Shearing is the most common fibre separation technology used, but there are several new approaches under development that could be used in regional processing facilities.**

- **Most carpet processors in the US use shearing technology for fibre separation, a technology that is relatively low-cost and that produces a decent-quality material, but that has a low yield (20-25 percent).** Once sheared, fibre is cleaned, melted, and pelletized. Sheared backing is shredded and turned into crude pellets for use in carpet backing or other durable goods. Some processors use mechanical technology for fibre separation that has a higher yield, but produces a lower quality...
material. Others use chemical processes to convert fibres back into base resins, which produce high-quality material, but are also highly expensive.

- **InterfaceFLOR, an international carpet manufacturer and leader in carpet recycling, is establishing strategic partnerships to advance carpet recycling technology in Canada and elsewhere (InterfaceFLOR, 2011).** The company is working with one of the Toronto-based carpet recyclers on the development of an alternative processing technology that the processor says will result in higher yields and higher quality materials from both fibre and backing than existing technologies. Another carpet recycler, based in the Western US is also developing an alternative technology that may achieve similar results. Both companies hope to have their new technologies ready for deployment in 2012.

- **There are several known re-manufacturers in Canada, although none in Metro Vancouver.** Nylene in Ontario and Dupont in Quebec are nylon yarn fabricators that will use recycled nylon from post-consumer carpet if it is of acceptable purity. There are also several plastics compounders and moulders, mostly located in Ontario and Eastern Canada, who are interested in using recycled carpet resins. Because most of the post-consumer carpet collected in Canada is currently sent to the US for processing, these re-manufacturers are not presently using much, if any, material from Canadian post-consumer carpet. However, they are in discussions with the Toronto-based carpet recycling companies, which are working to develop these relationships in advance of establishment/expansion of collection and processing.

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**Figure 3-4: Potential Future Flows of Metro Vancouver Carpet and Carpet Pad**

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3.3  End Markets and Prices

- Carpet recyclers agree that the biggest challenge is finding markets for PET from post-consumer carpet. The increase in use of PET is attributed, in part, to post-consumer use from beverage containers. The rPET market is large and growing, but there are many sources that can provide it at lower cost and/or higher quality (such as processors of PET beverage containers), making it difficult for carpet recyclers to compete. Because PET is a growing segment of post-consumer carpet, recyclers acknowledge that finding cost-effective outlets for rPET from carpet is going to be a challenge in the future.

- Calcium carbonate has multiple markets, although prices are generally low. Calcium carbonate is a common input in cement manufacturing, among other uses. Once separated from other post-consumer carpet components, it can be sold to a variety of different users. Industrial users are increasingly attracted to calcium carbonate from post-consumer carpet because it eliminates the need for mining virgin material and reduces costs (CARE, 2010b).

- Nylon prices are higher than other resins, although markets have been volatile recently. Post-consumer nylon sells at a discount of approximately 15 percent of virgin nylon prices—dependent on the purity of the recycled resin—but as quality of processing improves, manufacturers will likely be willing to pay closer to the price of virgin nylon (White, 2012).

- Markets for PP are also highly volatile. The market price of recycled PP is quite a bit lower than for virgin resin, discounted by perhaps as much as 50 percent. However, because the market for engineered resins is larger, recyclers are more confident about finding buyers for their material.

### Table 3-2: Market Value for Post-Consumer Carpet (January 2012)

<table>
<thead>
<tr>
<th>Carpet Component</th>
<th>Est. Price for Separated Baled Fibre, Backing ($ per tonne)</th>
<th>End Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon 6, Nylon 6,6</td>
<td>$1,323-$1,544 (depending on quality)</td>
<td>Yarn manufacturers – carpet; plastics compounders/moulders – engineered resins and moulded plastics.</td>
</tr>
<tr>
<td>Polypropylene (PP) fibre</td>
<td>$662</td>
<td>Plastics compounders – engineered resins.</td>
</tr>
<tr>
<td>Polypropylene (PP) backing</td>
<td>$662</td>
<td>Plastics compounders/moulders – lower-quality moulded plastics, such as plastic lumber; carpet manufacturers – carpet backing.</td>
</tr>
<tr>
<td>Polyethylene (PET) fibre</td>
<td>$662 (though markets are unreliable)</td>
<td>US or international commodity markets; cushion manufacturers.</td>
</tr>
<tr>
<td>Calcium carbonate</td>
<td>$11-$22</td>
<td>Cement manufacturers.</td>
</tr>
</tbody>
</table>

3.3.1  Current and Future Demand

- Demand for recycled nylon is growing in the carpet industry because of high virgin nylon prices, and shrinking supply of post-industrial materials. Even with the growing use of PET as a carpet fibre, nylon dominates the industry, and carpet manufacturers are in need of secure, long-term sources of resins. Carpet manufacturers are also interested in using recycled content as a way of
“closing the loop” in production, for public relations reasons, and because of increasing pressure on the industry for environmental stewardship. (Hall, 2011).

- **End users of other resins are interested in accessing any lower-cost supply of resins, as overall use of plastics is likely to increase in the future** (see Plastics section for more detail). Some end users are also interested in the use of recycled content for public relations and regulatory reasons (as long as performance is comparable). In addition, an industry group has formed—Canadian Carpet Recovery Effort—and the group’s spokesperson says it intends to be pro-active about developing recycling infrastructure so that carpet recycling and stewardship can grow voluntarily, without regulation (Hall, 2011).

![Figure 3-5: End Products Manufactured from Used Carpet in the US. CARE, 2010a](image)

### 3.3.2 Effect of EPR and other policies

- **The carpet industry expects provincial EPR regulations within the next three to five years, and is preparing through investment and coordination.** In 2009, the Canadian Council of Ministers of the Environment (CCME) published a Canada-wide action plan for EPR that included a commitment among the ministers to work toward implementing EPR programs for carpet by 2017 (CCME, 2009). Anticipation of EPR regulation is partly responsible for driving growth and investment in carpet recycling in Toronto and elsewhere in Canada.
3.4 Perceived Barriers and Opportunities

3.4.1 Perceived Barriers

- In the absence of a disposal ban, carpet collectors/processors must be able to charge carpet removal and/or tipping fees that are equivalent to, or slightly lower than, fees for disposal, and must be equally convenient for haulers. This has been a challenge for some of the nascent carpet recycling efforts in the region and elsewhere in Canada (Bell, 2011).

- It may be difficult to find a suitably convenient site for a collection facility in Metro Vancouver. Although no permanent carpet collection facility has been established in the MV region, one carpet collector did begin to develop a business plan for such an enterprise, and had difficulty finding a suitable, centrally located site with dock and grade loading. Having a central location is critical for offering a cost-effective collection point to haulers.

- Carpet installers, haulers, and other handlers need to be educated about proper collection and storage. Current carpet recycling technology cannot handle material that is wet, or that is collected from a DLC site where it is not kept clean, which means a large portion of the supply is currently unfit for recycling.

- As long as there is no processing capacity in the region, high shipping costs will limit the cost-effectiveness of carpet collection for recycling. Although collection of post-consumer carpet in the MV region is likely to grow somewhat in the short term, the costs and logistical challenges of shipping material to Toronto or the US for recycling will constrain the potential growth of the industry until processing capacity is developed in the region.

- Current carpet recycling and remanufacturing technology is not optimal. Recyclers must often choose between high yield and high quality in process outputs. For example, shearing processes deliver output of a very high purity, but typically only capture 20-30 percent of the fibre. Other processes can capture more material, but currently have much higher capital costs that preclude cost-effective application in most markets.

- Markets for PET and PP from recycled carpet are weak or non-existent. At present, markets for two major outputs of carpet recycling—PET and PP—do not currently have high-value end markets. This is in part because the feedstock of these resin-types that result from carpet recycling are not as high in quality as recycled feedstock from other sources (such as plastic food and beverage containers) available on the market, and because innovations are needed to develop alternative applications for these materials from recycled carpet.

- Public awareness about the potential for carpet recycling is limited. As one carpet recycler noted, “most people don’t even know that carpet is a petroleum product.” Limited awareness translates into limited commitment to recycling.

- Price signals do not create an incentive to recycle. Without a disposal ban or other policy driver, there is also limited incentive to recycle, because carpet can be landfilled, the costs of doing so are not prohibitive, and there are no readily available and less-costly alternatives.
3.4.2 Opportunities and Public Sector Options

- **Post-consumer recycling represents a business opportunity.** Technology improvements coming to the market soon are likely to strengthen the cost-effectiveness of carpet recycling, and will expand the carpet recycling capacity in Canada and the US. As processing capacity comes online in Toronto and the Western US, new business opportunities will arise in post-consumer carpet collection in Metro Vancouver. And as the supply of appropriately collected carpet grows, there will also be opportunities for carpet processors to open facilities in the Metro Vancouver region.

  - **Metro Vancouver could support business development for post-consumer carpet collection and processing by providing assistance to businesses seeking to establish themselves in the region.** Carpet recyclers from outside the region and businesses in the Metro Vancouver region that are interested in becoming involved in carpet recycling suggested that Metro Vancouver could support business development in carpet recycling by:

    - Facilitating the siting of collection and processing facilities, including working with municipalities to further establish and expand “eco-industrial” zones. Metro Vancouver could also evaluate the feasibility of using its existing infrastructure (e.g. transfer stations) to host collection.

    - Working with carpet recyclers to identify, train, and support new business partners in the region to collect post-consumer carpet. Metro Vancouver staff could also provide resources to interested entrepreneurs on issues like zoning, operations, and market connections.

    - Supporting the commercialization of promising post-consumer carpet processing technologies through grants or business tax credits to processing companies seeking to establish facilities in the region.

- **Support for closed loop recycling or market development for recycled carpet components such as PP and PET could help ensure the highest use of recycled materials.** Recycled nylon is becoming increasingly valuable as a feedstock for carpet manufacturing, especially as the quality of recycled nylon improves due to processing advances. Carpet manufacturer Interface has piloted the use of carpet leasing services as one way to “close the loop” and to bring used carpet back into the manufacturing process. Although this type of arrangement is not currently available in Canada, it is a business model that could become more common as carpet recycling infrastructure in the country grows. At the same time, as the presence of other fibre-types in the material stream grows, there is also the need and an opportunity to develop new or alternative markets for these materials.

  - **Metro Vancouver could engage Senior Government and Product Stewards during the development of a Carpet EPR plan to ensure highest use of materials.** Given nylon’s value, the abundance of expired carpet, and the fact that carpet-to-carpet recycling is optimal over ‘downcycling’, Metro Vancouver could work to ensure that “closed loop” recycling of nylon carpet fibre back into carpet is required under any carpet EPR regulation that is established.

  - **Metro Vancouver could collaborate with carpet recyclers to connect with, or develop end markets for PET and PP from post-consumer carpet in Canada.** There are already some potential end markets in Canada for materials from post-consumer carpet, but processors may need assistance building connections to those markets.
Establishment of a policy driver for recycling would likely catalyze development of the industry. Experiences in other regions have shown that both disposal bans—which eliminate the financial disincentive against recycling, relative to disposal—and EPR policies can catalyze the development of a carpet recycling industry. In California, where a carpet EPR regulation was established in 2010, many new collection and processing businesses have been established. New carpet recycling businesses are also being established in the Seattle area, in response to the City of Seattle's announced intention to ban landfill disposal of carpet in 2013.

- **Metro Vancouver could declare its intent to ban carpet disposal and set a firm date for implementation.** A disposal ban or other policy measure to limit the opportunity—and raise the costs—for disposal of post-consumer carpet would be an immediately effective method of encouraging recycling. This could be timed to complement the EPR plan.

- **Metro Vancouver could work with other regional and provincial government leaders to harmonize programs and policies across jurisdictions and ensure consistent government requirements.** Should any government jurisdiction move forward using local bylaws or provincial EPR legislation, it will be important for program success to align program planning and operational requirements with other jurisdictions, thus enabling a harmonized EPR approach across British Columbia and Canada.

### 4.0 ELECTRONICS AND SMALL APPLIANCES

#### 4.1 Introduction and Overview

EPR regulation is the major driver of electronics and small appliance recycling in Metro Vancouver. Since its establishment in 2006, the EPR regulation has required the stewardship of an expanding universe of electronics and electrical equipment, beginning in 2007 with computers, desktop printers, and televisions; adding a wide range of home and personal portable audio/video equipment, home theatre equipment, and non-cellular telephones in July 2010; and expanded to small electronics and appliances in October 2011. A final expansion to large electronics and appliances is planned for July 2012, at which time virtually every product with a cord or a battery will be regulated.

As a result of EPR programs, collection and recycling of electronics and small appliances has increased, and will continue to do so. The BC Recycling Regulation, which includes electronics and small appliance EPR guidelines, requires that producers provide collection facilities, and must manage the collected products according to the pollution prevention hierarchy, prioritizing reuse and recycling.

Stewardship organizations are playing an increasing role in electronics and small appliance recycling industry. Between 2007 and 2010, ESABC, an electronics steward, emerged as a major player with the ability to shape the business practices and processing infrastructure, to influence prices, and to stimulate end markets for electronics recycling in the region. The Canadian Electrical Stewardship Association (CESA), which was formed to manage the small appliance program, and its operational partner Product Care, are also poised to play similar roles. Additional stewardship organizations are likely to form to manage other electronics and appliance categories as they are phased in.
For this study, all electronics and small appliances in phases 1-4 of the BC Recycling Regulation are reviewed. Materials included in each phase are as follows:

- **Phase 1** – Televisions, computers, computer monitors, keyboards, mice and other peripherals, printers.
- **Phase 2** – A.V. and consumer equipment, thermostats, cell phones, residential fluorescent lamps, batteries used in Phase 2 products.
- **Phase 3** – Smoke detectors, batteries used in Phase 3 products.
- **Phase 4** – Small appliances, batteries used in Phase 4 products.

Reporting on quantities is only available for Phase 1 and 2 materials, since Phase 3 and 4 programs do not yet have data.

### 4.2 Market Conditions

#### 4.2.1 Trends and Key Variables Affecting Supply

- **In the past decade, electronics and small appliances have grown as a portion of the waste stream.** In 1998, these materials comprised less than half of one percent of all disposed waste. In 2004, they comprised almost five percent (Metro Vancouver, 2008). By 2009, electronics and small appliances had fallen to 2.3 percent of disposed waste, in part because of product weight and size reductions, as well as increased recycling of electronics (Metro Vancouver, 2010a). Although disposed quantities have fallen in recent years, they are still much higher than a decade ago, and thus represent a relatively new product category for recycling.

- **The material mix of electronics and small appliances is changing.** The market transition from the use of cathode ray tube (CRTs) to flat panel displays for televisions and computer monitors is already being seen in the end-of-life product supply stream, and will become more pronounced in the coming years. With this transition comes a reduction of hazardous materials (especially lead-laden CRTs), and an increase in the proportion of plastics, which represent approximately 40 percent of flat panel displays, by weight according to the European Flame Retardants Association (EFRA, 2011). Other material changes are occurring due to the increased efficiency and productivity of new circuit boards and processing components, which use fewer precious metals and rare earth minerals even as they deliver higher-powered processing performance (Shore, 2012).

#### 4.2.1.1 Current Supply

In 2010, 13,495 tonnes of electronics regulated by EPR (as of 2010) were disposed as residential and ICI waste. More than 60 percent of this material was disposed by the ICI sector. An additional 8,015 tonnes of small appliances and 4,803 tonnes of other electrical equipment were also disposed in 2010; these quantities were not included in Table 4-1 because they were not included in the Recycling Regulation at the time.
Table 4-1: EPR Electronics – Total Disposed and Recycled Quantities and Recycling Rate (2010)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>ICI</th>
<th>Take-Back</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposed (tonnes)</td>
<td>5,200</td>
<td>8,295</td>
<td>0</td>
<td>13,495</td>
</tr>
<tr>
<td>Recycled (tonnes)</td>
<td>0</td>
<td>0</td>
<td>9,154</td>
<td>9,154</td>
</tr>
<tr>
<td>Recycling Rate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40%</td>
</tr>
</tbody>
</table>


- Forty percent of all regulated waste electronics generated in 2010 (disposed and recycled) was collected for recycling, including 57 percent of computers and 51 percent of display devices. According to ESABC, the stewardship organization, 9,154 tonnes of regulated electronics were collected from the Metro Vancouver region in 2010 (ESABC, 2010). This represents a 40 percent recycling rate overall for all electronics regulated by EPR by July 1, 2010, as shown in Table 4-1.

Computers and display devices, which had been included under the first phase of EPR regulation, achieved higher levels of recycling by 2010, while electronics that were added to the program in July 2010 (scanners, fax machines, telephones, etc.) were recycled at lower levels.

Table 4-2: EPR Electronics – Product-Specific Quantities (tonnes) and Recycling Rates (2010)

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Generated¹</th>
<th>Recycled</th>
<th>Total Disposed</th>
<th>Recycling Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Electronics Disposed</td>
<td>N.A.</td>
<td>N.A.</td>
<td>13,495</td>
<td>N.A.</td>
</tr>
<tr>
<td>Computers (desktop and laptop)</td>
<td>1,918</td>
<td>1,098</td>
<td>820</td>
<td>57%</td>
</tr>
<tr>
<td>Display Devices (televisions, monitors)</td>
<td>12,045</td>
<td>6,133</td>
<td>5,912</td>
<td>51%</td>
</tr>
<tr>
<td>Computer Peripherals (printers, scanners, fax, other)</td>
<td>4,547</td>
<td>1,098</td>
<td>3,448</td>
<td>24%</td>
</tr>
<tr>
<td>Telephones/Telecommunications</td>
<td>404</td>
<td>92</td>
<td>312</td>
<td>23%</td>
</tr>
<tr>
<td>Audio/Video Equipment</td>
<td>3,735</td>
<td>732</td>
<td>3,003</td>
<td>20%</td>
</tr>
</tbody>
</table>


4.2.1.2 Potential Supply

Figure 4-1 below depicts the potential supply of electronics and small appliances, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.

¹ Though a large amount of electronics are reused prior to being recycled or disposed, reuse is not listed separately since all electronics generated eventually end up recycled or disposed.
4.2.2 Processing and Infrastructure

- **For functioning electronics, opportunities for reuse and refurbishment are available.** Several businesses and nonprofit organizations dedicated to the refurbishment of used electronics for resale or donation operate in Metro Vancouver. Through a partnership with the Recycling Council of British Columbia, ESABC also sponsors an online materials exchange, to support area residents who want to donate or sell small quantities of used electronics (ESABC, 2010).

- **Electronics are collected for recycling through the EPR program via four collection pathways:** Return-it depots and other permanent collection sites, collection events, retail returns (Best Buy and London Drugs), and on-site collection (which is free to large-volume generators). Small generators can also pay an electronics recycler privately to have material collected, but that material is not considered to be included in the EPR program (Shore, 2012). Palletized electronics are transported from collection sites to a consolidation facility for the Metro Vancouver region, where they are weighed, verified as acceptable materials, and combined for shipment in larger, more cost-effective truckload quantities to the program’s recyclers’ facilities (ESABC, 2010).

- **Small appliance collection is new, and more limited, but will expand over time.** Under “Unplugged,” the new EPR program run by CESA, small appliances can be taken to most
Return-It depots for collection and collection events are planned for 2012. London Drugs also offers collection at all of its locations, including over thirty in Metro Vancouver (Wisehart, 2011).

- **Four recyclers are currently certified to process electronics under the ESABC program, with a fifth coming online in early 2012:**
  - eCycle Solutions, the largest Canadian-owned electronics recycler, has facilities in Chilliwack, British Columbia and Airdrie, Alberta that process materials from Metro Vancouver.
  - Genesis Recycling, based in Langley, BC, focuses primarily on on-site collection from businesses, both through the ESABC program and independently.
  - Global Electric Electronic Processing (GEEP), a Canada-based group of international companies, has a small facility in Surrey, BC and a larger one in Edmonton, Alberta that process materials from Metro Vancouver.
  - Teck, a global mining and mineral processing company based in Vancouver, BC, has integrated electronics recycling in its Trail Operations lead smelting facility in BC.
  - FCM, a Québec-based processor, has also been approved as a primary recycler for ESABC. Their new facility, on Annacis Island, will be operational in early 2012 (Wisehart, 2011).

- **Three out of the four recyclers that are currently operational only do primary disassembly in BC.** This process includes the following steps:
  - Display devices, such as TVs and computer monitors, are hand-dismantled by removing the leaded glass Cathode Ray Tubes (CRTs), which are sent to Teck and other lead smelters that process CRTs. Also, plastics, copper and circuit boards are hand-sorted in this process and sent to downstream recyclers.
  - Computers, computer mice and keyboards are sent through shredding processes whereby plastics are machine sorted.
  - Aluminum, copper and steel are sorted through a mix of hand-sorting and machine-sorting to be sent for further recycling.
  - Plastics are machine-sorted and sent to downstream recyclers for further processing (ESABC, 2010).

- **Teck uses an alternative process to capture materials for recycling or energy generation.** Teck contracts primary disassembly to KC Recycling, a separate company in Trail. KC Recycling sends steel, aluminum, copper, and circuit boards to outside processors, and sends CRT glass and shredded plastics and residual materials to Teck’s smelting and slag furnaces (Teck, 2012). Teck’s process includes the following steps:
  - Lead, zinc, cadmium, tin, germanium, indium and other elements that fume are captured and processed.
  - Silica, iron, and aluminum remain in a slag which is further converted into value-added products for the construction/cement industry.
  - Plastics, wood and other organics are used as fuel, providing heat to the furnace and being converted to steam. This steam is captured and used to heat process vessels (ESABC, 2010).
Electronics processors are held to high recycling standards for protecting workers and the environment. ESABC has a rigorous audit and approval process for qualifying primary recyclers for its program, to ensure that the recycling process meets the stringent worker safety and responsible recycling requirements set by the province and the national government. Canada has ratified the Basel Convention, and many of the Convention’s principles are incorporated into the qualification standard, such as a prohibition against the export of hazardous materials and scrap to non-OECD countries (ESABC, 2010).

Small appliances collected through Unplugged are sent to eCycle Solutions or GEEP for recycling. Additional recyclers may be added as the program grows. Small appliance recycling is governed by fewer regulations. Recycling standards are set by Product Care, which also approves recyclers for participation in the program (Cheung, 2011).

Current electronics recycling capacity is sufficient, but ESABC is looking beyond existing processors to ensure that future needs can be met and to encourage competition. With FCM coming online, capacity should be sufficient to manage supply in the near term. However, ESABC has pursued Seattle-area recyclers as well and is in the process of certifying one there. The group says that it is interested in ensuring adequate long-term capacity and flexibility in the system (Wisehart, 2011).

The capacity of smelters and CRT processors is a major concern for the industry. This issue will be partly alleviated in 2014, when the new slag furnace that Teck is building at its Trail Operations is complete (Resource Recycling, 2011a). Over time, CRTs will be phased out of the waste stream, but in the near term, collection is likely to continue at comparable rates, which means that processing capacity could be an issue for industry for the next several years (US EPA, 2011).

Costs for the collection, transportation, and processing of regulated electronics under the ESABC program were approximately $1,140 per tonne in 2010. Average processing costs were $700 per tonne. Display devices (monitors and televisions) are relatively more costly to manage than other regulated electronics, because of the toxic components and the difficulty of finding CRT processors (ESABC, 2010). In the past, Canadian processors have charged more than US processors, but that dynamic appears to be shifting, and Canadian processors are coming in line with their American counterparts (Wisehart, 2011). Average collection and transport costs were approximately $440 per tonne, although freight costs varied significantly depending on the destination. Freight can be secured at a discount from Metro Vancouver to Seattle, compared to the costs of freight to Trail. This is because more trucks bring loads from the Port of Seattle to the Vancouver area than the reverse, so there is often empty space on trucks returning to Seattle (Wisehart, 2011).

Costs, rather than technology, are often the limiting factor in electronics recycling. Electronics recycling, especially primary disassembly is costly, in part because it is time- and labour-intensive. Once disassembled, much of the component material can be recovered and recycled, but costs increase in parallel with the level and purity of recovery achieved (Chan, 2011).

Contamination is largely not an issue for electronics and small appliance recycling. Because most electronics and small appliances are collected for recycling at staffed collection sites or events, stewardship organizations for both product categories report that their programs experience virtually no problems with contamination. The exception is for non-regulated electronics and appliances, which
are sometimes dropped off by customers at depots that accept EPR electronics. These items are usually still recycled, but the stewardship organizations do not pay the costs of recycling them. As EPR programs expand in the coming years, this issue will decrease (Chan, 2011; Cheung, 2011).

Figure 4-2: Current Flows of Metro Vancouver Electronics and Small Appliance Recycling
(Graphics are descriptive only and are not drawn to scale)

4.3 End Markets and Prices

- **End markets exist for most electronics and small appliance components, but prices are not always sufficient** to cover processing costs, and, in some cases, primary recyclers pay secondary processors to accept material.

- **CRT glass contains lead, which is recoverable and has value, but the recycling process has net costs.** CRT glass contains between 0.5 kg and 2 kg of lead (OECD, 2000). Most CRT glass from Metro Vancouver, including CRTs separated by other primary recyclers, goes to Teck's Trail Operations, although some is also sent to a lead smelter in Ohio. Primary recyclers pay Teck approximately $500 per tonne to send CRTs there, in addition to freight costs (Shore, 2012).

- **Plastics from electronics and small appliances have very low value,** especially from electronics, because they are often treated with fire retardants, dark in colour, and made from unidentified or mixed resin types. Dark-coloured plastics and plastics containing fire retardant additives can be recycled, but they have limited applications, such as non-potable plumbing and irrigation pipe. These plastics have a market value of less than $0.01 per kg. Light-coloured plastics from small appliances not treated with fire retardants have a larger range of applications, and currently sell for up
to $0.036 per kg, primarily to overseas markets, where demand for lower-grade plastics is higher (and processing costs are lower) than in North America.

- **Metals of various kinds make up about 30 percent of the total weight—and most of the value—of electronics.** Small appliances also contain metals, although proportionately less than electronics. Loose metals, primarily tin and steel, are sold to local scrap metal dealers. Metals contained in circuit boards and cables and wires are captured through shredding, grinding and/or smelting. As demand for precious and rare earth metals increases, recovering these materials is becoming more cost-effective (Shore, 2012). At the same time, electronics manufacturers are improving operating efficiencies, and metal content on both high-grade circuit boards (containing more metals) and low-grade circuit boards (containing fewer metals) is decreasing.

- Table 4-3 shows the process of recovery used, the resulting output, and the processing location for electronics components, as reported by ESABC in their 2010 Annual Report.

### Table 4-3: Electronics and Small Appliance Component Processing Locations and Results (Adapted from ESABC, 2010)

<table>
<thead>
<tr>
<th>Material/Component</th>
<th>Process</th>
<th>Result</th>
<th>Process Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaded Glass</td>
<td>Hand Dismantle / Crushed / Smelted</td>
<td>Metal Recovery</td>
<td>Canada / US</td>
</tr>
<tr>
<td>Glass</td>
<td>Grind</td>
<td>Material Recovery</td>
<td>Canada</td>
</tr>
<tr>
<td>Plastic</td>
<td>Regrind / Smelted</td>
<td>Plastic / Energy Recovery</td>
<td>Canada</td>
</tr>
<tr>
<td>Plastic</td>
<td>Baled / Ground</td>
<td>Plastic Commodity</td>
<td>US</td>
</tr>
<tr>
<td>Metal (non-ferrous)</td>
<td>Ground / Smelted</td>
<td>Metal Recovery</td>
<td>Canada / US</td>
</tr>
<tr>
<td>Metal (ferrous)</td>
<td>Ground / Smelted</td>
<td>Metal Recovery</td>
<td>Canada / US</td>
</tr>
<tr>
<td>Other Metals (brass, bronze, fine particles)</td>
<td>Smelter</td>
<td>Metal Recovery</td>
<td>Canada</td>
</tr>
<tr>
<td>Cables and Wires</td>
<td>Regrind</td>
<td>Metal Recovery</td>
<td>Canada</td>
</tr>
<tr>
<td>High Grade Circuit Boards</td>
<td>Smelted</td>
<td>Metal Recovery</td>
<td>Canada / Belgium</td>
</tr>
<tr>
<td>Low Grade Circuit Boards</td>
<td>Smelted</td>
<td>Metal Recovery</td>
<td>Canada / Belgium</td>
</tr>
<tr>
<td>Mercury Bulb</td>
<td>Distilled</td>
<td>Mercury</td>
<td>US</td>
</tr>
<tr>
<td>Mercury Bulb</td>
<td>Distilled</td>
<td>Phosphorus Recovery (Powder Reuse)</td>
<td>US</td>
</tr>
<tr>
<td>Batteries (non-rechargeable)</td>
<td>Smelted</td>
<td>Metal Recovery</td>
<td>Canada</td>
</tr>
<tr>
<td>Batteries (rechargeable)</td>
<td>Smelted</td>
<td>Metal Recovery (Lithium, Nickel, Cadmium)</td>
<td>Canada / US</td>
</tr>
</tbody>
</table>

### 4.3.1 Current and Future Demand

- Global demand for electronics continues to grow, driving up prices for precious and rare earth metals, and helping to improve the financial viability of electronics recycling. Increasing demand for electronics in emerging markets, combined with uncertain supply and other market...
Recycling Market Study
EBA FILE: V23201513 | MAY 2012 | ISSUED FOR USE

factors, has led to price increases for precious and rare earth metals, making used electronics an attractive alternative source of this material (Curwin, 2011).

- As EPR expands in BC and elsewhere, electronics manufacturers may find opportunities to incorporate other reclaimed materials from recycled electronics into new products. A few electronics manufacturers have begun to offer products such as ink cartridges with plastic made from used products, and this practice of “closed loop” manufacturing may become more common as EPR and design-for-end-of-life practices positively affect the recyclability of plastics in electronics.

4.3.2 Effects of EPR and Other Policies

- EPR for electronics has grown electronics recycling in British Columbia into a strong industry, with much of the activity and infrastructure located in Metro Vancouver. A few of the early electronics recyclers in Metro Vancouver were not able to survive the transition to the EPR system, but on the whole, EPR has contributed to growth in the electronics recycling industry in the area: several businesses have started or opened new facilities in the area as a result of increasing collection and recycling opportunities.

- The amount of regulated electronics in the disposed waste stream dropped by more than 60 percent between 2004 and 2009. In 2004, just over 20,500 tonnes of electronics covered in Phase I of the EPR regulation (computers, display devices, printers, and peripherals) were disposed in Metro Vancouver. In 2009, less than two years after the ESABC program had been established, the quantity of those products disposed in Metro Vancouver had fallen to approximately 8,150 tonnes (Metro Vancouver, 2005; Metro Vancouver, 2010a). Part of this reduction may be due to weight reductions in electronics being disposed, as well as by a potential slowdown in electronics replacement due to the economic downturn, but a large portion of this reduction can be accounted for in the 7,353 tonnes collected by ESABC from Metro Vancouver in 2009 (ESABC, 2009).

- The small appliance program is too new to have quantifiable results, but it is likely that the program will lead to similar outcomes, including marked reductions in the amount of small appliances in the disposed waste stream, increased recovery of materials, and positive effects on the recycling industry in Metro Vancouver.

4.4 Perceived Barriers and Opportunities

4.4.1 Perceived Barriers

- End markets for CRT glass are almost saturated. If more recycling programs begin in the US or Canada, or if there is a significant uptick in CRT collection, the recycling industry’s capacity will be overwhelmed. Although some additional capacity is expected in the Metro Vancouver region in 2014, it may not be able to handle all of the region’s supply (Shore, 2012). Because adding capacity to a lead smelter is a large capital investment, it is questionable whether other smelters will expand, given the finite supply of CRT glass as flat panel displays replace CRT display devices in the market.

- Plastics from electronics and small appliances have low value and minimal end markets, in part because of the presence of flame retardants. In addition, many of the plastics used in electronics and
appliances are not marked by resin type, making it difficult for recyclers to separate them effectively. Recyclers report that even automated plastic sorters have a 20-30 percent failure rate, leading to highly contaminated loads and sub-optimal recycling (Shore, 2012).

- **The collection infrastructure is not adequate for an expanding universe of products.** The depot-based collection system is strained in terms of collection and storage space. Many depots that were set up to collect beverage containers have now expanded to take electronics, small appliances, and milk containers, and their capacity to accept more material is limited. Furthermore, the depot model will not be appropriate for many of the new products covered by Phase V of the EPR regulation. New collection capacity and alternative collection methods are needed to support successful expansion (Wisehart, 2011).

- **New recycling depots face multiple barriers to opening.** Zoning and development regulations, high leasing and property costs, and neighbourhood resistance were all mentioned by industry representatives as barriers to the siting and opening of new recycling depots.

### 4.4.2 Opportunities and Public Sector Options

- **The expansion of electronics EPR provides an opportunity to expand and enhance the collection infrastructure for electronics.** ESABC has an approved stewardship plan for some, but not all, of the additional product categories covered in Phase V. New stewardship organizations are forming for remaining product categories, such as power tools and electronic toys, but the plans and collection systems are still being formed, and there is a short window of opportunity to influence decisions before collection begins in July 2012.

  – **Metro Vancouver could bolster electronics recycling by supporting expansion of the collection infrastructure and promoting recycling programs to residents.** Recyclers and stewards suggested that Metro Vancouver could support the continued success of electronics recycling by: facilitating the opening of additional Return-It depots and other collection locations with municipalities, and working with the various electronics stewards to promote and coordinate communication and messaging to Metro Vancouver residents and businesses about the expanding set of EPR programs.

- **There may be some opportunity to develop alternative end markets for CRT components.** CRT components have varying levels of lead, and some may have levels low enough that they may not be treated as hazardous material, which would increase the potential for alternative end markets. Recyclers are looking for guidance from the government on what components are considered toxic in CRTs (Shore, 2012).

  – **Metro Vancouver could assist recyclers’ efforts to identify alternative end markets for CRT components by working with the provincial government to provide clarity about which/how components are classified as hazardous.**
5.0 GLASS CONTAINERS

5.1 Introduction and Overview

Glass is one of the most easily recycled materials—glass can be recycled endlessly into new glass, including in “closed loop” bottle-to-bottle manufacturing, reducing energy needs. Glass containers (including beverage, food, and other glass containers) have the highest level of recycling and reuse among recyclable materials in the Metro Vancouver waste stream, achieving a combined estimated 88 percent recovery rate. Recycling infrastructure exists and is expected to remain relatively stable for Metro Vancouver’s two glass streams – refundable and non-refundable glass. Over 70 percent of glass containers generated in Metro Vancouver are managed through deposit-refund systems: refillable beer bottles managed by Brewers Distributor Ltd., and all other beverage containers (including for wine, spirits, and non-refillable beer) managed by Encorp Pacific. Non-refundable glass containers are typically collected through municipal curbside or drop-off recycling programs, and through some commercial recycling programs.

Non-refundable glass, largely collected through curbside programs, has much lower value than refundable glass, and fewer outlets. This material is generally “downcycled” (i.e. transformed into a product of lesser quality and reduced functionality) as sand blasting or construction aggregate. The upcoming packaging and printed paper (PPP) legislation will likely affect curbside glass recycling collection, although it is unclear how at this point. Metro Vancouver should monitor opportunities and threats to recycling for this material, which has a moderate to weak market for refundable and curbside glass respectively.

For this study, the definition of recyclable glass is confined to beverage, food, and other product containers. According to the most recent Metro Vancouver waste composition study, non-container glass—which includes window glass, flatware, mirrors, incandescent light bulbs, and fiberglass insulation—is not considered recyclable at this time.

5.2 Market Conditions

5.2.1 Trends and Key Variables Affecting Supply

- **Refundable glass beverage containers are collected through depots and processed by Encorp; over 90 percent of these containers are currently recovered.** Most of the containers are typically collected unbroken and sorted by colour prior to processing, which results in a higher-value feedstock for re-manufacturers. Slightly more than 38,000 tonnes of glass bottles were recycled in 2010 from Metro Vancouver (Encorp, 2010).

- **Refillable beer bottles are managed by Brewers Distributor Ltd. and reused an average of 15 times before being recycled.** Refillable beer, cider, and cooler bottles are collected through retail stores, depots, and government liquor stores. Consumers returned nearly 22,000 tonnes of refillable glass bottles in Metro Vancouver in 2009. Because they are largely collected unbroken, bottles can be returned to breweries and other beverage manufacturers for cleaning and reuse (BDL, 2010).
Non-refundable containers, and a small amount of refundable beverage containers, are collected through curbside and drop-off recycling programs. Almost all member municipalities in Metro Vancouver accept glass bottles and jars in their curbside, “Blue Box,” collection programs. Between 11,000 and 15,000 tonnes, or about 70 percent, of these containers are recovered.

Curbside collection adversely affects the quality of glass available for recycling. Curbside collection leads to breakage and commingling of different colours of glass. This results in a lower-value mixed-colour cullet that requires extensive processing to separate colours, which is necessary for re-manufacturing into bottles. In response to this trend, some glass sorting facilities, including eCullet in Seattle, WA, have installed more sophisticated colour separation and processing equipment. eCullet, the closest glass processing facility, does not have enough capacity to absorb BC’s curbside glass, which takes longer to process. As a result, this material often is used in other applications, such as sandblasting or as aggregate in construction.

Contaminants in recycled glass, particularly ceramics, compromise the structure of bottles. The most troublesome contaminant is ceramic, which is sometimes mistakenly confused for glass. If ceramic makes it into new bottles, it compromises the structural integrity of the bottle and can result in costly defects.

According to industry sources, a slowing of liquor sales has somewhat reduced the supply of glass. Local generation of beverage containers has diminished recently, perhaps in response to the drinking and driving laws that went into effect in September 2010 (Elias, 2011).

Although glass lost market share to plastic and TetraPak containers in the past, the glass market share for food and beverage containers remains relatively stable. In particular, glass holds a dominant position in alcoholic beverage containers (Powell, 2011). Further, consumers may be increasingly choosing glass food packaging in response to concerns of toxins leaching from plastic containers and liners in canned food, such as Bisphenol-A (BPA) (Martin, 2012). However, some industry analysts forecast a marked drop in the use of glass containers in the coming 5-10 years (Kelleher Environmental, 2010).

The PPP EPR legislation, which goes into effect in 2014, will likely increase the capture rate of non-refundable glass containers. At this point, however, the specific effects of the program on the collection and processing systems are unknown.

A number of Metro Vancouver bottlers use product destruction companies to manage unmarketable and/or expired beverage products. These beverage destruction companies produce clean supplies of glass and aluminum containers for recycling which nominally increases material recovery for glass and other material streams.

5.2.1.1 Current Supply

Approximately 81,478 tonnes of recyclable glass were generated in Metro Vancouver in 2010. As shown in Table 5-1, 88 percent of recyclable glass is currently recycled.
### Table 5-1: Glass Containers – Disposed and Recycled Quantities and Recycling Rate (2010)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>ICI</th>
<th>Take-Back</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposed (tonnes)</td>
<td>7,111</td>
<td>2,950</td>
<td>0</td>
<td>10,061</td>
</tr>
<tr>
<td>Recycled (tonnes)</td>
<td>14,481</td>
<td>339</td>
<td>56,597</td>
<td>71,417</td>
</tr>
<tr>
<td>Recycling Rate</td>
<td>67%</td>
<td>10%</td>
<td>-</td>
<td>88%</td>
</tr>
</tbody>
</table>


#### 5.2.1.2 Potential Supply

Figure 5-1 below depicts the potential supply of recyclable glass, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.

![Figure 5-1: Current and Potential Future Supply of Recyclable Glass in Metro Vancouver](image)

**Figure 5-1: Current and Potential Future Supply of Recyclable Glass in Metro Vancouver**
5.2.2 Processing and Infrastructure

- Metro Vancouver’s refundable glass beverage containers collected at depots, licensed by Encorp, are processed by United Concrete, and recycled back into bottles. United Concrete sorts and crushes them, and sends them to eCullet, a recycled cullet processor in Washington State (Vancouver Sun, 2010).

- Non-refundable glass containers collected through municipal and commercial recycling programs are processed at nine material recovery facilities (MRFs), run by four companies and one non-profit organization. (This stream also includes small amounts of refundable glass beverage containers.)
  - Cascades Recovery has two facilities - one in Vancouver and one in Surrey, both handling ICI-generated material only.
  - CK Fibre (CKF) has one multi-stream MRF in Richmond, handling material primarily collected through municipal programs.
  - Emterra has three facilities: a multi-stream MRF in North Vancouver, a single-stream MRF in Surrey, and a MRF for ICI-generated material only in Vancouver.
  - Urban Impact has two facilities: a multi-stream MRF in Richmond and a single-stream MRF in New Westminster.
  - Ridge Meadows Recycling Society (RMRS), a non-profit organization, operates a recycling depot and multi-stream MRF in Maple Ridge.

- MRFs send some curbside glass to United Concrete, who recycles it into a sandblasting abrasive product. eCullet is not interested in this supply of glass due to the low quality. United Concrete has developed a process to refine the curbside glass to produce a sandblast abrasive, which can be used in surface preparation to remove paint or rust, for example. One MRF reportedly sends about half of their glass for use as an aggregate for construction as backfill or to increase drainage.

- United Concrete reports that it could process 30-50 percent more container glass. Most of the material it currently processes is from Encorp, but it is expanding its processing of curbside glass for its sandblasting abrasive production.

- MRFs are paying to recycle curbside glass. Because glass is a heavy material, high transportation costs, coupled with the tipping fees charged by recyclers, result in MRFs reportedly paying from $40-$70 per tonne to recycle curbside glass.
5.3 End Markets and Prices

- **Refundable glass beverage containers from depots sent to eCullet’s processing facility in Seattle, Washington are recycled into bottles.** Because the refundable glass collected at depots and other authorized collection sites is very clean, eCullet estimates they recover 97-98 percent of this supply, which is sold as furnace-ready cullet to Saint-Gobain. Saint-Gobain, the glass bottle manufacturer, is able to use 48-50 percent recycled content in their bottles.

- **Processors receive $30-$50 per tonne for refundable glass.** Processors, such as United Concrete, providing high-quality, clean crushed glass feedstock for cullet re-manufacturing are likely getting $30-$50 per tonne. Market prices for colour-sorted, furnace-ready cullet are estimated between $80 and $90 per tonne.

- **Market prices for curbside glass processed by MRFs are weak,** and have been for many years. MRFs are losing money on glass, and market prices for mixed-colour glass are near zero (Waste and Recycling News, 2012).

The three-year average price per tonne for sorted glass is depicted in Figure 5-3 below. In 2010, prices for all three colors of glass were steady: flint glass at $38.59 per tonne, amber glass at $19.29 per tonne, and green at $12.13 per tonne, until mid-2011 when the price of flint ($17.09) and amber ($15.44) fell while green ($15.44) glass increased (WRN, 2010).
5.3.1 Current and Future Demand

- **Demand for high-quality, clean glass is strong and growing.** Glass bottle manufacturers are interested in incorporating more recycled cullet into new bottles because recycled cullet requires lower energy input than virgin silica. In addition, raw materials for glass-making are expected to increase due, in part, to competition from natural gas hydraulic fracturing. The largest cullet processing companies are responding to this demand by investing in new facilities, some built on or next to glass bottle manufacturing facilities (Powell, 2011). Container deposit systems, such as BC’s, offer a desirable supply for this industry as they produce clean bottles at a high recovery rate.

- **MRFs are usually able to find outlets for curbside glass, but prices are very low.** United Concrete’s sandblasting abrasive is one of the only products being made with non-refundable container glass. Other manufacturers can use this glass, but prices are very low, and transportation costs can make shipping outside the area prohibitively expensive.
5.3.2 Effects of EPR and Other Policies

- **BC’s deposit-refund system drives current high levels of recovery.** Consumers have a financial incentive to return refundable beverage containers to depots or retail drop-offs to reclaim their deposits. The depots provide separate bins for glass bottle collection, so the quality of the glass bottles is maintained.

- **The likely effect of new PPP EPR regulations is not clear.** PPP EPR regulations slated for implementation in 2014 may change the way glass containers not currently managed through deposit systems are managed, but it is not clear yet what changes (if any) will be made to the current collection system, or what the effects will be on supply.

5.4 Perceived Barriers and Opportunities

5.4.1 Perceived Barriers

- **Non-refundable glass, collected through curbside collection, has limited markets.**
  - **Transforming curbside glass into a clean feedstock for re-manufacturing is challenging.** Without access to facilities with sophisticated processing equipment, this material has lower value and limited end uses. Currently, Metro Vancouver’s curbside glass is processed for use as a sandblast abrasive and construction aggregate.

  - **Facilities such as eCullet can process curbside glass. It is necessary to process almost twice as much of this material as bottle depot glass for the same yield.** Because of this disparity, eCullet limits its curbside mixed feedstock to Washington and only sources clean, sorted glass from outside the state (Martin, 2012).

- **High freight costs limit access to other markets.** Metro Vancouver’s glass recycling infrastructure for all recyclable glass, both refundable and non-refundable, is limited to a few companies. The temporary or permanent closure of any of those firms would threaten glass recycling in the region. Shipping Metro Vancouver’s glass to other users, such as Vitreous Glass Inc. in Alberta, is not cost-effective.

5.4.2 Opportunities and Public Sector Options

- **The establishment of a glass recycling and remanufacturing facility in the region could make recycling of curbside glass financially sustainable.** In areas where eCullet has co-located its processing facilities with glass container manufacturing operations, recycling curbside glass has become more cost-effective.

  - **Metro Vancouver could encourage the siting of a new processing facility or for an existing facility to add processing equipment or to incorporate recycled glass into new containers.**

- **Local users may have additional glass recycling capacity in the future.** United Concrete has potential to expand production of sandblasting abrasive. Encorp sends some refundable glass containers collected from outside of Metro Vancouver to Vitreous Glass Inc., an Alberta fiberglass
manufacturer. Fiberglass sales, and consequently, the demand for glass as a feedstock, have decreased due to the construction slump in the past few years (Powell, 2011). The good news for recycled glass being used for fiberglass is there is increased demand for fiberglass manufactured with recycled glass (DSM Environmental, 2011). If Vitreous increases production, it may become another buyer of glass from Metro Vancouver.

- Metro Vancouver could monitor glass recycling companies to keep track of expanded opportunities.

- PPP EPR implementation could represent an opportunity to positively change the landscape for glass recycling in Metro Vancouver. PPP EPR is likely to reduce the quantity of glass containers in the disposed waste stream, although whether this is due to higher recovery rates of non-refundable containers through curbside programs, the use of alternative collection approaches that result in higher-value glass, or reductions in total supply of glass containers, is undetermined.

- Metro Vancouver could simply monitor changes in the glass packaging supply and collection system under the new PPP EPR program, or it could take a more active role, representing the interests of municipalities and local industries and attempting to influence decisions about the landscape for recycling made during the EPR program development process.

6.0 ORGANICS

6.1 Introduction and Overview

Building infrastructure for the collection and processing of compostable organics is a priority in the region. In 2010, compostable organics represented approximately 35 percent of the residential and ICI sector waste stream (28 percent when DLC is included). Given the significant amount of organics still being disposed, targeting organics serves as a critical component for successfully achieving diversion goals set by the region. Metro Vancouver currently has a 38 percent recovery rate for organics.

There are two primary facilities that process compostable organics, including food scraps. Between current facility expansion and the development of new processing capacity, including anaerobic digestion and in-vessel composting, processing infrastructure is expected to increase as more organic feedstock is available. It is expected that more material will be recovered as garbage prices increase and an organics disposal ban is phased in by 2015.

Organics collected in Metro Vancouver are transformed into a variety of products, including compost and soil mixes, which are sold predominantly to landscapers, residents and government. The market for compost in the region is considered moderate and some interviewees are concerned it will weaken as more material enters the marketplace. While more can be done to promote compost use, it is generally recognized as having value for long-term soil building by adding nutrients, reducing run off, retaining moisture, and enhancing disease resistance. However, the region has a relatively limited land base limited by geography with an increase in intensive farming and a growing population. There is a resulting overabundance of nutrients in the form of agricultural manures, biosolids, as well as food scraps and yard trimmings that adds a layer of complexity to organics management in the region.
For this section compostable organics include food scraps, yard and garden materials, and compostable/food-soiled paper. Biosolids, animal and agricultural waste, and wood waste are not considered part of the study.

6.2 Market Conditions

6.2.1 Trends and Key Variables Affecting Supply

- **Single family yard trimming collection programs are well established in the region.** In 2010, 171,594 tonnes of organic material were collected from residences, with yard trimmings comprising a majority of the tonnage.

- **Backyard composting continues to be an important source reduction organics management strategy** for the appropriate materials, and is estimated to reduce materials at source by approximately 250 kilograms per household per year with associated cost savings related to fuel and tipping fees (Leboe, 2011).

- **Food scraps and compostable paper have been added to yard trimmings for over 50 percent of single-family homes.** Seven municipalities currently have pilots or programs underway. By the end of 2012, a minimum of 15 of the 22 municipalities in the region will have food scraps recycling programs in place. Municipal control of program implementation has made this the easiest sector to engage in maximizing organics diversion. Municipal education campaigns are reinforcing new norms by expanding the list of acceptable compostable organics that can be received at facilities. An estimated 75 percent (almost 170,000 tonnes) of residential compostable organics consists of food scraps.

- **Metro Vancouver and its member municipalities are currently building capacity for the collection of food scraps and compostable paper, which also indirectly supports the development of facilities.** In 2009, Fraser Richmond Soil and Fibre, a Division of Harvest Power, became the first in-region composting facility licensed to accept food scraps in addition municipal yard and garden materials. As a result, several single family residential food scraps recycling programs were able to commence. Residential organics (food scraps and yard trimmings) are collected as co-mingled material in the same curbside containers while commercial collection tends to have a higher concentration of higher-nutrient food scraps. Municipal fleets or contracted haulers collect single family residential organics, while most multi-family residential and ICI sector collection is provided by private haulers.

- **Significant ICI sector organics diversion opportunities exist.** An estimated 147,188 tonnes of compostable organics were disposed by businesses in Metro Vancouver in 2010. Larger producers, such as grocery stores, are most likely to benefit from cost savings at present. According to industry-based waste composition studies, the existing waste stream for food stores and full service restaurants is approximately 75 percent organics (Cascadia, 2006b). As haulers increase efficiency and build route density, and garbage prices are increased, compost facility operators expect that more businesses will launch organics collection programs. Positive public relations derived from adopting organics collection programs serves as another motivator for businesses, as demonstrated by smaller producers.
Policies and bylaws are expected to significantly increase organics diversion over time. Disposal bans will be phased in starting in 2012 as part of the updated ISWRM, and are discussed further in Section 6.2.1.2 Potential Supply. The cost differential between organics processing and garbage disposal currently provides a moderate financial incentive to divert organics. For 2012, the tipping fee for garbage is $107 per tonne while posted organics are $63 per tonne. This differential is expected to continue to grow, with projections for garbage estimated to reach $182 per tonne by 2015 (Metro Vancouver, 2011b). These initiatives are expected to drive increased organics diversion and provide feedstock (compostable material) for private sector haulers and facility operators and support entrepreneurial innovation to further develop regional organics management infrastructure (Marr, 2011a).

6.2.1.1 Current Supply

Table 6-1 summarizes our estimates of the quantities of compostable organics generated in Metro Vancouver in 2010. Disposal figures in this table were drawn from the Metro Vancouver 2010 Waste Composition Study. Recycling figures for municipal and commercial collection were drawn from the draft 2010 Solid Waste Management Annual Summary.

As the table indicates, approximately 628,117 tonnes of compostable organics were generated in Metro Vancouver in 2010. Of this, approximately 238,346 tonnes were recycled, resulting in an overall recovery rate of 38 percent. Recovery rates for compostable organics from the residential and ICI sectors were 43 and 31 percent, respectively.

Food scraps are the most abundant compostable organic material still in the waste stream, comprising 262,930 of the 389,771 tonnes of all organic material still going into the garbage. Food scraps account for 67 percent of the total compostable organics disposed. Yard and garden material comprises 18 percent while food-soiled paper comprises 15 percent of compostable organics.

Residents disposed an estimated 226,668 tonnes of compostable organics while businesses disposed an estimated 147,188 tonnes. There was 15,915 tonnes disposed from the DLC sector.

Of the compostable organics disposed of by the residential sector, 75 percent comprised food scraps; 14 percent comprised yard waste; and 11 percent comprised food-soiled paper. Sixty five percent of food scraps disposed is from the residential sector.

For the ICI sector, 63 percent comprised food scraps; 15 percent comprised yard waste; and 22 percent comprised food-soiled paper. Fifty six percent of food-soiled paper disposed is from the ICI sector.

In the DLC sector, wood waste (i.e. large yard waste – branches over 1 m long and 15 cm in diameter) is the primary compostable organic material disposed in the waste stream. Note that wood waste was not in the scope of this study, however in the DLC sector wood waste accounts for 90 percent of compostable organics.
### Table 6-1: Organics – Disposed and Recycled Quantities and Diversion Rate (2010)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>ICI</th>
<th>DLC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disposed (tonnes)</strong></td>
<td>226,668</td>
<td>147,188</td>
<td>15,915</td>
<td>389,771</td>
</tr>
<tr>
<td><strong>Recycled (tonnes)</strong></td>
<td>171,594</td>
<td>66,752</td>
<td>N.A.</td>
<td>238,346</td>
</tr>
<tr>
<td><strong>Diversion Rate</strong></td>
<td>43%</td>
<td>31%</td>
<td>-</td>
<td>38%</td>
</tr>
</tbody>
</table>


1 ICI organics does not include wood waste, which is beyond the scope of this study.

2 Total disposed organics estimates fluctuate based on the total percentage of the waste stream during a given year.

#### 6.2.1.2 Potential Supply

The diversion of food scraps and compostable paper is expected to increase considerably in the next three years as an organics ban is phased in by 2015. Metro Vancouver has set a goal of diverting an additional 265,000 tonnes per annum of compostable organics generated by homes and business away from disposal by 2015 (Marr, 2011a). A ban will be phased in by using a surcharge to target the loads with the largest amounts of compostable organics. This will initially affect the biggest offenders who still have organics in the waste stream, such as grocery stores and restaurants. Over time, the amount of organics permitted in the load (i.e. threshold), will be decreased to enforce the ban for smaller producers of organics (Marr, 2011b). There are logistical challenges around enforcing the ban, especially when smaller amounts are bagged and not easily visible, but the phasing of the ban is expected to have a significant effect on diversion from both a public relations as well as a regulatory standpoint. When San Francisco initiated a mandatory organics recycling program, the amount of organics collected increased by 150 percent (Sullivan, 2011).

- Figure 6-1 below depicts the potential supply of compostable organics, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.
6.2.2 Processing and Infrastructure

- **Food recovery is an emerging market, but still captures a small amount of edible food.** The two primary food recovery organizations, Quest and the Greater Vancouver Food Bank, capture an estimated 600 tonnes of food to share with communities in need. Nevertheless, only a small fraction of food is recovered due to extensive logistical and resource challenges, including lack of cold storage. More opportunities exist to reduce and recover food.

- **There are two licensed compost facilities that currently accept food scraps along with other compostable items.** They are Fraser Richmond Soil and Fibre, a Division of Harvest Power (Fraser Richmond) and Enviro-Smart Organics (Enviro-Smart). Existing facilities use a mix of static aerated piles and windrows to process material. Both facilities are not operating at capacity and have room for expansion. Fraser Richmond is currently building a dry anaerobic digester (AD) for energy recovery and provides initial processing for putrescible items, in particular food scraps, which will be composted once energy is recovered. The AD facility will complement the existing static negative-aerated compost piles in place, and is expected to strengthen Fraser Richmond’s position as the largest compost facility in Metro Vancouver. Enviro-Smart is a turf farm that accepts some agricultural waste in addition to MSW compostable organics, and uses half of its finished compost on-site as per BC
Agricultural Land Reserve (ALR) requirements (Preet, 2011). They use covered aerated piles for initial processing and open windrows for the secondary curing stage.

- **There are other licensed facilities that accept Metro Vancouver compostable organics.** In-region licensed facilities able to accept yard and garden materials (not food scraps) include: the Vancouver landfill's compost operation; and Eco-waste, a private landfill in Richmond (garden and yard material-only windrows). Eco-waste also leases land to Arrow Transport, a company licensed to sell soil with processed biosolids. Biosolids are about 15 percent by volume and make up one part of a five part soil blend. Approximately 10,000 tonnes of biosolids are incorporated into soil blend products and distributed by Yard Works (Davies, 2012). Baird Cattle and Border Feed Lot is licensed to compost agricultural waste and yard trimmings, but is not actively doing so at this time. Given the higher transportation costs associated with moving compostable organics (Sheltair Group, 2008) out of region facilities are less inclined to actively seek out Metro Vancouver feedstock. A very small portion of compostable organics from the region goes to The Answer Garden Products in Abbotsford.

- **Current composting capacity in the region is over 300,000 tonnes.** Based on 2010 estimates, a total of 238,346 tonnes of compostable organics was recycled, and a majority of it was processed in the region. The current in-region capacity for MSW compostable organics (i.e. not biosolids and agricultural waste) in 2010 was between 300,000 and 350,000 tonnes. The primary variable for the range pertains to the potential for facilities to accept material beyond their current throughput to date. This is based on the estimated combined current capacity of Fraser Richmond, Enviro-Smart, and the Vancouver landfill's compost facility adjacent to the landfill. The agricultural feedstock accepted at Enviro-Smart was subtracted from the total estimated capacity.

- **Capacity for processing food scraps is expected to grow and diversify.** It is expected to grow by at least another 60,000 tonnes in 2012 with addition of the AD facility at Fraser Richmond and the establishment of at least one other facility. Four companies currently have license applications being considered by Metro Vancouver to process organics in the region. Proposed facilities include in-vessel composting systems which can operate on a smaller footprint in a more controlled environment, and AD facilities, which can produce biofuel or energy then process the remaining material through composting or other products. Facilities located in the eastern part of the region can help to reduce transport costs for nearby municipalities.

- **A few private companies have determined that a business case for anaerobic digestion exists, especially given current available capital funding.** Given the overabundance of nutrients in the Lower Mainland, from municipal solid waste sources, biosolids and agricultural waste, there is significant interest in processing material to benefit from energy production, then composting or producing dry pellets for fertilizer or fuel with excess nutrients. The two types of anaerobic digestion are wet and dry. For wet digestion, moisture is added to the waste stream, which allows for separation of plastics, so it is beneficial for waste streams with higher plastics contamination. However, more energy is needed and nutrients are lost (Kelleher, 2007). The waste inputs for dry digestion typically have lower moisture content and do not require the addition of liquid for processing. Dry digestion has lower energy requirements than wet digestion, retains more nutrients, and generates less odour (Schafer et al., 2006). At the provincial level, an Integrated Resource Recovery approach is being explored as a way to manage community infrastructure to maximize the recovery of value from waste
resources, including how to handle the overabundance of organics in the Lower Mainland (BC Ministry of Community Development, 2011; Paul, B., 2011).

- Several barriers exist for new organics management facilities seeking to get established in the region. New operators have to compete in a market place with established facilities that have additional capacity, even though there are transport costs for outlying municipalities. Commercial and industrial land is quite expensive and it is difficult to site a facility in proximity to residential areas. Use of ALR land requires that 50 percent of the finished material is applied to the farm land. While there is value to having farmers actively utilize more compost, using half of the finished compost on the same property requires considerable space depending on facility size. Start-up costs require considerable investment for application process, securing land, capital investments and more. New facility operators seeking a smaller footprint tend to have more expensive processing technology which makes it more challenging to compete in the market. Licensing and/or Solid Waste Plan Amendments are required through the Environmental Management Act if facilities are to receive organics generated from MSW generators (BC Ministry of Environment, 1994). When circumstances require it, MV and/or the Ministry may request a public review process that ensures due diligence of the proponent, but also has the potential to be time consuming and prevent a facility's construction. Lastly, new companies must build business relationships to establish customers and transportation in a competitive environment where existing operators have well-established connections with key private and public sector players (Taylor, 2011).

- Innovative onsite organics management systems are being piloted in the region, but the quantity handled at present is negligible. Providing capital and ongoing operations and maintenance costs can be accommodated, these systems could provide high nutrient compost with a relatively low carbon footprint, and add value to the composting infrastructure in the region. The University of BC has a Wright In-vessel composting system that processed 351 tonnes of food scraps and food-soiled paper in 2010 (Duff, 2011). Other smaller systems being tested in the region include Green Good Composters and Earth Tubs from Green Mountain Technology.

- Contaminants are being monitored closely, given that they increase production costs and they risk ending up in the final product. Facility operators generally strive for a two to three percent contamination maximum. Facilities currently have minimal infrastructure in place to pre-process incoming material, so most contamination is removed at the end of the composting process. Very few loads have been rejected by operators, who work closely with haulers to provide feedback to foster source-separation practices at the customer level. Operators agreed that starting at the source with public education is the best strategy for avoiding contamination. Single-family residents are encouraged to use paper liners only to minimize contamination related to confusion around compostable and non-compostable plastics (Aujla et al., 2011). Compostable plastic liners go through a certification process to ensure they will break down in a composter, while other plastics remain intact and have to be screened out. Contamination rates vary by municipality while new commercial users tend to have the highest contamination rates (Preet, 2011). Pre-consumer materials tend to have less contamination than ICI materials that are collected front of house.

- Transportation costs are disproportionately high for compost-related material and markets tend to stay localized as a result. Incoming organics from outlying areas are generally reloaded from
transfer stations onto large trucks that can take between 18 and 36 tonnes of material in one load (Augustine, 2011). Facility operators support keeping hauler costs down by extending hours so hauls can avoid heavier daytime traffic and bottlenecks at bridges and tunnels. Given the importance of transportation costs, an efficient fleet and/or established relationships with transportation companies and haulers are critical.

Figure 6-2: Current Flows of Metro Vancouver Organics
(Graphics are descriptive only and are not drawn to scale)

6.3 End Markets and Prices

- **Compostable organics are processed into a variety of products including compost and soil mixes.** Organics collected in Metro Vancouver are transformed into a variety of products including turf blends, garden blends, and pure compost. Turf blend has a higher percentage of sand than garden blends and all are prepared to meet texture requirements as per BC Landscape Standards. Pure compost is typically used as a soil amender or top dressing. Over 350,000 cubic yards of compost-blended products are sold in the Metro Vancouver region each year.

- **Market strength is considered moderate for current compost products on the market.** According to facility operators, in the last couple of years, wholesale prices have decreased by approximately 20 percent. In contrast, a review of retail prices showed that they have remained steady. Variables affecting the wholesale price shift include slowed construction due to recession and the completion of the 2010 Olympics. As diversion increases, more compost is being produced and there’s more competition for producers of finished compost.
Compost producers set their price based on available supply and market demand in the region. Retail and bulk prices are provided in the table below for various compost mixes. Other variables include product consistency, quality and quantity. Prices below are from retailers and private companies. The only public sector compost available locally is from the City of Vancouver composting facility and is sold at a price of $10 per cubic metre, the equivalent to $7.65 per cubic yard.

Table 6-2: Retail and Bulk Compost Prices

<table>
<thead>
<tr>
<th>Type</th>
<th>Price ($ per cubic yard)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Retail Average</td>
</tr>
<tr>
<td>Compost</td>
<td>$29</td>
</tr>
<tr>
<td>Turf Blend</td>
<td>$29</td>
</tr>
<tr>
<td>Garden Blend</td>
<td>$27</td>
</tr>
<tr>
<td>Biosolids Soil Blend</td>
<td>$13</td>
</tr>
<tr>
<td>High-Value Blend³</td>
<td>$55</td>
</tr>
</tbody>
</table>

1 Imperial units used to reflect industry standard
2 These prices are typically discounted for buyers who purchase large volumes
3 Bagged specialty products such as worm castings and Sea Soil average four to five times the high-value blend cost.

Primary compost users are landscapers, residents, local government. Compost and soil mixes are sold directly from the facility and through nurseries. Fraser Richmond also sells compost products through the North Shore Transfer Station.

Landscapers are a major buyer of compost products. All operators interviewed mentioned landscapers, directly or indirectly, as over half of their customer base. Construction-related compost product use is generally handled by commercial landscapers, who either pickup or have larger volumes delivered directly from composting facilities. While landscapers find the current products to be fairly consistent, there is some concern about compost quality (e.g. excessive plastic, larger particle sizes, less than optimal nutrients amounts and microbiological activity), especially for higher end uses such as edible gardens. Many commercial landscapers consider MSW compost a growing medium and add fertilizers in planting areas. To produce a cost-effective, higher nutrient blend, one landscaper makes a customized mix with MSW compost, sand and mushroom manure (Paetkau, 2011).

Residential buyers purchase garden blends and turf blends for home gardening and lawns from retailers and the transfer station. One retailer noted that up to 80 percent of sales are linked to weather over economy or other variables. “Cash and carry” customers account for two thirds of the business, and warm weather on a spring weekend will bring in an abundance of fair weather gardeners (Kosicki, 2011).

Local governments use finished products for a variety of applications, including parks maintenance and building construction.

Brokers also buy finished compost to add to agricultural manure blends that are bagged and sold in the retail market.

The agricultural sector uses very little compost, but may increase market share as more organic growers come on board. Larger facility operators interviewed did not list the agricultural sector as a significant market. Farmers with livestock use manure to add nutrient value to land while...
most berry growers use high carbon wood waste products with synthetic fertilizers. Overall, the Canadian composting industry has not done as well in marketing compost to the agricultural sector compared to the homeowner and horticultural sectors. Given the quantity of material needed, and other competing products (manures and growing media such as coco and wood chips), compost has to be marketed differently with competitive volume discounts. Farmers want to see compost’s value in the field through side-by-side demonstration trials comparing compost use with ‘normal’ farm practices, with farmers whom they know and trust. Successful agriculture tours for farms using municipal compost have taken place in Ontario’s Peel Region (van der Werf, 2011).

- **BC Landscape Standards texture requirements indirectly help to promote compost sales.** These Standards, as established by the BC Landscape & Nursery Association and the BC Landscape Architects, specify texture types for various planting mixes but do not specify quality or compost types (Paul, 2011). For example, garden beds require a garden blend top soil for the top 18 inches (BC Landscape Standards, 2008). That said, many commercial landscapers are inclined to purchase garden blends with a compost mix given the long term results yielded from the product.

- **As the value of compost for nutrient management, erosion control, water retention, and disease prevention continues to grow, there is potential for compost sales to increase.** According to a previous organics market assessment, there are applications for compost ranging from agricultural, commercial residential, transportation and more that are not fully actualized (Timmenga, 2006). Demand will depend primarily on consumer response and price variables. There is a potential for increased demand for compost in applications such as storm water green infrastructure services from soil and vegetation (McDonald, 2011). According to one vineyard-based composter, there is a market for higher-value compost in the agricultural sector, particularly for organic farms and vineyards (Avery, 2012). The demand for higher quality compost is likely to grow and there are niche market opportunities for compost with higher nutrient and microbial value, as demanded by a growing number of organic farmers. Consumers are increasingly interested in local, sustainably grown food and growth in organic food production has the potential to further increase demand, especially for higher value compost (Paul, J., 2011; Paul, J., 2010).

### 6.3.1 Effect of EPR and Other Policies

- **EPR does not currently affect compostable organic materials.** Some printed paper and packaging (PPP) includes compostable items, but there is no specific inclusion of compostable products in the recycling legislation at this time due to the broad definitions being applied; however, the PPP Product Stewardship Plan currently underway by the industry group, Multiple Materials BC (MMBC) may have provisions for compostable packaging.

- **Metro Vancouver policies and bylaws are expected to increase organics diversion.** Garbage disposal costs are expected to continue to increase at higher rates than organics tipping fees over time. Disposal bans are to be phased in starting in 2012. At the municipal level, a shift to every other week (EOW) garbage collection in leading municipalities has had a positive effect on reducing garbage and increasing organics collection.
6.4 Perceived Barriers and Opportunities

6.4.1 Perceived Barriers

- **Facility Operators expressed concern over regulatory and enforcement issues that prevent a level playing field for compost facility operators.** Two provincial regulations provide guidelines for composting facilities and land use respectively: the Organic Matter Recycling Regulation within the Environmental Management Act, and the Agricultural Land Reserve Use, Subdivision and Procedure Regulation within the Agricultural Land Commission Act. These regulations are briefly summarized below along with highlights of primary barriers related to cultivating a level playing field. The vantage point of the facility operators affects which playing field issues cause the most concern.

- **Organic Matter Recycling Regulation (OMRR)** – OMRR is a BC Ministry of Environment regulation, not a permit, that provides guidance to government and facility operators to protect soil quality and drinking water sources, and to provide an opportunity for the beneficial use of organic matter (BC Ministry of Environment, 2002). Facility operators maintain records that verify pathogen and vector attraction reduction, leachate management and other requirements are being met, and can be reviewed upon request. The regulation also includes other provisions around capacity, composting on an impermeable surface, and ensuring storage sites for managed organic matter (i.e. Class B) are covered in locations that receive more than 600 mm of rain between October and March. Using an average from four weather stations in Vancouver, Richmond and Delta, precipitation during this timeframe is over 800 mm (Environment Canada, 2011). As more food scraps are added to systems, composting processing issues related to moisture can be further exacerbated.

  - OMRR regulations are not actively enforced, but proposed facilities are expected to be in full compliance with OMRR specifications. Concerns were expressed about the lack of enforcement of OMRR at the provincial level given limited staff resources who respond primarily to complaints rather than conducting regular site visits. New facilities are expected to be in compliance with all OMRR provisions.

- **BC Agricultural Land Commission (ALC)** – The ALC is an independent Crown agency with a mission to preserve agricultural land and encourage and enable farm businesses throughout British Columbia (BC ALC, 2011a). Compost facilities are permitted on Agricultural Reserve Land (ALR) so long as they are in compliance with OMRR regulations and if at least 50 percent of the compost measured by volume is used on the farm (BC ALC, 2011b). Commercial composting, when not done for the benefit of agriculture, is an industrial land use and should be prioritized on industrial land (Schmidt, 2010).

  - Compost facilities sited on ALR lands benefit from cost savings. Those on industrial and commercial land are subject to much higher taxes given that land value is more than $1 million per acre compared to an estimated 1/10th of the value for agricultural land taxes. These cost advantages can be passed to customers in the form of lower tipping fees. Operating with limited resources, the ALR is observed to have some enforcement inconsistency and uses self-reporting from operators, and there was concern that facilities may not be in compliance with requirements to keep 50 percent of finished compost on the site. Given the unique circumstances of having adequate land for compost use combined with proximity to MSW compostable organics sources, there are limited opportunities
for other facilities to be sited on ALR land, which centralizes the benefit to a smaller number of facilities.

- Competing, lower-cost bulk materials, including composted biosolids, mineral soil, wood chips, and agricultural manures are often used in place of compost from MSW organics. Facility operators expressed the following concerns about these materials displacing compost use:

  - **Biosolids** – In 2010, soil blends incorporating biosolids added another estimated 40,000-50,000 tonnes of soil product to the marketplace. As of 2007, two variables changed the way composted biosolids are handled. There was a change in regulation (BC Ministry of Environment, 2007) so that biosolids can be incorporated into growing media. Second, regional planning efforts shifted to prioritize the handling of waste locally. Previously, composted biosolids were spread on ranch land in the BC Interior. Now, it enters the local landscape market where the price is less than half the cost of other compost mixes, which is of great concern to local operators. There are no labeling requirements inside the regulation for biosolids amended soil products to indicate that the compost was derived from biosolids. One biosolids compost retailer mentioned that although there are no labeling requirements, they tell their customers that the product contains biosolids when asked. Some customers prefer the lower price of biosolids compost, whereas others do not due to the smell or stigma associated using composted biosolids in vegetable or other types of gardens.

  - **Mineral Soils** – Compost facility operators also had concerns around unlicensed mineral soil producers who screen fill and add low-cost agricultural manures to make a landscape soil that displaces compost and can be sold at wholesale prices lower than $10 per cubic yard. The product tends to be inconsistent in quality and, compared to compost blends, has less long term benefits for water retention, storm water management and nutrient management. Manures used are not fully composted so leachate can negatively affect waterways.

  - **Wood Chips** – Bulky carbon materials are often used as growing media for berries and in green house settings, where fertilizers are used to add nutrient value. While wood waste products have higher value and have competing uses including biomass operations, they are still less than half the cost of compost mixes.

  - **Agricultural manures** – Manures are abundant in the region, and items such as mushroom manure are often added to blends and are often cheaper than compost while still increasing nutrient value. Manures are also applied directly to agricultural land, and they are an abundant material given the number of dairy and poultry farms in the Lower Mainland. However, this practice can be problematic for waterways given high aquifer levels and given the volume of available material. Poultry manure is shipped as far as the Columbia River Basin (Kosicki, 2011). However, some manure is used to create higher value compost, and is thereby incorporated into the local marketplace (Paul, 2011). Purchasing compost, even at bulk rates, to amend many acres of soil, is harder to justify when free sources of organic material are used as standard practice.

- The overabundance of nutrients in the region adds a layer of complexity to developing the compost market. While the value of compost is recognized, the region has a relatively limited landscape with an increase in intensive farming and growing population. This results in an overabundance of nutrients in the form of agricultural manures, biosolids, and both pre- and post-
consumer compostable organics. The consequence of this growth is further top-soil depletion, pollution to local waterways, and air pollution primarily in the form of odour and from ammonia which plays a role in the generation of the “white haze” in the Lower Mainland (Shore, 2010). By increasing the production of compost with the use of available nutrients in the lower mainland including Metro Vancouver and the Fraser Valley, the following benefits can be expected:

- Maintaining or increasing the amount of topsoil and reducing the amounts imported;
- Improving the overall air quality by reducing odour and the production of emissions such as ammonia;
- Improving air quality will contribute to a reduction in health related effects on residents; and
- Improving water quality in many of the rivers and lakes.

6.4.2 Opportunities and Public Sector Options

- **Increase educational and technical support to continue to promote food waste reduction, food recovery, and the diversion of compostable organics.** Given the abundance of organics in the region from MSW, agriculture manures and biosolids, there is value in continuing to foster a 3Rs approach to food scraps management.
  - *Metro Vancouver could expand the promotion of residential curbside food scraps collection with a regional campaign.*
  - *Metro Vancouver could provide technical assistance and outreach programs for ICI sector businesses.*
  - *Metro Vancouver could collaborate with processing facilities to provide consistent messaging around materials appropriate for composting.* Address confusion around compostable liners and single use products to ensure material can be processed appropriately and doesn’t end up as residual at the front or back end of the processing phase.

- **Further refine regional policies to promote organics diversion.**
  - *Metro Vancouver could continue to increase garbage tipping fees to influence the cost effectiveness of diversion for public and private sector entities.* Also consider that facility operators need to balance revenue from tipping fees and sales in order to remain solvent. Establish and enforce the organics ban, as outlined in Section 6.2.1.2 Potential Supply.

- **Encourage diversification of processing facilities to decrease transportation costs (and associated environmental effects), build capacity to process higher volumes of food scraps, and produce a wider range of end products.** Diversification has an added benefit of maintaining a competitive market and minimizing the risk of having one or two larger players dominate and control pricing and material flow over time.
− **Metro Vancouver could collaborate with municipalities to specify available land for geographically dispersed facilities with smaller physical footprints.**

− **Metro Vancouver could work with municipalities to establish guidelines and ultimately streamline the permitting process.** This effort would ensure maximum efficiency (e.g., similar development and building permits across municipalities) and minimize start-up costs (e.g., leasing space while gaining each level of approval) and ensure a level playing field so new processors can compete with more established ones.

− **Metro Vancouver could help to establish best practices and provide technical assistance for onsite composting initiatives.**

  ▪ Work within regional and Senior Governments to harmonize policies and practices to promote compost use. There is opportunity to work within government to maintain a level playing field for regulation and enforcement, review land management practices, ensure adequate safety standards for facilities, and encourage compost use.

− **Metro Vancouver could work with facility operators and other partners to increase distribution opportunities for locally produced compost from MSW.** This could be accomplished by providing finished compost at more transfer stations, as capacity allows, and other sites that offer green waste collection to ‘close the loop’ and expand end user markets.

− **Metro Vancouver could consider the effect of composted biosolids on the local marketplace and re-evaluate how the two products (biosolids compost and compost from food scraps/yard and garden) are positioned in the market.**

− **Metro Vancouver could work with provincial leaders to identify strategies to ensure broader compliance and enforcement with OMRR and ALR composting parameters.** Other practices with deleterious environmental effects, such as extensive manure spreading, could also be addressed as part of these discussions.

− **Metro Vancouver could engage provincial leaders to address WorkSafe requirements needed to ensure worker training and safety for compost and AD facilities.** In 2009, assessed exposures to compost workers from airborne hazards (WorkSafe BC, 2011). Specific worker training requirements for AD facilities are not yet clearly established, and are critical given concerns related to potentially fatal hydrogen sulfide gases that can accumulate in contained spaces (Paul, J., 2011).

− **Metro Vancouver could encourage municipalities and Senior Governments to harmonize policies related to the cosmetic pesticide bans and other pesticide reduction efforts.** Compost use can reduce the need for water, fertilizers, and pesticides (US EPA, 2011). The province is considering a province-wide ban on cosmetic pesticide use and, currently, 38 communities in BC have similar legislation – including Port Coquitlam, Port Moody, Burnaby and New Westminster (Kurucz, 2011; MacLeod, 2011).

  ▪ **Encourage standards and facilitate the research and development of higher-value applications.** Several end users indicated there is significant demand for a higher-grade product than is currently offered by the primary facility operators in the region. Nurseries, vineyards, home gardeners, and
boutique landscapers often seek a product with finer texture and higher nutrient content, and these users have demonstrated they will pay more for such a product.

- **Metro Vancouver could work with the Compost Council of Canada to promote their voluntary Quality Control programs locally.** Consider developing a BC entity similar to the Washington Organics Recycling Council (www.compostwashington.org) that promotes the benefits of compost across sectors.

- **Metro Vancouver could collaborate with Universities on research and development, showcase compost value in general and develop higher-quality composts for niche markets.** Certain segments of the agriculture industry (greenhouses, nurseries, organic growers) and home gardeners have demonstrated they will pay more for higher end products. Producing such higher-value composts will be more viable as food scraps diversion expands.

- **Develop procurement policies and encourage use of compost to expand existing markets and establish new markets.** Use strategic partnerships with Senior Government and other organizations to legislate the use of compost.

  - **Metro Vancouver could work with the BC Landscape Architect Association and the BC Landscapes Trades Association to edit Landscape Standard to specify Class A compost to ensure quality product is promoted rather than providing texture-based recommendations.**

  - **Metro Vancouver could provide template standards to mandate that construction permits require use of locally-purchased Class A compost from MSW compostable organics.**

  - **Metro Vancouver could work with Senior Governments to promote legislation to mandate compost use for roadside application, which is a significant market for compost in other west coast jurisdictions.**

### 7.0 PAPER

#### 7.1 Introduction and Overview

Paper continues to be a valuable material for collection in Metro Vancouver. Markets are expected to be moderate to strong over the next several years, given the ongoing demand for fibre overseas. There is concern that the rapid growth of export markets over the last decade may taper off over the longer term. The strength of the export market, which has driven up prices for local mills, in conjunction with decreased demand for paper products, has contributed to the closure of the two primary regional re-manufacturers in the past two years and consolidation of several Northwest paper mills. Remaining Northwest mills are still willing to purchase higher grades of recycled paper and have strong relationships with Metro Vancouver brokers.

For this study, the four most commonly recycled grades of paper were reviewed - mixed waste paper (MWP), newspaper (ONP), cardboard (OCC), and office pack (OP).
7.2 Market Conditions

7.2.1 Trends and Key Variables Affecting Supply

- **Export markets continue to grow.** There is an increasing demand for recovered paper in China, where demand for recovered paper grew 15 percent from 2001 to 2009 (Stefenelli, 2010). Recovered paper imports are forecast to increase from 27.5 million tonnes in 2009 to 184 million tonnes by 2025 (Messenger, 2011). Due to the increased demand, the price also increased from $97 per tonne in 1999 to peak at $247 per tonne in 2011, making the export market more attractive for domestic (i.e. North American) brokers. In the Metro Vancouver region, close to 70 percent of recovered paper is exported.

- **Demand for paper in domestic markets has declined.** In North America, ONP generation dropped 34 percent between 2007 and 2009 and is expected to continue to drop (Powell, 2010). Although some of this can be attributed to the recession, there has been a shift over the past decade from paper to electronics as a means to transmit knowledge. The use of ‘knowledge grade’ paper (e.g., newspaper, books, printing and writing paper) has declined by a total of 15 million tonnes since 2000 in the United States (Miller, 2011).

- **Contamination in paper streams is a major barrier for domestic markets and affects the quality of the supply.** Due to several variables, re-manufacturers report a significant increase in contamination that negatively affects processing. The export driven market has a high tolerance for lower quality material due to demand for fibre and cheaper labour abroad for additional sorting. Even with gradual improvements in processing, many market experts attribute single stream collection as the primary reason for lowering the quality of commodities due to higher contamination. Domestic re-manufacturers struggle to compete in the market place since they are forced to buy reduced quality recovered paper at a higher price, and sell finished product at low prices given product surplus and reduced consumer demand.

- **Residential and ICI programs are well established yet have potential to further maximize diversion.** Each sector has almost 60,000 tonnes of paper that is still disposed as garbage, and paper makes up 11 percent of the waste stream. Regional disposal bans reinforce education programs in both sectors, but more can be done to foster behaviour change.

- **The printed paper and packaging (PPP) provincial recycling legislation will likely affect recycling systems and has the potential to increase supply.** Most interviewees were familiar with the upcoming printed paper and packaging (PPP) legislation but didn’t have enough information to provide detailed comments on how it will affect recycling markets. It is anticipated that it will have a positive effect on supply when it is implemented in 2014. Many market experts, from municipal coordinators to brokers, raised concerns about changing the status quo and potentially over-regulating the market.

7.2.1.1 Current Supply

- Table 7-1 summarizes our estimates of the quantities of paper generated in Metro Vancouver in 2010. Disposal figures in this table were drawn from the Metro Vancouver 2010 Waste Composition Study.
Recycling figures for municipal and commercial collection were drawn from the draft 2010 Solid Waste Management Annual Summary.

- As the table indicates, approximately 424,762 tonnes of recyclable paper were generated in Metro Vancouver in 2010 from disposed and recycled paper tonnage. Of this, approximately 303,910 tonnes were recycled, resulting in an overall recovery rate of 72 percent. Recovery rates for recyclable paper from the residential and ICI sectors were 66 and 76 percent, respectively.

- Residents disposed an estimated 59,710 tonnes of recyclable paper in curbside garbage while businesses disposed an estimated 59,611 tonnes.

- The recyclable paper disposed by the residential sector was comprised of 29 percent ONP; 27 percent MWP; 22 percent OP; and 21 percent OCC and cartons. Seventy two percent of MWP disposed is from the residential sector.

- The recyclable paper disposed by the ICI sector was comprised of 32 percent OP; 28 percent OCC; 24 percent ONP, and 18 percent MWP and cartons. Almost 60 percent of OCC and OP, remaining in the waste stream, are from the ICI sector.

- In the DLC sector, cardboard is the primary recoverable paper still in the waste stream.

Table 7-1: Paper - Disposed and Recycled Quantities and Diversion Rate (2010)

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th>ICI</th>
<th>DLC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposed (tonnes)</td>
<td>59,710</td>
<td>59,611</td>
<td>1,530</td>
<td>120,852</td>
</tr>
<tr>
<td>Recycled (tonnes)</td>
<td>115,830</td>
<td>188,080</td>
<td>N.A.</td>
<td>303,910</td>
</tr>
<tr>
<td>Diversion Rate</td>
<td>66%</td>
<td>76%</td>
<td>-</td>
<td>72%</td>
</tr>
</tbody>
</table>

Source: Metro Vancouver, 2010a, Metro Vancouver 2011b.

7.2.1.2 Potential Supply

Figure 7-1 below depicts the potential supply of recyclable paper, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.
7.2.2 Processing and Infrastructure

- **Paper recycling collection infrastructure is well established in the region.** Municipal fleets and private haulers contracted by municipalities pick up residential paper; ICI paper is collected by over 20 private haulers. All MRF companies do some hauling.

- **Four companies and one non-profit organization run a total of nine MRFs handling paper collected from the Metro Vancouver, and are listed in Section 4.4.2.** They all have some collection capacity as well.

- **Together, these nine facilities process over 300,000 tonnes of paper from Metro Vancouver annually.** CK Fibre, Emterra and Urban Impact are the largest market players. There are also a handful of unlicensed brokers who handle paper. MRF operators have a sound understanding of markets and prepare materials according to buyer specifications. For single stream processing, a significant portion of the sorting process is automated. For all processors, the speed of the conveyor belt can be adjusted to increase volume when there’s higher tolerance for contamination, or be slowed down to increase “picks per minute” as workers further sort materials to produce higher grade bales.
Source separated material reduces the sorting needed, which allows material to be processed more efficiently at higher speeds.

- **Since 2010, the last two large remanufacturing facilities for recovered paper have closed or curtailed operations.** This has virtually eliminated local processing capacity for paper and resulted in a loss in capacity of 270,000 tonnes per year ONP and OCC combined. Catalyst closed its Coquitlam de-inking plant and Elk Falls paper mill, and discontinued use of ONP at the remaining three pulp mills. This shift was particularly significant for the Crofton mill, which used 80 percent of the ONP bought by Catalyst. Cascades closed its Norampac linerboard mill in Burnaby at the end of 2011 (Recycling Today, 2011c). Primary reasons for the closures or curtailments of domestic mills include 1) a steep decline in domestic demand for paper products, 2) higher prices paid by offshore mills, and 3) overall lower quality of recovered paper (Pulp and Paper Canada, 2010). MRF operators emphasized that these closures represent a huge shift politically, and increase risks associated with more volatile export markets.

- **CKF Inc. is the last remaining paper re-manufacturer in Metro Vancouver.** Their pulp mill opened in 2007 and they produce paper egg cartons and food containers as well as polystyrene food packaging. Their portion of the recovered paper market is less than 1 percent.

- **All MRF operators interviewed had established relationships with Northwest mills.** Simpson Paper, Port Townsend Paper, Sonoco, Georgia Pacific, and International Paper are the primary mills that accept recovered paper from the Metro Vancouver region. Domestic mills are valuable market players as they have a more consistent demand for paper, work in the same time zone and language, and typically do not have problems with freight (Stefenelli, 2010). One Northwest mill buyer cited strong relationships and consistent product as the main reasons for continuing to buy from Metro Vancouver suppliers.

- **Increasingly-contaminated paper bales negatively affect domestic re-manufacturers.** High offshore demand and tolerance for lower quality bales is driving contamination up in recovered paper bales. While processing technology continues to improve, market forces are driving recyclers to process tonnage faster and sort less. Norampac’s procurement manager explained that more tolerance for lower grades affects broker rates. If a buyer raises concern over bale quality not meeting grade, they risk suppliers going elsewhere. As a result, when a bale should have only 5-7 percent contamination, it will sometimes have closer to 25-30 percent contamination, which negatively affects equipment and increases disposal costs. When markets are depressed, export marketers are more selective and local buyers are more likely to get first pick of materials (MacDowell, 2011)

- **Export shipping challenges include availability of containers, and congested Port Metro Vancouver has increased hauling time due to more congested roadways.** One broker reported being able to complete two truck trips per day when three were possible previously. It was noted by another broker that infrastructure improvements, such as the Gateway Program—which includes highway expansion and the eventual opening of the Port Mann bridge—will have a positive effect on commerce and the industry overall.

- **While domestic shipping is more convenient and has a lower cost, additional factors such as border crossing and increased fuel costs affect profit margins.**
7.3 End Markets and Prices

- Markets for paper are considered strong overall and recovered paper export demand continues to drive prices. Below are some findings and trends for specific grades:
  - **Mixed Waste Paper (MWP)** has a strong export market due to the ongoing demand for fibre abroad, especially in China, and over 99 percent of material is sent offshore. Market prices peaked in 2011 when Northwest regional averages reached $140 per tonne (WRN, 2011). MWP comprises approximately 26 percent of what’s recycled by the region’s MRFs.
  - **The Office Pack (OP) market** is primarily overseas with less than a quarter of supply staying in domestic markets. While Georgia Pacific is a primary consumer of OP, one Northwest mill reported that they may need to supplement supply with office pack due to the decline in newspaper supply. OP represents an estimated 4 percent of recycled paper in the region.
  - **Old Newspaper (ONP)** has the strongest domestic market with almost half of this material staying in domestic markets. Higher grade ONP with less contamination is expected by domestic buyers (Grade #8 vs. #6), which requires more meticulous sorting from MRFs. More sorting has cost implications for local brokers, especially in single-stream facilities. ONP represents approximately 20 percent of the paper currently processed by the region’s MRFs.
  - **Old Corrugated Cardboard (OCC)** continues to be a highly valued commodity and approximately 43 percent is sold domestically. It is bought by Port Townsend Paper, Simpson Paper and other Northwest mills. The percentage of boxboard acceptable in OCC bales varies by
facility. OCC represents an estimated 49 percent of the material currently processed by the region’s MRFs.

- Approximately 32 percent of recovered paper generated in Metro Vancouver is sold to domestic mills. However, this percentage ranges from less than 10 percent to 96 percent of estimated domestic sales by individual MRFs. See the Table 7-2 for a breakout of estimated aggregate domestic and export paper sales by material type.

<table>
<thead>
<tr>
<th>Paper Type</th>
<th>Domestic</th>
<th>Export</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWP</td>
<td>&lt;1%</td>
<td>99%</td>
</tr>
<tr>
<td>OP</td>
<td>22%</td>
<td>78%</td>
</tr>
<tr>
<td>OCC</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>ONP</td>
<td>49%</td>
<td>51%</td>
</tr>
</tbody>
</table>

Note: Data to produce percentages is from aggregated MRF data and does not factor in independent brokers.

- Over the past ten years, recovered paper prices have fluctuated considerably, as illustrated for Northwest sales in Figure 6-3 below. Aggregate paper prices peaked in 2006, and then dropped significantly during the beginning of the recession in 2008. The prices rose again through 2009 and 2010, and adjusted in the last two quarters of 2011 after reaching a peak earlier that year. Export market prices follow similar trends, but tend to be more volatile. Asian mills in particular will offer significantly higher prices for lower grade materials, and continue to drive prices up overall.

- Particularly since the price drop in recycling markets at the end of 2008, companies are protecting their relationships with domestic mills. When markets decline, higher quality material is demanded and domestic markets are closer geographically with well-established mill contacts. As a result, MRFs are inclined to meet specifications needed for domestic markets to maintain those relationships over time.

- Seasonal variation in paper markets is generally expected. Export sales taper off in the fourth quarter, and then pick up again after the Chinese New Year when buying resumes (RISI 2011).

- Brokers report that domestic markets may yield prices above export sales for high quality separated materials, especially when markets are in decline. However it tends to be for much smaller volumes than what can be sent offshore. The export market has a much higher tolerance for lower grade materials given that material can be sorted abroad at a lower cost.
Figure 7-3: Northwest Market Prices for Sorted and Baled Paper.
Source: WRN, 2012

<table>
<thead>
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<tbody>
<tr>
<td>Mixed (#1)</td>
<td>42.5</td>
<td>74.6</td>
<td>61.6</td>
<td>92.2</td>
<td>91.7</td>
<td>117.5</td>
</tr>
<tr>
<td>Newspaper (#6)</td>
<td>55.0</td>
<td>72.3</td>
<td>67.5</td>
<td>87.8</td>
<td>72.9</td>
<td>99.8</td>
</tr>
<tr>
<td>OCC (#11)</td>
<td>69.0</td>
<td>97.7</td>
<td>85.5</td>
<td>98.0</td>
<td>128.6</td>
<td>150.3</td>
</tr>
<tr>
<td>Office Pack (#27)</td>
<td>140.0</td>
<td>138.3</td>
<td>115.5</td>
<td>211.4</td>
<td>205.5</td>
<td>243.3</td>
</tr>
</tbody>
</table>

7.3.1 Current and Future Demand

- **Current demand is strong for export markets, which continue to drive all paper values, especially mixed paper.** Most interviewees felt that China would continue to have a strong market over the next several years. One Northwest mill points out that global demand for post-consumer paper is outstretching supply and there will continue to be big growth in overseas export markets, including China, India and Vietnam, for the next 10-15 years.

- **Market experts are concerned about the long term viability of export markets.** There was widespread concern from market experts that export markets, particularly in China, will level off in the future and domestic markets will not be able to handle the surplus recovered paper. A research report was recently released by the Asian paper packaging analyst at Resource Information Systems Inc.
(RISI) suggests that the rapid expansion of paper recycling capacity in China is reaching its peak, and growth will slow down in the coming years. The largest surge in capacity growth was in 2011, when 8.0 million tons of containerboard (i.e. OCC) and boxboard capacity came on line (Resource Recycling, 2012). According to one re-manufacturer, the factors influencing a reduction in demand in China include increased labour costs and expanded domestic recycling programs as the middle class grows and increases consumption (Lovell, 2011).

- **Declining paper use continues to be a factor as electronic tools replace paper.** Readership, consumption and advertising expenditures are the three primary trends driving a reduction in ONP generation, as depicted in the figure below. However opportunities exist to increase recovery by continuing to improve diversion efforts across sectors and by expanding materials collected (e.g. gable top containers).


- **Feedstock quality and competition continue to hinder domestic paper mills.** The crunch created by high export demand and the recent global recession has been toughest on the domestic paper industry. Northwest mills continue to struggle to attain adequate quality feedstock due to export
markets allowing for higher levels of contamination and a shift to single stream collection. A Northwest buyer noted that, while relationships with Metro Vancouver suppliers are strong, Canadian OCC tends to be more contaminated than bales from the US. This is likely due to increased use of front end containers, due to disposal bans, that are easily accessible and may not be closely monitored.

- **Domestic markets are strongest for ONP, OCC and OP.** Export markets take the majority of mixed paper, and there is a growing trend for exporters to buy mixed loads (both co-mingled materials as well as mixed paper) at lower cost and then re-sort materials at their facilities (Rogers, 2011).

- **Canada collects more recovered paper fibre than it has capacity to use.** Canadian paper recovery rates peaked in 2000 at over 20 million tonnes per year and have declined to approximately 12 million tonnes annually by 2010. Canadian mill consumption of recovered paper has stayed level with 6-8 million tonnes used per year between 1994 and 2010, as per the figure below.

![Canadian Post Consumer Fibre Imports/Exports](image)

**Figure 7-5: Canadian Post Consumer Fibre Imports/Exports.** Source: Boxfish Group, 2011.

### 7.3.2 Effects of EPR and Other Policies

- **The effect of PPP EPR legislation on paper recycling is unknown at this time.** The PPP EPR program is in the early phases of development, but will have some effect on the industry depending on
what systems are chosen for collection and processing by the stewardship group, Multi-Material British Columbia (MMBC).

- **Disposal bans have had a positive effect but regular enforcement is sometimes challenging.** Regional disposal bans have been particularly effective for OCC since the material is bulky and easily visible when loads are tipped at transfer stations. Paper within bagged garbage is harder to detect and there are considerable logistical and safety issues associated with opening bags and inspecting loads (Marr, 2011b).

### 7.4 Perceived Barriers and Opportunities

#### 7.4.1 Perceived Barriers

- **Contamination is a primary concern for local re-manufacturers.** Front end OCC bins in the commercial sector tend to have significant levels of contamination. The Norampac buyer emphasized that more than 5 percent contamination is too high, resulting in extra labour costs and a toll on equipment (MacDowell, 2011).

- **Making the business case for local remanufacturing of paper has become very difficult.** The weakened US dollar has negatively affected local re-manufacturer’s ability to market end products or paper products south of the border. The reduction in use of paper products reported by manufacturers further weakens the business case for local paper production. There are additional costs associated with using recovered paper. According to the Catalyst Paper’s Director of Risk & Environment, based on 2008 data, the paper recycling operation was discontinued in part due to the high costs: approximately 3 percent of the overall manufacturing costs was from using recovered paper at their four mills (Kilback, 2011). Catalyst maintains three Vancouver Island pulp mills but only uses virgin material now. The costs for disposing the contaminated material from low grade materials pose an additional challenge (MacDowell, 2011).

#### 7.4.2 Opportunities and Public Sector Options

- **Expanded education could reduce contamination and affect consumer choices.** Re-manufacturers uniformly emphasized the importance of recycling education efforts to reinforce sorting practices and encourage more diversion, especially in lower performing sub-sectors like rural areas and multi-family buildings.

  − *Metro Vancouver could collaborate with municipalities to increase recycling education to collect high quality material and maximize recovery.* Include recycling information in social media campaigns and facilitate consistent messaging across the region.

- **Continue to establish and enforce policy drivers to maximize diversion, including disposal bans, garbage fee increases, and contract design.** A majority of market experts agreed that these tools have a role in increasing recycling rates.
Metro Vancouver could further strengthen enforcement of disposal bans and use garbage fee increases to provide cost-based incentives for improving diversion. The ICI sector in particular needs financial incentive to participate while maintaining viable businesses.

Metro Vancouver could promote revenue sharing as a way for municipalities and larger commercial businesses to recoup processing costs, especially when markets are strong. This practice is most common with source separated programs, which have an added benefit of providing clean material streams and reducing processing costs.

Create incentives for local remanufacturing. Paper needs more domestic long-term end users, especially for mixed paper.

Metro Vancouver could develop resources and encourage municipalities to add contract specifications that support local market development. Establish standards to specify market domestic destinations for recovered material, as market constraints permit. Include municipal revenues to maintain a commitment to understanding markets and supporting their long-term viability. Work with municipalities, haulers and processors to ensure clean material is consistently available to domestic markets.

Metro Vancouver could provide technical assistance and access to available incentive programs for start-up and existing companies, from larger re-manufacturers to "boutique" operations to serve niche markets, and work with Universities on research and development of these markets.

Metro Vancouver could encourage upgrades to existing processing facilities or the establishment of new facilities. This could be done through municipal property tax breaks and BC Hydro energy rebates and incentives.

Transportation and efficient infrastructure needs to continue to improve. High fuel and freight costs make the transport of materials in domestic and international markets increasingly challenging. Highway system improvements and adding efficiency at the port are two strategies that will increase transportation efficiency in the region.

Metro Vancouver could continue to work with other regional and Senior Government leaders to promote infrastructure development, which will support recycling efforts.

Government procurement policy and practices can be a tool to advance the use of recycled products.

Metro Vancouver could actively work with Senior Government to establish more recycled-content procurement policies and practices. Recycled-content specifications for manufacturers combined with supporting procurement policies for government contracts can help to stimulate demand for locally produced recycled-content products.

Metro Vancouver could actively advocate for recycled-content legislation with Senior Governments. In California, state law mandates the use of a specific amount of recycled-content newsprint by printers and publishers located in California, and CalRecycle implements the program to encourage and track the use of this recycled content (CalRecycle, 2012).
8.0 PLASTIC

8.1 Introduction and Overview

Plastics represent a growing and dynamic market. Current demand for recycled plastic resins is generally strong and expected to remain so, especially as demand from overseas continues to surge. Generation is likely to increase, as high oil prices and efficiency considerations encourage product manufacturers to switch from heavier packaging materials to plastics. Frequently used and simple resin types, such as polyethylene terephthalate (PET) and high density polyethylene (HDPE), have high capture rates and strong markets, resulting in high levels of recycling and remanufacturing. However, new types and combinations of plastics are being regularly introduced, making it difficult for recycling technology to keep up, and some types of resin remain difficult to recycle, either for technological or market reasons.

Overall, about one-third of all plastics in Metro Vancouver are recycled. Once implemented, the impending extended producer responsibility (EPR) program for printed paper and packaging (PPP) is likely to drive up recovery rates for plastics. In addition, new technologies for processing plastics into products as well as energy are emerging, which may also expand opportunities for plastics recovery within a few years.

For this study, recyclable plastics are defined as all #1-7 rigid plastic containers (including single-serving plastic drink cups), clean single-use plastic retail bags, and other plastic film. Wherever possible, resin-specific information is provided. Plastics from electronics and small appliances are discussed separately in Section 4.0. Plastics from carpet are discussed in Section 3.0.

8.2 Market Conditions

8.2.1 Trends and Key Variables Affecting Supply

- Increasing single-stream curbside recycling has had mixed effects. Over the past decade, municipalities in Metro Vancouver have been shifting to single-stream curbside collection of recyclables. This has increased the quantity collected, but some argue it has lowered the quality and the value of resulting feedstock due to higher contamination and the presence of other, lower value resin types. Processors are making improvements to reduce contamination, but some Canadian and US re-manufacturers and end users still struggle with contamination.

- Deposit-refund system collects a large share of plastics with high recycling potential. British Columbia’s deposit-refund system for beverage containers is successful in capturing most refundable plastics at depots and other authorized collection points. Encorp, the industry-funded stewardship organization, reports an average recovery rate of 76 percent of plastics covered by the program (Encorp, 2010). Although recycling through the deposit-refund system accounts for only 30 percent of plastics recycling in Metro Vancouver, the materials collected—primarily PET (#1) bottles—are among the most easily recycled plastics with viable (if volatile) end markets.

- Milk jugs are primarily collected through municipal and commercial programs, but some are collected at depots. Through a voluntary stewardship program funded by the BC Dairy Council, plastic (HDPE) milk jugs can also be taken to depots. However, only 7 percent of milk jugs sold in the
province were collected at depots, and the Dairy Council estimates that the majority of jugs sold in 2010 (63-73 percent) were collected through municipal and commercial recycling programs (BC Dairy Council, 2010).

- **Some additional non-refundable plastics are taken to depots instead of being put in curbside collection, and little data are available about them.** Non-refundable plastics taken to private depots (not including milk jugs) fall into a grey area of materials management that is not closely tracked. Private depots do not need to report these material quantities to Encorp or to Metro Vancouver, so they may not be captured in recovery estimates. In addition, these materials are often sold directly to brokers, shipped to overseas processors, and are not included in regional processing data.

- **The packaging mix continues to change, and plastics are likely to gain packaging market share.** Recent market studies on packaging trends suggest that plastics will be increasingly substituted for glass and steel, as part of a general trend towards packaging getting lighter. In addition, the mix of plastics used in packaging will change, with film-based packaging such as stand-up pouches, and multi-layer packaging making up a growing part of the plastic packaging supply (Kelleher Environmental, 2010).

- **More PET thermoform packaging is coming onto the market, and there will be less look-alike thermoform packaging in the waste stream soon.** Thermoform packaging, which is created by moulding sheets of plastic resin into a shape, has been a recycling challenge for many years, in part because of the difficulty in distinguishing between PET (which can be recycled with other PET products) and non-PET thermoform packaging (which is a contaminant in PET recycling). Industry collaboration to address this issue has recently led to an agreement by five of Canada’s major grocers to use only PET-based thermoform packaging (and to encourage their suppliers to follow suit). Canadian plastics recyclers and re-manufacturers are working simultaneously on increasing PET thermoform recycling. Consequently, more PET thermoform, which currently makes up about 25 percent of the thermoform packaging market in the US and Canada is expected to enter the material stream in the coming years (Resource Recycling, 2011).

- **Mounting government pressure on the plastics and retail industries is driving reduced use and increased recycling of plastic shopping bags.** Although plastic bags have not been banned from distribution or disposal in Metro Vancouver, governments in the region have expressed a strong desire to see the use of single-use plastic bags decrease. Industry groups have recently restated their commitment to reduce the number of plastic bags distributed by 50 percent and to ensure that all bags are recyclable, by 2015 (Sinoski, 2011).

- **The impending PPP EPR regulation may significantly increase the supply of plastics collected for recycling, once it goes into effect in 2014.** The new EPR program will cover all plastic packaging collected from residential and municipal (non-ICI/DLC) premises that is not currently covered by the beverage container deposit-refund system. The list of materials covered will likely include non-beverage PET and HDPE containers, #3-7 containers, expanded polystyrene packing material, and all plastic film that has been used in transport and packaging.
As collection and composting of organics grows, more compostable plastics are likely to appear in the recycling stream, becoming a potential contaminant. Compostable, non-recyclable biodegradable plastics, which are often labelled “#7,” making them difficult to distinguish from non-compostable #7 (“other/mixed resin”) plastics, have become a problematic material for plastics recyclers, especially in places where organics recycling is in place (Dell, 2010). A recent market study forecasted strong growth in the compostable plastics market, including an annual growth rate of 12 percent for PLA in North America for the next seven years, suggesting that the presence of this and other compostable plastics is likely to grow, with some portion likely ending up in the recycling stream (Ceresana Research, 2012).

8.2.1.1 Current Supply

Table 7-1 summarizes our estimates of the quantities of recyclable plastics generated in Metro Vancouver. Disposal figures in this table were drawn from the Metro Vancouver 2010 Solid Waste Composition Study. Recycling figures were drawn from the Metro Vancouver 2010 Recycling and Solid Waste Annual Summary, with supplemental information for “take-back” programs drawn from the Encorp 2010 Annual Report and the US Dairy Council 2010 Annual Report.

More than 74,000 tonnes of recyclable plastics were generated in Metro Vancouver in 2010. Of this, approximately 23,800 tonnes were recycled, resulting in an overall recovery rate of 32 percent. Recovery rates for recyclable plastics from the residential and ICI sectors were 41 percent and 27 percent, respectively. Take-back programs for beverage containers and milk jugs collected 6,564 tonnes (27.5 percent of all plastics recycled), and these materials are predominantly PET bottles. The composition of recyclables collected through municipal and commercial programs is not well documented, but based on interviews with MRF operators, it appears that almost three-quarters are #3-7 containers, with the remaining 25 percent dominated by HDPE, with a small portion coming from PET, plastic film and other rigid plastics.

The residential sector disposed an estimated 13,338 tonnes of recyclable plastics in curbside garbage and in self-hauled loads, of which over 40 percent was PET or HDPE. The ICI sector disposed an estimated 20,687 tonnes, which also comprised 40 percent PET and HDPE materials. The DLC sector disposed approximately 16,500 tonnes, 96 percent of which was plastic film.

<table>
<thead>
<tr>
<th>Table 8-1: Recyclable Plastics – Disposed and Recycled Quantities and Recycling Rate (2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Disposed (tonnes)</td>
</tr>
<tr>
<td>Recycled (tonnes)</td>
</tr>
<tr>
<td>Recycling Rate</td>
</tr>
</tbody>
</table>

Sources: Metro Vancouver, 2010a, Metro Vancouver 2011, Encorp 2010.
8.2.1.2 Potential Supply

Figure 8-1 below depicts the potential supply of recyclable plastics, based on waste generation projections from Metro Vancouver (which assumes per capita waste generation remains constant at 2010 rates) for estimated population levels in 2015 and 2020.

Figure 8-1: Current and Potential Future Supply of Recyclable Plastics in Metro Vancouver

8.2.2 Processing and Infrastructure

- **Refundable plastics are sent directly to a processor, while plastics from municipal and commercial programs are sorted at MRFs and then sent to area processors.** According to Encorp, refundable plastics collected via depots and other authorized return locations are sent to Encorp’s contracted processor, Merlin Plastics, for sorting and processing (Chan, 2011). Plastics collected via municipal and commercial collection programs are taken to material recovery facilities (MRFs) for sorting and baling before being sent on to Merlin and other processors.

- **Municipal curbside collection is still largely source separated, but single-stream collection is growing for high-value plastic resins.** Approximately three-quarters of municipalities in Metro Vancouver collect source-separated materials from single-family and multi-family residences. However, several municipalities are considering transitioning to single-stream in the coming years. Both single-stream and source-separated programs generally accept non-refundable PET (#1), HDPE (#2), low-density polyethylene (LDPE) (#4), and PP (#5) materials. A few programs also officially
accept #3, #6, and #7 containers. Approximately half of curbside programs accept plastic bags and film.

- **MRFs in the Metro Vancouver region are owned by companies that also do collection**, supplying for at least a portion of the materials processed at their facilities. Other collection is done by municipal crews or independent haulers (through municipal contracts and independent commercial services), of which Waste Management is the largest.

- **Four companies and one non-profit organization run a total of nine MRFs handling plastics collected from the Metro Vancouver, and are listed in Section 4.4.2. Together, these nine facilities process approximately 17,000 tonnes of plastics from Metro Vancouver annually.** CK Fibre, Emterra, and Urban Impact are the largest market players, and together they handle a large majority of the plastics collected. Cascades focuses primarily on fibre, and handles only a small portion of the plastics stream. Ridge Meadows serves two municipalities and has smaller volumes as a result.

- **Most MRFs bale non-refundable PET, HDPE, #3-7 containers, and plastic film.** In most cases, MRFs bale natural and pigmented HDPE containers separately. One MRF also re-grinds HDPE-natural before sending it to Merlin Plastics for processing. At least one MRF bales non-refundable PET containers with #3-7 containers, because it does not collect a sufficient amount of PET to justify separation. All MRFs separate out any refundable plastic containers they receive and send them for processing at Merlin Plastics under the Encorp system terms.

- **Both single-stream MRFs currently have surplus capacity, and there is sufficient capacity for current collection levels at multi-stream MRFS.** The single-stream MRFs are currently underused, although both operators anticipate increasing quantities in the next several years. Some multi-stream MRFs also have additional capacity, while others are operating near or at capacity.

- **Merlin Plastics is the major processor of plastics from Metro Vancouver.** Merlin’s facility in Delta, BC processes all refundable plastics and the majority of non-refundable containers and film collected through municipal programs in Metro Vancouver, in addition to plastics from outside the region. Merlin receives separated and mixed loads of #1-7 containers of varying quality and cleanliness, as well as plastic film, and a very small amount of condensed polystyrene. Its processing facility is designed to allow for sorting and processing, and it produces pelletized and flaked materials for manufacturers in Canada, the US, and (a very small portion) overseas. It also sells some bales of lower quality plastics to overseas markets. Merlin reports having more than sufficient capacity to process all the material it currently receives, and anticipates making regular improvements to the efficiency of operations, suggesting that processing capacity is not an issue (Andrews, 2011).

- **Silverdale Recycling also operates a small plastics processing facility in Maple Ridge, BC.**

- **Commodity brokers are also active in Metro Vancouver, and sell a portion of collected plastics to overseas markets.** Very little information is available about brokers’ role in the plastics market, but they are active in the region, primarily purchasing non-refundable containers, other rigid plastics, and film from private haulers and depots.
West Coast Plastic Recycling Inc. operates a collection and brokering business for film and rigid plastics, serving predominantly commercial and industrial customers. Based in Richmond, BC, and launched in 2008, West Coast Plastic offers free film and non-container rigid plastics collection services to industrial and commercial generators in parts of the Metro Vancouver region. West Coast Plastic delivers a small portion of collected plastics to a regional manufacturer of plastic pipes and other products, and sells the rest on overseas markets. It also receives bales of mixed #1-7 plastic containers from other recycling collectors and MRFs, which it also brokers on overseas markets. The company’s collection quantities are comparable to the larger regional MRF operators, and it reports that business has expanded significantly every year since it started its operations; a trend that it believes is likely to continue for the next several years (Kemp, 2012).

Many MRF operators prefer to sell plastics to Merlin because of the company’s consistency, and preference for domestic/North American end markets. MRF operators noted that although Merlin’s purchase prices for lower grade plastics were sometimes lower than prices that baled plastics could fetch from overseas buyers, they are a steadier buyer, making them an attractive outlet for MRF bales. In addition, Merlin’s preference for supplying North American end users (rather than exporting overseas) aligns with the values and priorities of many of the municipalities that contract with MRF operators. Nevertheless, Merlin does send some bales of lower grade plastics overseas, and MRF operators also sometimes directly sell (or work with brokers to sell) bales of lower grade plastics on overseas markets as well, depending on prices, supply, and other considerations.

Mansonville Plastics, a regional manufacturer of expanded polystyrene (EPS), recycles used EPS packaging into EPS-based landscaping products. Located in Surrey, BC, Mansonville accepts EPS from individuals and businesses at its manufacturing facility. However, they are operating overcapacity with significant backlog, because they do not like to turn collectors away. The process costs more than manufacturing EPS with virgin inputs, but they are committed to using recycled material, even though consumers are not willing to pay the increased cost of recycled-content. Genesis Recycling also accepts EPS from the ICI sector, which it processes into compressed bricks and sells to manufacturers of recycled plastic products.
8.3 End Markets and Prices

- Markets for plastics are moderate to strong, but prices are highly volatile. MRF operators and commercial plastics collectors in Metro Vancouver are able to choose between selling to a stable regional processor—Merlin—and brokering (or working with a broker) and exporting bales to global markets, predominantly in Asia. Prices for baled plastics typically track market prices for recycled resins. Markets for processed recycled resins (i.e. pellets or flakes) are also highly volatile, especially the overseas markets, and prices are constantly fluctuating. Nevertheless, Merlin, which primarily sells directly to manufacturers and prefers to secure high-volume contracts as opposed to seeking the highest prices, reports having a sufficient number and diversity of buyers.

Market trends for specific resins include the following:

- **PET (#1) has a large, volatile global market with many buyers.** Market prices fell from record highs in mid-2011, dropping by 20-30 percent by the end of the year (Secondary Materials Pricing, 2012). Recycled PET resins typically go into textiles (fleece, carpet, clothing, etc.) or into non-food grade packaging.

- **HDPE (#2) has a strong market with the steadiest prices.** This is especially true for HDPE-natural, which can sell for as much as PET, while HDPE-pigmented sells for half as much. Recycled HDPE-natural resin often goes back into packaging, such as non-food grade bottles and bags, while recycled HDPE-pigmented resin goes into a dark-coloured product, such as irrigation piping.
Other rigid plastics (#3-7) have the least value, with weaker and less consistent markets, especially when baled together. These materials are generally “downcycled” into thicker-grade products, such as plant pots and lower-grade packaging.

Plastic film, if collected clean and separated by colour, has numerous applications and moderate markets. Single-use retail bags and clean garbage bags often go into a dark product like garbage bags, while shrink wrap and other clear film often goes back into similar packaging. Clean film is also used in composite lumber products manufactured in the Pacific Northwest and elsewhere.

A large portion of plastics collected in Metro Vancouver is sold as pellets or flakes to manufacturers and plastics compounders in the US or in Canada, including a few BC firms.

For some materials—especially lower-quality bales—local recycling markets are weak or non-existent. These materials are generally sent overseas (predominantly to China) where demand for plastics of all types and qualities is high, and where the costs of processing these materials to acceptable levels for use in re-manufacturing in Canada is prohibitively high. Although difficult to trace the entire value chain of these materials, anecdotal evidence suggests that most plastics sent overseas are recycled rather than used for energy.

Market prices for recycled plastics of all marketable resin types have increased over the past three years. As Figure 8-3 illustrates, prices for sorted and baled plastics have increased significantly since January of 2009, although they have softened significantly from the record-high levels reached in mid-2011 (Waste and Recycling News, 2012).
Plastics resin markets are fairly mature, and supply and demand generally determine prices for buyers and sellers. Market prices are generally very close to individual buying and selling prices reported by regional MRFs and processors, and thus are good indicators of regional prices and market strength (Foster, 2011). Current market prices for sorted and baled plastics, as well as for recycled plastic pellets or flakes, are shown in Table 8-2 below.

Table 8-2: Average Prices and End Markets for Plastics, by Resin Type (January 2012)

<table>
<thead>
<tr>
<th>Plastic Resin</th>
<th>Average Price for Sorted and Baled Plastics¹ (US $ per tonne)</th>
<th>Average Price for Clean Flake or Pellets² (US $ per tonne)</th>
<th>Description of Remanufacturing and End Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET (#1) bottles, clear</td>
<td>$540</td>
<td>$1,544</td>
<td>Pellets or regrind are used to manufacture fleece, carpet, clothing, packaging</td>
</tr>
<tr>
<td>HDPE (#2) bottles, natural</td>
<td>$496</td>
<td>$1,676</td>
<td>Pellets are used to manufacture bottles, bags, packaging</td>
</tr>
<tr>
<td>HDPE (#2) containers, coloured</td>
<td>$408</td>
<td>$1,455</td>
<td>Pellets are used to manufacture black products – piping, furniture</td>
</tr>
<tr>
<td>Mixed (#1-7) bottles, tubs, jars – incl. material without #s, rigid packaging</td>
<td>$22³</td>
<td>$353³</td>
<td>Custom pellets (different combinations for different buyers) are used to manufacture plant pots, lower grade packaging</td>
</tr>
<tr>
<td>Other rigids – buckets, crates, pallets, etc.</td>
<td>$221³</td>
<td>$551³</td>
<td>Custom pellets (different combinations for different buyers) are used to manufacture thick-grade products</td>
</tr>
<tr>
<td>Clean film</td>
<td>$342</td>
<td>$728</td>
<td>Pellets are used to manufacture bags, other film packaging, and composite lumber</td>
</tr>
</tbody>
</table>

¹ Unless otherwise noted, prices for sorted and baled plastics are median average of reported weekly high and low market prices in the Pacific Northwest region from Waste and Recycling News, January 11, 2012. All prices are in US dollars per tonne delivered.

² Unless otherwise noted, prices for re-grind/flake and pellets are median average of reported weekly US market high and low prices from plasticsnews.com, January 9, 2012. All prices are in US dollars per tonne delivered.

³ Prices for Mixed #1-7 and other rigid plastics are from interviews with Metro Vancouver area processors.

8.3.1 Current and Future Demand

- Demand for recycled resins is still on the rise. In the past three years, demand for film and PE has been exceptionally strong (Recycling Product News, 2011b; Foster, 2011).

- Asian demand for plastic feedstock of all resin types is growing, and the export market will be a long-term presence, especially for lower-value or mixed-material loads. Some local collectors have reported a sharp uptick in buyers of lower-value or mixed-material loads. As one industry representative put it, "Current demand is so strong, all I have to do is let someone in the industry know
that I have a load of material (whatever it is) and the phone will be ringing within 8 hours." Figure 8-4 illustrates the growth in plastics exports from North America since 1997 (Resource Recycling, 2010).

Figure 8-4: North American Plastics Exports (in tonnes), 1997-2010.  

- **Regional demand for feedstock also exists, but the quality requirements are higher.** The economic downturn created demand for higher quality material in both domestic and international markets, and this has prevailed as a general trend (Foster, 2011).

- **Demand for recycled content is increasing, which could drive up prices.** Demand for recycled content in products and packaging is increasing, driven by consumer demand and public policy. Growing demand could drive up recycled resin prices, making them more expensive than virgin resins, which would have a negative effect on market demand for recycled resins over the long term. This can be avoided if the supply of recycled resins continues to expand to match demand (APPR, 2010).

### 8.3.2 Effects of EPR and Other Policies

- **British Columbia is one of Canada’s top leaders in recycling, in large part because of its deposit-return system.** Beverage containers in BC are returned at a very high percentage—78.3 percent of all plastics sold in 2010 were returned—which makes for a predictable, consistent supply of materials of relatively high value (Encorp, 2010). This supports businesses in the recycling industry and makes it possible for them to operate in the region (Andrews, 2011).

- **The new PPP EPR program will have a significant effect on the plastics recycling industry in Metro Vancouver, although the likely effects are still unknown.** Because the PPP EPR program is
still in the early phases of development, no one knows what effects the program will have on the industry, which will depend heavily on what systems for collection and processing are chosen by Multi Material British Columbia (MMBC), the stewardship organization.

- **PPP EPR regulation will likely increase the supply of plastics collected for recycling, including plastics with no processing infrastructure or end markets**, including difficult-to-recycle materials, such as EPS. The region’s current processing infrastructure is not designed to manage EPS, and there are very few end markets. Adding materials like EPS to the plastics recycling market in Metro Vancouver could pose challenges to the cost-effectiveness of the industry. PPP EPR has the potential to add incentive for changing product design to be more environmentally-friendly and/or to develop end markets as manufacturers assume responsibility for handling materials at end of life.

### 8.4 Perceived Barriers and Opportunities

#### 8.4.1 Perceived Barriers

- **Transport to end markets—both domestic and international—is increasingly difficult.**
  - High fuel and freight costs make it increasingly difficult for processors to transport loads to end markets in other regions of Canada and the US. Freight companies are charging fuel surcharges and raising prices. This is having a negative effect on the cost-effectiveness of shipping processed plastics to domestic and North American markets (Andrews, 2011).
  - Several MRF operators noted that high oil prices are also affecting the export market, as is growing congestion at the Port Metro Vancouver, and a shortage of shipping containers.

- **Single-stream collection may make it harder to market recycled plastics to regional manufacturers.** North American manufacturers tend to have higher quality feedstock standards than overseas buyers, and some manufacturers in the Metro Vancouver region have complained that they have seen higher levels of contamination, including other types of plastic, in the feedstock they purchase from the area as a result of the growing practice of single-stream collection.

- **Sorting technology needs improvement, especially as single-stream collection increases.** As product and packaging manufacturers acquire more responsibility for—and control of—recycling, the collection system is likely to move increasingly toward single-stream. Multi-stream MRF operators have expressed concern about the transition to single-stream collection, noting that their operations will require substantial investment in new equipment to be able to sort and process single-stream material.

#### 8.4.2 Opportunities and Public Sector Options

- **Innovative sorting, processing, and re-manufacturing technologies may create new possibilities for cost-effective plastics recycling and recovery.** The plastics recycling industry is in a period of growth, particularly in the area of research and development. Advances in technology are allowing more plastics to be recycled or recovered for beneficial use.
There are several new innovations in plastics sorting that can help MRF operators separate different materials efficiently and with precision, such as optical sorters, which can be used to separate plastics by resin type and by colour, allowing for higher-quality, more consistent bales of a growing range of plastic types (Recycling Today, 2011a).

An example of new processing technology is thermokinetic processing, developed by Groupe RCM from Quebec in partnership with Tetra Pak. The process uses high-speed knives to homogenize disparate plastic-based materials—including plastic film, gable top cartons, and aseptic packaging—and transforms the mix into a marketable thermoplastic resin (Tetra Pak, 2010).

Another promising emerging technology is waste plastics-to-oil conversion, a process advanced by Portland, OR-based Agylix and Toronto-based JBI, Inc., among others, in which difficult-to-recycle waste plastics are converted into refinery-ready crude oil (Carroll, 2011; JBI, 2012). This type of technology could represent an opportunity for Metro Vancouver to achieve its goal, identified in the recent Integrated Solid Waste Management Plan, of recovering energy from the waste stream remaining after material recycling.

Metro Vancouver could monitor the technological developments in the plastics recycling industry and be poised to help local businesses take advantage of new opportunities as they arise. Metro Vancouver can monitor the plastics industry and communicate regularly with industry representatives to ensure that local businesses are aware of new developments. Metro Vancouver can also support existing and new sorting, processing, and re-manufacturing businesses that are interested in making investments in new technologies and facilities by encouraging member municipalities to provide appropriate zoning and siting assistance.

PPP EPR may lead to expanded processing for expanded polystyrene and other plastic packaging with currently low recycling rates. Although the precise definition of PPP is not yet determined, it is likely that some types of EPS and other currently difficult-to-recycle plastics will be covered, and could lead to investment in new collection and processing infrastructure. Nevertheless, adding these products to the recycling industry will require care to ensure that their addition expands overall recycling and does not negatively affect existing plastics recycling.

Metro Vancouver could play an important role as an advocate for the local recycling industry to encourage the development of definitions and parameters for the new PPP system that meet the needs of recycling industry stakeholders, including collectors and processors.

Government procurement policy and practice can be a tool to advance the use of recycled products. As major purchasers of products and materials, governments are often highly influential market actors and can use procurement as a tool for developing end markets and testing new applications of recycled-content materials.

One example of this is the use of Altwood plastic lumber, manufactured in Victoria by Syntal Products using recycled plastics from the region, in the Lynn Creek Rail Bridge and Brooksbank Avenue Underpass project, the first in a series of projects in Port Metro Vancouver’s long-term infrastructure investment plan (Douglas Magazine, 2011).
Metro Vancouver could continue to encourage provincial and municipal purchasing of recycled-content products and set policies for its own departments to specify recycled content when plastics-related materials are used. An example of such additional opportunities includes the use of recycled EPS in road and highway projects that use EPS forms.

9.0 SWOT ANALYSIS

An analysis of strengths, weaknesses, opportunities, and threats (SWOT) was conducted for each target material category related to developing recycling markets in Metro Vancouver. These tables can be found in Appendix B.

The following potential market influences were considered when conducting the SWOT:

- Processing and shipping costs
- Buyer availability and location
- Market opportunities, especially organics
- Future market trends
- Potential and existing effects from policy changes – EPR, disposal bans, procurement, recycled-content legislation, licensing requirements, MRF standards, contract development, and land use
- Internal or in cooperation across levels of government
- Collection system methods – source separated and single stream; curbside, depot, return-to-retail
- Market controlling factors - material quality and quantity, price point, manufacturing cycle, consumer demand, labour costs, worker health, and transportation/port
- Environmental factors – carbon footprint, air emissions, water and soil quality, land use changes
- Social factors - educational programming, job creation opportunities

While it is beyond the scope of the study to quantify and rank each market influence, it is important to note the role of EPR legislation as a specific strategy for influencing local market development. The BC Recycling Regulation already specifies the principle of highest and best material use within the context of the pollution prevention hierarchy. When well executed, use of the hierarchy helps to minimize the overall carbon footprint and discharge of toxics in the production life cycle of the material and product. For example, as demonstrated through the BC Recycling Regulation for electronics, transport distances are reduced as materials are handled through five local processors, and local jobs have been created. As EPR for more items, including packaging and printed paper (PPP), come online, legislation can potentially be developed to specify that a percentage of what’s recovered needs to be processed locally, which could help to stimulate local market development.
10.0 CONCLUSIONS

10.1 How to Use the Recycling Markets Study

As stated in Strategy 2.3 of the ISWRM, there is a shortage of recycling processing capacity for many materials in the region. This study was intended to gather information on regional recycling markets in order to present opportunities for Metro Vancouver and member municipalities to use tools at their disposal to change the business environment so that the private sector can increase capacity.

To that end, the public sector is positioned to legislate, educate, and facilitate to realize change in the marketplace. For each target material, this study provides an overview of how each commodity moves through the marketplace, and then highlights specific opportunities for Metro Vancouver to explore.

Metro Vancouver can now take these opportunities and conduct some level of internal and external analysis to come up with prioritized strategies to be implemented through policies and/or programs. These opportunities are also included in the SWOT table in Appendix B. A number of these opportunities further validate strategies already identified in the ISWRM and can help MV staff members to frame aspects of their implementation. Strategies listed in 2.3 of the ISWRM include:

- Reviewing desirability, feasibility and opportunity for establishing a non-profit organization to facilitate the development of recycling businesses and markets, along the lines of the 'London Remade' model in the U.K.;
- Establishing a land acquisition strategy for required recycling facilities; and,
- Enhancing policy-based initiatives to promote local recycled-content in consumer goods.

In light of the packaging and printed paper (PPP) EPR program development currently underway through the BC Recycling Regulation, this study was expanded to explore the quantity of ICI PPP that is currently disposed and recovered, its end destination, and barriers to diverting this material from the ICI sector. An ICI PPP technical memo can be found in Appendix C.

10.2 Next Steps for Increasing Understanding of Recycling Markets

There is a growing body of work that addresses recycling markets and broader resource management issues in a global context. While Metro Vancouver has a relatively small role in this larger arena, there is value to understanding the forces at play, and how the public sector can use existing tools to interface with the market place in the most sustainable manner. As Samantha MacBride, a New York recycling expert, notes in Recycling Reconsidered: The Present Failure and Future Promise of Environmental Action in the United States, “The whole point of recycling is to privilege ecological rationality over a purely economic calculus so as to spare human health, resource stocks, and ecosystems the physiochemical burden of a linear flow of materials through the human economy” (2012).

While financial profitability plays a key role in material flow within the global marketplace, focus is starting to shift to address environmental and social issues as well. Released in cooperation with the UN Global Compact, the World Business Council for Sustainable Development and the United Nations
Environment Programme, a 2012 KPMG study, “Expecting the Unexpected: Building Business Value in a Changing World”, researches the rapidly growing, externalized environmental costs that are expected to significantly affect corporate growth globally over the next two decades. If companies had to pay for the full environmental costs of their production, they would lose 41 cents on average for every US dollar in earnings (KPMG, 2012). The report recognized that governments alone cannot address resource limitations, and asserts that businesses must take a leadership role in the development of solutions that will help to create a more sustainable future (KPMG, 2012). Government can have a role in helping to leverage opportunities for business to enhance processes, create efficiencies, manage risk, and drive innovation to contribute to society and long-term financial growth. This is part of a larger initiative to decouple material and energy flows from social and financial progress, which is examined in detail through another recent study conducted by the United Nations Environmental Programme (2012).

To that end, there are several ways Metro Vancouver can build upon the baseline of recycling market knowledge captured in this study as long-term, sustainable waste reduction and recycling practices are further established in the region:

- Run triple bottom line analysis on opportunities to provide a more comprehensive priority ranking of market influences;
- Determine implications of opportunities on other operations and strategic initiatives (e.g. biosolids, air quality, regional growth, regulatory function, procurement);
- Compile existing life cycle analysis (LCA) and/or support new LCA to compare recycling to disposal for each product and material;
- Further the discussion on virgin material subsidies and quantify the true cost of virgin resource extraction as compared with using recycled materials;
- Collaborate with Senior Governments and other partners to explore further opportunities to encourage or require industry to better design products for the environment (reduced packaging, ability to disassemble and deconstruct etc.);
- Explore strategies for further dematerializing consumption;
- Conduct a detailed review of the MMBC documents in the context of this report and lobby Provincial Government to ensure MV concerns are registered in their Product Stewardship Plan;
- Conduct a detailed analysis of the downcycling and downgrading of materials within these markets and what MV can do to encourage the highest and best use of materials; and,
- Review all opportunities and develop a set of recommendations on how to address them individually and where synergies apply. Review EPR Plans, and interview Product Steward representatives and Provincial Government to see how opportunities listed in this study can be further leveraged through existing and future EPR Plans.
11.0 CLOSURE

We trust this report meets your present requirements. These commodity summaries are written to highlight overall market trends while respecting the confidential nature of the information shared by market experts. If you have any questions or comments, please contact the undersigned.

Sincerely,

EBA Engineering Consultants Ltd.
Cascadia Consulting Group

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REFERENCES

Section 3.0 Carpet


Section 4.0 Electronics


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Waste and Recycling News (WRN), 2012. Current and historic commodity market prices for sorted recyclable glass, metals, paper, and plastic are available to members at: http://www.wasterecyclingnews.com/smp/


Section 5.0 Glass


**Section 6.0 Organics**


http://www.worksafebc.com/contact_us/research/funding_decisions/assets/pdf/2006/RS2006_OG08.pdf

Section 7.0 Paper


Waste and Recycling News (WRN), 2012. Current and historic commodity market prices for sorted recyclable glass, metals, paper, and plastic are available to members at: http://www.wasterecyclingnews.com/smp/

**Section 8.0 Plastics**


Waste and Recycling News (WRN), 2012. Current and historic commodity market prices for sorted recyclable glass, metals, paper, and plastic are available to members at: http://www.wasterecyclingnews.com/smp/

Section 10.0 Conclusions


APPENDIX A
EBÁ’S GENERAL CONDITIONS
GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

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

1.0 USE OF REPORT AND OWNERSHIP

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

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

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

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

SWOT SUMMARY TABLES BY TARGET RECYCLABLE MATERIAL
## SWOT Summary – Carpet

<table>
<thead>
<tr>
<th>Processing Stage</th>
<th>Collection</th>
<th>Material Recovery Facility (MRF)</th>
<th>Processing</th>
<th>Re-manufacturing/End Markets</th>
</tr>
</thead>
</table>
| **Strengths**    | • Initial collection through retailers or depots - even with trucking to distant locations - will help to develop initial collection infrastructure  
• CCME Canada-wide Plan sets carpet for Extended Producer Responsibility (EPR) implementation by 2017, which will stimulate collection infrastructure and likely processing as well  
• Some used carpet is collected and sold for reuse | • Not applicable | • Demand by carpet manufacturers for recycled material continues to grow | • Consumer demand for recycled-content products exists locally and is expected to continue to grow in future. |
| **Weaknesses**   | • Collection of used carpet for recycling in Metro Vancouver is very limited  
• Storing and transporting carpet to distant recycling facilities is expensive | • In the absence of a disposal ban, carpet collectors (through contractors) and processors must be able to charge carpet removal and/or tipping fees that are equivalent to, or slightly lower than, fees for disposal, and must be equally convenient for haulers | • No processing facilities exist in Metro Vancouver or BC | • No re-manufacturing facilities exist in Metro Vancouver or BC |
| **Opportunities**| • Support business development for post-consumer carpet collection and processing by providing assistance to businesses. Metro Vancouver could:  
− Facilitate the siting of collection and processing facilities and/or work with municipalities to further establish and expand eco-industrial zones as per Section 2.3.3 of the Integrated Solid Waste and Resource Management Plan (ISWRM)  
− Work with carpet recyclers to identify, train and support new business partners in the region to collect post-consumer carpet  
− Establish a policy to encourage or require carpet recycling. Metro Vancouver could:  
− Declare the intent to ban carpet disposal and; time it to complement any EPR plan  
− Work with regional and provincial government leaders to harmonize programs and policies across jurisdictions | • Not applicable | • Support the commercialization of promising post-consumer carpet processing technologies through grants or business tax credits | • Support for closed loop recycling or market development for recycled carpet components could help ensure the highest use of materials. Metro Vancouver could:  
− Engage senior government and Product Stewards during the development of the carpet EPR plan to ensure highest use of materials  
− Collaborate with carpet recyclers to connect with, or develop and markets for Polystyrene Terephthalate (PET) and Polypropylene (PP) from post-consumer carpet  
− Work with municipalities to facilitate the siting of private sector recycling activities, as per Strategy 2.3.3 in the Integrated Solid Waste and Resource Management Plan (ISWRM)  
− Refine procurement practices to include best practices such as leasing, using carpet squares, and including recycled-content specifications; encourage businesses to follow suit. |
| **Threats**      | • The supply of post-consumer carpet fluctuates with demolition and construction activity  
• It may be difficult to find a suitably convenient site for a collection facility in Metro Vancouver  
• As long as there is no processing capacity in the region, high shipping costs will limit the cost-effectiveness of carpet collection for recycling  
• Public awareness about the potential for carpet recycling is limited  
• The cost to remove and recycle carpet exceeds disposal costs and does not encourage its recycling | • Current carpet recycling and remanufacturing technology is not optimal; recyclers must often choose between high yield and high quality in process outputs | • Not applicable | • Markets for PET and PP from recycled carpet are weak or non-existent  
• Recycled Polystyrene Terephthalate (rPET) from beverage containers is being down cycled and added to the recycled-content carpet market instead of being used for higher quality resin materials  
• Calcium carbonate has lower value markets  
• Nylon and PP markets are volatile |
### SWOT Summary – Electronics and Small Appliances

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<tr>
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</table>
| **Strengths**    | • As per Strategy 2.2.1 (d) of the Integrated Solid Waste and Resource Management Plan (ISWRM), electronics are banned from disposal to support provincial EPR programs  
• Electronics are collected for recycling through the provincial EPR programs via four collection pathways including return to retail, depots collection events, and onsite  
• The amount of regulated electronics in the disposed waste stream dropped by more than 80 percent between 2004 and 2009  
• For functioning electronics, opportunities to collect for reuse and refurbishment are available | • Some MRFs that sort blue box materials also divert electronics, either through collection or diverting from recyclables | • Material composition is shifting; the transition from Cathode Ray Tubes (CRTs) to flat panel screens comes with a reduction in hazardous materials  
• Contamination is largely not an issue for electronics and small appliance recycling  
• Metals make up about 30 percent of the total weight, and most of the value, of electronics  
• Electronics processors are held to high recycling standards for protecting workers and the environment; five BC recyclers exist | • Global demand for electronics continues to grow, which helps to improve the financial viability of electronics recycling  
• As EPR expands in BC and elsewhere, electronics manufacturers may find opportunities to incorporate other reclaimed materials from recycled electronics into new products  
• EPR has grown electronics recycling into a strong industry, especially in Metro Vancouver |
| **Weaknesses**   | • The infrastructure is not adequate to collect a growing variety of related products.  
• Small appliance collection is new, and more limited, but will expand over time. Metro Vancouver could:  
  - Bolster electronics recycling by supporting expansion of the collection infrastructure and promoting recycling programs to residents  
  - Development or building permit requirements could require the space allocation for the in-house collection of EPR products  
• Expansion of electronics Extended Producer Responsibility (EPR) provides an opportunity to expand and enhance the collection infrastructure. Metro Vancouver could:  
  - Visit electronics recycling through the provincial EPR programs via four collection pathways including return to retail, depots collection events, and on site  
  - The amount of regulated electronics in the disposed waste stream dropped by more than 80 percent between 2004 and 2009  
  - For functioning electronics, opportunities to collect for reuse and refurbishment are available | • There is a high level of downcycling and downgrading of product material types  
• Electronics and small appliances have grown as a portion of the waste stream  
• Material composition is shifting; more efficient circuitry is resulting in less use of recoverable precious metals and rare earth minerals  
• Material composition is shifting; a higher percentage of plastic, that tend to be lower value material, is being used in electronics | • Electronics and small appliances have grown as a portion of the waste stream  
• Material composition is shifting; more efficient circuitry is resulting in less use of recoverable precious metals and rare earth minerals  
• Material composition is shifting; a higher percentage of plastic, that tend to be lower value material, is being used in electronics | • Not applicable |
| **Opportunities**| • MRFs could more actively divert electronics from materials collected | • There may be some opportunity to develop alternative end markets for CRT components. Metro Vancouver could:  
  - Assist recyclers’ efforts to identify alternative end markets for CRT components by working with the provincial government to provide clarity about which/how components are classified as hazardous  
• Opportunities exist to improve consumer access to recycled-content products. Metro Vancouver could:  
  - Collaborate with the province and Product Stewards to encourage or require the advancement of recycled-content requirements in products and design for the environment (e.g. improve durability, upgradability and disassembly options, use easily recyclable materials)  
  - Establish procurement practices to require electronics with highest recycled-content, lowest energy consumption, options to upgrade and/or lease, maximum durability, and lowest amounts of hazardous material/greenest products  
• Opportunities also exist to increase reuse through repair and rebuild businesses. Metro Vancouver could:  
  - Work with the Province and Product Stewards to legislate and re-vitalize a repair/rebuild industry for electronics and small appliances | • Opportunities exist to improve consumer access to recycled-content products. Metro Vancouver could:  
  - Collaborate with the province and Product Stewards to encourage or require the advancement of recycled-content requirements in products and design for the environment (e.g. improve durability, upgradability and disassembly options, use easily recyclable materials)  
  - Establish procurement practices to require electronics with highest recycled-content, lowest energy consumption, options to upgrade and/or lease, maximum durability, and lowest amounts of hazardous material/greenest products  
• Opportunities also exist to increase reuse through repair and rebuild businesses. Metro Vancouver could:  
  - Work with the Province and Product Stewards to legislate and re-vitalize a repair/rebuild industry for electronics and small appliances |
| **Threats**      | • New recycling depots face multiple barriers to opening and the space in existing retail stores is limited  
• If Eco-Centres are established without consideration of other collection sites, existing businesses could be threatened | • Not applicable | • The limited capacity of smelters and CRT processors is a major concern for the industry  
• Costs rather than technology are often the limiting factor in electronics recycling  
• While end markets exist for most components, prices are not sufficient which sometimes results in primary recyclers paying secondary processors to accept materials  
• Plastics from electronics have very low value; they are often made with mixed or unidentified resins, darker colours and treated with fire retardants | • End markets for CRT glass are almost saturated |
## SWOT Summary – Glass

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<td>As per Strategy 2.2.1 of the Integrated Solid Waste and Resource Management Plan (ISWRM), glass is banned from disposal</td>
<td>Provincial PPP EPR legislation will potentially offset current costs for handling curbside glass</td>
<td>Metro Vancouver’s refundable glass beverage containers collected at depots, licensed by Encorp, are processed by United Concrete, and recycled back into bottles</td>
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<td>BC’s Recycling Regulation mandates a deposit-refund system, which drives current high levels of recovery at capture rates of over 90 percent</td>
<td>Refillable beer bottles are managed by Brewers Distributor Ltd. and reused an average of 15 times before being recycled</td>
<td>Demand for high-quality, clean glass is strong and growing</td>
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<td>Provincial packaging and printed paper (PPP) Extended Producer Responsibility (EPR) legislation, which goes into effect in 2014, will likely increase the capture rate of non-refundable glass containers</td>
<td>MRFs send some non-refundable curbside glass containers to United Concrete, who recycles it into a sandblasting abrasive product</td>
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<td>Curbside and drop off recycling programs capture approximately 70 percent of non-refundable glass bottles and jars</td>
<td>United Concrete has capacity to process 30-50 percent more container glass</td>
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<td>A number of Metro Vancouver bottlers use product destruction companies to manage unmarketable and expired beverage products</td>
<td>Processors receive $30-50 per tonne for refundable glass beverage containers.</td>
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<td><strong>Weaknesses</strong></td>
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<td>Curbside collection causes breakage and the mixing of cutlet which adversely affects the quality of glass available for recycling</td>
<td>MRFs are able to find outlets for curbside glass but prices are very low</td>
<td>No local markets exist for remanufacturing non-refundable curbside glass, which is downcycled for sand blasting abrasive and for use in construction</td>
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<td>With the onset of new PPP EPR programs, collection systems could be diversified and adapted to improve quality of non-refundable glass containers (e.g. drop off sites)</td>
<td>Excessive amounts of broken glass have the potential to reduce bale quality for other recyclable commodities</td>
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<td>Improvements to collection could be explored, such as collecting through depots only, to avoid damage to non-refundable beverage containers</td>
<td>Broken glass has potential to be a health and safety concern to workers</td>
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<td>Many MRF operators do not sort out glass beverage containers for deposit given that the material is harder to manage and often breaks prior to sorting</td>
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<tr>
<td><strong>Opportunities</strong></td>
<td></td>
<td>With the onset of new PPP EPR programs, MRFs may have the opportunity to further refine processing systems to more easily extract glass refundable containers and manage curbside non-refundable containers to maximize highest and best value</td>
<td>Providing a better range of homogeneous cutlet, processors will maintain the material value and avoid down-cycling</td>
<td>Establishment of a glass recycling and remanufacturing facility in the region could make recycling of curbside glass financially sustainable</td>
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<td>Similar to collection, there may be opportunity for MRFs to receive compensation from Product Stewards for non-refundable glass</td>
<td>Business opportunities exist to further promote the refillable glass containers given their durability and inert nature. Metro Vancouver could:</td>
<td>– Metro Vancouver could encourage the siting of a new facility or for an existing facility to add processing equipment or incorporate recycled glass into new containers, as per Strategy 2.3.3 in the ISWRM</td>
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<td></td>
<td></td>
<td>With the onset of new PPP EPR programs, MRFs may have the opportunity to further refine processing systems to more easily extract glass refundable containers and manage curbside non-refundable containers to maximize highest and best value</td>
<td>Metro Vancouver could:</td>
<td>– Local users may have additional glass recycling capacity in the future</td>
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<td>– Metro Vancouver could monitor glass recycling companies to keep track of expanded opportunities</td>
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<td>– PPP EPR implementation could represent an opportunity to positively change the landscape for local glass recycling and promote pollution prevention hierarchy principles by reusing and recycling more glass back into bottles.</td>
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<td>– Metro Vancouver could monitor changes in the glass packaging supply and collection system under the new PPP EPR program, or take a more active role, representing the interests of municipalities and local industries and attempting to influence decisions that advocate for highest and best use of materials (e.g. refillable containers and bottle-to-bottle recycling)</td>
</tr>
<tr>
<td><strong>Threats</strong></td>
<td></td>
<td>Contaminants in recycled glass, particularly ceramics, compromise the structure of bottles</td>
<td>When factoring in transportation costs, MRFs are paying to recycle curbside glass</td>
<td>Transforming curbside glass into a clean feedstock for remanufacturing is challenging, twice as much material as bottle depot glass is needed for the same yield</td>
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<td>Collection systems with high breakage levels will reduce viability of reuse and making bottles, and instead using cutlet for downcycling</td>
<td>The region lacks processing diversification with only one company performing this function</td>
<td>High freight costs limit access to other markets and may contribute to further decline of glass use</td>
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<td>– Long-term glass recycling may have a negative impact on the market due to continuing high freight costs</td>
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### SWOT Summary – Organics

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<tr>
<th>Processing Stage</th>
<th>Collection</th>
<th>Re-manufacturing</th>
<th>End Markets</th>
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<tbody>
<tr>
<td><strong>Weaknesses</strong></td>
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<tr>
<td></td>
<td>Processing</td>
<td>Capacity exists and continues to grow; current compost capacity in the region is over 300,000 tonnes</td>
<td>Targeted for increased recycling in ISWRM</td>
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<tr>
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<td>Stage</td>
<td>There are two facilities licensed to accept food scraps along with other compostable items, and one will increase food scraps process capacity by adding an anaerobic digester in 2012</td>
<td>Policies and bylaws are expected to significantly increase diversion; disposal ban is to be phased in by 2015</td>
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<td>One facility in the eastern part of the region is expected to come online in 2012 and will have food scraps processing capacity</td>
<td>Curbside collection is becoming established, materials to be collected is consistent across programs</td>
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<td>Innovative onsite organics management systems are being piloted in the region</td>
<td>Policies and bylaws are being phased in to ensure feedstock to supply facilities and encourage entrepreneurial innovation</td>
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<td>Several barriers exist for new organics management facilities seeking to get established in the region</td>
<td>Pricing of final product may decrease as more finished compost enters the market place, depending on what actions are taken to stimulate end use of materials</td>
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<td>Limited facilities, long travel periods, considerable road and air quality effects over time</td>
<td>Policies and bylaws are being phased in to ensure feedstock to supply facilities and encourage entrepreneurial innovation</td>
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<td>With two primary facilities and a concentrated potential tonnage to be handled at just one facility, the region lacks diversification in processing capacity that would keep system in balance should a primary facility shut down for unforeseen reasons</td>
<td>Policies and bylaws are being phased in to ensure feedstock to supply facilities and encourage entrepreneurial innovation</td>
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<td><strong>Opportunities</strong></td>
<td></td>
<td>Encourage diversification of processing facilities to decrease transportation costs,</td>
<td>Encourage standards and facilitate the research and development of higher-value applications. Metro Vancouver could:</td>
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<td>build capacity to process more food scraps, and produce a wider range of end products. Metro Vancouver could:</td>
<td>– Work with the Compost Council of Canada to promote Quality Control programs and collaborate with facility operators and Universities on research and development to produce higher quality composts</td>
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<td>– Work with municipalities to establish guidelines and streamline permitting processes</td>
<td>Develop procurement policies and encourage use of compost to expand existing markets and establish new markets. Metro Vancouver could:</td>
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<td>– Work with municipalities to facilitate the siting of private sector recycling activities, as per Strategy 2.3.3 in the ISWRM, which includes specifying available land for geographically dispersed facilities</td>
<td>– Work with the BC Landscape Architect Association and the BC Landscape and Nursery Association to modify Landscape Standards to specify Class A compost use</td>
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<td>– Work with regional and Senior Governments to harmonize policies and practices to regulate production and promote compost use. Metro Vancouver could:</td>
<td>– Provide template standards to mandate that construction permits require use of locally produced Class A compost, and work with municipalities and Senior Government to promote legislation to mandate the use of Class A compost (e.g. in construction permits and for roadside application)</td>
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<td>– Consider the effect of subsidized biosolids in the local marketplace and explore solutions</td>
<td>– Help to establish best practices and provide technical assistance for onsite composting initiatives</td>
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<td>Work with facility operators and other partners to increase distribution for locally produced compost from municipal solid waste (MSW) sources</td>
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<td>Engage provincial leaders to identify strategies to ensure broader compliance and enforcement with Organic Matter Recycling Regulation (OMRR) and Agricultural Land Commission (ALC) composting regulation parameters, to ensure a level playing field; address WorkSafe requirements improvements and convene representatives from multiple levels of government to harmonize pesticide reduction efforts</td>
<td>– Engage provincial leaders to identify strategies to ensure broader compliance and enforcement with Organic Matter Recycling Regulation (OMRR) and Agricultural Land Commission (ALC) composting regulation parameters, to ensure a level playing field; address WorkSafe requirements improvements and convene representatives from multiple levels of government to harmonize pesticide reduction efforts</td>
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<td>Work with appropriate partners to develop franchise zones to increase collection efficiency and reduce collection costs for businesses</td>
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<td>The agricultural sector may be a great source of complementary organic feedstocks and could be included more on future organics initiatives</td>
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</table>
### Threats

- Collection costs are higher due to inefficient collection for ICI and MF residential; multiple haulers cover the same area and no franchise zones are established
- The fee structure has not advanced enough to make collection cost effective, split trucks are not yet used to add efficiency by carrying multiple materials, and recycling fees not embedded in overall cost
- Contaminants are being monitored closely, given that they increase production costs and they risk ending up in the final product
- Private enterprise facilities limit government control over material flow and prioritizes profitability over triple bottom line planning
- Several level playing field issues exist due to regulatory and enforcement inconsistency
- Compost facilities sited on ALR lands benefit from cost savings that they can pass along to the customer to be more competitive
- The supply of carbon, which is an important component for the composting process, is gradually declining as mills close, export of raw logs continues, and biomass/cogeneration plants use carbon for energy
- Competing, lower-cost bulk materials, including composted biosolids, mineral soil, wood chips, and agricultural manures are often used in place of compost from MSW organics
- The overabundance of nutrients in the region adds a layer of complexity to developing the compost market
- As moderate-grade compost is used most often by landscapers and developers, there’s a risk that results from compost use are not as productive as they could be, which affects perception of the value of compost
### SWOT Summary – Paper

<table>
<thead>
<tr>
<th>Processing Stage</th>
<th>Collection</th>
<th>Material Recovery Facility (MRF)</th>
<th>Re-manufacturing/End Markets</th>
</tr>
</thead>
</table>
| **Strengths**    | • As per Strategy 2.2.1 of the Integrated Solid Waste and Resource Management Plan (ISWRM), paper is banned from disposal, which has had a positive effect on diversion, especially as it pertains to old corrugated cardboard (OCC) recovery  
• Residential and industrial, commercial and institutional (ICI) programs are becoming more established, yet have potential to further maximize diversion  
• Provincial packaging and printed paper (PPP) recycling legislation will likely affect recycling systems and has the potential to increase supply  
• All MRF operators interviewed have established relationships with Northwest mills  
• Markets for paper are considered strong overall and recovered paper export demand continues to drive prices  
• Particularly since the price drop in recycling markets at the end of 2008, companies are protecting their relationships with domestic mills; approximately 32 percent of recovered paper stays domestic  
• Brokers report that domestic markets may yield prices above export sales for high quality separated materials, especially when markets are in decline | | |
| **Weaknesses**   | • Single stream results in a higher percentage of mixed waste paper, and less sorting by paper grades at the collection level, which results in material downgrades  
• Contaminants such as glass shards (especially from out-of-region commingled bales), can lower the value of paper products | • Contaminants such as glass shards (especially from out-of-region commingled bales), can lower the value of paper products  
• Since 2010, the last two large remanufacturing facilities for recovered paper have closed or curtailed operations  
• Demand for paper products in domestic markets has declined | |
| **Opportunities**| • Expanded education could reduce contamination and influence consumer choices. Metro Vancouver could:  
  - Collaborate with municipalities to increase recycling education  
  - Promote revenue sharing as a way for municipalities and larger commercial businesses to recoup a portion of processing costs  
  - Continue to establish and enforce policy drivers to maximize diversion, including disposal bans, garbage fee increases, and revenue sharing contract design  
  - Further strengthen enforcement of disposal bans and use garbage fee increases  
• Sort paper to recover the highest and best value for each grade  
• Continue to maintain relationships with domestic (North American) buyers and seek local markets as available  
• Create incentives for local remanufacturing. Metro Vancouver could:  
  - Develop resources and encourage municipalities to specify local markets in contracts, as markets permit  
  - Provide technical assistance and access to available incentive programs for start-up and existing companies, from larger re-manufacturers to “boutique” operations to serve niche markets, and work with Universities on research and development of these markets  
  - Encourage upgrades to existing processing facilities or the establishment of new facilities. This could be done through municipal property tax breaks and BC Hydro energy rebates and incentives  
• Transportation and efficient infrastructure needs to continue to improve. Metro Vancouver could:  
  - Continue to work with other regional and Senior Government leaders to promote infrastructure development  
• Government procurement policy and practices can be a tool to advance the use of recycled products. Metro Vancouver could:  
  - Actively work internally and with Senior Government to establish more recycled-content procurement policies and practices  
  - Actively advocate for recycled-content legislation with Senior Governments  
  - Work with municipalities to facilitate the siting of private sector recycling activities, as per Strategy 2.3.3 in the ISWRM, including those related to paper | • Export shipping challenges include availability of containers, congested Port Metro Vancouver, increased hauling time due to more congested roadways  
• While domestic shipping is more convenient and has a lower cost, additional factors such as border crossing and increased fuel costs affect profit margins  
• Increasingly-contaminated paper bales negatively affect domestic re-manufacturers, and making the business case for local remanufacturing of paper has become very difficult  
• Market experts are concerned about the long term viability of export markets | |
| **Threats**       | • Single stream collection can lower paper bale grade due to contaminants (thorough processing can offset this issue to a certain extent, but requires more labour and resources) | | |

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*Appendix B: SWOT Summary FINAL.docx*
### SWOT Summary – Plastic

<table>
<thead>
<tr>
<th>Processing Stage</th>
<th>Collection</th>
<th>Material Recovery Facility (MRF)</th>
<th>Processing</th>
<th>Re-manufacturing/End Markets</th>
</tr>
</thead>
</table>
| **Strengths**    | • As per Strategy 2.2.1 of the Integrated Solid Waste and Resource Management Plan (ISWRM), plastics #1,2,4,5 are banned from disposal  
• As per Section 2.8, plastics are targeted for increased recycling, which includes cooperating with retail partners to reduce the use of disposable packaging.  
• Provincial Recycling Regulations mandate a deposit-refund system for beverage containers, which collects a large share of plastics with high recycling potential  
• Most MRFs separate and bale non-refundable Polyethylene Terephthalate (PET), High Density Polyethylene (HDPE) - neutral and pigmented, and plastic film to recover maximum value for materials  
• Both single-stream MRFs currently have surplus capacity, and there is sufficient capacity for current collection levels at multi-stream MRFs  
• Refundable plastics are sent directly to a local Product Steward-contracted processor, while plastics from municipal and commercial programs are sorted at MRFs and then sent to the local processor  
• Demand for recycled resins is still on the rise; Asian demand for plastic feedstock of all resin types is growing, and the export market will remain strong over the long-term, especially for lower-value or mixed-material loads  
• The trend of plastic replacing glass packaging should continue in favour of lower energy costs  
• Regional demand for feedstock also exists, but the quality requirements are higher  
• A large portion of plastics collected in Metro Vancouver is sold as pellets or flakes to manufacturers and plastics compounders in the US or in Canada, including a few BC firms.  
• There is some regional capacity for recovering expanded polystyrene  
• Demand for recycled-content products is increasing, which could drive up prices  
• Market prices for recycled plastics of all marketable resin types have increased over the past three years. | |
| **Weaknesses**   | • Increasing single-stream curbside recycling has had mixed effects; it has potential to increase processing time, and decrease quality and the value of resulting feedstock due to higher contamination and the presence of other, lower value resin types  
• As collection and composting of organics grows, more bioplastics are likely to appear in the plastics recycling stream, becoming a potential contaminant  
• Sorting technology continues to improve; nevertheless, contamination is higher, especially with the increase of single-stream collection and the growing list of collected plastic  
• Plastics #3-7 are usually baled together, even though #4 and 5 plastics are considered higher value material  
• Given there’s only one local processor, there would be no other processing alternative if the company were to shut down  
• For some markets—especially lower-quality bales—local recycling markets are weak or non-existent  
• Most #3-7 plastics are exported and do not have local markets  
• Plastic resins have limited reuse and re-manufacturing opportunities given the nature of the material  
| |
| **Opportunities**| • Provincial packaging and printed paper (PPP) Extended Producer Responsibility (EPR) regulation will likely increase the supply of plastics collected for recycling, including plastics with no processing infrastructure or end markets. Metro Vancouver could:  
  - Continue to strongly advocate for the recycling industry as the PPP system transitions to manufacturer responsibility  
  - Educate public on value of purchasing items with less packaging, especially for plastic, given challenges around reusing or recycling (vs. downgrading) lower quality plastics  
  - Sort plastic resins to recover the highest and best value for each grade  
  - Continue to maintain relationships with domestic (North American) buyers and seek local markets as available  
  - Provincial PPP EPR may lead to expanded processing for expanded polystyrene and other plastic packaging with currently low recycling rates  
  - Innovative sorting, processing, and remanufacturing technologies may create new possibilities for cost-effective plastics recycling and recovery as plastics market share continues to grow. Metro Vancouver could:  
  - Monitor the technological developments in the plastics recycling industry, encourage municipalities to provide appropriate zoning and siting assistance, and help local businesses take advantage of new opportunities  
  - Government procurement policy and practice can be a tool to advance the use of recycled products. Metro Vancouver could:  
  - Continue to encourage provincial and municipal purchasing of recycled-content products and set policies for its own departments  
  - Work with municipalities to facilitate the siting of private sector recycling activities, as per Strategy 2.3.3 in ISWRM  |
| **Threats**      | • Single-stream collection may make it harder to market recycled plastics to regional manufacturers  
• The increased use of a variety of resin types in one container to ensure the integrity of the product has the potential to increase the amount of lower-quality plastics on the market (i.e. #7)  
• The movement to single-stream increases processing costs, so material is less likely to be sorted by resin type, which could exacerbate the trend towards downgrading and downcycling plastics  
• Fuel production from plastics is lower on the pollution prevention hierarchy, as compared to reducing, re-designing, reusing, and recycling plastics, and could be perceived as a deterrent to designing for environment  
• Transport to end markets—both domestic and international—is increasingly difficult and is expected to cost more with rising fuel prices (although it may increase the value of recycled products over virgin products over time)  
• By relying on markets that accept lower-value containers and products, there’s a risk that producers will continue to avoid reducing these items in products and packaging, even with the introduction of Provincial PPP EPR legislation  | |

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*Source: SWOT Summaries FPR04.doc*
APPENDIX C
ICI PPP TECHNICAL MEMO
1.0 INTRODUCTION

EBA Engineering Consultants Ltd. operating as EBA, a Tetra Tech Company (EBA) was retained by Metro Vancouver to address information needs related to packaging and printed paper (PPP) in the industrial, commercial and institutional (ICI) sector. EBA worked in partnership with subcontractor Cascadia Consulting Group to complete this work as part of the larger Metro Vancouver Recycling Market study.

The following three questions are addressed in this memo for ICI materials generated in Metro Vancouver:

1. Section 2.0 addresses What percentage of PPP from the ICI sector is disposed vs. diverted for recycling?
2. Section 3.0 addresses Where do diverted and non-diverted PPP materials from the ICI sector end up?
3. Section 4.0 addresses What are the barriers to diversion of ICI PPP materials?

Section 5.0 Closure presents a brief conclusion. Three appendices follow the main memo and provide general conditions, a table showing which material types were categorized as PPP, and quantities of waste disposed at facilities located in FVRD and Eastern MV.

This work supports the BC Ministry of Environment’s Extended Producer Responsibility (EPR) programs, which shifts responsibility for public to private sector for end of life management of materials. Metro Vancouver’s Integrated Solid Waste and Resource Management: a Solid Waste Management Plan (ISWRM) lists monitoring performance of EPR programs as one of the key performance measures for Goal 2: Maximize reuse, recycling and material recovery (Metro Vancouver, 2010a).
2.0 ICI PPP DISPOSED AND DIVERTED ESTIMATES

Disposed and diverted quantities of PPP from the ICI sector were calculated using the following steps.

Disposed Quantities

1. In consultation with the BC Ministry of Environment and Metro Vancouver, the list of materials from the most recent Metro Vancouver waste characterization study was evaluated to identify PPP materials (Metro Vancouver, 2011). See Appendix B Waste Composition Categories.

2. The ICI quantities (tonnes) were summed for all of the PPP-designated categories.

Diverted Quantities

1. Total quantities diverted for Metro Vancouver were calculated for Paper, Plastic, Glass, and Metal.
   - For Paper and Plastic, quantities were based on interviews with local material recovery facilities (MRFs).
   - For Metal and Glass, the total quantity recycled was drawn from the 2010 recycling and solid waste management annual report (Metro Vancouver, 2010b).

2. For each of the recycled quantities for the four material classes, the percent PPP was calculated.
   - Paper. It was assumed that 100 percent of paper materials will be classified as PPP.
   - Glass. Recyclable glass that does not currently have a deposit will likely be included as PPP. Non-refundable glass as a portion of total recyclable glass was calculated to be 46% based on an interview with a large local MRF.
   - Plastic. All recyclable plastic that does not currently have a deposit will likely be included as PPP.
   - Metal. As with glass and plastic, recyclable metal that does not currently have a deposit will likely be included as PPP. The portion of metal that will be included as PPP (6%) was based on the ratio of PPP material quantities to total metal disposed. It was calculated by summing the quantities of metal PPP categories in ICI waste (1,468 tonnes) and dividing by total ICI disposed metal (26,099 tonnes).

3. For each of the recycled quantities for the four material classes, the percent ICI was calculated.
   - For Paper, Plastic, and Glass, the portion of ICI recycling to total ICI and residential recycling was calculated from the 2010 recycling and solid waste management annual report (Metro Vancouver, 2010b).
   - For Metal, 100 percent was used, as the percent PPP, calculated in Step 2 above, reflected only the ICI portion.

4. For each material class, the total recycled quantity for Metro Vancouver was multiplied by the percent PPP and the percent ICI.
The below table summarizes the diverted and disposed quantities of ICI PPP for Metro Vancouver in 2010 and the resulting recycling rates.

### Table 1: Diverted and Disposed Quantities of ICI PPP for Metro Vancouver (2010)

<table>
<thead>
<tr>
<th>Material</th>
<th>Total Recycling (Tonnes)</th>
<th>Percent PPP</th>
<th>Percent ICI</th>
<th>ICI PPP Recycling (Tonnes)</th>
<th>ICI PPP Disposed (Tonnes)</th>
<th>Percent Recycled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>322,413</td>
<td>100%</td>
<td>62%</td>
<td>199,532</td>
<td>67,264</td>
<td>75%</td>
</tr>
<tr>
<td>Glass</td>
<td>14,820</td>
<td>46%</td>
<td>2%</td>
<td>155</td>
<td>1,196</td>
<td>11%</td>
</tr>
<tr>
<td>Plastic</td>
<td>19,854</td>
<td>100%</td>
<td>43%</td>
<td>8,620</td>
<td>41,426</td>
<td>17%</td>
</tr>
<tr>
<td>Metal</td>
<td>10,899</td>
<td>6%</td>
<td>100%</td>
<td>613</td>
<td>1,468</td>
<td>29%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>208,920</td>
<td>111,354</td>
<td></td>
</tr>
</tbody>
</table>

### 3.0 ICI MATERIALS DESTINATION

#### 3.1 ICI PPP Materials Diverted and Disposed Outside Metro Vancouver

For the purpose of addressing this aspect of the overall study, non-diverted PPP materials are defined as those unsorted PPP products and materials shipped from the lower mainland (defined as the Fraser Valley Regional District (FVRD) and MV) to an external jurisdiction. These ICI PPP materials are included in the waste. External jurisdictions will be defined as those outside the regulatory control of the FVRD and MV Solid Waste Management Plans including: Federal Land (First Nations property); the United States, and other Regional Districts.

Anecdotal information is provided, where available, on the inter-jurisdictional flow of PPP materials between MV and the FVRD. However, based on transportation routes, geography, markets, and proximity, it is assumed the data is incomplete and has limited accuracy.

#### 3.2 ICI Materials Destination

The purpose of this section is to identify the facilities where disposed PPP materials from the ICI sector end up and to estimate the quantities of paper, glass, metal and plastic this represents.

It is clear that haulers with facilities located in the FVRD collect ICI PPP related materials generated in MV; however, no figures are available to quantify the amounts. The FVRD facilities referenced are Abbotsford Mission Recycling Program, BFI Transfer Station, Capt ‘N’ Crunch Transfer Station, and the First Class Transfer Station. Additionally, interviews revealed that some MRFs in MV may be shipping materials into the US for disposal if loads are too contaminated to recycle. Again, the only information on this issue is anecdotal in nature and cannot be verified. For this reason, estimating ICI PPP materials being exported through diversion or otherwise from MRF will not be considered further in this report.
3.3  Research Approach

The research approach taken was to gather anecdotal information from a variety of sources within the existing private and public sectors and compare that to existing factual information gathered from validated sources.

3.3.1  Sources

In order to establish an understanding of the current flow of these PPP materials and products to outside jurisdictions, the following efforts were made to gather this information:

- In person and telephone interviews were conducted with key representatives of regional and Federal government and private companies as follows:
  - Wastech Inc.
  - MV
  - FVRD
  - Cascades Recovery
  - Abbotsford Mission Recycling Program
  - BFI Transfer Station

- The questions were as follows:
  - Do you have any factual information collected on the export of disposed and diverted mixed recyclables that are being exported out of the lower mainland or between the FVRD and MV?
  - Are you aware of any other sources for this information? Any other key contacts?
  - What key facilities are you aware of that receive these materials?
  - Do you have any sense of the quantities and types (e.g. tonnes, volume, # of trucks, etc.)?
  - Do you think these materials are being accounted for in the MV annual waste and diversion estimates?
  - What is your overall impression of the flow of ICI PPP material and products in and out of the lower mainland? Do you have any suggestions on how to improve overall MV diversion in the lower mainland and to improve the tracking and/or stem the flow of these materials and products?

- A review of website information for landfills located on Federal Land and transfer stations that export to the US.

- A review of available literature pertaining to each of the facilities in the FVRD.
3.4 Facilities

The following facilities were identified as those disposing of municipal waste that consists in part of recyclable products from the ICI PPP sector generated in MV.

3.4.1 Cheam Landfill

This landfill is located at 52496 W Victor Drive, Rosedale, BC and is owned and operated by the Cheam First Nation and is considered outside the jurisdiction of both MV and the FVRD. Current estimates show that the company running this facility has annual revenue of $1,262,560 and employs a staff of approximately 8 members. The current tipping rate is unknown and the landfill accepts mostly DLC waste, but also ICI and residential waste from reportedly a variety of hauling companies servicing the lower mainland. Based on the annual revenue divided by an assumed tipping fee of $40 per tonne, then approximately 31,500 tonnes could have at one time been entering the facility annually. Based on the lack of activity observed recently and the fact that no one is answering the company telephone, it is believed that this facility is no longer accepting any significant amount of waste.

The FVRD Solid Waste Management Plan, updated February, 2000, states that this facility is not authorized to accept MSW from the FVRD and that it is not a Federal permitted facility. Also, stated on page 28 of the Plan is the following paragraph: “This site is not permitted under the provincial or federal systems. This site accepts primarily DLC waste and some dry household waste from private haulers in the FVRD and GVRD. As this property does not comply with BC Environment standards for landfills, or this Plan, the Regional District does not sanction the delivery of waste to this site.”

3.4.2 Skway Landfill

The Skway Landfill reportedly disposes of DLC waste only and will no longer be considered further in this memo.

3.4.3 BFI Transfer Station

This transfer station (TS) loads intermodal containers and ships MSW to the Roosevelt Landfill, located in Sumas, Washington, via intermodal system. This facility was approved in the FVRD Solid Waste Management Plan in February, 2000 allowing MSW generated in the FVRD to be shipped to this facility.

Figures provided to the FVRD by BFI have been kept confidential; however, they are included in the overall total waste statistics provided by private facilities to the FVRD. Based on a telephone interview, a tipping fee of $92.35 is charged to customers for both garbage and recyclables. Batteries, tires, propane tanks and products collected by Product Care are not collected at this facility. Dry-wall is collected for a fee of $130 per tonne.

The FVRD Solid Waste Management Plan states the following on Page 15. “In addition to the above, significant quantities of putrescible household waste (collected primarily from multi-family dwelling units) is being disposed of at the Roosevelt Landfill in Washington State. This waste is being transported via a transfer station constructed by Salish Disposal Inc. in January of 1996.”
3.4.4 ‘First Class’ Transfer Station

First Class Waste Services opened up a Transfer Station on 63 West Railway, Abbotsford and may be in the midst of moving to another location in the vicinity. This company provides collection services for the ICI and residential sectors and is reportedly shipping waste across the border to the U.S. The disposal quantities for this facility are included in the total private facility figures.

3.4.5 Capt ‘N’ Crunch Transfer Station

This small transfer station is located at 34314 Vye Road, Abbotsford. Historically, mostly metal and wood waste has been accepted at this site. However, “other materials” are now accepted, as reported to the FVRD Board of Directors in February, 2011. It was also reported that they have been shipping waste into the US, which may include smaller amounts of refuse. The amount disposed at this facility is also included in the total quantity disposed at private facilities.

3.5 ICI PPP Materials Disposed at Facilities Outside MV

The following Table 2 provided by both the FVRD and MV provides the total amounts of waste disposed at or by each facility that currently is in operation and receives significant amounts of MV waste. All private facilities are reportedly shipping the majority of their waste to the U.S. The MV facilities impacted by the opening of private facilities have been included to identify the changes in annual amounts of waste received.

<table>
<thead>
<tr>
<th>Disposal Facility</th>
<th>MSW ( tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operators</td>
<td></td>
</tr>
<tr>
<td>Fraser Valley Regional District (all)</td>
<td>76,183</td>
</tr>
<tr>
<td>Metro Vancouver (Surrey, Matsqui, Maple Ridge)</td>
<td>242,079</td>
</tr>
<tr>
<td>Private Companies Located in FVRD</td>
<td>113,093</td>
</tr>
<tr>
<td><strong>Total Waste</strong></td>
<td><strong>431,355</strong></td>
</tr>
</tbody>
</table>

Based on the information provided in Table 2 (with detail included in Appendix C) and anecdotal information the following conclusions were drawn:

- Variation in total amount disposed from year to year does not reflect identifiable trends based on the boundaries of this analysis. The Surrey TS receives periodically waste from the Coquitlam TS, a catchment area outside of the Fraser Valley.

- There is a considerably greater relative impact by private transfer stations on FVRD public facilities than on MV facilities where there was an approximate 40 tonne decrease (in FVRD facilities) versus a
50 tonne increase (in private facilities) from 2006 to 2011, respectively. MV facilities increased approximately 10,000 tonnes over the same period.

- The total disposed at the private facilities includes both FVRD and MV waste and as such the waste cannot be differentiated between FVRD and MV generators; however, based on the original amounts in 2005 with the first transfer station opening (60,000 tonnes), adding the approximate 30,000 tonnes reduced over this time period at the Matsqui TS (operated on behalf of the FVRD by MV), it is reasonable to assume the 90,000 tonnes per annum are passing through private transfer stations in the FVRD from FVRD generated sources.

- The total difference from the total 113,093 tonnes being exported and 90,000 tonnes generated in the FVRD is approximately 25,000 tonnes expected to be coming from Metro Vancouver.

- Of this material, it is also suggested that it is mostly ICI garbage since most of the DLC could be handled at a lower rate at dedicated facilities on Federal Land.

A breakdown of ICI PPP from outside the region is extrapolated in the table below using 2010 MV waste composition date and the following assumptions:

- 25,000 tonnes of the total waste was generated from MV, and
- 100 percent of this waste is generated from the ICI sector.

### Table 3: Estimated Value of Recyclables in Metro Vancouver Exported Waste

<table>
<thead>
<tr>
<th>Category</th>
<th>MV Disposed 2010&lt;sup&gt;1&lt;/sup&gt; (tonnes)</th>
<th>Exported 2011 (tonnes)</th>
<th>Price Range (per tonne)</th>
<th>Estimated Total Value&lt;sup&gt;6&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>10,669</td>
<td>244</td>
<td>$13 to $35</td>
<td>$3,172 to $8,540</td>
</tr>
<tr>
<td>Paper</td>
<td>120,852</td>
<td>2,764</td>
<td>$74 to $120</td>
<td>$204,534 to $331,680</td>
</tr>
<tr>
<td>Plastic</td>
<td>52,468</td>
<td>1,200</td>
<td>$22 to $481</td>
<td>$26,400 to $577,200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>234,106</strong></td>
<td><strong>917,420</strong></td>
<td><strong>Value</strong></td>
<td><strong>$234,106 to $917,420</strong></td>
</tr>
</tbody>
</table>

**Notes:**

1. The total MV waste disposed in 2010 is 1,093,211 tonnes not including estimated 25,000 exported.
2. Metal is not included here due to the lack of information available.
3. Assumes that the portion of MV disposed.
4. Assumes composition of commodities in MV waste disposed is similar to waste being exported from MV.
5. Assumes exported waste is all ICI generated despite some waste being from multi-family residential.
6. Value estimates do not factor in costs of transporting, preparing, sorting, or delivering to buyers, which may exceed the market value.

- Based on relative component percentages of glass, paper, and plastic, as per Table 3 within this disposed waste, it is estimated that 1, 11, and 5 percent respectively are being exported to the US, which represents approximately $575,000 per annum.

- These estimates do not include ICI PPP generated in MV which is accepted at FVRD facilities or disposed by MV MRFs.
It is also assumed that multi-family residential units are a part of the ICI stream since they are collected primarily through private commercial contracts. It is not possible to estimate this relative percentage in the total leaving MV.

4.0 BARRIERS TO ICI PPP DIVERSION

The ICI sector can account for as much as 35 percent to 45 percent of the waste stream (excluding multifamily units and construction and demolition materials) (Bacot, McCoy, and Plagman-Galvin, 2002). Therefore, increasing ICI diversion can provide one strategy to increase overall waste management performance. In order to increase ICI diversion however, an understanding of the existing barriers is necessary.

A review of the literature revealed that barriers to ICI diversion tend to fall into one of five categories.

- Infrastructure
- Behaviour
- Financial Effectiveness
- End Markets
- Internal Operations

While all categories require consideration to maximize PPP diversion in the ICI sector, MRF operators and other market experts consistently addressed the lack of communication and education moving up through the collection chain. As noted in the infrastructure section below, hauling companies do not have adequate feedback loops in place to properly inform commercial customers about recycling requirements and other factors that could help to reduce contamination and maximize diversion. If concerns are raised, haulers risk having customers move onto another hauler, and this dynamic reinforces status quo. The need for ongoing education and technical assistance to ensure a high quality and quantity of material recovered was a consistent theme throughout interviews.

**Infrastructure**

The following barriers were identified in this category:

- Local governments lack sufficient funding to adequately address commercial educational needs
- Hauling companies do not properly inform commercial customers of recycling requirements or elevate recycling service pricing, since it is a disincentive for participation (especially without franchise zones)
- Businesses have limited recycling options
- Printers and copiers may not perform double sided printing/copying reliably
- Individual computer defaults are not double-sided
- Copier defaults are not double-sided
- Lack of recycling bins at work locations
- Lack of recycling bins at other strategic locations (e.g. copiers, shipping and receiving areas, and in employee eating areas)
- Recycling and garbage bins are not distinguishable
- Office may not have been designed with sufficient space (either in work locations or garbage storage area) to house recycling bins
- Inadequate network of markets for recovered materials
- Inconsistency in education materials or enforcement standards
- Commercial property owner/lease company turnover

**Behaviour**

The following barriers were identified in this category:

- Challenge for businesses to get customers to put materials into proper recycling and waste containers
- People tend to make more copies than needed
- People find it hard to change habits and get frustrated with new systems
- People forget to double side
- Employees receive unsolicited mail at work
- Many prefer to proofread hard copies
- Many tend to select the first/easiest bin (resulting in recycling in garbage or garbage in recycling)
- People do not trust electronic archives and feel the need to keep hard copies as permanent records
- Multiple subscriptions to magazines/newspaper
- People do not know or understand how to recycle
- People are busy and do not take the time to understand recycling requirements
- Belief that actions will have only minor benefits
- Belief that easy actions have already been taken and anything else will require major change
- Conflict between recycling and reduction (which is better?)
- Janitors put separated recycling into the garbage bins

**Economics**

The following barriers were identified in this category:
Many businesses are unaware of the cost savings attributed to waste reduction and recycling

Recycling is not perceived as financially beneficial for small to medium businesses

Insufficient or lack of information regarding the financial incentives for resource recovery

Additional labour costs associated with segregating recycling

Initial costs of program launch (e.g., management time to set up program, purchase of containers, staff training, etc.)

Increased level of service is usually associated with increased cost of service, and cost savings on garbage disposal are not always passed on to tenants (particularly if garbage and recycling are provided by two separate contractors)

Fear that waste prevention will not improve—and may detract from—the efficiency of existing business practices

**Internal Operations**

The following barriers were identified in this category:

- Standardized forms are single-sided
- Business Manager turnover
- Employee turnover - new employees may not know how to use the system
- Current contract with janitors does not specify recycling requirements
- Tenancy lease does not require recycling
- There is no building-wide service and the tenant has not implemented their own service
- Management (at building or tenant level) is not interested in introducing a recycling program
- Company does not have an environmental policy
- Security and legal concerns may make management hesitant to use recycling services
- Number of forms employees are required to use
- Coversheets required on faxes
- Mailing lists are not maintained and contain duplicate and out of date entries
- Aesthetic concerns regarding double-siding or belief that all packaging is necessary
- Lack of understanding of the problem (baseline conditions)
- Lack of information about what to do (alternatives to status quo)
- Lack of influence over the supply chain
- Uncertainty over who is responsible to make necessary changes
5.0 CLOSURE

We trust this report meets your present requirements. These commodity summaries are written to highlight overall market trends while respecting the confidential nature of the information shared by market experts. If you have any questions or comments, please contact the undersigned.

Sincerely,
EBA Engineering Consultants Ltd.
Cascadia Consulting Group

Prepared by: Reviewed by:

ISSUED FOR REVIEW

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Attachments: Appendix A – General Conditions
Appendix B – PPP Waste Composition Categories
Appendix C – Waste Disposed at Facilities Located in the FVRD and Eastern MV
REFERENCES


City of Abbotsford, 2011. List of Recycling and Disposal Information and Options in Abbotsford, Engineering Department. Retrieved March 5, 2012:
   http://www.abbotsford.ca/Assets/Abbotsford/Engineering+Department/Recycle+and+Disposal+Options.pdf


APPENDIX A

EBA’S GENERAL CONDITIONS
### Table: PPP Waste Composition Categories (Metro Vancouver)

<table>
<thead>
<tr>
<th>2010 Waste Composition Categories</th>
<th>PPP Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paper</strong></td>
<td></td>
</tr>
<tr>
<td>Fine, computer, office</td>
<td>Junk Mail</td>
</tr>
<tr>
<td></td>
<td>Other fine office paper or envelopes</td>
</tr>
<tr>
<td>Newsprint</td>
<td>Sales Inserts and Free Prints</td>
</tr>
<tr>
<td></td>
<td>Other Newsprint</td>
</tr>
<tr>
<td>OCC</td>
<td>Recyclable OCC</td>
</tr>
<tr>
<td></td>
<td>Non-recyclable OCC</td>
</tr>
<tr>
<td></td>
<td>Other non-recyclable OCC (contaminated with food/blood/grease)</td>
</tr>
<tr>
<td>Boxboard</td>
<td>Yes</td>
</tr>
<tr>
<td>Telephone Books</td>
<td>Yes</td>
</tr>
<tr>
<td>Magazines</td>
<td>Yes</td>
</tr>
<tr>
<td>Books</td>
<td>Yes</td>
</tr>
<tr>
<td>Tissue Paper/towelling</td>
<td>No</td>
</tr>
<tr>
<td>Beverage containers - Drink Box / Aseptic Containers (Tetra)</td>
<td>Dairy or Dairy Substitute</td>
</tr>
<tr>
<td></td>
<td>Non-Dairy / Deposit</td>
</tr>
<tr>
<td>Other Paper</td>
<td>Single Serving Drink Cups (coffee, tea, drinks, etc.)</td>
</tr>
<tr>
<td></td>
<td>Other (wrappers, paper plates, etc.)</td>
</tr>
<tr>
<td><strong>Plastic</strong></td>
<td></td>
</tr>
<tr>
<td>Film</td>
<td>Bags - Retail &amp; Grocery carry out bags</td>
</tr>
<tr>
<td></td>
<td>Re-used as kitchen catchers: HDPE &amp; LDPE retail bags containing waste</td>
</tr>
<tr>
<td></td>
<td>Empty: HDPE and LDPE retail bags that have not been reused</td>
</tr>
<tr>
<td></td>
<td>Consumable non-carry out bags and film (Bread, meat chips, etc.)</td>
</tr>
<tr>
<td></td>
<td>Bags - Non Packaging products</td>
</tr>
<tr>
<td></td>
<td>HDPE and LDPE sandwich bags</td>
</tr>
<tr>
<td></td>
<td>Deposit Beverage Pouches (juice, etc.)</td>
</tr>
<tr>
<td></td>
<td>Other Plastic Film (Pallet / distribution wrap and lumber wrap (non-woven))</td>
</tr>
<tr>
<td>Textiles</td>
<td>Clothing (blends, polyester, Gore-Tex, fleece, nylon, etc.)*</td>
</tr>
<tr>
<td>Rigid Beverage Containers</td>
<td>Other synthetic textiles (blankets, bags, etc.)</td>
</tr>
<tr>
<td></td>
<td>Dairy or Dairy Substitute</td>
</tr>
</tbody>
</table>
Table: PPP Waste Composition Categories (Metro Vancouver)

<table>
<thead>
<tr>
<th>2010 Waste Composition Categories</th>
<th>PPP Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Containers (juice, pop, alcohol)</td>
<td>PET Bottles No</td>
</tr>
<tr>
<td>HDPE Bottles No</td>
<td></td>
</tr>
<tr>
<td>Single Serving Drink Cups (PE, PS, coffee, tea, drinks, etc.)</td>
<td>Yes</td>
</tr>
<tr>
<td>Other Film</td>
<td>Yes</td>
</tr>
<tr>
<td>Rigid (non beverage)</td>
<td>#1 PETE</td>
</tr>
<tr>
<td>#1 PETE (excluding bottles that contained HHW)</td>
<td>Yes</td>
</tr>
<tr>
<td>Other Bottles and Jars: #1. bakery, clamshells, trays, egg cartons</td>
<td>Yes</td>
</tr>
<tr>
<td>#2 HDPE</td>
<td>Other Bottles and Jugs: #2. (excluding bottles that contained HHW)</td>
</tr>
<tr>
<td>#2 HDPE (excluding bottles that contained HHW)</td>
<td>Yes</td>
</tr>
<tr>
<td>Wide mouth tubs, pails and lids, etc.</td>
<td>Yes</td>
</tr>
<tr>
<td>#3 PVC</td>
<td>Yes</td>
</tr>
<tr>
<td>#4 LDPE</td>
<td>Yes</td>
</tr>
<tr>
<td>#5 PP</td>
<td>Wide mouth tubs and lids, dairy tubs, etc.2</td>
</tr>
<tr>
<td>#6 PS</td>
<td>#6 PS (non-foam), trays, clamshells, lids, pill, trays, etc.</td>
</tr>
<tr>
<td>#6 PS (foam), food trays, clamshells, seedling trays, PS, etc.</td>
<td>Yes</td>
</tr>
<tr>
<td>#7 Mixed Resin Plastic (food, mustard, ketchup, juices)</td>
<td>Yes</td>
</tr>
<tr>
<td>Other rigid plastic packaging or containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Durable Plastic Products</td>
<td>No</td>
</tr>
<tr>
<td>Other/mixed plastics</td>
<td>No</td>
</tr>
<tr>
<td>Compostable Organics</td>
<td>Yard and Garden</td>
</tr>
<tr>
<td>Grass Clippings</td>
<td>No</td>
</tr>
<tr>
<td>Small yard waste (leaves, branches, brush, wood chips, etc.)</td>
<td>No</td>
</tr>
<tr>
<td>Other large yard wastes (branches, etc. over 15 cm dia. Or 1 m long)</td>
<td>No</td>
</tr>
<tr>
<td>Food Waste</td>
<td>Backyard compostable (e.g. fruits, vegetables)</td>
</tr>
<tr>
<td>Backyard Non-compostable (Meat, bones, breads, non-liquid dairy, fats)</td>
<td>No</td>
</tr>
<tr>
<td>Wood</td>
<td>Wood Pallets (unpainted, untreated)</td>
</tr>
<tr>
<td>Unfinished Wood Furniture (no composites)</td>
<td>No</td>
</tr>
<tr>
<td>2010 Waste Composition Categories</td>
<td>PPP Category</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Other Wood (mixed lumber, rotting wood) - unpainted, untreated</td>
<td>No</td>
</tr>
<tr>
<td>Wood (treated lumber, shingles, etc.) - (pressure treated)</td>
<td>No</td>
</tr>
<tr>
<td>Finshed Wood - painted, stained or finished</td>
<td>No</td>
</tr>
<tr>
<td>Finshed Wood furniture (no composite)</td>
<td>No</td>
</tr>
<tr>
<td>Natural Fiber Clothing</td>
<td>No</td>
</tr>
<tr>
<td>Other Textile Products</td>
<td>No</td>
</tr>
<tr>
<td>Leather</td>
<td>No</td>
</tr>
<tr>
<td>Tires</td>
<td>No</td>
</tr>
<tr>
<td>Other rubber</td>
<td>No</td>
</tr>
<tr>
<td>Multiple / Composite organic materials (footwear, etc.)</td>
<td>No</td>
</tr>
<tr>
<td>Ferrous</td>
<td>Alcoholic</td>
</tr>
<tr>
<td>Alcoholic</td>
<td>No</td>
</tr>
<tr>
<td>Non-alcoholic</td>
<td>No</td>
</tr>
<tr>
<td>Ferrous Food containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Other</td>
<td>No</td>
</tr>
<tr>
<td>Bimetallic</td>
<td>Bimetallic Food containers</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>No</td>
</tr>
<tr>
<td>Non-ferrous</td>
<td>Alcoholic</td>
</tr>
<tr>
<td>Alcoholic Non-Ferrous</td>
<td>No</td>
</tr>
<tr>
<td>Non-alcoholic Non-Ferrous</td>
<td>No</td>
</tr>
<tr>
<td>Non-Ferrous Food containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Foil trays, wrap</td>
<td>Yes</td>
</tr>
<tr>
<td>Other Non-Ferrous Metals</td>
<td>No</td>
</tr>
<tr>
<td>Non-C</td>
<td>Kitchen and Bath Fixtures</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Electric Motors</td>
<td>No</td>
</tr>
<tr>
<td>Other/ Renovation(nails, tools, doors, panels)</td>
<td>No</td>
</tr>
<tr>
<td>Glass</td>
<td>Beverage containers</td>
</tr>
<tr>
<td>Beer</td>
<td>No</td>
</tr>
<tr>
<td>Alcoholic (non beer)</td>
<td>No</td>
</tr>
<tr>
<td>Non-Alcoholic &amp; Non Dairy</td>
<td>No</td>
</tr>
<tr>
<td>Dairy or Dairy Subst. (e.g. Avalon Milk)</td>
<td>Yes</td>
</tr>
<tr>
<td>Glass Food Containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Other glass containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Other glass Items</td>
<td>No</td>
</tr>
<tr>
<td>Building Material</td>
<td>Gypsum/drywall, plaster</td>
</tr>
</tbody>
</table>
### Table: PPP Waste Composition Categories (Metro Vancouver)

<table>
<thead>
<tr>
<th>2010 Waste Composition Categories</th>
<th>PPP Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bricks, blocks, concrete, etc.</td>
<td>No</td>
</tr>
<tr>
<td>Masonry</td>
<td>No</td>
</tr>
<tr>
<td>Rock, sand, dirt, ceramic</td>
<td>No</td>
</tr>
<tr>
<td>Rigid Asphalt Products</td>
<td>No</td>
</tr>
<tr>
<td>Asphalt</td>
<td>No</td>
</tr>
<tr>
<td>Carpet Waste (and underlay)</td>
<td>No</td>
</tr>
<tr>
<td>Other Inorganics (linoleum, etc.)</td>
<td>No</td>
</tr>
<tr>
<td>Insulation</td>
<td>No</td>
</tr>
<tr>
<td><strong>Electronic Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Desktop computers</td>
<td>No</td>
</tr>
<tr>
<td>Notebook computers</td>
<td>No</td>
</tr>
<tr>
<td>Peripherals</td>
<td>No</td>
</tr>
<tr>
<td>Computer monitors</td>
<td>No</td>
</tr>
<tr>
<td>Computer printers, scanners, fax machines</td>
<td>No</td>
</tr>
<tr>
<td>Televisions</td>
<td>No</td>
</tr>
<tr>
<td>Stereo/video equipment</td>
<td>No</td>
</tr>
<tr>
<td>Telephones and Telecommunications</td>
<td></td>
</tr>
<tr>
<td>Mobile</td>
<td>No</td>
</tr>
<tr>
<td>Other Telecom Equipment</td>
<td>No</td>
</tr>
<tr>
<td>Small appliances</td>
<td>No</td>
</tr>
<tr>
<td>Electronic toys</td>
<td>No</td>
</tr>
<tr>
<td>Smoke Detectors</td>
<td>No</td>
</tr>
<tr>
<td>Other Electronics</td>
<td>No</td>
</tr>
<tr>
<td><strong>Household Hazardous</strong></td>
<td></td>
</tr>
<tr>
<td>Batteries</td>
<td></td>
</tr>
<tr>
<td>Lead acid batteries (over 2 kg under BCBCP Stewardship Program)</td>
<td>No</td>
</tr>
<tr>
<td>Other batteries</td>
<td>No</td>
</tr>
<tr>
<td>Medical/Biological</td>
<td></td>
</tr>
<tr>
<td>Sharps (needles)</td>
<td>No</td>
</tr>
<tr>
<td>Animal carcass</td>
<td>No</td>
</tr>
<tr>
<td>Other (bandages, iv bags, etc.)</td>
<td>No</td>
</tr>
<tr>
<td>HHW in containers</td>
<td></td>
</tr>
<tr>
<td>Stains/preservatives</td>
<td>No</td>
</tr>
<tr>
<td>Latex paint</td>
<td>No</td>
</tr>
<tr>
<td>Oil-based paint</td>
<td>No</td>
</tr>
<tr>
<td>Paint Aerosols</td>
<td>No</td>
</tr>
<tr>
<td>Solvents</td>
<td>No</td>
</tr>
<tr>
<td>Cleaners, soaps, etc.</td>
<td>No</td>
</tr>
</tbody>
</table>
### Table: PPP Waste Composition Categories (Metro Vancouver)

<table>
<thead>
<tr>
<th>2010 Waste Composition Categories</th>
<th>PPP Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pesticides / Herbicides / Preserv under PCA (with PCP Reg. #)</td>
<td>No</td>
</tr>
<tr>
<td>Motor oil bottles</td>
<td>No</td>
</tr>
<tr>
<td>Antifreeze containers</td>
<td>No</td>
</tr>
<tr>
<td>Other Petroleum Based Products</td>
<td>No</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>No</td>
</tr>
<tr>
<td>Other HHW in Containers</td>
<td>No</td>
</tr>
<tr>
<td>Empty HHW containers</td>
<td>No</td>
</tr>
<tr>
<td>Empty Stains/preservatives</td>
<td>No</td>
</tr>
<tr>
<td>Empty Latex paint</td>
<td>No</td>
</tr>
<tr>
<td>Empty Oil-based paint</td>
<td>No</td>
</tr>
<tr>
<td>Empty Paint Aerosols</td>
<td>No</td>
</tr>
<tr>
<td>Empty Solvents</td>
<td>No</td>
</tr>
<tr>
<td>Empty Cleaners, soaps, etc.</td>
<td>Yes</td>
</tr>
<tr>
<td>Empty Pesticides / Herbicides / Preserv under PCA (with PCP Reg. #)</td>
<td>No</td>
</tr>
<tr>
<td>Empty Motor oil bottles</td>
<td>No</td>
</tr>
<tr>
<td>Empty Antifreeze containers</td>
<td>No</td>
</tr>
<tr>
<td>Other Empty Petroleum Based Products</td>
<td>No</td>
</tr>
<tr>
<td>Empty Pharmaceuticals</td>
<td>No</td>
</tr>
<tr>
<td>Other Empty HHW Containers</td>
<td>Yes</td>
</tr>
<tr>
<td>Oil Filters</td>
<td>No</td>
</tr>
<tr>
<td>Mercury Containing Items</td>
<td>No</td>
</tr>
<tr>
<td>Thermostats and switches</td>
<td>No</td>
</tr>
<tr>
<td>Compact fluorescent light bulbs and tubes</td>
<td>No</td>
</tr>
<tr>
<td>Other HHW</td>
<td>No</td>
</tr>
<tr>
<td>Household Hygiene</td>
<td></td>
</tr>
<tr>
<td>Diapers</td>
<td>No</td>
</tr>
<tr>
<td>Pet Waste (animals feces, bedding, cat litter)</td>
<td>No</td>
</tr>
<tr>
<td>Other (sanitary napkins, tampons)</td>
<td>No</td>
</tr>
<tr>
<td>Bulky Objects</td>
<td></td>
</tr>
<tr>
<td>White goods</td>
<td>No</td>
</tr>
<tr>
<td>Upholstered Furniture</td>
<td></td>
</tr>
<tr>
<td>Mattress, Box Spring</td>
<td>No</td>
</tr>
<tr>
<td>Other Upholstered furniture</td>
<td>No</td>
</tr>
<tr>
<td>Other furniture</td>
<td>No</td>
</tr>
<tr>
<td>Fines</td>
<td>No</td>
</tr>
</tbody>
</table>
APPENDIX C

WASTE DISPOSED AT FACILITIES LOCATED IN THE FVRD AND EASTERN MV
Table: Waste Disposed at Facilities Located in the FVRD and Eastern MV

<table>
<thead>
<tr>
<th>Disposal Facility</th>
<th>MSW (t) 2011</th>
<th>MSW (t) 2010</th>
<th>MSW (t) 2009</th>
<th>MSW (t) 2008</th>
<th>MSW (t) 2007</th>
<th>MSW (t) 2006</th>
<th>MSW (t) 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bailey LF</td>
<td>27,164</td>
<td>36,962</td>
<td>32,497</td>
<td>36,306</td>
<td>37,797</td>
<td>31,584</td>
<td>32,808</td>
</tr>
<tr>
<td>Mission LF</td>
<td>12,873</td>
<td>15,898</td>
<td>13,755</td>
<td>16,879</td>
<td>20,600</td>
<td>17,854</td>
<td>16,717</td>
</tr>
<tr>
<td>Hope LF</td>
<td>3,611</td>
<td>2,119</td>
<td>4,211</td>
<td>4,062</td>
<td>4,261</td>
<td>4,000</td>
<td>3,882</td>
</tr>
<tr>
<td>Matsqui TS</td>
<td>32,535</td>
<td>46,621</td>
<td>50,854</td>
<td>61,541</td>
<td>79,733</td>
<td>61,042</td>
<td>57,132</td>
</tr>
<tr>
<td><strong>Subtotal Public Facilities (FVRD)</strong></td>
<td>76,183</td>
<td>101,599</td>
<td>101,317</td>
<td>118,788</td>
<td>142,391</td>
<td>114,480</td>
<td>110,539</td>
</tr>
<tr>
<td><strong>Difference from Prior Year</strong></td>
<td>-25,416</td>
<td>282</td>
<td>-17,471</td>
<td>-23,603</td>
<td>27,911</td>
<td>3,941</td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal Private TSs (FVRD)</strong></td>
<td>113,093</td>
<td>107,858</td>
<td>75,736</td>
<td>72,033</td>
<td>84,789</td>
<td>62,346</td>
<td>61,640</td>
</tr>
<tr>
<td><strong>Difference from Prior Year</strong></td>
<td>5,235</td>
<td>32,122</td>
<td>3,703</td>
<td>-12,756</td>
<td>22,443</td>
<td>706</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FVRD Disposed</strong></td>
<td>189,276</td>
<td>209,457</td>
<td>177,053</td>
<td>190,821</td>
<td>227,180</td>
<td>176,826</td>
<td>172,179</td>
</tr>
<tr>
<td><strong>Ratio FVRD Public/Private</strong></td>
<td>0.67</td>
<td>0.94</td>
<td>1.34</td>
<td>1.65</td>
<td>1.68</td>
<td>1.84</td>
<td>1.79</td>
</tr>
<tr>
<td>Langley TS (MV)</td>
<td>12,679</td>
<td>13,785</td>
<td>15,825</td>
<td>15,228</td>
<td>18,139</td>
<td>15,470</td>
<td></td>
</tr>
<tr>
<td>M Ridge TS (MV)</td>
<td>15,853</td>
<td>16,602</td>
<td>17,338</td>
<td>20,249</td>
<td>20,780</td>
<td>19,757</td>
<td></td>
</tr>
<tr>
<td>Surrey TS (MV)</td>
<td>213,547</td>
<td>228,956</td>
<td>229,120</td>
<td>238,488</td>
<td>237,687</td>
<td>198,202</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL MV TSs in/near Valley</strong></td>
<td>242,079</td>
<td>259,343</td>
<td>262,283</td>
<td>273,965</td>
<td>276,606</td>
<td>233,429</td>
<td></td>
</tr>
<tr>
<td><strong>Difference from Prior Year (MV)</strong></td>
<td>-17,264</td>
<td>-2,940</td>
<td>-11,682</td>
<td>-2,641</td>
<td>43,177</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL Waste Disposed in Corridor</strong></td>
<td>431,355</td>
<td>468,800</td>
<td>439,336</td>
<td>464,786</td>
<td>503,786</td>
<td>410,255</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL Waste Disposed (public facilities)</strong></td>
<td>318,262</td>
<td>360,942</td>
<td>363,600</td>
<td>392,753</td>
<td>418,997</td>
<td>347,909</td>
<td></td>
</tr>
</tbody>
</table>