SOLID WASTE MANAGEMENT
Annual Operations and Monitoring Report
Salmon Arm Refuse Disposal Site MR-5479
2014

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1.0 EXECUTIVE SUMMARY

This report has been prepared in accordance with Section 4.4 of Operational Certificate MR-05479. The main objective of the report is to provide the Ministry of Environment with an overview of the operations at the Salmon Arm landfill for 2012 and to address the specific requirements outlined in Section 4.4.

In 2014, approximately 18,277 tonnes of waste was directed to the active face and landfilled. This figure represents an 8% increase over 2013 and, based on census data for the area, a per capita disposal rate of 0.53 tonnes per person.

The CSRD hired a new environmental consultant, Western Water, in 2014 to conduct all monitoring and reporting for CSRD landfill sites, as per the requirements of the Operational Certificate. Western Water has provided conclusions and recommendations based on the 2014 data collected, which will be posted on the CSRD website for public review after April 1, 2015.

Major projects at the Salmon Arm landfill in 2014 included the construction of a storage building to house the new mattress recycling program whereby by a tipping fee of $25/mattress is charged to marshal, collect and recycle. Recycling is a process of deconstructing and separating materials including, metal, wood and waste into categories to be returned to the Salmon Arm landfill for recycling or disposal. In 2014 994 mattresses were diverted for recycling.

2.0 INTRODUCTION

The Salmon Arm refuse disposal site (hereinafter referred to as “the site”) is located at 4290 20th Ave SE Salmon Arm, approximately 3.5 km from the downtown Salmon Arm. The legal description of the property is Lot 1, Plan 45716, Section 7, Township 20, Range 9, West of the Sixth Meridian, Kamloops Division of the Yale District.

The site has been in operation since 1979, when the Ministry of Environment, Lands and Parks issued Permit PR 5479 to the District of Salmon Arm. In 1997, the permit was transferred to the Columbia Shuswap Regional District (CSRD). The property is owned by the CSRD and covers an area of approximately 22 hectares. The site is operated by Craig Hillson under contract with the CSRD (expires June, 2014).

The site provides solid waste disposal and residual processing services to residents, businesses, and institutions located within the municipality of Salmon Arm and to Electoral Areas 'C', 'D', ‘E’ and 'F'. CSRD manned transfer stations in Malakwa, Skimikin, Scotch Creek, Seymour Arm, Glenemma, and Falkland deliver solid wastes to the site in 50 yard containers on a regular frequency.

The site is operated under an Operating Certificate issued by the Ministry of Environment and is governed in operating and closure standards by Provincial criteria. Requirements include remedial plans to establish methods by which the site will be upgraded or closed. Site specific closure plans are required to set out a closure schedule, procedure and post-closure environmental monitoring protocol.

The CSRD hired a new environmental consultant, Western Water, in 2014 to conduct all monitoring and reporting for the Golden Landfill in 2014, as per the requirements of the Operational Certificate. Western Water has provided conclusions and recommendations based on the 2014 data collected, which will be posted on the CSRD website for public review after April 1, 2015.

In accordance with the user-pay principles of the Solid Waste Management Plan, fees are charged for the disposal of all waste materials. The disposal fee for co-mingled municipal solid waste across scaled sites is set at $70 per tonne, as per changes in the 2009 in accordance with the new Solid Waste Management Plan. Furthermore, in 2010 a differential tipping fee was introduced to encourage recycling by creating disincentive fees for loads which are not separated.

2.0 BACKGROUND

The site is open on the following schedule:

April 1 – October 31	Monday – Sunday 9:00 am to 5:00 pm.
November 1 – March 31	Monday – Sunday 9:00 am to 4:00 pm.

*The site is closed Christmas, New Years & Remembrance Day

The site contains a lockable gate, a single truck scale with electronic weighing and reporting software, a scale house, and an internal transfer station. The site operates on a user pay system where payment is collected on a load weight basis.

3.0 OBJECTIVES

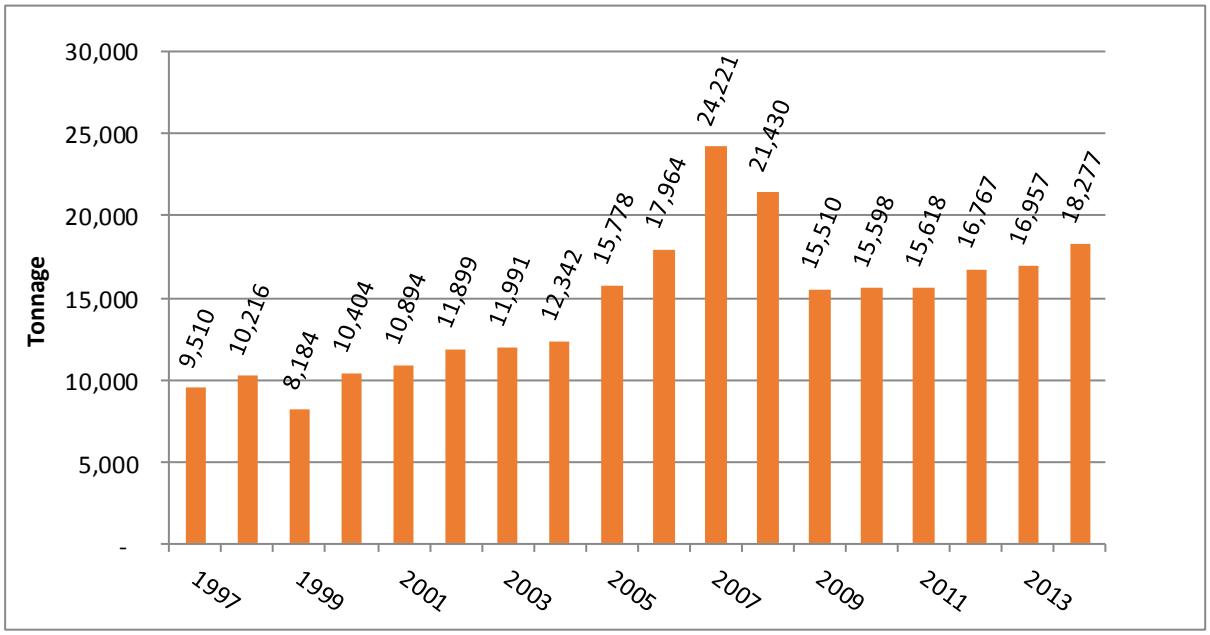
The objective of this report is to provide information required to meet the annual reporting requirements in Section 4.4 of Operational Certificate MR- 05479 issued by the BC Ministry of Environment on December 19, 2006 (most recent).

3.1 Total Tonnage of Waste Discharged (Fig.1)

In 2014 approximately 30,447 tonnes of refuse and recoverable wastes were managed at the Salmon Arm landfill, 4% decrease over 2013. Approximately 18,277 tonnes of waste was directed to the active face and landfilled. This figure represents a 7% increase over 2013. Using the most recent census date (2011) the per capita disposal rate for 2014 was 0.58 tonnes/person/year, based on a population of 31,760 for the service area.

Nearly half of all incoming materials, 12,168 tonnes (42%), were diverted to marshalling areas for recovery. Existing diversion programs include; mattress, drywall, asphalt shingles, concrete, contaminated soil, wood waste, metal and reusable items. 2014 saw the introduction of a mattress recycling program whereby by a tipping fee of $25/mattress is charged to marshal, collect and recycle. Recycling is a process of deconstructing and separating materials including, metal, wood and waste into categories to be returned to the Salmon Arm landfill for recycling or disposal. In 2014 994 mattresses were diverted for recycling.

Fig.1



3.2 Design Volume/Life Expectancy

The Salmon Arm Landfill Design and Operations Plan was prepared by Sperling Hansen Associates in December 2008. According to the plan, the site will be constructed and progressively closed in four phases. The first scheduled closure is phase 1 and the majority of work to close phase 1 was completed in 2010. During the closure work, phase 2 was prepared, incorporating a liner system and leachate collection works.

The D&O Plan required revisions to detail the phase 1 Closure work, which were forwarded to the MOE. In addition, as per the requirements of the British Columbia Landfill Gas Regulation, an Initial Assessment Report was submitted to the MOE in December, 2010.

It was determined by survey that 29,080 m^3 of air space was consumed at the site in 2014, representing a 13% increase over 2013. The surveyed air space represents the refuse that has been landfilled in Phase 2.

3.3 Accomplishments in 2014

The CSRD continued to manage and maintain 1,100 hybrid poplar trees, planted on top of the closed Phase 1 of the landfill, for the purposes of leachate disposal. In 2014, the system used to disperse leachate to the hybrid poplar trees was upgraded. A

report on the activities related to phytoremediation was prepared by the CSRD's summer student with the help of Forsite Engineering. The report discusses moisture assessments, foliar analysis and leachate quality results and can be made available upon request.

The landfill gas collection system continues to operate and in 2014 Fortis BC was able to operate their equipment to upgrade gas to pipeline quality for much of the year. It is estimated that approximately 9,000 CO2 equivalents will be claimed for 2014.

In addition, the first batch of Class "A" compost was completed in 2014 and the finished product was distributed to CSRD transfer stations, as well as the Salmon Arm landfill, and made available for sale to the public. In less than a month the product was sold out. Plans to distribute the product to the public and commercial users are underway for 2015.

The site was inspected four times in 2014. The contractor was found to be in compliance with the contract and the design and operations plan during all inspections.

Landfill contracts expired on June 30, 2014 and new contractors were hired. The Cover and Compaction contract was won by R. Craig Hillson and the Scalehouse Operations contract was won by Cleansite Management.

3.4 Wildlife Occurrences

There was one occurrence of wildlife in August with a moose and calf entering the leachate pond. The calf was seen in the leachate pond once more. Barbed wire was added to the fence to deter animals from entering the pond area. The moose caused damage to the leachate pond liner which was repaired by Western Tank and Liner.

3.5 Closure Fund

Each spring the CSRD's Finance Department assesses closure reserves, future closure projects and landfill capacity to ensure adequate reserve funds are available for planned closure work. A copy of this assessment work has been included as Appendix 'B'.

3.6 Landfill Gas

The CSRD continued to flare landfill gas in 2014 and monitor the associated flow rates and composition to comply with the agreement with Pacific Carbon Trust (PCT) which was signed in 2010 and ended in 2014. The agreement with PCT allows the CSRD to collect carbon credits and sell those credits to PCT. Carbon credits will be verified through an independent 3rd party verifier, Ruby Canyon Engineering out of Colorado.

In September of 2012, Fortis BC began work on installing their landfill gas upgrader infrastructure, designed to upgrade the biomethane to pipeline quality standards. The system consists of vessels to remove hydrogen sulphide, soloxanes and carbon dioxide from the gas. Testing and commissioning of the landfill gas upgrader was

completed in the first quarter of 2014. Issues were encountered which led to landfill gas being flared for the second and third quarters of 2014. Landfill gas was upgraded and sent to the Fortis pipeline for the majority of the fourth quarter of 2014. Issues continue to be encountered and fixed which has led to a combination of upgrading and flaring of landfill gas in 2014.

3.7 Plans for 2015

The CSRD and FortisBC continue to work towards more sustained upgrading of landfill gas. The CSRD has budgeted for the installation of a second (first phase installed in 2013) phase of horizontal gas collectors. These collectors will be trenched into Phase 2 and will tie into the main gas collection header system. This will create increased methane extraction in phase 2.

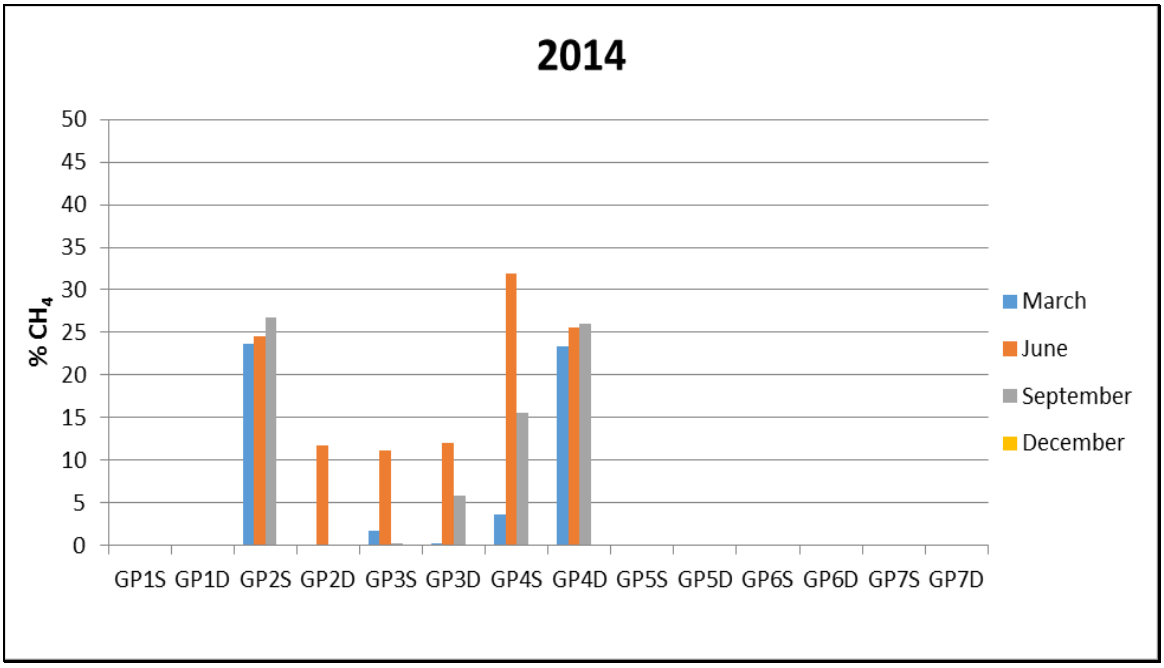
4.0 ENVIRONMENTAL MONITORING

4.1 Ground Water Monitoring

The CSRD hired a new environmental consultant, Western Water, in 2014 to conduct all monitoring and reporting for the Salmon Arm Landfill in 2014, as per the requirements of the Operational Certificate. Western Water has provided conclusions and recommendations based on the 2014 data collected, which will be posted on the CSRD website for public review after April 1, 2015.

4.2 Perimeter Gas Monitoring

The Salmon Arm landfill has seven soil gas monitoring probes situated around the landfill property. Gas probes 1-4 are located along the north property boundary bordering the Salmon Arm airport. Gas probes 5 and 6 are on the northern portion of the west property boundary bordering an orchard. Gas probe 7 is located on the south property boundary as a control for natural soil conditions.



Each monitoring probe has two nested gas sampling probes for shallow and deep sampling indicated by an S or D in the tag. Each probe has 3 metres of screened pipe and nested probes are isolated by a 1 metre bentonite plug. Shallow probes are screened from approximately 1 to 4 metres depth and deep probes are screened approximately 5 to 8 metres depth.

Sampling was done quarterly using a Landtec GEM2000 portable gas analyzer. Samples were not taken for December 2014 due to the gas analyzer being damaged and being sent to the manufacturer for repairs. Each gas probe is purged for 10 minutes before the sample is taken. Landfill gas extraction from phase 1 began in January 2011 after it was closed and capped in the summer of 2010.
Overall averages show that soil methane concentrations dropped in 2014 by 2.4% from 8.2% in 2013 to 5.8% in 2014. The following is a summary of methane concentrations for each well for 2014:

- Methane concentrations in gas probe 1S and 1D remained at 0% this year after quickly dropping to zero in 2011 when methane extraction began.
- Gas probe 2S showed a small decrease remaining in the 20 - 30% range and 2D remained below 20% in 2014.
- Gas probe 3S and 3D continued to decease to below 15%.
- Gas probe 4S and 4D remained around 25%.
- Gas probe 5S and 5D remained at 0%.

- Gas probe 6S and 6D remained at 0%.
- Gas probe 7S and 7D is located on the far south edge of the property and has never produced any landfill gas.

Carbon dioxide was found in the soil gas in areas where methane is present as they are the two main constituents of landfill gas. Carbon dioxide was present from 0% – 35.5% and is an indicator of migrating landfill gas. Salmon Arm landfill gas has a hydrogen sulphide gas range of 200-300 ppm although gas probe samples had only trace amounts of H_2S with the exception of GP2S which had readings around 100ppm. Carbon monoxide and hydrogen gas where detected in trace amounts with maximum readings of 13 and 129 ppm respectively. Methane concentrations pose potential hazards with 3 of the 7 probes having readings above the methane LEL of 5%. All structures on site are elevated on skids or are well vented to avoid the buildup of migrating landfill gas. Reductions in landfill gas were observed in 2014 in the monitoring probes surrounding the landfill. The CSRD plans to continue quarterly gas readings to acquire more data and monitor landfill perimeter soil gas concentrations in 2015. With landfill gas extraction continuing at the landfill soil gas concentrations should continue to drop in the coming years.

4.3 Litter, Dust and Vector Control

Dust is controlled by the application of Magnesium Chloride to the high use dirt roads on an as need basis. Vectors were not an issue in 2014.

4.4 Bird Control

Bird control services continued at the site in 2014, provided by an independent contractor. Bird control is achieved through the use of predatory hawks and pyrotechnics, which consist of bird bangers and screechers. The use of the predatory hawks is governed by a permit issued by the Federal Government. The contractor's annual report is available upon request.

5.0 WASTE HIERARCY

The CSRD emphasizes and encourages the 6R Hierarchy of Rethink, Reuse, Reduce, Recycle, Recovery and Residual management and continually strives towards a higher 'R' in waste management practice. The programs offered within each category along with successes and challenges experienced in 2014 are indicated below.

5.1 Rethink

5.1.1) Composter Incentive Program

In the fall of 2009, the CSRD launched a Region wide composter incentive program. The CSRD purchased a number of Earth Machine outdoor compost units at a cost of $45 per unit. These composters were then offered to residents in the spring of 2014 in the Shuswap for the same price. To ensure that all residents receiving a composter understood the benefits of home composting as well as how to properly use the Earth Machine composter, all

individuals purchasing a composter were given the option to attend a 30 minute training seminar given by CSRD staff.

5.1.2) Reuse Website

The CSRD, in partnership with the Recycling Council of BC, previously promoted a reuse website, called www.csrd.reuses.com. The website allowed users to post items for sale, or post wanted items for free, up to a maximum of value of $99.00. The site had seen very few exchanges, however, so was discontinued in 2014.

5.2 Reduce

5.2.1 Media Communications and Advertising

The CSRD continues to utilize local radio advertisements aired on the EZ Rock Network (FM Stations – 91.5) and newspaper advertisements in the local paper (Salmon Arm Observer, Shuswap Market) to make residents aware of special events, and to promote various waste reduction themes. Social media (Facebook, Twitter, and website) is also used to help promote waste reduction. The CSRD also published The Loop Newsletter in the Shuswap Market, which included information regarding the upcoming transition to the Multi Materials BC program for packaging and printed paper.

5.3 REUSE

5.3.1 Marshalling Areas at Refuse Disposal Sites

The Salmon Arm Refuse Disposal Site contains reuse marshalling areas for wood waste and propane tanks. A large portion of wood waste material is chipped and reused as alternate daily cover (in a soil /wood blend) or placed on the unloading pads of the active face when the ground is saturated and un-drivable.

5.3.2 Woodwaste Grinding and Composting

In 2014, 21,916 m^3 of white wood waste was chipped at the landfill site, along with 12,203 m^3 of organic wood waste. 2,300 tonnes of wood waste and 2,549 tonnes of yard waste was received at the site in 2014.

In the fall of 2012, a windrow composting operation was started at the site, using the yard and garden waste as feedstock. In the spring of 2014, 1,300 m3 of finished compost was available for sale. Several loads were distributed to transfer stations in the Shuswap area, as well as sold at the Salmon Arm landfill, and all the finished compost was sold. In 2014, the chipped yard and garden waste was composted using windrows, and roughly 1,500 m3 of screened compost was prepared for curing at the end of the year.

5.3.3 Propane Tank Collection

762 propane tanks were collected from the facility in 2014, compared to 399 in 2013.

5.3.4 Reuse Centre

The CSRD installed a Reuse Centre at the Salmon Arm landfill in the fall of 2009. In 2014, over 255 items were salvaged from the Reuse Centre by residents. Items include household items, sports equipment, building material, and appliances. Residents are required to pay the regular disposal rate for items, but can chose to place items that are in good working order in the Reuse Centre for someone to take home free of charge.

5.4 Recycling

5.4.1 Marshalling Areas at Refuse Disposal Sites

All CSRD landfills contain recycling marshalling areas for metal wastes including white goods and scrap metal, gypsum, asphalt shingles, concrete, and household recyclables, including mixed paper, newspaper, tin cans, glass containers, plastics #1 to #7 and corrugated cardboard.

5.4.2 Scrap Metal Recovery

This site recycled approximately 502 tonnes of scrap metal in 2014 which includes source separated metal wastes deposited at the site from commercial and residential sources, as well as loads brought in from three CSRD Transfer Stations. This is compared to 568 tonnes in 2013. The amount of metal received at the landfill over all was 518 tonnes for 2014.

5.4.3 *Ozone Depleting Substance Removal*

In Salmon Arm, 231 refrigeration units were serviced to have the ozone depleting substances removed before recycling.

5.4.4 *Household and Automotive Battery Recycling*

In 2011, the battery bin was removed from the site due to repeated theft of auto batteries. Local businesses in Salmon Arm receive batteries from the public.

5.4.5 *Gypsum/Asphalt Shingles/Concrete*

Marshalling areas for gypsum, asphalt shingles and concrete have been established at the Salmon Arm landfill. 303 tonnes of shingles and 330.1 tonnes of drywall were collected for recycling in 2014. Concrete was not crushed in 2014. 377 tonnes of drywall and 353 tonnes of shingles were received at the site in 2014, along with 376 tonnes of concrete.

5.4.6 *Mattress Recycling*

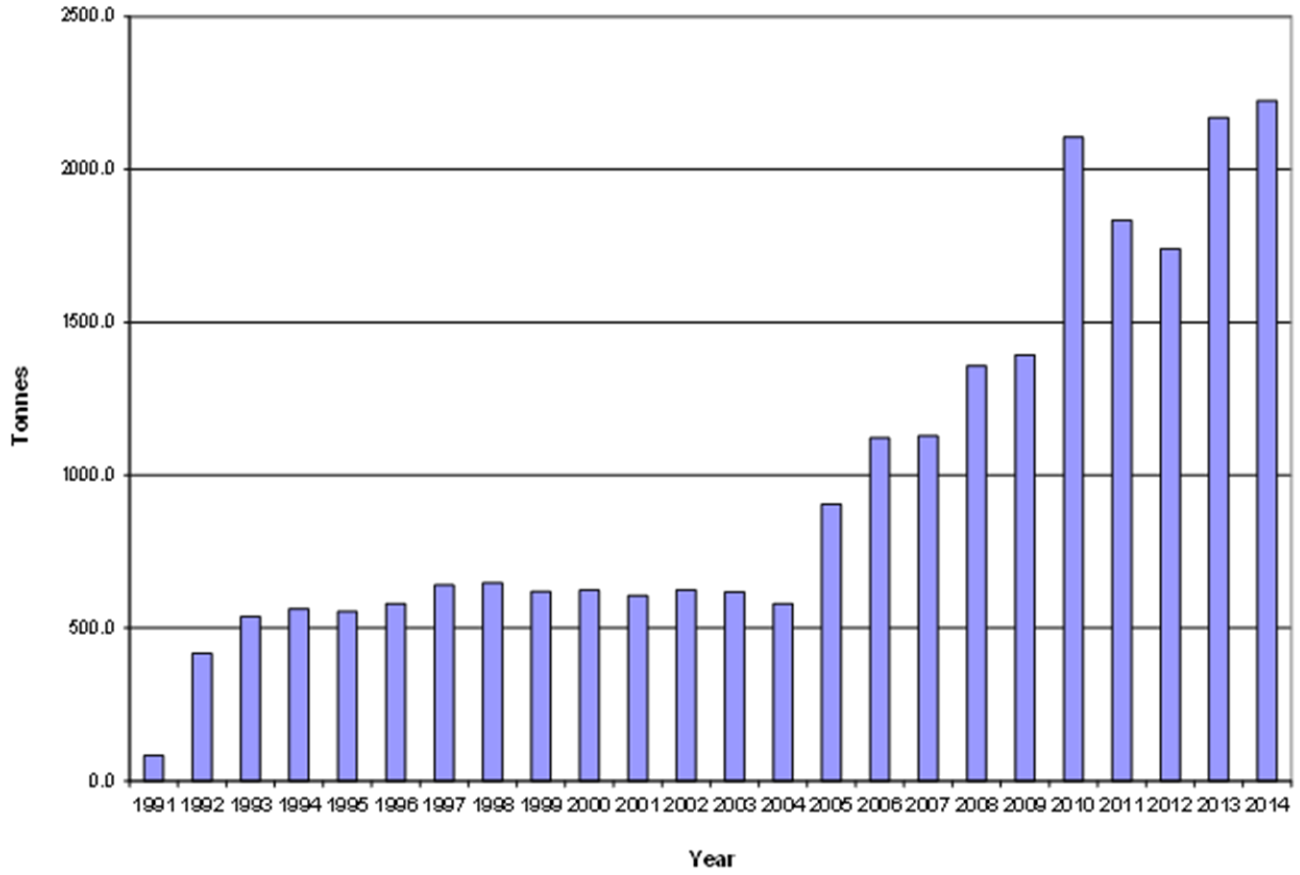
In June of 2014, the CSRD started a mattress recycling program. Mattresses are deconstructed, with metal springs being added to scrap metal, and wood material added to wood waste. The remaining foam and textile portion of the mattress is landfilled. In 2014, 994 mattress were collected at the site for recycling.

5.4.6.1 Depot Recycling

Opportunities to deposit recyclable items such as: newspaper, mixed waste paper, food cans, glass containers, plastic containers #1 to 7, and corrugated cardboard exist at all Regional District Refuse Disposal sites and depots found in downtown municipalities. In Salmon Arm, the downtown recycle depot is located in the bottle depot parking lot. The bottle depot provides a separate residential and commercial cardboard collection service. The City of Salmon Arm also provides a curbside collection program. In the fall of 2009, the recycling collection changed to a comingled collection system. A total of 744 tonnes of mixed waste paper, tin food cans, newspaper glass jars and bottles, corrugated cardboard and plastics #1 to 7 were collected in 2014 from the Salmon Arm landfill and downtown depot. This is a 4.3% increase from the previous year depot collection program for Salmon Arm only.

On a region wide basis, the depot collection program increased 2.6% from 2013 to 2225 tonnes. The following graph represents recycling collection quantities collected region wide (from all depots) since 1991.

Figure 1-Recycling Collected in Depots Region Wide

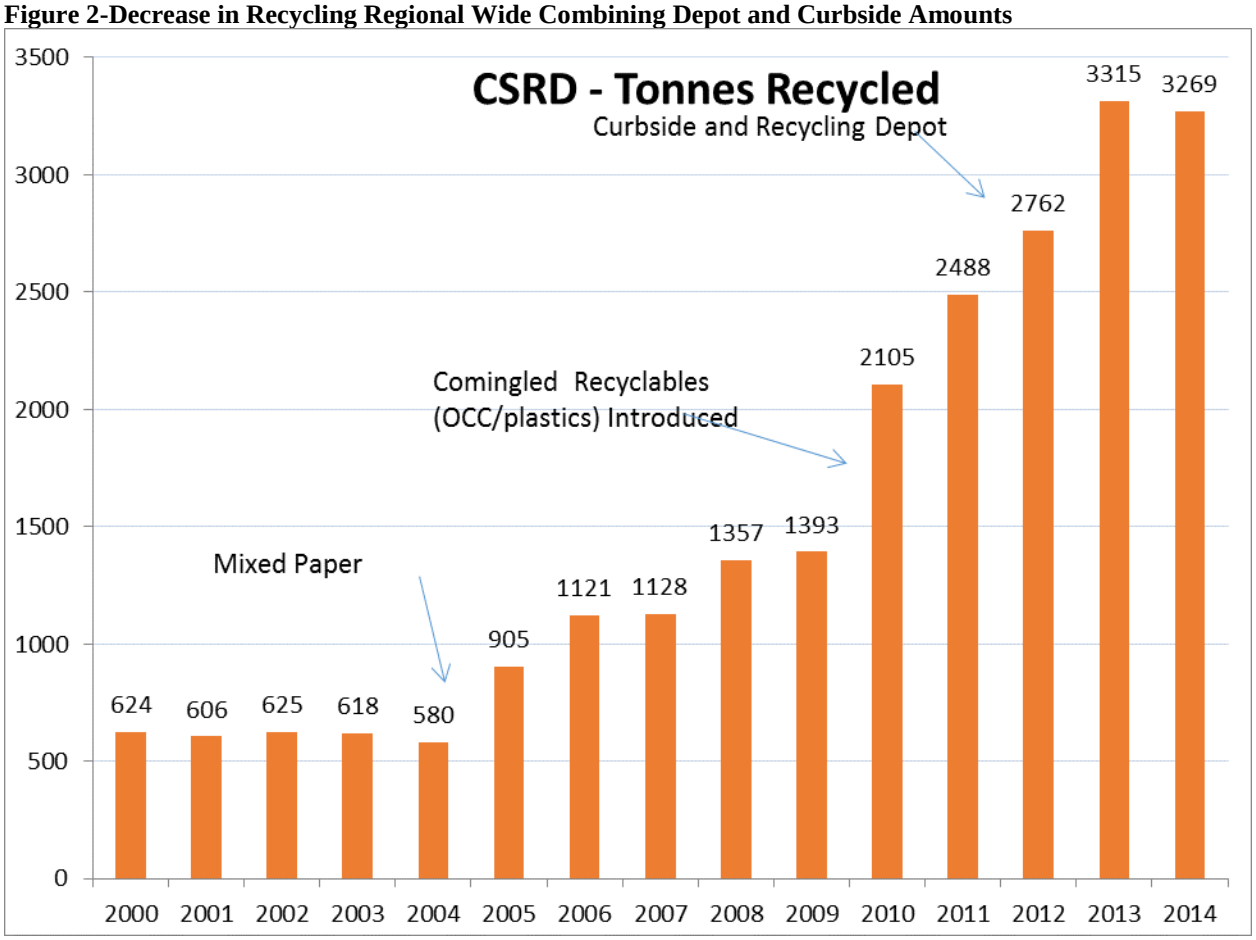


Recycling is collected through a blue bag collection system from all single family dwellings within the City of Salmon Arm. Prior to May 19, the material was delivered to a reload station at the Salmon Arm landfill, and sent to Cascades Recovery in Kelowna through the municipal collection program. In May, the City of Salmon Arm collection transitioned to the Multi Materials BC collection program for Packaging and Printed Paper. Material continued to be collected through a curbside blue bag program, and the landfill reload station continues to be utilized. In 2014, 609 tonnes of material was collected through the curbside program (239 tonnes from January 1st to May 19th, and 370 tonnes from May 20th to December 31st). This is a -2.2% decrease over last year.

This, combined with the depot program, resulted in an overall tonnage of 1354, or a -0.2% decrease overall for Salmon Arm.

There is a -1.4% decrease in recycling from 2013 over the entire region for all depot and curbside collection tonnages combined in 2013, amounting to 3269 tonnes.

Figure 2-Decrease in Recycling Regional Wide Combining Depot and Curbside Amounts



5.4.6.3 Recycle Fair Events

A spring and hazardous waste and Stewardship round up event was held in Salmon Arm in 2014. Hazardous waste, not included in a Provincial Stewardship Plan, was included.

5.4.7 *Extended Producer Responsibility*

Provincial stewardship programs such as the beverage container deposit-refund system, paint, pesticides and other residuals, waste oil and oil containers, tire recovery programs, pharmaceuticals and electronics contribute to diverting materials from local landfills. Unfortunately, the Province of British Columbia does not require Stewardship agencies to report quantities recycled on a regional district basis; therefore quantities diverted from CSRD landfills through extended producer responsibility programs are largely unknown.

5.4.8 *Private Sector Recycling*

At this time the Regional District does not have quantitative values of wastes collected through other programs and therefore cannot adequately determine the overall waste diversion rate from the Shuswap.

Appendix 'A' - Solid Waste Landfill Closure and Post-Closure Liability

COLUMBIA SHUSWAP REGIONAL DISTRICT

Notes to Consolidated Financial Statements

December 31, 2014

5. Solid Waste Landfill Closure and Post-Closure Liability

The Environmental Management Act of B.C. and the Ministry of Environment of B.C. set out the landfill criteria to properly close and maintain all active and inactive landfill sites. Under the guidelines, there is a requirement for closure and post-closure care of solid waste landfill sites. Provisions are therefore made over the estimated remaining life of the Regional District landfill sites based on scalehouse records and through tipping fees.

The main components of the landfill closure plans are: final capping using an engineered cap design and the implementation of a drainage and gas management plan. The post-closure care requirements may involve: cap maintenance; groundwater monitoring; gas management system operation and maintenance; inspections; leachate treatment and monitoring; and annual reports. Post-closure care activities begin once the entire landfill site no longer accepts waste and continues on for a period of 25 years. As the date of the site closure is unknown, management estimates the liability to begin after the closure of the current active phase, assuming another phase will not be opened. In the event another phase is opened, the start date for the liability will be adjusted to begin upon closure of the newly opened phase.

The table below sets out the liability based on the estimated capacities used in cubic metres, multiplied by the estimated total expenditures, expressed as discounted present values, assuming 1.00% (2013 - 0.00%) inflation and 3.00% (2013 - 3.85%) long-term borrowing rate (fall issue MFA 25 year rate). The amount remaining to be recognized in future years is $983,900 (2013 - $1,229,700). The annual provision is reported as an Operating Fund expense and the accumulated provision is reported as a liability on the Consolidated Statement of Financial Position. Reserve funds totalling $899,720 (2013 - $843,389) have been established to provide for this liability in the Landfill Closure Special Reserve Fund.

The table also indicates the remaining landfill life in years and remaining capacity (100 minus % used) on the open phases and the anticipated post-closure costs recognized on total site capacity used.

	Estimated Remaining Life (Years)	Estimated Total Expenditure for Closure	Cumulative Capacity Used (m^3)	Total Estimated Capacity (m^3)	Used (%)	Liability for Closure December 31, 2014
Salmon Arm (phase 2 of 5)	12	$ 1,650,000	114,708	383,778	30	$ 493,200
Golden (pre-phase)	14	268,600	613,416	613,416	100	268,600
Golden (phase 1 of 4)	14	307,000	56,591	157,000	36	110,700
Revelstoke (pre-phase)	1	292,000	70,000	70,000	100	292,000
Revelstoke (phase 1 of 4)	1	655,100	98,535	98,535	100	655,100
Revelstoke (phase 2 of 4)	13	541,900	13,067	156,212	8	45,300
Sicamous (phase 2 of 4)	11	220,000	73,706	166,000	44	97,700
Sicamous (phase 4 of 4)	29	257,600	110,000	125,000	88	226,700
Closure liability subtotal		$ 4,192,200	1,150,023	1,769,941	65	2,189,300
Post closure liability subtotal						1,019,000
2014 total liability						3,208,300
Less: Expenses previously recognized						(2,309,200)
2014 reduction in the liability for landfill closure						$ 899,100