Cariboo Regional District

Cariboo Regional District Solid Waste Management Plan Review

STAGE 3 – IMPLEMENTATION PLAN REPORT

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May 15, 2013

Certified Copy of Resolution No. 13-05A-31 from the May 10, 2013 Cariboo Regional District Board Minutes

"That the agenda item summary from Mitch Minchau, Manager of Environmental Services, dated April 19, 2013, regarding the conditional approval of the Cariboo Regional District's Solid Waste Management Plan, be received. Further, that the Cariboo Regional District accept the conditions of the approval provided in the Minister of Environment's letter dated April 2, 2013, and adopt the Solid Waste Management Plan for implementation."

I hereby certify that this is a true and correct copy of Resolution No. 13-05A-31 as endorsed on May 10, 2013 by the Cariboo Regional District Board of Directors.

A Johnston

Corporate Officer

BRITISH COLUMBIA

Reference: 187904

APR 0 2 2013

Al Richmond, Chair
and Directors
Cariboo Regional District
Suite D, 180 North Third Avenue
Williams Lake BC V2G 2A4

Dear Chair Richmond and Directors:

I am pleased to advise you that the Ministry of Environment has completed a review of the proposed amendment of the Cariboo Regional District's (CRD's) Solid Waste Management Plan (the Plan) that was approved by the CRD Board of Directors on January 18, 2013, and submitted in accordance with Section 24(1) of the *Environmental Management Act*.

Based on the recommendations of the Regional Director for Environmental Protection in the Ministry of Environment's Thompson/Cariboo Region, I am satisfied that there has been an adequate public review and consultation process with respect to the development of the amended Plan. The Plan reflects strategies to address the specific areas of concern identified by the CRD through the Plan review process, and demonstrates the CRD's ongoing commitment to environmentally and fiscally responsible solid waste management within its regional district boundaries.

Accordingly, pursuant to Section 24(5) of the *Environmental Management Act*, I hereby approve the amended CRD Solid Waste Management Plan, subject to the following conditions:

- Should the CRD wish to pursue the concept of importing solid waste from out of region as is suggested in Section 5.14 of the Plan, please be advised that this would entail a plan amendment in addition to the public consultation envisioned in the Plan.
- The CRD shall submit to the Regional Director, Environmental Protection, a Plan Implementation Dispute Resolution Procedure in accordance with Section 32 of the *Guide to the Preparation of Regional Solid Waste Management Plans by Regional Districts, 1994* (the Guide). The Procedure shall be submitted for approval of the Regional Director, Environmental Protection, within six months of the date of this letter.
- The CRD shall maintain and support a Plan Monitoring Advisory Committee to facilitate ongoing public involvement during implementation of the amended Plan, in accordance with Section 35 of the Guide. The CRD's proposal for the nature and composition of this committee shall be submitted for approval of the Regional Director, Environmental Protection, within six months of the date of this letter.

...2

Ministry of Environment
Office of the Minister
Mailing Address: Parliament Buildings Victoria BC V8V 1X4
Telephone: 250 387-1187
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- Commencing in 2014, the CRD shall submit, by March 31 of each year, an annual Plan Implementation Progress Report and, at the end of phases one and two, a complete Plan Effectiveness Review in accordance with Section 36 of the Guide.
- Pursuant to Section 24(9) of the *Environmental Management Act,* where the approved Plan conflicts with a pre-existing permit or approval, the Plan supersedes the former authorizations.
- Before exercising its authority under Section 25 of the *Environmental Management Act,* in the creation of bylaws to regulate the management of municipal solid waste or recyclable materials, the CRD must ensure that meaningful consultations have taken place with potentially affected stakeholders in accordance with Section 25(4) of the *Environmental Management Act.*

The CRD Board may now proceed with adoption of the Plan and begin formal implementation. The implementation of this Plan will require amendments of operational certificates for the authorization of existing municipal solid waste management facilities. Ministry staff in the Williams Lake office will be preparing operational certificates based on the detailed operating and environmental protection requirements for the solid waste management facilities specified in the Plan. The regional Solid Waste Management Plan, together with the operational certificates, will form the basis of the authority to operate these facilities.

In closing, I commend the CRD for demonstrating progressive leadership in the development of this revised Plan. This Plan will achieve improved environmental management of solid waste transfer and disposal sites, and encourage further diversion of material from the waste stream, thereby conserving resources, creating job opportunities and reducing greenhouse gas emissions.

Sincerely,

Terry Lake
Minister of Environment

cc: Cassandra Caunce, Regional Director, Environmental Protection, Thompson/Cariboo, Ministry of Environment

March 7, 2013

Certified Copy of Resolution No. 13-01A-19 from the January 18, 2013 Cariboo Regional District Board Minutes

"That the agenda item summary from Mitch Minchau, Manager of Environmental Services, dated January 8, 2013, regarding the final draft of the updated Solid Waste Management Plan, with attachments, be received. Further, that the Board approve the Plan and direct staff to submit it to the Ministry of Environment for approval."

I hereby certify that this is a true and correct copy of Resolution No. 13-01A-19 as endorsed on January 18, 2013 by the Cariboo Regional District Board of Directors.

L A Johnston

Corporate Officer

CARIBOO REGIONAL DISTRICT
SOLID WASTE MANAGEMENT PLAN

The Cariboo Regional District (CRD) has a Solid Waste Management Plan, which was originally prepared in 1997 and approved by the Ministry of Environment, Lands and Parks. Since that time, the CRD has worked to implement the improvements identified within the Plan.

In August 2009, the CRD implemented a formal review of its Solid Waste Management Plan. This comprehensive review process has resulted in an updated Solid Waste Management Plan, which identifies a number of program improvements that will: increase waste diversion, make recycling accessible to all residents of the Region, protect the environment and increase operational efficiencies.

The CRD chose to use a single Advisor Committee (AC) that combined both public and technical individuals. The AC was active throughout the review process and enabled the CRD to produce a Plan that reflects values of CRD residents while meeting the Ministry of Environment's Plan requirements.

The updated Plan was completed in June of 2012. In July of 2012 the CRD's Board of Directors approved the Plan in principal. During September and October 2012 the Plan was presented to the District of 100 Mile House, the City of Williams Lake and the City of Quesnel. These municipalities provided the CRD with their resolutions to support or approve the Plan (resolutions can be found within the Public Consultation Report) by December of 2012. The municipalities requested the inclusion of language within the Plan that:

1. required Municipal Council's approval for implementation strategies that would have financial implications for the municipalities, and
2. allowed for Municipal Councils to retain control over recycling directions within their boundaries

The implementation timeline of 2012 – 2021 is stated repeatedly throughout the Plan; however, since the Plan will not be submitted to the Ministry of Environment until 2013 the timeline will shift accordingly.

The updated Plan is presented in this Stage 3 – *Implementation Plan Report,* which is supported by two other documents. The complete works of this review are listed below:

Reports

A. Implementation Plan Report, June, 2012

The Plan document which provides the regional plan objectives, management strategies, programs and implementation schedule that will increase waste diversion, make recycling accessible to all CRD residents, protect the environment and increase operational efficiencies.

B. Supporting Documents, December, 2011

This is a compilation of Stage 1 and Stage 2 reports completed during the review process: Stage 1 Characterization of the Existing System Report, Stage 2 Evaluation of Options Report, and Stage 2 Rural Landfill Efficiency Analysis Report. These documents are amended to the Implementation Plan Report.

C. Public Consultation Report, December, 2012

This report summarizes all of the public, first nations, community and municipality consultation that occurred throughout the review and development of the Plan. Appendix A contains samples of consultation activities. Appendix B contains the Advisory Committee, First Nations and municipality consultation. Appendix C contains public information and promotional materials. Appendix D contains the Stage 1 Public Opinion Survey Report, the Stage 2 Public Survey Report, both surveys and open house feedback. This report is presented in a separate document due to its length.

EXECUTIVE SUMMARY

This document is the Regional Solid Waste Management Plan (RSWMP) for the Cariboo Regional District (CRD) with an implementation timeline of 2012 – 2021. The RSWMP was developed over a three year period between August 2009 and April 2012 in accordance with the "Guide to the Preparation of Regional Solid Waste Management Plans by Regional Districts". The plan also presents new strategies to address specific issues of concern identified by the CRD through the Plan Review Process. It introduces a number of new approaches and programs for increasing waste diversion to achieve a 50% waste reduction goal by the end of the planning period in 2021.

Introduction

During the three year RSWMP review process CRD staff and the consulting team prepared a number of reports for the Advisory Committee (AC). The reports were generally circulated to the AC members a week or two before committee meetings. The following is a list of the major reports prepared for the AC as part of the review process.

Stage 1 Characterization of the Existing System Report
Stage 1 Public Opinion Survey Report
Stage 2 Evaluation of Options Report
Stage 2 Rural Landfill Efficiency Analysis Report
Stage 2 Public Survey Report
Public Consultation Report
Stage 3 Implementation Plan Report

The Stage 1 and 2 Public Survey Reports are appended to the Public Consultation Report; the other reports listed above are appended at the end of this Stage 3 Implementation Plan Report.

Guiding Principles

The key guiding principles adopted at the outset of the planning process include:

- Protect the Cariboo's natural environment, including surface and groundwater and air quality
- Long term goal of Zero Waste
- Support of Product Stewardship and Extended Producer Responsibility Programs
- Minimize GHG Emissions
- Maintain an Affordable System
- Recognize Rural Advantages and Limitations
- Carefully implement some elements of User Pay approach to program funding
- Promote local jobs where practical

Regional Management Plan Objectives

In alignment with the above guiding principles, the performance goals that the CRD aspires to attain over the next 10 year implementation period are established. These objectives include:

- Make recycling accessible to all residents of the CRD
- Gradually increase solid waste diversion to 50% by 2021
- Work to lower per capita waste generation rate to 889 Kg/person/year
- Reduce per capita residuals going to landfill from current 775 Kg/person to 500 Kg/person
- Work to lower residential residual generation rate to less than 5.70 Kg/person/week
- Expand participation of Institutional / Commercial / Industrial (ICI) Sector in waste diversion programs

MSW Management Strategies and Programs

The CRD will continue to systematically upgrade the solid waste system to improve diversion, to achieve greater efficiencies and reduce environmental risks.

Foremost, access to recycling services will be provided for the first time with the addition of recycling bins at all existing CRD facilities. The CRD will initiate consultations with Multi Materials B.C. and other Stewards to provide residents and businesses in the CRD convenient access to Extended Producer Responsibility (EPR) programs. Three new Eco-Depots will be established to provide convenient and centralized location where EPR materials can be deposited, so long as member municipalities agree to partner with the CRD for Depot costs.

The CRD will work with member municipalities to improve the efficiency of residential and commercial collection systems. Upgrades of the collection fleet to automated collection are already taking place in Quesnel and Williams Lake. Gradual conversion of the residential recycling program to single stream is also taking place. Steps will also be taken to improve the efficiency of hauling waste from rural transfer stations and from the Williams Lake transfer station to the Gibraltar Landfill.

More organics will be diverted from the landfills. Expansion of the successful back yard composting program will be top priority, followed by evaluation of centralized composting of yard and garden and vegetable waste deposited at the Eco-Depots. In vessel composting of putrescible food waste will not be pursued unless economic barriers are eliminated. Wood waste will be carefully sorted at all attended landfills and transfer stations that accept wood waste. Clean wood waste will be diverted for waste-to-energy where available. Contaminated wood waste will be landfilled directly or chipped and used to augment operational cover.

The amount of DLC waste landfilled will be dramatically reduced. Wood waste will be sorted at all attended sites, with clean wood waste diverted for waste-to-energy. Roofing material and concrete may be separated and diverted to beneficial use. Contaminated soil will be screened to ensure that it is not contaminated in excess of permit limits. Suitable soil will continue to be diverted for beneficial use as operational cover.

The CRD will strive to make all landfills efficient in terms of operating cost and air space consumption. Contractors will be required to attain best practices levels of compaction density and waste to cover ratio in their contracts. Use of alternate daily cover systems will be mandatory at most CRD landfill sites. Steps will be taken to maintain all CRD landfills compliant with the Landfill Criteria. In particular, progressive closure will continue to be implemented at central sites to reduce environmental impacts and to minimize long term liabilities.

Illegal dumping will be discouraged through new bylaws that will be enforced by a new bylaw enforcement officer dedicated to solid waste matters. Education programs will be continued and expanded to promote waste diversion.

The CRD will track GHG emissions from all aspects of the solid waste program, including methane emissions from landfills and CO_2 emissions from waste transportation. GHG emissions will be considered when evaluating changes to the solid waste program.

Policies

The key policies that will be adopted by the CRD to encourage participation in waste diversion programs are:

- Consultative Policy Development and Enforcement;
- Authorization of waste management facilities in CRD;
- Disposal bans on recyclable materials included in EPR programs;
- Bylaw enforcement of disposal bans and illegal dumping activities;
- Tipping fee consistency across CRD with incentives to sort materials and recycle;
- Waste stream management licensing;
- Policy on Importation of Waste from Out of Region; and
- Funding solid waste programs from taxation, supplementing with tipping fees when able.

Implementation Schedule

The programs identified in the plan have been prioritized to reflect public input and achievable diversion levels, with those programs resulting in the greatest diversion for least cost being prioritized in Phase 1. The priorities for the planned solid waste system upgrades and outlines are detailed in the implementation schedule presented as Table 6.1, with system upgrades scheduled across the three phase implementation period over the next 10 years.

The highest priority tasks are providing recycling services to rural residents, expanding the number of locations available for rural residents to drop off recycling, and diverting clean wood waste to waste to energy programs.

Costs of Plan Implementation

The CRD is currently budgeting the following amounts for the solid waste program costs as follows:

2010	$6,604,841
2011	$6,451,909
2012	$6,554,429
2013	$5,824,430
2014	$6,470,574

Stage 2 of this RSWMP review determined that program costs can be expected to range between $6.52 and $6.85 million with the addition of attended transfer stations and landfills, 3 Eco Depots, improved public education programs and expanded back yard composting. Based on public input, the CRD is moving to adopt waste management Option E with back yard composting in Phase 1. According to the Stage 2 Economic Study, the costs of this option are expected to be about $6.56 million per year.

In Phase 2, the CRD may look to gradually implement windrow based composting of yard and garden waste. Enhanced diversion of organics would be expected to increase program costs to about $6.82 million, excluding the cost of curbside collection of yard waste, which would be borne by member municipalities.

This plan anticipates the following budget for solid waste management over the next five years:

2012	$6,600,000
2013	$6,700,000
2014	$6,800,000
2015	$6,500,000
2016	$6,500,000

Illegal dumping is a major concern in the CRD, so user pay will be implemented gradually on selected items to ensure that it does not trigger a rash of illegal dumping activity. To avoid the uncertainty of reduced tipping fees, the CRD will continue to generate most of its revenue from a taxation based revenue structure.

Plan Administration

The CRD Solid Waste Management Plan will be administered by CRD staff and reviewed annually by the CRD Board. Progress on the plan will be reviewed annually against established targets and will be summarized in an annual implementation review. System costs will also be tracked annually against budget. Adjustments to program implementation will be made as necessary to respond to changing market conditions and to ensure that overall solid waste management remains cost effective.

1. INTRODUCTION

This document is the Regional Solid Waste Management Plan (RSWMP) for the Cariboo Regional District (CRD) with an implementation timeline of 2012 – 2021. The RSWMP was developed over a three year period between August 2009 and April, 2012 in accordance with the "Guide to the Preparation of Regional Solid Waste Management Plans by Regional Districts". The plan also presents new strategies to address specific issues of concern identified by the CRD through the Plan Review Process.

1.1 Background

The CRD is responsible for coordinating and administering the solid waste management function in the Cariboo. The solid waste system services four municipalities (Williams Lake, Quesnel, 100 Mile House and Wells) together with 12 Electoral Areas (A to L) and numerous First Nations Reserves. The four municipalities provide refuse collection services and recycling support within municipal boundaries. In the Electoral Areas the CRD is responsible for all aspects of refuse collection (from transfer stations), hauling and ultimate disposal of residuals in landfills. The CRD also provides a number of programs to reduce the waste going into landfill, including programs to chip and recycle or burn clean wood waste, Share Shed programs to promote reuse of serviceable goods and a recycling depot at the Williams Lake Transfer Station.

In August, 2009 the Cariboo Regional District (CRD) initiated a major review of its Regional Solid Waste Management Plan (RSWMP) that was originally prepared in June 1997 and subsequently amended annually on four occasions in 1998, 1999, 2000 and 2001. The original RSWMP divided the 8,026,200 Ha CRD into four solid waste management areas: 1) North Cariboo, 2) Central Cariboo, 3) South Cariboo and 4) Rural Cariboo. For each of the management areas, an ambitious program and implementation schedule were developed for improving regional landfill sites, implementing urban recycling, promotion and education, phasing out of open burning, closing small landfill sites and establishing new transfer stations to better serve the public.

1.2 Objectives

At the onset of the project, the CRD asked that the updated RSWMP build on the 1997 Plan, with a planning horizon to extend over a 10 year period from 2012 to 2021. The review process to be undertaken was to follow the methodology outlined in the B.C. Ministry of Environment Document "Guide to the Preparation of Regional Solid Waste Management Plans by Regional Districts". It was expected that RSWMP review would be a lengthy process, one that would include a significant level of consultation with multiple stakeholders, especially the public and would give consideration to concerns and requests raised by the stakeholders, with relevant issues included in the final documents. Cooperation was to be maintained with member municipalities to ensure that proposed new initiatives in the revised RSWMP would be supported.

Key tasks to be completed during the review included the following:

- Extensive public consultation to solicit input on existing and desired waste management practices
- Establishment of one or more advisory committees
- Adherence to environmental guiding principles and regional objectives
- Review of current solid waste management practices to identify operational improvements or efficiencies
- Review of evolving solid waste management practices and how they can be applied to the current system
- Review of promotion and education programs
- Cooperation with member municipalities and First Nations
- Consultation with Adjacent Regional Districts
- Guidance for plan monitoring and evaluation of plan effectiveness
- Staged reporting conforming to the MOE Guidelines

In particular, the RSWMP review was to evaluate and compare the costs and benefits of various solid waste management options. The tasks were organized into four broad categories that included Recycling and Waste Reduction, Improved Operational Efficiencies, Tipping Fees and Cost Controls and Reduced Environmental Impact. The individual tasks in each category were to include:

Recycling and Waste Reduction

- Enhanced recycling opportunities at rural refuse disposal sites
- Provide a strategy for interacting with Stewards responsible for Extended Producer Responsibility programs
- Investigate opportunities for establishing regional composting facilities
- DLC waste reduction programs
- Implementation of landfill bans on recyclables and product stewardship items
- Identify opportunities for moving toward a long term goal of Zero Waste

Improved Operational Efficiencies

- Evaluate the potential for closure of existing transfer stations and landfills
- Determine feasibility and acceptability of importing waste from other jurisdictions
- Determine acceptability, through public and stakeholder consultation, of using Refuse Derived Fuel for energy generation

- Review CRD Waste-to-Energy report for the purpose of incorporating report recommendations into the new RSWMP
- Determine CRD staffing requirements for implementation of the revised SWMP, based on roles and responsibilities of existing resources in the Environmental Services Department

Tipping Fees and Cost Controls

- Implement controlled access and commercial tipping fees at currently uncontrolled facilities
- Restructure tipping fees to encourage waste reduction
- Evaluate consistency of user fees applied throughout the District
- Determine operating and capital requirements for implementation of specific waste reduction initiatives and enhanced operational procedures

Reduced Environmental Impact

- Formulate an illegal dumping strategy with options for enforcement
- Determine GHG impacts and potential reductions

1.3 Plan Review Process

The CRD elected to retain a specialist consultant to assist with the RSWMP update through a competitive RFP process. A detailed RFP was issued in July, 2009. A consulting team comprised of solid waste planning and communications specialists from Sperling Hansen Associates, Carney's Waste Systems and Jan Enns Communications were selected to assist CRD staff and support the RSWMP Advisory Committee (AC).

Recruitment of volunteers for the AC was initiated in March, 2010. 24 members were ultimately selected, representing a diverse group of independent residents, First Nations, local politicians, the recycling sector, community groups, local businesses, local environmental and sustainability groups, local professionals and a representative from the Ministry of Environment. The AC was active, meeting a total of six times throughout the RSWMP review process. Details are provided in the appended report under the tab Public Consultation Report.

During the three year RSWMP review process CRD staff and the consulting team prepared a number of reports for the AC. The reports were generally circulated to the AC members a week or two before committee meetings. The following is a list of the major reports prepared for the AC as part of the review process.

Stage 1 Characterization of the Existing System Report
Stage 1 Public Opinion Survey Report
Stage 2 Evaluation of Options Report
Stage 2 Rural Landfill Efficiency Analysis Report
Stage 2 Public Survey Report
Public Consultation Report

Each report is briefly summarized below. A Powerpoint Presentation was typically prepared and presented by staff or a representative of the consulting team at the committee meetings. The Powerpoint presentations are compiled in Appendix B of the Public Consultation Report.

Stage 1 Characterization of the Existing System: Under the guidance of the AC, Stage 1 of the RSWMP was initiated. The purpose of the Stage 1 Review was to fully understand and quantify the existing system, to obtain input from the public on their level of satisfaction with the existing system and to obtain input regarding where the CRD should be focusing future resources to further improve service delivery and make the program more sustainable.

The RSWMP Review Stage 1 Report – Characterization of the Existing System is appended. The report is organized into seven sections as follows: 1) Description of the Existing System, 2) Quantifying the Existing System, 3) System Costs, 4) Cost Comparison to Other Regional Districts, 5) Stage 1 Public Consultation, 6) Summary of Desired Changes to the System and 7) Conclusions and Recommendations. The Stage 1 work was carried out between March 18th and September 30th, 2010. The report is appended under the tab Stage 1 Characterization Report.

An efficiency review of the CRD's key facilities was conducted by Owen Carney of Carney's Waste Systems, together with Dr. Tony Sperling of SHA. During the review the team toured all of the CRD's recycling depots, a number of transfer stations and landfills and met with most of the operational contractors. The Stage 1 report identifies the system improvements suggested by Mr. Carney. As well it summarizes the applicable comments and recommendations made by contractors on a site by site basis.

Stage 1 Public Opinion Survey: Extensive Public Consultation was conducted as part of the Stage 1 Review by the Cariboo Regional District and the consulting team over a six week period from June 1st, 2010 to July 9th, 2010. The results of the public survey that included more than 850 responses were presented in a separate report entitled RSWMP Review Stage 1 Report – Public Survey dated September 12th, 2010. The report can be found under the Appendix D tab of the Public Consultation Report.

Stage 2 Evaluation of Options: The Stage 2 Report was developed by the consulting team with CRD staff input and direction from the AC. The report first established the performance of the existing CRD waste management system in terms of tonnages and costs processed by each facility and system, including rural transfer stations, wood waste management, rural landfills, rural haulage, central transfer station, central recycling and central landfills. In 2009 the CRD system was processing 69,085 tonnes of MSW and recyclables per year at a overall system cost of $6.25 million per year, which translates to $90.59 per tonne.

The Stage 2 analysis determined that total solid waste diversion in 2009 was 13,074 tonnes of recyclables, representing 18.9% of the total MSW stream. The Stage 2 report examined a range of options for increasing the level of recycling, and particularly for providing recycling services to the rural residents of the CRD. Five recycling options (A, B, C, D and E) were developed. These options incorporated various combinations of enhanced services, including Eco Depots in the regional service

hubs in Quesnel, Williams Lake and 100 Mile House, 9 fully attended transfer stations facilities at CRD's busiest transfer stations and landfills and recycling bins at all remaining facilities.

A sophisticated model of the entire CRD solid waste system was used to evaluate the diversion performance and costs of each waste management option on overall system performance. This powerful model allowed for direct comparison of options, and for prioritizing those options that resulted in the highest level of diversion at minimum cost.

The Stage 2 Analysis determined that waste diversion could be increased to 53% (36,502 tonnes) by implementing single stream curbside recycling in urban areas, providing bins for recyclable materials at all CRD Transfer Stations and Landfills, adding three regional Eco Depots, upgrading nine transfer stations to attended sites, recycling all incoming broken concrete to aggregate, and diverting all incoming contaminated soil for operational cover. Additional efficiencies could be realized by reconfiguring the costly air curtain burning to high intensity open burns. Overall, the analysis determined that system costs would increase to $6.62 million annually.

As well, the Stage 2 Evaluation of Options Report explored four options for adding organic waste diversion, ranging from back yard composters, through yard and garden waste diversion to in-vessel composting systems. The evaluation of organic management options concluded that curbside collection of food and yard waste would be prohibitively expensive in the CRD, at $391/tonne. On the other hand, self haul and ICI drop-off of yard and vegetable waste for low tech seasonal composting at Urban Eco Depots and the nine attended transfer sites was projected to increase diversion by 1.9% (2,013 tonnes) at a nominal cost of $41.52 per tonne. The existing back yard composting program was shown to be very cost effective and Stage 2 recommended that the program be expanded to add 500 additional composters at a subsidized rate.

The Stage 2 Evaluation of Options Report determined that currently, the average operating cost of the three large regional landfills is $30/tonne whereas the cost of operating the small rural landfill sites was determined to be $163/tonne. The report recommended that a detailed analysis be undertaken to investigate whether it would be in the CRD's best interest to close the small landfills and instead to transfer waste to the existing regional landfill sites. The detailed analysis was subsequently undertaken by CRD staff. Results were presented in a separate report, summarized below.

The Stage 2 Evaluation of Options Report is appended to this RSWMP under the tab Stage 2 Options Report.

Stage 2 Rural Landfill Efficiency Analysis Report: Historically the Cariboo Regional District (CRD) operated 28 rural landfills. Over the past several years the CRD closed 16 of these sites and created transfer station where it was either more financially feasible to do so or an existing landfill did not meet the environmental requirements. At this time 12 rural landfills are in operation. In the Evaluation of Options Report the consulting team determined that the cost per tonne to operate the rural landfills was high as compared to larger urban sites and suggested that a review should occur to determine the feasibility of converting these sites to transfer stations.

District staff completed an assessment of 4 representative sites at Nazko, West Chilcotin, Tatla Lake and Inter-Lakes which are geographically distributed throughout the district. The analysis revealed

that current land filling practices are still financially more feasible then transfer stations. In the scenarios analyzed the use of tamped 40 yard bins with a load capacity of 7 tonnes versus a mechanical compaction unit with a load capacity of 9 tonnes were chosen. The tamped bins would provide for greater flexibility to accept larger waste materials, do not require constant supervision, no mechanical maintenance issues, no potential freezing issues associated with wet materials and the tamping equipment (small tractor or excavator) can be used on the site for sorting and piling metals and wood waste as well as snow removal and minor road work.

The plan recognizes that the MOE is currently upgrading the Landfill Criteria for Municipal Solid Waste and the new Criteria may require additional environmental safeguards at small landfills sites such as continuous supervision when the landfills are open. These requirements may change the overall economics of the small rural sites. The economic analysis will be re-evaluated when the new Landfill Criteria are implemented.

The Stage 2 Rural Landfill Efficiency Analysis is appended to this RSWMP under the tab Stage 2 Rural Landfill Report.

Stage 2 Public Survey Report: A second public opinion survey was conducted as an exit survey during open houses and concurrently as an on line Survey-Monkey survey. In total, 435 CRD residents responded. Responses showed strong support (70 to 100%) for the following new programs:

- Providing access to recycling services for all rural residents by adding permanent recycling bins at all landfills and transfer stations.
- Sorting of wood waste into clean wood for waste-to-energy and contaminated wood for landfill.
- Working with EPR Stewards including Multi Materials B.C. and Product Care to improve access to free drop off locations and/or host special collections of recyclables covered by the programs.
- Selling backyard composters and/or worm composters at a reduced rate to encourage composting of organics at home.
- Improving public education so that people will know what materials to recycle and where to take them.
- Developing a "Waste Wise" education program for schools.
- Supporting community clean-up projects by providing bags, signage, support vehicles and staff.
- Implementing a reporting program and cleaning up illegal dump sites.
- Pursuing opportunities to use wood waste for waste-to-energy projects.
- Facilitating public discussion regarding the environmental impacts of mass incineration of MSW.

The Stage 2 Public Survey Report can be found under the Appendix D tab of the Public Consultation Report.

Public Consultation Report: An extensive public consultation process was conduced to engage residents, businesses, First Nations and various other stake holder groups in the RSWMP review. The public consultation was conducted in three ways: Committee Consultation, First Nation Consultation and Community Consultation.

The 24 member AC was actively engaged at all stages of the RSWMP review through six meetings and extensive e-mail correspondence. All 15 First Nations were contacted and invited to participate in the review. Four First Nations named representatives to participate on the AC. Bands were included in all direct public communications. Community consultation included an Initial Opinion Survey that generated 869 responses, 14 open houses held in all four service areas of the CRD, an exit survey that generated 435 responses. The campaign was supported by a dedicated "Let's Talk Trash" section on the CRD web site, distribution of e-mails to stakeholders including member municipalities, First Nations, community groups, service clubs and neighbourhood organizations and media coverage that included news releases, advertisements and media coverage including news stories and radio coverage.

This report is presented as a separate document, due to its length.

Stage 3 Implementation Plan Report: The final report of the RSWMP is this document which synthesized all of the analyses, AC input an public comment to develop a strategy for managing solid waste in the CRD during the new planning period from 2012 to 2021. The contents of the Stage 3 Report are outlined in the following section.

1.4 Stage 3 Report Structure

This Stage 3 Implementation Plan outlines a detailed strategy for the management of solid waste including recyclables, organics and residuals generated within the boundaries of the CRD. It introduces a number of new approaches and programs for increasing waste diversion to achieve a 50% waste reduction goal by the end of the planning period in 2021.
The report is organized into the following eight sections.

1. Introduction
2. Guiding Principles
3. Regional Plan Objectives
4. MSW Management Strategies and Programs
5. Policies
6. Implementation Schedule
7. Costs of Plan Implementation
8. Plan Administration

The contents of each section are briefly summarized below.

Section 1. Introduction: This section presented a "big picture" overview of the work undertaken by the AC, District staff, supporting consultants and public. The contents and key conclusions of each of the eight subject specific reports were briefly summarized.

Section 2. Guiding Principles: This section lists the key guiding principles that were adopted at the outset of the planning process. These principles form the cornerstone of the plan. The key guiding principles that were adopted include:

- Protect the Cariboo's natural environment, including surface and groundwater and air quality
- Long term goal of Zero Waste
- Support of Product Stewardship and Extended Producer Responsibility Programs
- Minimize GHG Emissions
- Maintain an Affordable System
- Recognize Rural Advantages and Limitations
- Carefully implement some elements of User Pay approach to program funding
- Promote local jobs where practical

Section 3. Regional Management Plan Objectives: In alignment with the above guiding principles, Section 3 describes the performance goals that the CRD aspires to attain over the next 10 year implementation period. These objectives include:

- Make recycling accessible to all residents of the CRD
- Gradually increase solid waste diversion to 50% by 2021
- Work to lower per capita waste generation rate to 889 Kg/person/year
- Reduce per capita residuals going to landfill from current 775 Kg/person to 500 Kg/person
- Work to lower residential residual generation rate to less than 5.70 Kg/person/week
- Expand participation of Institutional / Commercial / Industrial (ICI) Sector in waste diversion programs

Section 4. MSW Management Strategies and Programs: The CRD will continue to systematically upgrade the solid waste system. Section 4 describes each of the planned system upgrades to improve diversion, to achieve greater efficiencies and reduce environmental risks.

Section 5. Policies: This section outlines the key policies that will be adopted by the CRD to encourage participation in waste diversion programs. These policies include:

- Consultative Policy Development and Enforcement;
- Authorization of waste management facilities in CRD;
- Disposal bans on recyclable materials included in EPR programs;
- Bylaw enforcement of disposal bans and illegal dumping activities;
- Tipping fee consistency across CRD with incentives to sort materials and recycle;
- Waste stream management licensing;
- Policy on Importation of Waste from Out of Region; and

- Funding solid waste programs from taxation, supplementing with tipping fees when able

Section 6. Implementation Schedule: This section prioritizes the planned solid waste system upgrades and outlines a detailed implementation schedule for system upgrades over the next 10 years. A Gantt chart maps out the planned works.

Section 7. Costs of Plan Implementation: This section documents the anticipated program costs, including capital investments and annual operating costs. Cost recovery is also discussed in terms of planned tipping fees and gradual transition of some of the program elements from a taxation based to a user pay system, where practical. Illegal dumping is a major concern in the CRD, so user pay will be implemented gradually to ensure that it does not trigger a rash of illegal dumping activity.

Section 8. Plan Administration: The CRD Solid Waste Management Plan will be administered by CRD staff and reviewed annually by the CRD Board. Progress on the plan will be reviewed annually against established targets and will be summarized in an annual implementation review. System costs will also be tracked annually against budget. Adjustments to program implementation will be made as necessary to respond to changing market conditions and to ensure that overall solid waste management remains cost effective.

2. GUIDING PRINCIPLES

The starting point in the CRD's RSWMP review was to develop a set of guiding principles that would focus and prioritize policies and strategies developed during the plan review. The guiding principles serve as the foundation on which the CRD's RSWMP has been developed. The CRD has adopted the following principles to guide the development of the waste management plan.

2.1 Protecting Cariboo's Natural Environment

The Cariboo is a region that is rich in natural resources, wide open spaces and spectacular vistas. The people who live in the CRD place strong values on these attributes of their home. It is important to operate the solid waste system in a way that will protect the natural environment, one that will not cause extensive illegal dumping problems, that will reduce litter along highways, that will protect streams, groundwater resources and air quality, and that will not cause unacceptable odours or noise impacts on the residents or workers in the CRD.

Photo 2-1. The Cariboo, a natural environment worth protecting

2.2 Long Term Goal of Zero Waste

The residents of the CRD recognize that the resources of this planet are finite and cannot be wasted if we are to achieve a sustainable future. "Zero Waste" is an encompassing philosophy that strives to maximize recycling, minimize waste, reduce consumption, and ensure that products designed to be reused, repaired or recycled back into nature or into the market place.

Zero Waste goes beyond simple recycling by adopting a "whole system" approach to the flow of resources over their entire life cycle. This approach could include redesigning a product to use fewer raw materials, or finding new markets that use waste as a resource for a different product. For individual residents of the CRD, Zero Waste may mean changing purchasing habits to avoid buying items with excessive packaging, setting up a back yard composter or supporting new product stewardship initiatives by diverting more materials into the single stream recycling bin than into the garbage bin.

Zero Waste does not mean that Zero Waste will be generated or disposed of at the end of the day. Rather, it means that the CRD will work diligently and continuously to reduce the amount of residuals going to landfill by adopting aggressive waste reduction policies. The CRD recognizes that many communities across B.C. and Canada have already adopted a Zero Waste goal, and have demonstrated that the philosophy has lead to a marked reduction in the amount of waste ultimately disposed to the landfill.

Adopting Zero Waste will also allow the CRD to become more aligned with the direction of neighbouring regional districts, including the TNRD, the CSRD and the RDFFG, as well as the future direction of the province. The CRD will also work through the Southern Interior Waste Managers and UBCM to support the adoption of Zero Waste as a province wide goal at the provincial level.

2.3 Support of Product Stewardship and Extended Producer Responsibility Programs:

Product Stewardship, also known as Extended Producer Responsibility (EPR) is a resource management policy where the producer's responsibility for managing the environmental impact of their product is extended across the entire life cycle of the product, from initial section of materials, through use and ultimate disposal at end-of-life. Product Stewardship places financial responsibility for the management of the product, from production through final disposal on producers and consumers. Thus it removes the financial burden of managing components the waste from Local Government.

The Stewardship agencies that include Multi Materials B.C., ENCORP, B.C. Used Oil Association, Product Care B.C. amongst others have been formed by producers and brand owners to deliver a single efficient program for each recyclable material. The stewards have the flexibility to collect recyclables at point of sale and/or at recycling depots. It has been demonstrated that one of the most effective means of EPR program delivery is at Eco Depots where many different recyclables can be dropped off by the public at one convenient location.

The Stewardship Agencies are responsible for educating consumers regarding their programs and for providing information about collection options, fees, and handling practices. Most agencies maintain websites, and / or utilize the services of the Recycling Council of BC Hotline.

Details of the existing EPR programs in British Columbia were provided in Section 5 of the Stage 2 Evaluation of Options Report (appended). Since the Stage 2 Report was prepared, the Ministry of Environment commenced the roll out of a major new EPR program that is targeted at all printed paper and packaging. Under the Waste Management Act, packaging is defined as "a material, substance, or object that is (a) used to protect, contain, or transport a commodity or product, or (b) attached to the commodity or product or its container for the purpose of marketing or communicating information about the commodity or product". Printed Paper is defined in the Recycling Regulation as including all paper printed with text or graphics (e.g. news papers, magazines, flyers, phone books), with the exception of bound books.

According to the Recycling Regulation Amendment of May 19th, 2011 the new EPR program will come into effect within three years of regulatory amendment, by May 19th, 2014. In B.C. the above materials will be managed by a newly formed Steward, Multi Materials B.C. (MMBC). MMBC will be tasked with establishing collection programs, transporting collected recyclables and ultimately reusing those materials or selling the recycled commodities for reprocessing elsewhere. The MMBC program could divert up to 40% of the solid waste from CRD's system.

According to the Ministry of Environment, local governments may choose to participate in or assist a product stewardship program by:

- providing facilities or operational services as a service provider at a landfill, transfer station or other local site for product collection or processing,
- helping to inform the public that the stewardship program is available,
- assisting the EPR Stewards with local land use and business licence issues relating to collection and processing facilities, and
- imposing bans on the landfilling of the relevant products, when appropriate.

Residents of the CRD agree strongly with expanding EPR programs across the entire Regional District and improving access to recycling of the items covered by EPR. The level of support is 96.3% region wide.

The CRD supports the concept and practice of product stewardship. In support of the MMBC program and other EPR programs already in place or to be launched in the future, the CRD will work with the Stewards to make EPR a success in the region. As part of ongoing EPR implementation, the CRD anticipates undertaking the following.

1. The CRD will offer to work directly with stewardship agencies and BC Ministry of Environment to help ensure that stewardship agency collection depots are well sited and meet the needs of CRD's communities.

2. The CRD will work with EPR Stewards to improve access to free Eco-Depot drop off locations at the three main business centres at Quesnel, Williams Lake and 100 Mile House. Two options are currently envisioned for service delivery:

   A) CRD Eco-Depots whereby CRD will partner with stewardship agencies to provide collection services at the CRD operated facilities. At the CRD Eco-Depots, the CRD would provide space and staffing for the collection and storage of EPR-regulated products. The stewardship agencies would provide funding for:

   a. Construction of storage buildings (if required)
   b. Containers appropriate for storage of the materials
   c. Training for Eco Depot staff
   d. Transportation and disposal/recycling of the collected materials

   B) Private Sector Eco-Depots whereby participating Stewards would contract directly with a private sector service provider to administer the various collection services. Recognizing that private waste management companies including Quesnel Recycling Depot, Central Cariboo Disposal and Gold Trail Recycling are important service providers with a well established presence in the hub communities, the CRD supports the delivery of future EPR programs in a way that will compliment rather than compete with existing programs, with the overlying objective of making the services as convenient as can be for the public.

3. The CRD will work with EPR Stewards to host special collection events for extended producer responsibility items in smaller communities and in major centres for materials that are not included at the Eco-Depots. For these events, CRD will coordinate activities and provide on-site staff to greet and direct participants. The stewardship agencies would be expected to provide:

   a. Funding for event promotion,
   b. Technicians for each event that are familiar with the receipt and packing of the hazardous waste products received at the events,
   c. Approved collection containers, and
   d. Transportation and proper disposal or recycling of the collected items.

4. The CRD will ban disposal of items covered by EPR programs from CRD's transfer stations and landfills when adequate EPR programs are in place to serve as practical options.

5. The CRD will monitor non-controlled landfills and transfer stations to determine if the use of these sites increases as a result of the EPR bans.

The benefits of EPR to local government and taxpayers are significant and it is critical that any long term waste management planning and ensuing contracts recognize the changes that will come from a product waste going into a stewardship program. Further, CRD, as with other outlying jurisdictions, also has the challenge of getting stewards to provide adequate levels of service to significantly impact waste volumes. Stewardship Plans set provincial targets for materials recovery and in many cases those targets can be reached by having efficient metropolitan based programs with little need to incur the costs of operating less efficient programs to service lower population density areas. Part of this problem can be addressed by having regional recovery targets as part of the provincial target in the stewardship plan and CRD and other jurisdictions should continue to work to ensure that the Provincial

Government recognizes this imbalance. It is also critical that CRD maintain an ongoing working relationship with all of the stewards so they will meet the CRD's needs and opportunities.

2.4 Promote Local Jobs Where Practical

Strong communities are built on local jobs. Other things being equal, the CRD will support and give preference to local contractors and local workers in the delivery of solid waste management services, be they collection, processing, or disposal. However; it is understood in this plan that strong economies of scale do exist in most solid waste management programs, and many aspects of waste management, such as automated sorting of single stream recycling can be done more efficiently at large scale facilities that are typically located in major metropolitan areas such as Metro Vancouver.

2.5 Process Waste and Recyclables Responsibly

The CRD will require recyclers dealing with waste generated in the CRD to process that waste in a responsible and safe way.

2.6 Prioritize Diversion of Hazardous Substances

The CRD solid waste program will prioritize the diversion of hazardous materials from landfill. High priority objectives will include diversion of hazardous materials like fluorescent light bulbs that contain mercury, recyclable batteries that contain heavy metals, and liquid wastes like oils, solvents, pesticides, etc.

2.7 Implementation of New Programs and the 5-R's Hierarchy

Any program that is implemented in the CRD will be technically sound, economically feasible and acceptable to the public. Programs will be prioritized following the 5-R's hierarchy of Reduce, Reuse, Recycle, Recovery and Residuals Management. Any new solid waste management program chosen for implementation will be communicated appropriately to affected stakeholders, and further consultation specific to that program will be carried out in impacted communities and service areas as required. To support the implementation of new programs, the CRD may elect to implement pilot programs to test the effectiveness of major changes before full implementation. The results of the pilot programs will be used to determine if full-scale implementation of the tested program is justified.

2.8 Maintain an Affordable System

The CRD recognizes that many waste diversion programs can be much more expensive than residual management. The CRD will continuously evaluate waste diversion opportunities and prioritize program implementation to select those programs that achieve the highest level of diversion at the lowest cost.

2.9 Minimize GHG Emissions

The evidence that green house gas emissions released by mankind is detrimental to our environment is strong. Because residents of the CRD rely on a healthy environment to support their livelihood, curtailing of GHG emissions is a priority. The CRD will track total GHG emissions generated by the

Solid Waste program on an annual basis and will seek ways to reduce those emissions over time through implementation of new technologies. Measures that will be explored during this plan implementation period will include voluntary collection and flaring of methane from the three regional landfills, active biocovers to reduce fugitive methane emissions, optimized hauling of waste materials and diversion of organics from landfill where practical.

2.10 Education

Public behaviour can be effectively altered through awareness. Education and social marketing will be key aspects of the CRD's solid waste program to attain a high level of public awareness about the importance of reducing solid waste and will be critical to the success of the waste management program. The CRD is committed to supporting a comprehensive education and social marketing program and all of the waste diversion programs that will be introduced will include an integral public education component. Outreach to young people in school through the "Waste Wise" program will be a top priority. The CRD will continue to improve existing waste reduction and awareness programs and will introduce new programs as they become available. The CRD will look to partner will neighbouring regional districts to take advantage of cost sharing on educational program opportunities.

2.11 Support for Cooperation Opportunities

The CRD recognizes that member municipalities and First Nations are important partners in the implementation of this RSWMP. Also, the CRD anticipates benefits of coordinating policies with neighbouring regional districts. Sections 5.9, 5.11 and 5.12 of this plan outline how the CRD will cooperate with member municipalities, First Nations and neighbouring regional districts.

2.12 Recognize Rural Advantages and Limitations

The CRD is one of the largest and least densely populated regional districts in the province. The CRD's solid waste programs will give consideration to this important demographic. Priority will be given to programs that minimize transportation. Back yard composting of organics is the best example of a program that will make beneficial use of solid waste without any transportation. Local re-use of clean wood waste for large scale waste-to-energy in mills and thermal plants, and for small scale waste-to-energy as home heating fuel is another example.

Given the large distances, emphasis will be placed on hauling solid waste as efficiently as possible, always striving to maximize load tonnages to legal weight and to use the largest, highest capacity truck / trailer combinations practical for each job.

2.13 Move toward User Pay approach to program funding

Solid waste programs and services delivered by the CRD are currently funded primarily by general taxation, with only a limited number of weight based tipping fees in place for commercial waste. The CRD recognizes that unlike a user pay program where costs increase proportionately with the amount of trash thrown away, the taxation based fee structure does not encourage waste reduction. This is because in the taxation model costs for waste disposal are fixed and the true costs of waste

management are not readily apparent to the user. In addition, the taxation model does not provide a financial incentive for users to reduce the tonnage of residuals disposed.

However, the AC and the public are concerned that moving toward a user pay system may result in significant unintended consequences with illegal dumping. Also, the CRD envisions significant barriers to user pay at its various rural unattended landfill and transfer station sites. Finally, the user pay principle currently receives only a moderate level of support by the public, with an approval rating of about 56.3% across the region.

Given these constraints, the CRD intends to move slowly and carefully toward user pay, implementing the program gradually and only when all of the infrastructure is in place to properly collect tipping fees (attendants), bylaw enforcement is in place, and a public education campaign has been implemented to better educate the public about the benefits of the user pay approach to cost recovery.

3. REGIONAL PLAN OBJECTIVES

The overall purpose of the Solid Waste Management Plan Review is to update the SWMP, last amended in 2001, to reflect the current status and goals for solid waste management in the region. This report brings together the results from Stages 1 and 2 of the review. Stage 1 was to provide an analysis of the current waste management system and an overview of possible future upgrades to the system. Stage 2 provided a detailed economic analysis of the current waste management system and an overview of a range possible future upgrades to the system intended to achieve further waste reduction.

The overriding objective of this Stage 3 Report is to provide the CRD with guidance for moving forward with implementing the Solid Waste Management strategies and programs. In alignment with the guiding principles presented in Section 2, the CRD has set out 6 goals to achieve during this 10 year implementation period, from 2012 to 2021.

3.1 Make recycling accessible to all residents of the CRD

The top priority of the updated RSWMP is to make recycling accessible to all residents in the CRD. To date, recycling has only been accessible to residents living in the major urban centres of the CRD, including Williams Lake, Quesnel and 100 Mile House. Residents of outlying areas have had the option to haul recyclables into recycling depots established in the three above noted communities, but this was not particularly convenient and the CRD is looking to expand recycling services to all CRD landfills and transfer stations.

3.2 Gradually increase solid waste diversion to 50% by 2021

In 2009 the CRD diverted 18.3% of solid waste from landfill. The CRD looks to make big strides in improving waste diversion levels during this plan implementation period, setting a goal to divert 50% of incoming waste by 2021. To achieve this ambitious goal the CRD will work with municipal partners and Multi-Material BC to divert considerably more paper and packaging from the residential and ICI waste streams. Also, diversion and beneficial use of crushed concrete and low level contaminated soils are seen as low hanging fruit that can be diverted from direct landfill disposal. Finally, the CRD will strive to expand back yard composting and to add simple windrow composting of yard and garden waste and vegetable waste at three urban compost sites toward the end of this implementation period.

3.3 Work to lower per capita waste generation rate to 889 Kg/person/year

In 2009, the total MSW production in the CRD was 60,725 tonnes, generated by a population of 61,437 residents. Thus, the per capita MSW generation rate (including recyclables) was 988 Kg of MSW per person per year. Consistent with the Zero Waste policy, the CRD will strive to educate the public to consume less resources and generate less waste. The CRD's goal is to reduce total MSW generation during this 10 year implementation period by 10% to 889 Kg per person, or less.

3.4 Reduce per capita residuals going to landfill to 500 Kg/person

In 2009, 47,651 tonnes of waste was landfilled, representing 775 Kg/person/year. To achieve the 50% diversion goal by 2021, the CRD is looking to reduce the tonnage going to landfill to 30,362 tonnes or less by 2021, and the per capita residual generation rate to 500 Kg/person/year.

3.5 Lower residential residual generation rate to less than 5.70 Kg/person/week

Of the total solid waste stream, about 60% of MSW is generated at home, with the balance generated by the ICI sector and as demolition / land clearing / construction waste (DLC). The CRD goal is to have each resident generate less than 5.70 Kg of residuals in their trash bin each week.

Through the Waste Wise program, the CRD public education program will challenge residents to weigh their residuals and to dispose of less than 0.8 Kg/person/day.

3.6 Expand participation of ICI Sector in waste diversion programs

To date the focus of recycling education and CRD's diversion programs have been aimed primarily at the residential sector. The ICI sector generates almost half of the MSW in our region. In this plan, educational outreach will be targeted to educate restaurants, stores and businesses to divert more of their solid waste.

Provided in this report is a road map toward achieving the above six objectives, including an overview of applicable policies, an implementation schedule, costs for plan implementation and suggestions for plan administration.

4. MSW MANAGEMENT STRATEGIES AND PROGRAMS

This Section describes the planned improvements to the existing solid waste system that will allow the Regional District and its member municipalities to move toward 50% waste diversion over the next 10 years, and ultimately toward the long term goal of Zero Waste. Also, the plan identifies ways to make the existing system more efficient through adjustments in the collection, hauling and processing systems that are currently in place.

The program outlined below combines waste diversion, residual management strategies and policy options to effectively manage solid waste within the Region and achieve the above goals. The section reviews each of the major components of the solid waste system, including:

1. Extended Producer Responsibility Programs
2. Recycling
3. Organics Management
4. DLC Waste Reduction Program
5. Wood Waste Management
6. Waste to Energy
7. Waste and Recycling Collection
8. Residual Waste Management
9. Illegal Dumping Clean Up
10. Education and Promotion
11. GHG Reduction

Targeted programs are identified for each of the above services. The plan recognizes that all of the planned program upgrades cannot be implemented at once. Therefore, an implementation schedule has been developed which prioritizes the programs based on the potential waste diversion that can be achieved and cost per tonne, so that the CRD can achieve maximum levels of diversion quickly and at minimum cost.

Also, the phasing recognizes that at this time there is a very large amount of uncertainty with respect to the roll-out of the MMBC program for packaging and printed paper materials. Therefore, major elements of the recycling program involving these materials may be delayed to Phase 2, when clarity is obtained as to how collection of recyclables will be conducted and funded by MMBC.

Phase 1 programs are recommended for high priority implementation in the short term, between now and December, 2014. Phase 2 programs are targeted for implementation in the medium term between January 2015 and December, 2017. Phase 3 Programs are targeted for the long term, between January 2018 and December, 2021.

The order in which programs are rolled out also recognizes the need to undertake preparatory studies and complete other tasks in advance of full program implementation. For the same reason, some programs will straddle two or more phases, beginning with preparatory activities and/or pilot programs in Phase 1, and continuing to full implementation in Phase 2 or Phase 3. Where appropriate, specific policy tools to support these initiatives have also been identified.

4.1 Extended Producer Responsibility

"In British Columbia, Industry-led Product Stewardship is a government strategy to place the responsibility for end of life product management on the producer and consumers of a product and not the general taxpayer or local government." (BC Ministry of Environment Product Stewardship website).

Product stewardship programs play an integral and increasingly significant role in the management of municipal solid waste in BC. Most existing product stewardship programs, also referred to as Extended Producer Responsibility (EPR) programs, have been established by producers and brand-owners of products in accordance with requirements set out in the *BC Recycling Regulation*.

In accordance with the *BC Recycling Regulation*, mandatory waste management programs have been established for the following categories of products:

Products currently covered by an EPR program:

- Paint
- Tires
- Cell Phones
- Batteries
- Televisions
- Antifreeze
- Used motor oil, oil filters and empty oil containers
- Solvents
- Fuels
- Thermostats
- Small appliances
- Residential fluorescent lamps
- Audio-visual and consumer equipment
- Pesticides
- Pharmaceuticals
- Beverage containers
- Smoke detectors
- Printers
- Lead Acid Batteries
- Computer monitors, keyboards, mice and other peripherals

The EPR programs are managed by Stewards that have been formed by brand owners of the various manufactured goods to efficiently manage each category of recycled materials these stewards include:

- Encorp – Beverage containers
- Product Care – Paint, Solvents, Pesticides, Fuels, CFL's
- Tire Stewardship B.C. – Automobile Tires
- British Columbia Used Oil Management Association – used oil, oil filters
- Multi Materials B.C. (MMBC) - cardboard, mixed paper, plastic packaging
- Canadian Battery Association (CBA) - lead acid batteries
- Call2Recycle - electronics batteries
- Electronics Stewardship Association of British Columbia - E-waste
- Canadian Wireless and Telecommunications Association (CWTA) - Cell Phones
- Summerhill Impact - Thermostats
- Alarm Recycle - Smoke and Carbon Monoxide Alarms under a stewardship program

Products to be covered by an EPR program:

As of July 2012

- Large appliances
- Electrical and electronic tools
- Medical devices
- Automatic dispensers
- Lighting equipment
- Toys, leisure and sports equipment
- Monitoring and control instruments
- IT and telecommunications equipment
- Batteries used in these products

As of May, 2014

- Packaging
- Printed Paper

Centralized EPR Eco-Depots (Phase 2): Setting up the collection infrastructure for mandatory product stewardship programs is the responsibility of the Stewards. Return to point of purchase programs are effective for some commodities like tires; but for most products such programs are not convenient for the public. It has been demonstrated that well equipped Eco-Depots that accept recyclables from the full spectrum of EPR programs, as well as other recyclable materials not covered by EPR are the most efficient and convenient way to collect recyclables.

The CRD supports the concept and practice of product stewardship and will assist stewardship agencies in the siting of collection depots to meet the needs of CRD's communities. Stewards will be encouraged to establish a presence at a centralized Eco Depot in each of CRD's major municipalities.

One model for the Eco Depot program delivery being considered is for CRD to establish three Eco Depots in the major municipalities and to encourage stewardship agencies to provide collection services at the CRD's Eco Depots. At the eco depots, the CRD would provide space and staffing for the collection and storage of EPR-regulated products. The stewardship agencies would provide funding for:

Photo 4.1 Typical Hazardous Waste Eco-Depot, Grande Prairie

- Construction of storage buildings (if required)
- Containers appropriate for storage of the materials
- Training for Eco Depot staff
- Transportation and disposal/recycling of the collected materials

Round-Up Events in Smaller Municipalities (Phases 1 to 3): The CRD will support stewardship agencies to provide round up events for smaller communities on a regular basis.

4.1.1 Material Bans to Support EPR

Disposal Bans on ICI Materials (Phases 1 to 3): Disposal bans will be implemented for all materials included in provincial EPR programs for which practical diversion options are in place in the CRD. Commercial loads containing these materials may be banned from disposal at CRD's transfer stations and landfills.

Implementation of recycling bans will involve a targeted public information campaign in advance of each program being implemented, as well as a transition grace period where ban reminders and education materials will be issued to haulers disposing of banned materials. The transition grace period will be followed by full scale implementation and enforcement of the material ban.

The CRD may step up bylaw enforcement activities at transfer stations and landfills during the early stages of the implementation period to put out the message that the regional district is serious about ban implementation. Section 5 outlines the enforcement tools that may be implemented in support of disposal bans.

4.1.2 Working with Multi Materials BC

Coordination of Collection Programs with MMBC (Phase 1): If it achieves 75% collection efficiency, the MMBC EPR program for packaging and printed paper is likely to capture about 14,574 tonnes of recyclables per year in the CRD (based on 60,725 tonnes of waste (excluding contaminated soil), 20% paper and 12% plastics, and 75% capture rate). This represents about 24% of the CRD's solid waste stream. Therefore, it will be vitally important to coordinate both urban and rural recycling programs with MMBC.

Issues that will need to be resolved as part of plan implementation include:

- Will MMBC collect materials as single stream format or source separated materials?
- How much contamination will be acceptable to MMBC?
- Will MMBC take over existing curbside recycling programs?
- Will MMBC be responsible from collecting recyclables from attended transfer stations in the CRD?

- Will MMBC be responsible for collecting printed paper and packaging from CRD's unattended sites that have small tonnages and long haul distances?
- How will MMBC interface with established recycling businesses?
- Will MMBC participate in CRD's Eco Depots?
- How will MMBC reimburse the CRD for collection costs?

CRD staff will liaise with MMBC and neighbouring regional districts to answer the above questions and to generally facilitate a smooth transition to the new EPR program.

4.1.3 Monitoring

CRD staff will monitor unattended transfer stations and landfills to determine if implementation of bans at the controlled sites results in the redirection of solid wastes containing banned materials to CRD's unattended sites. If significant redirection of waste is observed, the CRD will step up control activities at these sites.

4.2 Recycling

4.2.1 Urban System

Urban recycling programs in the CRD are in a state of flux. Drop-off facilities for recyclables have been in place for many years in the major municipalities, and offer programs for diversion of cardboard, mixed paper, plastics, glass, metals and EPR materials. Starting in 2009 Williams Lake commenced a curbside program for single stream recyclables.

The CRD is committed to improving access to recycling programs for the public during this implementation period; however, this plan recognizes that responsibility for diversion of a large portion of the solid waste stream is being shifted to producers through EPR programs, and most significantly, the upcoming paper and packaging program that is being rolled out by Multi-Material B.C. Support of EPR programs and methods of interaction between the CRD and EPR stewards are discussed in Section 4.1.

Implementing Three New Eco-Depots (Phase 2): To provide better and more centralized access to recycling services, the CRD intends to establish full service recycling Eco-Depots in Williams Lake, Quesnel and 100 Mile House. It is the CRD's intent to base the Eco Depot program on the very successful Eco Depots that have been developed at Hartland Landfill (Capital Regional District) and Grande Prairie, Alberta for example. These depots provide for all recyclable materials, including:

- cardboard, mixed paper, plastic packaging with a 75% diversion goal by May 2014, under the Multi Materials B.C. Program
- paint, used oil, oil filters and HHW under Product Care Program
- lead acid batteries under the Canadian Battery Association (CBA) stewardship program

- electronics batteries with a 40% recovery for disposable and rechargeable batteries under Call2 Recycle program,
- E-waste under Electronics Stewardship Association of British Columbia,
- Cell Phones with a 80% diversion target by 2015 under the Canadian Wireless and Telecommunications Association (CWTA)
- fluorescent light tubes, CFL's, U-tubes and metal halide bulbs with a 40 to 75% recovery rate for CFL's under the Product Care Program,
- Thermostats with a 75% diversion rate under the Summerhill Impact program
- Smoke and Carbon Monoxide Alarms under a stewardship program
- glass,
- yard waste,
- clean wood waste,
- used cooking oil,
- Styrofoam,
- ink jet cartridges
- propane canisters

As well, the facilities may provide a re-use facility for building materials.

The CRD will carefully evaluate and consult with the public and the various Stewards to determine whether the Eco-Depots will be owned and operated by the CRD, whether they will be contracted, or whether the CRD will look to partner with existing private sector providers to implement the Eco-Depots. Regardless of the management model, the goal will be to have a single, conveniently located and easily accessible facility in each major municipality of the CRD where the public and businesses can take all of their recyclables for processing and shipment.

The Eco-Depot program will not be implemented until there is clarity with regards to the roll-out of the MMBC program in the CRD. Eco Depots establishment is scheduled to start in 2015-2016, so long as member municipalities agree to partner with the CRD for Depot costs.

Material Bans for OCC and Packaging (Phase 1): Recycling from the institutional / commercial / industrial (ICI) sector will be encouraged through material bans at disposal facilities. Old corrugated cardboard (OCC), printed paper and packaging will be the main products targeted, as will vegetable waste once composting operations are established. Unlike the residential programs, which may be moved toward single stream, ICI programs will be encouraged to maintain material separation so that the highest values can be maintained in the products. This program will be implemented in 2014.

Education Targeted at ICI Sector (Phase 1): Recycling rates in the workplace are currently 10 to 25% lower than in the residential system according to the Stage 1 Public Opinion Survey, with recycling rates of 45% to 75% participation. To increase recycling rates in the work place, the CRD

Public Education Program will target development and delivery of recycling education programs for businesses to increase the participation rate. The ICI education program will be implemented in the period 2012-2013.

Photo 4-2. Loads of recyclable EPR materials will be banned from landfills

4.2.2 Rural System

Recycling in rural areas is currently not supported by the CRD. Residents can recycle by bringing their sorted materials to one of the existing recycling facilities in Williams Lake, Quesnel or 100 Mile House.

Providing access to recycling services in rural areas was considered the top priority for capital expenditure in the CRD Stage 1 Public Opinion Survey. During the Stage 2 Evaluation of Options it was determined that the most efficient method of delivering the service would be to provide the following services:

- Three staffed full service Eco Depots accepting full range of EPR products
- Nine staffed transfer stations with recycling bins for household recyclables and facilities for recyclables including scrap metal and clean wood waste.

Bins for household recyclables will be provided at unattended transfer stations and landfills, or the closest rural community. Due to challenges with transportation logistics, E-Waste will not be accepted at rural sites or communities. E-waste, will be banned from all landfills and transfer stations. Residents and businesses will be required to transport their E-waste to the nearest Depot for proper disposal.

Nine Staffed Transfer Stations and Landfills with Support for Recycling (Phase 1): To maintain clean and safe facilities, the CRD recognizes there is an immediate need to provide supervision and

bylaw enforcement at its busiest refuse sites. In Phase 1, the CRD will provide attendant facilities and staff the following nine facilities:

Photo 4-3. Typical Attended Transfer Station in Elmworth, note attendant shelter

1. Lac La Hache Transfer Station (2012 pilot, with full implementation in 2013)
2. Wildwood Transfer Station (2014)
3. Frost Creek Transfer Station (2014)
4. Baker Creek Transfer Station (2014)
5. Lone Butte Transfer Station (2013)
6. Forest Grove Transfer Station (2013)
7. 150 Mile Transfer Station (2014)
8. Inter-Lakes Landfill (2013)
9. Watch Lakes Landfill (2013)

The facility upgrades will include the addition of an attendant shelter, security fencing and a controlled gate (as required), one or more recycling bins for household recyclables, a bin, or marshaling area for clean wood waste, and a pad or bin for scrap metal.

Recycling Bins at Unattended Sites (Phase 1): Bear proof, fully enclosed roll-off bins for the collection of recyclables will be provided at unmanned transfer stations and landfills, or their closest community. A public education program will be included on implementation. The quality of recyclables will be evaluated on an ongoing basis to assess the level of contamination. Education and bylaw enforcement will be ramped up if necessary to improve the quality of materials collected. If recycling bins are not a success, they will be removed from the unattended sites / communities on a site by site basis.

Transfer Station Attendants (Phase 1): Attendants will interface with residents, businesses and contractors. They will educate patrons on recycling opportunities and will direct them to unload the various recyclables and residuals in the appropriate bins or areas. In particular, they will ensure that all materials are appropriately deposited in the household recycling bins, clean wood waste bins or marshaling yards and scrap metal pads. The attendants will complete tipping fee forms, where applicable and will ensure that commercial haulers from outside the service areas and users from outside the region are not dumping at the sites to avoid tipping fees at other facilities. The attendants will also be responsible for cleaning up and maintaining the sites.

Each transfer station and landfill will have posted signs that indicate operating hours. The facility hours will also be posted on the CRD's web site. Access to each facility will be allowed only during open hours. Operating hours will be chosen carefully in consultation with the public to meet the needs of each service area. Recognizing that the costs of facility operation are proportional to the time that it is open, the CRD will work with each community to identify a schedule that provides convenient access for most users while reducing the total hours that the facility is open each week. A combination of morning, afternoon and weekday / weekend hours are envisioned.

Municipal hauling schedules and collection schedules will need to be synchronized such that municipal, First Nations and commercial haulers will not be adversely impacted in the execution of their routine business.

Weigh Scales: Weigh Scales are in place at the 100 Mile Regional Landfill and at the Williams Lake Transfer Station. The Quesnel Landfill is scheduled to have a scale within the phase 1 timeline. As the CRD does not anticipate moving to a full User Pay system in the short to medium term, scale facilities will not be added to the attended transfer stations and landfills. Instead, for those materials subject to a tipping fee, volume based tipping fees that are a function of vehicle size will be developed.

All waste and recyclables entering the CRD system will ultimately be scaled at regional landfill facilities, except the waste deposited at the CRD's rural landfills. The tonnage of waste received by the rural landfills represents about 5% of the total MSW in the region.

4.3 Organics Management

Organic waste currently represents about 22% of the total waste disposed in the CRD system, representing about 10,000 tonnes per year. The organics are broken out to include 5,800 tonnes of food waste, 1,600 tonnes of residential yard waste and 2,600 tonnes of ICI brush and yard clippings. At present almost all of the food waste and yard and garden waste are landfilled.

4.3.1 Back Yard and Vermi Composting

Back yard composting is already main-stream in the CRD, with a participation rate of 60 to 70% according to the Stage 1 Public Opinion Survey. The CRD has supported back-yard composting in the past with distribution of subsidized composter units and public education. Because organic waste is managed at home and the product is used to fertilize gardens, backyard composting is the best method to manage yard and garden waste and vegetable waste generated by the residential sector in the CRD. Due to the risk of attracting bears and other wildlife, composting of odorous food scraps will be discouraged.

Back yard composters are typically larger volume plastic containers designed to allow for the decomposition of organic waste under aerobic conditions. They are capable of diverting up to 200 Kg of yard and garden waste and vegetative food waste per year. They are suitable for use in homes with gardens where space is available to accommodate the unit.

Photo 4-4 Back Yard Composter

Photo 4-5 Vermi-Composter

Vermi-composters or worm composters use a more compact design and special worms that accelerate the composting process and allow composting occur in a smaller space such as an apartment or condominium with limited or no access to yard space. Worm composters can process about 50 Kg of food waste per year.

Distribution of Back Yard and Vermi Composters (Phase 1): In the implementation of this program, the CRD will arrange for the purchase and distribution of back yard and/or in-home composters to residents that desire to participate in the at-home composting program. CRD staff will determine the number of back yard or in-home composters desired each year and will coordinate distribution activities. Member municipalities will be encouraged to participate in the back yard composting initiative, as will interested businesses.

This plan anticipates that between 200 and 500 composters will be distributed to residents each year. The composters will be subsidized between 25% and 50%. The program will continue to be implemented in 2013 and 2014. After two years the program will be evaluated to determine if demand for backyard composting has been saturated.

Composting at-home Education Program (Phase 1): A public education program will be developed on how to effectively compost organic waste in a back yard composting program. The program will include a course taught by a public education coordinator for the CRD and on-line education material on CRD's website.

4.3.2 Centralized Composting of Yard and Garden Waste

Centralized composting of yard waste received moderate support from CRD's residents in the public consultation survey; however, it was suggested that the support for the program was low because the survey questions were not clearly structured.

Centralized Windrow Composting (Phase 2): Simple composting of yard waste, including grass clippings, leaves and brush is a program that can be managed at a cost lower than that of transfer to a centralized landfill. The CRD will conduct a detailed feasibility study of windrow composting costs and diversion potential from both the residential and ICI sector in 2014-2015. If results are positive, the CRD will propose a partnership with the City of Williams Lake to introduce a centralized composting pilot program in Williams Lake in 2016 for organic waste generated at the CRD's transfer stations (see below). Materials would be combined with those currently collected at the Central Cariboo Transfer Station. If the Williams Lake program proves effective, it will be expanded, in partnership with the other host municipalities.

The compost will be accumulated for use in the progressive closure of the Williams Lake Landfill. Compost will also be made available for sale to residents of the CRD.

Photo 4-6 Typical Centralized Windrow Composting Facility

Yard and Garden Bins at Attended Transfer Sites (Phase 2): Roll-off bins or compactor bins for clean yard and garden waste may be put in place at the three central attended transfer stations (150, Frost Creek and Wildwood) concurrently with the launch of the Williams Lake centralized windrow composting program. The bins will be hauled to the centralized composting facility where the material will be composted in aerated windrows. The collection program will be rolled out in 2016-2017, subject to positive results of the 2014-2015 feasibility study.

Yard Waste Collection from Urban Areas (Phase 3): If centralized yard and garden waste composting programs are effectively implemented in the urban centers of the CRD, the CRD will consult with member municipalities to determine if the programs can be effectively expanded to include yard waste collected from residential curbside. In that case, the member municipalities would be required to fund and operate the collection programs.

The CRD will either continue to provide composting services on a cost shared basis at its facilities, or will look to participate in the larger scale composting programs organized by the member municipalities.

Yard and Garden Waste Ban (Phase 3): In support of the yard and garden waste diversion program, large volumes of yard and garden waste will be banned from disposal at all attended transfer station and landfill facilities where bins or tipping pads for yard and garden collection are in place. This ban may be implemented in 2018 once the yard and garden waste composting program is fully implemented.

4.3.3 Centralized Composting of Food Waste

The Stage 2 Evaluation of Options Report determined that about 11% of the existing waste stream could be diverted with an in-vessel composting program targeting food waste. However, because the program would require weekly collection of food scraps at the curbside and an expensive composting facility, it was not generally supported by the public.

Assessment of Food Waste Composting (Phase 3): The CRD will observe the evolution of food waste composting in other small municipalities before contemplating the roll out of such a program in the CRD. Foremost, it will be necessary to demonstrate that food waste composting can be done cost effectively at a scale of approximately 4,400 tonnes per year. Also, it will be necessary to establish that food waste can be collected effectively at curbside without attracting bears into neighbourhoods in a fringe urban setting that is surrounded by wilderness and bears.

4.4 Wood Waste Management

About 7,200 tonnes of wood waste is generated in the CRD each year. The wood is derived from two sources. The majority is comprised of brush, stumps organic debris generated during land clearing and property maintenance activities. A smaller amount is comprised of dimensional lumber from demolition and home renovation projects and from pallets. Of the total wood waste, 2000 tonnes was ground up and diverted to the Williams Lake Power Plant for waste-to-energy, 3,800 tonnes was burned on-site in air curtain burners and 1,400 tonnes was landfilled. The costs of chipping wood for waste to energy were determined to be $100/tonne, the costs of air curtain burning were about $65/tonne and the costs of landfill disposal in rural landfills was $189/tonne.

Wood waste was collected and chipped for cogen at Williams Lake, Frost Creek, Chimney Lake, 150 Mile House, and Wildwood transfer stations. At 100 Mile House landfill and the rural landfills and transfer stations wood waste and yard and garden waste was consolidated and periodically burned in an air curtain burner. At the Quesnel Landfill wood waste was ground and used at a local mill as hog fuel.

4.4.1 Wood Waste Separation

Sorting of Clean Wood for Waste to Energy (Phase 1): Diversion of wood waste from landfills was very strongly supported in the Stage 2 Public Opinion Survey, with 93% support. To implement an effective wood waste diversion program, the CRD will implement a clean wood waste diversion program at all attended waste management sites. Sorting pads or roll-off bins will be provided at each attended facility. The public will be required to sort wood waste into "clean wood" including unprocessed wood and dimensional lumber that is free of paint, stain, glue or wood preservative and "contaminated wood" includes one or more of the above contaminants. All plywood and particle board will be directed to the contaminated wood pile. The wood waste separation initiative will be phased in as attendants are added at each site in 2013 and 2014.

Photo 4-7. Wood Waste Sorted into Clean and Contaminated Piles - Kamloops

Clean wood will either be hauled to a central facility for chipping, or will be chipped on site and then hauled to a waste-to-energy facility or to a pellet plant. The CRD will investigate whether clean chipped wood has a market value and will seek to establish a long term supply contract with one or more facilities capable of utilizing the wood for waste-to-energy.

As long as the Williams Lake Power Plant is available and accepts the CRD's material, grinding of wood waste for energy production will be carried out at the following sites:

1) Wildwood Transfer Station
2) Frost Creek Transfer Station
3) 150 Mile House Transfer Station
4) Central Cariboo Transfer Station
5) Chimney Lake Transfer Station

If it becomes economical, clean wood waste will be ground at any of the CRD's refuse sites for energy production. If required, wood waste (clean and / or contaminated) may be ground and used as an amendment material for landfill cover.

4.4.2 Burning On Site

Burning Clean Wood Waste at Unattended Facilities (Phase 1): Air Curtain incineration of wood waste will continue to be carried out at unattended landfills and unattended transfer stations that currently have room for a wood waste marshaling area. Burning of clean wood may also be carried out at attended facilities at times when market forces make waste-to-energy fiscally unattractive. Clear signage will be provided at each pad to indicate what constitutes clean wood waste. Site maintenance contractors will be required to periodically clean up the pile to sort out and landfill obvious contamination while piling up and consolidating wood on the pad.

Air curtain incineration will be used, whether annually or less frequently if demand dictates at the following sites:

1) South Cariboo Landfill (100 Mile House)
2) Inter-Lakes Landfill
3) Watch Lake Landfill
4) Forest Grove Transfer Station
5) Lac La Hache Transfer Station
6) West Chilcotin Landfill
7) Baker Creek Transfer Station
8) Horsefly Transfer Station
9) Likely Transfer Station
10) McLeese Lake Transfer Station
11) Wells Transfer Station
12) Big Lake Landfill

Open burning will be conducted in compliance with the B.C. Landfill Criteria and site permits. Currently, only air curtain burning is permitted. However, it is anticipated that the MOE will authorize controlled dawn-to-dusk open burns of clean wood waste in the Updated Landfill Criteria that is schedule to be issued later this year. Controlled burning will result in a significant reduction in the cost of the burning programs.

If the Updated BC Landfill Criteria allows open burning of clean wood and brush the CRD would submit a technical assessment report demonstrating that due to the remote nature of many of the CRD sites there is no viable alternative to open burning such as reuse, recycling, energy recovery or composting. The CRD sites that fall into this category are listed below:

1) West Chilcotin Landfill
2) Mahood Lake Landfill
3) Wells Transfer Station
4) Baker Creek Transfer Station
5) Likley Landfill
6) Horsefly Transfer Statoion
7) Big Lake Landfill
8) McLeese Transfer Station

Beneficial Use of Contaminated Wood Waste (Phase 1): Contaminated wood waste may be directed to landfill for beneficial use as road construction material where possible. DLC waste is routinely used at a number of B.C. landfills for road sub-base. It is a strong, low density structural material that can offset the large cost of importing gravel or shot rock for road base applications.

Clean Wood Waste Ban (Phase 2): In support of the clean wood waste diversion initiative, clean wood waste will be banned from disposal at all attended transfer station and landfill facilities. This ban may be implemented in 2015 once the clean wood waste sorting programs are well established.

4.5 Waste to Energy

The typical MSW waste stream contains a significant amount of energy, with an energy content of 10 to 17 GJ/tonne, roughly 50% of that contained in gasoline. Wood waste processed as hog fuel contains even more energy, about 20 GJ/tonne. Recognizing that energy recovery is positioned above residual disposal in the waste management hierarchy, the CRD has actively investigated available options for energy recovery.

4.5.1 AECOM Study (2009)

AECOM was commissioned to undertake a "Waste to Bio-Energy Feasibility Study" in 2009. AECOM's report investigated a range of options for energy utilization from the entire waste stream, including conventional waste to energy (incineration) and advanced thermal processes (Gasification, Plasma and Pyrolysis) waste to energy. AECOM's report also investigated options for energy recovery from wood waste, which constitutes about 8% of CRD's solid waste stream.

AECOM concluded that conventional waste to energy would be very expensive, with net disposal costs of $180/tonne, excluding the costs of collection. AECOM also explored selectively processing CRD's MSW waste stream to produce refuse derived fuel (RDF). This process would consume 100% of wood waste and 46% of the MSW, for a net diversion of 69% of MSW. In 2009 the costs of processing refuse derived fuel from MSW were estimated to be $109/tonne. Additional costs of disposing of the RDF residual at $81/tonne, ash management and required air quality upgrades to the Capital Power boiler made this waste to energy option equally expensive.

AECOM investigated three processes to recover energy from the wood waste contained in CRD's waste stream, including mass burn of chipped wood waste at Capital Power, diversion of clean wood waste to an established Pellet Plant (Pinnacle Pellet) and development of a bio-oil facility.

Of the three wood waste options, burning of all clean wood at Capital Power or diversion of the wood waste to pellets were seen as fiscally attractive because the current costs of air curtain burning would be used to offset the costs of site supervision to achieve a cleaner wood supply. In particular, the costs of the pellet plant option were estimated to be only $60,000 per year on 12,400 tonnes of wood waste, or roughly $5/tonne. Furthermore, under this scenario, the CRD would stop further air curtain burning of wood waste, saving costs of $372,000 (in 2009).

However, the study did not recognize that the pellet plant would only accept clean wood waste, excluding plywood, pressure treated wood containing chromated copper arsenate, painted wood (potentially containing lead). SHA estimates that some 33% to 50% of the wood would be considered contaminated, and thus unsuitable for combustion (or air curtain burning). As a result, per tonne costs would be higher, but still very inexpensive in comparison to all other options.

AECOM concluded that the results of their analysis clearly indicated that the CRD should pursue the option to have wood waste processed into pelletized fuel. Although the options that process only wood waste do not achieve as much diversion as options that address both wood waste and MSW, using the wood waste to create wood pellets minimizes net GHG emissions, has the lowest cost (lower than the status quo), has minimal risk, and can be implemented as soon as the current contract with the air curtain burner has expired.

AECOM reported that the primary barriers to success for the pellet plant option are related to the cost of transporting the wood waste to the plant, and the ability of the CRD to provide a consistently clean feedstock to the plant. The cost of transporting the wood to the pellet plant has been modeled as breaking even with the value of the wood; should the value of wood drop (either due to external economic factors or due to the quality of the wood), the cost of this option could increase to be greater than or equal to the cost of sending all wood waste to Capital Power.

When diverting wood for pellet production, the level of contamination in the wood would have to be strictly monitored and enforced; this has been provided for by upgrading several of the remote transfer sites to have controlled access and staff; however, other transfer sites will continue to be uncontrolled. The quality of the wood from the uncontrolled sites may be improved through public education, and through the establishment of separate tipping areas for clean wood and treated wood.

During the Stage 1 Public Opinion Survey residents indicated that they were interested in more information about waste-to-energy programs. Residents were asked what programs they were interested in seeing investigated for costs. Generally, the respondents ranked "Waste-to-Energy" at least a 4 out of 5 in level of support. In the Stage 2 Public Opinion Survey, 93% of respondents indicated that they would like to see wood waste beneficially used for energy recovery.

4.5.2 Expanded Waste to Energy program from Wood Waste

Establish Supply Agreement for Wood Waste Derived Fuel (Phase 1): Acting on the conclusions of AECOM's study, the CRD will proceed (where feasible) to develop a long term supply agreement with a waste-to-energy operator in the private sector that will utilize the CRD's clean wood waste. The agreement will be structured in parallel with CRD's wood waste management strategy outlined in Section 4.4 above.

4.5.3 Incineration of MSW for Energy Recovery

The CRD will continue to track new developments in Waste-to-Energy. In particular, if opportunities are identified whereby a partnership is established with other regional districts to increase economies of scale, or whereby new technologies are developed that drive the per tonne costs significantly below current price points, then the CRD will re-evaluate its current residual management strategy that diverts all residuals to landfill.

4.6 Managing Wastes from the Construction Sector

Wastes from the construction sector, including DLC waste, concrete rubble and contaminated soil represent 35% of all MSW generated in the CRD. Effective diversion of these materials from landfill is a top priority in this RSWMP update.

Sorting Demolition Waste (Phase 1): Demolition waste is typically comprised of the following materials:

- Dimensional lumber;
- Roofing materials;
- Drywall;
- Concrete / Brick;
- Plastics and other Dry Waste;

To encourage diversion of recyclable materials, sorted DLC waste will be accepted at CRD's landfills and transfer stations that are configured to accept DLC for a reduced fee. Haulers will be required to deposit clean wood waste, concrete, and roofing materials where feasible into designated bins or pads for recycling. Contaminated wood and other non-recyclables will be directed for disposal as general refuse. Unsorted DLC waste will be accepted at an elevated tipping fee.

Beneficially Using Contaminated Soil (Phase 1): Soil contaminated with metals and/or hydrocarbons at concentrations below "Hazardous Waste", as defined in the Hazardous Waste Regulation, can be landfilled at CRD's regional landfill facilities or used for daily and intermediate cover. The CRD will accept soils contaminated with metals up to "Hazardous Waste" concentration, and soil contaminated with hydrocarbons up to CL/IL minus concentration, at its landfill facilities. A tipping fee for this soil may be charged if soil storage and handling become a logistical issue. Contaminated soil will be stockpiled at regional landfill facilities, where it will be diverted for beneficial use as daily and intermediate cover. Such beneficial use does not constitute disposal, as the contaminated soil will be used to replace cover soil excavated on site or imported to the landfill site. Large volumes of uniform soil will be analyzed for suitability as final cover material and stockpiled as needed.

Processing Concrete (Phase 1): Concrete rubble is currently stockpiled at the Williams Lake landfill and 100 Mile House Landfill, and used to construct large cell partitions at Quesnel Landfill. To divert this material to a beneficial use, the rubble will be periodically crushed. Local road building contractors will be offered the crushed aggregate for road construction projects. Crushed concrete will also be used at CRD's landfills as aggregate for road sub-base and base course applications and may be used as aggregate in the gas collection layer of final cover systems

Photo 4-8. Mobile Crushed for Processing Broken Concrete

Use of Soil Bioremediation Facilities (Phase 1): Although soils contaminated with hydrocarbons up to "Hazardous Waste" levels are authorized for disposal, they can emit hydrocarbon odours and contamination from those soils can migrate into leachate. For those reasons, the CRD will only accept hydrocarbon contaminated soils that are at contaminant levels of CL/IL minus, as defined in the Contaminated Sites Regulation, at its regional landfill facilities. If soil containing higher levels of hydrocarbons is to be disposed, it must first be treated to reduce the level of contamination.

The CRD has partnered with Tervita to operate a soil bioremediation facility at 100 Mile House and with Quantum Murray to operate a bioremediation facility at the Williams Lake DLC landfill site. Soils are accepted with approval from CRD staff and subject to a tipping fee.

Soil bioremediation at these facilities typically involves the treatment of hydrocarbon contaminated soils using bacterial and biological agents and fertilizers to break down the organic contaminants in the soil. Contaminated soils are received and placed on geomembrane lined pads with leachate collection and treatment systems, where required. Excavators are typically used to place and turn the soil as treatment progresses. Advantages of conducting soil remediation at landfills include the access to scale facilities, a secure work area, an area where some dust impact can be tolerated, and a beneficial use for the soil once it is treated below target levels.

The City of Quesnel may also consider developing a contaminated soil bioremediation facility at its landfill facility.

Disposal of contaminated soils will not be authorized at any of CRD's smaller rural landfill facilities that rely completely on natural attenuation of leachate.

Recycling Asphalt Roofing (Phase 1): Asphalt roofing may be separated at attended transfer stations and landfill facilities. The CRD will contact local paving companies regarding the development of a quality ground-up asphalt roofing material for incorporation in asphalt pavement.

Disposal Bans on Concrete Rubble and Roofing (Phase 2): In support of CRD's goal to divert recyclable construction waste from landfill, disposal bans may be set in place for the above noted materials once effective recycling programs are in place that recycle or beneficially reuse these materials.

4.7 Waste and Recycling Collection

At 80,000 km^2, the CRD is the third largest Regional District in B.C. (after Peace River and Kitimat Stikine R.D.'s). As a result, the solid waste programs extend over a very large region and a large portion of the waste and recyclables generated in the region must be transported long distances. As a result, efficient collection and transportation strategies are a key aspect of this RSWMP.

4.7.1 Urban Collection of Waste

Collection of MSW residuals in urban areas is the responsibility of the member municipalities. Weekly curbside collection services are provided in Quesnel, Williams Lake, 100 Mile House, 108 Mile House and Wells. Contractors managing residential refuse collection programs in Quesnel and Williams Lake have recently switched to automated haul trucks that collect refuse from roll-out totes deposited at curbside. Due to collection efficiencies and health and safety benefits, the CRD supports the switch to automated collection and encourages other member municipalities to adopt automated collection as well.

Increase Tonnage of Trucks Hauling to Gibraltar Landfill (Phase 1): MSW loads hauled from Williams Lake Transfer Station to Gibraltar Landfill are transported in walking floor trailers. The CRD will structure future haul contracts to ensure that high capacity trailers that maximize tonnage per load will be adopted and that methods of densifying loads through tamping or pre-load compaction be investigated.

4.7.2 Urban Collection of Recyclables

Recyclables are currently collected curbside only in Williams Lake. The Williams Lake residential collection program is a single stream program.

The CRD will endeavor to facilitate conversion to curbside collection programs for waste and recyclables such that they will be consistent across the region. The objective will be to increase operational efficiencies, maximum utilization and sharing of resources.

The commercial recycling program is focused on OCC with lesser amounts of mixed paper collected. Three to six yard cardboard bins are distributed strategically at businesses in the member municipalities.

The CRD recognizes that it is important that the rural recycling program operated by the region be aligned with the type of recycling program implemented by member municipalities, so that recyclables

collected in the rural program can be processed and marketed together with the recyclables from the municipal programs.

4.7.3 Collection and Hauling of Waste from Rural Transfer Stations

Transition from Transtors to 40 Cu.Yd. Roll-off Bins (Phase 1 and Phase 2): The CRD's rural transfer station system is comprised primarily of self-tipping 25 cu.yd. Transtor bins, with a smaller amount of 40 cu.yd. roll-offs. As the Transtor bins reach the end of their service life they may gradually be replaced by more efficient and less expensive high capacity roll-off bins (40 or 50 cu.yd. capacity). To achieve the greatest efficiency, retention of Transtor bins at long haul sites in combination with compaction haul trailers may also be considered. This transition may require that transfer stations that are being changed over be reconfigured.

Add Tamping Capacity at Attended Sites (Phase 1): The CRD will require that attended roll-off bin transfer stations be equipped with a small back hoe that is capable of tamping waste and densifying loads to maximize load tonnages and increase hauling efficiency.

Add Capacity to Haul Two Bins on Live Trailer (Phase 1 and 2): The CRD will structure future hauling contracts in a way that encourages hauling efficiency. Hauling two or more bins with a live trailer on long hauls, increasing load density and servicing bins when at or near capacity will be the guiding principles that will be incorporated in the contracts.

4.7.4 Rural Collection of Recyclables from Transfer Stations and Landfills

Provide and Service Recycling Bins at All Rural Sites (Phase 1 and 2): All 29 rural transfer stations and landfills will be equipped with roll-off containers for collection of recyclable materials. Large volume (40 or 50 yd) containers with lids that can be top loaded, or enclosed containers with side chute doors will be provided.

Depending on participation rates, bins may eventually be upgraded to compactors at high use sites. Collected recyclables may be hauled to central baling facilities in Williams Lake, Quesnel or 100 Mile House for baling.

During initial roll-out of the rural collection programs, a recycling trailer may initially be used in the affected communities to educate the public on proper recycling techniques and what materials are suitable for recycling.

Add Live Trailers on Long Hauls (Phase 1): The CRD will structure future hauling contracts to require haulers on longer transfer station hauls to haul at least two bins per trip (a refuse bin and a recycling bin, or two refuse bins). Adding a second bin will increase haul efficiencies by 40 to 50%.
To benefit from lower processing costs, baled single stream recyclables may be shipped to a high capacity automated MRF out of region for sorting and shipment to markets.

Transition Rural Recycling Program to MMBC (Phase 2): The CRD will liaise with MMBC to establish how the rural collection program will be integrated into and financed by MMBC when the printed paper and packaging EPR program is implemented in May, 2014.

4.8 Residual Waste Management

Residual waste (solid waste material that is not recycled) is landfilled in three regional and 12 rural landfill sites. In 2009, 47,651 tonnes of MSW was landfilled. Of that total, only 3,689 tonnes was deposited in the CRD's 12 rural landfill facilities. The balance was deposited in the three regional landfills.

4.8.1 Regional Landfill Facilities

Three regional landfill facilities are located in the CRD, Quesnel Landfill services the North Cariboo, Gibraltar Landfill services the Central Cariboo and 100 Mile Landfill services the South Cariboo. Quesnel Landfill is owned and operated by the City of Quesnel. Gibraltar Landfill and 100 Mile Landfill are owned and operated by CRD.

The Gibraltar Landfill is a fully engineered landfill that meets all requirements of the current landfill criteria, including a geomembrane liner system, leachate collection and treatment and progressive closure. Because it is a fully compliant engineered site, Gibraltar costs more to operate than the natural control landfill sites at Quesnel and 100 Mile House.

Assess Existing Regional Landfills Against New Landfill Criteria (Phase 1): The updated Landfill Criteria for Municipal Solid Waste, 2nd Edition is expected to contain a number of requirements that will make landfills environmentally safer and more efficient. The CRD will undertake reviews of regional landfills to identify any areas that may be out of compliance with the new criteria requirements. Plans for addressing any compliance issues will be developed.

Require that Progressive Closure be implemented at all regional landfill sites (Phases 1 to 3): Progressive closure of completed landfill phases is required in the current landfill criteria. Progressive closure requirements are expected to be even more stringent in the Updated Landfill Criteria, 2nd Edition. Because progressive closure reduces environmental risks and liabilities, the CRD will require that progressive closure be conducted as per approved design and operations plans for each facility.

Require that Managers of Regional Landfill Facilities be SWANA MOLO Certified and that operators be SWANA BCQLO Certified: The B.C. Yukon Chapter of the Solid Waste Association of North America offers two excellent training programs. A comprehensive Manager of Landfill Operations (MOLO) certification course is designed to train Managers how to safely and efficiently operate landfill facilities. The B.C. Qualified Landfill Operator Course (BCQLO) is a course designed for front line landfill staff. It teaches best practices for cell construction, air space conservation, landfill safety, amongst many other related topics. Having all staff properly trained in landfill operations is important to ensure that CRD's landfills will continue to be operated in a safe and efficient manner, reflecting current best practices and standards.

4.8.2 Attended Rural Landfill Facilities

Convert Watch Lake and Inter-Lakes Landfills to Attended Sites (Phase 1): High use rural landfills at Inter-Lakes and Watch Lake will be converted to attended landfill facilities. The upgrade will include provision for an attendant shelter, expanded facilities for sorting wood waste into clean and contaminated streams, expanded recycling facilities for scrap metal and household recyclables. Additional recycling capacity for some EPR materials may be added in a lockable roll-off containers.

Evaluation of cross border use of the Watch Lake landfill and the 70 Mile transfer station by CRD residents and Thompson-Nicola Regional District residents will be completed and recommendations made.

Establish Service Hours for Attended Landfills (Phase 1): Public consultation will be undertaken to determine appropriate service hours for each facility that provide adequate access while minimizing the hours that each facility will be open to the public, thereby reducing operating costs.

4.8.3 Unattended Landfills

The CRD currently operates 12 unattended landfills. This number will be reduced to the following ten facilities when attendants are added at Watch Lakes and Inter-Lakes:

1. Nazko Landfill
2. Likely Landfill
3. Big Lake Landfill
4. Mahood Lake Landfill
5. West Chilcotin Landfill
6. Kleana Kleene Landfill
7. Tatla Lake Landfill
8. Cochin Lake Landfill
9. Puntzi Lake Landfill
10. Nemiah Valley Landfill

An economic study undertaken by the CRD concluded that despite being very expensive to operate at an average of $189/tonne, continued operation of small unattended landfills continues to be less expensive than servicing these areas with transfer stations.

Adding Safety Railings and Fall Protection at Trench Landfills (Phase 1): SHA's Stage 1 Efficiency Review identified a risk factor in that the public was exposed to dangerous slopes at several of the trench type landfills. Reconfiguration of the landfills to incorporate flatter slopes at the tipping face, or to add a portable safety rail will be implemented on a priority basis.

Evaluating Feasibility of Unattended Sites with Criteria (Phase 2): New environmental and safe landfill operating requirements may be added in the Updated Landfill Criteria, 2nd Edition. These requirements may increase the operating costs of the small unattended facilities. The CRD will evaluate the compliance status of each landfill once the new guidelines are introduced and will then evaluate whether continued operation of the facilities remains in the best public interest.

4.9 Illegal Dumping Clean-Up

With access to a multitude of back roads, illegal dumping of waste continues to be a problem in the CRD and the AC is concerned that implementation of user pay programs would increase the magnitude of the problem in the region. To reduce the occurrence of illegal dumping the CRD will introduce bylaws that discourage illegal dumping and will put in place financial penalties to serve as deterrent for illegal dumpers. The Bylaw enforcement program will be empowered to prosecute illegal dumpers.

Supporting Clean-Up of Illegal Dumping (Phases 1 to 3): The RSWMP will make provisions to encourage volunteer driven clean-up of illegal dump sites and will support illegal dumping clean-up activities through targeted funding. Where necessary, funding and resources will be directed toward organizing clean-up events, supplying equipment and staff time to support volunteers and allowing free dumping of all waste that is collected.

4.10 Education and Promotion

In order to achieve the higher waste reduction and diversion goals targeted in this RSWMP it will be vital to get the message to the public in both the residential and ICI sectors. The success of waste management programs and policies requires that people know and understand why and how to effectively participate in the programs. Therefore, education and promotion are integral and critical components of the overall solid waste management system.

Promotion and education efforts directly related to municipally-provided waste management services such as curbside garbage collection will continue to be done by the municipality providing the service. The CRD will be responsible for promotion and education efforts related to their services such as recycling drop-off depots, transfer stations, landfills, as well as promotion and education in regards to waste reduction and reuse, composting, household hazardous waste and product stewardship programs. The CRD will be a willing partner with the various stewards, to promote available EPR programs as promotion opportunities arise. In particular, the CRD is prepared to support MMBC to effectively launch the printed paper and packaging EPR program in the Cariboo.
Moving forward, it will be necessary for the Regional District, Municipalities and product stewards to work together to ensure consistency in promotion and education programs.

Promotion and education activities will use a range of promotion and education activities and tools to coordinate solid waste management activities, to increase waste diversion and to work towards zero waste. These activities may include:

- The "Waste Wise" program for schools
- Web-based information
- Sponsoring and promotion of the RCBC Telephone "hotline"
- Promoting the information provided in the local telephone directories
- TV and Radio campaigns to promote new programs
- Newspaper advertising
- Engaging local cable stations to develop more in-depth information on the CRD waste management system and waste management issues
- Community Outreach
    - Participation in community events
    - Displays at community locations
    - Contests

    - Recognition programs (e.g. awards for exemplary actions towards waste reduction)
    - Facility tours
    - Workshops and seminars
- Social media (e.g., Facebook)
- Partnering with stewards to promote EPR programs

Some of the key programs that will be delivered include:

Improved Public Information on Recycling (Phase 1): Improvements and updating of the CRD's web site to provide current information on how to recycle and where various materials can be deposited, complete with addresses and contact numbers. Utilizing mapping technology provided Google Maps will be investigated. Consolidated information on a simple 1 page map for each region may also be considered.

Education Targeted at ICI Sector (Phase 1): Recycling rates in the workplace are currently 10 to 25% lower than in the residential system according to the Stage 1 Public Opinion Survey, with recycling rates of 45% to 75% participation. To increase recycling rates in the work place, the CRD Public Education Program will target development and delivery of recycling education programs for businesses to increase the participation rate. The ICI education program will be implemented in the period 2012-2013.

Composting at-home Education Program (Phase 1): A public education program will be developed on how to effectively compost organic waste in a back yard composting program. The program will include a course taught by an education coordinator for the CRD and on-line education material on CRD's website.

Waste-Wise School Program (Phases 1 to 3): Teaching elementary and high school students about sustainable solid waste management is an effective way to disseminate knowledge into communities. Foremost, because students are likely to incorporate the environmental knowledge and sustainability principles into their future lives, the Waste Wise education programs will pay long term dividends. In the short term, many students will bring the information home and will educate parents and siblings to do the right thing at home as well.

The CRD sets a Phase 1 goal of providing an opportunity for every child in the school program to participate in the Waste Wise Program at least once in elementary school. In Phase 2 or Phase 3 the CRD will strive to develop a second program targeted at high school students.

Partnering with Stewardship Agencies in Promotion and Communications (Phase 1 to 3): In British Columbia, the Stewardship Agencies are responsible for educating consumers regarding their programs and for providing information about collection options, fees, and handling practices. Most agencies maintain websites, and / or utilize the services of the Recycling Council of BC Hotline.

As the lead proponent responsible for coordinating solid waste programs in the CRD and with well established communication networks, the CRD is well positioned to efficiently distribute messages

regarding EPR programs throughout the region. The CRD will partner with Stewards as opportunities arise and assist them in promoting their programs with the assistance of the CRD's website and communications resources. As EPR stewards are responsible for the promotion of their programs, any promotional activities conducted by the CRD will be provided on a cost recovery basis.

Minimizing Use of Paper (Phases 1 to 3): Promotion and education initiatives will aim to minimize the use of paper through using electronic media to distribute information whenever practical.

Funding Public Education Program (Phases 1 to 3): The budget for these programs is based on a cost of $5 per household per year, for an annual budget of approximately $75,000. This estimate includes the existing $25,000 budget for the Waste Wise program. Efforts will be made to cost share the education programs with EPR stewards in situations where activities are directly related to EPR programs.

Public education will initially be delivered by a qualified contractor. In Phase 2 the CRD will review whether a Public Education Coordinator position should be implemented at staff level.

Education and promotion will continue to be implemented on an annual basis throughout the implementation period, 2012-2021.

4.11 GHG Reduction

The Cariboo Regional District is aware of the importance of reducing anthropogenic green house gas emissions to slow global warming. The devastating pine beetle epidemic that has severely impacted the fibre supply for local mills has been linked to our changing climate.

To reduce the region's GHG emissions, the CRD will be pro-active in promoting emission reductions. Most important, the wood waste and fibre recycling initiatives presented above will divert a large amount of the carbon away from landfill, where it would otherwise decompose over time to produce methane gas.

The CRD will implement landfill gas collection systems at the major regional landfills when methane production rates exceed 1,000 tonnes per year. Earlier implementation of voluntary capture and flaring will be evaluated as opportunities arise.

The CRD will consider overall GHG emissions in all of its waste and recycling programs, particularly emissions related to transportation. Total GHG emissions from the solid waste program will be reported annually.

5. POLICIES

5.1 Consultative Policy Development and Enforcement

The Environmental Management Act Part 3 authorizes all Regional Districts significant legal powers with respect to solid waste management. These powers are granted without limitation, and include the ability of a Regional District to establish bylaws with respect to the fees, types, quality or quantity of municipal solid waste or recyclable materials that may be brought onto or removed from a site.

Many of the options for waste diversion that are presented in this RSWMP will be supported by policies or bylaws to achieve the waste diversion objectives outlined within. Regional Districts may establish different prohibitions, conditions, requirements and exemptions for different classes of users, sites, operations, activities, municipal solid wastes and recyclables bases on Sections 25 and 26 of Part 3 of the Act.

This Plan also recognizes that the CRD's mandate under the Environmental Management Act extends its jurisdiction and authority to solid waste facilities and operations that may be the responsibility of member municipalities, and/or private operators. While it is anticipated that the existing positive relationships between facility operators and the CRD will result in broad support for the policies proposed, the CRD may exercise this authority as approved by the Board to ensure that the principles of the RSWMP are adhered to by all facility owners and operators.

The CRD understands that with this authority comes significant responsibility to consult with all affected stakeholders prior to implementation of new policies or bylaws, so as to ensure that all interests are properly represented. To this end, the CRD will undertake such consultation as may be required, and will work with the Ministry of Environment to develop appropriate consultation plans.

The CRD will also be responsible for ensuring compliance with new policies and bylaws by establishing appropriate enforcement measures. It is recognized that additional enforcement capacity within the CRD will be required to achieve compliance and resources may be added to the solid waste program accordingly.

5.2 New Bylaws

As part of the RSWMP, the CRD plans to implement two new bylaws which are described in further detail below.

5.2.1 Landfill Bans on Recyclables and Product Stewardship Items

The CRD will implement a new bylaw focusing on preventing recyclables and Product Stewardship items from being landfilled. The implementation of disposal bans on recyclables will only be introduced once an alternative exists for handling that material. The list of recyclables that will be considered for disposal bans includes: paper and cardboard, blue bag recyclables, yard waste, ICI recyclables including metals and plastics, and DLC recyclables.

5.2.2 Illegal Dumping Bylaw

Illegal dumping is a serious concern in the CRD; therefore the CRD will impose a new bylaw specifically targeting illegal dumping. Financial penalties will be imposed for illegal dumping offenders. Funds collected through imposing the new illegal dumping bylaw can be used to promote educational programs to discourage illegal dumping as well as clean up programs.

5.3 Bylaw Enforcement

The CRD is in the process of retaining an additional bylaw officer. Enforcement of solid waste bylaws will be a core part of the duties as the bylaws are implemented. The CRD will evaluate the need for a dedicated bylaw officer focused strictly on solid waste as implementation of the plan, particularly enforcing the new landfill bans and illegal dumping bylaws as they are implemented.

5.4 Controlled Access

All new attended landfill facilities will be gated and fenced to control after-hours access. The existing facilities will be gated to prevent any dumping outside of regular hours.

5.5 CRD Staffing Requirements

Currently the CRD does not have a dedicated bylaw officer for enforcement of waste related infringements. As mentioned previously, the CRD will explore the need for hiring an additional bylaw enforcement officer in the future.

5.6 Tipping Fees Policy

The goal of the tipping fees policy is to implement consistency across the CRD, member municipalities and the private sector. The tipping fees will be consistent with, but not lower than tipping fees set in regional districts surrounding the CRD. The CRD will maintain a taxation-based model for cost recovery and is reluctant to shift to a user-pay system for two reasons. There are illegal dumping concerns in the region and increasing tipping fees will lead to an increase in illegal dumping. Additionally, there is a concern that with decreasing waste streams due to increased recycling and EPR programs, reduced tonnage to landfills would then result in a decreasing revenue stream or steeply rising tipping fees if the CRD were to shift to a user-pay policy.

5.7 User Fee Structure for Commercial Wood Waste

The CRD will support a consistent fee structure for commercial wood waste at all attended facilities. Where feasible the CRD will implement wood waste sorting at collection facilities to separate energy recoverable wood waste from that which is not.

5.8 Funding Program from Taxation

The CRD will maintain the current system of funding for solid waste management from taxation. The funds generated from tipping fees and bylaw penalties will supplement the taxation funding.

5.9 Sharing Costs of Programs and Municipalities

The CRD will seek opportunities for sharing waste management services or contracts with the member municipalities. The CRD recognizes that this will provide greater economies of scale and potentially reduce the administrative burden of contract management for all parties involved. The CRD will look to partner with the member municipalities for cost sharing and improve the efficiency of the solid waste management system.

5.10 Scrap Metal and Auto Hulk Recycling

The Cariboo Regional District will provide a scrap metal and auto hulk recycling program in rural areas to utilize private enterprise to process and market metals. The Cariboo Regional District will also provide controlled marshalling yards where necessary for the orderly disposal of metals.

Recycling operations will remain consistent in the types of materials they receive and work towards eventual economic self-sustainability.

5.11 Working with First Nations

The CRD recognizes the importance of continuing to cooperate with First Nations in achieving the goals of this RSWMP. The CRD plans to partner with First Nations on the program implementation and cost sharing of these programs. The details for waste disposal agreements between the CRD and First Nations will be developed with the goals of protecting the environment, reducing waste disposal as much as possible and providing service to all residents within a given area.

5.12 Working with Neighbouring Regional Districts

The CRD recognizes the benefits to be gained with economies of scale through working with the neighbouring Regional Districts. The opportunities for partnering on recycling programs can improve access to recycling for all residents.

5.13 GHG Emissions

The recommendations made in this RSWMP are made with the reduction of greenhouse gas (GHG) emissions as an important goal. As described in the 'Guide to the Preparation of Regional Solid Waste Plans', landfills are the main anthropogenic source of GHG emissions. It was projected that they account for 51-55% of total anthropogenic methane emitted in the past 15 years, and approximately 25% of the anthropogenically generated greenhouse gases emitted in British Columbia. Methane emissions from landfills come from the decomposition of the organic fraction of municipal solid waste, wood residue and sludge from pulp mills -- with respective contributions of 79%, 17% and 4% in 1990. The two main strategies for reducing the impact of methane on the global environment are to reduce the flow of organic, compostable materials to landfills, and to implement landfill gas recovery systems.

The CRD understands that eliminating open burning, even of segregated wood waste, can also be justified as a way of reducing the effect of local release of carbon dioxide on the global atmosphere.

Open burning of mixed MSW, including substances such as plastic, rubber, batteries and chemicals of all kinds, also releases a number of toxic substances as well as other greenhouse gases.

In addition to GHG emissions from landfills, waste hauling and transfer contributes to emissions. The CRD is one of the largest geographic Regional Districts in the province; therefore, waste transfer by trucks is an integral part of the CRD solid waste management system.

The recommendations made in this RSWMP were done with minimization of haul times and truck hours keeping in mind the need to reduce GHG emissions.

5.14 Importation of Out of Region Waste

The CRD recognizes the possibility to accept waste from outside of the region due to the airspace capabilities of the existing landfills. There are benefits to be gained from importation of waste due to economies of scale and the CRD plans to keep this option open for the future. If this option is pursued in the future, the tipping fees structure will be modified for out of region waste to ensure local waste disposal is held as a priority. Furthermore, it is recognized that making a decision on the importation of out of region waste will require a public consultation process.

6. IMPLEMENTATION SCHEDULE

The sequencing of tasks into Phases 1, 2 and 3 was introduced in Chapter 4 when the programs were individually described. In scheduling individual programs consideration was given foremost to prioritizing programs that would quickly increase diversion at minimal cost and programs that were identified as highest priority during public consultation. In particular, offering recycling services to rural residents, expanding the recycling locations in rural areas and diverting waste, particularly biomass waste, to waste-to-energy applications.

Table 6.1 presents a master schedule of planned program implementation, broken out into Phases 1, 2 and 3. Colour codes are used to distinguish between program design and planning (or engineering design), construction and operation. It is recognized that many programs will also require public consultation, public education, negotiation with stakeholders and/or contractors, staffing commitments and purchasing commitments. Each of these activities are shown with different colour.

In Table 6.1 the order of tasks follows the same order individual programs are described in Chapter 4.

6.1 Phase 1 Programs (2012-2014)

The key programs in Phase 1 include upgrading of the seven transfer stations and two landfills to attended facilities complete with recycling drop-off capacity, segregating and diverting clean wood waste for waste to energy applications and preparing the public for the significant shift in recycling programs expected as a result of the new MMBC recycling program.

6.2 Phase 2 Programs (2015-2017)

The primary focus in Phase 2 is going to be implementation of the three full service Eco-Depots in Williams Lake, Quesnel and 100 Mile House. The CRD intends to implement one of these facilities each year in 2015, 2016 and 2017. It remains to be determined how these facilities will interface with MMBC, Encorp and the other Stewards and who will ultimately control the facilities. The CRD is committed to consolidating recycling operations at one location to provide a single one-stop-shop to meet the public's recycling drop-off requirements; however the Eco-Depots program will require each host municipality to partner in depot costs. Consultation with host municipalities will have to precede Eco-Depot Design.

6.3 Phase 3 Programs (2018-2021)

Phase 3 will be primarily an ongoing operations Phase, with most programs introduced in Phase 1 and Phase 2 continuing. Expansion of composting may be undertaken to include curbside collection of yard and garden waste.

Table 6.1 Implementation Schedule

		Phase 1			Phase 2			Phase 3			
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Coordinating with MMBC	Phases 1-3										
Extended Producer Responsibility	Phases 1-3										
Eco Depot Williams Lake	Phase 2										
Eco Depot 100 Mile House	Phase 2										
Eco Depot Quesnel	Phase 2										
Round Up Events	Phases 1-3										
Disposal Bans	Phases 1-3										
Material Ban for OCC Packaging	Phase 1										
Education Targeted at ICI Sector	Phase 1										
9 Staffed Transfer Stations											
Pilot 2012 1 Lac La Hache Transfer Station	Phase 1										
2 Wildwood Transfer Station	Phase 1										
3 Frost Creek Transfer Station	Phase 1										
4 Baker Creek Transfer Station	Phase 1										
5 Lone Butte Transfer Station	Phase 1										
6 Forest Grove Transfer Station	Phase 1										
7 150 Mile Transfer Station	Phase 1										
8 Inter-Lakes Landfill	Phase 1										
9 Watch Lakes Landfill	Phase 1										
Establish Service Hours at Controlled Sites	Phase 1										
Provide Recycling Bins for Rural Communities	Phase 1										
Back Yard and Vermi Composting	Phase 1										
Composting at Home Education Program	Phase 1										
Centralized Windrow Composting Pilot	Phase 2										
Yard and Garden Bins at Attended Sites*	Phase 2										
Yard Waste Collection from Urban Areas*	Phase 3										
Yard and Garden Waste Ban*	Phase 3										
Wood Waste Separation	Phase 1										
Burning on Site	Phase 1										
Elimination of Air Curtain Burning	Phase 1										
Beneficial Use of Contaminated Wood Waste	Phase 1										
Clean Wood Waste Ban	Phase 2										
Supply Agreement for Wood Waste Fuel	Phase 1										
Sorting Demolition Waste	Phase 1										
Beneficially Using Contaminated Soil	Phases 1-3										
Processing Concrete Pilot	Phases 1-3										
Processing Roofing	Phases 1-3										
Disposal Bans on Concrete Rubble and Roofing*	Phase 2										
Increase Tonnage of Trucks Hauling to Gibraltar	Phase 1										
Transition Transtors to Roll-Offs	Phases 1-2										
Add Tamping Capacity at Attended Sites	Phase 1										
Add Capacity to Haul Two Bins	Phases 1-2										
Transition Rural Recycling Program to MMBC	Phase 2										
Assess Existing Landfills Against New Criteria	Phase 1										
Require Progressive Closure at Regional Landfills	Phases 1-3										
Require MOLO and BCQLO Training of Operators	Phases 1-3										
Add Safety Railings as Fall Protection	Phase 1										
Evaluate Feasibility of Unattended Sites	Phase 2										
Illegal Dumping Clean-Up	Phases 1-3										
Improved Public Education on Recycling	Phases 1-2										
Improved Public Education for ICI Sector	Phases 1-3										
Waste Wise School Program	Phases 1-3										
Partnering with Stewardship Agencies	Phases 1-3										
Minimizing Use of Paper	Phases 1-3										
Funding Public Education Program	Phases 1-3										
GHG Reduction Monitoring	Phases 1-3										

Design
Construction
Operation
Public Education
Negotiation
Staffing
Purchasing
* Dependant on Success of Polot Programs

7. COSTS OF PLAN IMPLEMENTATION

7.1 Current Solid Waste Budget

The annual costs of the CRD Solid Waste CRD Solid waste system was $6.489 million in 2010. This translates into a total system cost of $93.92 per tonne, or $257 per average household per year. Table 7.1 presents the summary of the five year solid waste budget that was formulated in 2010, breaking out expenditures by major categories. This budget was prepared before the RSWMP review.

Table 7.1 Five Year CRD Solid Waste Budget (2010 Version)

	2010	2011	2012	2013	2014
REVENUE					
Rural Refuse	5,218,801	5,121,948	4,452,474	4,536,300	4,633,069
South Cariboo Solid Waste	1,079,423	1,085,438	1,138,207	1,142,946	1,148,119
Solid Waste Management	191,031	34,215	37,123	39,740	42,050
Total Revenue	$ 6,489,255	$ 6,241,600	$ 5,627,803	$ 5,718,986	$ 5,823,238
EXPENDITURES					
Management					
	$ 818,510	$ 689,002	$ 703,571	$ 720,277	$ 739,439
South Cariboo Solid Waste					
	$ 36,631	$ 38,741	$ 41,000	$ 43,570	$ 46,496
Solid Waste Management					
	$ 163,018	$ 43,082	$ 43,154	$ 43,234	$ 43,325
Total Management Costs	$ 1,018,159	$ 770,825	$ 787,725	$ 807,082	$ 829,260
Total Collection System Costs	$ 1,253,785	$ 1,321,278	$ 1,321,278	$ 1,321,278	$ 1,341,278
Total Recycling Costs	$ 232,724	$ 258,822	$ 266,262	$ 266,262	$ 266,262
Total Landfill Costs	$ 3,984,587	$ 3,890,677	$ 3,252,539	$ 3,324,364	$ 3,386,438
Grand Total Costs:	$ 6,489,255	$ 6,241,601	$ 5,627,804	$ 5,718,986	$ 5,823,238

7.2 Evaluation of Options

In Stage 2 of this RSWMP review, the project team investigated the costs of a range of solid waste program delivery options that included attended transfer stations and landfills, Eco-Depots, composting operations ranging from back-yard composting to in-vessel composting and curbside collection of recyclables and organics.

The review determined that program costs can be expected to range between $6.06 million if minimal changes are made to the current system to $8.76 million per year if in-vessel composting of food waste was brought on stream, together with advanced single stream recycling, Eco-Depots and attended landfill sites.

Most of the options that excluded in-vessel composting, but provided improved access to composting for rural residents ranged between $6.55 and $6.82 million. Based on public input, the CRD is moving

to adopt waste management Option E with back yard composting in Phase 1. According to the Stage 2 Economic Study, the costs of this option are expected to be about $6.56 million per year.

Table 7.2 presents an overview of the total and per tonne costs of the various components of the solid waste system, as identified for Option E, with backyard composting. Details are provided in Table F-1 of the Stage 2 Evaluation of Options Report.

Table 7.2 Projected Costs of CRD Solid Waste System with Back Yard Compost Program

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		37,202	
Total Tonnage of Residuals Landfilled		31,883	
Diversion Percentage		53.85%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,557,243	69,085	$ 95
Cost of Urban Collection	$ 813,504	52,042	$ 16
Cost of Rural Transfer Stations	$ 969,518	11,890	$ 82
Cost or Rural Hauling	$ 192,628	11,890	$ 16
Cost of Transfer and Haul to Gibraltar	$ 752,488	8,918	$ 84
Cost of Regional Landfills	$ 1,869,481	58,749	$ 32
Cost of Rural Landfills	$ 620,008	5,153	$ 120
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,557,243		
Cost of North Cariboo System	$ 1,434,875	23,891	$ 3,568
Cost of Central Cariboo System	$ 2,625,329	27,214	$ 3,604
Cost of South Cariboo System	$ 1,497,792	16,998	$ 3,596
Cost of Chilcotin System	$ 200,447	982	$ 3,712
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,557,243	69,085	$ 95
Cost of Recycling Programs	$ 763,606	16,563	$ 46
Cost of Organics Diversion	$ 5,500	700	$ 8
Cost of Wood Waste Management	$ 314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,252,235	31,883	$ 165
	$ 6,557,243	69,085	$ 94.92

In Phase 2, the CRD may look to gradually implement windrow based composting of yard and garden waste. Enhanced diversion of organics would be expected to increase program costs to about $6.82 million, excluding the cost of curbside collection of yard waste, which would be borne by member municipalities.

This plan anticipates the following budget for solid waste management over the next five years:

2012 $6,600,000
2013 $6,700,000
2014 $6,800,000
2015 $6,500,000
2016 $6,500,000

7.3 Uncertainties with MMBC EPR Program

The roll-out of the MMBC EPR program for printed paper and packaging is expected to shift the cost of managing packaging discards from municipal government to the brand owners, and likely consumers, through increased prices for goods purchased. It has been estimated that the MMBC program could divert up to 14,500 tonnes of recyclables from the CRD's waste stream, about 13,000 tonnes more than is currently diverted.

The implications of this shift would be a 27% decrease in the tonnage of residuals going to landfill. As a result, the CRD could expect reduced costs on hauling of waste and to a lesser extent on landfill operations (as many landfill activities are not directly related to changes in tonnage). Also, the costs incurred in shipping recyclables to market will be shifted to MMBC. It is recommended that the CRD initiate further investigations to identify the expected impacts and cost savings that will be realized with implementation of the MMBC program. Also, it will be necessary to establish whether the stewards will indeed be required to achieve a capture rate of 75% in the CRD, as it may prove much more efficient to instead achieve higher diversion efficiencies in the more populated areas of the Lower Mainland while still achieving the province wide 75% target.

8. PLAN ADMINISTRATION

To remain an effective tool toward continued waste reduction and increased operational efficiencies, the CRD's RSWMP will be a living document. Performance against established goals will be tracked and reported. Progress on plan implementation will be tracked and evaluated at the end of each implementation Phase. The plan will be administered by staff in CRD's Environmental Services Department. Oversight will be provided by the Board. If major changes to plan are contemplated, then the current Solid Waste Advisory Committee may be reactivated.

8.1 Measurement and Reporting

The CRD will continue to track the effectiveness of plan implementation in terms of solid waste flows. Standard and recognized methods will be adopted in order to measure waste reduction results, and to benchmark performance against the 50% waste diversion goal by 2021.

The MOE is launching a new program that will allow regional districts to track their waste diversion efforts in two ways: Method 1 is a simple per capita disposal rate, defined as MSW Residuals Landfilled / Service Population. Method 2 determines the regional waste diversion rate as the tonnage of waste diverted / total tonnage of MSW generated.

In measuring the above performance statistics, the CRD will track the following performance statistics and will report them publically on the CRD's web site and on the MOE's Calculator tool.

- Regional Population (estimated from latest census and annual growth rate)
- MSW Tonnage Landfilled (scaled at regional sites, estimated at rural sites)
- Total Tonnage Diverted (divided into following categories)
    - Recycling Collected (curbside and depots)
    - Recycling Diverted by MMBC Program
    - Wood Waste Diverted for Waste to Energy
    - Wood Waste Diverted from Landfill
    - Household Hazardous Waste Diverted by Product Care
    - Beverage Containers Diverted by Encorp
    - Electronics Diverted by Encorp
    - Scrap Tires Diverted
    - Organics Diverted by Backyard Composting Programs (estimated)
    - Broken Concrete Processed for Reuse
    - Contaminated Soil Beneficially Utilized

The CRD will encourage its member municipalities to adopt the same method for waste tracking and reporting. Also, the CRD will request that all EPR partners operating in the CRD tabulate their annual diversion statistics for the region in terms of tonnes of material diverted each calendar year.

When appropriate, the CRD will undertake further measures to characterize the waste stream and diversion performance, such as waste composition studies conducted according to the procedures developed by the Canadian Council of Ministers for the Environment (CCME) or other applicable

guidelines. If feasible, waste composition studies will be scheduled for the end of Phase 1 in 2014, immediately before the implementation of the provincial MMBC Stewardship program, and at the end of Phase 2 in 2017.

Costs of solid waste services will also be tracked annually and compared to budget. Where practical, costs will be tracked by category including urban collection, rural transfer station, landfill, Eco Depot, Public Education, Bylaw Enforcement and EPR Programs.

8.2 Plan Review

The CRD will initiate a minor review of the RSWMP on completion of each Phase in 2015, 2018 and 2021. In each review, the CRD will evaluate how implementation is proceeding in terms of programs implemented on schedule, and whether the expected levels of diversion are being realized. Adjustments to the plan may be undertaken, as required. The 2021 review will be a major update of the SWMP for the next 10 year planning period.

8.3 Financial Planning

The CRD is required by law to prepare a Five Year Financial Plan each year, which identifies expected revenues, expenditures and means of cost recovery for solid waste management services and programs provided. This budgeting exercise also allows the CRD to make a realistic assessment of the budget implications of proposed new programs, and the impacts those programs will have on taxes. Maintaining consistency with the format of cost impacts on residents, program cost information will be presented in terms of $/household per year.

Cariboo Regional District

Regional Solid Waste Management Plan Review
STAGE 1 – Characterization of Existing System Report

Cariboo Regional District

Let's talk trash!

Sperling Hansen Associates

Jan enns communications
CONSULTING · TRAINING

Maura Walker & Associates
ENVIRONMENTAL CONSULTANTS

Carney's Waste Systems

SPERLING
HANSEN
ASSOCIATES

• Landfill Engineering
• Solid Waste Planning
• Environmental Monitoring
• Landfill Fire Control

October 29th, 2010 SHA PRJ09062

Ms. Tera Grady
Supervisor of Solid Waste Management
Cariboo Regional District
Suit D, 180 North Third Avenue
Williams Lake, BC V2G 2A4

RE: Cariboo Regional District Solid Waste Management Plan Review
Stage 1 - Characterization of Existing System Report

Dear Tera:

This document presents a compilation of the Stage 1 Review of your Solid Waste Management Plan that has been completed by Sperling Hansen Associates (SHA), together with Jan Enns Communications (JEC) and Carney's Waste Systems (CWS). The purpose of Stage 1 of the plan was to fully understand and quantify the existing system and to obtain input from the public on their level of satisfaction with the existing system and where the Cariboo Regional District (CRD) should be focusing future resources to further improve service delivery and make the program more sustainable.

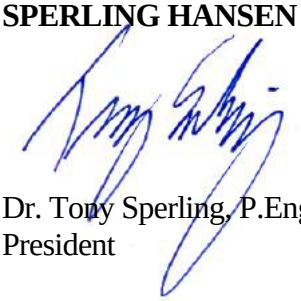
This report is organized into seven sections as follows: 1) Description of the Existing System, 2) Quantifying the Existing System, 3) System Costs, 4) Cost Comparison to Other Regional Districts, 5) Stage 1 Public Consultation, 6) Summary of Desired Changes to the System and 7) Conclusions and Recommendations. The Stage 1 work was carried out between March 18th and September 30th, 2010.

Extensive Public Consultation was conducted as part of the Stage 1 Review by the Cariboo Regional District and our consulting team over a six week period from June 1st, 2010 to July 9th, 2010. The results of the public survey that included more than 850 responses were presented in a separate report entitled Solid Waste Management Plan Review – Stage 1 Survey Report dated September 12th, 2010. The Survey Report will be appended to the completed SWMP update document, as will this Stage 1 Report.

An efficiency review of the CRD's key facilities was conducted by Owen Carney of Carney's Waste Systems, together with Tony Sperling of SHA. During the review we toured all of the CRD's recycling depots, a number of transfer stations and landfills and met with most of the operational contractors. This report identifies the system improvements suggested by Mr. Carney. As well it summarizes the applicable comments and recommendations made by contractors on a site by site basis. We envision closely evaluating these recommendations in Stage 2 of the SWMP Review.

We trust this report will provide the Advisory Committee with a solid information base to move into the Stage 2 Assessment of options. Please contact us if you have any questions about this report.

Yours truly,
SPERLING HANSEN ASSOCIATES



Dr. Tony Sperling, P.Eng.
President

Dr. Iqbal Bhuiyan
Environmental Engineer

October 29th, 2010

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1. INTRODUCTION

The Cariboo Regional District (CRD) is responsible for coordinating and administering the solid waste management function in the Cariboo. The solid waste system services four municipalities (Williams Lake, Quesnel, 100 Mile House and Wells) together with 12 Electoral Areas (A to L) and numerous First Nations Reserves. The four municipalities provide refuse collection services and recycling support within municipal boundaries. In the Electoral Areas the CRD is responsible for all aspects of refuse collection (from transfer stations), hauling and ultimate disposal of residuals in landfills. The CRD also provides a number of programs to reduce the waste going into landfill, including programs to chip and recycle or burn clean wood waste, Share Shed programs to promote reuse of serviceable goods and a recycling depot at the Williams Lake Transfer Station.

1.1 Objectives

The purpose of this report is to document the Solid Waste Management Plan (SWMP) activities that have been undertaken by the CRD during Stage 1 of the SWMP Review. The report has been prepared in accordance with the "Guide to the Preparation of Regional Solid Waste Management Plans" The objective of this section is to provide an analysis of the current waste management system and an overview of possible future upgrades to the system.

1.2 History of Solid Waste Management

The existing SWMP was developed by the CRD in June, 1997. The plan included the following seven elements:

1. Reduction and Reuse Program
2. Multi Material Recycling Program
3. 3R's Promotion and Education Program
4. Landfill Upgrading Program
5. Transfer Station and Marshalling Yard Program
6. Wood Waste Management Program
7. Plan Monitoring

The plan set in place a strategy to reduce and reuse waste by co-operating with provincial and federal stewardship programs, working with the Recycling Council of B.C. to implement a waste exchange for institutional, commercial and industrial (ICI) waste. Diversion levels of 4 to 7% percent were anticipated.

As well, the plan required the Cities of Williams Lake, Quesnel and the District of 100 Mile House to implement recycling programs for paper and large metal appliances at a minimum, possibly expanded to other materials not covered by stewardship programs. Municipal recycling was expected to reduce the waste stream by 10%.

The CRD committed to a promotional and educational program to support reduction and reuse initiatives, including a recycling hot line.

The plan indicated that three Central Landfills would be developed and upgraded to meet standards of the Landfill Criteria, including the existing landfills at Quesnel and 100 Mile House and a new landfill at Gibraltar Mine to service the Central region. All three landfills have been upgraded to meet Criteria, with the Gibraltar Landfill in particular being operated as a fully compliant lined landfill with leachate treatment.

Operations were to continue at 14 rural landfills, with the landfills being serviced to provide proper compaction and cover and to minimize litter. Of those facilities, 12 remain operational with landfills at Wells and Alexis Creek being converted to transfer stations.

Wood waste was to be managed by either air curtain burning or landfilling at the various landfill sites. At present, wood waste at several CRD wood waste facilities is ground up and hauled to Capital Power's cogen facility in Williams Lake, while the remainder is incinerated in high temperature air curtain burners that are contracted by the CRD.

The CRD committed to developing 14 transfer stations over time to process MSW. Of those, six transfer stations were to be upgraded to include marshalling yards for scrap metal and wood waste. All fourteen of the planned facilities have been put in place. Additional transfer stations have been developed at Tite Town, Alexis Creek and Wells.

A 15 year implementation schedule and capital program was put in place, with a work schedule and implementation budget developed for each of the four service areas: North, Central, South and Rural Cariboo. The capital and operational budget was set at $1.96 million in 1996, increasing to $2.44 million in 2010.

1.3 Geographic Setting

The CRD, highlighted in red in Figure 1-1 is shown in relation to neighbouring Regional Districts. With an area of 80,629 km^2, the CRD is the second largest regional district in B.C. The Cariboo is situated at a mid elevation plateau that is bisected from North to South by the Fraser River. The two largest communities of Quesnel and Williams Lake have been developed on the east side of the River. Highway 97 that follows the historical gold route to the Cariboo links the major communities and provides the main transportation corridor to hauling solid waste to the three regional landfill facilities and recyclables to markets that are primarily located on the Coast.

The topography in the Cariboo is dominated by glacial ablation landforms that include rolling hills, and hundreds of small lakes that are popular cottage destinations. Most of the land is covered with thick deposits of dense glacial till, with the main valley of the Fraser River incising into massive deposits of glacial outwash sand and gravel. The low permeability glacial till deposits have proven to be an effective formation for construction of small natural control landfill sites that continue to be operated in many of the more remote communities in the CRD.

The dominant biogeoclimatic zones in the Cariboo are Sub-Boreal Spruce, Sub-Boreal Pine /Spruce and Interior Douglas Fir, with a small area of Bunchgrass. Most of the land in the Cariboo is covered by forests. Historically, the forests have been the economic engine of the Cariboo, giving rise to large pulp mill and sawmill operations in the three major towns. The recent pine beetle infestations have devastated the Lodgepole Pine forests. The infestation has resulted in the mortality of up to 80% of the pine trees throughout the region, and has had profound implications on the production of clean woodwaste throughout the CRD.

1.4 Population

Based on the 2006 Census, the population in the CRD was 62,190 residents, comprised of 38,389 residents in the four municipalities (Quesnel, Williams Lake, 100 Mile House and Wells), 20,081 rural residents residing in Electoral Areas A to L and 3,270 residents residing on Indian Reserves. Table 1-1 presents the population distribution as reported in the Canadian Census statistics in 2006, 2001 and 1991. In the "Adjusted 2006 Population" column, to properly track waste generation statistics, the First Nations population living on Reserves has been distributed throughout each electoral area.

As can be seen in Figure 1-1, the population of the CRD is clustered mainly along Hwy. 97, while the Chilcotin and the northeast Cariboo are very sparsely populated. The CRD does have a relatively high proportion of rural to urban residents (62% urban, 38% rural). As a result of these demographics, a relatively small population base and large travel distances between the three main population centers in the CRD the provision of garbage disposal and recycling services is challenging and expensive.

1.5 Current Waste System

The CRD solid waste management system is comprised of six main services: 1) transfer stations for collecting waste and recyclables, 2) hauling services to transport solid waste and recyclables to landfills / recycling facilities, 3) processing and shipping of recyclables to markets 4) landfilling of residuals, 5) grinding or air curtain burning of clean wood waste and 6) operation of Share Sheds to reuse materials.

As shown in Figure 1-2, the CRD waste system is organized into four operational areas:

1. North Cariboo (around Quesnel)
2. Central Cariboo (around Williams Lake)
3. South Cariboo (around 100 Mile House)
4 West Cariboo (Chilcotin Country)

In the next sections, the various sites of the solid waste management facilities for the CRD are described and the site list is shown in Table 1-2.

1.5.1 Urban System

The two Municipalities and two Districts provide garbage and recycling services for residents living within municipal boundaries.

Curbside Collection of Residential MSW: Collection of curbside refuse occurs once per week. Contractors in Quesnel and Williams Lake have implemented automated systems that utilize a 65 gallon roll-out tote. In Quesnel 3,000 homes are serviced with collection on Tuesday, Wednesday or Thursday. MSW is hauled directly to the Quesnel Landfill. In Williams Lake about 4,400 homes are serviced with automated curbside collection. Collected waste is hauled to the Williams Lake Transfer Station that is operated by the CRD. In 100 Mile House waste is hauled to the 100 Mile House Landfill while refuse from Wells is hauled to the Wells transfer station and then to the Quesnel Landfill.

Collection of Commercial Solid Waste: Collection of solid waste generated by the commercial sector is conducted by a number of local garbage hauling contractors in each community. The solid waste that is collected is hauled to Quesnel, 100 Mile and Gibraltar central landfill facilities. In the case of solid waste generated in Williams Lake, haulers tip at the Williams Lake Transfer Station.

Collection of Residential Recyclables: To deliver recycling services the CRD operates one large recycling depot at the Williams Lake Transfer Station. As well, the CRD and participating municipalities partner with three private for profit recycling depots in Quesnel, Williams Lake and 100 Mile House to provide drop-off recycling services for materials in designated Extended Producer Responsibility (EPR) programs and for common recyclables including cardboard, mixed paper and plastics.

Curbside collection of residential recyclables is a service that is currently provided only to approximately 4,400 homes in Williams Lake on a weekly basis. The implemented system is known as an automated co-mingled system. Residents deposit all of their recyclables (cardboard, mixed paper, plastic containers, and tin cans) in a blue recycle cart which is then collected by Central Cariboo Disposal. To avoid contamination, glass is not included in the curbside program. This program was rolled out by the City of Williams Lake in the spring of 2009. According to the Contractor, two truck loads of recyclables totaling approximately 2,400 Kg are collected daily. The recyclables are sorted on a picking line at Central Cariboo's material recycling facility and then shipped loose to the Quesnel recycling facility for baling, as shown in Photo 1-1.

Photo 1-1. Recycle Sorting Line at Central Cariboo Disposal – Williams Lake

Recycling Depots: Recyclables that are too large to fit into the blue carts, and recyclables generated by residents that are not serviced by the curbside program can drop off their recyclables at the Williams Lake Transfer Station and Recycling Depot, pictured in Photo 1-2. This depot provides 6 yd. Haul-All bins for a range of recyclable materials including cardboard, mixed paper, plastic containers, glass, milk jugs and tin cans. As well, the facility provides a drop-off point for yard and garden waste, propane canisters, and car batteries..

Photo 1-2. Williams Lake Recycling Facilities at Transfer Station

Quesnel does not provide a curb-side collection program for recyclables at present but is considering implementation of such a service. Instead, a large recycling depot has been established adjacent to the landfill. The facility provides an array of bins for the common recyclables. In addition, several partitioned roll-off bins together with Haul-All 6 Yd. bins are located in commercial areas of Quesnel for convenient access by the public.

Photo 1-3 Quesnel Recycling Drop on Hwy. 97 in South Quesnel

The Quesnel recycling facility operates a large manual tie horizontal baler to bale the various commodities. Typically, the plant processes 12 to 14 tonnes per day. The facility process all of the materials marshaled in the Quesnel area, as well as those marshaled in the Williams Lake area. Most recyclables are shipped to Blue Water in Vancouver.

In 100 Mile House recyclables are taken to the Gold Trail Recycling Depot where materials are baled and shipped to market. Gold Trail accepts cardboard, mixed paper, newspaper, #2 plastics only (milk jugs) and beverage containers as part of the Encorp stewardship program. On a busy day the facility processes about 4 tonnes.

Photo 1-4 Baled Newsprint and Beverage Containers at Gold Trail Recycling

Recycling in the ICI Sector: The CRD is not directly involved in recycling activities within the ICI sector. Most major businesses such as Save-On Foods and Canadian Tire have programs in place for recycling their packaging and other recyclables that are accumulated such as tires, batteries, used motor oil. The Williams Lake Canadian Tire store is particularly active in collecting a full range of recyclables that include tires (4 per customer), automotive batteries, clean glass, used oil, automotive coolant, 20lb propane tanks and most recently, alkaline household batteries and fluorescent lightbulbs.

3 yd. and 6 yd. bins for recycling cardboard are supplied by the primary recyclers in each community, collected and then hauled to Quesnel or 100 Mile House for bailing. In Williams Lake Canadian Tire and Save-On Foods ship their cardboard directly to the bailing facilities, with Canadian Tire shipping to Quesnel and Save-On Foods shipping to 100 Mile House.

Photo 1-5 Drop off facility for clean glass at Canadian Tire

Williams Lake Transfer Station: Unlike the Quesnel and 100 Mile House landfills that are relatively close to town, the facility receiving Williams Lake refuse is situated more than 90 km away at Gibraltar Mine, situated northeast of McLeese Lake. As direct hauling to Gibraltar is not practical, the CRD developed the Central Cariboo Transfer Station in an industrial area on the north side of town.

All incoming refuse is weighed across the facility's scale deck, including recyclables. The transfer station, pictured in Photo 1-6 is a push-pit type facility. Refuse is tipped onto a concrete floor and then pushed into a 53' walking floor tri-axle trailer that hauls the refuse to Gibraltar. The transfer trailers average payloads of about 17 tonnes.

Photo 1-6 Williams Lake Transfer Station with Yard Waste Bins in foreground

The transfer station has been established at the old Williams Lake Landfill site. This facility continues to operate as a demolition / land clearing / construction waste (DLC) landfill, a drop-off for clean wood waste that is chipped for co-gen and a concrete rubble dump.

Share Sheds: The CRD operates Share Sheds at the Williams Lake Transfer Station and at the 100 Mile House Landfill. A low cost store for used goods is also operated at the Cariboo Recycling Depot in Quesnel. Materials commonly deposited for recycling at these facilities include used furniture, appliances, dishes, books, toys old sports equipment and clothing. The public survey indicated that the Share Sheds were one of the most popular recycling programs provided by the CRD.

Photo 1-7 Share Shed in Williams Lake

Photo 1-8 Recyle Depot in Quesnel

Central Landfills: MSW generated in the urban centers is ultimately hauled to the three central landfill facilities at Gibraltar, Quesnel and 100 Mile House.

Gibraltar Landfill: The Gibraltar Landfill is a fully compliant engineered landfill site that has been developed on top of a waste rock dump at Gibraltar Mine. The landfill first opened in 2003 with a design capacity of 1.289 million m^3 and a projected lifespan extending to 2063. In 2009 the landfill received 13,115 tonnes of MSW. Landfill operations are conducted under contract by Gibraltar Mines Ltd.

The Gibraltar Landfill is fully lined with a clay / geomembrane double lining system. Leachate is collected and treated in a three stage treatment facility that includes an aeration pond, a settling pond and a polishing wetland.

Quesnel Landfill: This facility is operated by the City of Quesnel. It is a natural control landfill facility that was originally developed as a trenching operation but is now being operated as an area fill. In 2009 the landfill received 10,859 tonnes of MSW. On average, about 30,000 m^3 of air space are consumed annually. The landfill is expected to reach capacity in about 20 years. In addition to the landfill, the property is also used for a large scrap metal operation and for grinding clean wood waste. Concrete rubble is utilized within the landfill to partition cells.

Photo 1-9 Active Face at Quesnel Landfill, Scrap in foreground

100 Mile House Landfill: The 100 Mile House Landfill, located 3 km northeast of the town centre is a natural control landfill that was originally developed as a trench type facility, but is now being expanded vertically as an area fill. The landfill includes a small vehicle bin drop-off area, a yard and garden waste pile, commercial and residential woodwaste areas, a concrete rubble pile, an MSW active face, a DLC cell, and a contaminated soil treatment area.

The 100 Mile House Landfill accepted 9,253 tonnes of MSW in 2009. The landfill provided 339,350 m^3 of capacity effective 2003. At that time a lifespan of 38 years, extending to 2041 was projected.

1.5.2 Rural System

The CRD's rural solid waste system is currently comprised of 16 rural transfer stations and 12 unmanned rural landfills that provide disposal service for household waste to residents who do not receive the municipal collection services provided by Quesnel, Williams Lake, 100 Mile House and Wells.

Rural Transfer Stations: The 16 rural transfer station facilities are unattended. Hauling contractors dump the bins as needed and haul the refuse to the nearest landfill or the Central Transfer Station in Williams Lake. The frequency of visits varies. Busy sites are serviced several times a day, while remote sites may only be serviced once or twice per week. The transfer stations are also serviced by a maintenance contractor who cleans up the sites, empties Share Sheds and sorts and stacks metals, wood waste and yard and garden waste at those facilities that include marshalling yards.

Most rural transfer stations in the CRD utilize self tipping 25 yd^3 Transtor bins to store MSW deposited by residents. As pictured in Photo 1-10, each bin has a small drop down door that is used for disposal of garbage bags and other small refuse. As well, the bins have a large "mattress door" for

disposal of mattresses and other large items such as wood. The bins do not accommodate large bulky items.

Photo 1-10 Transtor Bin at Alexandria Transfer Station

These present a significant operational challenge at many of the CRD's transfer stations, as discussed in greater detail in Chapter 2. Table 1-2, lists the transfer station and landfill facilities in the Rural CRD system and indicates the services provided at each site.

Another major problem that is developing at the rural transfer stations, and particularly in the South Cariboo where tipping fees have recently been implemented at the 100 Mile House Landfill is that in order to avoid tipping fees, users are instead hauling waste to nearby transfer stations at Lac La Hache, Forest Grove and Lone Butte. This not only results in the loss of the tipping fee, but further increases the CRD's costs in that the waste has to be hauled back to the landfill. Similar problems are expected to develop in the North Cariboo once Quesnel implements a scale at their landfill. These emerging issues require consideration in Stage 2 of this study.

Rural Recycling Services: Recycling services for rural residents are limited to provision of Share Sheds at many of the rural landfills transfer stations and marshalling yards for scrap metal, wood waste and yard and garden waste at six of the recycling areas and several rural landfills. As well, the various self haul recycling programs that are available to the urban population are also accessible to rural residents, including services at the Williams Lake and Quesnel Transfer Stations and the Gold Trail Recycling Depot. As is discussed in greater detail in Chapter 7, provision of expanded recycling services to the rural residents of the CRD was identified as one of the top priorities of the recently completed public survey.

ILJ Ventures initiated a small scale pilot recycling program at the 150 Mile Transfer Station, as shown in Photo 1-11. The bins generated $70 worth of recyclable beverage containers in the first three days.

Since then, collection and maintenance of the bins has been taken over by a local non-profit organization.

Photo 1-11 Pilot Recycling Bins at 150 Mile Transfer Station

Rural Landfills: The CRD operates 12 rural landfills, in the more remote areas of the regional district. All 12 facilities are unattended trench type landfills. The locations of the landfill facilities are presented in Figure 1-2 and the facilities that are provided are listed in Table 1-2.

The rural landfills are all natural control trench landfill sites. At each landfill solid waste is dumped at a tipping pad into a deep vertical trench. As noted in Chapter 5, the lack of safety railings and supervision is deemed to present a significant safety risk at these facilities.

Photo 1-12 Unloading Refuse at Interlakes Landfill Site

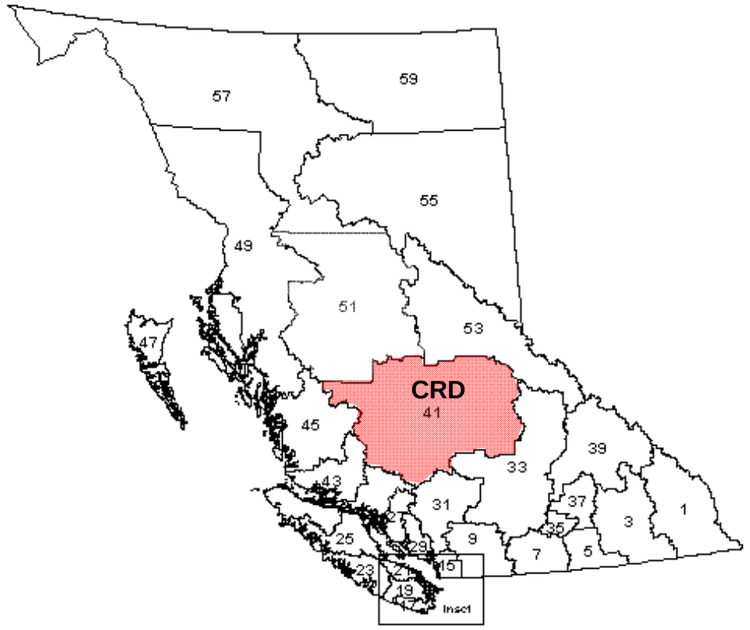
Refuse is periodically picked up from the tipping face and hauled to the back side of the trench with an excavator or track machine. The refuse is then compacted and covered, typically once or twice per week.

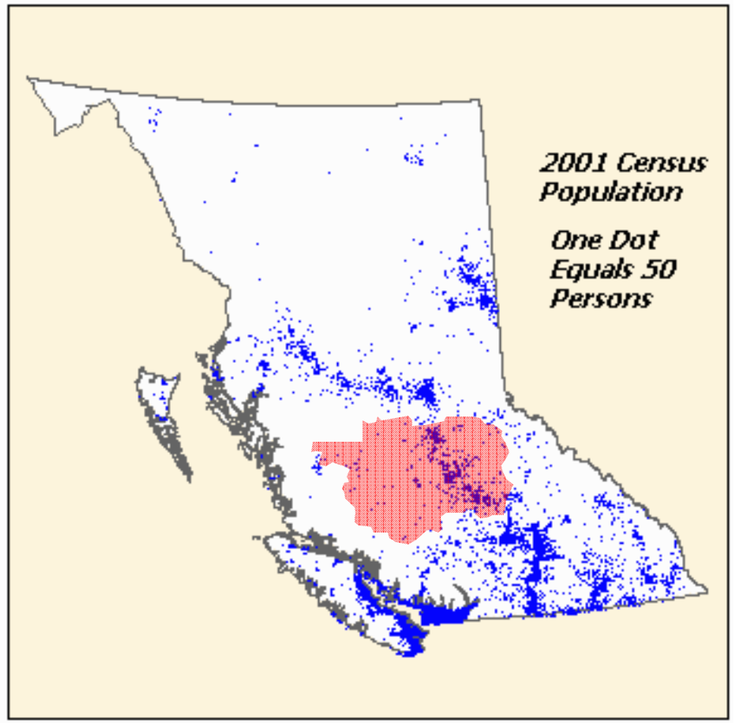
Wood Waste Management: This service is provided at select landfill facilities including Interlakes, Watch Lake, West Chilcotin, Big Lake, Mahood and Likely. Wood waste is stockpiled at these facilities and periodically burned in an air curtain incinerator or ground for recycling..

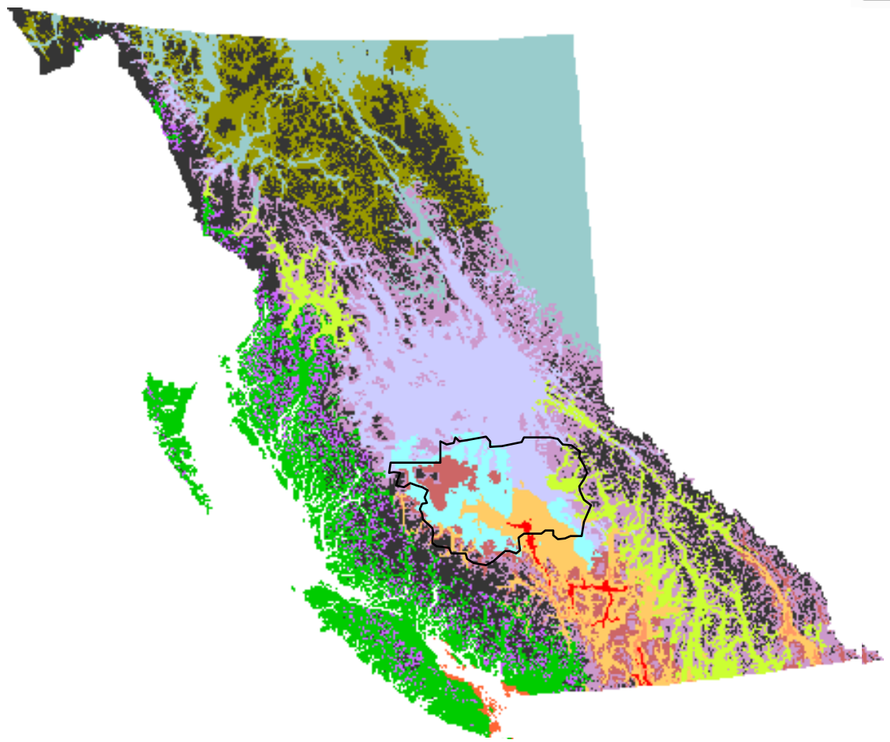
Photo 1-13 Air Curtain Burner at Interlakes LF

Photo 1-14 Air Curtain Unit at CRD LF

Most CRD landfills are fenced to prevent incursions by bears. Litter is picked up under contract once to three times a year. Depending on the risk to the environment, CRD landfills are monitored fully (including at least 3 wells, surface waters), receive site assessment monitoring, or no monitoring if there is determined to be no risk to the environment.







Biogeoclimatic Zones

- Alpine Tundra
- Spruce? Willow? Birch
- Boreal White and Black Spruce
- Sub-Boreal Pine? Spruce
- Sub-Boreal Spruce
- Mountain Hemlock
- Engelmann Spruce? Subalpine Fir
- Montane Spruce
- Bunchgrass
- Ponderosa Pine
- Interior Douglas-fir
- Coastal Douglas-fir
- Interior Cedar? Hemlock
- Coastal Western Hemlock

Sperling Hansen Associates

Landfill Services Group
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- Design & Operations Plans
- Landfill Siting
- Environmental Monitoring

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LEGEND:

CLIENT: Cariboo Regional District

PROJECT:
Solid Waste Management Plan Review – Stage 1

TITLE:
Land Area, Population and Biogeoclimatic Data

SCALE:	DATE:	PROJECT NO:
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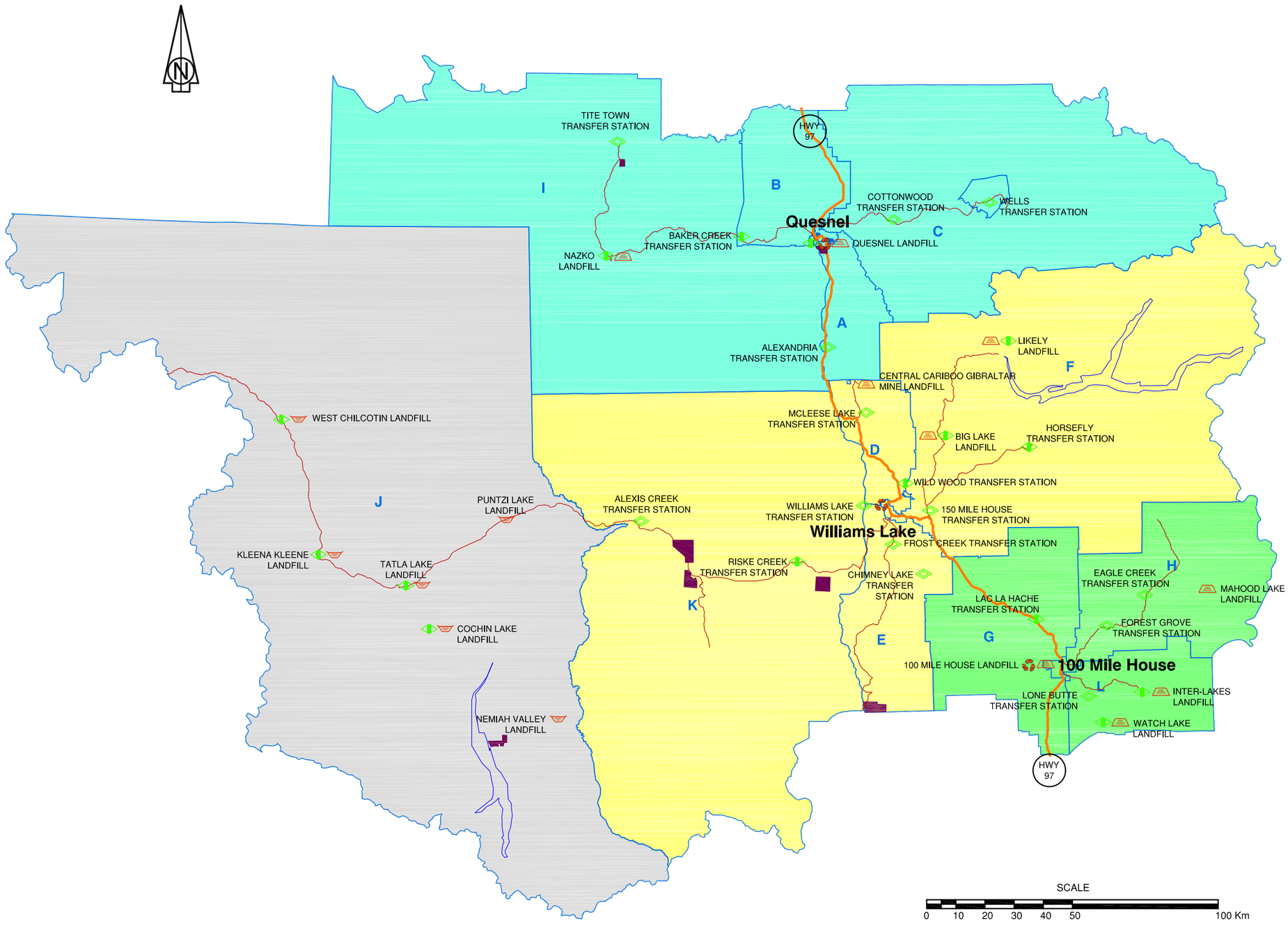

SPERLING HANSEN ASSOCIATES

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LEGEND:

- ELECTORAL AREAS
- PAVED ROAD
- HIGHWAY 97
- NORTH CARIBOO CATCHMENT
- CENTRAL CARIBOO CATCHMENT
- SOUTH CARIBOO CATCHMENT
- RURAL LANDFILLS
- A÷L ELECTORAL AREAS
- FIRST NATION RESERVES
- RURAL LANDFILL
- REGIONAL LANDFILL
- RECYCLE DEPOT
- TRANSFER STATION
- TRANSFER STATION AND MARSHALLING YARD

CLIENT: Cariboo Regional District

PROJECT:

SOLID WASTE MANAGEMENT PLAN REVIEW

TITLE:

CARIBOO REGIONAL DISTRICT LANDFILLS AND TRANSFER STATIONS

SCALE:	DATE:	PROJECT NO:
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TABLE 1-1. Population Statistics in Cariboo Regional District
Source: Statistics Canada

		Community	Population 2006	Adjusted 2006 Population	Population 2001	Population 1991	Proportion of Total 1991	Homes	People per home	Sq. Km.
Cariboo	RD		**62,190**	**62,190**	**65,659**	**60,297**		25,218	2.47	80,629.34
QUESNEL LANDFILL										
Quesnel	CY	Quesnel	9,326	19,673	10,044	20,331	0.89	3,917	2.38	35.34
		IR		128						
Cariboo A	A		5,859		6,428			2,308	2.54	783.36
		Alexandria		762		785	0.03			
		IR		42						
Cariboo B	A		3,858		4,338			1,552	2.49	1,419.74
		Baker Creek		762		784	0.03			
Cariboo C	A		1,164		1,323			487	2.39	7,392.10
		Cottonwood		153		158	0.01			
Cariboo I	A		1,661		1,773			664	2.50	11,942.85
		Nazko		392		404	0.02			
		Titetown		75		n/a				
		IR		149						
Wells	DM	Wells	236	287	235	295	0.01	130	1.82	159.15
			22,104	**22,423**		**22,757**				
GIBRALTAR LANDFILL										
Williams Lake	CY		10,744	14,493	11,153	15,656	0.63	4,455	2.41	33.11
		IR		237						
Cariboo D	A		3,073		3,296			1,242	2.47	856.15
		McLeese Lake		873		943	0.04			
		IR		125						
		Wildwood		1,842		1,990	0.08			
		IR		179						
Cariboo E	A		4,336		4,668	2,933		1,665	2.60	1,744.06
		Chimney/Felker		248		268	0.01			
		Frost Creek		1,024		1,106	0.04			
		IR		484						
		Dog Creek		400		432	0.02			
Cariboo F	A		4,384		4,961	1,806		1,740	2.52	9,775.63
		Horsefly		595		643	0.03			
		Likely		528		570	0.02			
		Big Lake		554		598	0.02			
		150 Mile House		1,164		1,257	0.05			
Cariboo K	A		552		674	3,068		234	2.36	13,650.75
		Alexis Creek		1,078		1164	0.05			
		IR		753						
		Riske Creek		291		314	0.01			
		IR		128						
						1478				
			23,089	**24,995**		**24,941**				
100 MILE HOUSE LANDFILL										
100 Hundred Mile House	DM	100 Mile House	1,885	4,387	1,739	3,799	0.34	811	2.32	51.34
Cariboo H	A		1,744	0	1,834			769	2.27	2,603.71
		Eagle Creek		633		548	0.05			
		Forest Grove		1,129		978	0.09			
		IR		253						
		Mahood Lake		84		73	0.01			
Cariboo G	A		4,974		5,001	1,599		2,085	2.39	2,678.81
		Lac La Hache		3,715		3,217	0.29			
Cariboo L	A		4,316		4,254	3,217		1862	2.32	1,268.42
		Lone Butte		1,173		1,016	0.09			
		Sheridan Lake		1,353		1,172	0.10			
		IR		87						
		Watch Lake		445		385	0.03			
						2,573				
			12,919	**13,259**		**11,188**				
RURAL LANDFILLS										
Indian Reserves	IR		3,270		3,058			954	3.43	286.36
Cariboo J	A		808		880			343	2.36	25,948.44
		Anahim Lake		153		265	0.19			
		IR		195						
		Cochin Lake		90		157	0.11			
		Klena Kleene		40		70	0.05			
		IR		100						
		Nimpo Lake				n/a				
		Puntzi		289		502	0.36			
		IR		263						
		Tatla Lake		46		80	0.06			
		IR		100						
		Nemaiah		189		328	0.23			
		IR		47						
			808	**1,513**		**1402**				
			4,886							
		Total Urban Population	22,191	**38,839**			Urban %	**62%**		
		Total Rural Population		**20,081**			Rural %	**32%**		
		Total First Nations on IR		**3,270**			First Nations%	**5%**		
			62,190	**62,190**	**65,659**	**60,288**				

Table 1-2. List of CRD Waste Management Facilities

Site I.D.	Site Name	Electoral Area	Haul Route	Destination	Scrap Metal Marshalling	Wood Waste Collection	Share Shed	
	NORTH CARIBOO							
LF 1	Quesnel Landfill	Quesnel		Quesnel	Yes	Yes	Yes	Large LF, Scrap Metal, White Goods, Wood, DLC LF and Large Recycle Centre.
RLF1	Nazko Landfill	Cariboo I		Nazko	Yes	No	Yes	Small landfill with metals area.
RTS1	Alexandria Transfer Station	Cariboo A	Cariboo Hwy (97)	Quesnel	No	No	Yes	Little Transtor with Share Shed.
RTS2	Baker Creek Transfer Station	Cariboo B	Nazko Rd	Quesnel	Yes	Yes	Yes	75% of garbage dumped in wood waste area, people drive by Transtor bins. Needs
RTS3	Cottonwood Transfer Station	Cariboo C	Bakerville Hwy (26)	Quesnel	No	No	Yes	Single Transtor. Oversize bin needed.
RTS4	Wells Transfer Station	Wells	Bakerville Hwy (26)	Quesnel	Yes	Yes	Yes	Open top 50 yd. bins, wood waste, metals, auto hulks. Lots of contamination in wood. Needs signs, bins need to be lower as hard to dump into.
RTS5	Titetown Transfer Station	Cariboo I	Batnuni Rd	Quesnel	No	No	No	Roll off Bin TS, bear fence.
	CENTRAL CARIBOO							
LF2	Gibraltar Landfill	Cariboo D		Gibraltar				
RLF2	Likely Landfill	Cariboo F		Likely	Yes	Yes	No	Small LF, no problem site.
RLF3	Big Lake Landfill	Cariboo F		Big Lake	Yes	Yes	Yes	Medium LF, no problem site.
TS1	Williams Lake Transfer Station	Williams Lake	Cariboo Hwy (97)	Gibraltar	No	Yes	Yes	Full service recycling centre. Push pit transfer site. DLC landfill area.
RTS6	McLeese Lake Transfer Station	Cariboo D	Cariboo Hwy (97)	Gibraltar	Yes	Yes	No	Transtor, wood, metals, A site.
RTS7	Wildwood Transfer Station	Cariboo D	Cariboo Hwy (97)	Gibraltar	Yes	Yes	No	Huge contamination in metals area.
RTS8	Frost Creek Transfer Station	Cariboo E	Dog Creek Road	Gibraltar	No	Yes	Yes	2 Transtors, wood waste 3 km away. Problem site.
RTS9	Chimney Lake Transfer Station	Cariboo E	Dog Creek Road	Gibraltar	No	Yes	Yes	1 Transtor, no trouble site.
RTS10	150 Mile Transfer Station	Cariboo F	Cariboo Hwy (97)	Gibraltar	No	Yes	No	2 Transtors, wood waste up hill, no oversize.
RTS11	Horsefly Transfer Station	Cariboo F	Horsefly Rd	Gibraltar	Yes	Yes	Yes	2 Transtors, metals and wood waste site.
RTS12	Alexis Creek Transfer Station	Cariboo K	Chilcotin-Bella Coola Hwy (20)	Gibraltar	Yes	No	Yes	
RTS13	Riske Creek Transfer Station	Cariboo K	Chilcotin-Bella Coola Hwy (20)	Gibraltar	Yes	No	Yes	ILJ services every 10 days. Trouble free site.
	Total Williams Lake Transfer Station							
	SOUTH CARIBOO							
LF3	100 Hundred Mile House Landfill	100 Mile House		100 Mile	Yes	Yes	Yes	Landfill, DLC cell, concrete dump, contaminated
RLF 4	Mahood Lake Landfill	Cariboo H		Mahood	Yes	Yes	Yes	Tiny landfill, 5 people live in the area in the winter.
RLF5	Inter-Lakes Landfill	Cariboo L		Inter-Lakes	Yes	Yes	Yes	Busy landfill site. Lots of wood waste accumulating, safety railing urgently needed.
RLF6	Watch Lake Landfill	Cariboo L		Watch Lake	Yes	Yes	Yes	
RTS14	Eagle Creek Transfer Station	Cariboo H	Canim-Hendrix Lake Rd	100 Mile	No	No	Yes	1 Transtor, tight site respected by users, no problems.
RTS15	Forest Grove Transfer Station	Cariboo H	Canim-Hendrix Lake Rd	100 Mile	Yes	Yes	Yes	2 Transtors. 60 cars per day, no accountability. Problem site. 100 Mile House tipping fee dodgers. Needs attendant.
RTS16	Lac La Hache Transfer Station	Cariboo G	Cariboo Hwy (97)	100 Mile	Yes	Yes	Yes	3 Transtors. 2 times as busy as 100 Mile. Super busy with huge volume. Bins dumped 6 to 9 times/day Metals area has huge contamination. Should be attended site.
RTS17	Lone Butte Transfer Station	Cariboo L	Little Fort Hwy (24)	100 Mile	No	No	Yes	2 Transtors. Share shed gets lots of oversize
	RURAL LANDFILLS							
RLF7	West Chilcotin Landfill	Cariboo J		West Chilcotin	Yes	Yes	Yes	Local Conractor hauls in small excavator to service.
RLF8	Kleana Kleene Landfill	Cariboo J		Klena Kleene	Yes	No	Yes	Very small landfill, wood goes in trench.
RLF9	Tatla Lake Landfill	Cariboo J		Tatla Lake	Yes	No	Yes	Small landfill with metals area.
RLF10	Cochin Lake Landfill	Cariboo J		Cochin Lake	Yes	No	Yes	Small landfill with metals area.
RLF11	Puntzi Lake Landfill	Cariboo J		Puntzi Lake	Yes	No	Yes	
RLF12	Nemiah Valley Landfill	Cariboo J		Nemiah Valley	Yes	No	Yes	

2. QUANTIFYING THE SYSTEM

This chapter presents a broad overview of the current system employed by the CRD to manage solid waste in the region, as well as the basic data used as a foundation to build the economic models of the various future transfer stations, collection and recycling options examined.

2.1 Waste Tonnages

As described in the previous chapter, the Cariboo Regional District is separated into four subregions three are associated with regional landfills, the North Cariboo (Quesnel Landfill), Central Cariboo (Gibraltar Landfill), South Cariboo (the 100 Mile House Landfill) and Rural Cariboo (Chilcotin Landfills). The rural areas have access to small landfills or transfer stations that are trucked to one of the regional landfills.

The transfer station and regional landfill system for the Central and South Cariboo is well quantified as both of the landfills have scales and are attended. Therefore, the tonnage received at the Gibraltar Landfill is known and was 13,115 tonnes in 2009 and the 100 Mile House Landfill received 9,253 tonnes in 2009. The Quesnel Landfill does not have a scale; therefore the tonnage received was proportionately calculated based on the waste generation rate in the Central Cariboo as 10,859 tonnes. The landfill tonnages and service population are shown in Table 2-1.

Table 2-1 – Waste Tonnages for the Regional Landfills

Landfill	Tonnage Received (2009)	Service Population
Gibraltar	13,115	23,914
Quesnel	10,859	22,031
100 Mile House	9,253	11,290

The 12 rural landfill facilities are located in the Chilcotin and in the outlying areas of the other three service areas. The rural landfills are not attended and do not have scales. Therefore, the tonnages in the rural landfill system were calculated based on the service population and per capita waste generation rates, as measured by waste received from rural transfer stations. In addition, at those facilities that include wood waste and scrap metal marshalling yards, the tonnages were increased accordingly to account for those materials. Several of the rural landfills accept wood waste and it is assumed that in the areas that do not receive wood waste, it is burned by the residents. Therefore, determining the waste generation rates and in turn, the tonnages received at the rural landfills, wood waste was an important factor. The waste generation rates are discussed in more detail in Section 2-3.

The service population for many of the small landfills includes First Nations residents living on Indian Reserves. As discussed in Chapter 1, the populations living on reserves were estimated using the online Statistics Canada website data. The Reserve populations are provided as a Census-subdivision (equivalent to a municipality) and there are 54 Indian Reserves in the Cariboo Regional District. The total Indian Reserve population for the CRD was determined from Census Canada and then distributed across each electoral areas based on previous population estimates undertaken by the CRD. The population on reserve was then linked with the landfill or transfer station nearest to the Indian Reserve.

For the non-Reserve population the 2006 Census Canada data is only broken out by Electoral Area. To estimate the service population at each facility, the Electoral Area population was evenly distributed to provide an approximate service population for each of the rural landfills or transfer stations. The service population and tonnages for each of the landfills are shown in Table 2-2.

Table 2-2 – Waste Tonnages for the Rural Landfills

Landfill	Tonnage	Service Population	Wood Waste
Nazko	245	392	N
Likely	325	528	Y
Big Lake	341	554	Y
Mahood Lake	52	84	Y
Inter-Lakes	1,968	1,440	Y
Watch Lake	472	445	Y
West Chilcotin	240	348	Y
Kleena Kleene	86	140	N
Tatla Lake	90	146	N
Cochin Lake	56	90	N
Puntzi Lake	340	552	N
Nemiah Valley	145	236	N

The total tonnage of solid waste that was managed in the Cariboo Regional District in 2009 was 54,220 tonnes.

2.2 Recycling Tonnages

The previous chapter described the recycling facilities in the Cariboo Regional District and the challenges with recycling in areas with small populations spread out over large distances. The primary recycling occurs in the urban areas of Williams Lake with curbside pickup and Quesnel with a large drop off and sorting area at the Quesnel Landfill and recycling drop-off stations throughout the community.

The recycling tonnages for the Cariboo Regional District are shown in Table 2-3. In the North Cariboo, the recycling tonnages are generated from user drop off at the Quesnel Landfill, wood waste and metal areas at the landfill, and two transfer stations that provide for diversion of wood waste and metals, at Baker Creek and Wells.

The Central Cariboo has curb side pick up in the City of Williams Lake, a full service recycling depot at the Williams Lake Transfer Station that offers diversion of wood waste and the full range of recyclables. As well wood waste is diverted at drop off facilities at both of the rural landfills (Likely and Big Lake) and 6 of the transfer stations – McLeese Lake, Wildwood, Frost Creek, Chimney Lake, 150 Mile House and Horsefly. The South Cariboo has scrap metal and wood waste recycling at the 100 Mile House, Inter-Lakes and Watch Lake landfills and at the Forest Grove Transfer Station.

Table 2-3 – Recycling Tonnages for the Cariboo Regional District

Region	Recycling/Wood Waste Tonnages
North Cariboo	4,388
Central Cariboo	3,071
South Cariboo	2,818
Rural Cariboo	26

The wood waste tonnages were calculated from the volumes provided by the CRD. The assumed density of the wood waste is 102 kg/m^3. The tonnage of wood waste entering the 100-Mile Landfill is scaled. In 2009, 568 tonnes of wood waste were received. This number was then divided into the total tonnage to provide a proportion of wood waste, which was determined to be 12%. The same value was used to estimate wood waste quantities at the other facilities that are unattended and without scales.

The total recycling (including wood waste and metals) tonnage in the CRD for 2009 was 10,303 tonnes.

2.3 Per Capita Waste Generation

The Cariboo Regional District's waste generation rates vary from North, Central and South Cariboo. The waste generation statistics include recycling and wood waste where applicable. The North Cariboo per capita waste generation rate was estimated using the waste generation rate of the hauled waste to the Gibraltar Landfill, which is 548 kg/person. The estimated population was then used to break out the various waste generation rates for each waste collection system. The estimated per capita waste generation for the entire North Cariboo catchment is 753 kg per person, see Table 2-4. The rural areas in the catchments have a lower waste generation rate, which may be due to the fact that residents dispose of their wood waste on their personal property. The urban catchments have a slightly higher waste generation rates as they include both the wood and recycling tonnages.

Table 2-4 – North Cariboo Waste Generation Rates

Waste Generation Categories	Waste Generation Rates (kg/person)
Entire Catchment	753
Quesnel Landfill Catchment	755
Quesnel Urban System	766
Rural Transfer System	660
Rural Landfill System	625

The Central Cariboo waste generation rates are shown in Table 2-5. The Central Cariboo waste generation rates are slightly higher than those of the North Cariboo, which may be due to the DLC and concrete waste that is included in the waste tonnages for the region. The rural systems are virtually equivalent while the Williams Lake Urban system is about 235 kg/person more than Quesnel. The entire catchment is 847 kg/person.

Table 2-5 – Central Cariboo Waste Generation Rates

Waste Generation Categories	Waste Generation Rates (kg/person)
Entire Catchment	847
Williams Lake Transfer Station	754
Gibraltar Landfill Catchment	548
Williams Lake Urban System	1,001
Rural Transfer System	629
Rural Landfill System	616

The South Cariboo has the highest per capita waste generation of the three regional landfill systems. The entire catchment has a waste generation rate of 1,146 kg/person (see Table 2-6), the reason for this higher waste generation value may be due to the limited recycling available in the area compared to the North and Central. Additionally, there was a large amount of wood waste received at the Inter-Lakes Landfill in 2009 (1,081 tonnes, 1.2 times the amount of waste received). This large wood waste value will skew the rural landfill system result and the overall catchment waste generation rate. The per capita waste generation rate from the 100-Mile House Urban system is similar to that of Williams Lake, but approximately 155 kg/person more.

Table 2-6 – South Cariboo Waste Generation Rates

Waste Generation Categories	Waste Generation Rates (kg/person)
Entire Catchment	1,146
100 Mile House Landfill Catchment	1,125
100 Mile House Urban System	1,156
Rural Transfer System	829
Rural Landfill System	1,265

Lastly, the waste generation rates used for the rural landfills in the West Cariboo are shown in Table 2-7. The rates were assumed to be the same as the Central Cariboo at 616 kg/person. The slightly higher rate for the West Chilcotin accounts for the wood waste received at that landfill.

Table 2-7 – West Cariboo Waste Generation Rates – Rural Landfills

Landfill	Waste Generation Rates (kg/person)
West Chilcotin	690
Kleana Kleene	616
Tatla Lake	616
Cochin Lake	616
Puntzi Lake	616
Nemiah Valley	616

Table 2-8 at the back of this chapter provides a detailed compilation of the population and waste generation rate for each facility.

Table 2-9 presents comparative statistics from nine regional districts in B.C. The total per capita MSW generation in the region ranges from a low of 671 Kg per person in the Capital Regional District, to a high of 1,546 Kg/person in the District of Squamish. At an average per capita waste generation rate of 872 Kg/person, the CRD rates right in the middle (4th lowest) of the nine regional districts analyzed. In terms of recycling rates, the CRD rates the third lowest at 19.0%. As a result of these two statistics, the per capita mass of residuals landfilled is right in the middle of the nine jurisdictions analyzed in the province, at 706 Kg/year.

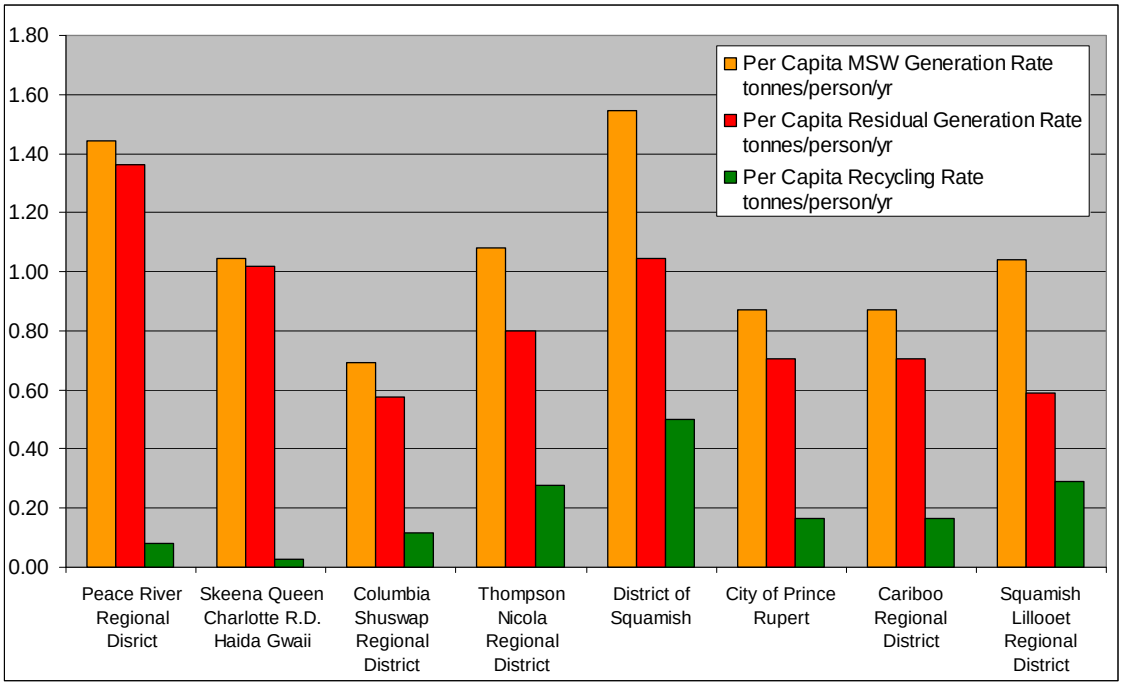
Table 2-9 – Per Capita Waste Generation Rates by Regional District

	Population	Waste Generated (tonnes/yr)	Residuals Landfilled/ Incinerated (tonnes/yr)	Waste Recycled (tonnes/yr)	Percent Recycled (%)	Per Capita MSW Generation (Kg/capita/yr)	Per Capita Residuals Landfilled
Cariboo Regional District (2009)	**62,190**	**54,220**	**43,917**	**10,303**	**19.0%**	**872**	**706**
Capital Regional District (2007)	364,121	244,325	165,381	78,944	32.3%	671	454
Columbia Shuswap R.D. (2009)	53,713	37,193	31,000	6,193	16.7%	692	577
District of Squamish (2009)	17,111	26,446	17,918	8,528	32.2%	1,546	1,047
Metro Vancouver R.D. (2005)	2,132,824	3,072,596	1,476,703	1,595,893	51.9%	1,441	692
Peace River Regional District (2009)	54,071	77,913	73,635	4,278	5.5%	1,441	1,362
R.D. of Fraser Fort George (2008)	92,264	121,515	95,706	25,809	21.2%	1,317	1,037
Skeena Queen Charlotte R.D.	20,281	17,556	14,751	2,805	16.0%	866	727
Squamish Lillooet R.D.	54,266	47,629	31,929	15,700	33.0%	878	588
Thompson Nicola Regional District (2008)	122,286	132,044	97,941	34,103	25.8%	1,080	801

2.4 Per Capita Waste Disposal

The total tonnage landfilled in the CRD was 43,917 tonnes in 2009, therefore, the residual per capita waste generation is 706 kg/person. This statistic recognizes that the wood waste received at the landfills and transfer stations is not landfilled and is instead either burned on site or ground for use as hog fuel in a waste to energy facility. Figure 2-1 provides a comparative graph to the 8 other R.Ds.

Figure 2-1 Comparison of CRD's Waste Generation Rates to other Regional Districts



2.5 Waste Composition

The CRD has not undertaken a waste composition study due to the large cost involved and the fact that the data is generally consistent across regional districts in B.C. Instead, solid waste planning decisions are being made on analysis of data collected in other programs, as described below.

The most current Canadian waste composition data is from 2002. In 2002, Canadians generated 971 kg per capita of municipal solid waste, of which 39% was from household waste (Statistics Canada, 2005). Industrial, Commercial, Construction, and Demolition Waste accounted for the rest. 95% of the total amount of waste disposed at the disposal facilities was landfilled and the remaining 5% was incinerated.

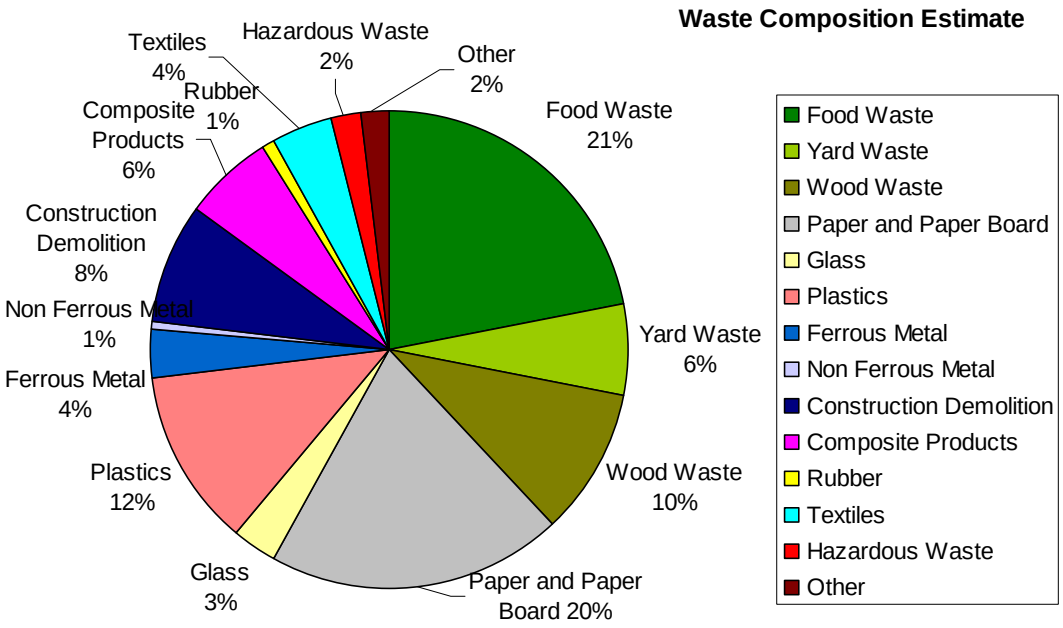
British Columbia waste generation and recycling statistics are compiled for a number of regional districts in British Columbia in Table 2-10. As can be seen in the table, the per capita waste generation rates differ considerably from region to region. This is in part due to the amount of construction / renovation activity under way, and in part due to differences regarding the components counted in the waste diversion rates. For example, Metro Vancouver counts road pavement grindings and broken concrete as a recycled material, dramatically increasing the total amount of MSW generated.

Based on the provincial trends the right most column of Table 2-10 presents SHA's best estimate of the waste composition of the solid waste stream in the Cariboo Regional District. The information is graphed as a pie chart in Figure 2-3.

Table 2-10 British Columbia Waste Composition

Primary Waste Category	Secondary Waste Category	Canada Household Waste	Castlegar	Metro Vancouver	Capital Regional District	Thompson Nicola Regional District	Kamloops	Cariboo Regional District (estimated)
		2002	1991	2007	2009	2006	2006	2009
Organics		**40.0**	**25.5**	**34.2**	**40.4**	**39.7**	**37.9**	**38.0**
	Food Waste		20.5	23.2	25.4	20.0	8.0	22.0
	Yard Waste		3.4	5.8	6.8	6.6	0.0	6.0
	Wood Waste		1.5	5.2	8.2	13.1	30.0	10.0
Paper and Paper Board		**26.0**	**43.1**	**23.1**	**17.1**	**18.1**	**13.4**	**20.0**
Glass		**3.0**	**5.2**	**2.3**	**1.7**	**3.8**	**1.4**	**3.0**
Plastics		**9.0**	**8.8**	**13.4**	**12.9**	**13.1**	**8.8**	**12.0**
Metals		**4.0**	**5.2**	**3.5**	**2.6**	**6.3**	**2.1**	**4.0**
	Ferrous Metal		4.0	1.0	1.9	5.5	1.7	3.5
	Non Ferrous Metal		1.2	2.4	0.7	0.8	0.5	0.5
Other		**18.0**	**12.2**	**23.6**	**25.3**	**19.0**	**36.3**	**23.0**
	Construction Demolition		2.9	7.5	6.3	6.6	17.1	8.0
	Composite Products		0.8	1.5	5.7	5.6	11.8	6.0
	Rubber		0.2	0.4	0.7	0.8	0.2	1.0
	Textiles		1.2	1.2	5.7	4.2	6.3	4.0
	Hazardous Waste		2.2	3.1	0.8	1.8	0.9	2.0
	Other		4.9	13.0	6.1	0.0	0.0	2.0
Total		100	100.0	100	100	100	100	100
Per Capita (Kg/Year)		971.0	401.2	1,440.9	671.0	987.5	1,200.0	871.8

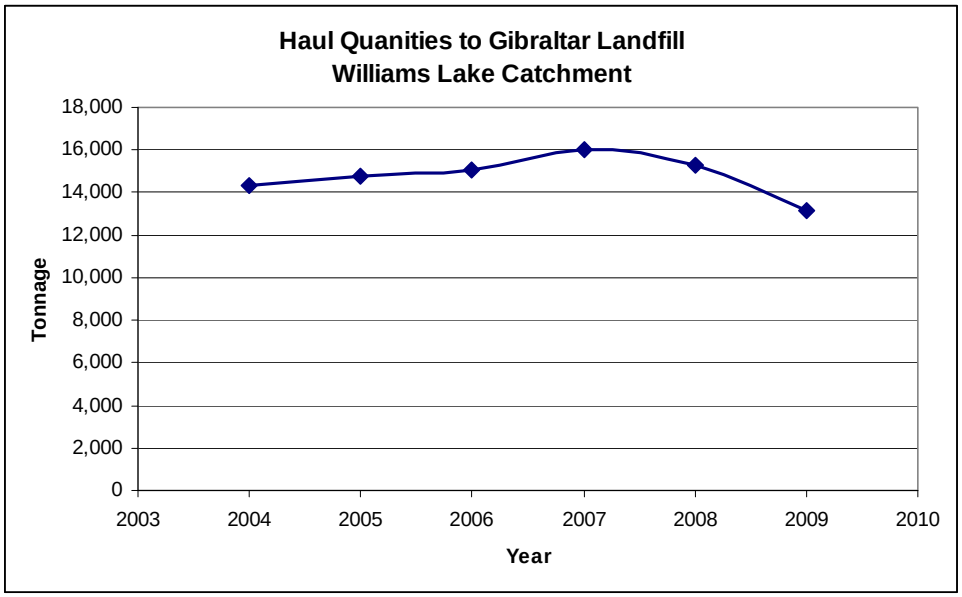
Figure 2-3 Pie Chart of Estimated CRD Waste Composition



2.6 Temporal Changes

As the CRD has not had scales at most facilities, except the Central Cariboo Transfer Station (Williams Lake) and the 100 Mile House Landfill, tracking of material quantities is not presented for the regional system as it would be an exercise in guess work. Hard data is available for the Central Cariboo that is shipped to Gibraltar. This data, collected since 2004 shows residual tonnages steadily increasing up to 2007 and then decreasing in 2008 and 2009, see Figure 2-4. The decrease in residuals is in part due to the curbside collection program implemented in Williams Lake in 2009 and in part due to the slow down in economy.

Figure 2-4 Gibraltar Landfill Haul Quantities



Landfill Experience of Sperling Hansen Associates

Last updated: Apr. 2, 2008

	Landfill	Client	Hydrogeotechnical Investigation	D & O Plan	Closure Plan	Geotechnical Review	Annual Operations Monitoring	Eng. Design & Construction	Capital Project Implementation	Stability Assessment	Environmental Monitoring	Environmental Site Assessment	Landfill Gas Management	Biosolids Assmt. for Reclamation	Other Projects
1	7-Mile Landfill	Regional District of Mount Waddington	●	●		●						●	●		
2	Alpha Landfill	Harry Utzig			●										
3	Bailey Road	District of Chilliwack	●	●				●	●						5
4	Barriere	Thompson-Nicola Regional District	●	●	●		●				●	●			3
5	Brookmere	Thompson-Nicola Regional District			●										
6	Burns Lake	Regional District of Bulkley-Nechako		●	●										
7	Campbell Mountain	Regional District of Okanagan-Similkameen		●	●			●	●		●		●	●	8
8	Carney's Landfill	Carney's Waste Systems				●									
9	Cedar Road	District of Nanaimo			●		●	●		●					4
10	Chase	Thompson-Nicola Regional District	●	●	●		●				●	●			
11	Chaumox Landfill	Fraser Valley Regional District					●								3
12	China Creek	MacMillan Bloedel			●				●	●					1
13	Clearwater	Thompson-Nicola Regional District	●	●	●		●					●			
14	Clinton	Thompson-Nicola Regional District	●	●	●										
15	Coquitlam	Greater Vancouver Regional District									●	●			
16	Creston Landfill	Regional District of Central Kootenay													
17	Delta Shake & Shingle	Delta Shake & Shingle			●						●	●			2
18	Fernie Landfill	Regional District of East Kootenay													
19	Foothills Blvd.	RD Fraser-Fort George		●									●		
20	Fort Fraser	Regional District of Bulkley-Nechako		●	●										
21	Fort St. James	Regional District of Bulkley-Nechako		●	●				●	●					1
22	Fraser Lake	Regional District of Bulkley-Nechako		●	●										
23	Gibraltar Landfill	Cariboo Regional District		●			●	●							
24	Gingolx	Kincolith Village													1
25	Gitlakdamix	Nass Valley Stakeholders Group	●								●				2
26	Granisle	Regional District of Bulkley-Nechako		●	●										
27	Hartland	Capital Regional District	●	●	●			●	●		●			●	17
28	Heffley Creek	Thompson-Nicola Regional District	●	●	●		●				●	●			
29	Hisperia	City of Vernon				●							●		
30	Hope	District of Hope		●	●			●	●	●	●				5
31	Iona Island WWTP Grit	GVRD		●	●									●	
32	Iskut	Regional District of Kitimat-Stikine		●											
33	Kamloops	City of Kamloops			●	●							●		
34	Keremeos	Regional District of Okanagan-Similkameen	●	●	●										1
35	Kitwanga	Regional District of Kitimat-Stikine			●										
36	Knockholt	Regional District of Bulkley-Nechako	●					●	●		●				1
37	Lakalzap	Nass Valley Stakeholders Group			●										1
38	Lillooet Landfill	Squamish-Lillooet Regional District	●	●											
39	Logan Lake	Thompson-Nicola Regional District		●	●										
40	Lower Nicola	Thompson-Nicola Regional District	●	●	●		●					●			1
41	Lytton	Thompson-Nicola Regional District		●	●										
42	Manson Creek	Regional District of Bulkley-Nechako		●	●										
43	Meadowland Peat Landfill	Meadowland Peat		●											
44	Mission Flats	City of Kamloops		●			●								
45	New Aiyansh Landfill	Nisga'a Lisims Govt.		●	●										1
46	Norampac Paper Mill Landfill	Norampac Paper Division, Burnaby					●				●				
47	Old Smithers	Town of Smithers									●	●			
48	Port Clements	Skeena-Queen Charlottes Regional District	●	●			●					●			
49	Premier Street	Dist. of North Vancouver	●		●	●		●	●	●				●	7
50	Prince Rupert	City of Prince Rupert		●									●		
51	Princeton	Town of Princeton		●							●		●		
52	Ravelstoke Landfill	Columbia Shuswap Regional District		●											3
53	Rosswood	Regional District of Kitimat-Stikine		●											1
54	Salmon Arm	Columbia Shuswap Regional District		●											
55	Savona	Thompson-Nicola Regional District			●									●	
56	Sicamous Landfill	Columbia Shuswap Regional District													1
57	Skimikin	Columbia-Shuswap R.D.			●										3
58	Smithers / Telkwa	Regional District of Bulkley-Nechako		●	●							●			
59	Squamish Landfill	District of Squamish		●	●									●	
60	Summerland	Disrict of Summerland		●											1
61	Surrey	City of Surrey													1
62	Terrace	City of Terrace			●						●		●		
63	Thornhill	Regional District of Kitimat-Stikine	●								●				3
64	Vancouver	City of Vancouver	●	●	●	●	●						●		5
65	Vanderhoof	Regional District of Bulkley-Nechako		●	●										
66	Various Small Sites	Regional District of Bulkley-Nechako			13										
67	Wantage Road	City of Prince Rupert			●	●					●				
68	West Vancouver	Dist. Of West Vancouver									●				1
69	Westwold	Thompson-Nicola Regional District		●	●										
70	Whistler	Regional Municipality of Whistler			●			●	●						2
71	Windermere	Regional District of East Kootenay		●	●										
		Projects in Total	**17**	**41**	**41**	**8**	**12**	**9**	**9**	**5**	**17**	**13**	**9**	**10**	**83**

Table 2-8. Solid Waste Generation by Facility

Site Name	Electoral Area	Service Population (2006)	Garbage Tonnes	Recycle/ Wood Waste Tonnes	Total Tonnes	Per Capita Total Solid Waste
Cariboo	**RD**	**62,190**	**43,917**	**10,303**	**54,220**	**0.872**
NORTH CARIBOO CATCHMENT						
Quesnel Landfill	Quesnel	19,801	10,859		15,168	0.625
Quesnel Landfill Recycle				4,309		
Nazko Landfill	Cariboo I	392	245	0	245	0.625
Alexandria Transfer Station	Cariboo A	804	503	0	503	0.625
Baker Creek Transfer Station	Cariboo B	762	476	57	533	0.700
Cottonwood Transfer Station	Cariboo C	153	96	0	96	0.625
Wells Transfer Station	Wells	287	179	21	201	0.700
Titetown Transfer Station	Cariboo I	224	140	0	140	0.625
Entire Catchment		**22,423**	**12,499**	**4,388**	**16,887**	**0.753**
Quesnel Landfill Catchment		**22,031**	**12,253**	**79**	**16,641**	**0.755**
Quesnel Urban System		**19,801**	**10,859**	**0**	**15,168**	**0.766**
North Rural Transfer System		**2,230**	**1,394**	**79**	**1,473**	**0.660**
North Rural Landfill System		**392**	**245**	**0**	**245**	**0.625**
Check Sum		**22,423**	**12,499**	**79**	**16,887**	
					16,887	
CENTRAL CARIBOO CATCHMENT						
Gibraltar Landfill	Cariboo D	23,914	13,115	0	13,115	0.548
Likely Landfill	Cariboo F	528	290	35	325	0.616
Big Lake Landfill	Cariboo F	554	304	37	341	0.616
Williams Lake DLC Landfill	Williams Lake		2,492	0	2,492	
Williams Lake TS from Williams Lake	Williams Lake	14,730	8,079	1,577	9,656	1.001
Williams Lake Wood Waste				683	683	
Williams Lake Concrete			1,910		1,910	
McLeese Lake Transfer Station	Cariboo D	998	547	66	613	0.614
Wildwood Transfer Station	Cariboo D	2,021	1,109	185	1,294	0.640
Frost Creek Transfer Station	Cariboo E	1,908	1,046	252	1,299	0.681
Chimney Lake Transfer Station	Cariboo E	248	136	16	152	0.614
150 Mile Transfer Station	Cariboo F	1,164	638	181	819	0.704
Horsefly Transfer Station	Cariboo F	595	326	39	366	0.614
Alexis Creek Transfer Station	Cariboo K	1,831	1,004	0	1,004	0.548
Riske Creek Transfer Station	Cariboo K	419	230	0	230	0.548
Entire Catchment		**24,995**	**18,111**	**3,071**	**21,182**	**0.847**
Williams Lake Transfer Station		**23,914**	**15,025**	**2,999**	**18,024**	**0.754**
Haul to Gibraltar Landfill		**23,914**	**13,115**	**0**	**13,115**	**0.548**
Williams Lake Urban System		**14,730**	**12,480**	**2,260**	**14,740**	**1.001**
Central Rural Transfer System		**9,183**	**5,036**	**740**	**5,776**	**0.629**
Central Rural Landfill System		**1,081**	**595**	**71**	**666**	**0.616**
Central Check Sum			**18,111**	**3,071**	**21,182**	
SOUTH CARIBOO CATCHMENT						
100 Hundred Mile House Landfill	100 Mile House	4,387	9,253	0	9,253	
100 Mile House DLC Waste			672	0	672	
100 Mile House Wood Waste Burned				568	568	
100 Mile House Concrete Landfilled			1,237	0	1,237	
100 Mile House Metals Recycled				77	77	
100 Mile House Gold Trail Recycling				833	833	
Mahood Lake	Cariboo H	84	52	0	52	0.616
Inter-Lakes	Cariboo L	1440	887	1,081	1,968	1.366
Watch Lake	Cariboo L	445	274	198	472	1.061
100 Mile House Total Urban			3,595		3,595	
Eagle Creek Transfer Station	Cariboo H	633	519	0	519	0.820
Forest Grove Transfer Station	Cariboo H	1,382	1,133	62	1,195	0.865
Lac La Hache Transfer Station	Cariboo G	3,715	3,045	0	3,045	0.820
Lone Butte Transfer Station	Cariboo L	1,173	962	0	962	0.820
Entire Catchment		**13,259**	**12,375**	**2,818**	**15,193**	**1.146**
100 Mile House LF Catchment		**11,290**	**11,162**	**1,540**	**12,702**	**1.125**
South Rural Transfer Station		**6,903**	**5,658**	**62**	**5,720**	**0.829**
100 Mile House Urban System		**4,387**	**4,832**	**1,478**	**6,310**	**1.438**
South Rural Landfill System		**1,969**	**1,213**	**1,278**	**2,491**	**1.265**
South Check Sum		**13,259**	**11,703**	**2,818**	**15,193**	
RURAL LANDFILLS			0	0	0	0.616
West Chilcotin Landfill	Cariboo J	348	214	26	240	0.690
Kleana Kleene Landfill	Cariboo J	140	86		86	0.616
Tatla Lake Landfill	Cariboo J	146	90		90	0.616
Cochin Lake Landfill	Cariboo J	90	56		56	0.616
Puntzi Lake Landfill	Cariboo J	552	340		340	0.616
Nemiah Valley Landfill	Cariboo J	236	145		145	0.616
		1513	932	26	958	0.633

3. SYSTEM COSTS

This Chapter outlines the Cariboo Regional District (CRD) costs associated with the solid waste management system. The costs were presented to the CRD Advisory Committee on July 13, 2010. Since then, the costs have been updated to incorporate new information and to adjust costs as we became more familiar with the intricacies of the CRD system and budget, the cost table is presented in Table 3-1 and the detailed hauling and budget breakdown are available in the Appendix.

3.1 Total System Cost

The 2009 budget indicates that the total system cost for the CRD is $6.3 million. Typical annual expenditures for the various cost categories tracked in this study were $5.57 million. This represents the average annual budget. The 2009 budget was higher than long term average because capital costs associated with the expansion and progressive closure construction at the Gibraltar Landfill. In this analysis, the average annual budget was used for comparison.

3.2 Cost of Rural Transfer Stations

The cost of maintaining and hauling waste from the rural transfer stations is $1,191,000, which is roughly one fifth of the total system cost. This cost does not include the operations and hauling of the Williams Lake Transfer Station. The operations cost of the rural transfer stations is $397,000 and the hauling cost from those sites to the landfills (or Williams Lake TS) is $794,000, which also includes the winter road maintenance for the CRD. The costs of rural transfer station operations are very high on a per tonne basis. Including transfer station and haul, the costs often exceed $100/tonne and are estimated to be $187/tonne at Riske Creek. $264/tonne at Cottonwood and $517/tonne at Titetown.

3.3 Cost of Central Transfer Station and Hauling Waste to Gibraltar

The total cost of the Central Transfer Station contract was $573,314 in 2009. The cost of hauling waste from the Williams Lake Transfer Station to the Gibraltar Landfill is roughly $341,000, and was approximated based on typical haul rates and haul hours. The cost of transfer station operations was estimated at $232,314. On a per tonne basis, the cost of transfer station operations and hauling to Gibraltar was $39/tonne for residents of Williams Lake and $60/tonne when the additional transfer station and haul costs from the satellite transfer stations were included.

3.4 Cost of Municipal Waste Collection

Collection of municipal waste in the four member municipalities in the CRD is the responsibility of those municipalities. Thus it is not tracked by the CRD. The current collections contract for weekly garbage pick up and weekly recycling system for about 4,400 homes in Williams Lake is $8.80/residence per month. This is consistent with industry norms. It costs about $1/residence per week to service a home in a typical urban setting. Collection costs were not available for Quesnel, 100 Mile House or Wells, but are likely to be in the same order of magnitude.

3.5 Cost of Municipal Curbside Recyclable Collection

The cost of curbside recycling collection is not tracked separately, as it is part of the Central Cariboo Disposal Contract. Typical costs of $4 to $5/month per residence must be expected for a weekly service. With about 7,400 people serviced in Williams Lake and Quesnel, the monthly cost of weekly collection is expected to be $65,000, or $781,000 per year. If a bi-weekly collection service of both

garbage and recyclables is implemented instead, costs could be significantly reduced, as has been proven in the District of Squamish.

3.6 Cost of Regional Landfills

The cost of the three regional landfills (Quesnel, Gibraltar and 100-Mile House) is $1,845,000, which is approximately one-third of the cost of the total system. Gibraltar Landfill cost $814,529, Quesnel's costs were estimated at $620,620 and 100 Mile costs were $410,325. On a per tonne (MSW landfilled) basis, Gibraltar Landfill cost $62/tonne, Quesnel Landfill was estimated to cost $51/tonne and 100 Mile Landfill cost $37/tonne.

3.7 Cost of Small Rural Landfills

The total cost for the servicing and maintenance of the small rural landfills in the CRD for 2009 was $854,000, which is only about 15% of the total cost of the system. On average, the rural landfills cost $227/tonne, which appears costly; however, when one factors in that there are no associated costs of transfer station operation, hauling and disposal at a regional landfill, the rural landfills are the lowest cost option. It should also be noted that without scales at these sites the actual tonnage received may be higher than estimated, especially for the sites close to adjacent regional districts.

3.8 Wood Waste Management

Managing wood waste in the CRD requires continuous management and for 2009, the cost was $496,000. This cost is the total for the transfer stations, rural and regional landfills. The wood waste is either burned on site or ground up for use in a co-gen facility.

Table 3-1. Detailed Breakdown of Solid Waste Management Costs by Facility

Site Name	Service Population	Per Capita Residential MSW Tonnes/yr	Annual Tonnage MSW Tonnes/yr	Annual Tonnage Recycled Tonnes/yr	Annual Wood Waste Tonnes/yr	Annual Total MSW Tonnes/yr	TRANSFER STATION COSTING: Transfer Station Operating Cost Total 2009 $/Yr	Transfer Station Capital Cost $/yr	Transfer Station Haul Cost Total 2009 $/yr	Total Transfer Station Cost 2009 $/yr	Transfer Station Cost Per Tonne $/tonne/yr	WOOD WASTE COSTING: Wood Waste Cost 2009 $/yr	Wood Waste Cost Per Tonne $/tonne/yr	LANDFILL COSTING: Landfill Operating Cost $/yr	Landfill Capital Cost $/Yr	Landfill Reclamation Costs	Total Landfill Cost $/yr	Landfill Cost Per Tonne $/tonne/yr	Total System Cost $/yr	Subregional System Costs Per Tonne $/tonne/yr
NORTH CARIBOO CATCHMENT																				
Quesnel Landfill	19,801	0.77	10,859	4,309	0	15,168								$497,463	$98,157	$25,000	620,620	$57	$620,620	
Nazko Landfill	392	0.63	245	0		245								$27,336	$15,000	$10,000	$52,336	$213	$52,336	
Alexandria Transfer Station	804	0.66	503	0		503	$4,819	$7,000	$15,345	$27,164	$54								$27,164	
Baker Creek Transfer Station	762	0.66	476	0	57	533	$33,543	$7,000	$51,920	$92,463	$194	$9,000	$158						$101,463	
Cottonwood Transfer Station	153	0.66	96	0	0	96	$4,131	$7,000	$14,157	$25,288	$264								$25,288	
Wells Transfer Station	287	0.66	179	0	21	201	$12,888	$7,000	$16,418	$36,306	$203	$12,500	$581						$48,806	
Titetown Transfer Station	224	0.66	140	0		140	$55,200	$7,000	$10,200	$72,400	$517								$72,400	
	22,423		**12,499**	**4,309**	**79**	**16,887**	**$110,581**	**$35,000**	**$108,040**	**$253,621**	$20	**$21,500**		**$524,799**	**$113,157**	**$35,000**	**$672,956**	$54	**$948,077**	$74
CENTRAL CARIBOO CATCHMENT																		#DIV/0!		
Gibraltar Landfill	23,914	0.75	13,115	0		13,115								$429,686	$214,843	$170,000	$814,529	$62	$814,529	
Likely Landfill	528	0.62	290	0	35	325						$18,150	$521	$34,630	$15,000	$10,000	$59,630	$205	$77,780	
Big Lake Landfill	554	0.62	304	0	37	341						$8,925	$244	$57,277	$15,000	$10,000	$82,277	$270	$91,202	
Williams Lake aka Central Cariboo Transfer Station	14,730	0.63	12,480	1,578	683	14,741	$232,314	$20,000	$341,000	$593,314	$39	$100,000	$146						$693,314	
McLeese Lake Transfer Station	998	0.63	547		66	613	$11,467	$7,000	$11,901	$30,368	$55	$9,375	$143						$39,743	
Wildwood Transfer Station	2,021	0.63	1,109		185	1,294	$27,134	$7,000	$77,446	$111,580	$101	$36,200	$195						$147,780	
Frost Creek Transfer Station	1,908	0.63	1,046		252	1,299	$20,270	$7,000	$74,552	$101,822	$97	$20,850	$83						$122,672	
Chimney Lake Transfer Station	248	0.63	136		16	152	$3,972	$7,000	$11,610	$22,582	$166	$8,950	$548						$31,532	
150 Mile Transfer Station	1,164	0.63	638		181	819	$18,851	$7,000	$85,892	$111,743	$175	$27,300	$151						$139,043	
Horsefly Transfer Station	595	0.63	326		39	366	$11,564	$7,000	$32,604	$51,168	$157	$13,900	$355						$65,068	
Alexis Creek Transfer Station	1,831	0.63	1,004		0	1,004	$3,941	$7,000	$11,059	$22,000	$22	$0							$22,000	
Riske Creek Transfer Station	419	0.63	230		0	230	$12,035	$7,000	$23,837	$42,872	$187	$0							$42,872	
Total Williams Lake Transfer Station	23,914	0.63	17,517		1,494	19,010	$341,548				$19								0	
	24,995		**18,111**	**1,578**	**1,494**	**21,183**	**$341,548**	**$76,000**	**$669,901**	**$1,087,449**	$60	**$243,650**		**$521,593**	**$244,843**	**$190,000**	**$956,436**	$53	**$2,287,535**	$113
SOUTH CARIBOO CATCHMENT																				
100 Hundred Mile House Landfill	4,387	1.13	5,504	910	568	6,982						$43,052		$309,825	$75,000	$25,500	$410,325	$75	$453,377	
Mahood Lake Landfill	84	1.27	52	0		52								$13,200	$15,000	$10,000	$38,200	$736	$38,200	
Inter-Lakes aka Sheriden Landfill	1,440	1.27	887	0	1,081	1,968						$113,996	$105	$65,816	$15,000	$10,000	$90,816	$102	$204,812	
Watch Lake Landfill	445	1.27	274	0	198	472						$26,000	$132	$32,205	$15,000	$10,000	$57,205	$209	$83,205	
Eagle Creek Transfer Station	633	0.83	519	0		519	$2,868	$7,000	$6,339	$16,207	$31								$16,207	
Forest Grove Transfer Station	1,382	0.83	1,133	0	62	1,195	$21,693	$7,000	$53,392	$82,085	$72	$38,000	$611						$120,085	
Lac La Hache Transfer Station	3,715	0.83	3,045	0		3,045	$24,060	$7,000	$157,950	$189,010	$62								$189,010	
Lone Butte Transfer Station	1,173	0.83	962	0		962	$9,800	$7,000	$92,943	$109,743	$114								109743	
	13,259		**12,375**	**910**	**1,908**	**15,193**	**$58,421**	**$28,000**	**$310,624**	**$397,045**	$32	**$221,048**		**$421,046**	**$120,000**	**$55,500**	**$596,546**	$48	**$1,214,639**	$80
RURAL LANDFILLS																				
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	214	0	26	240						$9,425	$367	$42,176	$15,000	$10,000	$67,176	$314	$76,601	
Kleana Kleene Landfill	140	0.62	86	0		86								$14,380	$15,000	$10,000	$39,380	$456	$39,380	
Tatla Lake Landfill	146	0.62	90	0		90								$15,160	$15,000	$10,000	$40,160	$446	$40,160	
Cochin Lake Landfill	90	0.62	56	0		56								$16,095	$15,000	$10,000	$41,095	$737	$41,095	
Puntzi Lake Landfill	552	0.62	340	0		340								$28,220	$15,000	$10,000	$53,220	$156	$53,220	
Nemiah Valley Landfil	236	0.62	145	0		145								$30,939	$15,000	$10,000	$55,939	$385	$55,939	
	1,513		**932**	**0**	**26**	**958**	**$0**	**$0**	**$0**	**$0**	**$0**	**$9,425**		**$146,970**	**$90,000**	**$60,000**	**$296,970**	$319	**$306,395**	$319
CRD DEBT PAYMENT															**$178,000**		**$178,000**		**$178,000**	
CRD MANAGEMENT COST															**$309,321**		**$309,321**		**$309,321**	
CRD RECYCLING PROGRAM															**$232,724**		**$232,724**		**$232,724**	
CRD WINTER ROAD MAINTENANCE									**$46,092**	**$46,092**					**$0**		**$0**		**$46,092**	
Totals Entire System	**62,190**		**43,917**	**6,797**	**3,507**	**54,221**	**$510,550**	**$139,000**	**$1,134,657**	**$1,784,207**	**$33**	**$495,623**	**$141**	**$1,614,408**	**$1,288,045**	**$340,500**	**$3,242,953**	**$74**	**$5,522,783**	**$102**
Total Urban Centre Transfer Station and Landfill	**38,918**		**28,844**	**6,797**	**1,251**	**36,892**	**$232,314**	**$20,000**	**$341,000**	**$593,314**	**$23**	**$143,052**	**$114**	**$1,216,177**	**$388,000**	**$220,500**	**$1,845,474**	**$64**	**$2,581,840**	**$70**
Total Small Landfills	**4,956**		**2,985**	**0**	**1,375**	**4,360**	**$0**	**$0**	**$0**	**$0**	**$0**	**$176,496**	**$128**	**$377,434**	**$180,000**	**$120,000**	**$677,434**	**$227**	**$853,930**	**$196**
Totals Satelite Transfer Stations	**18,316**		**12,088**	**0**	**881**	**12,969**	**$278,236**	**$119,000**	**$793,657**	**$1,190,893**	**$92**	**$176,075**	**$200**	**$165,007**	**$720,045**	**$0**	**$720,045**	**n/a**	**$2,087,013**	**$161**

4. BENCHMARKING COMPARISON

To assess how the CRD solid waste program compares to other typical rural / urban regional districts in B.C., SHA undertook a benchmarking survey. This involved analyzing cost and performance data from seven regional districts and municipalities. These included:

- Skeena Queen Charlotte Regional District – Haida Gwaii
- Columbia Shuswap Regional District
- Thompson Nicola Regional District
- District of Squamish
- City of Prince Rupert
- Peace River Regional District
- Squamish Lillooet Regional District

Section 4.1 discusses some of the unique attributes utilized in each of the above regional districts to manage solid waste.

The benchmarking analysis presented in Section 4.2 identified the following metrics for each of the above regional districts/municipalities:

- Service Population
- Number of Homes
- Total MSW Tonnage
- Total Tonnage Hauled
- Total Tonnage Landfilled
- Total Tonnage Recycled
- Per Capita MSW Generation Rate
- Per Capita Residual Generation Rate
- Per Capita Recycling Rate
- Total System Cost per Tonne
- Total System Cost per Person
- Landfill Cost Per Tonne Landfilled
- Transfer Cost Per Tonne Hauled
- Recycling Cost Per Tonne Recycled
- Management Cost Per Tonne MSW

The cost information was generally obtained from the five-year budget, using 2009 actual costs whenever possible. The budgets were obtained digitally from the participating regional districts and then line items were re-organized into the following categories:

- Management
- Transfer Station and Hauling
- Landfill
- Recycling

Unit costs were then obtained for each benchmarking index by dividing the annual cost for that service by the total tonnes processed through the system, be it landfill, recycling system, transfer station, etc. Per capita costs were obtained by dividing by the current service population, usually obtained from the 2006 Census.

4.1 Overview of Regional Districts

Peace River Regional District: The PRRD operates a solid waste management system that is the most comparable to the CRD in both population size and service area, so it provides and excellent comparative benchmark. The PRRD system is based around three natural control landfills sites at Fort St. John, Dawson Creek (Bessborough) and Chetwynd. 39 transfer stations service the more rural areas of the PRRD. Most of the transfer stations are comprised of multiple 6 yd. Haul-All bins, although a few of the transfer stations have Transtors.

Recycling services are provided by a primary contractor that has partnered with local Encorp depots in the large service centers as well as limited recycle drop off services in "chicken cages" at some of the rural transfer stations (see Photo 4-1). The present recycle rate in the PRRD is 5.49%.

Photo 4-1. Chicken Cage Structures for Recyclables in PRRD

The largest communities in the PRRD are starting to consider automated collection of both MSW and recyclables, but this service remains to be implemented. Based on SHA's recently completed efficiency review, the PRRD is upgrading many of their transfer stations to attended facilities that utilize large compactors for consolidating loads. Bins for oversize refuse, scrap metal and wood are also being provided.

Skeena Queen Charlotte Regional District – Haida Gwaii: This very small system services the entire Queen Charlotte Islands, including a number of First Nations communities. The system includes five lock block transfer stations with one or two 50 Yd. roll-off bins each, curbside and bin collection in some of the communities through private haulers who dump into the transfer stations and a depot based recycling program that uses a system of containers similar to the "chicken cages" used in the PRRD.

The landfill is a sand based natural control site with no environmental controls. An excavator is used to compact the garbage. Recyclables are baled in two recycling depots (Islands Landfill and Queen Charlotte City) and shipped off island in two axle 40' trailers to Prince Rupert. At Prince Rupert the loads are sorted and shipped in bulk shipments to Vancouver by truck.

Because of the small tonnage and huge shipping costs, the Haida Gwaii recycling costs were determined to be the highest in the province at $1,343/tonne. In 2009 the diversion rate was 2.6%. Since then, the SQCRD has implemented a drive to make the Islands Solid Waste System more efficient. Costs in 2010 have been lowered significantly, but actuals are not available for this study.

Columbia Shuswap Regional District: The CSRD operates a number of regional landfills at Salmon Arm, Revelstoke, Golden and Sicamous. These receive waste from the host communities as well as a number of satellite transfer stations (see Photo 4-2). The satellite transfer stations are generally set up with 50 yd roll-off bins. Most also provide the ability to recycle. Recyclables were historically stored in containers similar to the PRRD's "chicken cages". Recently, the CSRD switched to using compartmentalized roll-off bins to collect recyclables at the transfer stations to reduce labour.

Photo 4-2. Roll-Off Bin Transfer Site at Skimikin

The landfills are typically natural control sites; however, the largest landfill in Salmon Arm is undergoing a $3.5 million environmental upgrade this summer to make it compliant with landfill criteria. Landfills generally operate with steel wheeled compactors and all sites have recently

implemented the Revelstoke Iron Grizzly alternate daily cover system to dramatically reduce the amount of dirt being consumed for operational cover.

Recycling services are being expanded in the CSRD with a focus on education, reduction initiatives and back yard composting. A curb side recycling program is being launched in 2011. Wood waste is being chipped and diverted to a local saw-mill for combustion in their co-gen plant. The diversion rate is currently 16.65%.

Thompson Nicola Regional District: The TNRD currently operates five landfills at Heffley Creek, Lower Nicola, Chase, Barriere and Clearwater. The City of Kamloops operates a large landfill at Mission Flats and a smaller site at Barnhartvale. Wastech's Cache Creek landfill also receives waste from several of TNRD's transfer stations surrounding Cache Creek. The TNRD operates 32 roll-off transfer stations, most of which are presently unmanned. They are moving toward reducing the number of transfer stations and having attended sites.

In most municipalities within the TNRD curbside collection of solid waste is provided. The City of Kamloops provides an automated collection system with roll-out totes.

The City of Kamloops operates a large yard waste composting facility that also composts biosolids. Recycling programs in the TNRD are based on the depot system. No curbside services are currently provided. The diversion rate is currently 25.8%.

District of Squamish: The District of Squamish operates a very well integrated solid waste management system controlled by Carney's Waste Systems. Residuals are landfilled at Squamish's natural control landfill. This facility will be undergoing a $6 million upgrade to a compliant engineered landfill site in 2011.

An automated curbside collection program has been implemented recently where garbage is collected one week and comingled single stream recyclables are collected during the second week. Two roll-out totes are provided to each residence as part of this system.

Yard waste organics are composted in windrows at the landfill. Commercial food waste and biosolids are diverted to an in-vessel composting facility operated by the Resort Municipality of Whistler. Wood waste is processed and sorted. Clean wood waste is diverted for cogen at Howe Sound Pulp and Paper.

With the integrated system, Carney's municipal waste diversion programs for the District of Squamish are achieving a diversion rate of 32%, excluding stewardship commodities. With these commodities included, Squamish is realizing a diversion rate of 35%. In addition, Tryack Resources is diverting large volumes of wood waste for co-gen at Howe Sound Pulp and Paper. Private scrap metal dealers are diverting scrap outside Carney's system and asphalt and concrete is being recycled by paving contractors. With these contributions, the District of Squamish recycle rate is about 65%.

Photo 4-3 Recycling Milk Jugs at Carney's Squamish Facility (before single stream)

City of Prince Rupert: The City of Prince Rupert, in partnership with the Skeena Queen Charlotte Regional District, operates a very efficient solid waste system. The City operates a natural control landfill about 10 km from town. The City's garbage trucks haul directly to the landfill.

Photo 4-4. Prince Rupert's Materials Recover Facility

The SQCRD operates a major Materials Recovery Facility in Prince Rupert that also serves as the local Stewardship hub for the full range of materials, including beverage containers, electronic waste, scrap metal and household chemicals. This approach provides the residents of Prince Rupert with a one-stop recycling solution that serves as an excellent model. The recycling rate in Prince Rupert is 19%.

Squamish Lillooet Regional District: The Squamish Lillooet Regional District administers solid waste programs for all communities in the SLRD except Squamish and the Resort Municipality of Whistler that are operated directly by the municipalities. A number of transfer stations are operated throughout the SLRD at Pemberton, Anderson Lake, Devine, Gold Bridge and Darcy. Waste from facilities in the western SLRD is shipped to the Whistler transfer station. Waste from the east is shipped to the Lillooet Transfer Station. A recycling depot is operated at the Lillooet Landfill.

4.2 Results of Benchmarking Analysis

The results of the benchmarking analysis are tabulated in Table 4-1. The following paragraphs discuss each of the 18 comparative parameters.

Population: The Regional Districts / Populations considered ranged in size from 15,881 people in the City of Prince Rupert to 122,286 people in the Thompson Nicola Regional District. The CRD has a Census population of 62,190

Number of Homes: ranged from 5,948 to 122,286. The CRD has 25,218 homes. In the CRD the average number of residents per home is 2.47. The number of residents ranges from 2.05 in the CSRD to 2.99 in the SQCRD.

Total MSW Tonnage: The total tonnes of MSW produced, including residuals and recyclables ranged from 5,234 in Haida Gwaii to 132,044 tonnes in the TNRD. The CRD produced 54,221 tonnes of waste in 2009.

Total Tonnes Hauled: This statistic tracks the total tonnage processed through transfer stations. Zero waste was processed through transfer in Prince Rupert. 12,518 tonnes of MSW was transferred in the TNRD. In the CRD 24,569 tonnes of MSW were transferred in 2009, making it the regional district that transfers by far the largest volume of waste. This is because all of the waste from Williams Lake is transferred to Gibraltar Landfill.

Total Tonnage Landfilled: The total tonnes of landfilled waste ranged from 5,098 in Haida Gwaii to 97,941 tonnes in the TNRD. In the CRD 43,917 tonnes of MSW were landfilled in 2009.

Total Tonnage Recycled: The tonnages recycled ranged from 136 tonnes in Haida Gwaii to 34,103 tonnes in the TNRD. Including wood waste, 10,304 tonnes were recycled in the CRD.

Per Capita MSW Generation Rate: The per capita waste generation rate ranges from a low of 0.69 tonnes/person in the Columbia Shuswap Regional District to a high of 1.55 tonnes per person in the

District of Squamish. The amount of solid waste generated appears to be a function of construction activity and proximity to commerce (e.g. PRRD and District of Squamish continued to experience significant building activity in 2009), the amount of waste reused or otherwise recycled at home (burned paper, back yard compost, etc.) and proximity large scale box stores. For example, Squamish was experiencing a huge boom in construction in 2009 leading up to the Olympic games and completion of the Sea-to-Sky Highway. The CRD has a per capita generation rate of 0.87 tonnes/person/year, which is second lowest of the eight jurisdictions surveyed.

Per Capita Residual Generation Rate: This metric measures the amount of garbage disposed of in landfill or incinerator. In SHA's opinion, it is the best metric of how wasteful a society is. The per capita residual generation rate ranges from 0.58 tonnes/person/year in the Columbia Shuswap to 1.36 tonnes/person per year in the Peace River R.D. The CRD is currently the fourth least wasteful jurisdiction of eight surveyed with a residual generation rate of 0.71 tonnes/person/year, see Figure 4-1.

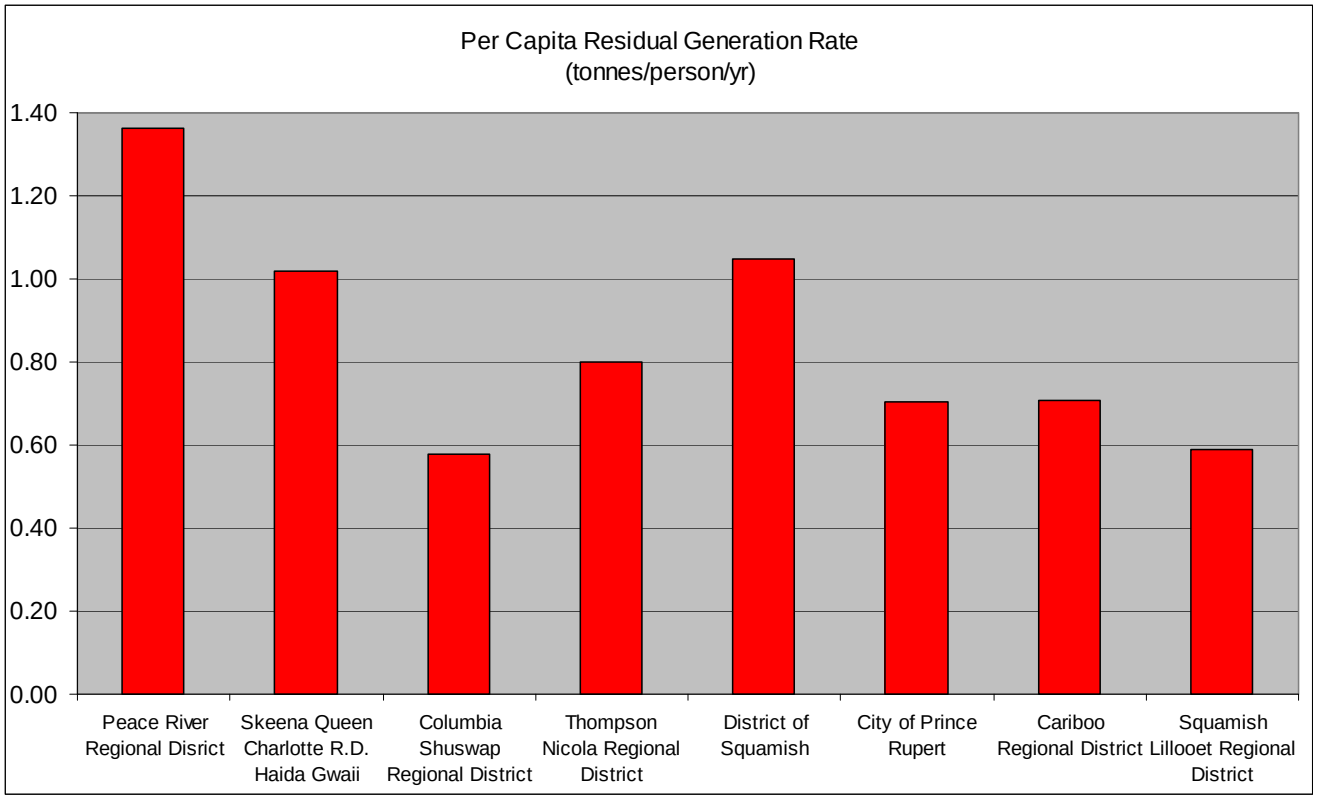


Figure 4-1 Per Capita Residual Generation Rates in B.C.

Per Capita Recycling Rate: The recycling rate ranged from 0.03 tonnes/person/year in Haida Gwaii to 0.50 tonnes/person per year in the District of Squamish. The CRD recycling rate is 0.17 tonnes/person/year, fourth highest of eight jurisdictions considered, see Figure 4-2. As one would expect, the regional districts with very low waste generation rates also had low per capita recycling rates. This shows that the metric of waste diversion is totally misleading and totally dependent on the

amount of solid waste generated. A much better metric to use in evaluating environmental sustainability is per capita residuals generated (i.e. the amount of garbage not recycled).

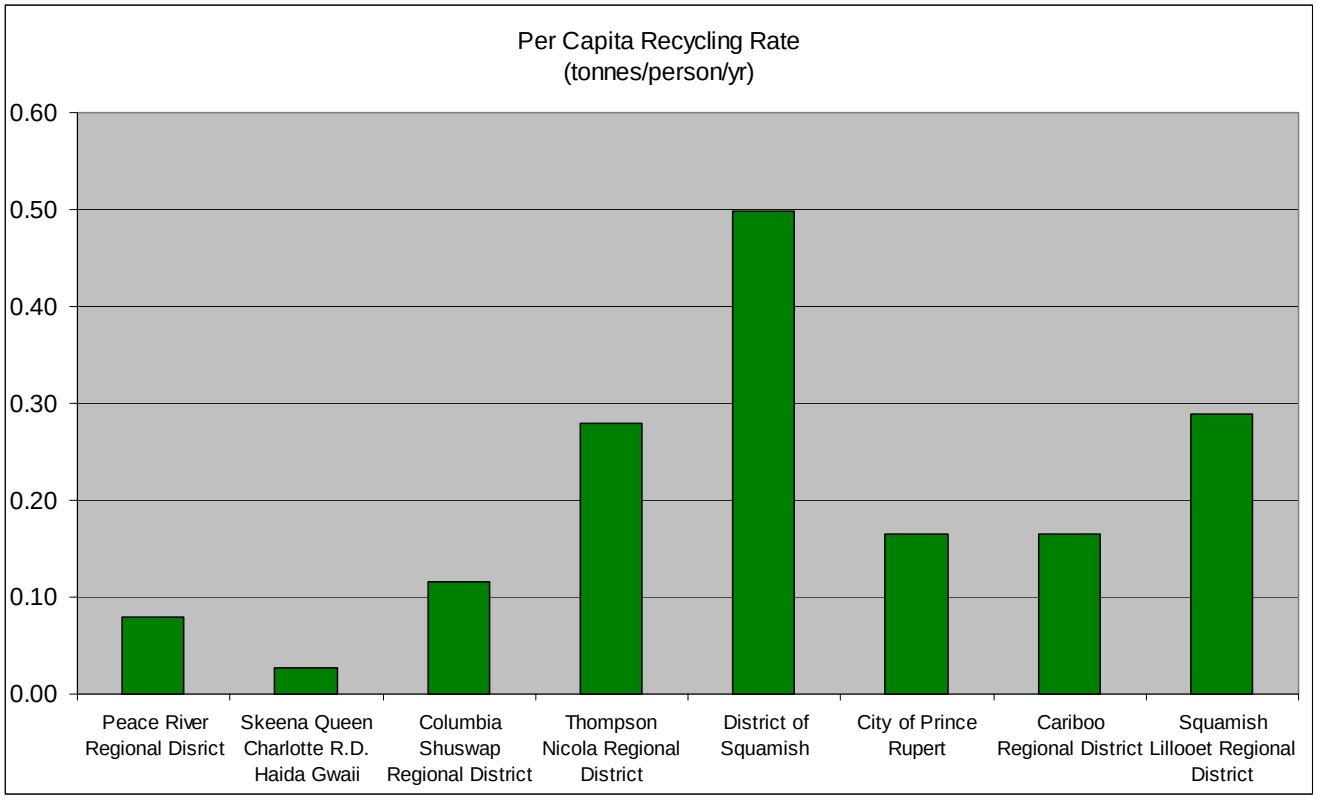


Figure 4-2 Per Capita Recycling Rates in B.C.

Percent of Waste Diverted: The percent of waste diverted from the MSW waste stream ranges from a low of 2.61% for Haida Gwaii to 32.25% for the District of Squamish. The CRD has a relatively high waste diversion rate of 19%, which includes wood waste. Although the District of Squamish does the best job of diverting from the waste stream, it is still the second worst waste generator in terms of solid waste residuals produced after recycling.

Total System Cost: In itself, total system cost is not a useful metric as it is population dependent. It does emphasize the fact that management of solid waste is a very costly service, costing most regional districts millions of dollars each year.

Total System Cost Per Tonne: This system cost measures the overall cost of the waste management system including transfer station operation, hauling, recycling and landfill. System costs range from a low $53.38 for the TNRD to $157.05/tonne for Haida Gwaii. System costs are strongly affected by economies of scale. For example, the TNRD which is the most populous regional district surveyed experiences the lowest system costs whereas Haida Gwaii, the least populous experiences the highest costs. Also a factor is the haul distance that waste has to be hauled. Regional districts with large travel distances between transfer stations and landfills and large haul distances for recyclables to market experience higher system costs. The CRD total system cost per tonne is $102.70. This is the fifth highest unit cost in the study area, i.e. in the middle of the pack.

Total System Cost per Person: From a tax payers perspective, the total system cost per person is undoubtedly the most important metric because it measures how much money a household has to pay for solid waste disposal each year, either through taxation, tipping fees or both. The per person costs range from a low of $41.81 per person for Haida Gwaii to $143.86 for the PRRD. Thus, the CRD per person cost is $89.54.

Landfill Cost per Tonne Landfilled: The per tonne cost to operate the landfill facility ranges from a low of $28.64 in the District of Squamish to $108.16 in the Squamish Lillooet R.D. (for Lillooet Landfill). The CRD cost at $82.27 per tonne is the third highest of eight surveyed. The cost of landfill operations is primarily a function of whether the facility is natural control or engineered, and in part a function of economy of scale. Because the CRD operates relatively small landfills and because Gibraltar is one of the few fully compliant engineered landfills in B.C., landfill costs in the CRD are relatively high.

Transfer Cost per Tonne Hauled: This metric measures the cost of the transfer station and hauling systems. The costs range from $57.52/tonne in the Cariboo to $234.46/tonne in the PRRD. The CRD's transfer station and haulage system cost is the lowest, in part because haul distances from the transfer stations are short and the bulk haul to Gibraltar is conducted in fairly efficient walking floor trailers.

Recycling Cost per Tonne Recycled: This metric measures the unit expenditures on recycling programs. The costs range from a low of $21.96/tonne in the Cariboo R.D. to $1,343/tonne in Haida Gwaii. One of the biggest cost factors is the distance and shipping cost of materials to market. Haida Gwaii is cursed with having to ship recyclables off-island on a very expensive ferry system and then haul very long distances by truck from Prince Rupert to Vancouver. At $21.96, the CRD's per tonne recycling cost is the lowest of the eight surveyed.

Management Cost per Tonne: This metric tracks administration costs. These range from $5.70/tonne for the CRD to $30.00/tonne for the Columbia Shuswap Regional District. The CRD's management costs are the lowest in the province. Like the District of Squamish, whose management costs are only slightly higher, the costs of these regional districts are low because all of the operations are conducted by Contractors within their contract.

Current Tipping Fee: Basic MSW tipping fees range from a low of $18.31/tonne in Haida Gwaii to $92/tonne in Prince Rupert. At an average cost of $30/tonne the CRD tipping fee is one of the lowest in the Province.

Most of the jurisdictions surveyed have adopted differential tipping fees where problem materials and mixed loads of recyclable materials are charged a much higher tipping fee, typically 50 to 100% higher than the base rate. In most jurisdictions recyclables are collected free of charge.

Based on the tremendous success of the Columbia Shuswap solid waste system that has by far the lowest waste generation rates and per person system costs that are ½ to ⅓ those of most other jurisdictions, the key to an efficient solid waste system is waste reduction and minimization at the

source. Clearly, residents in the CSRD must be making a conscious effort to reduce waste through less consumption of packaging, backyard composting and perhaps burning of paper to achieve such low per capita waste generation rates.

Similar results can be achieved in the CRD by further focusing on diversion of waste at home through back yard composting, burning of paper for home heating and by embracing the extended producer responsibility (EPR) concept aggressively in the CRD, working with stewards to recycle materials and packaging in an efficient manner that achieves recycling with minimum inconvenience to the consumer.

With EPR, packaging materials will be managed efficiently by producers through return at source programs. For example, appliance distributors will be responsible for delivering new white goods and taking away the old white goods and packaging. This way, the cardboard and protective packaging can be managed efficiently at the distribution centre instead of being mixed and contaminated in a municipally run waste system. Other waste materials such as E-wastes should be returned to source or to a designated one-stop recycling centre that processes the full suite of EPR materials. More details on recommended improvements to the CRD recycling program are presented in Chapter 7.

Table 4-1 Results of Economic Benchmarking Analysis

		Peace River Regional District	Skeena Queen Charlotte R.D. Haida Gwaii	Columbia Shuswap Regional District	Thompson Nicola Regional District	District of Squamish	City of Prince Rupert	**Cariboo Regional District**	Squamish Lillooet Regional District
Service Population		54,071	5,000	53,713	122,286	17,111	15,881	**62,190**	54,266
Number of Homes		24,019	1,667	26,146	55,274	6,409	5,948	**25,218**	18,649
Total MSW Tonnage	tonnes/yr	77,913	5,234	37,193	132,044	26,446	13,827	**54,221**	56,444
Total Tonnage Hauled	tonnes/yr	5,851	5,000	3,000	12,518	2,818	0	**24,569**	2,320
Total Tonnage Landfilled	tonnes/yr	73,635	5,098	31,000	97,941	17,918	11,194	**43,917**	31,929
Total Tonnage Recycled	tonnes/yr	4,278	136	6,193	34,103	8,528	2,633	**10,304**	15,700
Per Capita MSW Generation Rate	tonnes/person/yr	1.44	1.05	0.69	1.08	1.55	0.87	**0.87**	1.04
Per Capita Residual Generation Rate	tonnes/person/yr	1.36	1.02	0.58	0.80	1.05	0.70	**0.71**	0.59
Per Capita Recycling Rate	tonnes/person/yr	0.08	0.03	0.12	0.28	0.50	0.17	**0.17**	0.29
Percent of Waste Diverted	%	5.49%	2.61%	16.65%	25.83%	32.25%	19.04%	**19.00%**	27.82%
Total System Cost	$	$7,778,586	$822,084	$3,842,132	$7,048,497	$1,506,850	n/a	**$5,568,364**	$1,379,437
Total System Cost per Tonne	$/tonne	$99.84	$157.05	$103.30	$53.38	$57.55	n/a	**$102.70**	$78.44
Total System Cost per Person	$/person/yr	$143.86	$164.42	$71.53	$57.64	$88.95	n/a	**$89.54**	$81.59
Landfill Cost Per Tonne Landfilled	$/tonne	$37.09	$34.61	$56.04	$35.34	$28.64	$92.00	**$82.27**	$108.16
Transfer Cost Per Tonne Hauled	$/tonne	$234.46	$68.36	$113.35	$206.14	$170.58	n/a	**$57.52**	$150.99
Recycling Cost Per Tonne Recycled	$/tonne	$345.25	$1,343.50	$105.77	$29.51	$41.79	$218.21	**$21.96**	$27.06
Management Cost Per Tonne MSW	$/tonne	$17.95	$23.04	$30.00	n/a	$5.92	n/a	**$5.70**	$7.64
Current Tipping Fee	$/tonne	$30.00	$18.31	$70.00	$60.00	$80.00	$92.00	**$0 - $45**	$65.50

5. FUNCTIONALITY REVIEW

This chapter provides a summary of observations and recommendations from the functionality and efficiency review of the CRD Solid Waste System that was conducted by Owen Carney, President of Carney's Waste Systems and Dr. Tony Sperling, President of Sperling Hansen Associates on July 13, 14 and 19, 2010. The review included site visits to all of the CRD's primary recycling facilities in Williams Lake, Quesnel and 100 Mile House, visits to several transfer stations along Hwy. 97, 24 and 26 and inspection of the 100 Mile, Interlakes and Watch Lake Landfills.

5.1 Functionality of Urban Solid Waste System

Residential MSW Collection Program: Automated collection of MSW in roll-out carts is without doubt the most efficient means of collecting solid waste as it requires only one operator and he does not have to leave the truck cab. Automated collection programs are typically capable of servicing about 1,000 homes per day.

The City of Williams has implemented the automated collection program whereby garbage is picked up from 4,400 residences once per week with an automated packer truck. SHA has estimated that 4,300 tonnes of MSW are picked up annually in the residential collection program. Assuming full 9 tonne loads, to service all the homes the packer truck must make two trips to the transfer station per day on a weekly collection cycle. The average weight of MSW in each cart is presently 18.39 Kg, or 40 lbs.

Quesnel also operates an automated collection program for MSW. The program currently services 3,000 residences on a weekly basis. Pick up occurs on Tuesday, Wednesday and Thursday, servicing approximately 1,000 homes per day.

The large 65 gallon carts can typically accommodate 30 to 40 Kg of household garbage. In Squamish, Carney's Waste Systems have found that homes need not be serviced every week. Instead, they have implemented a bi-weekly collection program, collecting MSW from each home only every second week. This level of service was quickly accepted by the residents of Squamish once they learned that the cost of their garbage collection program would be cut in half, from $4 per month to $2 per month. Owen Carney believes that the same strategy could be adopted in Williams Lake, Quesnel and 100 Mile House to cut collection costs in all three communities in half.

SHA estimates that at present weekly automated collection of refuse costs $4.10 per home per month in Williams Lake. A similar cost is likely experienced in Quesnel. As explained below, this saving in resources could then be applied to the collection of recyclables without increasing overall collection program costs.

Residential Collection Program for Recyclables: Automated collection of comingled recyclables is two to three times faster and hence much cheaper than blue bag or blue box programs where materials are sorted at the curb. The City of Williams has implemented an automated collection program

whereby recyclables in 65 gallon blue carts are also collected weekly. At present, one collection vehicle is able to service all 4,400 residences in the program in four days. Based on information provided by Central Cariboo Disposal, the recycle truck picks up about 2,000 Kg of recyclables daily. This requires two trips to the depot as the collection truck bulks out at about 1,000 Kg per load.

Based on the success of the Squamish bi-weekly model, Owen Carney believes that recyclables in Williams Lake could be collected with the same truck that collects MSW, with all homes receiving MSW service one week and collection of comingled recyclables the next. A single high capacity packer will easily be able to service the 4,400 homes in Williams Lake.

At present Quesnel does not have a recyclables collection program, but is exploring provision of this service in the near future. With 3,917 homes in Quesnel according to the 2006 Census, a single automated packer would also be able to provide bi-weekly refuse collection and bi-weekly collection of comingled residential recyclables in that community, without increasing existing collection costs.

With only 817 homes in 100 Mile House and 130 homes in Wells, these communities are two small to justify an automated collection vehicle as the number of homes could easily be serviced in one working day. However, Stage 2 of the SWMP should investigate whether it would be cost effective to have the Quesnel packer provide a contracted services in Wells on an off day, and the Williams Lake packer provide collection services in 100 Mile House.

Williams Lake Recycle Station: Recyclables are accumulated in Haul-All 6 yd. self tipping bins. Due to the configuration of the side loading doors, these bins have an actual capacity of about 4 yds. The bins have to be tipped into a special side loading truck manufactured by Haul-All that does not provide compaction. Unloading of full bins typically requires multiple tips (see Photo 5-1). Capacity and efficiency of this system could be markedly improved by replacing the bins with dedicated compactors, particularly for mixed paper and cardboard. Photo 5-2 shows a practical example of a 40 yd. cardboard compactor at Whistler Transfer Station.

Photo 5-1. Haul All 6 yd. Bin being tipped into Haul All truck.

The comingled recyclables are sorted at Central Cariboo Disposal into tin, cardboard, mixed paper and mixed plastics. Tin is shipped loose in a 4 yd bin to Williams Lake Scrap Metal. The mixed paper and plastics are currently shipped loose in 40 yd. roll off bins for baling in Quesnel. The cardboard is placed in a compactor. Less than 1 tonne of mixed loose paper and plastics can typically be placed in a bin. As the roll-off bins are hauled to Quesnel without using a trailer and the round trip requires three hours, haul costs alone exceed $225/tonne. This type of hauling is very inefficient. Haul efficiencies could be doubled by simply adding a trailer to haul two bins at once. Furthermore, the frequency of trips could be cut by 75% or more by also compacting the paper and plastics into roll-off containers as shown in Photo 5-2. Another option would be to bale the commodities directly in Williams Lake, instead of shipping them loose to Quesnel.

Photo 5-2. Dedicated Cardboard Compactor with 40 Yd. Bin

Commercial CardBoard Recycling in Williams Lake: Commercial cardboard in Williams Lake is collected from 40 large cardboard bins distributed at businesses throughout the city. The Cardboard is compacted at Central Cariboo Disposal and then trucked to Quesnel for bailing. Canadian Tire manages its own compactor and hauls cardboard directly to Quesnel while Save-On Foods ships its cardboard to Gold Trail Recycling in 100 Mile House.

Hauling of commercial cardboard to Quesnel requires a round trip of about 3 hours. The haul cost to Quesnel is estimated at $55/tonne. As the cardboard is typically shipped back to the coast for processing, the system efficiencies could be increased by baling and shipping directly from Williams Lake.

Williams Lake Transfer Station: The inspection of this facility confirmed that it is well designed and functional. One issue that was noted by CRD staff is that on windy days the wind whistles through the facility and blows litter out the door. Perhaps litter could be controlled by establishing a litter fence outside the facility in the predominant downwind direction.

The transfer trailers that haul refuse to Gibraltar were examined. The current trailers are well used and probably approaching the end of their service life. CRD staff have received numerous complaints about litter blowing out from these trailers. Automated tarping systems that roll across the trailer, such as those used on the fleet of B-train trailers hauled by Arrow to Cache Creek and the City of Vancouver walking floor trailers are very reliable. Photo 5-3 shows three Metro Vancouver trailers. Each has a different variation on the tarping system, but in each case the tarp deploys across the long axis of the trailer from the right side of the trailer to the left.

Photo 5-3 Metro Vancouver Transfer Trailers, note similar litter tarp systems used

The trailers used on the Gibraltar haul are 53' tri-axles. Reportedly, they only average 17 tonnes per load. The legal payload for tri-axles is 27 tonnes. Carney's averages payloads of 23 to 25 tonnes on 48' tri-axle trailers. Owen recommended that on subsequent contracts the CRD require that the haulage contractor lightly tamp the refuse loads in the trailer with a backhoe or excavator to consolidate the garbage that is otherwise fluffed when pushed into the trailer from the tipping floor with a loader. Typically, such tamping can increase payloads by 50% without damaging the trailers. Photo 5-4 shows a backhoe that was used to consolidate loads at the Smithers transfer station.

Photo 5-4 Back Hoe used to tamp loads at Smithers Transfer Station

SHA conducted an economic analysis of the potential cost savings of tamping loads, assuming that payload densities could be increased from the current 17 tonnes per trailer to 24 tonnes per trailer. The net cost savings were determined to be $81,000 per year. The analysis is presented in Appendix A.

Williams Lake DLC Landfill: The old Williams Lake Landfill continues to operate, but waste input has been limited to construction demolition material. The site has been established on the top edge of the east terrace of the Williams River valley. The valley side is very steep and continues to actively erode. The long term stability of the landfill should be carefully addressed.

At present waste going into the landfill is placed with a track machine, but previously a rubber wheeled loader was being used. A rubber wheeled loader does not break up the waste properly as the ground pressure is very low. As a result, the material is less compacted than it should be, loosing air space and increasing the risk of landfill fire.

Photo 5-5 Williams Lake DLC Landfill, note very narrow ridge at edge of canyon

DLC landfills pose a very significant risk of landfill fire due to spontaneous combustion. The CRD must ensure that the waste is placed properly in cells and that each cell is fully encapsulated with a minimum of 300 mm of inert, low permeability soil all around.

Williams Lake Concrete Dump: Concrete is currently dumped over the edge of the river escarpment into a very steep rotational slope failure gully that had failed sometime in the past. The concrete dump is shown in Photo 5-6. The concrete is being pushed over the edge and is establishing a very steep

angle of repose well in excess of 1H:1V. As the material is being filled onto an existing plane of weakness, there exists a risk that the landslide will recur.

Crushed concrete is being used as a road base aggregate in many jurisdictions. The material could for example be used for road base and granular aggregate in landfill closure applications at the Gibraltar Mine. An updated operational and closure plan for the Williams Lake transfer station and landfill is currently being developed and will address the future use and management of the concrete dump.

Photo 5-6 Very Steep Slope on Concrete Dump above Williams River Valley

Quesnel Recycling Facility: The Quesnel Recycling facility on Carson Pit Road is the primary baling facility in the Cariboo, shipping the bulk of commercial cardboard, plastics and mixed paper recycled in the region. Recyclables are dropped off by the public at the drop off station at the Recycle Depot or at one of a number of partitioned roll-off bins that are strategically placed at shopping centers in the community. Cardboard, mixed paper and plastics collected in the Williams Lake curbside and commercial programs are also hauled to this facility. Cardboard and milk jugs from Williams Lake are purchased by Northern Recycling from Central Cariboo Disposal, baled and then shipped to market.

The large manual tie horizontal baler operated by Northern Recycling (see Photo 5-7) is capable of processing about 14 tonnes of product per day. As pictured in Photo 5-8, at the time of our visit there was a very large backlog of uncompacted cardboard outside the facility. Such a large backlog is not best practice and presents a significant fire risk. Mr. Carney recommends that the backlog at this facility be limited to no more than one week of loose material.

During the tour Jack Marsh from the City of Quesnel noted that Williams Lake and the CRD are not in his opinion paying their fair share of the cost to operate the facility. The City of Quesnel supports the recycling program at a cost of $242,000/year. Materials being brought in from Williams Lake do not contribute to the overhead cost of maintaining the facility.

Photo 5-7 Northern Recycling Horizontal Baler

Photo 5-8 Large Backlog of Unprocessed Cardboard at Recycling Depot

Quesnel Recycling Depot: In our opinion, the Quesnel Recycling Depot "Re-Use Center" is the most impressive "Share Shed" type facility of its kind in B.C. It is clearly well organized, and filled with materials that appear to have much higher value than the materials found in the other Share Sheds in the Cariboo. Most likely, this is because materials are screened and organized by facility staff. The Quesnel Depot provides an excellent model for other such facilities.

5.2 Functionality of the Rural Solid Waste System

As described in Chapter 1 the rural solid waste system is made up of 16 transfer stations and 12 rural landfills. Although each facility is unique, many of the facilities appear to have common attributes and problems. Recommendations for improving these facilities are discussed below: These recommendations are derived from suggestions made by Owen Carney during the field inspection and input provided by Ian Hicks of ILJ Ventures, the maintenance contractor for many of the CRD facilities.

Transfer Stations: All CRD transfer stations are currently unmanned sites. As indicated in Table 1-2, some facilities provide marshalling areas for scrap metal, wood waste and yard and garden waste, others do not.

A common problem to all of the transfer stations that operate using the Transtor Bins is that there is no provision for disposal of oversize material. Residents bring oversize materials for disposal to the transfer stations. When these materials cannot be placed in the bins, they are either dumped by the Share Sheds, placed in the wood waste or metals piles or thrown out elsewhere on the property. Management of oversize materials appears to be the largest problem at the transfer station sites that results in very large clean-up costs. Photo 5-9 shows the typical problem with contamination at the transfer station in Wells. Ian Hicks provided a more dramatic example from Baker Creek, presented in Photo 5-10

Photo 5-9 Oversize couches and mattresses in clean woodwaste pile – Wells TS

The most problematic transfer stations in the CRD System are Frost Creek, Baker Creek, Forest Grove and 150 Mile House wood marshalling area. Frost Creek is problematic in that it does not provide a metal marshalling yard. At Baker Creek there appears to be a total lack of discipline in terms of dumping materials where they should go. Forest Grove is a very small facility that receives a large amount of traffic, 60 to 70 vehicles per day.

Photo 5-10 Uncontrolled dumping at Baker Creek Transfer Station

Managing oversize materials is a challenge. Amongst the solutions that should be considered in Stage 2 include the following:

- Providing open roll-off bins strictly for oversize materials
- Providing locked roll-off containers that can be used by Maintenance Contractor
- Placing oversize items on top of Transtor Bins
- Attendants on site to enforce ban of oversize materials at facilities not set up for it
- Phasing out the Transtor system in favour of roll-off bins that can accommodate oversize
- Dump amnesty / large item day

During his presentation on July 13th, Ian Hicks presented a strong argument for improved bylaw enforcement. SHA and Carney's agree that a strong bylaw presence is essential and will prove to be effective. In the Whistler Area the bylaw officers respond quickly to any illegal or inappropriate

dumping activities. This has reduced the effort expended by Carney's to maintain sites considerably. Full time attendants and controlled hours could be considered for the more problematic sites.

Hauling from Transfer Stations: Servicing of CRD transfer stations in the North Cariboo is contracted to Go-Fer Contracting and Disposal, The Central Cariboo is service by Dan Jensen Contracting. Transtors are dumped into a 50 yd. roll-off truck that then hauls waste to the Quesnel Landfill and Williams Lake Transfer Station. Refuse from transfer stations in the North Cariboo, including Wells, Cottonwood, Baker Creek, Alexandria and Tite Town is hauled to the Quesnel facility while waste from the Central Cariboo transfer stations is hauled to the Williams Lake facility.

Transfer stations in the South Cariboo are serviced by Alessandro Garbin. To improve haul efficiency Garbin uses a custom built open top chain drive compactor that consolidates loads. This truck is pictured in Photo 5-11 at the Lac La Hache Transfer Station.

Photo 5-11. Garbin Compactor Truck servicing Transtor

Carney recommends that the feasibility of adding a live trailer to haul multiple bins be evaluated, particularly for the North and Central Cariboo hauls that are longer than the route around 100 Mile House. To further increase efficiency, Carney recommends that the CRD evaluate replacing worn Transtors with compactor units. Carney's Waste Systems utilizes large compactors to manage MSW at both their attended Pemberton and unattended Whistler Transfer stations. A typical MSW compactor is pictured in Photo 5-12.

As briefly discussed in Chapter 1, the implementation of scales at 100 Mile House Landfill has resulted in a decrease in tonnages at the landfill and a corresponding increase in tonnages at the nearby transfer stations in Forest Grove, Lac La Hache and Lone Butte. This trend is completely understandable, at a tipping fee of 50/tonne, a resident undertaking a major clean up or a commercial contractor (e.g. builder) may have 1 to 2 tonnes of waste in a pick up trailer. Clearly, driving to a

transfer station 30 minutes away is well worthwhile if it can save $50 to $100. Adding to this problem is the perception by many residents that they will be charged for using the 100 Mile Landfill, regardless of how small their load is. Only residential loads over 350kg have tipping fees,

Addressing this issue in Stage 2 will be essential, particularly as diversion of waste to transfer stations forces the CRD to pay haul costs which currently average over $57/tonne. Thus not only is the CRD missing out on $50/tonne of revenue, but it is increasing costs by a further $57/tonne.

Possible solutions to this problem may include aggressive bylaw enforcement to ensure only local residents are using the transfer station (possibly with passes), controlling access and charging tipping fees at transfer stations within 60 minutes drive time from the major facilities where fees are charged, or eliminating tipping fees from the major facilities and reverting to a tax based system. The last option would probably not work because it will encourage leakage from nearby regional districts such as TNRD and RDFFG where substantial tipping fees are being charged.

Photo 5-12 Garbage Compactor at Whistler Transfer Station

Used Motor Oil: Used motor oil is a problem at CRD landfills and transfer stations. Containers of motor oil and hydraulic oil are frequently dumped at the sites. Ian Hicks recommended that used oil tanks be established at all transfer stations and landfills that are controlled. SHA recommends that CRD contact the B.C. Used Oil Management Association to determine if collection tanks could be established at these locations.

Used Tires: Although technically not accepted at CRD sites, tires accumulate by the hundreds. They are hard to contain and hard to sort. A solution is required.

Rural Landfills: CRD's rural landfills are composed of trenches typically 5 m deep excavated into the natural clay soils. A tipping area with a bumper log is established at the head of each trench. The

public dumps garbage over the edge of the trench where it accumulates until the landfill is serviced. During service the waste it picked up by an excavator or track machine and transported to the back of the trench where it is compacted and covered.

The above operating mode results in minimum windblown litter as the garbage is maintained in the bottom of the hole, but it is not in compliance with the requirement for daily cover. Vectors such as birds and coyotes have continuous access to the refuse and are able to spread litter off property.

A more immediate problem that should be addressed by the CRD is the lack of fall protection. At present, there is no safety railing to prevent people unloading garbage from falling into the trench. A fall could result in serious injury or death and as such presents a large liability to the CRD. To reduce the risk of falls, SHA recommends that tipping chutes complete with safety railings be established at all CRD trench type landfills to limit this liability. Appropriate signage should also be erected.

Rural Recycling Services: At present access to recycling services is not provided at CRD's rural transfer stations. Providing these services was one of the highest priorities identified during the public consultation survey. Two basic options can be considered to provide this service. The most common solution is to provide a partitioned roll-off bin to accumulate recyclables including cardboard, mixed paper, plastics, glass, aluminium and tin cans. Roll-off containers such as that shown in Photo 5-13 are commonly used in many regional districts in B.C. to collect recyclables.

Photo 5-13 Partitioned Roll-off Bin for Recyclables - Chilliwack

A second option would be to supply a number of custom trailers such as the one shown in Photo 5-14 that is in use in Waterton. Inside the trailer are bins that are off-loaded with a fork lift at the depot.

Photo 5-14 Recycling Trailer used in Waterton, Alta.

A third option that is in use in the Peace River Regional District is to accumulate recyclables in bulk bags within wooden cribs, as pictured in Photo 5-15. Although inexpensive to implement, this method requires considerably more handling and is hence more expensive in the long run.

Photo 5-15 Recycle Cages with Bulk Bags – Peace River R.D.

6. STAGE 1 PUBLIC CONSULTATION

This section of the report summarizes the thorough analysis of the recently completed Stage 1 Solid Waste Survey that was prepared by Jan Enns Communications and SHA together with CRD staff during June and July of 2010. The survey was presented on-line. Hard copies of the questionnaire were also distributed to allow responses from those that were not able to access the web. In total, 869 responses were received. The results of the survey were analyzed by SHA and documented in a report entitled "Solid Waste Management Review – Stage 1 Survey Report (September, 2010).

6.1 Overview of Survey

The survey was developed using the free online tool, Survey Monkey with Jan Enns Communications, SHA and the CRD being involved in developing the structure and timing of the survey. The survey was comprised of 16 questions, meant to outline the satisfaction level of the Regional District and member municipalities as well as gain insight into which direction the various communities would like to focus on with their solid waste management.

The 16 questions posed in the voluntary survey were:

1. How do you currently dispose of your household garbage?
2. How do you currently dispose of your household recyclables?
3. How do you currently dispose of your household yard waste?
4. How do you currently dispose of your household food waste?
5. Do you use the "Share Shed" or "Re-Use Building" at your local landfill or transfer station to drop off or pick up used household items?
6. Please rate your level of satisfaction with the following services in your community. Rate your level of satisfaction on a scale from 1 to 5 with 1 being very unsatisfied and 5 being very satisfied.
    a. Municipal garbage and recycling collection
    b. Municipal garbage collection
    c. Private garbage collection
    d. Rural transfer station or landfill site
    e. Access to recycling depots or bins
    f. Variety of materials accepted for recycling
    g. Share sheds at landfills and transfer stations
    h. Availability of waste management information/education
7. Are you aware of the locations in the Regional District to where you can bring the following items for recycling or proper disposal?
    a. Type of waste, e.g. cardboard, electronics, paint, etc.

8. Is your business/working place currently reducing or recycling waste?
9. If yes what do you recycle at work?
    a. Paper
    b. Cardboard
    c. Beverage containers
    d. Scrap metal
    e. Other
10. Please rate your support for investigating the cost, 1 being low support and 5 being high support.
    a. Expand recycling locations/ bins in urban areas
    b. Extend recycling bins to rural areas
    c. Provide curbside collection of recyclables in urban areas
    d. Centralized composting of yard waste materials
    e. Centralized composting of food waste materials
    f. Closure of existing small tonnage landfill sites
    g. Regulate hours of operation at high use landfills and transfer stations
    h. Introduce "User Pay" at Transfer Stations and Landfills - rather than spreading the costs of disposal over all taxpayers. The more garbage you throw out, the more you pay. The more you recycle, the less you pay.
    i. "Waste to Energy" options – a number of technologies are available for turning solid waste into clean energy through different combustion processes.
11. What do you feel is the more important priority for selecting our future waste management solutions?
    a. Keeping costs as low as possible
    b. Protecting the environment (water and air quality)
    c. Waste reduction and greenhouse gas reduction
    d. Most convenient
    e. Job creation/local economic opportunities
    f. Other
12. How do you currently get your information about recycling and garbage services/programs/events?
13. Which area are you from?
14. Including yourself, how many people live in your household?

15. Please indicate your age

16. Please indicate your gender

The results of the 16 questions posed in the survey were graphed comparatively and the information was presented in 68 graphs broken out by Electoral Area and grouped into five regional areas: 1) Urban including Quesnel, Williams Lake, 100 Mile House and Wells, 2) North Cariboo including Electoral Areas A, B, C and I, 3) Central Cariboo including Areas D, E and F, 4) South Cariboo including Areas G, H and L and 5) Chilcotin including Areas J and K.

In total, 869 questionnaires were completed which is considered an excellent result showing very strong public participation. Of the questionnaires completed 142 were mailed or handed in and 727 were completed on line. The total number of residents represented by the completed surveys is 2,192 based on one survey per household.

6.2 Satisfaction with Current Program – Questionnaire

Although there was significant variability in survey results, the vast majority of survey responses were remarkably similar across the entire Cariboo and provided strong indications as to public preferences regarding the future of the solid waste program in the CRD. Since the responses were analyzed based on where the respondents live, the summary of results are presented by area. For rating satisfaction levels, the respondents were asked to rate out of 5 (as mentioned above). For more detailed survey results, please refer to the Stage 1 Survey Report recently finalized by SHA.

The urban respondents are generally satisfied with access to recycling services with scores of 3.9 in Williams Lake, 2.8 in 100 Mile House and 3.1 in Quesnel. In Wells the public is very unsatisfied with a score of 1.5.

In the rural North Cariboo (Areas A, B, C and I) the public is generally satisfied with current access to recycling programs with scores of 3.0 to 4.2 (out of 5). In the Central Cariboo (Areas D, E and F) the public would like to see improvements to recycling access with satisfaction scores of only 1.9 to 2.2. In the South Cariboo (areas G, H and L) access to recycling scored 2.3 to 2.6 points. Finally, in the Chilcotin access to recycling was rated at 2.0 to 2.8. Overall, access to recycling received the lowest scores in terms of satisfaction with services; thus this survey clearly indicates that expanded access to recycling in rural areas is the public's top priority. Additionally, the public is moderately satisfied with the number of materials recycled with scores typically ranging between 3.0 and 4.0 in most areas.

The public is generally very satisfied with the Share Shed program with typical scores of 3.5 to 4.5, except in the Central Cariboo where the level of satisfaction ranges between 2.5 and 3.5.

Composting of food waste is also a very common practice, particularly in rural areas where 60 to 70% of households surveyed compost their food waste. In urban areas participation is lower, with 40 to 50% of respondents participating. Home composting of food waste is an excellent means of reducing the organic waste going to landfill and should continue to be strongly promoted to increase participation rates even higher.

Respondents were asked to show their support for a range of capital improvements (question 10) to the solid waste system. In all cases, the top three priorities were the same and scored very high, typically 4.2 to 4.5. The first priority was generally expanding recycling services in rural areas, the second priority was expanding recycling locations in urban areas and the third priority was investigating waste to energy. The order of the top three priorities did vary, with a number of electoral areas indicating Waste to Energy as the second priority. Provision of curbside collection of recyclables was also rated a very high priority in Williams Lake, Quesnel and 100 Mile House, but not in Wells or the rural areas. Composting of yard waste was typically ranked as the fourth priority with a score of 3.0 to 3.5 while composting of food waste was generally 5th with a score of 2.7 to 3.2.

6.3 Satisfaction with Current Program – Comments Section

At the end of the survey, an option was given to provide additional comments upon completion of the survey. Nearly half (40%) of the respondents provided additional comments and of the comments, over half (58%) were related to recycling and concerns about the availability of recycling facilities. Some of the key concerns were related to limited recycling available at the transfer stations and small landfills. There were several positive comments about the curbside recycling programs available in Williams Lake and being rolled out in Quesnel. There is concern about recycling in the rural areas as shown below in the comments.

Below are some of the key comments related to recycling:

> *"Very pleased to see the City issue the recycling bins within the city limits."*

> *"Continue with incentives to recycle. Have someone randomly monitor recycling/waste disposal sites & hand out brochures and spot prize such as gift card or home composter or garbage can or watering can or whatever to provide positive recognition of those that use the recycle /waste sites. Set up demo of composting at a landfill or recycle site & involve school children or children's organization (scouts 4H etc to participate and help)"*

> *"I recycle all that I can however I am extremely unsatisfied with the amount of items we can recycle in our community. I am thankful that Goldrush recycling now takes all cardboard paper glass and cans however they only accept #2 white (will not take #2 coloured) plastic…This needs to be addressed as soon as possible most of our garbage is plastic. The one other thing I would like to mention is I do like the idea of a user pay system however until recycling is more available in our area it is not a fair option. Thank you."*

> *"We moved to the West Chilcotin this spring and took over Nimpo Lake Resort. We were completely shocked and appalled when we discovered that there is absolutely no recycling program in place in this region…There are hidden costs here such as the cost of the reputation of our region when tourists ask if we want them to separate their trash. When they find out we do not recycle here, they judge us as not caring about the very special environment that we are fortunate enough to live in."*

While recycling was the main focus of most of the comments, several respondents were concerned with the possibility of the user fees at local landfills resulting in dumping of waste in the environment.

Approximately 6% of the respondents who supplied comments listed this as a concern. Related to the user pay option, a few comments highlighted a concern with dumping from residents outside of the CRD (see the second quote below).

> *"Do not make dumping a pay per dump option. There are too many locations for people to just dump or burn their waste"*

> *"I live on North Green Lake. Mine and my neighbours issue is the overusage of our landfill by non-CRD residents (TNRD) due to their fee for use at their landfill. I don't want my garbage tax to increase, so my suggestion is to have an attendant at our landfill collect fees from all non-residents based on address…I would even be happy if it was only open certain hours/days as long as you had to show proof of residency…Part time hours with a part time attendant with fees for non-residents should hopefully pay for the attendant and reduce total costs as now there will be a lot less garbage at our site. I definitely don't want to see people starting to dump their garbage in the woods."*

> *"I think that charging people to dump garbage at the dump is a good idea in theory to offset the tax payers that don't use the facility however the amount of garbage that we will see in the bush will definitely increase and impact the environment and regional tax payers more as people will have to be employed to remove it, if it even gets removed! Please don't implement a dump fee for the sake of the forests!"*

In addition to concerns about user pay options and monitoring of the landfill, several comments (6%) were related to the share sheds located at several of the rural transfer stations and landfills. The majority of the comments related to the accessibility of the share sheds and quality control of the products left in the sheds.

> *"I would love it if a share shed could be built again at the 150 Mile house, maybe out of bricks as our last one was burnt down. It is a far drive to bring my quality items I don't need to the Williams lake share shed."*

> *"I feel that the share sheds in the rural transfer stations are badly abused. People just drop off broken, unusable junk that won't fit in the garbage container. Share sheds are most likely only viable in areas where they can be closely monitored."*

There were several (15, 4%) comments about composting and were largely in support of additional composting options available especially in the urban areas. As mentioned in the previous section, composting is a common practice in the rural areas of the Cariboo Regional District with the urban areas being less likely to compost. The comments reaffirm this result as the respondents were primarily focused on increasing composting in the urban areas.

> *"Community composting is a high priority for me, but I'd like to see CRD support for someone to develop it as a green entrepreneurial opportunity."*

"I would love to see the city offering some composting, either pay to drop off kitchen, yard waste and receive free product or drop off yard waste kitchen scraps free and pay for finished product. I would utilize such a service."

In general, the comments supplemented and were consistent with the survey questionnaire in highlighting the concerns of the respondents and the satisfaction level with the current solid waste management system.

6.4 Priorities for Upgrading the System

The public consultation results indicate that in general, the Cariboo Regional District working in the right direction with the solid waste management system, but there is dissatisfaction with some key areas. Recycling availability in the rural areas should be a priority and practical implementation of such a strategy should be investigated and implemented if feasible in Stage 2. The public is also interested in seeing the range of materials that are recycled expanded, particularly to include all plastics.

The public is very interested in doing the right thing to protect the environment, including taking measures to reduce GHG emissions and examining waste to energy to manage solid waste. Keeping program costs low was rated as the third priority, well below protecting the environment and conserving resources.

7. CONCLUSIONS AND RECOMMENDATIONS

System Overview:

With a population of only 62,910 people in 2006 and the second largest service area in the province, the Cariboo Regional District is managed to provide an efficient yet affordable Solid Waste Management service. The CRD solid waste management system is comprised of six main services:

1) transfer stations for collecting waste and recyclables,
2) hauling services to transport solid waste and recyclables to landfills / recycling facilities,
3) processing and shipping of recyclables to markets,
4) landfilling of residuals,
5) grinding or air curtain burning of clean wood waste and
6) operation of Share Sheds to reuse materials.

The transfer stations typically include one or more Transtor bins. Most transfer stations also include Share Sheds. Wood waste and scrap metals are collected at several of the sites.

Servicing of the transfer stations is achieved by tandem axle trucks. Go-Fer Contracting services the North Cariboo, Dan Jensen Contracting services the Central Cariboo and Alessandro Garbin services the South Cariboo. Go-Fer and Dan Jensen utilize roll-off trucks with 50 yd. bins to haul the waste while Alessandro Garbin uses a customized compactor truck. Efficiency of the hauling services could be improved by adding a trailer, and by compacting the waste.

As a result of new tipping fees, diversion of waste from the 100 Mile Landfill to nearby transfer stations is proving to be an emerging problem. The same problem is expected to develop in Quesnel once tipping fees are implemented there. The additional costs of diverted waste to the CRD exceed $100/tonne.

In the urban areas of the CRD, including Williams Lake, Quesnel, 100 Mile House and Wells garbage is collected curbside once per week. Williams Lake and Quesnel operate an automated system that uses 65 gallon carts. Williams Lake services about 4,400 people and Quesnel services roughly 3,000. Programs in 100 Mile House and Wells are not automated.

Recyclables are consolidated in three recycling depots located adjacent to the Quesnel Landfill, at the Central Cariboo Transfer Station in Williams Lake and at Gold Trail Recycling in 100 Mile House. Curbside collection of single stream recyclables has been implemented by Williams Lake and is being considered by Quesnel. There are no recycling services of significance provided to rural residents.

Wood waste is collected and chipped for cogen at Williams Lake , Frost Creek, Chimney Lake, 150 Mile House, and Wildwood transfer stations. At 100 Mile House landfill and the rural landfills and transfer stations wood waste and yard and garden waste are consolidated and periodically burned in an air curtain burner.

Quantifying the System

The CRD Solid Waste System managed 54,221 tonnes of solid waste in 2009. Of that waste, 36,892 tonnes was generated from the four urban areas, 12,969 originated from rural transfer stations and 4,360 was deposited in small rural landfills. Of the 54,221 tonnes of waste generated, 43,917 tonnes were landfilled, 6,797 tonnes were recycled paper, metals and plastics and 3,507 tonnes were recycled wood waste. The summary table below shows the approximate tonnage of residuals landfilled at the three regional landfill facilities.

Landfill	Tonnage Received (2009)	Service Population
Gibraltar	13,115	23,914
Quesnel	10,859	22,031
100 Mile House	9,253	11,290

10,303 tonnes of waste were recycled in the CRD in 2009. The diverted material included 6,797 tonnes of paper, metals and plastics and 3,507 tonnes of wood waste.

The average per capita waste generation rate in the Cariboo is 872 Kg/person per year. People living in the rural Cariboo generate slightly less than the average (610 to 690 Kg/person per year) while people in urban areas generate slightly more. Statistics for the South Cariboo are skewed because a lot of urban residents appear to be hauling waste to the rural transfer stations

System Costs and Comparison to Other Regional Districts

The Cariboo Regional District appears in the middle of the pack when compared to seven other urban/rural regional districts in B.C., including the SLRD, CSRD, TNRD, SQCRD, PRRD, District of Squamish and City of Prince Rupert. CRD's per capita MSW generation rate of 0.87 is mid range between the low of 0.69 and the high of 1.55 tonnes/person per year. Similarly, the per capita recycling rate is mid range at 0.17 tonnes/person/year, between a low of 0.03 and a high of 0.50 tonnes/person/year. The CRD has achieved a 19% diversion rate, again mid range between 3% and 32.25%.

The total cost of the CRD Solid Waste System was $5,568,364 in 2009. On a per tonne basis, the system cost was $102.70 per tonne, which is mid range between a low of $53.38 for the TNRD and $157.05/tonne for the Islands waste system in the SQCRD. The comparative study revealed that there is a strong economy of scale on costs with the most populous regional districts experiencing the lowest costs. Also, transportation plays a large part in costs. With long hauls and transfer station operations, the CRD's costs will always be higher than those of the District of Squamish for example where all waste goes directly from curbside to landfill.

The per capita costs in the CRD were $89.54/person/year, mid range between a low of $41.81/person/year in the SQCRD and $143.86/person/year in the PRRD.

At $82.87/tonne, the costs of landfill operations were relatively high. This is mostly due to the economy of scale effect as the CRD's regional sites are around 10,000 tonnes/year.

The CRD's haul costs were surprisingly low at $57.52/tonne. In part this is because many of the transfer stations serviced are quite close to the landfill and because the large volume haul to Gibraltar is quite efficient (although there is still room for improvement).

The CRD's management costs were the lowest in the province at $5.70/tonne.

The CRD tipping fee varies from $0 to $50/tonne. Even at $50/tonne as the average tipping fee, it is amongst the lowest in the province. An increase in the tipping fee to better reflect actual costs and to promote diversion through the user pay system should be considered it is understood that certain wastes have a greater tipping fee such as $160/tonne for DLC at WL.

Functionality Review

A functionality review of the CRD Solid Waste System was conducted by Owen Carney, President of Carney's Waste Systems and Dr. Tony Sperling, President of Sperling Hansen Associates. The three day review focused on the major waste management facilities in the CRD as well as a number of the smaller satellite transfer stations and landfills. The following bullets summarize the observations of the review team.

- Management of oversize materials appears to be the largest problem at the transfer station sites that results in very large clean-up costs. Provision of roll-off containers for oversize waste should be considered.

- Williams Lake and Quesnel currently provide a weekly collection program for garbage. Williams Lake also provides a weekly collection program for recyclables. Owen Carney recommended that based on his experience, both cities could switch to a bi-weekly collection system whereby garbage is picked up one week and recyclables the next. This could cut collection costs in half.

- A number of inefficiencies were identified in the recycling program. Most important, shipping of loose recyclables to Quesnel is very costly and highly inefficient. Recyclables should either be baled right in Williams Lake or accumulated in compactors that can then be shipped to Quesnel for baling.

- The Haul-All 6 yd. bins are very inefficient and should be replaced by compactors over time.

- The Williams Lake concrete dump area and the DLC landfill were both identified as potential liabilities for the CRD due to potential slope instability and risk of landfill fire.

- The Quesnel Recycling facility is well set up. The only issue of concern was the large amount of unprocessed cardboard that has accumulated on site, posing a significant fire risk.

- The rural transfer stations present a number of inefficiencies. Hauling most loads uncompacted and without a trailers is inefficient.

- Several of the transfer stations are abused and require significant clean up. These include Baker Creek, Frost Creek and Forest Grove, in particular. Management of oversize material appears to be a key contributing factor. Lack of bylaw enforcement of site rules is another contributing factor.

- Accumulation of used motor oil and lubricants and tires is a problem at many sites, despite these materials being banned from the landfill and transfer station facilities.

- At the rural landfills, safety is the overriding issue at this time. Safety railings are urgently required at all remote trench type landfill sites to mitigate the current fall hazard.

- The rural landfills and transfer stations lack any form of recycling facilities.

- All rural transfer stations and landfills are not controlled.

Stage 1 Public Consultation

A public consultation survey was conducted in June and July, 2010. The survey received 869 responses. Overall, respondents were satisfied with the CRD program. In particular, the public really likes the Share Shed program. The survey indicated that the top priority for the CRD should be to provide recycling services at the rural landfills and transfer stations. The public would also like to see an expanded range of recyclables collected. The third priority for the CRD should be to investigate Waste to Energy.

The public is very interested in doing the right thing to protect the environment; including taking measures to reduce GHG emissions and examining waste to energy to manage solid waste. Keeping program costs low was rated as the third priority, well below protecting the environment and conserving resources.

A surprising result of the survey revealed that in most areas 60 to 70% of residents compost.

Key Recommendations

Coming out of the Stage 1 review is a list of recommendations for considerations in the Stage 2 Assessment of Options. Also included are the recommendations provided by the advisory committee at the October 13th, 2010 meeting (items 18 to 20).

1. Provision of tipping chutes with safety railings should be a top priority at all rural landfills where a fall hazard exists.
2. The Concrete dump in Williams Lake needs to be assessed for stability and compliance with landfill regulations. Preferably this facility should be closed and the concrete should be recycled.
3. Provision of recycling services to rural residents. The CRD should explore how to best deliver recycling services to rural facilities. Some options to be considered include partitioned roll-off

bins, Haul-All 6 yd. bins, a modified horse trailer such as at Waterton, “bird cages” like in the PRRD, or some other system.

4. A system for managing oversize waste at transfer stations needs to be developed. Options include a dedicated roll-off bin for oversize, a locked bin into which attendants / clean-up crews can place illegally dumped oversize materials. Options must also include better signage and improved enforcement, either through an attendant or a bylaw inspector.
5. The SWMP update needs to address the issue of scale dodging by urban residents. Dumping of urban waste at free transfer stations costs the CRD tax payers over $100/tonne. Options for consideration include attended facilities with controlled hours, frequent bylaw enforcement together with authorized user cards, automated access for authorized users only and elimination of fees at all CRD facilities. The last option is presented for discussion, but is not supported by SHA as it eliminates User Pay principle and could result in cross-regional illegal dumping from neighboring regional districts. Use of free dump sites by TNRD residents appears to be a considerable problem already according to one public survey comment.
6. Over time the existing Transtor bins should be phased out in favour a system that achieves compaction. High capacity 50 yd. compactors consolidate waste loads at least three times.
7. The CRD should look closely at servicing transfer stations with trucks that haul trailers. Haul efficiency can be improved nearly 50% with a very minimal capital investment.
8. The CRD should investigate the tamping of loads on the haul from the Central Transfer Station to Gibraltar. Tamping is expected to result in cost savings of about $80,000 per year.
9. Tarping systems on haul trucks should be upgraded to minimize litter on CRD’s highways.
10. Municipalities including Williams Lake and Quesnel should consider implementing bi-weekly collection of garbage and recyclables instead of the present weekly program. CRD and City staff should visit the District of Squamish and familiarize themselves with the benefits of this approach.
11. Wells and 100 Mile House should explore partnering with Williams Lake and Quesnel to extend the curbside single stream recycling program to their communities. The Quesnel truck could service Wells in one day and the Williams Lake truck could service 100 Mile House in one day.
12. Hauling of loose recyclables from Williams Lake to Quesnel is grossly inefficient and expensive. Either the mixed paper and plastics should be baled in Williams Lake or they should be placed in compactors and hauled to Quesnel to containers at a time on a truck and trailer.
13. Furniture in the Share Shed program is being vandalized (e.g. cushions being slashed or stolen to make couches unusable). Enforcement should be initiated against those vandalizing this property as the resulting costs of managing the materials as waste are considerable.
14. Additional outreach on back yard composting should be considered to further expand this successful program, offering bear proof bins is an option.
15. Solutions should be developed for managing used oil, lubricants and tires in association with the stewards responsible for these EPR programs.

16. The Regional District should explore diverting more of the wood waste to a waste to energy program, possibly in association with other Regional Districts.
17. The amount of loose recyclables stockpiled at recycling facilities should be controlled, either through contract terms or bylaw.
18. Consideration of closure of some refuse sites is recommended. For example, Lone Butte Transfer Station is very close to both the Inter-Lakes and Watch Lake Landfills. Lone Butte could be closed as a transfer station and operate as a remote recycling location for one day a week, focusing on non EPR materials like glass, tin, mixed paper, cardboard and perhaps mixed plastics.
19. Education/ad campaigns to improve access to information regarding solid waste management, waste reduction, waste to energy and recycling should be considered.
20. Assessment of the Central Cariboo Transfer Station for "ease of use", could the drop off area be made more user friendly, i.e. shoots.

APPENDIX A

Cariboo Regional District Solid Waste 5 Year Budget Forecast
Gibraltar Hauling Analysis
Williams Lake Collection System Model – Existing System
Williams Lake Collection System Model – Biweekly System

TABLE A-1
CARIBOO R.D. SOLID WASTE FIVE YEAR BUDGET FORECAST - REORGANIZED FOR COMPARISON

STATISTICS			
Service Population	62190		
Number of Homes	25,218		
Total MSW Tonnage	54,221	Tonnes/yr	
Total Tonnage Hauled	24,568.5	Tonnes/yr	includes all rural, plus Williams Lake TS
Total Tonnage Landfilled	43,917.0		
Total Tonnage Recycled inc. wood	10,303.8	Tonnes/yr	
Per Capita MSW Generation Rate	0.87	Tonnes/yr	includes wood
Per Capita Residual Generation Rate	0.71	Tonnes/yr	
Per Capita Recycling Rate	0.17	Tonnes/yr	
Percentage Recycled	19%		
Total System Cost	$5,568,364		
Total System Cost per Tonne	$ 102.70		
Total System Cost per Person	$ 89.54		
Landfill Cost Per Tonne Landfilled	$ 82.27		
Transfer Cost Per Tonne Hauled	$ 57.52		
Recycling Cost Per Tonne Recycled	$ 21.96		
Management Cost Per Tonne MSW	$ 5.70		

	2009 Projected	**2011**	**2012**	**2013**	**2014**
REVENUE					
Rural Refuse	5,325,646	5,121,948	4,452,474	4,536,300	4,633,069
South Cariboo Solid Waste	887,908	1,085,438	1,138,207	1,142,946	1,148,119
Solid Waste Management	45,084	34,215	37,123	39,740	42,050
Total Revenue	**$ 6,258,638**	**$ 6,241,600**	**$ 5,627,803**	**$ 5,718,986**	**$ 5,823,238**
EXPENDITURES					
Management					
Rural Refuse					
Hiring Expense	780	780	780	780	780
Travel	13,000	14,920	15,218	15,522	15,833
Postage & Supplies	500	800	800	800	800
Telephone	5,500	5,500	5,500	5,500	5,500
Advertising	17,000	15,000	15,000	15,000	15,000
Legal	3,500	2,500	2,500	2,500	2,500
Training Travel	3,200	3,000	3,000	3,000	3,000
Employee Upgrading	2,300	3,500	3,500	3,500	3,500
ICI Material Exchange Program	500	-	-	-	-
Professional/Consulting	106,000	12,000	12,000	12,000	12,000
Insurance	74,804	94,627	108,821	125,144	143,915
Lease Fees	1,500	1,500	1,500	1,500	1,500
Building Expense Allocation	3,700	3,849	3,926	4,005	4,085
Furniture & Equipment	700	1,000	1,000	1,000	1,000
Site Capital	15,000	18,000	18,000	18,000	18,000
	$ 247,984	**$ 176,976**	**$ 191,545**	**$ 208,251**	**$ 227,413**
South Cariboo Solid Waste					
Travel	10,200	10,404	10,612	10,824	11,041
Postage & Supplies	175	175	175	175	175
Telephone	650	650	650	650	650
Advertising	2,000	2,000	2,000	2,000	2,000
Legal	377	377	377	377	377
Employee Upgrading	755	755	755	755	755
Professional/Consulting	5,300	5,420	5,420	5,420	5,420
Insurance	11,814	13,586	15,624	17,968	20,663
Lease Fees	1,000	1,000	1,000	1,000	1,000
Building Expense Allocation	678	692	705	719	734
Equipment & Supplies	3,682	3,682	3,682	3,682	3,682
	$ 36,631	**$ 38,741**	**$ 41,000**	**$ 43,570**	**$ 46,496**
Solid Waste Management					
Travel	150	812	828	845	862
Telephone	807	625	625	625	625
Recycling Hotline	2,194				
Recycling & Reuse Promotion	-				
Professional Services	20,000				
Insurance	280	370	426	490	563
Dues/Memberships	1,275	1,275	1,275	1,275	1,275
	$ 24,706	**$ 3,082**	**$ 3,154**	**$ 3,234**	**$ 3,325**
Total Management Costs	**$ 309,321**	**$ 218,799**	**$ 235,699**	**$ 255,056**	**$ 277,234**
Transfer Station and Hauling					
Central Transfer Station	332,314	332,314	332,314	332,314	332,314
Central Haul to Gibraltar	341,000	393,462	393,462	393,462	393,462
Rural Refuse Transfer Station Operating	517,579	517,579	517,579	517,579	517,579
Wood Waste Management Transfer Sites	176,075	184,879	194,123	203,829	214,020
Winter Road Maintenance Contracts	24,092	27,173	27,173	27,173	27,173
Winter Road Maintenance Contracts South Ca	22,000	22,000	22,000	22,000	22,000
Total Collection System Costs	**$ 1,413,060**	**$ 1,477,407**	**$ 1,486,651**	**$ 1,496,357**	**$ 1,506,548**
Recycling Costs					
Quesnel Recycling	222,400	248,498	255,938	255,938	255,938
Metals Recycling Contract	3,000	3,000	3,000	3,000	3,000
ICI Material Exchange Program	840	840	840	840	840
	$ 226,240	**$ 252,338**	**$ 259,778**	**$ 259,778**	**$ 259,778**
South Cariboo Solid Waste					
Metals Recycling Contract	2,000	2,000	2,000	2,000	2,000
ICI Material Exchange Program	237	237	237	237	237
	$ 2,237	**$ 2,237**	**$ 2,237**	**$ 2,237**	**$ 2,237**
Solid Waste Management					
Recycling Hotline	2,217	2,217	2,217	2,217	2,217
Recycling & Reuse Promotion	2,030	2,030	2,030	2,030	2,030
	$ 4,247	**$ 4,247**	**$ 4,247**	**$ 4,247**	**$ 4,247**
Total Recycling Costs	**$ 232,724**	**$ 258,822**	**$ 266,262**	**$ 266,262**	**$ 266,262**
Landfill Costs					
Gibraltar Landfill Operations	429,686	451,170	473,729	497,415	522,286
Gibraltar Landfill Capital	1,001,735	214,843	225,585	236,864	248,708
Landfill Reclamation	250,000	250,000	250,000	250,000	250,000
Other Landfills Capital	98,157	98,157	98,157	98,157	98,157
City of Quesnel Landfill Operations	497,463	497,463	497,463	497,463	497,463
Wood Waste Management Landfills	176,496	185,321	194,587	204,316	214,532
Personnel	220,257	230,225	240,829	252,120	264,156
Site Maintenance	12,000	12,000	12,000	12,000	12,000
Landfill Closure Costs	250,000	250,000	250,000	250,000	250,000
Repairs & Maintenance	1,000	1,000	1,000	1,000	1,000
	$ 2,936,794	**$ 2,190,179**	**$ 2,243,349**	**$ 2,299,336**	**$ 2,358,302**
South Cariboo Solid Waste					
Site Operating	463,046	486,198	510,508	536,034	562,835
Site Capital	119,286	125,250	131,513	138,088	144,993
Personnel	59,452	61,473	63,566	65,735	67,982
Site Maintenance	2,250	2,250	2,250	2,250	2,250
Landfill Closure Costs / Reclamation	25,500	25,500	25,500	25,500	25,500
Repairs & Maintenance	695	695	695	695	695
	$ 670,229	**$ 701,367**	**$ 734,032**	**$ 768,302**	**$ 804,255**
Solid Waste Management Plan					
Personnel	6,236	6,448	6,667	6,894	7,129
Total Landfill Costs	**$ 3,613,259**	**$ 2,897,993**	**$ 2,984,048**	**$ 3,074,531**	**$ 3,169,686**
Grand Total Costs:	**$ 5,568,364**	**$ 4,853,021**	**$ 4,972,661**	**$ 5,092,206**	**$ 5,219,730**

Table A-2 - GIBRALTAR HAULING ANALYSIS

13115.4	tonnes	MSW Hauled to Gibraltar (per CRD Data Table)
$341,000	$	Budget for Haul Portion of Contract 2009
$232,314	$	Budget for Transfer Station Operation Portion of Contract
$573,314	$	Total Budget for Transfer and Haul
$1,103,000	$	Actual cost for entire Gibraltar System (TS, Haul and Gibraltar LF) according to Tera
$529,686	$	Actual Cost of Gibraltar Landfills Operations (excluding capital) according to Tera based on above
$429,686	$	Budget Landfill Operations Cost (excluding capital and reclamation)
$344,148	$	According to contract per tonne ops cost is $26.24/tonne
$85,538	$	Flat Rate Cost for Gibraltar
$19.96	$/tonne	Gibraltar Flat Rate Costs Component 1
$6.28	$/tonne	Gibraltar Flat Rate Costs Component 2
$26.24	$/tonne	Gibraltar Total Flat Rate Component for Ops.
$43.71	$/tonne	All in cost for transfer station and haul based on Scale table
17	tonnes	Actual current average payload per trailer
771.4941176	trailers/yr	No. of Transfer Trailers (about 2 trailers per day)
3.5	hours	Estimated round trip time
2700.229412	hours	Total haul hours per year
$127.00	$/hr	Estimated rate for haul trucks
$342,929.14	$/yr	Total Estimated Cost of haul contract based of $127/hour (note matches well with Budget #)
24	tonnes	Actual current average payload per trailer
546.475	trailers/yr	No. of Transfer Trailers (about 2 trailers per day)
3.5	hours	Estimated round trip time
1912.6625	hours	Total haul hours per year
$127.00	$/hr	Estimated rate for haul trucks
$242,908.14	$/yr	Total Estimated Cost of haul contract based of $127/hour (note matches well with Budget #)
$100,021.00	$/yr	Predicted Gross Cost Savings
$0.17	hrs/load	Tamping Time
$128.58	hrs/yr	Total Tamping Time
$150.00	$/hour	Excavator Rate
$19,287.35	$/yr	Excavator Costs (estimate 10 minutes tamping per load)
$80,733.64	$/yr	Net Cost Savings

Table A-3 - Williams Lake Collection System Model - Existing System

Recycling Collection System

65		Gallon Blue Recycle Cart
4400		Number of Homes Serviced in Williams Lake
4	days/wk	Number of Days Recylables Picked Up
2	trips/day	Number of Trips Made
8	trips/wk	Number of loads per week
10940	Kg	Gross Truck Weight
10080	Kg	Tare Truck Weight
0.86	Tonnes	Weight of Full Load
6.88	tonnes	Tonnes Collected per biweekly cycle
13.76	tonnes/mnth	Tonnes recyclables/month
113	$/hour	Truck cost (with drive)
8		Hours per day
32		Hours per cycle
$3,616.00		Cost per Cycle
$7,232.00		Collection Cost per Month
$525.58		Collection Cost per Tonne
$8.80		Revenue per Home per Month
$38,720.00		Total Revenue per month
$19,360.00		Total Revenue per cycle

Refuse Collection System

65		Gallon MSW Tote
4400		Number of Homes Serviced in Williams Lake
5	days/wk	Number of Days MSW Picked Up
2	trips/day	Number of Trips Made
10	trips/wk	Number of loads per week
19080	Kg	Gross Truck Weight
10080	Kg	Tare Truck Weight
9	Tonnes	Weight of Full Load
90	tonnes	Tonnes Collected per weekly cycle
360	Tonnes/mnth	Tonnes MSW collected per month
$113.00	$/hour	Truck cost (with drive)
8		Hours per day
40		Hours per cycle
$4,520.00		Cost per Cycle
$18,080.00		Collection Cost per Month
$50.22		Collection Cost per Tonne
4320		

Recycle Processing Cost

13.76	tonnes/mnth	Recyclables collected monthy
4	Sorters	
6	Hours	Hours worked per day
4	days/wk	Days worked per week
384	Hours/Mnth	
$20.00	$/hour	
$7,680.00	$/mnth	Monthly Labour Cost - sorting
$2,000.00	$/mnth	
$9,680.00	$/month	Processing cost per month
$703.49	$/tonne	Processing cost per tonne

Recycle Hauling Cost (to Quesnel)

110	$/hour	Cost of Roll off truck/hr
3	hours	Cycle Time
1	tonne/load	payload of loose recyclables
14	trips/mnth	No of hauls to Quesnel per month
$330.00	$/trip	Haul Cost per Trip
$4,620.00	$/month	Haul Cost per Month
$335.76	$/tonne	Haul Cost per Tonne

Note: Analysis assumes that 50% of MSW into Williams Lake TS is from residential collection and 50% is commercial and self haul.

Williams Lake Collection System Summary

MSW Tonnes/month	360
MSW Collection $/tonne	$50.22
MSW Collection $/month	$18,080.00
MSW Collection $/home	4.1090909
Recyle Tonnes/month	13.76
Recycle Collection $/tonne	$1,564.83
Recycle Collection $/home	$4.89
Recycle Collection $/Month	$21,532.00
Total System Cost $/month	$39,612.00
Total System Cost $/home	$9.00

65		Gallon MSW Tote
5000		Number of Homes Serviced in Williams Lake
5	days/wk	Number of Days MSW Picked Up
2	trips/day	Number of Trips Made
10	trips/wk	Number of loads per week
19080	Kg	Gross Truck Weight
10080	Kg	Tare Truck Weight
9	Tonnes	Weight of Full Load
90	tonnes	Tonnes Collected per weekly cycle
360	Tonnes/mnth	Tonnes MSW collected per month
$113.00	$/hour	Truck cost (with drive)
8		Hours per day
40		Hours per cycle
$4,520.00		Cost per Cycle
$18,080.00		Collection Cost per Month
$50.22		Collection Cost per Tonne
3.616		Collection Cost per home

Table A-4 - Williams Lake Collection System Model - Biweekly System

Biweekly Recycling Collection System

65		Gallon Blue Recycle Cart
4400		Number of Homes Serviced in Williams Lake
4	days/wk	Number of Days Recylables Picked Up
2	trips/day	Number of Trips Made
8	trips/wk	Number of loads per week
10940	Kg	Gross Truck Weight
10080	Kg	Tare Truck Weight
0.86	Tonnes	Weight of Full Load
6.88	tonnes	Tonnes Collected per biweekly cycle
13.76	tonnes/mnth	Tonnes recyclables/month
113	$/hour	Truck cost (with drive)
8		Hours per day
32		Hours per cycle
$3,616.00		Cost per Cycle
$7,232.00		Collection Cost per Month
$525.58		Collection Cost per Tonne
$8.80		Revenue per Home per Month
$38,720.00		Total Revenue per month
$19,360.00		Total Revenue per cycle

Biweekly Refuse Collection System

65		Gallon MSW Tote
4400		Number of Homes Serviced in Williams Lake
5	days/wk	Number of Days MSW Picked Up
4	trips/day	Number of Trips Made
20	trips/wk	Number of loads per week
19080	Kg	Gross Truck Weight
10080	Kg	Tare Truck Weight
9	Tonnes	Weight of Full Load
180	tonnes	Tonnes Collected per bi-weekly cycle
360	Tonnes/mnth	Tonnes MSW collected per month
$113.00	$/hour	Truck cost (with drive)
10		Hours per day
50		Hours per cycle
$5,650.00		Cost per Cycle
$22,600.00		Collection Cost per Month
$31.39		Collection Cost per Tonne
4320		

Recycle Processing Cost

13.76	tonnes/mnth	Recyclables collected monthy
4	Sorters	
6	Hours	Hours worked per day
4	days/wk	Days worked per week
384	Hours/Mnth	
$20.00	$/hour	
$7,680.00	$/mnth	Monthly Labour Cost - sorting
$2,000.00	$/mnth	
$9,680.00	$/month	Processing cost per month
$703.49	$/tonne	Processing cost per tonne

Recycle Hauling Cost (to Quesnel) (add baling)

117	$/hour	Cost of Roll off truck and trailer/hr
3	hours	Cycle Time
1	tonne/load	payload of loose recyclables
14	trips/mnth	No of hauls to Quesnel per month
$351.00	$/trip	Haul Cost per Trip
$4,914.00	$/month	Haul Cost per Month
$357.12	$/tonne	Haul Cost per Tonne

Williams Lake Collection System Summary

MSW Tonnes/month	360
MSW Collection $/tonne	$31.39
MSW Collection $/month	$22,600.00
MSW Collection $/home	5.1363636
Recyle Tonnes/month	13.76
Recycle Collection $/tonne	$1,586.19
Recycle Collection $/home	$4.96
Recycle Collection $/Month	$21,826.00
Total System Cost $/month	$44,426.00
Total System Cost $/home	$10.10

SOLID WASTE MANAGEMENT PLAN REVIEW
Stage 2 Evaluation of Options Final Report




PREPARED FOR: CARIBOO REGIONAL DISTRICT

PREPARED BY: SPERLING HANSEN ASSOCIATES

PRJ09062

July 4th, 2011

SPERLING HANSEN ASSOCIATES
Maura Walker & Associates ENVIRONMENTAL CONSULTANTS
jan enns communications CONSULTING • TRAINING
Cariboo Regional District building communities together

SPERLING
HANSEN
ASSOCIATES

- Landfill Engineering
- Solid Waste Planning
- Environmental Monitoring
- Landfill Fire Control

July 4th, 2011

SHA PRJ09062

Mr. Mitch Minchau
Supervisor of Solid Waste Management
Cariboo Regional District
Suit D, 180 North Third Avenue
Williams Lake, BC V2G 2A4

RE: Cariboo Regional District Solid Waste Management Plan Review – Stage 2 Options Evaluation - Final Report

Dear Mitch:

SHA is pleased to submit to the CRD the Final Stage 2 Options Evaluation Report that was developed by our consulting team with guidance from yourself and Tera Grady. The report first establishes the performance of the existing CRD waste management system in terms of tonnages and costs processed by each facility and system, including rural transfer stations, wood waste management, rural landfills, rural haulage, central transfer station, central recycling and central landfills. Currently the CRD system processes 69,085 tonnes of MSW and recyclables per year at a overall system cost of $6.1 million per year, which translates to $88 per tonne.

The report examines a range of options for increasing the level of recycling, and particularly for providing recycling services to the rural residents of the CRD. Five recycling options (A, B, C, D and E) are developed that incorporate various combinations of enhanced services, including Eco Depots in the regional service hubs in Quesnel, Williams Lake and 100 Mile House, 9 fully attended transfer stations facilities at CRD's busiest transfer stations and landfills, recycling bins at all remaining facilities.

As well, the report explores four options for adding organic waste diversion, ranging from back yard composters, through yard and garden waste diversion to in-vessel composting systems.

A sophisticated model of the entire CRD solid waste system is used by SHA to evaluate the diversion performance and costs of each waste management option on overall system performance. This powerful model allows for direct comparison of options, and for prioritizing those options that result in the highest level of diversion at minimum cost.

We trust this report will provide the Advisory Committee with a solid information base to move into the Stage 2 Public Review and Comment of the proposed options. Please contact us if you have any questions about this report.

Yours truly,
SPERLING HANSEN ASSOCIATES

July 4th, 2011

Dr. Tony Sperling, P.Eng.
President

TABLE OF CONTENTS

1. INTRODUCTION

The Cariboo Regional District (CRD) is responsible for coordinating and administering the solid waste management function in the Cariboo. The solid waste system services four municipalities (Williams Lake, Quesnel, 100 Mile House and Wells) together with 12 Electoral Areas (A to L) and numerous First Nations Reserves.

The CRD Solid Waste System is divided into four semi-autonomous service areas that include the North Cariboo (based on Quesnel service hub), the Central Cariboo (based on Williams Lake service hub and Gibraltar Landfill), the South Cariboo (based on 100 Mile House service hub) and the Chilcotin (which relies on a number of small landfills).

The four municipalities provide refuse collection services and recycling support within municipal boundaries. In the Electoral Areas the CRD is responsible for all aspects of refuse collection (at transfer stations), hauling and ultimate disposal of residuals in landfills. The CRD also provides a number of programs to reduce the waste going into landfill, including programs to chip and recycle or burn clean wood waste, scrap metal collection programs at several landfills and transfer sites, Share Shed programs to promote reuse of serviceable goods and recycling depots jointly funded with municipalities..

1.1 Work Completed to Date – Key Conclusions

In Stage 1 of the SWMP the project team, including Sperling Hansen Associates (SHA), Carney's Waste Systems and Jan Enns Communications, together with CRD staff and under guidance from the CRD Solid Waste Advisory Committee, conducted a detailed review and quantification of the existing CRD solid waste system. As well, public input was obtained to gauge their level of satisfaction with the existing system and to provide guidance as to where the CRD should be focusing future resources to further improve service delivery and make the program more sustainable.

The survey received 869 responses. Overall, respondents were satisfied with the CRD program. In particular, the public is enthusiastic about the Share Shed program. The survey indicated that the top priority for the CRD should be to provide recycling services at the rural landfills and transfer stations. The public would also like to see an expanded range of recyclables collected. The third priority for the CRD, as indicated by the survey responses, should be to investigate Waste to Energy.

The public is very interested in protecting the environment; including taking measures to reduce GHG emissions and examining waste to energy to manage solid waste. Keeping program costs low was rated as the third priority, well below protecting the environment and conserving resources.

A surprising result of the survey revealed that in most areas 60 to 70% of residents compost.

1.2 Objectives

The goal of this Stage 2 Evaluation of Options report is to provide a detailed economic analysis of the current waste management system and an overview of a range possible future upgrades to the system intended to achieve further waste reduction. These contemplated upgrades, including staffed transfer stations, Eco Depots, a recyclables collection program in rural areas of the CRD, several different composting program options and a range of transportation systems, are presented in this report for consideration and feedback by the Advisory Committee and the general public. The public input will be obtained in June of 2011 via four Open Houses and via an on-line survey.

This report documents the Solid Waste Management Plan (SWMP) activities that have been undertaken by the CRD during Stage 2 of the SWMP Review. The report has been prepared in accordance with the "Guide to the Preparation of Regional Solid Waste Management Plans".

2. OPTIONS FOR FUTURE SOLID WASTE MANAGEMENT SYSTEM

This report presents and evaluates a diverse range of options to be considered for inclusion in the updated SWMP. The system modifications and associated options that were developed during the Stage 1 and Stage 2 of the planning process are introduced below and are explored individually in subsequent chapters.

Recycling Options: Expansion of recycling options, particularly into the rural Cariboo, is the highest priority. Four systems are being considered to achieve this goal:

1. Provision of convenient, easily accessible Eco-Depots at three regional service hubs in the CRD at Quesnel, Williams Lake and 100 Mile House.
2. Provision of recycling services at staffed Recycling Depots at existing high-use transfer stations and landfills in the region
3. Provision of recycling material drop-off bins at all waste management sites in the CRD, including transfer stations and landfills, and
4. Provision of periodic visits to the smaller, more remote communities in the CRD with a Recycle Trailer.

To deliver recycling services to all residents in the CRD, four service packages have been suggested by CRD staff, encompassing various permutations of the above four systems. The packages, defined as Option A, Option B, Option C and Option D have been organized to deliver a range of service improvements, and associated costs. The options include a core group of services that are common to all three options (e.g. Eco Depots, bylaw enforcement, staffing of high volume landfills and transfer stations, reconfiguring of transfer stations to realize efficiency improvements, beneficial use of concrete and contaminated soil), and a palate of service options for the outlying regions that range from staffed recycling centres to periodic service by a Recycle Trailer.

Recycled Material Processing: The recyclables collected in CRD's recycling program will have to be segregated and shipped to markets for eventual reuse. Due to collection efficiencies and user convenience, most municipalities in B.C. are moving toward single stream collection of recyclable commodities, although many regions do continue to collect recyclables using the multi-stream (blue box or blue bag) approach. The pros and cons of the two methods of recycling are examined. Also, this section explores the advantages of processing the recyclables in a large automated Materials Recovery Facility (MRF) located out of region vs. processing in smaller semi-automated systems, such as that currently employed by Central Cariboo Disposal in Williams Lake.

Extended Producer Responsibility Programs (EPR): Product stewardship programs are in place for many recyclable commodities in B.C. including beverage containers, electronics, tires, batteries and motor oil. Programs are being expanded and more products are being added to the stewardship programs each year. Planning for effective integration of EPR programs delivered by the Stewards into the CRD's SWMP is an important task to ensure that the resulting program will be efficient and convenient for the public, especially as the new packaging & printed paper EPR program is rolled out.

Composting: Composting is an effective means of diverting organic matter from landfill and instead producing a useful soil like product from the waste material. At this stage composting is at its infancy in the CRD, with activity limited to back yard composting by 60 to 70% of residences. This section examines a number of composting systems that have been rolled out in other regional districts and municipalities in B.C., including windrow compost pads for yard and garden waste, aerated static piles and in-vessel composting systems for food waste.

Wood Waste Management: Each year the CRD diverts about 5,900 tonnes of wood waste from landfills in the region. Diverted wood waste is either chipped and hauled to Capital Power's co-gen plant in Williams Lake, or it is burned in mobile air curtain burners. Continued diversion of wood waste from landfill is desirable because decomposition of wood waste in landfills generates methane gas, a very potent green house gas that has a global warming potential 21 times higher than CO_2. Also, due to air quality emission concerns, the new Landfill Criteria currently being developed for the management of wood waste at landfill sites will likely require that on-site burning of wood waste be restricted to non-dimensional lumber. This new directive will require improved separation of wood waste at landfills and transfer stations.

The presence of oversize materials, and particularly, dimensional lumber also reduces the tonnage of waste that can be placed in haul trucks servicing CRD's transfer stations. Plans are laid out in Section 7 of this report to replace the existing Transtor bins with larger 50 yd. roll-off bins that can accommodate the oversize material.

Transfer Stations: Transfer stations play an important role in the CRD solid waste management system. In general, transfer stations have been established by the CRD in outlying areas of the Cariboo that were not effectively served by landfills or where landfills were not ideally sited in the past and were closed to avoid environmental impacts. At present, most transfer stations in the CRD are based on the 25 cu.yd. Transtor container, with a smaller number of sites utilizing 40 cu. yd. roll-off bins. Many of these containers are approaching mid life to end-of-life so consideration needs to be given as to the most efficient collection system to replace these. Options include 40 or 50 cu.yd. roll-off bins, larger Transtors and high volume compactors. Push pit systems that top load into a walking floor trailer or B-train could also be considered at some of the busiest sites. This section of the Stage 2 Report explores these other transfer station delivery methods.

Because transportation represents a significant cost of service delivery, especially in a large and sparsely populated regional district like the CRD, setting up transfer stations in a way that will facilitate trucking of maximum payloads is an important objective.

Uncontrolled dumping of waste, particularly of oversize materials, and contamination of recyclable materials piles are common issues at many of CRD's transfer sites. Staffing of the busier transfer station sites is proposed to promote and enforce proper segregation of materials and to limit site clean-up expenditures.

Transportation: Transfer Stations in the CRD are serviced by several haulage contractors that utilize conventional tandem trucks hauling roll-off bins and in one case a custom manufactured horizontal top loading compactor to service the network of 17 rural transfer stations in the CRD. SHA estimates that over 8,000 truck hours are currently spent on transporting MSW from the transfer stations to the

regional landfills. Hauling requirements are expected to increase as recycling programs are expanded to rural areas.

This section explores a number of systems that should be considered by the Advisory Committee to increase the efficiency of the hauling system. These include tamping of bins, hauling of compacted bins and hauling two bins at once by adding a live trailer.

Landfills: Today, landfills are the final repository for 82% of the solid waste stream in the CRD. The bulk of solid waste residuals are deposited in the three regional landfills that service the North, Central and South Cariboo. Of the three facilities at Quesnel, 100 Mile House and Gibraltar, only the Gibraltar Landfill has been developed as a fully engineered landfill with liners, leachate collection and leachate treatment. The Quesnel and 100 Mile House landfills rely on natural attenuation.

Twelve small trench type landfills service the more remote areas of the region, including most of the towns, villages and First Nations reserves in the Chilcotin. The economic analysis of the CRD system presented in Chapter 15 revealed that in particular, landfill disposal in the West Chilcotin is very expensive at $357 per tonne while the entire rural landfill program averages $163/tonne. As the average regional landfill cost is only $28/tonne, transfer and haul to Gibraltar costs $66/tonne and rural hauling averages $67/tonne, SHA recommended that the CRD investigate whether lower costs could be realized by closing some of the remaining landfill sites and instead converting them to transfer stations.

Based on SHA's recommendation, CRD staff conducted a more detailed review of four typical landfills in the CRD system and concluded that in each case the total system costs for landfill proved to be the same as or lower than the costs of transfer. Therefore, it was concluded that despite their high costs, the small landfills still continue to be the lowest cost option for managing solid waste in the more remote areas of the CRD. Therefore, no significant upgrades to the landfill infrastructure are envisioned in this update to the Solid Waste Management Plan.

Tipping Fees: Presently, the CRD solid waste system is financed from a combination of general taxation and tipping fees. The 2010 Solid Waste Budget costs were $6,489,255. SHA's economic model indicates that a tipping fee of $94/tonne would be required on all solid waste and recyclables if the existing program were to become revenue neutral and be fully funded by tipping fees on all solid waste totaling 69,085 tonnes/year and including recyclables, wood waste, concrete and contaminated soil. If costs were to be recovered on MSW and wood waste tonnages only (not on dirt, concrete or recyclables) then the costs would be distributed over 56,011 tonnes/year and the required tipping fee would increase to $116/tonne.

This chapter explores the dangers of financing the solid waste system strictly on tipping fees from residuals, as this can lead to an upward spiral of cost increases that eventually result in residual leakage from the system and a collapse of revenue.

The pros and cons of a user pay are then examined and compared to financing the solid waste system through taxation.

Promotion and Education: The success of waste management programs and policies requires that people know and understand why and how to effectively participate in the programs. Promotion and

education, therefore, are critical to all components of the solid waste management system. It is proposed that CRD be responsible for promotion and education efforts related to CRD services such as recycling depots, transfer stations and landfills, as well as promotion and education in regards to waste reduction and reuse, composting, household hazardous waste and product stewardship programs. Furthermore, it is proposed that the promotion and education program be ramped up as part of the basic service upgrade, with the goal to continue the "Waste Wise" program in schools, as well as expand outreach into the ICI sector, sponsorship of the RCBC "hotline", expansion of advertising through media including radio, TV, newspapers and the web and community outreach. A total budget of $75,000 per year is required.

Illegal Dumping Prevention: Illegal dumping of waste is a common affliction in rural areas throughout British Columbia. This section of the report recommends that the CRD develop an illegal dumping strategy to reduce the incidence of illegal dumping. This strategy could include supporting community cleanup projects, developing a reporting program, cleaning up of illegal dumping sites, development of an anti-dumping bylaw and enforcement. Core to that upgrade will be the hiring of a full time bylaw enforcement officer. The illegal dumping strategy will be included as part of the basic service upgrade.

Plan Monitoring: The BC Guidelines for the Preparation of Regional Solid Waste Management Plans by Regional Districts recommends monitoring and evaluating the effectiveness of the SWMP during its implementation. To evaluate the plan's implementation and to ensure that the plan remains current, it is proposed that, on an annual basis, the CRD compile data to evaluate the status of the Plan's implementation and progress toward waste reduction targets. Evaluation tools will include landfill scale house data and reporting from public and private service providers regarding the quantity of waste materials recycled and composted.

The Advisory Committee that was formed to develop this updated plan will be discontinued once the Plan is approved the Minister of Environment. A Plan Monitoring Committee may be formed to oversee the implementation of the Plan and report directly to the Regional Board, or the Board may elect to oversee the program directly.

3. RECYCLING OPTIONS

A key objective of this planning process is to increase the amount of recycling, especially for rural residents. This can be achieved through increasing access to recycling services. Within municipal areas (Williams Lake, Quesnel, 100 Mile House and Wells), the provision of waste management collection services, including recycling collection, will continue to be the responsibility of the municipal government while electoral areas, small towns and villages outside municipal boundaries are served by the CRD. This report focuses on delivery of recycling services to CRD residents in these areas. However, as integration of CRD's rural program with existing and future municipal programs is seen as a critical part of the plan, consideration is also given to a big picture vision of future recycling service implementation across the entire region.

Due to operational efficiencies in collection and customer convenience, Williams Lake is collecting recyclables single stream and Quesnel is in the process of implementing a single stream collection system as well. As the CRD rural system will generate less recyclables than the urban system, it is important that it be configured so as to be compatible with the urban system in order to benefit from available economies of scale and to avoid configuring a different, more complex system for only a small part of the overall waste stream.

This section also explores whether future processing of the single stream waste should be undertaken locally in the three service hubs, or whether all single stream commodities should simply be baled and shipped to the Lower Mainland or other large automated material recovery facilities (MRF's) in the Lower Mainland, Kelowna or Tacoma.

3.1 Target Materials

In Williams Lake, the curbside recycling program accepts newspaper, cardboard, all other papers (except magazines and glossy paper), and rigid plastics (#1-7). Glass is not accepted in the curbside program. This range of materials is common in many BC recycling programs, with the exception of magazines/glossy paper that are generally included in recycling programs. Table 3.1 provides some examples of the recyclable materials collected in programs in BC communities.

Table 3.1 Recyclable Materials Collected in Four BC Communities

Material	Williams Lake	Summerland	Ladysmith	Vernon
Newspaper	✓	✓	✓	✓
Cardboard	✓	✓	✓	✓
Magazines	x	✓	✓	✓
All other recyclable paper	✓	✓	✓	✓
Metal cans	✓	✓	✓	✓
Glass bottles and jars	x	x	x	x
Plastic #1 & 2	✓	✓	✓	✓
Plastic #3 thru 7	✓	✓	✓	✓
Soft plastic (bags, wrap)	x	✓	✓	✓

Note that glass is not collected in any of the programs shown in the table. The exclusion of glass is a common feature of recycling programs for several reasons, including:

- most glass containers are beverage containers which are currently collected through the bottle deposit (Encorp) system, resulting in very little glass in the waste stream;
- glass is a problematic contaminant in other recyclables as the glass shards from broken glass in other recyclables (e.g. paper, plastic) can cause them to be downgraded or rejected by recycling markets;
- there are no consistent markets in BC for glass, making it particularly expensive to ship to recycling markets; and
- glass, if it does get landfilled, is inert in landfills – i.e. it doesn't biodegrade and it doesn't release any toxic materials.

Therefore, for the purposes of developing the recycling options, it was assumed that the following materials will be collected in the curbside recycling program:

- Cardboard
- Newspaper
- All other recyclable paper (including magazines)
- Metal cans
- Rigid plastics #1-7

Provision for glass recycling should be continued at all transfer stations, Eco Depots and landfills where dedicated glass bins should be maintained. Glass collected by this program should be crushed and slated for use as drainage aggregate at the landfills.

Soft plastics have not been included at this time due to their low market value.

3.2 Level of Material Separation

In the recycling options described below, it is assumed that moving forward; the rural recycling collection system will be based on single-stream recycling for the residential program, where all types of household recyclables will be placed in the same recycling roll-off bin or trailer. This approach was selected because it is most convenient for the participating households and it has a greatest potential for maximizing the space in the collection container between pickups, thereby reducing transportation requirements and associated costs. In multi-compartment recycling bins where users are required to sort their recyclables out by type of material (e.g. cardboard, metal, plastic, paper), there is the potential for one compartment of the container to fill up faster than the others, resulting in the container needing to be picked up with unused space in the other compartments of the container. The disadvantage of this approach is that the mixed recyclables would need to be separated out at the materials recovery facility (MRF), which often adds processing costs.

The single-stream approach was also selected for the options because:

- It models the approach that Williams Lake is already using for its curbside collection program and which is being rolled out in Quesnel.
- The local MRF in Williams Lake is set up to handle singe-stream recycling

- When at unstaffed sites, multi-compartment recycling bins tend to accumulate significant levels of contamination that require additional sorting at the MRF.

Although single-stream recycling has been assumed for purposes of developing costs for the recycling options, the final decision regarding single-stream vs. multi-stream recycling bins is anticipated to happen as part of implementing the Solid Waste Management Plan and will be best determined through a detailed costing exercise once the number of staffed and unstaffed recycling depots, location-specific transportation requirements and processing costs are known.

3.3 Approaches to Collection

Three approaches to recycling collection are described in this section: eco depots, staffed recycling depots, and mobile recycling trailers. These approaches refer to collection of recyclables at transfer stations and in the electoral areas. Municipal collection of recyclables will play an important role in achieving the CRD's waste diversion goals, but will be defined by each municipality. Therefore, it is not addressed as part of these options.

3.3.1 Eco Depots

Eco Depots are multi-function waste management sites that are intended to be one-stop locations for most waste management needs. Eco Depots typically include:

- recycling for common household recyclables such as paper, cardboard, plastic containers and metal cans;
- recycling for other recyclable items such as appliances;
- collections of EPR-regulated products on behalf of the stewardship organizations (See discussion on EPR-regulated Products and Packaging in Section 5.);
- an area set aside for reusable goods (e.g. a "free store" or "share shed");
- garbage disposal services; and
- staff that are on-site whenever the Eco Depot is open.

As Eco Depots provide a wide variety of services, they are often centrally located to their service population and serve a large geographic area. The key advantage of Eco Depots is convenience, since most waste management services can be found at a single location.

Several communities have eco depots. Examples provided in this report are the Valemount transfer station in the Regional District of Fraser Fort George and the AQUATERA Eco Centre in Grande Prairie, Alberta.

The Valemount transfer station, shown in photographs captioned Photos 3-1 on the next page, provides a staffed Eco Depot for roughly 1,000 households. Services at the site include waste disposal, recycling, collection of some EPR products, and a reuse shed. The specific items collected at the site are:

- Recyclables: paper, metal cans, milk jugs, cardboard

- EPR Products: Used motor oil and containers, paints, solvents, rechargeable batteries, lead-acid (automotive) batteries, antifreeze, tires
- Other Recycling: wood, appliances, scrap metal

The cost to operate the Valemount Transfer Station/Eco Depot is roughly $107,000 per year, including tipping fees for disposing of the garbage at the landfill in Prince George. The per household cost is roughly $100 each.

AQUATERA is the government-owned utility that provides waste management services for the City of Grande Prairie and surrounding communities. One of the services operated by the utility is a central Eco Depot that they called their "Eco Centre". Photos of the facility are presented in Photo 3-2. At the Eco Centre, residents can drop off household recyclables, household hazardous waste and yard waste. There is also a compost demonstration garden and a reuse centre for used building materials at the centre. The staffed facility serves a population of 40,000 (15,000 households) and is open daily. The approximate cost to operate the Eco Centre (excluding capital) is $150,000 per year, including $24,000 for the reuse centre for used building materials. This is roughly $10 per household.

The significant difference in per household cost between Valemount and Grande Prairie reflect the scale of the community and the transportation requirements. Grande Prairie's Eco Centre is located next door to the recycling processing facility and yard waste is transported to a nearby composting facility. Valemount must truck their recyclables and garbage 300 km to Prince George.

The CRD is considering developing full service Eco Depots in Quesnel, Williams Lake and 100 Mile House as part of the basic upgrade to solid waste services that would be core to all three service improvement options A, B and C. SHA has developed a working budget for such Eco Depots, as presented in Table 3-2.

Photos 3-1. Valemount Transfer Station/Eco Depot

EPR materials (oil, antifreeze, paints & stains)

Household Recyclables Recycling Bin

Large Appliances and Scrap Metal

Garbage Transfer Bins

Compactor for Cardboard

Wood Waste

Photos 3-2 Photos of Grande Prairie/Eco Centre

	
Recycling Bins	**Household Hazardous Waste Storage**
	
Yard Waste Bins	**Electronic Waste and Fluorescent Tube Storage**

Table 3-2. Preliminary Budget for Eco Depot

Operating Costs				
Full Time Staff (1)			$ 49,340	
Plant Supervisor (33% allocation)			$ 22,486	
Part Time Staff			$ 12,335	
Staff Memberships			$ 500	
Staff Training			$ 300	
Staff Travel			$ 1,000	
Computer			$ 300	
Communications			$ 1,000	
Depot Capital			$ -	
Depot Maintenance			$ 3,000	
Depot Operation			$ 10,000	
Depot Utilities			$ 10,000	
Property Rent			$ 18,000	
Disposal Charges - Batteries			$ 5,000	
Equipment Lease			$ 20,000	
Equipment Maintenance			$ 15,000	
Freight			$ -	
Insurance			$ 5,000	
Miscellanenous			$ 4,000	
Promotion			$ -	
Supplies			$ 3,000	
Tipping Fees			$ -	
Administration			$ 5,000	
			185,261.71	
Capital Costs				
Bins (5)		5	$75,000.00	
Compactor 4 CC		1	$30,000.00	
Compactor 2 CC		1	$20,000.00	
Electrical Wiring		1	$10,000.00	
BobCat		1	$25,000.00	
Total Recycling Capital			$160,000.00	
Principal Payment (10 years)				$13,326.55
Interest Payment at 4% (MFA 1)				$7,744.00
				$21,070.55
Total Cost of Eco Depot				**$206,332.27**
	Quesnel		4,492	**$45.93** per tonne
	Williams Lk.		3,754	**$54.96** per tonne
	100 Mile House		1,934	**$106.69** per tonne

3.3.2 Staffed Recycling Depots

Staffed recycling depots, as shown in Photos 3-3, are simpler version of Eco Depots, as they provide recycling services but do not typically provide disposal options for EPR-regulated materials or provide reuse opportunities. The advantages of having staffed recycling depots are:

- Staff can provide information on proper use of the facility and local options for waste materials that are not accepted at the recycling depot;
- Contamination of the recyclables is reduced;
- They tend to be tidier than unstaffed sites;
- Tipping fees can be collected if a user-pay system is implemented
- Access to the facility can be restricted to unauthorized users (e.g. commercial haulers)

Photos 3-3. Typical Staffed Recycling Depots

Staffed Recycling Depot on Sunshine Coast

Recycling Depot Attendant

Photo 3-4. Typical Recycling Bin

Assuming that single-stream recycling is implemented at the CRD's recycling depots, 40 yd^3 single compartment roll-off bins like the one shown in the photograph to the left, would be the most efficient choice for a collection container. The cost to purchase this type of container is approximately $10,000 to $12,000. At busier depots, it may be cost-effective to have a second container for only cardboard because of the volume of cardboard and potential market value of keeping this material separate.

Anticipated operating and amortized capital costs for a typical staffed recycling depot and transfer station are presented in Table 3-3 below. In the analysis, the capital costs of upgrading the transfer stations from the current 25 cu.yd. Transtor configuration to a more efficient 50 yd. roll-off bin are considered. These upgrades are discussed in more detail in Section 7.

Table 3-3. Typical Budget for Staffed Recycling Depot and Transfer Station

Input Parameters		
No. of MSW Bins	1	
Volume of Refuse Bin	50	cu.yds
No. of Recycle Bins	1	
Volume of Recycle Bin	40	
No. of Oversize Bins	1	
Volume of Oversize Bins	40	
Hours of Operation per Week	40	
Capital Cost of MSW Bin	12000	
Capital Cost of Single Stream Bin	10000	
Capital Cost of Oversize Bin	10000	
Lock Block Wall Length	144	ft
	43.8912	m
Earthworks Volume	877.824	m3
Earthworks Rate	15	per m3
Earthworks Cost	$13,167.36	
Number of Blocks	88	
Price of Blocks (installed)	$200.00	
Total Cost of Blocks	$17,600.00	
Price Safety Railing	$5,000.00	
Surface Area of T.S.	12040.234	m2
Volume of Gravel Surfacing	2408.0468	m3
Cost of Gravel Placed	$35.00	per m3
Cost of Gravel	$84,281.64	
Area of Concrete	702.2592	m2
Volume of Concrete	210.67776	m3
Cost of Concrete	$100	m3
Cost of Concrete Pad	$21,067.78	
Locking Gate Cost	$5,000.00	
Attendant Shelter Cost (Sea Can)	$20,000.00	
Total Cost for T.S.	$188,116.77	
Engineering @25%	47029.1935	
Contingency @25%	58786.4918	
Total Cost for T.S.	$293,932.46	
Ammortization Cost @ 25 years	**$23,514.60**	
Attendant Hourly Salary	$20.00	
Annual Salary Cost	$41,600.00	
Total Transfer Station Cost	**$65,114.60**	
Note: existing costs for Maintenance, Marshalling yard management, share shed, snow removal, grading, wood burning, etc. continue to be carried per existing budget.		

3.3.3 Recycling Trailer

A mobile trailer for recycling that moves around the regional district on a regular schedule is the third proposed approach to recycling. Recycling trailers come in a variety of shapes and sizes, as shown in the photos below.

Photo 3-5 Photos of assorted Recycling Trailer options

The advantage of trailers for recycling is the low capital cost (estimated to be $20,000-30,000 per trailer). Operating costs for trailer systems are variable and depend on how quickly the trailer fills up (as it needs to be brought back to the recycling facility to be emptied before it can be moved to the next location), and the distance traveled between locations.

The use of mobile recycling trailers to provide community recycling collection is common in Alberta. The Town of Canmore provides a Community Recycling Trailer that services several communities in the town. The trailer, pictured in Photo 3-6, is moved to a new community each day of the week. The trailer is generally located in school parking lots, so that it services the school's recycling needs as well. The local school district partnered with the Town in the purchase of the trailer. The trailer, as shown below, is made by Haul-All and cost $65,000.

Photos 3-6. Canmore's Recycling Trailer

Some communities that have used trailers for several years are phasing out the trailer-based recycling program in favour of permanent drop-off bins for recycling. Demand for more frequent access to recycling, the need for more capacity for recyclables (due to the popularity of recycling), and increasing hauling costs are the reasons cited for replacing the trailer with permanent bins. The trailers were considered a good starting point for recycling in these communities as they confirmed the communities' interest in recycling.

Due to the very large distances involved, recycling trailers are going to be less efficient in servicing the more remote communities of the CRD because of their very limited capacity. The very largest recycling trailers bulk out at about 20 cu.yds. On the other hand, roll-off bins provide 200 to 250% more capacity, and when one considers that two bins can be hauled concurrently, the service frequency can be reduced by a factor of 5. The costs of both systems are explored in

3.4 Recycling Options and Estimated Costs

Based on the review of systems, four options have been developed by the project team for consideration by the Advisory Committee and the public. These options aim to increase access to recycling for residents outside of municipal boundaries:

A. Eco Depots in 100 Mile House, Williams Lake and Quesnel
+ 6 staffed transfer stations at Baker Creek, Frost Creek, Forest Grove, Lac La Hache, Wildwood and 150 Mile House, 3 staffed landfills at Watch Lake, Inter Lakes and West Chilcotin, 29 Recycling roll-off bins at all refuse sites

B. Eco Depots in 100 Mile House, Williams Lake and Quesnel
+ 9 staffed transfer stations and landfills with no recycling provisions. All 29 rural communities to be visited by the Recycle Trailer

C. Eco Depots in 100 Mile House, Williams Lake and Quesnel
+ all remaining communities are visited by the Recycle Trailer

D. No new Eco Depots.

+ 9 staffed transfer stations with no recycling provisions. All 29 rural communities to be visited by the Recycle Trailer.

A fifth option, Option E, was added later by SHA. This option is essentially the same as Option A, expect that instead of having the recycling containters located at the landfills and transfer stations they would instead be into into high profile locations in each community.

The options have been structured such that Option A would likely achieve the highest level of diversion and would likely be associated with the highest implementation costs, while Option D would require much less capital investment but would realize the lowest increase in diversion of recyclables.

Recognizing some long standing problems with system delivery, all four options would include a number of basic core services that include:

- Controlled sites with regulated hours for the nine busiest transfer stations and landfills
- Site upgrades at all landfills to provide safety rails and marshalling areas for wood waste and metals at landfills where those facilities are lacking
- New 50 yd bins at all transfer stations to accommodate oversize materials
- Increased promotion and education programs
- Dedicated bylaw enforcement officer and strategies to counter illegal dumping

The following assumptions have been used to develop the cost estimates for the recycling options:

- Eco Depots will be incorporated into local transfer stations in Williams Lake, Quesnel and 100 Mile House. Williams Lake facility may be relocated to a more convenient property
- The six busiest transfer stations at Baker Creek, Frost Creek, Forest Grove, Lac La Hache, Wildwood and 150 Mile House will be staffed 40 hours per week
- The three busiest landfills at Watch Lake, Inter Lakes and West Chilcotin will be staffed 40 hours per week
- If provided, the recycle trailer will be sited close to developed areas and near high-traffic locations, such as in a retail or school parking area
- No additional land costs have been considered
- Staff for the Eco Depots and the recycling depots will be the same staff that operate the refuse disposal sites
- Processing of the recyclables will be done by a private recycling processor using the most effective system
- Revenue from recyclables will be used to offset hauling costs
- The net cost of shipping recycled materials to market will depend on markets and prices paid for the commodities, including cardboard and mixed single stream recyclables, and on future haul costs

Based on the information collected to date, Maura Walker Associates have projected the likely level of diversion that could be realized with each of the above options. The projections for each scenario are summarized in Table 3-4. These performance projections are carried forward into SHA's integrated model of the CRD's solid waste system to determine the overall diversion efficiency that would likely be realized with each option, as well as the overall system cost. The results of the modelling analysis are presented in Section 15 of this report.

Table 3-4. Diversion Performance Levels for Recycling Options A, B and C

	Services									
Recycling	Garbage	Large items	Household recyclables	Scrap metal	Yard waste	Clean wood waste	Dirty wood waste	Reuse Area	EPR Collection	
Services at each site (existing and planned)										x *refers to future service*
Eco depots at 100 Mile, Williams Lk & Quesnel	x	x	x	x	x	x	x	x	x	
9 staffed transfer stations	x	x	x	x	x	x	x	x		
Unstaffed transfer stations	x	x	x							
Recycling Trailer			x							

Recycling	Impact of implementation								Assumptions
	Garbage (landfilled)	Recycling	Yard waste	Food waste	metal	wood	EPR	Commercial recycler	
Option A	%	%	%	%	%	%	%	%	
Eco depots at 100 Mile, Williams Lk & Quesnel	75	5	0	0	2	0	2	16	Assumes disposal bans and promo/ed
9 staffed transfer stations with recycling bins	82	16	0	0	2	0	0	0	Assumes disposal bans and promo/ed
Recycling bins at unstaffed sites	97	3	0	0	0	0	0	0	No disposal bans in place.
Option B	%	%	%	%	%	%	%	%	
Eco depots at 100 Mile, Williams Lk & Quesnel	75	5	0	0	2	0	2	16	Serves host communities, disposal bans implements to drive ICI diversion
9 staffed transfer stations with recycling bins	82	16	0	0	2	0	0	0	Assumes disposal bans, promo/ed, active engagement of staff with custom
Recycling Trailer services remaining 20 communities	92	8	0	0	0	0	0	0	Trailer located in high profile area (not at refuse site)
Option C	%	%	%	%	%	%	%	%	
Eco depots at 100 Mile, Williams Lk & Quesnel	75	5	0	0	2	0	2	16	Assumes disposal bans and promo/ed
Recycling Trailer services remaining communities	92	8	0	0	0	0	0	0	Trailer located in high profile area (not at refuse site)
Option D	%	%	%	%	%	%	%	%	
Recycling Trailer services all 29 rural communities	92	8	0	0	0	0	0	0	Trailer located in high profile area (not at refuse site)
Option E	%	%	%	%	%	%	%	%	
Eco depots at 100 Mile, Williams Lk & Quesnel	75	5	0	0	2	0	2	16	Assumes disposal bans and promo/ed
9 staffed transfer stations with recycling bins	82	16	0	0	2	0	0	0	Assumes disposal bans and promo/ed
29 recycling bins in high profile locations in communities	92	8	0	0	0	0	0	0	Bins located in high profile area (not at refuse site)

Assumptions:

All the diversion numbers shown above are based on NEW diversion from waste that is currently landfilled

If there is a zero, it is assumed that no NEW diversion will be achieved given the suite of actions proposed (there may already be diversion, but that info is not included here)

32% of waste disposed is recyclable

2% of waste disposed is HHW (EPR-regulated products)

22% of waste disposed is food waste

6% of waste disposed is yard waste

10% of waste disposed is wood waste

4% is metal

All of the composition data used (as shown to the left), is taken from the Stage 1 report

For the areas with eco depots, it is assumed that disposal bans will be a big driver for ICI diversion. As a result, some diversion to commercial recycling collection companies is expected.

Based on disposal bans, the eco centre and additional promo/ed, 66% diversion of recyclables is expected in Williams Lk, 100 Mile and Quesnel.

In rural areas with staffed depots, recyclables diversion of 50% is assumed, based on disposal bans, promo/ed and staff engagement with customers ("that cardboard goes in the recycling bin over there.."

At unstaffed transfer sites, recycling diversion is expected to be 10%

The recycling trailer is expected to get 25% diversion (may be too high) due to higher visibility and aggressive promo/ed campaign

3.5 Recycling Program Performance and Costs

SHA developed a comprehensive computer model of the entire CRD solid waste system, including collection, transfer stations, haulage, recycling facilities, landfills, education and commodity sales. The results of the integrated model are explored in Chapter 15 of this report. This section focuses exclusively on the performance of the five recycling collection options.

Based on established unit rates and performance statistics for the various collection and recyclable material handling systems, SHA determined the annual and per tonne program costs for each of the recycling options A to E described above. The results are summarized in Table 6-2.

Table 3-5 Comparative Performance and Costs of Various Recycling Options

Level of recycling service for recyclable discards	Assumptions	Estimated Recycle Costs	Estimated Diversion
Existing System	• 3 Urban Recyle Centres • Curbside Single Stream in WL No rural recycling	$331,338 $46/Tonne $13/household/yr (avg)	10.4% 7,200 Tonnes
Option A: • Three Eco-depots • Recycling bins at all transfer stations/landfills	• 3 Eco Depots • 9 Attended Transfer Stations with Recycling Bins • 20 Recycling Bins located in Communities • Concrete Recycling and Air Curtain incineration	$805,455 $49/Tonne $32/household/yr (avg)	23.7% 16,361 Tonnes
Option B: • Three Eco-depots • Recycling bins at the nine busiest refuse sites • Recycling trailer to service remaining sites or community location	• 3 Eco Depots • 9 Attended Transfer Stations with Recycling Bins • 20 Communities serviced with Recycling Trailer • Concrete Recycling and Air Curtain incineration	$812,209 $49/tonne $32/household/yr (avg)	24.0% 16,563 Tonnes
Option C: • Three Eco-depots • Recycling trailer to visit all sites or community location	• 3 Eco Depots • 9 Attended Transfer Stations with No Recycling • 20 Communities serviced with Recycling Trailer • Concrete Recycling and Air Curtain incineration	$792,682 $50/tonne $31/household/yr (avg)	22.8% 15,718 Tonnes
Option D: • No Eco-depots • Recycling trailer to visit all sites or community location	• No Eco Depots • 9 Attended Transfer Stations with No Recycling • 20 Communities serviced with Recycling Trailer • Concrete Recycling and Air Curtain incineration	$255,564 $30/Tonne $18/household/yr (avg)	12.4% 8,578 Tonnes
Option E: • Eco Depots and 29 Recycling Bins in Communities	• 3 Eco Depots • 9 Attended Transfer Stations with no recycling • 29 Recycling bins conveniently located in communities • Concrete Recycling and	$774,459 $47/tonne $31/household	24.0% 16,563 Tonnes

	Controlled Burning		

In Table 3-5 the programs are generally arranged in order from most effective (and most costly) to least effective and least costly. Eco Depots generate a very large percentage of the overall recycling diversion (about 13,000 tonnes diverted through program) because they service a large population base. The community rural collection programs are slightly more expensive than collection at the landfills and transfer stations, but they are also expected to achieve a higher participation rate. Therefore, community based bin or trailer locations are recommended, as presented in Options B and E. As the recycle bin program will reduce collection costs by about $20,000 per year while delivering a more convenient service than a weekly or bi-weekly trailer visit (bins will be available around the clock) this program is considered more effective than the recycling trailer. If this service is abused and residents also dump garbage into the bins, then they will need to be relocated to the attended landfill facilities.

4. PROCESSING OF RECYCLABLE MATERIALS

The processing of recyclables (the sorting and preparing of recyclables for the recycling marketplace) collected through the CRD and a municipally funded recycling program is currently provided by private recycling companies located within the CRD. Processing services are contracted out through a competitive process. In BC, the contracting out of processing services to recycling businesses with the equipment, expertise and market access, is the most common method of program delivery for municipal and regional governments and generally results in the lowest service costs. This approach to recycling processing will be continued in the CRD.

Due to efficiencies in collection and public convenience, the Williams Lake curbside recycling program has been implemented as a single stream recycling program where the following recyclables are collected: cardboard, mixed paper, plastic containers, and tin cans. The recyclables are placed in a 260 L blue recycle cart which is then collected weekly by Central Cariboo Disposal. To avoid contamination, glass is not included in the curbside program.

Curbside collection of residential recyclables is a service in Williams Lake that is currently provided to approximately 4,400 homes on a weekly basis. According to the Contractor, two truck loads of recyclables totaling approximately 2,400 Kg are collected daily. The Quesnel recyclable collection program is also being implemented as a single stream system.

At present recyclables collected in the Williams Lake Program are processed at a semi-automated materials recycling facility (MRF) facility in Williams Lake. The recyclables are sorted on a picking line as shown in Photo 4-1 and then shipped loose to the Quesnel recycling facility for baling.

Photo 4-1. Recycle Sorting Line at Central Cariboo Disposal – Williams Lake

Because it is very labour intensive, many municipal programs have switched from small tonnage community based MRF facilities with operating costs of several hundred dollars per tonne to instead baling the single stream recyclables and shipping them unsorted for processing in a large capacity, fully automated MRFs, such as the Urban Impact facility in Richmond (pictured in Photo 4-2), the Metro Waste Paper Recovery Plant in Kelowna or the SP Recycling Corporation facility in Tacoma, Washington.

Photo 4-2 Urban Impact Automated MRF Facility in Richmond

The large automated MRF facilities such as Urban Impact typically pay $30 to $75/tonne for uncontaminated commingled recyclables, depending primarily on demand in overseas markets. During the economic collapse of 2008, for a period of time MRF facilities lost access to markets and started charging producers to take single stream recyclables. This is not considered the norm. On average, a price of $40 to $45/tonne can be expected, FOB Vancouver.

To benefit from the efficiencies and large economies of scale, the CRD is encouraged to set up the CRD residential recycling system such that single stream recyclables will be baled in Quesnel, Williams Lake and 100 Mile House and shipped to a large automated MRF for final processing. Although it provides four jobs in the community, the manual sorting of recyclables using the semi-automated system, such as is currently done by Central Cariboo Disposal in Williams Lake, should be discontinued.

5. EXTENDED PRODUCER RESPONSIBILITY OPTIONS

"In British Columbia, Industry-led Product Stewardship is a government strategy to place the responsibility for end of life product management on the producer and consumers of a product and not the general taxpayer or local government." (BC Ministry of Environment Product Stewardship website).

The Extended Producer Responsibility (EPR) or Product Stewardship programs reflect the above policy by assigning brand owners and consumers full financial responsibility for managing the environmental impact of a product across the whole life cycle of the product from production to final disposal. The key to EPR programs is that there are no costs for the management of the end-of-life product waste borne by the local government or waste disposal authority. The initial focus was to reduce the level of toxicity in the waste stream and subsequently to reduce high volume waste. Currently, there are nine EPR Product Stewardship programs in place for the following materials:

Products currently covered by an EPR program:

- Paint;
- Tires;
- Cell Phones
- Televisions
- Used motor oil, oil filters and empty oil containers
- Batteries
- Solvents;
- Fuels
- Thermostats
- Residential fluorescent lamps
- Audio-visual and consumer equipment
- Small appliances
- Pesticides;
- Pharmaceuticals
- Beverage containers
- Printers
- Computer monitors, keyboards, mice and other peripherals
- Smoke detectors

In the coming months the program will be expanded to include the following materials:

Products to be covered by an EPR program:

<u>As of July 2011</u>

- Antifreeze
- Lead-acid batteries

<u>As of July 2012</u>

- Large appliances
- Electrical and electronic tools
- Medical devices
- Automatic dispensers
- Lighting equipment
- Toys, leisure and sports equipment
- Monitoring and control instruments
- IT and telecommunications equipment
- Batteries used in these products

The Provincial Government has set out the schedule for phased expansion to include a greater range of products and to focus on products with high toxicity. Anti-freeze and specific small batteries are significant from a toxicity reduction perspective while other products such as large electrical

appliances, the white goods of the waste stream, will reduce both toxicity and volume from the waste stream.

A brand new EPR program for printed paper and packaging was recently announced by the Ministry of Environment. The program will require the producers of printed paper and packaging to implement and fully manage these discards. Implementation of the program will occur over the next three years and the program will be fully implemented by May, 2014. When the full product schedule is in place it could remove as much as 40% of the waste stream from local and regional government responsibility (the bulk of paper and plastics would be included). How the new program will interface with municipal recycling collection programs remains to be determined.

The collection infrastructure for mandatory product stewardship programs may consist of return-to-retail and / or stand-alone depot systems. Stewardship agencies may directly operate their collection and / or recycling / disposal systems themselves or under contract to service providers. In accordance with the *BC Recycling Regulation*, the costs of collection and management of product stewardship programs are to be borne by producers and consumers, not by local governments or taxpayers. Most programs charge separate fees at the point of purchase to cover the costs of managing the discarded product, and the fee is shown on the sales receipt as an "eco-fee". These fees are applied by producers / brand owners as part of the price of the product; they are not government-applied taxes.

The Stewardship agencies that include ENCORP, B.C. Used Oil Association, Product Care B.C. amongst others have been formed by producers and brand owners to deliver a single efficient program for each recyclable material. The stewards have the flexibility to collect recyclables at point of sale and/or at recycling depots. It has been demonstrated that one of the most effective means of EPR program delivery is at Eco Depots where many different recyclables can dropped of by the public at one convenient location.

The Stewardship Agencies are responsible for educating consumers regarding their programs and for providing information about collection options, fees, and handling practices. Most agencies maintain websites, and / or utilize the services of the Recycling Council of BC Hotline.

Planning for effective integration of EPR programs into the CRD's SWMP is an important task. In particular, the integration of the new printed paper and packaging EPR program is expected to have a profound impact on how the bulk of recyclables will be managed in the future within the CRD. A key objective should be centralization of recycling services. The delivery models being used include full municipal implementation, such as the state-of-the-art Eco Depot operated by the Capital Regional District at Hartland Landfill and the full service Recycling Centre operated by Skeena Queen Charlotte Regional District in Prince Rupert to private / public facilities such as the Aquattera Eco-Depot in Grande Prairie that is located across the road from the private for profit Recycle Plus Recycling Centre, to the completely private for profit Eco-Depot recycling centre in Fort St. John.

Recognizing that private waste management companies including Quesnel Recycling Depot, Central Cariboo Disposal and Gold Trail Recycling are important service providers with a well established presence in the hub communities, it is important to plan the delivery of future EPR programs in a way that will compliment rather than compete with existing programs, with the overlying objective of making the services as convenient as can be for the public.

The CRD supports the concept and practice of product stewardship. The following options are available to improving the product stewardship-related services in the CRD:

i. CRD will work directly with stewardship agencies and BC Ministry of Environment to ensure that stewardship agency collection depots are well-sited and meet the needs of the CRD's communities.

ii. CRD will partner with stewardship agencies to provide collection services at the CRD's Eco Depots. At the eco depots, the CRD will provide space and staffing for the collection and storage of EPR-regulated products. The stewardship agencies will provide funding for:

- Construction of storage buildings (if required)
- Containers appropriate for storage of the materials
- Training for Eco Depot staff
- Transportation and disposal/recycling of the collected materials

iii. The CRD will partner with stewardship agencies to provide round up events for smaller communities on a regular basis (e.g., biannually). For these events, CRD will coordinate the collection events and provide on-site staff to greet and direct participants. The stewardship agencies will provide:

- Funding for event promotion,
- Technicians for each event that are familiar with the receipt and packing of the hazardous waste products received at the events,
- Approved collection containers, and
- Transportation and proper disposal or recycling of the collected items.

iv. CRD will participate on the Local Government Stewardship Council (LGSC) to lobby stewardship agencies to improve services and funding levels to collection agents.

v. The CRD will ban disposal of EPR-regulated products as garbage at local transfer stations and landfills.

The benefits of EPR to local government and taxpayers are significant and it is critical that any long term waste management planning and ensuing contracts recognize the changes that will come from a product waste going into a stewardship program. Further, CRD, as with other outlying jurisdictions, also has the challenge of getting stewards to provide adequate levels of service to significantly impact waste volumes. Stewardship Plans set provincial targets for materials recovery and in many cases those targets can be reached by having efficient metropolitan based programs with little need to incur the costs of operating less efficient programs to service lower population density areas. Part of this problem can be addressed by having regional recovery targets as part of the provincial target in the stewardship plan and CRD and other jurisdictions should continue to work to ensure that the Provincial Government recognizes this imbalance. It is also critical that CRD maintain an ongoing working relationship with all of the stewards so they will meet the CRD's needs and opportunities.

Further, in many cases, some of the benefits of stewardship programs can be gained for non-stewardship products by CRD working with retailers and business operators to develop complementary programs. For example, currently large screen televisions are part of the electronics stewardship program. It is not unusual for a consumer to buy a new large screen television and include delivery,

set-up and removal of the old television as part of the purchase price and service. Typically this means that the while the televisions are the actual EPR product, the packaging is removed and taken back to the retailer or distribution centre. This way, the packaging including the cardboard, plastic film and expanded polystyrene cushion packaging are kept clean and consolidated in a central location. All of these materials are recyclable and if the CRD has worked with the retailer to ensure that a recycling program is in place then the materials will not go into the waste stream. The packaging, while not currently a stewardship item, can be managed very efficiently as a complementary program paid for by the consumer and diverted from the waste stream as a clean high quality secondary material at little if any cost to taxpayer.

6. COMPOSTING

Composting is the controlled biological decomposition and stabilization of organic waste under conditions that allow microorganisms to produce a stable, humus – like soil product. Organic waste is comprised of yard and garden waste (grass, leaves, weeds, twigs), food waste (from food production and consumption) and wood waste (branches, stumps, clean structural wood). The organic fraction of landfilled waste is estimated to be 38% by weight and therefore finding other methods to manage the organics represents a significant opportunity to reduce the amount of waste sent to landfill. By redirecting the organic fraction to composting, the following can be achieved:

- increasing the life of our landfills;
- reducing the production of leachate at landfills;
- reducing the production of landfill gas and reducing greenhouse gas emissions;
- reducing subsidence in the landfills;
- reducing the attraction of vectors (birds, rodents, bears) to the landfills; and
- developing useful end-products such as compost (that can also generate revenue).

Providing composting opportunities also reduces the incidence of burning as a means of disposal. Burning is commonly used to dispose of yard waste and woody waste, both of which can be used for making compost. The following sections describe options to divert organic waste from landfills and reduce the incidence of organic waste burning as a means of disposal.

Expansion of composting programs is strongly supported by the residents of the CRD. In the Stage 1 Public Consultation Survey, composting of yard and garden waste was ranked as the fourth highest priority with a score of 3.0 to 3.5 out of 5.

6.1 Backyard Composting Program

Backyard composting is one of the most cost effective methods of waste reduction. When people compost at home, that organic material does not require collection, disposal or composting at a centralized facility, and the associated costs can be avoided.

A backyard composting program would include the following components:

- Development and distribution of "how-to" compost and grass cycling brochures;
- Sale and distribution of subsidized backyard compost bins;
- Delivery of composting workshops
- Compost demonstration sites (located in community gardens).

Depending on the level of compost bin subsidization, a backyard composting program can be a very low cost method of waste reduction. Programs can be delivered for under $1 per household per year.

6.2 Centralized Composting

Backyard composting does not appeal or is not possible for every home and business that generates organic waste. Additionally, composting some food wastes, such as meat, bones, grains, grease and dairy is not appropriate for a backyard composter. As a result, a centralized composting system to handle large volumes of organics is required to maximize the diversion of organic waste.

The process conditions under which composting proceeds are managed by controlling the following parameters: temperature, oxygen supply, moisture content, and ratio of carbon to nitrogen in the organic waste materials.

Most composting systems include design features that recognize the need for addressing several potential issues present when handling organic waste. Most important among these issues are odour control, management of liquids generated during the composting process, and achieving minimum temperature and residence time to eliminate pathogenic organisms contained in the organic waste.

Available composting processes are diverse and mechanically quite different, although all operate to achieve similar objectives in disposal of waste and production of a useful product. There are two composting processes being considered as part of this planning process: in-vessel composting and turned windrow composting.

6.3 Turned Windrow Composting

A turned windrow composting facility places a blend of organic wastes in long "windrows" or linear triangular piles some 2-3 meters high, 3-5 meters wide, and up to several hundred meters long arranged in parallel lines (see Photo 6-1 below). The piles are periodically turned with the frequency being determined by the stage of composting. Turning the windrows speeds the composting process and ensures uniform pathogen reduction and product quality. About 75% of the composting facilities in Canada are windrow facilities.

The advantages of turned windrow composting are relatively low capital and operating costs (estimated to be roughly $50 per tonne), simple low technology requirements, and flexibility in management of material. Disadvantages associated with turned windrow methods include large land area requirements, difficulty maintaining moisture in dry climates, managing leachate in wet climates, and potential for significant odour and vector attraction issues. Open windrow composting is suitable for many organic waste materials, although it is most commonly used for processing yard waste.

Many regional districts and municipalities have been operating windrow composting programs to divert organic waste from landfill for years. Some of the best known programs include Kelowna's yard and garden waste and biosolids composting program that markets their compost under the popular Ogo-Grow brand, the Regional District of Fraser Fort George windrow composting program that diverts some 8,000 tonnes of compost each year, and the City of Kamloops composting operation.

Photo 6-1 Turned Windrow Composting Facility

6.4 Aerated Static Pile Composting

Aerated static pile composting involves forming large piles of feedstock (compostable materials) and introducing air to the composting mass either through positive aeration or negative aeration. Air is supplied by industrial fans and conveyed to the composting mass via pipes embedded underneath the compost pile. Airflow is controlled through timers or temperature probes that trigger aeration for cooling when the piles approach the maximum threshold temperatures for efficient composting Pre-processing of feedstock is very important with these systems as piles are constructed using a front-end loader and are not usually turned or agitated after they are formed.

Photo 6-2 Kelowna's aerated static pile composting system

Most large aerated static pile systems contain similar elements. These include an impermeable surface with embedded aeration pipes, industrial blowers and aeration controls. Some advantages of aerated static piles are: smaller land area requirements than for windrows, effective air management, and relatively low overall technology and staffing requirements. Disadvantages of aerated static piles systems include higher capital costs than for windrow systems, potential odor management and vector problems, and potential for preferential air channels to develop that lead to an inconsistent end product.

Aerated static piles systems are most suitable for well-blended homogenous feed stocks. Composting of yard waste and biosolids has been successfully composted using this system.

6.5 In-Vessel Compost Processing

In-vessel composters are completely enclosed composting units. Organic wastes are composted under conditions where air, moisture and temperature are carefully controlled. In vessel technologies are highly automated and come in two general varieties: batch processes or a continuous feed processes.

Photos 6-3. Photographs of In-Vessel Composting Facilities

Batch processes often use modular containers that are loaded with premixed organic wastes and are generally not disturbed again until after the composting process is complete. Continuous feed systems employ rotating drum or tunnel technology. Each day new material is added to one end of the system and finished product is removed from the other end.

In-vessel technologies offer almost total control of the composting environment and require the least amount of land per volume of material processed. In-vessel technologies are best suited to situations where a high degree of process control is desirable or the threshold of tolerance for odours and vectors is very low.

The advantages of in-vessel composters are: the high degree of process control achievable (temperature, moisture and oxygen levels), the ability to completely control odours during initial composting; and scalability (most in-vessel systems are modular and can be extended or added to).

High capital costs and mechanical complexity have been cited as a disadvantage of in-vessel composting. The estimated per tonne cost for in-vessel systems is $80-100 per tonne (including capital). Additionally, many systems require continued composting/curing after the initial in vessel residence time is complete. This can be a source of odours, since the partially composted and odourous material must be further cured in windrows or static piles.

In-vessel composters have their greatest application in the composting of pathogenic organic wastes such as commercial and residential food wastes, fish waste, and biosolids. Recently, a number of municipalities have started gearing up to divert these materials from landfill. To control odours, some form of in-vessel composting system is generally required. Pioneers in this area include Carney's Waste Systems and the Resort Municipality of Whistler operating in the Sea-to-Sky corridor serving Squamish and Whistler, and the Regional District of Nanaimo and International Composting

Corporation (ICC) serving east Vancouver Island. Metro Vancouver is moving toward organic waste diversion in a big way, with the overall goal of increasing diversion from 55 to 70%.

Collection of organics is an important part of food waste composting programs. Implementation of a food waste composting program in the CRD would require curbside collection of organics on a weekly basis. Options for collection are explored below.

6.6 Organics Collection

As with recycling, the two main collection mechanisms for organics collection are curbside and depots. Curbside collection of yard waste is provided in many municipalities across Canada, typically in urban and suburban communities. This service is generally seasonal and may operate from spring through fall. For example, Kelowna's cart-based yard waste collection is offered bi-weekly from March through November. On average, they collect 240 kg of yard waste per home.

Curbside collection of yard waste in rural areas is much less common due to the cost of providing the service and generally the lack of interest in receiving such a service by rural area residents.

Curbside collection of food waste or a combination of food and yard waste is an emerging service in Canada. Several BC communities have implemented programs in recent years, including Ladysmith, Mission, Port Coquitlam, Vancouver, Duncan and Nanaimo. The Ladysmith program collects food waste only (all types of food, but no yard waste), while the Vancouver program collects yard waste and uncooked vegetative food waste (peelings, apple cores, etc.)

A typical cost for bi-weekly collection of organics at curbside is $20-25 per home per year (not including the cost for collection containers, if used) while a weekly year-round collection program costs about $65 per home per year.

Yard waste depots are probably the most popular method of yard waste collection due to their low cost and flexibility to handle the seasonal fluctuations in volumes. The disadvantage of depot based collection is generally lower participation and lower diversion.

6.7 Composting Options

In the CRD, differing composting options will be required for different areas, based on needs and capacity to site and operate a composting facility. Ultimately, a detailed composting strategy that will define what types of composting systems are needed and where the facilities should be located will be required. This section describes some composting options that could be applied in the CRD.

Composting Option A – Back Yard Composters:

- Back yard composter and/or worm com poster program (provide to residents at a subsidized price)

Composting Option B – Windrow Composting of Yard and Garden Waste with Curbside Based Collection (urban):

- Central yard and garden waste windrow composting facilities at 100 Mile House, Williams Lake and Quesnel
- Curbside collection of yard and garden waste (and vegetable waste) in Williams Lake, Quesnel and 100 Mile House
- Yard waste bins at 9 staffed transfer stations and landfills
- Back yard composter and/or worm composter program (provide to residents at a subsidized price)

Composting Option C – In-Vessel Food Waste and Y&G with Curbside Collection (urban):

- Central in-vessel food waste and yard and garden waste composting facility at Williams Lake, also serving Quesnel and 100 Mile House
- Curbside collection of food waste, yard and garden waste (and vegetable waste) in Williams Lake, Quesnel and 100 Mile House
- Yard waste depots at Williams Lake, Quesnel and 100 Mile House
- Yard waste bins at 9 staffed transfer stations and landfills
- Back yard composters and/or worm composter program (provided to residents at a subsidized price)

Composting Option D – Windrow Composting Program for Yard and Garden Waste, Bins Provided at Eco Depots and Attended Transfer Stations:

- Back yard composter and/or worm composter program (provide to residents at a subsidized price)
- Yard waste bins at 9 staffed transfer stations and landfills
- Yard waste bins at 100 Mile House, Williams Lake and Quesnel Eco Depots.
- Centralized yard and garden waste composting facilities at 100 Mile House, Williams Lake and Quesnel.

Composting Option E - No Organic Waste Diversion:

- No additional support for composting programs

Maura Walker Associates developed estimates of the level of diversion that could be anticipated with the implementation of each type of organic waste diversion program. Table 6-1 presents an overview of the anticipated percentage of diversion that could be expected from the existing MSW waste stream.

Back Yard Composters: Backyard composters can divert up to 200 kg of yard and garden waste and vegetative food waste per year while apartment based worm composters can process about 50 kg of organic matter per year. In developing program budgets, MWA assumed that 500 back yard composters and 50 worm composters would be distributed to residents each year. The composters would be subsidized by 25% (purchased at $40 per unit and sold at $30 per unit). On full implementation the program is expected to divert 700 tonnes of organic waste from landfill.

Yard Waste Collection: MWA estimates that urban curbside collection programs will capture 75% of yard waste generated in urban communities. If a bi-weekly curbside collection program for yard and vegetative waste was implemented (6 months per year), MWA estimates that such a program would capture 2.3% of the MSW waste stream as yard and garden waste and 4.1% of the waste stream as vegetative food waste.

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Depot based yard waste programs are expected to capture 75% of yard waste generated from the ICI sector and 25% from residential self hauls. Given that yard waste is 6% of the total waste disposed, MWA estimates that yard waste bins at the three urban Eco Depots would capture 2.3% of the total waste stream as ICI Y&G waste with no food waste component. Bins at the 9 attended transfer stations are expected to capture 1.5% of the total waste stream arriving at the transfer stations

Food Waste Collection: Food waste represents 22% of the total waste disposed. MWA estimates that 50% of food waste would be captured in a curbside mixed food waste and yard and garden waste program in urban areas. These anticipated levels of performance translate into diverting 5.5% of the food waste stream through a curbside organics collection program in urban areas, and a further 5.5% through an organics program targeted at the ICI sector. Furthermore, the curbside collection program would also divert 2.3% of the total waste stream as yard and garden waste.

In developing the above estimates, the following assumptions were made:

- 10,000 tonnes of organics available in waste stream (5,800 t of food waste, 1,600 t of yard waste and 2,600 t of wood waste)
- 50% capture rate for food waste collected at curb
- 75% capture rate for yard waste collected at curb
- 25% capture rate for depot-based yard waste collection from residential self hauls
- 75% capture for depot based yard waste generated by the ICI sector
- 10% of food waste would be captured by adding vegetative waste to yard waste collection

The resulting diversion efficiencies for the Option A, B, C and D programs are presented in Table 6-1 below.

Table 6-1. Diversion Performance Levels for Composting Options A, B, C and D

Composting	Impact of implementation								Assumptions
	Garbage (landfilled)	Recycling	Yard waste	Food waste	metal	wood	EPR	Commercial recycler	
Option A									
Backyard composting program	98.5		1.5						Equivalent to 700 tonnes per year upon full implementation
Option B									
Curbside yard and vegetative waste in Williams Lake, 100 Mile and Quesnel	93.6		2.3	4.1					Res waste is 50% of waste disposed. Urban areas represent 64% of waste disposed.
Yard waste depots at Williams Lake, 100 Mile and Quesnel transfer stations/eco depots	97.8		2.3						Mainly ICI yard waste. Supported through collection and disposal ban on yard waste.
Yard waste bins at 9 staffed transfer stations	98.5		1.5						Supported through collection and disposal ban on yard waste
Backyard composting program	98.5		1.5						Equivalent to 700 tonnes per year upon full implementation
Option C	%	%	%	%	%	%	%	%	
Curbside food and yard waste collection in Williams Lake, 100 Mile and Quesnel	92.3		2.3	5.5					Res waste is 50% of waste disposed. Urban areas represent 64% of waste disposed.
ICI food waste collection (through ban &/or provision of service) in Williams Lake, 100 Mile and Quesnel	94.5			5.5					ICI waste is 50% of waste disposed. 75% of ICI food waste is capturable. Urban areas represent 64% of waste disposed.
Yard waste depots at Williams Lake, 100 Mile and Quesnel transfer stations/eco depots	97.8		2.3						Mainly ICI yard waste. Supported through collection and disposal ban on yard waste.
Yard waste bins at 9 staffed transfer stations	98.5		1.5						These 9 sites represent 20% of waste disposed
Backyard composting program	98.5		1.5						Equivalent to 700 tonnes per year upon full implementation
Option D									
Depot Drop off of yard and vegetative waste in Williams Lake, 100 Mile and Quesnel	97.9		0.8	1.4					Res waste is 50% of waste disposed. Urban areas represent 64% of waste disposed.
Yard waste depots at Williams Lake, 100 Mile and Quesnel transfer stations/eco depots	99.3		0.8						Mainly ICI yard waste. Supported through collection and disposal ban on yard waste.
Yard waste bins at 9 staffed transfer stations	98.5		1.5						Supported through collection and disposal ban on yard waste
Backyard composting program	98.5		1.5						Equivalent to 700 tonnes per year upon full implementation

Assumptions

Backyard composter program distributes 500 backyard composters and 50 worm composters per year over 5 years
Each BYC diverts 200 kg per year. Each worm composter diverts 50 kg per year.
50% capture rate for food waste collected at curb (75% of FW is vegetative)
75% capture rate for yard waste collected at curb
25% capture rate for depot-based yard waste collection
10% of food waste would be captured by adding vegetative waste to yard waste collection
organics is 38% of waste disposed
food waste is 22% of waste disposed
yard waste is 6% of waste disposed
wood waste is 10% of waste disposed
No NEW wood waste diversion is assumed (wood waste currently collected and burned is calculated as diversion)

512.5 tonnes of waste diverted per year by back yard composters
1.47% Percent Diversion of total MSW from back yard composters

	Cost	Tonnes	$/Tonne
A	$ 5,500	700	$ 7.86
B	$ 306,855	3749	$ 81.85
C	$ 2,360,266	6030	$ 391.42
D	$ 83,578	2013	$ 41.52

6.8 Rolling Out Composting Programs

Option A - Back Yard Composting: Based on the Stage 1 Public Survey, 63.7% of CRD residents already participate in backyard yard waste composting programs. Therefore, it is anticipated that a back yard composter program for yard waste and vegetative waste would be well received. It has been assumed that 500 composters per year would be sold with a $10 per unit subsidy (sold for $30 each vs. $40 price). The maximum diversion level of this program is 700 tonnes per year. The annual cost of the program would be $5,500 plus staff time.

Option B -Yard Waste Composting with Curbside: Centralized yard waste composting would be conducted at three centralized composting facilities at Quesnel, Williams Lake and 100 Mile House. Most likely, these facilities would be situated at the central landfills. The operations would be simple low-tech windrow or static aerated pile programs. The implementation costs of the composting programs would be in the range of $40/tonne. In urban areas yard waste and vegetative food waste would be collected at curbside on a bi-weekly basis six months of the year. Also, tipping areas would be provided at the composting facilities for ICI haulers. In rural areas bins for yard and garden waste would be provided at the 9 attended transfer stations and landfills. The total diversion potential of this system is estimated at 3,749 tonnes per year and the program cost is estimated at $306,855 per year, including municipal curbside collection costs of $255,517.

Option C - In Vessel Composting: Due to significant economies of scale, it is anticipated that if food waste composting were implemented, a single central facility would be established. Assuming that a residential and commercial collection program would capture 3,636 tonnes of food waste, and that material would be composted with a blend of 3,636 tonnes shredded yard and garden waste and wood waste, a total of about 7,300 tonnes of organics would be processed annually, or roughly 20 tonnes per day (based on a five day work week). This throughput is sufficient for a small capacity composting operation. For example, a single Wright Technologies tunnel like the one currently used at the Whistler composting plant requires a throughput of 25 tonnes/day. The all-in costs of operating the in-vessel composting system are estimated at $100 to $120 per tonne, excluding hauling. This cost would include a capital investment in the range of $4 to $8 million for the plant and associated equipment, including the in-vessel composter, a grinder, and a loader. The total diversion potential of this system is estimated at 6,030 tonnes per year and the program cost is estimated at $2,360,266 per year, including municipal curbside collection costs of $1,022,068.

Option D – Yard Waste Composting with Depot Collection: In this program the same windrow based yard and garden waste composting program could be carried out in Quesnel, Williams Lake and 100 Mile House, the only difference being, that instead of the urban organics being collected at curbside, residents would be required to bring their organic wastes to the 3 Eco Depots. Organics at the nine attended waste management sites would continue to be serviced by roll-off bins. The total diversion potential of this system is estimated at 2,013 tonnes per year and the program cost is estimated at $83,578 per year. No municipal curbside collection costs would be incurred..

6.9 Composting Program Costs

Based on the above unit costs of the various systems, SHA determined that the annual and per tonne program costs for each of the options described above. The results are summarized in Table 6-2.

Table 6-2 Comparative Costs of Various Composting Options

Level of recycling service for organic wastes	Estimated Costs	Estimated diversion
Existing System	$0	1.0% 700 Tonnes
Option A: Backyard Composting • Sell back yard composters at a reduced rate • Provide info and education	$5,500 $8/Tonne $0.25/household/yr (avg)	2.0% 1,400 Tonnes
Option B: Yard, Garden and Veggie Waste • Seasonal curbside collection in municipalities. Additional costs include collection containers (est. $40 /home) and annual costs for bi-weekly collection (est. $10/home/year) • Seasonal bins for drop-off at Eco-depots and the nine busiest transfer station sites	$306,855 $82/Tonne $15/household/yr (avg)	5.4% 3,749 Tonnes
Option C: Yard, Garden, Veggie and Food Scraps • Curbside collection in municipalities. Additional costs include collection containers (est. $40 /home) and annual costs for weekly collection (est. $65/home/year) • Bins for drop-off at Eco-depots and the nine busiest transfer station sites	$2,360,266 $391/Tonne $113/household/yr (avg)	8.7% 6,030 Tonnes
Option D: Yard Waste Drop-off • Bins for yard waste only at three Eco-depots and nine staffed transfer stations	$83,578 $42/tonne $4.02/household/yr (avg)	2.9% 2,013 Tonnes

In Table 6-2 programs A, B and C are arranged in order from simplest and least expensive to most effective (and most costly). Program D is added to provide a lower cost solution that does not involve curbside collection. Clearly, back yard composters provide by far the best value for money because they do not require any transportation. The CRD may want to explore how to accelerate and maximize the implementation of this program. Further subsidization of the program would also be justified in SHA's opinion.

Program D, windrow composting if yard and garden waste collected in a depot program (without expensive curbside collection) is also very cost effective, costing significantly less than landfill. The program is cost effective because it does not require large expenditures on hauling.

Program B, a yard waste program including curbside collection in urban areas would increase diversion efficiencies further to about 5.4% of the total waste stream. At $82/tonne the program is comparable to the current cost of landfilling. Given that significant GHG reductions are also realized by diversion of

organic waste, such a program could be considered if participation rates in backyard composting and self hauls to transfer stations do not achieve targets.

In-vessel composting of food waste would be a very expensive program, costing nearly $400/tonne. Implementation of this program should be a low priority in SHA's opinion as most of the other programs provide higher diversion levels at less cost.

6.10 Compost Market Assessment

The long-term viability of composting as a waste management strategy will be dependent on having a local use for the compost. Potential end uses include:

- Soil blending (for making top soil and other garden blends)
- Municipal greenspaces (parks, planters, roadsides)
- Landfill cover (intermediate and final)
- Site remediation (e.g. mine sites)
- Agriculture
- Silviculture.

The technology used to make compost and the extent that composting is employed as a method to manage organic waste will, to a great extent, be defined by the potential end uses for the compost. Therefore, a market assessment will be required as part of developing CRD composting strategy.

7. WOOD WASTE MANAGEMENT

Wood waste is currently segregated from MSW destined to landfill at most of CRD landfills and at several of CRD's transfer stations. CRD staff estimate that the average yearly tonnage of wood waste for the entire CRD is 7,200 tonnes (2,000 tonnes from 5 central sites, 4,200 tonnes from North and South Cariboo and West Chilcotin and 1,000 tonnes from North, Central and South Cariboo sites that burn due to arson). SHA's model estimates that presently about 5,800 tonnes of wood waste are diverted, including 2,000 tonnes in the Central Cariboo, 2,000 tonnes in the South Cariboo and it is estimated that about 1,800 tonnes are diverted at Quesnel Landfill in the North Cariboo. The remaining 1,400 tonnes of wood waste are landfilled.

Wood waste is derived from two sources. A large percentage of wood waste is brush, stumps and other organic debris that is generated during land clearing and property maintenance activities. A smaller amount of wood waste is dimensional lumber that is generated during demolition and renovation projects. As well, some wood furniture gets thrown onto wood piles. Photo 7-1 illustrates at typical wood pile

Photo 7-1 Wood Waste Pad at Watch Lakes Landfill

7.1 Costs of Wood Waste Management

Wood waste collected at the Central Cariboo transfer stations is sent to the Capital Power co-generation plant where it is used as bio-fuel to produce electricity. The ground wood is scaled as it goes to Capital Power. In 2010 a total of 2,000 tonnes of wood waste was processed from five of the central sites (Central Cariboo, Chimney Lake, Frost Creek, Wildwood and the 150 Mile House Transfer Stations). The total cost of grinding and hauling the ground wood for processing amounted to $200,000. Of that $80,000 was spent on sorting by the grinding contractor. The resulting costs translate to about $100/tonne.

In 2010 $275,000 was spent on controlled wood waste incineration (air curtain burning) in the South and North Cariboo and the West Chilcotin. Based on production data at the 100 Mile Landfill where wood waste is scaled, it is estimated that air curtain burning costs about $65/tonne. From this unit rate, it is estimated that the tonnage of wood waste burned in the entire South Cariboo, North Cariboo and West Chilcotin totals 4,230 tonnes.

Photo 7-2 Air Curtain Burner at Inter-Lakes Landfill

7.2 Cost and benefit of wood waste management by controlling sites

Uncontrolled dumping of wood waste at uncontrolled sites increases handling costs, introduces contamination into the wood and increases the risk of arson or spontaneous combustion ignited fires. Each year the CRD spends thousands of dollars on fire suppression and there is always the risk that sparks from a large fire at as waste site could ignite a major forest fire in the surrounding area.

CRD staff estimate that $60,000 to $70,000 per year could be saved by proper segregation of wood waste at four of the central sites (by having attendants supervise deposition of wood waste at the Central Cariboo, Frost Creek, Wildwood and the 150 Mile House Transfer Stations). The total cost of grinding and hauling the ground wood for processing amounted to $200,000. Of that, $80,000 was spent on sorting by the grinding contractor.

An estimated $60,000 to $70,000 per year could be saved by proper segregation of wood waste at 4 of the central sites (Chimney Lake TS may not become controlled). The savings in air curtain burning would be realized because the volume of material requiring processing and burning would decrease. The CRD estimates that 15% of wood waste material is contamination. Therefore, total wood waste volumes would be reduced by 15% if loads were inspected. Furthermore, contaminant related emissions would also decrease because wood materials containing toxins like pressure treated dimensional lumber, plywood and furniture would be diverted.

Significant cost savings could also be realized if the CRD was authorized to conduct controlled burns of the clean wood waste pile rather than burning the wood in an air curtain burner. Because burning of clean wood piles would be conducted only under ideal venting conditions, because the burn would be hot and because such burning would be limited to a single dawn-to-dusk burn rather than weeks of low volume burning in an air curtain, it is anticipated that overall emission impacts would be lower than currently experienced. The MOE is currently reviewing policy on wood waste burning as part of the Landfill Criteria Review and authorization of open burning of clean, non-dimensional lumber is one of the key items being considered (see Section 7.4 below).

In 2010 $60,000 of wood waste management budgeted funds were not spent because the wood burned up in uncontrolled arson fires at wood waste marshaling areas at: Baker Creek, Horsefly, Likely, Mcleese Lake and Inter-Lakes refuse sites. Although these fires reduced the cost of wood processing, they increased fire suppression costs, and more importantly exposed the CRD and residents in the area to a much higher risk of forest fire. If controls were placed at Baker Creek and Inter-Lakes this number would be reduced to $30,000.

Additional management cost savings may be achieved by providing clean wood waste material for re-use at some of the sites, i.e. wood without nails or other hazards. This material could also be accepted free of charge.

CRD staff concludes that staffing of the nine larger transfer stations and supervising the wood waste management areas would likely reduce the overall CRD wood waste management costs by a minimum of $130,000/year.

7.3 Commercial Wood Waste

At present commercial wood waste in the Cariboo is charged a tipping fee of $45/tonne in the Central Cariboo and $25/tonne in the South Cariboo. In the North Cariboo the majority of wood waste is received at the Quesnel Landfill. The tipping fee for that wood waste is not known. Because the rural transfer stations are not attended, wood waste received at these facilities comes in for free.

Staffing the nine busiest transfer stations and landfills will allow the CRD to charge a volume based tipping fee for large volume commercial wood waste generators. Based on the following assumptions, the CRD estimates about $94,500 in revenue could be generated each year from wood waste tipping fees at attended transfer stations and landfill sites.

- 50% of wood waste volume is commercial (or large residential loads), 50% is residential
- Only some sites will be controlled, accounting for 6,000 t of wood waste
- Some residents may burn on their own property if they have to pay for large wood waste loads to be disposed of at a CRD site, reduce tonnage by 10%
- Total commercial tonnage that could be charge for per year = 2,700 t. The current wood waste rate in the Central Cariboo is $45/tonne, and $25/tonne in the South Cariboo. Using $35/tonne, $94,500 in revenue could be generated per year.

CRD staff concludes that if staffing of large landfills and transfer stations is supported in the SWMP review process and controlled sites are implemented, commercial and large residential loads of wood waste should be charged on a per truck basis. This would provide for additional revenue, the total would depend on the truck fees charged. Furthermore, because commercial haulers would no longer be allowed to dump for free, they would no longer be incentivized to dump their loads at the free transfer stations outside of town instead of paying tipping fees at the central landfill sites.

7.4 Implications of Update to B.C. Municipal Landfill Criteria

The Landfill Criteria are currently being updated. Significant changes to wood waste management guidelines are being considered. In order of priority, the guidelines being contemplated call for:

- Clean yard and garden waste, brush and tree waste (e.g. pine beetle kill) should be ground up and utilized as a carbon source in a composting program.
- Clean non-dimensional wood (trees, brush, and stumps) should be separated for chipping and exported to a waste-to-energy or co-gen plant where the energy content of the wood waste can be recovered.
- Brush and yard and garden waste should be ground up and blended with mineral soil at a ratio not exceeding 33% ground organic matter on a volume basis for use in daily or intermediate cover.
- Open burning of brush and non-dimensional wood waste (trees, brush, and stumps) is discouraged. Open burning may be authorized by the Director, but only as a last resort to avoid deposition of this material in landfill, where it will decompose to produce GHG's.
- If open burning of brush and non-dimensional wood waste (trees, brush, stumps) is going to be undertaken at a landfill the burn shall comply with requirements of the Open Burning Smoke Control Regulation and a number of additional requirements will be required to ensure a safe, clean burn.

The implications of the new guidelines, if adopted, are that open burning of wood waste will be authorized only as a last resort, and only for non-dimensional lumber. Therefore, it will be imperative for the CRD to ensure that all wood piles contain only clean non dimensional wood waste. Organics from those programs should be diverted to composting or waste to energy. The Director may authorize controlled open burns of seasoned wood lasting no more than 12 hours without requiring ongoing combustion in air curtain burners.

8. TRANSFER STATIONS

The CRD currently operates 17 rural transfer stations and one regional transfer station (Central Cariboo) at Williams Lake. Of the rural sites, 13 are configured with one, two or three 25 cu.yd. Transtor bins and the remainder are configured with conventional roll-off bins.

All of the transfer stations are unattended and are open 24 hours/day. As a result of the small door in Transtor bins not being configured for oversize material, as shown in Photo 8-1, many of CRD's transfer sites experience problems with oversize waste being dropped off on site. Many of the challenges faced at the rural transfer stations were discussed in Section 5.2 of the Stage 1 Report (SHA, October, 2010).

Photo 8-1. Transtor Bin at Alexandria Transfer Site

8.1 Transtor Bin System

Early in 2010 an inspection was completed by CRD staff of all of the bins to identify maintenance and repairs that would be needed for the year. Additionally there were several sites in which "emergency repairs" were required throughout the year; most of these consisted of doors or lids falling off, or the bins coming off their supports. Five (5) sites had bins completely re-painted; this amounted to nine (9) bins for a total cost of $12,600. The bin painting has **not** been included in the costs summary below.

In 2010 a total of $33,210 was spent on maintenance and repairs for all twenty one (21) bins, an average of $1,581 per bin. Frost Creek's 12 year old bins had major planned and emergency work required which may have brought the average cost up higher than a normal year.

Table 8-1. Transtor Bin Statistics

Refuse Sites	# of Bins	Bin Year	2010 Totals ($)
Wildwood	2	1999	2,114
Horsefly	2	2000	1,024
Chimney	1	2004	684
McLeese	1	2001	962
Frost Creek	2	1999	10,069
Alexandria	1	1999	84
Cottonwood	1	2006	1,434
Baker Creek	2	2003	244
Riske Creek	1	1997	1,469
Eagle Creek	1	1999	385
Lone Butte	2	1997	3,323
Lac La Hache	3	1998	4,369
Forest Grove	2	1997	625
Total	**21**		**33,210**

Bins range from 5 to 14 years old with the most averaging 12 years. Haul All Equipment states that their Transtor bins have a minimum 15 to 20 year life cycle, and that well maintained and non-abused Transtors can last longer. As many of the bins, particularly in the South Cariboo, have one to seven years of expected service life remaining, the CRD needs to make plans on how the Transtor bins are going to be replaced.

Haul-All no longer manufactures the 25 cu.yd. Transtor bins because they do not match well with the capacity of service trucks which are typically 40 to 50 cu.yds. or more. Therefore, the CRD will need to switch to a different type of transfer station as the existing bins are replaced.

With continued abuse (fires, heavy loads being placed on the doors, large wood material forced into bins, etc.) the long-term use of the Transtor bins may be limited. If transfer stations become controlled the life expectancy of the bins should increase and the repairs and maintenance costs should decrease. Also, with an attendant on site the large top lid of the bins can be left open during site hours allowing for easy access to the bin and reducing the wear and tear on the front door and latches. Fires should be dramatically reduced (if not completely stopped) and wood waste will not be permitted in the bins.

8.2 Transtors vs. Compactor plus Roll-off

SHA's model indicates that haul trucks spend more than 8,000 hours on the road hauling MSW waste from transfer stations to landfill. Our analysis of payload tonnages indicates that the tandem trucks are hauling payloads that range from a low 0.6 tonnes to a high of 3.5 tonnes per load, and average 2.5 tonnes per load.

In contrast, the industry average for a fully loaded 40 cu.yd. roll-off bin is 4.0 tonnes, and for a tamped roll-off bin it is 7.0 tonnes. Even better compaction can be realized by installing compactor units for MSW, like the unit pictured in Photo 8-2, with average payloads of 9.0 tonnes. Compactors are used extensively at the Squamish Lillooet Regional District, and they are also being introduced in the Peace River Regional District, amongst others.

Photo 8-2. Compactor Bin at Pemberton Transfer Station

The significance of increased compaction and load density is that fewer hauls have to be made. Assuming that the haul trucks cost about $85/hour, increasing the load density from 2.5 to 9.0 tonnes would equate to a reduction in the annual haul hours required to service the transfer stations declining from 8,000 to 2,200. This would translate to an annual cost saving of about $493,000.

However, to benefit from the increased payload a compactor can deliver, the CRD would have to make significant investments in infrastructure. An investigation by CRD staff determined that the cost on a per site basis to install compactor bins ranges from approximately $80,000- $120,000 based on the following:

- Power supply $7, 000 to $10,000
- Compactor $42,000 to 64,000
- Delivery $2,500 to $5,000
- Site development $15,000 to $25,000
- Installation and removal of existing Transtor$12,000 to $17,000
- Compactors can also be rented on a monthly basis for $600 to $1000 on a 5 year contract.

In addition, bins would have to be provided to service oversize material. The cost on a per site basis to convert an existing Transtor to an oversized bin would be approximately $2,000 (cost to have power and install lid opening devices).

Another option that can achieve nearly the same tonnage per load as a compactor bin is to fully consolidate MSW deposited in roll-off bins by tamping the deposited waste with a small back hoe or excavator. Pay loads of about 7 tonnes per 40 yd. bin can be realized. Additional haul efficiencies can be realized by always hauling two bins (with the addition of a live trailer).

CRD staff conducted a detailed economic analysis of reconfiguring all existing transfer stations to a system utilizing tamped 50 yd. roll-off bins. The analysis, presented in Appendix A, concluded that cost savings of about $160,000 per year could be realized by switching to the tamped roll-off bin system, while at the same time providing attendants at six of the transfer station sites. A further $245,000 could be saved if the transfer stations were to remain unattended. Further cost savings of about 44,000 could be realized by hauling waste from transfer stations in the Central Cariboo directly to Gibraltar Landfill. The bottom line of the analysis revealed that about $450,000 per year in savings could be realized by switching from hauling loose waste from Transtors to hauling compacted loads in tamped 50 yd roll off bins, with all trips hauling two bins at a time. SHA's independent analysis of the cost savings that could be realized by more efficient hauling was $513,528 per year.

As many of the existing Transtor sites do have five to ten years of life remaining, it is recommended that in the short term the existing Transtor system continue to be used. When the bins reach their service life, it is recommended that transfer stations be reconfigured to accommodate one or two 50 yd. roll-off bins (depending on site tonnage), and a small back-hoe in a sea-can container to be used for load tamping, snow clearing and site maintenance.. Furthermore, SHA recommends that the CRD configure one transfer station in the CRD as a tamped roll-off site immediately to establish CRD specific performance characteristics. Wells transfer station sites may be good locations to pilot the tamped roll-off bin approach in the 3 to 5 year range. (Note: Wells transfer station is not one of the 9 sites identified for a controlled site)

Most of the CRD Transtors still have 10 years of usable life; thus the conversion of the transfer stations to tamped roll-off facilities should be re-assessed in 5 to 8 years when the Transtors may need replacing. This will also staff to evaluate the long term performance of the pilot and to compare the tamped transfer station performance to that of compactor sites, which are being installed for the Peace River Regional District.

8.3 Managing Oversize Items

As identified in Stage 1, oversize materials present one of the largest obstacles to keeping sites tidy. To provide a solution for oversize material three options are available: 1) to replace existin Transtors with 50 yd. roll-off bins that can accommodate oversize material, 2) to provide an extra dedicated 40 cu.yd. roll-off bin exclusively for oversize waste at existing Transtor sites, and 3) to configure the Transtor bin such that the lid can be raised by the site attendant.

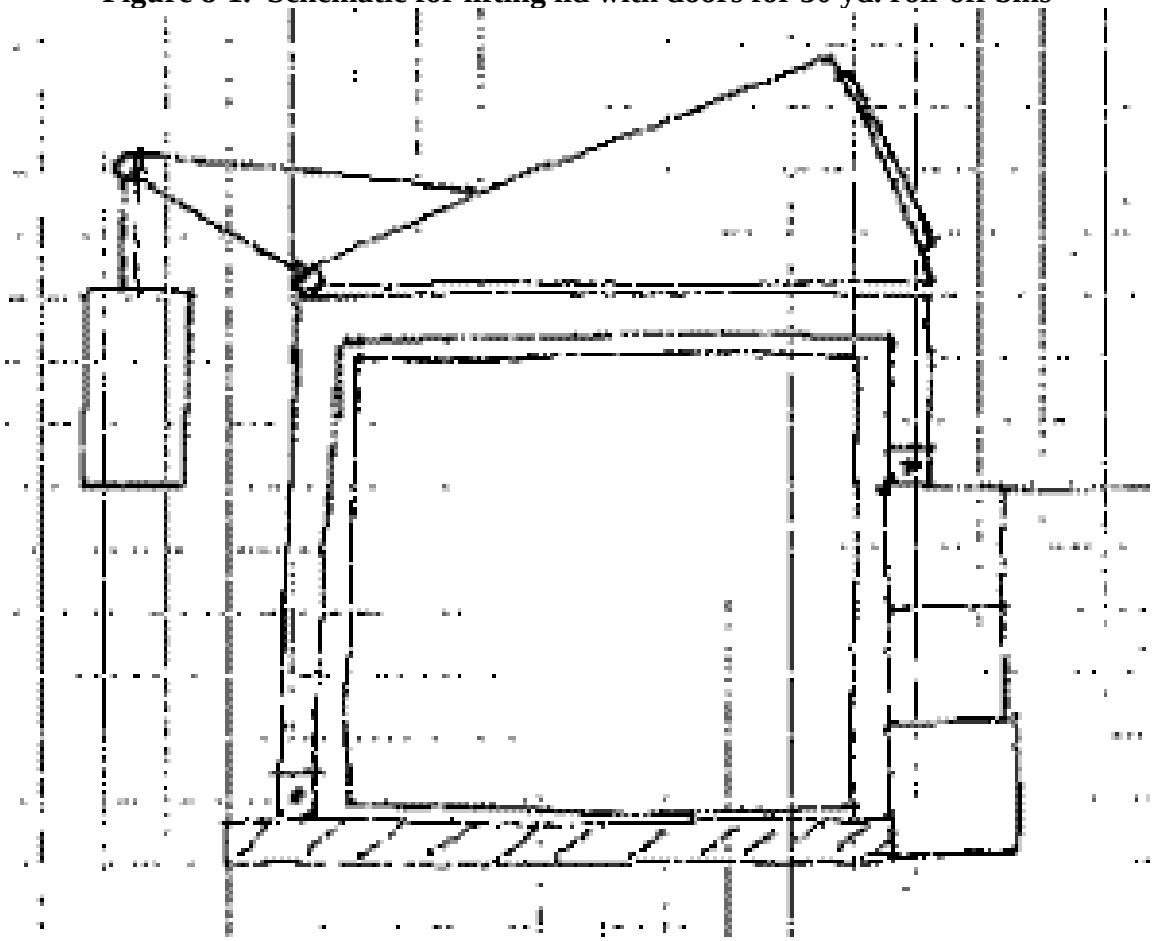
It is recommended that in the short term existing Transtors at the attended sites be fitted with devices to open the Transtor lids. With attendants on site lids can be left open during operating hours and bin

capacity can be fully utilized. With attendants on site the wood and metal waste currently being deposited into bins should cease. Attendants will be able to communicate with hauling contractors to indicate if and when bins need servicing. Sites with multiple Transtor bins may be able to dedicate one Transtor as an oversized bin rather than alter the site to add a roll off bin. As the Transtors are replaced, they should be replaced with high capacity 50 yd. roll-offs that can accommodate oversize material. The above recommendations took into consideration:

- Cost of keeping Transtors $0.
- Cost per site to add a 40 yard roll off bin ranges from $ 13,000 to $15,000 (cost of bin plus site development to make room for roll off)
- Cost of adding an automated lid raising

When the new 50 yd roll of bins are provided, it will be imperative to configure the new transfer station bays such that each bin is covered with a tiltable lid, as shown conceptually in Figure 8-1. The lid will be needed to prevent vectors including bears, ravens, eagles and other wildlife from entering the bins and dispersing waste around the transfer station. The lids must be configured such that they can tilt up so the loads can be tamped as required.

Figure 8-1. Schematic for lifting lid with doors for 50 yd. roll-off bins



9. TRANSPORTATION

At a budgeted cost of $1.1 million per year, hauling represents a significant portion of CRD's annual $6.2 million solid waste budget. Hauling is currently conducted by three contractors: Go-Fer in the North Cariboo, Dan Jensen Contracting in the Central Cariboo and Alessandro Garbin in the South Cariboo. Loads in the North and Central Cariboo are hauled uncompacted. Garbin uses a top loading compactor truck to increase load densities to an average of about 3.5 tonnes per load.

As discussed above, the average load density of the CRD system is 2.5 tonnes per load. The average load density of the uncompacted roll-offs in the North and Central Cariboo is 2.2 tonnes per load. Based on input from Owen Carney, there exists significant opportunity to improve the haul system in the Cariboo by increasing load density through compaction, and by adding a live trailer to haul a second bin, where appropriate.

9.1 Compacting Loads

North Sites: Adding a Compactor and hauling compacted loads could increase efficiency for Cottonwood and Wells sites as it is rare both sites can be collected at the same time (even with a 63 yard bin).

Central Sites: Compaction could increase efficiency of hauling from some sites, however, wood waste in bins would hamper the effectiveness of the compactor truck, so would only be a benefit if wood waste and oversize is placed in separate bin. To make this work, it would likely be necessary to have an attendant on site at ALL transfer stations, i.e. at Alexis Creek and Riske Creek Transfer Stations both have high wood waste content. Wildwood and 150 Mile House sites do not have enough space on site for a compactor truck to reduce trips to these sites. However, as these are some of the busiest transfer stations in the system, the CRD would realize the greatest benefit from implementing compaction at these sites. Compactors may reduce the need for individual trips to Horsefly and McLeese during the busy months of the year.

South Sites: Compactor truck currently in use. Efficiency would increase with attendants as wood waste in the bins would be eliminated.

Recommendation: Would cost less to have compactor trucks vs. compactors at each site. Some efficiencies would be gained. Re-visit option once attendants have been in place. Proper segregation of waste may gain hauling efficiencies

9.1.1 Adding Trailer

North Sites: A trailer could increase efficiency for Cottonwood and Wells sites as it is rare both sites can be collected at the same time (even with a 63 yard bin). A trailer would also allow servicing on Tite Town and Baker Creek on the same haul. Not much would be gained for Alexandria due to its location as the only site in the North Cariboo on Hwy 97 (no opportunity to double up sites per trip at present). However, with the addition of a recycle bin, and an oversize bin, the opportunities will exist to haul two bins from most transfer stations.

Photo 9-1 Tandem with Live Trailer Hauling 2 Bins

Central Sites: In the Central Cariboo a trailer would increase efficiency on servicing 150 Mile and Horsefly, as well as Frost Creek and Chimney Lake and Alexis Creek and Riske Creek. Addition of recycle bins will make a trailer even more efficient when bins have to be pulled from those distant sites. It is important to note that several sites would need site development to accommodate a truck and trailer system.

South Sites: May increase efficiency, however, several sites would need site development to accommodate a truck and trailer system.

Recommendation: Re-visit option once attendants have been in place. Proper segregation of waste may gain hauling efficiencies.

9.2 Dedicated Back Hoe for Tamping

If a conventional roll-off is going to be used for servicing bins, then density of loads could be increased by tamping waste into the bin with a small wheeled backhoe. Owen Carney recommended that on subsequent contracts the CRD require that the haulage contractor or site attendant lightly tamp the refuse in the bins with a backhoe or excavator to consolidate the garbage that is otherwise fluffed when pushed into the trailer from the tipping floor with a loader. Typically, such tamping can increase payloads by 50% without damaging the bins. Photo 9-2 shows a backhoe that was used to consolidate loads at the Smithers transfer station. In otherwords, tamping will increase bin capacity from 3 to 4 tonnes loose to 7 or 8 tonnes tamped. Tamping could be carried out by the site attendant on a daily basis. The small back hoe could also be used to conduct site maintenance and clear snow.

Photo 9-2. Backhoe used to Densify Loads in Smithers

9.3 Hauls to Gibraltar

The trailers used on the Gibraltar haul are 53' tri-axles. Reportedly, they only average 17 tonnes per load. The legal payload for tri-axles is 27 tonnes. Carney's averages payloads of 23 to 25 tonnes on 48' tri-axle trailers. The CRD should investigate methods of compacting loads into the trailers to increase load density. Options include tamping or a dedicated load compactor. As nearly $350,000 is spent on hauling each year, improving the haul efficiency could generate cost savings of more than $100,000 per year.

10. LANDFILL UPGRADES

Three regional and 12 rural landfills are utilized in the CRD solid waste system. The regional landfills receive the vast majority of tonnage (51,000 tonnes/year) while the small tonnage landfills accumulate about 5,100 tonnes per year.

10.1 Closing Rural Landfills

Using SHA's CRD solid waste system model, it was determined that currently the average cost of operating the rural landfills is $163 per tonne while the comparative cost of rural transfer station, rural hauling and regional landfill was $128/tonne. It is anticipated by SHA that overall system costs and environmental liabilities could be reduced by closing all of CRD's small landfills and converting the sites to transfer stations. A detailed analysis of the economics of such a change was conducted by CRD staff, and the analysis is presented in Appendix B. The analysis revealed that for the four sites considered, current costs of landfilling are the same as or lower than the costs of operating a transfer station. The report recommended that at current landfill operating costs, utilization of these sites should be continued.

The anticipated update to the Landfill Criteria Landfills will place stricter requirements on the operation of landfills in B.C., including the requirement for attendants at all landfill sites whenever they are open. Once the new regulations are implemented, the CRD may find that transfer stations will prove less costly than the small tonnage rural landfill sites.

10.2 Concrete Recycling

Concrete is currently landfilled at all three sites. At present, about 5,600 tonnes of concrete are accepted as waste each year. Concrete is a valuable construction material that can be processed into aggregate by breaking up the concrete to remove rebar and then crushing the blocks into a specified aggregate material. Crushing costs are on the order of $40/tonne or less. Also, by diverting the concrete from landfill the CRD recycling rate will be increased dramatically at nominal cost and valuable air space will be conserved at all three regional sites.

Photo 10-1 Concrete Crusher

10.3 Using Contaminated Soil for Cover Material

Currently, some 8,400 tonnes of contaminated soil are received at Quesnel, 100-Mile House and Williams Lake DLC sites. This material is currently considered an inbound waste material. As contaminated soil can be used as an alternate cover material instead of on-site or imported clean-fill, this material should be diverted strictly for that function and considered as a recycled waste. Also, Gibraltar Landfill is short of daily and intermediate cover soil, so it may be worthwhile to consider hauling some of the contaminated soil for use at that site.

10.4 Safety Railings

Provision of tipping chutes with safety railings was identified as a top safety related recommendation in the Stage 1 SWMP review.

10.5 Marshalling Areas for Metal and Wood Waste

CRD staff recommend budget be set aside for general improvements to tipping areas as rural landfills. For basic cost increase calculation: 12 trench style landfill sites, $5,000 to $10,000 per site for capital investment, $1,000 yearly operational costs.

11. TIPPING FEES

Presently, the CRD solid waste system is financed from a combination of general taxation and tipping fees. The 2010 Solid Waste Budget costs were $6,489,255. Offsetting revenues were derived primarily from tax requisition. In 2009, $151,000 was raised from tipping fees in the South Cariboo (100 Mile House Landfill) and $394,259 was raised from tipping fees in the Central Cariboo (Central Cariboo Transfer Station). All other facilities are currently free.

Based on the 2010 budget a breakeven tipping fee of $93/tonne would be required to pay for all solid waste services. Averaged over the long term, solid waste costs are projected to be slightly lower with the current system, averaging $6,057,695 according to SHA's model. Based on those costs SHA's economic model indicates that a tipping fee of $88/tonne would be required on all solid waste and recyclables if the existing program were to become revenue neutral and be fully funded by tipping fees on all solid waste (including recyclables).

If fees were to be charged on the residuals destined for landfill, and all recyclables were to be free (as is done in many regional districts) then a tipping fee of $108/tonne would be required. SHA encourages the CRD not to rely on residual based tipping fees for all revenues in the future because as recycling programs are expanded the total residual tonnage will decline while the costs of running the transfer stations, haulage and landfills will remain essentially unchanged. As a result, the tipping fee will have to increase dramatically to continue to finance the solid waste system. For example, with Option E that is projected to achieve a recycle rate of 53%, a break-even tipping fee of $203/tonne would be required to pay for waste disposal. At such a high rate, significant leakage from the system would likely start to occur whereby commercial haulers would transfer their waste to Cache Creek Landfill which would likely charge a tipping fee around $50/tonne. In the worst case scenario, the system could collapse because there would not be sufficient revenue to pay for the recycling programs.

11.1 User Fees – Pros and Cons

Each form of revenue collection has its pros and cons. The following is a brief review of the pros and cons of the User Fee approach to funding the solid waste management function

Pros:

- Pay based on the amount generated; i.e. most fair
- Can apply price-based incentives for behaviour change (e.g. low cost or no cost for recycling or composting)
- People become more aware of the true cost of waste management
- Increased ability to enforce bag limits

Cons:

- Greater likelihood that some people will illegally dump (including using commercial and public waste receptacles for household waste) or backyard burn some or all of their waste (may end up causing environmental damage, particularly increase dioxins in environment from use of burn barrels)
- Need staffing to ensure fees are collected
- Need to deal with money collected at waste management sites

- System more inconvenient than a free dump site or transfer station

11.2 Taxation – Pros and Cons

Pros:

- Everyone pays for the protection of the environment
- No incentive to not use the solid waste management system – i.e. no economic incentive to illegally dump or backyard burn.

Cons:

- No incentive to reduce waste
- People not property generate waste – the cost is not allocated to the amount of waste generated, but rather the value of the property

11.3 Options for Implementation

The following options are available for implementation of a user pay program:

- Ramp up to full user pay (at landfills, attended transfer stations)
- Tags for residents (e.g. 52 tags for 52 bags of garbage), all other waste must be paid for
- User pay is less effective with automated curbside collection utilizing large totes as people generating a small amount of waste each week pay the same as those stuffing the tote to capacity.

11.4 Budget

A budget of $63,057 has been established in SHA's model for the all in operation of each attended transfer station. Having the attendant on site will facilitate the implementation of tipping fees at the attended transfer sites, if desired.

12. PROMOTION AND EDUCATION

The success of waste management programs and policies requires that people know and understand why and how to effectively participate in the programs. Therefore, promotion and education are critical to all components of the solid waste management system.

Promotion and education efforts directly related to municipally-provided waste management services such as curbside garbage collection will continue to be done by the municipality providing the service. It is proposed that CRD be responsible for promotion and education efforts related to their services such as recycling drop-off depots, transfer stations, landfills, as well as promotion and education in regards to waste reduction and reuse, composting, household hazardous waste and product stewardship programs. The CRD should partner with the various stewards to promote available EPR programs. Where possible the Regional District, Municipalities and product stewards should work together to ensure consistency in promotion and education programs.

Promotion and education activities will use a range of promotion and education activities and tools for solid waste management and zero waste, including:

- The "Waste Wise" program for schools
- Web-based information, including a searchable database
- Sponsor and promote the RCBC Telephone "hotline"
- Promote the information provided in the local telephone directories
- TV and Radio campaign
- Newspaper advertising
- Engage local cable stations to develop more in-depth information on the CRD waste management system and waste management issues
- Community Outreach
    - Participation in community events
    - Displays at community locations
    - Contests
    - Recognition programs (e.g. awards for exemplary actions towards waste reduction)
    - Facility tours
    - Workshops and seminars
    - Social media (e.g., Facebook)
- Partnering with stewards to promote EPR programs.

Promotion and education initiatives will aim to minimize the use of paper through using electronic media to distribute information whenever practical.

12.1 Budget

To undertake the above initiatives, it is anticipated that these programs will be undertake by contractors or contract staff. The budget for these programs is based on a cost of $5 per household per year, for an annual budget of approximately $75,000. This estimate includes the existing $25,000 budget for the Waste Wise outreach program for schools.

The Public Education budget is included in the Basic Services package. $75,000 per year is being reserved for continuation of the current school outreach program, as well as funding for additional program education, advertising and outreach.

Photo 12-1 Kids learn about recycling in Squamish

13. ILLEGAL DUMPING PREVENTION

Illegal dumping of waste is a common affliction in rural areas throughout British Columbia. The CRD will develop an illegal dumping strategy to reduce the incidence and impact of illegal dumping.

13.1 Options

Options to reduce illegal dumping include:

- Support community cleanup projects
  - Supply of bags, signage, vehicles and staff
  - Waive tipping fees at landfills and transfer stations
  - Develop a fund for clean-ups by community groups
- Implement a Reporting Program, e.g. RDOS's "1-866-NO-DUMP" illegal dumping hotline
- Work with stakeholders/user groups to identify problem sites and increase reporting
- Clean-up of known and reported sites
- Implement an anti-dumping bylaw that would put the onus for proper disposal on the waste generator.
- Enforce by-law by funding full time by-law enforcement officer dedicated to solid waste

Funding for the above initiatives has been incorporated into the Basic Services package that has been included in the economic model for all five Options (A, B, C, D and E).

Photo 13-1 Illegally dumped garbage at Baker Creek T.S.

The following initiatives also assist in preventing illegal dumping:

- Education programs to ensure that people are aware of the disposal and recycling options available in the CRD;
- Yard waste collection programs. It is believed that chronic illegal dumping sites often start when people dispose of yard waste at a non-authorized location; and
- Improving the CRD's bylaw enforcement capacity.

13.2 Budget

The budget presented in Table 13-1 is incorporated in the economic model for the by-law enforcement program. The total budget is $83,944 per year. This assumes that the by-law enforcement officer will issue two tickets per day at a value of $50 each, which will generate $23,500 in revenues. If the officer was able to issue 10 tickets per day, then the program would be revenue neutral. However, we anticipate that once the public becomes aware of the risk of a significant fine and learns the required procedures, then the number of violations will drop and the expectation that the by-law officer will observe 10 violations each will become unrealistic.

Table 13-1 Budget of By-law Enforcement

Projected Costs		
Bylaw Enforcement Officer Salary (1820 hrs)	$	68,141
Bylaw Enforcement 4x4 Truck (5 Year Ammortize)	$	12,000
Truck Fuel (assume 50,000 km/year)	$	4,375
Truck Maintenance	$	5,000
Staff Training	$	3,000
Notebook Computer	$	500
Communications	$	6,000
Administration Support	$	6,000
Supplies	$	2,400
		$107,416
Projected Revenues		
Number of Violation Tickets per day		2
Value of Each Ticket		$50
2 Violation Tickets Per Day (@$50/ticket)		$23,471
Net Cost of Bylaw Enforcement Officer		**$83,944**

14. PLAN MONITORING

14.1 Plan Monitoring Committee

The Advisory Committee that was formed to develop this updated plan will be discontinued once the Plan is approved the Minister of Environment. A Plan Monitoring Committee mayl be formed to oversee the implementation of the Plan and report directly to the Regional Board or monitoring of the program may be undertaken by staff with Board oversight. In either case, staff or committee members will:

- Review and become familiar with the Solid Waste Management Plan;
- Review and become familiar with the existing solid waste management system in the CRD;
- Identify methodologies to be employed in the monitoring and evaluation of the Plan's implementation;
- Monitor the implementation of the Plan and annually report on the effectiveness of the Plan at achieving its objectives; and
- Make recommendations to increase the effectiveness of the Plan or the solid waste management system.

The committee membership will strive to have a broad representation of interests including local governments, First Nations, the waste management industry, environmental organizations, the business sector, and the construction and demolition sector.

If the committee is implemented, it is expected that there would be 2-3 meetings per year of the committee with the provision for additional meetings, workshops or other presentations at the committee's discretion or as required.

14.2 Plan Evaluation

To ensure that the plan's implementation is on-track, it is proposed that, on an annual basis, the CRD will compile data that reflects the status of the Plan's implementation and progress toward waste reduction targets. This data will be provided to the Plan Monitoring Committee, the Board and the regional office of the Ministry of the Environment.

14.2.1 Data tracking

The key mechanism for tracking progress towards the Plan's waste reduction goals will be scale house data from CRD landfills and tonnages of recycled materials, as reported by the private sector recycling service providers and EPR stewards. The quantity of waste disposed will be calculated on a per capita basis, using best available population data. Statistics will be compiled annually and reviewed against goals. As well, statistics will be benchmarked against other regional districts of comparable size and areal extent (e.g. TNRD, PRRD) once every five years.

14.3 Plan Updates

As suggested in the Provincial guidelines, it is recommended that a review and update of the Solid Waste Management Plan be undertaken every five years to ensure that the Plan reflects the current needs of the CRD.

14.4 Budget

The plan monitoring will be funded from the CRD staff budget. In SHA's model $309,000 per year has been set reserved for CRD administrative support of the solid waste management program. Funding for the Plan Implementation Committee would be derived from this budget.

15. ECONOMIC ANALYSIS

To assist the CRD Solid Waste Advisory Committee in prioritizing the implementation of various recycling programs SHA undertook to develop a comprehensive model of the entire solid waste system. We believe this comprehensive model is the first detailed model of a rural based solid waste system in B.C., and will prove a powerful tool for budgeting, tracking costs and planning further upgrades to the system in the future.

SHA's model of the CRD system is an Excel spreadsheet based model that considers six recycling system options, as follows:

1. Existing Case
2. Option A: 3 Eco Depots, 9 Attended TS, Recycle Bins at 29 sites
3. Option B: 3 Eco Depots, 9 Attended TS with Bins, 20 Community Trailer Sites
4. Option C: 3 Eco Depots, 9 Attended TS, 29 Trailer Sites
5. Option D: 9 Attended TS, 29 Community Trailer Sites
6. Option E: 3 Eco Depots, 9 Attended TS, Recycle Bins in Town

SHA developed a spreadsheet for each of the above options. Each spreadsheet is organized into four parts: 1) tonnage information, 2) expected diversion levels, 3) expected haulage requirements and 4) expected annual costs. The spreadsheet models for each of the above options are presented in Appendix C.

The models are constructed by tracking tonnages and costs at each site. Each CRD facility is assigned a single row in the spreadsheet. For each facility, the total tonnage of each waste stream is determined based on current numbers where scales are available, and where scales are not available, based on tonnage projections made in the Stage 1 Report. Tonnages are broken out as follows:

Residuals

- Actual MSW
- Actual DLC Waste
- Actual Concrete
- Actual Contaminated Soil

Recyclables

- Single Steam
- Y&G Waste
- Food Waste
- Scrap Metal
- EPR
- Cardboard
- Crushed Concrete
- Contaminated Soil
- Glass

Based on experience from other regional districts MWA estimated the expected level of diversion that would be achieved if the various diversion options (A to E) were implemented. The diversion levels were presented earlier in Table 3-4. These were entered into SHA's model and used to project diversion tonnages for each material.

Once the tonnages were identified, the number of full loads required to haul the various materials from transfer stations to landfill or recycling facility were calculated. In the existing system model SHA estimated load counts based on current load averages experienced by hauling contractors in the South and Central Cariboo. In models A to E SHA analyzed the cost savings that could be realized by implementing a haulage solution that tamped containers and utilized a live trailer to haul two containers on all trips.

For each transfer station, haul times were estimated based on the kilometres travelled and average haul speeds. Total annual hours for each haul were then determined based on load counts. In total, more than 8,000 haul truck hours are currently required.

In the final section of each model, the solid waste service costs were calculated for each work category. Tasks that were costed included:

- Transfer Station/Landfill Operations Contracts
- Haul Costs
- Facility Operation Costs
- Clean-Up Costs
- Grading Costs
- Maintenance Costs
- Marshalling Yard Contract
- Concrete Processing Costs
- Cont. Soil Management Costs
- Incineration of Wood Waste
- Scrap Metal and Recycling Costs
- Organics Management
- Share Shed Maintenance Costs
- Operational Contingency
- Capital Projects

For each facility, the costs for each of the above work items were estimated based on tonnage and historic or estimated unit costs. The costs were then summed across each row to determine total costs of operating each facility. Total system costs were then determined by summing costs downward across all facilities in the system.

The results of each model were then tabulated in a summary table. Table 15-1 presents the summary table for the existing solid waste system. In the summary table tonnages for each general solid waste category are reported, as are the total costs to provide the service and the costs per tonne.

Table 15-1 Summary of CRD's Existing Solid Waste System

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		13,074	
Total Tonnage of Residuals Landfilled		56,011	
Diversion Percentage		18.9%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Tonnage in			
Total System Cost	$ 6,057,695	69,085	$ 88
Cost of Urban Collection	$ 587,029	52,042	$ 11
Cost of Rural Transfer Stations	$ 444,011	11,890	$ 37
Cost or Rural Hauling	$ 747,565	11,890	$ 63
Cost of Transfer and Haul to Gibraltar	$ 861,614	13,115	$ 66
Cost of Regional Landfills	$ 1,787,856	62,946	$ 28
Cost of Rural Landfills	$ 840,890	5,153	$ 163
Cost of CRD Program Costs	$ 788,730	69,085	$ 11
Check Sum	$ 6,057,695		
Cost of North Cariboo System	$ 1,153,236	23,891	$ 60
Cost of Central Cariboo System	$ 2,467,335	27,214	$ 102
Cost of South Cariboo System	$ 1,310,999	16,998	$ 89
Cost of Chilcotin System	$ 337,395	982	$ 355
Cost of CRD Program Costs	$ 788,730	69,085	$ 11
Check Sum	$ 6,057,695	69,085	$ 88
Cost of Recycling Programs	$ 243,718	7,200	$ 34
Cost of Wood Waste Management	$ 494,123	5,874	$ 84
Cost of Landfill Disposal	$ 5,268,965	56,011	$ 94

Summary tables for each of the six options modeled are presented as Tables E1-S to E6-S in Appendix C, together with the accompanying detailed models.

Of particular significance, the summary table indicates that the CRD waste system manages 69,085 tonnes of solid waste at a total cost of $6,057,695, or $88 per tonne. Of interest, management of residuals to landfill (including hauling) currently costs $94/tonne, slightly more than the total average. In particular, landfill disposal in the West Chilcotin is very expensive at $360 per tonne. This is due to small tonnages and large distances to service those sites.

The rural landfills, including all rural landfills in the north, central and south Cariboo and Chilcotin average $163/tonne. As the regional landfills cost only $28/tonne, transfer station operation costs $37/tonne, transfer and haul to Gibraltar costs $66/tonne and rural hauling averages $63/tonne, SHA felt that the CRD could potentially realize cost savings by closing some existing rural landfills and converting those sites to transfer stations. Further cost savings would be realized by the CRD as waste

management costs for the regional system would decline due to economies of scale as the fixed costs of landfill operation would be distributed over a larger tonnage. A detailed comparative analysis of landfills vs. transfer stations was conducted by CRD staff and it was concluded that landfills were still more economic than hauling out and transfer; however, the difference in costs was small.

The total tonnage recycled in the existing system (including wood waste) is 18.9%. This includes 7,200 tonnes of recylables (i.e. cardboard, glass, scrap metal) and 5,874 tonnes of wood waste. The cost of current recycling programs is relatively inexpensive at $46/tonne because collection costs are paid by municipalities.

Table 15-2 presents the summary sheet for Option E, which SHA developed to provide maximum diversion efficiencies and the lowest possible costs. Option E includes all of the basic services desired by CRD, including a bylaw officer, nine staffed transfer stations/landfills at CRD's busiest sites. Also included in the model are three regional Eco Depots. This option introduces tamped 50 yd. roll-off bins and live trailers to reduce haul costs. Wood waste burning is reconfigured to open burns to eliminate expensive air curtain burning and an investment is made to convert concrete, currently a waste product, into a value added crushed concrete aggregate. As well, treated contaminated soil is beneficially used for landfill daily and intermediate cover.

In this option the total recycling tonnage is increased to 36,502 tonnes, the diversion rate is increased to 53% while total system costs are increased to $6,620,114. The average system cost per tonne increases modestly from $93 to $163/tonne. Of significance, note that the cost of landfilling increases from $88 to $162/tonne. This increase is primarily due to distributing the fixed costs of landfill operations over a much smaller tonnage and adding nine attended transfer sites.

The costs of organic waste management were also investigated by SHA. Four organic waste management models were developed. These were added onto the Option E recycling model. In practice, the services could also be added onto Options A to D. The costs of the various composting options were already discussed in Section 6.9 and summarized in Table 6-2.

For comparative purposes, Table 15-3 presents the cost summary for the Option E Recycling System, together with the Option D Composting Program which would provide a windrow based composting system that uses distributed bins at Eco Depots and the 9 attended transfer stations but does not provide curbside organic collection in urban areas. This service appears to provide the best value organics management solution.

Relative to Option E without composting, costs actually decrease from $6,620,114 to $6,611,841 while diversion increases from 52.8% to 55.7%. Although diversion increases almost 3%, system costs decrease by 0.2% because the composting service is very inexpensive, at $42/tonne.

Table 15-4 presents the grand summary table of all options considered. This table provides an excellent comparative summary all key statistics for each option, including tonnage, diversion efficiency, total cost and cost per tonne of key systems.

Of significance, note that as the diversion efficiency increases, the per tonne cost of landfilling increases considerably. This is due to the fact that fixed annual costs of landfill operations are distributed over a shrinking tonnage base.

Table 15-2 Summary of SHA's Option E Recycling System Scenario

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		36,502	
Total Tonnage of Residuals Landfilled		32,583	
Diversion Percentage		52.84%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,620,114	69,085	$ 96
Cost of Urban Collection	$ 808,004	52,042	$ 16
Cost of Rural Transfer Stations	$ 969,518	11,890	$ 82
Cost or Rural Hauling	$ 235,841	11,890	$ 20
Cost of Transfer and Haul to Gibraltar	$ 759,183	9,175	$ 83
Cost of Regional Landfills	$ 1,886,587	59,006	$ 32
Cost of Rural Landfills	$ 621,364	5,153	$ 121
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,620,114		
Cost of North Cariboo System	$ 1,445,470	23,891	$ 3,569
Cost of Central Cariboo System	$ 2,655,994	27,214	$ 3,606
Cost of South Cariboo System	$ 1,518,341	16,998	$ 3,597
Cost of Chilcotin System	$ 201,508	982	$ 3,713
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,620,114	69,085	$ 96
Cost of Recycling Programs	$ 774,459	16,563	$ 47
Cost of Wood Waste Management	$ 314,927	5,969	$ 53
Cost of soil and concrete recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,309,753	32,583	$ 163
Check Sum	$ 6,620,114	69,085	$ 95.83

Table 15-3 Summary of SHA's Option E Recycling System with Option D Composting Scenario

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		38,514	
Total Tonnage of Residuals Landfilled		30,571	
Diversion Percentage		55.75%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,611,841	69,085	$ 96
Cost of Urban Collection	$ 873,008	52,042	$ 17
Cost of Rural Transfer Stations	$ 984,832	11,890	$ 83
Cost or Rural Hauling	$ 211,265	11,890	$ 18
Cost of Transfer and Haul to Gibraltar	$ 739,685	8,426	$ 88
Cost of Regional Landfills	$ 1,841,538	58,256	$ 32
Cost of Rural Landfills	$ 621,898	5,153	$ 121
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,611,841		
Cost of North Cariboo System	$ 1,456,981	23,891	$ 3,569
Cost of Central Cariboo System	$ 2,631,015	27,214	$ 3,605
Cost of South Cariboo System	$ 1,519,035	16,998	$ 3,597
Cost of Chilcotin System	$ 206,010	982	$ 3,718
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,611,841	69,085	$ 96
Cost of Recycling Programs	$ 779,022	16,563	$ 47
Cost of Organics Diversion	$ 83,578	2,013	$ 42
Cost of Wood Waste Management	$ 314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,213,339	30,571	$ 171
	$ 6,611,841	69,085	$ 95.71

Table 15-4 Grand Summary of Solid Waste Management Options in the Cariboo Regional District

Option	Description	Total Tonnage	Total Recycled Tonnage, including wood, concrete, etc.	Increase in Recycling (tonnes)	Diversion Percent	Total Cost	Transfer Station and Landfill Cost	Discard Recyle Cost excluding Wood, Composting	Soil an dConcrete Recycling	Wood Waste Cost	Composting Cost	Check Sum	Total Cost per Tonne	Landfill Cost per Tonne	Recylce Cost Per Tonne	Recycle Cost per Household	Soil and Concrete Cost per Tonne	Wood Waste Cost per Tonne	Composting Cost per Tonne	Composting Cost per Household
	Existing System	69,085	13,074	0	18.9%	$ 6,057,695	$ 5,232,234	$ 331,338	$ -	$ 494,123	$ -	$ 6,057,695	$ 88	$ 93	$ 46	$ 13	$ -	$ 84	$ -	$ -
A	3 Eco Depots, 9 Attended TS, Recycle Bins at 29 sites	69,085	36,205	23,131	52.4%	$ 6,782,289	$ 5,261,736	$ 805,455	$ 220,975	$ 494,123	$ -	$ 6,782,289	$ 98	$160	$ 49	$ 32	$ 16	$ 84	$ -	$ -
B	3 Eco Depots, 9 Attended TS with Bins, 20 Community Trailer Sites	69,085	36,407	23,333	52.7%	$ 6,804,644	$ 5,277,338	$ 812,209	$ 220,975	$ 494,123	$ -	$ 6,804,644	$ 98	$161	$ 49	$ 32	$ 16	$ 84	$ -	$ -
C	3 Eco Depots, 9 Attended TS, 29 Trailer Sites	69,085	35,563	22,489	51.5%	$ 6,847,349	$ 5,339,569	$ 792,682	$ 220,975	$ 494,123	$ -	$ 6,847,349	$ 99	$159	$ 50	$ 31	$ 16	$ 84	$ -	$ -
D	9 Attended TS, 29 Community Trailer Sites	69,085	28,423	15,349	41.1%	$ 6,528,307	$ 5,557,646	$ 255,564	$ 220,975	$ 494,123	$ -	$ 6,528,307	$ 94	$137	$ 30	$ 10	$ 16	$ 84	$ -	$ -
E	3 Eco Depots, 9 Attended TS, Recycle Bins in Town, Bin Trailer, Concrete	69,085	36,502	23,428	52.8%	$ 6,620,114	$ 5,309,753	$ 774,459	$ 220,975	$ 314,927	$ -	$ 6,620,114	$ 96	$163	$ 47	$ 31	$ 16	$ 53	$ -	$ -
E & Composting A	Option E Recycling as Above plus Back Yard Composters	69,085	37,202	24,128	53.9%	$ 6,557,243	$ 5,252,235	$ 763,606	$ 220,975	$ 314,927	$ 5,500	$ 6,557,243	$ 95	$165	$ 46	$ 37	$ 16	$ 53	$ 8	$ 0.26
E & Composting B	Option E Recycling as Above plus Yard and Garden Waste Curside	69,085	40,251	27,177	58.3%	$ 6,822,269	$ 5,186,814	$ 792,698	$ 220,975	$ 314,927	$ 306,855	$ 6,822,269	$ 99	$180	$ 48	$ 38	$ 16	$ 53	$ 82	$ 14.76
E & Composting C	Option E Recycling as Above plus Food Waste and Y&G Waste Curbside	69,085	42,532	29,458	61.6%	$ 8,764,383	$ 5,090,568	$ 777,648	$ 220,975	$ 314,927	$ 2,360,266	$ 8,764,383	$127	$192	$ 47	$ 37	$ 16	$ 53	$ 391	$ 113.54
E & Composting D	Option E Recycling as Above plus Y&G Waste Depot Drop Off only	69,085	38,514	25,440	55.7%	$ 6,611,841	$ 5,213,339	$ 779,022	$ 220,975	$ 314,927	$ 83,578	$ 6,611,841	$ 96	$171	$ 47	$ 37	$ 16	$ 53	$ 42	$ 4.02

16. STATEMENT OF LIMITATIONS

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of the Cariboo Regional District in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from the CRD and other external sources. This external information has not been independently verified or otherwise examined by Sperling Hansen Associates to determine its accuracy and completeness. Sperling Hansen Associates has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the Cariboo Regional District. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Sperling Hansen Associates does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to Sperling Hansen Associates during the course of this project. Should additional new data become available in the future, Sperling Hansen Associates should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

Sperling Hansen Associates has enjoyed working on this project with the Cariboo Regional District and looks forward to working with you again in the near future. Should you have any questions on concerns in regards to this report or require any further information please feel free to contact the undersigned at 604 986 7723.

Report prepared by:

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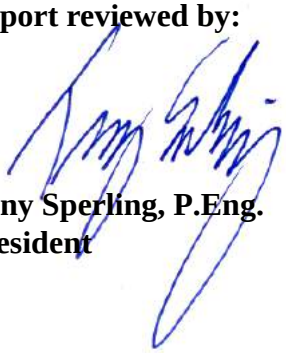

Tony Sperling, P.Eng.
President

June 25th, 2011

APPENDIX A
Transfer Station Compaction Efficiency Analysis

TRANSFER STATION COMPACTON EFFICIENCY ANALYSIS

During the recent solid waste management plan review Sperling Hansen and Associates determined that operational savings may be possible at existing transfer stations sites if densities could be increased for haul trucks.

District staff has completed an assessment and determined that substantial savings would be possible at high volume sites which also experience substantial clean up costs due to misuse. Little or no savings occurred at low volume sites where there is minimal user abuse. Medium volume sites could experience some savings provided a local area contractor could be retained to service the site.

For the analysis the use of tamped bins with a density of 7 tonnes versus a mechanical compaction unit with a density of 9 tonnes was chosen. The tamped bins would provide for greater flexibility to accept larger waste materials, do not require constant supervise, no mechanical maintenance issues, no potential issues with wet products and freezing conditions, and the tamping equipment (small tractor or excavator) can be used on the site for sorting and piling metals and wood waste as well as snow removal and minor road work.

With the above operating scenario a small tractor or excavator is required in order to achieve the required densities. Compacting the bin four times while waste is accumulating is required to achieve the densities. At high volume sites compaction would occur on a daily basis and at low volume sites this would occur once or twice per week. In order for low volume sites to gain any advantages from compaction a local resident contractor would have to have such equipment available and be willing to leave it at a site. Typically the unit would only be used for 78 hours per year as such it is impractical to dedicate it to a site. If for operational purposes sites are combined such as Alexandria and McLeese Lake than travel costs are incurred for transporting equipment, which reduces potential savings. However combining low volume sites is the only way to proceed operationally as dedicating equipment at these sites is not practical. At low volume sites it is not possible to utilize two bins because it can take over a month to fill the bins, thus hauling efficiencies are reduced by only utilizing one bin. During the summer period garbage starts to compost and will produce objectionable odours and become a health concern.

In the analysis high use sites would require that the equipment operator be on site for several hours per week as such it seemed logical to make these controlled sites (40 hours/week). Low and medium use sites would be open on a continuous basis.

For the high use sites the analysis concluded that a substantial savings would occur such that a full time attendant (40 hours/week) could be provided without any additional operating expenses. As well for the Central Cariboo sites additional savings, $44,000 could also be realized by hauling directly to the Gibraltar landfill. Should full time attendants not be provided at the seven sites as highlighted below

than additional savings of $245,000 could also realized, however district staff strongly recommend that attendants be provided. Overall cost savings, excluding attendant costs, would be in the order $200,000.

Table 1.0 Transfer Station Cost Comparison Utilizing Compacted Bins

Site	Existing Operational Costs **	Controlled Site With Full time Attendant	Non-Controlled Site	New Operating Cost with Compaction	Potential Savings	Potential Deficit
Alexandria	$23,523		Yes	$17,051	$6,472	
Baker Creek	$42,627	Yes		$69,805		$27,178
Cottonwood	$15,300		Yes	$14,856	$444	
Wells	$62,620		Yes	$49,554	$13,066	
Titetown	$9,000		Yes	$12,757		$3,757
McLeese Lake	$25,469		Yes	$18,455	$7,014	
Wildwood	$97,971	Yes		$84,478	$13,493	
Frost Creek	$97,971	Yes		$84,136	$13,835	
Chimney Creek	$20,813		Yes	$16,678	$4,135	
150 Mile House	$111,893	Yes		$87,135	$24,758	
Horsefly	$44,568		Yes	$38,783	$5,785	
Alexis Creek	$14,757		Yes	$23,802		$9,045
Riske Creek	$36,536		Yes	$20,328	$16,208	
Eagle Creek	$7,040		Yes	$15,828		$8,788
Forest Grove	$95,468	Yes		$88,918	$6,550	
Lac La Hache	$203,396	Yes		$125,275	$78,121	
Lone Butte	$104,189	Yes		$87,217	$16,972	
TOTAL	**$1,013,141**			**$855,056**	**$206,853**	**($48,768)**

An analysis of each of the CRD's transfer stations with the applicability of high density compacted roll-off bind is presented below.

ALEXANDRIA – NO ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase

density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and 1 day per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		220
Seasonal tonnage:	May to October	165 (0.92 t per day)
	Nov. to April	55 (0.3 t per day)
		220

Trucking

Number of hauling events per year:	16 (220 tonnes /14 tonnes per load)
Truck travel time return trip:	1.5 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.5 hrs.
Trucking Cost:	$3,400 ($85/hr x 2.5 hr x 16 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment hauling cost:	$3,276 ($1.4 x 30km x 78)
Tractor cost:	$3,900 ($50 x 78 hrs)
Total Maintenance:	$9,126

Capital Improvements

2 bins		$24,000
Expanded retaining wall		$7,200
Landing/Roads		$5,000
Concrete pad		$1,021
Gate		$5,000
Bear Fence		$15,000
Safety rail		$5,000
Sea Can		$4,500
	Total	$66,721

Total Operating Costs

Trucking:	$3,400	
Maintenance:	$9,126	
Capital Finance:	$4,525	(30 Years @ 5%)
Total	$17,051	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor. The annual cost of this operation is $23,523 which includes provisions for hauling, major site clean-up, and general maintenance. By changing operations an annual savings of $6,472 occurs.

BAKER CREEK – ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood.

Tonnage

Estimate MSW Annual Tonnage:		479
Seasonal tonnage:	May to October	359 (2.0 t per day)
	Nov. to April	120 (0.65 t per day)
		479

Trucking

Number of hauling events per year:	34 (479 tonnes /14 tonnes per load)
Truck travel time return trip:	1.5 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.5 hrs.
Trucking Cost:	$7,225 ($85/hr x 2.5 hr x 34 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$5,200 ($50 x 104 hrs)

Total Maintenance: $59,072

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$7,225	
Maintenance:	$59,072	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$69,805	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins and a metals/wood yard. The annual cost of this operation is $42,627 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations cost would increase by $27,178 however a full time attendant would be provided. This also opens the door for providing an attended recycling bin.

COTTONWOOD TRANSFER STATION – NO ATTENDANT

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		153
Seasonal tonnage:	May to October	115 (0.6 t per day)
	Nov. to April	38 (0.2 t per day)
		153

Trucking

Number of hauling events per year:	22 (153 tonnes /7 tonnes per load)
Truck travel time return trip:	1.0 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.0 hrs.
Trucking Cost:	$3,740 ($85/hr x 2 hr x 22 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment Hauling Cost:	$4,586 ($1.40 x 42 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)

Total Maintenance: $10,436

Capital Improvements

1 bin	$12,000
Landing/Roads	$5,000
Concrete pad	$600
Bear Fence	$15,000
Safety rail	$5,000
Total	$37,600

Total Operating Costs

Trucking:	$1,870	
Maintenance:	$10,436	
Capital Finance:	$2,550	(30 Years @ 5%)
Total	$14,856	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor. The annual cost of this operation is $15,300 which includes provisions for hauling, major site clean-up, and general maintenance. By changing operations an annual savings of $444 could be realized.

WELLS – NO ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would need to be expanded. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 3 days per week in the summer and two days per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		477
Seasonal tonnage:	May to October	358 (2.0 t per day)
	Nov. to April	119 (0.65 t per day)
		477

Trucking

Number of hauling events per year:	34 (477 tonnes /14 tonnes per load)
Truck travel time return trip:	2.7 hrs.
Loading time:	1.0 hrs.
Total Process Time	3.7 hrs.
Trucking Cost:	$10,693 ($85/hr x 3.7 hr x 34 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$3,250 ($25 x 3 hrs/week x 26 weeks) + ($25 x 2 hrs/week x 26 weeks)
Equipment hauling Cost:	$936 ($1.40 x 42 km x 78 visits)
Tractor cost:	$6,500 ($50 x 130 hrs)

Total Maintenance: $14,336

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Bear Fence	$15,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$66,721

Total Operating Costs

Trucking:	$10,693	
Maintenance:	$14,336	
Tipping Fees:	$20,000	
Capital Finance:	$4,525	(30 Years @ 5%)
Total	$49,554	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one open top bin and a metals/wood yard. The annual cost of this operation is $62,620 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations an annual savings of $13,066 could be realized.

TITETOWN – NO ATTENDANT

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal. The site would be serviced 2 days per week in the summer and once every two weeks k in the winter.

Tonnage

Estimate MSW Annual Tonnage:		89
Seasonal tonnage:	May to October	67 (0.4 t per day)
	Nov. to April	22 (0.1 t per day)
		89

Trucking

Number of hauling events per year:	13 (89 tonnes /7 tonnes per load)
Truck travel time return trip:	4.2 hrs.
Loading time:	1.0 hrs.
Total Process Time	5.2 hrs.
Trucking Cost:	$5,746 ($85/hr x 5.2 hr x 13 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$1,625 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 13 weeks)
Travel cost:	$468 ($0.60 x 12 km x 65 visits)
Tractor cost:	$3,250 ($50 x 65 hrs)

Total Maintenance: $5,343

Capital Improvements

1 bin	$12,000
Retaining wall	$2,000
Landing/Roads	$5,000
Concrete pad	$600
Safety rail	$5,000
Total	$24,600

Total Operating Costs

Trucking:	$5,746	
Maintenance:	$5,343	
Capital Finance:	$1,668	(30 Years @ 5%)
Total	$12,757	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one open top bin. The annual cost of this operation is $9,000 which includes provisions for hauling and general maintenance. Changing the style of operation would result in an increase of $3,757. This is due to the fact that only one bin is recommended due to odours from waste and the very low volume of waste at the site.

MCLEESE LAKE – NO ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. A direct haul to the Gibraltar site would occur. The site would be serviced 2 days per week in the summer and one day every two weeks in the winter.

Tonnage

Estimate MSW Annual Tonnage:		220
Seasonal tonnage:	May to October	165 (0.9 t per day)
	Nov. to April	55 (0.3 t per day)
		220

Trucking

Number of hauling events per year:	16 (220 tonnes /14 tonnes per load)
Truck travel time return trip:	1.5 hrs. (Direct haul to Gibraltar)
Loading time:	1.0 hrs.
Total Process Time	2.5 hrs.
Trucking Cost:	$3,400 ($85/hr x 2.5 hr x 16 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.4/km
Tractor	$50/hr

Labour cost:	$2,600 ($25 x 3 hrs/week x 26 weeks) + ($25 x 2 hrs/week x 13 weeks)
Equipment Haul Cost:	$2,730($1.40 x 30 km x 65 visits)

Tractor cost:	$5,200 ($50 x 104 hrs)
Total Maintenance:	$10,530

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Bear Fence	$15,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$66,721

Total Operating Costs

Trucking:	$3,400	
Maintenance:	$10,530	
Capital Finance:	$4,525	(30 Years @ 5%)
Total	$18,455	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor bin and a metals/wood yard. The annual cost of this operation is $25,469 which includes provisions for hauling, major site clean-up, general maintenance, sorting of wood/metals and snow removal. By changing operations an annual savings of $7,014 could be realized.

WILDWOOD TRANSFER STATION – ATTENDED SITE

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals.

Tonnage

Estimate MSW Annual Tonnage:		1,134
Seasonal tonnage:	May to October	850 (4.7 t per day)
	Nov. to April	284 (1.5 t per day)
		1,134

Trucking

Number of hauling events per year:	81 (1,134 tonnes /14 tonnes per load)
Truck travel time return trip:	0.67 hrs.
Loading time:	1.0 hrs.
Total Process Time	1.67 hrs.
Trucking Cost:	$11,498 ($85/hr x 1.67 hr x 81 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,500 ($50 x 6 hrs/week x 52 weeks)
Total Maintenance:	$69,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$11,498	
Maintenance:	$69,472	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$84,478	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins and a metals yard. The annual cost of this operation is $97,971 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations an annual savings of $13,495 could be realized while providing for a full time attendant and all of the operations listed above. This also opens the door for providing an attended recycling bin.

If an uncontrolled site is desired than additional savings of $35,000 would apply. With an uncontrolled site a contractor would service the site once per day from May to October and once every two days from Nov. to April. During a service the waste would be compacted metals sorted, snow removed and

general maintenance of the site. Bear fencing would have to be added which would increase the capital financing by $1,100.

With the above scenario waste is hauled to the Central Cariboo Transfer Station (CCTS) in Williams Lake where the material is processed at a rate of $13/tonne and shipped at a rate of $10/tonne to the landfill at Gibraltar. By not processing the material at CCTS and hauling the material directly to the landfill at Gibraltar an additional savings of $12,312 could be realized.

The current wood waste yard at Wildwood is at another location in order to provide this service an additional attendant would be required at an increased cost. By providing an additional bin at the transfer station for residential size loads (pick-up truck) another attendant can be eliminated and a reasonable service provided. Commercial size loads (dump truck) would have to transport wood waste directly to the CCTS. The estimated wood volume is 300 to 400 cubic meters per year. The cost of trucking this material would range from $1,000 to $1,500 per year and an additional $15,000 in capital funding would be required. A superior service would be provided at a lower cost than providing an attendant, at cost of $20,000/ year, at the satellite wood waste area.

FROST CREEK – ATTENDED SITE

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal .

Tonnage

Estimate MSW Annual Tonnage:		1,046
Seasonal tonnage:	May to October	784 (4.3 t per day)
	Nov. to April	262 (1.4 t per day)
		1,046

Trucking

Number of hauling events per year:	75 (1,046 tonnes /14 tonnes per load)
Truck travel time return trip:	0.75 hrs.
Loading time:	1.0 hrs.

	Total Process Time	1.75 hrs.
Trucking Cost:		$11,156 ($85/hr x 1.75 hr x75 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr

Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,500 ($50 x 6 hrs/week x 52 weeks)
Total Maintenance:	$69,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking: $11,156

Maintenance: $69,472

Capital Finance: $3,508 (30 Years @ 5%)

Total $84,136

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins. The annual cost of this operation is $97,971 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations an annual savings of $12,635 could be realized while providing for a full time attendant and all of the operations listed above. This also opens the door for providing an attended recycling bin.

If an uncontrolled site is desired than additional savings of $35,000 would apply. With an uncontrolled site a contractor would service the site once per day from May to October and once every two days from Nov. to April. During a service the waste would be compacted, snow removed and general maintenance of the site. Bear fencing would have to be added which would increase the capital financing by $1,100.

With the above scenario waste is hauled to the Central Cariboo Transfer Station (CCTS) in Williams Lake where the material is processed at a rate of $13/tonne and shipped at a rate of $10/tonne to the landfill at Gibraltar. By not processing the material at CCTS and hauling the material directly to the landfill at Gibraltar an additional savings of $12,312 could be realized.

The current wood waste yard at Frost Creek is at another location in order to provide this service an additional attendant would be required at an increased cost. By providing an additional bin at the transfer station for residential size loads (pick-up truck) another attendant can be eliminated and a reasonable service provided. Commercial size loads (dump truck) would have to transport wood waste directly to the CCTS. The estimated wood volume is 300 to 400 cubic meters per year. The cost of trucking this material would range from $1,000 to $1,500 per year and an additional $15,000 in capital funding would be required. A superior service would be provided at a lower cost than providing an attendant, at cost of $20,000/ year, at the satellite wood waste area.

CHIMNEY LAKE – NO ATTENDANT

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		136
Seasonal tonnage:	May to October	102 (0.56 t per day)
	Nov. to April	34 (0.18 t per day)
		136

Trucking

Number of hauling events per year:	20 (136 tonnes /7 tonnes per load)
Truck travel time return trip:	1.3 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.3 hrs.
Trucking Cost:	$3,910 ($85/hr x 2.3 hr x 20 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.4/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment Hauling Cost:	$4,368($1.40 x 40 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)

Total Maintenance: $10,218

Capital Improvements

1 bin		$12,000
Landing/Roads		$5,000
Concrete pad		$600
Bear Fence		$15,000
Safety rail		$5,000
	Total	$37,600

Total Operating Costs

Trucking:	$3,910	
Maintenance:	$10,218	
Capital Finance:	$2,550	(30 Years @ 5%)
Total	$16,678	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor. The annual cost of this operation is $20,813 which includes provisions for hauling, major site clean-up, sorting of metals/wood and general maintenance. By changing operations an annual savings of $4,135 could be realized.

150 MILE HOUSE – ATTENDED SITE

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would

provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal.

Tonnage

Estimate MSW Annual Tonnage:		1,276
Seasonal tonnage:	May to October	957 (5.3 t per day)
	Nov. to April	319 (1.7 t per day)
		1,276

Trucking

Number of hauling events per year:	91 (1,276 tonnes /14 tonnes per load)
Truck travel time return trip:	0.83 hrs.
Loading time:	1.0 hrs.
Total Process Time	1.83 hrs.
Trucking Cost:	$14,155 ($85/hr x 1.83 hr x91 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,500 ($50 x 6 hrs/week x 52 weeks)
Total Maintenance:	$69,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000

Concrete pad		$1,021
Gate		$5,000
Safety rail		$5,000
Shelter Sea Can		$4,500
	Total	$51,721

Total Operating Costs

Trucking:	$14,155	
Maintenance:	$69,472	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$87,135	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins. The annual cost of this operation is $111,893 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations an annual savings of $24,758 could be realized while providing for a full time attendant and all of the operations listed above. This also opens the door for providing an attended recycling bin.

If an uncontrolled site is desired than additional savings of $35,000 would apply. With an uncontrolled site a contractor would service the site once per day from May to October and once every two days from Nov. to April. During a service the waste would be compacted, snow removed and general maintenance of the site. Bear fencing would have to be added which would increase the capital financing by $1,100.

With the above scenario waste is hauled to the Central Cariboo Transfer Station (CCTS) in Williams Lake where the material is processed at a rate of $13/tonne and shipped at a rate of $10/tonne to the landfill at Gibraltar. By not processing the material at CCTS and hauling the material directly to the landfill at Gibraltar an additional savings of $13,312 could be realized.

The current wood waste/metals yard at 150 Mile House is accessed through the transfer station but is a kilometre away. Additional operator time of 2 hours per week for 8 months will be required to maintain this area valued at $13,000.

HORSEFLY TRANSFER STATION – NO ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 3 days per week in the summer and two days per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		375
Seasonal tonnage:	May to October	281 (1.56 t per day)
	Nov. to April	94 (0.5 t per day)
		375

Trucking

Number of hauling events per year:	27 (375 tonnes /14 tonnes per load)
Truck travel time return trip:	2.7 hrs.
Loading time:	1.0 hrs.
Total Process Time	3.7 hrs.
Trucking Cost:	$8,492 ($85/hr x 3.7 hr x 27 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$3,250 ($25 x 3 hrs/week x 26 weeks) + ($25 x 2 hrs/week x 26 weeks)
Equipment Hauling Cost:	$16,016 ($1.40 x 88 km x 130 visits)
Tractor cost:	$6,500 ($50 x 130 hrs)
Total Maintenance:	$25,766

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Bear Fence	$15,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$66,721

Total Operating Costs

Trucking:	$8,492	
Maintenance:	$25,766	
Capital Finance:	$4,525	(30 Years @ 5%)
Total	$38,783	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins and a metals/wood yard. The annual cost of this operation is $44,568 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations an annual savings of $5,785 could be realized.

With the above scenario waste is hauled to the Central Cariboo Transfer Station (CCTS) in Williams Lake where the material is processed at a rate of $13/tonne and shipped at a rate of $10/tonne to the landfill at Gibraltar. By not processing the material at CCTS and hauling the material directly to the landfill at Gibraltar an additional savings of $4,000 could be realized.

ALEXIS CREEK – NO ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and 1 day per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		285
Seasonal tonnage:	May to October	214 (1.2 t per day)
	Nov. to April	71 (0.4t per day)
		285

Trucking

Number of hauling events per year:	20 (285 tonnes /14 tonnes per load)
Truck travel time return trip:	3.0 hrs.
Loading time:	1.0 hrs.
Total Process Time	4.0 hrs.
Trucking Cost:	$6,800 ($85/hr x 4.0 hr x 20 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hrs/week x 26 weeks) + ($25 x 1 hrs/week x 26 weeks)
Equipment Hauling Cost:	$7,644 ($1.40 x 70 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)
Total Maintenance:	$13,494

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$6,800	
Maintenance:	$13,494	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$23,802	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one open top bin and a metal yard. The annual cost of this operation is $14,757 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations $9,045 in additional funding would be required.

With the above scenario waste is hauled to the Central Cariboo Transfer Station (CCTS) in Williams Lake where the material is processed at a rate of $13/tonne and shipped at a rate of $10/tonne to the landfill at Gibraltar. By not processing the material at CCTS and hauling the material directly to the landfill at Gibraltar an additional savings of $2,500 could be realized.

RISKE CREEK – NO ATTENDANT

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		147
Seasonal tonnage:	May to October	110 (0.6 t per day)
	Nov. to April	37 (0.2 t per day)
		147

Trucking

Number of hauling events per year:	21 (147 tonnes /7 tonnes per load)
Truck travel time return trip:	1.4 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.4 hrs.
Trucking Cost:	$4,284 ($85/hr x 2.4 hr x 21 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment Hauling Cost:	$7,644 ($1.40 x 70 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)

Total Maintenance: $13,494

Capital Improvements

1 bin		$12,000
Landing/Roads		$5,000
Concrete pad		$600
Bear Fence		$15,000
Safety rail		$5,000
	Total	$37,600

Total Operating Costs

Trucking:	$4,284	
Maintenance:	$13,494	
Capital Finance:	$2,550	(30 Years @ 5%)
Total	$20,328	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor. The annual cost of this operation is $36,536 which includes provisions for hauling, major site clean-up, sorting of metals and general maintenance. By changing operations an annual savings of $16,208 could be realized.

EAGLE CREEK – NO ATTENDANT

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. Electric bear fencing would also be required. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		101
Seasonal tonnage:	May to October	76 (0.42 t per day)
	Nov. to April	25 (0.14 t per day)
		101

Trucking

Number of hauling events per year:	15 (101 tonnes /7 tonnes per load)
Truck travel time return trip:	1.4 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.4 hrs.
Trucking Cost:	$3,060 ($85/hr x 2.4 hr x 15 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment Hauling Costs:	$4,368 ($1.40 x 40 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)

Total Maintenance: $10,218

Capital Improvements

1 bin		$12,000
Landing/Roads		$5,000
Concrete pad		$600
Bear Fence		$15,000
Safety rail		$5,000
	Total	$37,600

Total Operating Costs

Trucking:	$3,060	
Maintenance:	$10,218	
Capital Finance:	$2,550	(30 Years @ 5%)
Total	$15,828	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes one transtor. The annual cost of this operation is $7,040 which includes provisions for hauling, major site clean-up, and general maintenance. The cost would increase by $8,708 in order to change this system however a higher level of service would be provided.

FOREST GROVE TRANSFER STATION – ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood.

Tonnage

Estimate MSW Annual Tonnage:		1,051
Seasonal tonnage:	May to October	788 (4.4 t per day)
	Nov. to April	263 (1.4 t per day)
		1,051

Trucking

Number of hauling events per year:	75 (1,051 tonnes /14 tonnes per load)
Truck travel time return trip:	1.5 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.5 hrs.
Trucking Cost:	$15,938 ($85/hr x 2.5 hr x 75 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,500 ($50 x 6 hrs/week x 52 weeks)

Total Maintenance: $69,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$15,938	
Maintenance:	$69,472	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$88,918	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins and a metals/wood yard. The annual cost of this operation is $95,468 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations a savings of $6,550 would occur and a full time attendant would be provided under taking all of the operations listed above. This also opens the door for providing an attended recycling bin.

LAC LA HACHE – ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood.

Tonnage

Estimate MSW Annual Tonnage:		2,823
Seasonal tonnage:	May to October	2117 (11.8 t per day)
	Nov. to April	706 (3.8 t per day)
		2,823

Trucking

Number of hauling events per year:	201 (2823 tonnes /14 tonnes per load)
Truck travel time return trip:	1.3 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.3 hrs.
Trucking Cost:	$39,295 ($85/hr x 2.3 hr x 201 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$28,600 ($50 x 11 hrs/week x 52 weeks)
Total Maintenance:	$82,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$39,295	
Maintenance:	$82,472	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$125,275	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes three transtor bins and a metals yard. The annual cost of this operation is $203,396 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations a savings of $78,121 would occur and a full time attendant would be provided under taking all of the operations listed above. This also opens the door for providing an attended recycling bin.

LONE BUTTE – ATTENDANT

Operating conditions: The site would utilize 2 open top 40 cubic yard bins with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind, birds, during transport as well as keep bears out. The site would be open forty hours per week. The attendant would supervise the site during hours of operation. The contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal .

Tonnage

Estimate MSW Annual Tonnage:		892
Seasonal tonnage:	May to October	669 (3.7 t per day)
	Nov. to April	223 (1.2 t per day)
		892

Trucking

Number of hauling events per year:	67 (892 tonnes /14 tonnes per load)
Truck travel time return trip:	1.5 hrs.
Loading time:	1.0 hrs.
Total Process Time	2.5 hrs.
Trucking Cost:	$14,237 ($85/hr x 2.5 hr x 67 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,500 ($50 x 6 hrs/week x 52 weeks)
Total Maintenance:	$69,472

Capital Improvements

2 bins	$24,000
Expanded retaining wall	$7,200
Landing/Roads	$5,000
Concrete pad	$1,021
Gate	$5,000
Safety rail	$5,000
Shelter Sea Can	$4,500
Total	$51,721

Total Operating Costs

Trucking:	$14,237	
Maintenance:	$69,472	
Capital Finance:	$3,508	(30 Years @ 5%)
Total	$87,217	

Conclusion

The current transfer station is open 7 days per week 24 hours per day and includes two transtor bins and a metals/wood yard. The annual cost of this operation is $104,189 which includes provisions for hauling, major site clean-up, general maintenance and snow removal. By changing operations a savings of $16,972 significant would occur and a full time attendant would be provided under taking all of the operations listed above. This also opens the door for providing an attended recycling bin.

APPENDIX B
Economic Model of CRD Solid Waste System

TABLE A. Population Statistics in Cariboo Regional District
Source: Statistics Canada

		Community	Population 2006	Adjusted 2006 Population	Population 2001	Population 1991	Proportion of Total 1991	Homes	People per home	Sq. Km.
Cariboo	RD		**62,190**	**62,190**	**65,659**	**60,297**		25,218	2.47	80,629.34
QUESNEL LANDFILL										
Quesnel	CY	Quesnel	9,326	19,673	10,044	20,331	0.89	3,917	2.38	35.34
		IR		128						
Cariboo A	RDA		5,859		6,428			2,308	2.54	783.36
		Alexandria		762		785	0.03			
		IR		42						
Cariboo B	RDA		3,858		4,338			1,552	2.49	1,419.74
		Baker Creek		762		784	0.03			
Cariboo C	RDA		1,164		1,323			487	2.39	7,392.10
		Cottonwood		153		158	0.01			
Cariboo I	RDA		1,661		1,773			664	2.50	11,942.85
		Nazko		392		404	0.02			
		Titetown		75		n/a				
		IR		149						
Wells	DM	Wells	236	287	235	295	0.01	130	1.82	159.15
			22,104	**22,423**		**22,757**				
GIBRALTAR LANDFILL										
Williams Lake	CY		10,744	15,112	11,153	15,656	0.63	4,455	2.41	33.11
		IR		237						
Cariboo D	RDA		3,073		3,296			1,242	2.47	856.15
		McLeese Lake		873		943	0.04			
		IR		125						
		Wildwood		1,842		1,990	0.08			
		IR		179						
Cariboo E	RDA		4,336		4,668	2,933		1,665	2.60	1,744.06
		Chimney/Felker		248		268	0.01			
		Frost Creek		1,024		1,106	0.04			
		IR		484						
		Dog Creek		400		432	0.02			
Cariboo F	RDA		4,384		4,961	1,806		1,740	2.52	9,775.63
		Horsefly		595		643	0.03			
		Likely		528		570	0.02			
		Big Lake		554		598	0.02			
		150 Mile House		1,164		1,257	0.05			
Cariboo K	RDA		552		674	3,068		234	2.36	13,650.75
		Alexis Creek		459		1164	0.05			
		IR		753						
		Riske Creek		291		314	0.01			
		IR		128						
						1478				
			23,089	**24,995**		**24,941**				
100 MILE HOUSE LANDFILL										
100 Hundred Mile House	DM	100 Mile House	1,885	3,304	1,739	3,799	0.34	811	2.32	51.34
Cariboo H	RDA		1,744	0	1,834			769	2.27	2,603.71
		Eagle Creek		633		548	0.05			
		Forest Grove		1,129		978	0.09			
		IR		253						
		Mahood Lake		84		73	0.01			
Cariboo G	RDA		4,974		5,001	1,599		2,085	2.39	2,678.81
		Lac La Hache		3,715		3,217	0.29			
Cariboo L	RDA		4,316		4,254	3,217		1862	2.32	1,268.42
		Lone Butte		1,173		1,016	0.09			
		Sheridan Lake		2,436		1,172	0.10			
		IR		87						
		Watch Lake		445		385	0.03			
						2,573				
			12,919	**13,259**		**11,188**				
RURAL LANDFILLS										
Indian Reserves	IR		3,270		3,058			954	3.43	286.36
Cariboo J	RDA		808		880			343	2.36	25,948.44
		Anahim Lake		153		265	0.19			
		IR		195						
		Cochin Lake		90		157	0.11			
		Klena Kleene		40		70	0.05			
		IR		100						
		Nimpo Lake				n/a				
		Puntzi		289		502	0.36			
		IR		263						
		Tatla Lake		46		80	0.06			
		IR		100						
		Nemaiah		189		328	0.23			
		IR		47						
			808	**1,513**		**1402**				
			4,886							
		Total Urban Population	22,191	**38,375**			Urban %	**62%**		
		Total Rural Population		**20,545**			Rural %	**33%**		
		Total First Nations on IR		**3,270**			First Nations%	**5%**		
			62,190	**62,190**	**65,659**	**60,288**				

Note: Adjusted 2006 Populations used in model.

Table B. Solid Waste Generation by Source Area and Subregion

Site Name	Electoral Area	Service Population (2006)	MSW, Soil and Concrete Waste	Recycle/ Wood Waste Tonnes	Estimated EPR Materials	Total Tonnes	Per Capita Total Solid Waste
Cariboo	**RD**	**62,190**	**56,011**	**12,888**	**187**	**69,085**	**1.111**
NORTH CARIBOO CATCHMENT							
Quesnel Landfill	Quesnel	22,031	15,956			20,265	0.920
Nazko Landfill	Cariboo I	392	245	0	3	248	0.633
Quesnel Urban Collection Direct Haul		19,801	8,859			8,859	1.040
Quesnel Landfill Pure Recycle				4,309		4,309	
Quesnel DLC to Landfill			3,214			3,214	
Quesnel Wood Waste				1,745		1,745	
Quesnel Concrete			2,464			2,464	
Quesnel Contaminated Soil			1,500			1,500	
Alexandria Transfer Station	Cariboo A	804	220	0	7	227	0.282
Baker Creek Transfer Station	Cariboo B	762	479	57	6	543	0.713
Cottonwood Transfer Station	Cariboo C	153	153	0	1	154	1.005
Wells Transfer Station	Wells	287	477	57	2	537	1.873
Titetown Transfer Station	Cariboo I	224	89	0	2	91	0.405
Entire Catchment		**22,423**	**17,701**	**6,169**	**21**	**23,891**	**1.065**
Quesnel Landfill Catchment		**22,031**	**15,956**	**6,169**	**18**	**22,143**	**1.005**
Quesnel Urban System		**19,801**	**16,038**	**6,054**	**0**	**20,592**	**1.040**
North Rural Transfer System		**2,230**	**1,418**	**115**	**18**	**1,551**	**0.695**
North Rural Landfill System		**392**	**245**	**0**	**3**	**248**	**0.633**
Check Sum		**22,423**	**17,701**	**6,169**	**21**	**22,391**	
CENTRAL CARIBOO CATCHMENT							
Gibraltar Landfill	Cariboo D	23,161	13,115	0		13,115	0.566
Likely Landfill	Cariboo F	528	290	35	4	329	0.624
Big Lake Landfill	Cariboo F	554	304	37	4	346	0.624
WL Urban Collection/Direct Haul	Williams Lake	15,349	8,496			8,496	1.040
Williams Lake Pure Recycle				1,712		1,712	
Williams Lake DLC Landfill			2,492			2,492	
Williams Lake Wood Waste				1,353		1,353	
Williams Lake Concrete			1,910			1,910	
Williams Lake Contaminated Soil			5,188			5,188	
McLeese Lake Transfer Station	Cariboo D	998	220	26	8	255	0.255
Wildwood Transfer Station	Cariboo D	2,021	1,134	185	16	1,336	0.661
Frost Creek Transfer Station	Cariboo E	1,908	1,046	252	16	1,314	0.689
Chimney Lake Transfer Station	Cariboo E	248	136	16	2	154	0.622
150 Mile Transfer Station	Cariboo F	1,164	1,276	181	9	1,466	1.260
Horsefly Transfer Station	Cariboo F	595	375	45	5	425	0.714
Alexis Creek Transfer Station	Cariboo K	459	285	0	4	289	0.629
Riske Creek Transfer Station	Cariboo K	419	147	0	3	150	0.359
Entire Catchment		**24,242**	**23,299**	**3,842**	**72**	**27,214**	**1.123**
Williams Lake Transfer Station		**23,161**	**22,705**	**3,771**	**63**	**26,539**	**1.146**
Haul to Gibraltar Landfill		**23,161**	**13,115**	**0**	**0**	**13,115**	**0.566**
Williams Lake Urban System		**15,349**	**18,086**	**3,065**	**0**	**21,150**	**1.378**
Central Rural Transfer System		**7,812**	**4,619**	**706**	**63**	**5,389**	**0.690**
Central Rural Landfill System		**1,081**	**595**	**71**	**9**	**675**	**0.624**
Central Check Sum		**24,242**	**23,299**	**3,842**	**72**	**27,214**	
SOUTH CARIBOO CATCHMENT							
100 Hundred Mile House Landfill	100 Mile House	10,207	8,581	0		8,581	0.841
Mahood Lake	Cariboo H	84	53	0	1	53	0.632
Inter-Lakes	Cariboo L	2523	1,575	1,101	20	2,696	1.068
Watch Lake	Cariboo L	445	277	218	4	499	1.122
100 Mile House Urban MSW and DLC	100 Mile House	3304	3714			3,714	2.663
100 Mile House DLC Waste			672	0		672	
100 Mile House Wood Waste Burned				568		568	
100 Mile House Concrete Landfilled			1,237	0		1,237	
100 Mile Contaminated Soil Landfilled			1,672			1,672	
100 Mile House Metals Recycled				77		77	
100 Mile House Gold Trail Recycling				860		860	
Eagle Creek Transfer Station	Cariboo H	633	101	0	5	106	0.168
Forest Grove Transfer Station	Cariboo H	1,382	1,051	12	11	1,074	0.777
Lac La Hache Transfer Station	Cariboo G	3,715	2,823	15	30	2,868	0.772
Lone Butte Transfer Station	Cariboo L	1,173	892	0	10	902	0.768
Entire Catchment		**13,259**	**14,067**	**2,851**	**81**	**16,998**	**1.282**
100 Mile House LF Catchment		**10,207**	**12,162**	**1,532**	**56**	**13,750**	**1.347**
South Rural Transfer Station		**6,903**	**4,867**	**27**	**56**	**4,950**	**0.717**
100 Mile House Urban System		**3,304**	**7,295**	**1,505**	**0**	**8,800**	**2.663**
South Rural Landfill System		**3,052**	**1,905**	**1,318**	**25**	**3,248**	**1.064**
South Check Sum		**13,259**	**14,067**	**2,851**	**81**	**16,998**	
			0				
RURAL LANDFILLS			0	0		0	0.624
West Chilcotin Landfill	Cariboo J	348	217	26	3	246	0.707
Kleana Kleene Landfill	Cariboo J	140	88		1	89	0.632
Tatla Lake Landfill	Cariboo J	146	91		1	92	0.632
Cochin Lake Landfill	Cariboo J	90	56		1	57	0.632
Puntzi Lake Landfill	Cariboo J	552	345		4	349	0.632
Nemiah Valley Landfill	Cariboo J	236	147		2	149	0.632
		1513	944	26	12	983	0.649
Total Check Sum		**61,437**	**56,011**	**12,888**	**187**	**69,085**	

Table C. CARIBOO R.D. SOLID WASTE FIVE YEAR BUDGET FORECAST - REORGANIZED FOR COMPARISON

STATISTICS					
Service Population	62,192				
Number of Homes	25,218				
Total MSW Tonnage	39,066				
Total Tonnage Hauled	26,952				
Total Tonnage Landfilled	37,212				
Total Tonnage Recycled	3,137.0	(estimated)			
Per Capita MSW Generation Rate	0.65	(calculated based on Gibraltar data)			
Per Capita Residual Generation Rate	0.60				
Per Capita Recycling Rate	0.05				
Total System Cost	$6,489,255				
Total System Cost per Tonne	$ 166.11				
Total System Cost per Person	$ 104.34				
Landfill Cost Per Tonne Landfilled	$ 107.08				
Transfer Cost Per Tonne Hauled	$ 46.52				
Recycling Cost Per Tonne Recycled	$ 72.12				
Management Cost Per Tonne MSW	$ 26.06				
	2010	**2011**	**2012**	**2013**	**2014**
REVENUE					
Rural Refuse	5,218,801	5,121,948	4,452,474	4,536,300	4,633,069
South Cariboo Solid Waste	1,079,423	1,085,438	1,138,207	1,142,946	1,148,119
Solid Waste Management	191,031	34,215	37,123	39,740	42,050
Total Revenue	**$ 6,489,255**	**$ 6,241,600**	**$ 5,627,803**	**$ 5,718,986**	**$ 5,823,238**
EXPENDITURES					
Management					
Rural Refuse					
Hiring Expense	780	780	780	780	780
Travel	14,627	14,920	15,218	15,522	15,833
Postage & Supplies	800	800	800	800	800
Telephone	5,500	5,500	5,500	5,500	5,500
Advertising	15,000	15,000	15,000	15,000	15,000
Legal	2,500	2,500	2,500	2,500	2,500
Training Travel	3,000	3,000	3,000	3,000	3,000
Employee Upgrading	3,500	3,500	3,500	3,500	3,500
Professional/Consulting	93,000	12,000	12,000	12,000	12,000
Insurance	82,284	94,627	108,821	125,144	143,915
Lease Fees	1,500	1,500	1,500	1,500	1,500
Building Expense Allocation	3,774	3,849	3,926	4,005	4,085
Furniture & Equipment	1,000	1,000	1,000	1,000	1,000
Site Capital	15,000	18,000	18,000	18,000	18,000
Transfer to Reserve Bylaw 1016	-	18,000	18,000	18,000	18,000
Interest Charges Bylawy 1016	1,143	1,143	1,143	1,143	1,143
Transfer to Reserve Bylaw 1008	313,500	313,500	313,500	313,500	313,500
MFA Principal Bylaw 1008	69,558	69,558	69,558	69,558	69,558
MFA Interest Bylaw 1008	109,825	109,825	109,825	109,825	109,825
Budgeted Surplus Bylaw 1008	82,219	-	-	-	-
	$ 818,510	**$ 689,002**	**$ 703,571**	**$ 720,277**	**$ 739,439**
South Cariboo Solid Waste					
Travel	10,200	10,404	10,612	10,824	11,041
Postage & Supplies	175	175	175	175	175
Telephone	650	650	650	650	650
Advertising	2,000	2,000	2,000	2,000	2,000
Legal	377	377	377	377	377
Employee Upgrading	755	755	755	755	755
Professional/Consulting	5,300	5,420	5,420	5,420	5,420
Insurance	11,814	13,586	15,624	17,968	20,663
Lease Fees	1,000	1,000	1,000	1,000	1,000
Building Expense Allocation	678	692	705	719	734
Equipment & Supplies	3,682	3,682	3,682	3,682	3,682
	$ 36,631	**$ 38,741**	**$ 41,000**	**$ 43,570**	**$ 46,496**
Solid Waste Management					
Travel	796	812	828	845	862
Telephone	625	625	625	625	625
Professional/Consulting	160,000	40,000	40,000	40,000	40,000
Insurance	322	370	426	490	563
Dues/Memberships	1,275	1,275	1,275	1,275	1,275
	$ 163,018	**$ 43,082**	**$ 43,154**	**$ 43,234**	**$ 43,325**
Total Management Costs	**$ 1,018,159**	**$ 770,825**	**$ 787,725**	**$ 807,082**	**$ 829,260**
Collection System					
108 Garbage Collection	68,000	78,000	78,000	78,000	78,000
100 Mile Residential Garbage Collection	39,000	40,950	40,950	40,950	40,950
Central Transfer Station	300,000	300,000	300,000	300,000	320,000
Central Haul to Gibraltar	341,000	393,462	393,462	393,462	393,462
Rural Refuse Transfer Station Operating	459,693	459,693	459,693	459,693	459,693
Winter Road Maintenance Contracts	24,092	27,173	27,173	27,173	27,173
Winter Road Maintenance Contracts South Cariboo	22,000	22,000	22,000	22,000	22,000
Total Collection System Costs	**$ 1,253,785**	**$ 1,321,278**	**$ 1,321,278**	**$ 1,321,278**	**$ 1,341,278**
Recycling Costs					
Quesnel Recycling	222,400	248,498	255,938	255,938	255,938
Metals Recycling Contract	3,000	3,000	3,000	3,000	3,000
ICI Material Exchange Program	840	840	840	840	840
	$ 226,240	**$ 252,338**	**$ 259,778**	**$ 259,778**	**$ 259,778**
South Cariboo Solid Waste					
Metals Recycling Contract	2,000	2,000	2,000	2,000	2,000
ICI Material Exchange Program	237	237	237	237	237
	$ 2,237	**$ 2,237**	**$ 2,237**	**$ 2,237**	**$ 2,237**
Solid Waste Management					
Recycling Hotline	2,217	2,217	2,217	2,217	2,217
Recycling & Reuse Promotion	2,030	2,030	2,030	2,030	2,030
	$ 4,247	**$ 4,247**	**$ 4,247**	**$ 4,247**	**$ 4,247**
Total Recycling Costs	**$ 232,724**	**$ 258,822**	**$ 266,262**	**$ 266,262**	**$ 266,262**
Landfill Costs					
Gibraltar Landfill Operations	607,986	617,973	617,973	617,973	663,544
Gibraltar Landfill Capital	615,000	750,000	-	-	-
Gibraltar Improvements	97,000	-	-	-	-
Gibraltar Closure Costs	259,733	121,751	172,281	228,566	230,550
City of Quesnel Landfill	497,463	497,463	497,463	497,463	497,463
City of Quesnel - Contract (pay Quesnel Tipping fee for la	387,257	387,257	387,257	387,257	387,257
Fraser Fort George Regional District Pay RDFFG for land	13,243	13,243	13,243	15,097	15,097
Personnel	220,257	230,225	240,829	252,120	264,156
Site Maintenance	12,000	12,000	12,000	12,000	12,000
Landfill Closure Costs	250,000	250,000	250,000	250,000	250,000
Repairs & Maintenance	1,000	1,000	1,000	1,000	1,000
	$ 2,960,939	**$ 2,880,912**	**$ 2,192,046**	**$ 2,261,476**	**$ 2,321,067**
South Cariboo Solid Waste					
Site Operating	873,015	913,399	961,815	961,815	961,815
Site Capital	56,500	-	-	-	-
Personnel	59,452	61,473	63,566	65,735	67,982
Site Maintenance	2,250	2,250	2,250	2,250	2,250
Landfill Closure Costs	25,500	25,500	25,500	25,500	25,500
Repairs & Maintenance	695	695	695	695	695
	$ 1,017,412	**$ 1,003,317**	**$ 1,053,826**	**$ 1,055,995**	**$ 1,058,242**
Solid Waste Management					
Personnel	6,236	6,448	6,667	6,894	7,129
Total Landfill Costs	**$ 3,984,587**	**$ 3,890,677**	**$ 3,252,539**	**$ 3,324,364**	**$ 3,386,438**
Grand Total Costs:	**$ 6,489,255**	**$ 6,241,601**	**$ 5,627,804**	**$ 5,718,986**	**$ 5,823,238**
Total from Bylaw 1016	**$ 1,079,423**	**$ 1,085,438**	**$ 1,138,207**	**$ 1,142,946**	**$ 1,148,119**
Total from Bylaw 1009	**$ 191,031**	**$ 34,215**	**$ 37,123**	**$ 39,740**	**$ 42,050**
Total from Bylaw 1008	**$ 5,218,801**	**$ 5,121,948**	**$ 4,452,474**	**$ 4,536,300**	**$ 4,633,069**
	$ 6,489,255	**$ 6,241,601**	**$ 5,627,804**	**$ 5,718,986**	**$ 5,823,238**

Table C. CARIBOO R.D. SOLID WASTE FIVE YEAR BUDGET FORECAST - REORGANIZED FOR COMPARISON

STATISTICS					
Service Population	62,192				
Number of Homes	25,218				
Total MSW Tonnage	39,066				
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Total Tonnage Landfilled	37,212				
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Per Capita MSW Generation Rate	0.65	(calculated based on Gibraltar data)			
Per Capita Residual Generation Rate	0.60				
Per Capita Recycling Rate	0.05				
Total System Cost	$6,489,255				
Total System Cost per Tonne	$ 166.11				
Total System Cost per Person	$ 104.34				
Landfill Cost Per Tonne Landfilled	$ 107.08				
Transfer Cost Per Tonne Hauled	$ 46.52				
Recycling Cost Per Tonne Recycled	$ 72.12				
Management Cost Per Tonne MSW	$ 26.06				
	2010	**2011**	**2012**	**2013**	**2014**

Table D. Detailed Breakdown of Actual CRD Solid Waste Management Costs by Facility

							COLLECTION	TRANSFER STATION COSTING					WOOD WASTE COSTING		LANDFILL COSTING						
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Annual Tonnage MSW Tonnes/yr	Annual Tonnage Recycled Tonnes/yr	Annual Wood Waste Tonnes/yr	Annual Total MSW Tonnes/yr		Transfer Station Operating Cost Total 2009 $/Yr	Transfer Station Capital Cost $/yr	Transfer Station Haul Cost Total 2009 $/yr	Total Transfer Station Cost 2009 $/yr	Transfer Station Cost Per Tonne $/tonne/yr	Wood Waste Cost 2009 $/yr	Wood Waste Cost Per Tonne $/tonne/yr	Landfill Operating Cost $/yr	Landfill Capital Cost $/Yr	Landfill Reclamation Costs	Total Landfill Cost $/yr	Landfill Cost Per Tonne $/tonne/yr	Total System Cost $/yr	Subregional System Costs Per Tonne $/tonne/yr
NORTH CARIBOO CATCHMENT																					
Regional District of Fraser Fort George							$0													$0	
Quesnel Landfill	22,031	0.72	15,956			15,956	$391,786								$497,463	$98,157	$25,000	620,620	$36	$1,012,406	
Quesnel Urban Direct Haul	19,801	0.73	14,538	4,309	1,745	20,592		0													
Nazko Landfill	392	0.63	245	0		245									$27,336	$15,000	$10,000	$52,336	$213	$52,336	
Alexandria Transfer Station	804	0.27	220	0		220		$4,819	$7,000	$15,345	$27,164	$123								$27,164	
Baker Creek Transfer Station	762	0.63	479	0	57	536		$33,543	$7,000	$51,920	$92,463	$193	$9,000	$158						$101,463	
Cottonwood Transfer Station	153	1.00	153	0	0	153		$4,131	$7,000	$14,157	$25,288	$165								$25,288	
Wells Transfer Station	287	1.66	477	0	21	498		$12,888	$7,000	$16,418	$36,306	$76	$12,500	$581						$48,806	
Titetown Transfer Station	224	0.40	89	0		89		$55,200	$7,000	$10,200	$72,400	$813								$72,400	
	22,423		**16,201**	**4,309**	**1,824**	**22,334**	**$391,786**	**$110,581**	**$35,000**	**$108,040**	**$253,621**	**$16**	**$21,500**		$524,799	$113,157	$35,000	$672,956	$42	$1,339,863	$57
CENTRAL CARIBOO CATCHMENT																					
Gibraltar Landfill	24,242	0.54	13,115			13,115									$429,686	$214,843	$170,000	$814,529	$62	$814,529	
Williams Lake aka Central Cariboo Transfer Station	15,349	0.84	12,898	1,578	683	15,158	$75,000	$232,314	$97,000	$341,000	$670,314	$45	$191,300	$280						$936,614	
Likely Landfill	528	0.55	290	0	35	325							$18,150	$521	$34,630	$15,000	$10,000	$59,630	$205	$77,780	
Big Lake Landfill	554	0.55	304	0	37	341							$8,925	$244	$57,277	$15,000	$10,000	$82,277	$270	$91,202	
McLeese Lake Transfer Station	998	0.22	220		66	286		$11,467	$7,000	$11,901	$30,368	$138	$9,375	$143						$39,743	
Wildwood Transfer Station	2,021	0.56	1,134		185	1,319		$27,134	$7,000	$77,446	$111,580	$98	$36,200	$195						$147,780	
Frost Creek Transfer Station	1,908	0.55	1,046		252	1,298		$20,270	$7,000	$74,552	$101,822	$97	$20,850	$83						$122,672	
Chimney Lake Transfer Station	248	0.55	136		16	152		$3,972	$7,000	$11,610	$22,582	$166	$8,950	$548						$31,532	
150 Mile Transfer Station	1,164	1.10	1,276		181	1,457		$18,851	$7,000	$85,892	$111,743	$88	$27,300	$151						$139,043	
Horsefly Transfer Station	595	0.63	375		39	414		$11,564	$7,000	$32,604	$51,168	$136	$13,900	$355						$65,068	
Alexis Creek Transfer Station	459	0.62	285		0	285		$3,941	$7,000	$11,059	$22,000	$77	$0							$22,000	
Riske Creek Transfer Station	419	0.35	147		0	147		$12,035	$7,000	$23,837	$42,872	$292	$0							$42,872	
Total Central Cariboo Transfer Stations	24,242	0.75	18,111		811	18,922		$341,548				$19								0	
	24,242		**18,111**	**1,578**	**1,494**	**21,183**	**$75,000**	**$341,548**	**$153,000**	**$669,901**	**$1,164,449**	**$64**	**$334,950**		**$521,593**	**$244,843**	**$190,000**	**$956,436**	$53	$2,530,835	$117
SOUTH CARIBOO CATCHMENT																					
100 Hundred Mile House Landfill	10,207	0.84	8,581	0	0	8,581							$43,052		$309,825	$75,000	$25,500	$410,325	$48	$453,377	
100 and 108 Urban Direct Haul	3,304	2.21	7,295	849	568	6,660	$114,000													$114,000	
Mahood Lake Landfill	84	0.62	53	0		53									$13,200	$15,000	$10,000	$38,200	$726	$38,200	
Inter-Lakes aka Sheriden Landfill	2,523	0.62	1,575	0	1,081	2,655							$113,996	$105	$65,816	$15,000	$10,000	$90,816	$58	$204,812	
Watch Lake Landfill	445	0.62	277	0	198	475							$26,000	$132	$32,205	$15,000	$10,000	$57,205	$206	$83,205	
Eagle Creek Transfer Station	633	0.16	101	0		101		$2,868	$7,000	$6,339	$16,207	$160								$16,207	
Forest Grove Transfer Station	1,382	0.76	1,051	0	58	1,109		$21,693	$7,000	$53,392	$82,085	$78	$38,000	$658						$120,085	
Lac La Hache Transfer Station	3,715	0.76	2,823	0		2,823		$24,060	$7,000	$157,950	$189,010	$67								$189,010	
Lone Butte Transfer Station	1,173	0.76	892	0		892		$9,800	$7,000	$92,943	$109,743	$123								109743	
	13,259		**14,067**	**849**	**1,904**	**16,820**	**$114,000**	**$58,421**	**$28,000**	**$310,624**	**$397,045**	$28	**$221,048**		**$421,046**	**$120,000**	**$55,500**	**$596,546**	$42	$1,328,639	$71
RURAL LANDFILLS																					
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	26	243							$9,425	$367	$42,176	$15,000	$10,000	$67,176	$310	$76,601	
Kleana Kleene Landfill	140	0.62	88	0		88									$14,380	$15,000	$10,000	$39,380	$450	$39,380	
Tatla Lake Landfill	146	0.62	91	0		91									$15,160	$15,000	$10,000	$40,160	$440	$40,160	
Cochin Lake Landfill	90	0.62	56	0		56									$16,095	$15,000	$10,000	$41,095	$728	$41,095	
Puntzi Lake Landfill	552	0.62	345	0		345									$28,220	$15,000	$10,000	$53,220	$154	$53,220	
Nemiah Valley Landfil	236	0.62	147	0		147									$30,939	$15,000	$10,000	$55,939	$380	$55,939	
	1,513		**944**	**0**	**26**	**970**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$9,425**		**$146,970**	**$90,000**	**$60,000**	**$296,970**	$314	$306,395	$314
CRD DEBT PAYMENT																**$178,000**		**$178,000**		**$178,000**	
CRD RDFFG TIPPING FEE															**$13,343**						
CRD MANAGEMENT COST																**$309,321**		**$309,321**		**$309,321**	
CRD RECYCLING PROGRAM																**$148,974**		**$148,974**		**$148,974**	
CRD WINTER ROAD MAINTENANCE										**$46,092**	**$46,092**					**$0**		**$0**		**$46,092**	
Total CRD Overhead Costs							$0	**$0**	**$0**	**$46,092**	**$46,092**	**$0**	**$0**	**$0**	**$13,343**	**$636,295**	**$0**	**$636,295**	$0	$682,387	$0
Totals Entire System	**61,437**		**49,323**	**6,737**	**5,247**	**61,307**	**$580,786**	**$510,550**	**$216,000**	**$1,134,657**	**$1,861,207**	**$30**	**$586,923**	**$112**	**$1,627,751**	**$1,204,295**	**$340,500**	**$3,159,203**	**$64**	**$6,188,119**	**$91**
Total Urban Centre Transfer Station and Landfill	**38,454**		**34,730**	**6,737**	**2,996**	**42,411**	**$580,786**	**$228,463**	**$95,392**	**$367,803**	**$691,659**	**$24**	**$224,728**	**$75**	$1,148,599	**$812,511**	**$211,638**	**$2,163,353**	**$62**	**$3,607,377**	**$73**
Total Small Landfills	**6,039**		**3,689**	**0**	**1,375**	**5,064**	**$0**	**$0**	**$0**	**$3,447**	**$3,447**	**$0**	**$176,496**	**$128**	**$378,432**	**$227,590**	**$120,000**	**$725,024**	**$197**	**$904,968**	**$179**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**876**	**11,780**	**$0**	**$282,087**	**$120,608**	**$763,407**	**$1,166,101**	**$99**	**$185,699**	**$212**	$100,720	**$164,194**	**$8,862**	**$270,826**	**n/a**	**$1,675,774**	**$142**
Check Sum	**61,437**		**49,323**	**6,737**	**5,247**	**59,255**	**$580,786**	**$510,550**	**$216,000**	**$1,134,657**	**$1,861,207**		**$586,923**		**$1,627,751**	**$1,204,295**	**$340,500**	**$3,159,203**		**$6,188,119**	

Table E. Summary of Economic Analysis for Options A to E and Composting Options A to E.

Option	Description	Total Tonnage	Total Recycled Tonnage, including wood, concrete, etc.	Increase in Recycling (tonnes)	Diversion Percent	Total Cost	Transfer Station and Landfill Cost	Discard Recyle Cost excluding Wood, Composting	Soil an dConcrete Recycling	Wood Waste Cost	Composting Cost	Check Sum	Total Cost per Tonne	Landfill Cost per Tonne	Recylce Cost Per Tonne	Recycle Cost per Household	Soil and Concrete Cost per Tonne	Wood Waste Cost per Tonne	Composting Cost per Tonne	Composting Cost per Household
	Existing System	69,085	13,074	0	18.9%	$ 6,057,695	$ 5,232,234	$ 331,338	$ -	$ 494,123	$ -	$ 6,057,695	$ 88	$ 93	$ 46	$ 13	$ -	$ 84	$ -	$ -
A	3 Eco Depots, 9 Attended TS, Recycle Bins at 29 sites	69,085	36,205	23,131	52.4%	$ 6,782,289	$ 5,261,736	$ 805,455	$ 220,975	$ 494,123	$ -	$ 6,782,289	$ 98	$160	$ 49	$ 32	$ 16	$ 84	$ -	$ -
B	3 Eco Depots, 9 Attended TS with Bins, 20 Community Trailer Sites	69,085	36,407	23,333	52.7%	$ 6,804,644	$ 5,277,338	$ 812,209	$ 220,975	$ 494,123	$ -	$ 6,804,644	$ 98	$161	$ 49	$ 32	$ 16	$ 84	$ -	$ -
C	3 Eco Depots, 9 Attended TS, 29 Trailer Sites	69,085	35,563	22,489	51.5%	$ 6,847,349	$ 5,339,569	$ 792,682	$ 220,975	$ 494,123	$ -	$ 6,847,349	$ 99	$159	$ 50	$ 31	$ 16	$ 84	$ -	$ -
D	9 Attended TS, 29 Community Trailer Sites	69,085	28,423	15,349	41.1%	$ 6,528,307	$ 5,557,646	$ 255,564	$ 220,975	$ 494,123	$ -	$ 6,528,307	$ 94	$137	$ 30	$ 10	$ 16	$ 84	$ -	$ -
E	3 Eco Depots, 9 Attended TS, Recycle Bins in Town, Bin Trailer, Concrete	69,085	36,502	23,428	52.8%	$ 6,620,114	$ 5,309,753	$ 774,459	$ 220,975	$ 314,927	$ -	$ 6,620,114	$ 96	$163	$ 47	$ 31	$ 16	$ 53	$ -	$ -
E & Composting A	Option E Recycling as Above plus Back Yard Composters	69,085	37,202	24,128	53.9%	$ 6,557,243	$ 5,252,235	$ 763,606	$ 220,975	$ 314,927	$ 5,500	$ 6,557,243	$ 95	$165	$ 46	$ 37	$ 16	$ 53	$ 8	$ 0.26
E & Composting B	Option E Recycling as Above plus Yard and Garden Waste Curside	69,085	40,251	27,177	58.3%	$ 6,822,269	$ 5,186,814	$ 792,698	$ 220,975	$ 314,927	$ 306,855	$ 6,822,269	$ 99	$180	$ 48	$ 38	$ 16	$ 53	$ 82	$ 14.76
E & Composting C	Option E Recycling as Above plus Food Waste and Y&G Waste Curbside	69,085	42,532	29,458	61.6%	$ 8,764,383	$ 5,090,568	$ 777,648	$ 220,975	$ 314,927	$ 2,360,266	$ 8,764,383	$127	$192	$ 47	$ 37	$ 16	$ 53	$ 391	$ 113.54
E & Composting D	Option E Recycling as Above plus Y&G Waste Depot Drop Off only	69,085	38,514	25,440	55.7%	$ 6,611,841	$ 5,213,339	$ 779,022	$ 220,975	$ 314,927	$ 83,578	$ 6,611,841	$ 96	$171	$ 47	$ 37	$ 16	$ 53	$ 42	$ 4.02
																20,788				
																25218				

Table E1 (left). Model of CRD's Current Solid Waste System

			Tonnage Residual Waste by Material Type					Tonnage Recyclables by Material Type										Bin Service and Hauling Cost Analysis									
Site Name	Electoral Area	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Tonnage of MSW Tonnes/yr	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Number of Services per Year	Tonnage per Service	Average Density of Waste	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)
URBAN COLLECTION SYSTEM																											
City of Quesnel Urban		19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	1,036	0	0		1,745	1,648	1,524	102	6,054	22,092							Quesnel L.F.		0		
Williams Lake Urban		15,349	1.00	8,496	2,492	1,910	5,188	459	0	0	0	1,353	123	1,067	63	3,065	21,150							Williams Lake T.S.		0		
100 Mile House Urban		3,304	1.52	3,714	672	1,237	1,672	103	0	0	77	568	27	700	30	1,505	8,800							100 Mile Housel L.F.		0		
108 Mile House Residential Collection																								100 Mile Housel L.F.				
Regional District of Fraser Fort George																											
URBAN TRANSFER STATION SYSTEM																											
Williams Lake Urban Transfer Station																								Gibraltar L.F.		0		
RURAL TRANSFER STATIONS																											
Alexandria Transfer Station	A	804	0.66	220	0	0	0	0	0	0	0		7	0	0	7	227	1			145	1.5	0.10	Quesnel L.F.	Hwy 97	40	80	232
Baker Creek Transfer Station	B	762	0.66	479	0	0	0	0	0	0	0	57	6	0	0	64	543	2			225	2.1	0.14	Quesnel L.F.	Nazko Rd	35	60	398
Cottonwood Transfer Station	C	153	0.66	153	0	0	0	0	0	0	0	0	1	0	0	1	154	1			150	1.0	0.07	Quesnel L.F.	Barkerville Hwy	40	70	261
Wells Transfer Station	Wells	287	0.66	477	0	0	0	0	0	0	0	57	2	0	0	60	537		1		75	6.4	0.42	Quesnel L.F.	Barkerville Hwy	80	70	216
Titetown Transfer Station	I	224	0.66	89	0	0	0	0	0	0	0	0	2	0	0	2	91		1		*36*	2.5	0.16	Quesnel L.F.	Nazko Rd	145	60	193
McLeese Lake Transfer Station	D	998	0.63	220	0	0	0	0	0	0	0	26	8	0	0	35	255	1			204	1.1	0.07	Williams Lake T.S.	Hwy 97	50	80	377
Wildwood Transfer Station	D	2,021	0.63	1,134	0	0	0	0	0	0	0	185	16	0	0	202	1,336	2			630	1.8	0.12	Williams Lake T.S.	Hwy 97	12	60	630
Frost Creek Transfer Station	E	1,908	0.63	1,046	0	0	0	0	0	0	0	252	16	0	0	268	1,314	2			617	1.7	0.11	Williams Lake T.S.	Dog Creek Rd	15	60	679
Chimney Lake Transfer Station	E	248	0.63	136	0	0	0	0	0	0	0	16	2	0	0	18	154	1			155	0.9	0.06	Williams Lake T.S.	Dog Creek Rd	30	60	248
150 Mile Transfer Station	F	1,164	0.63	1,276	0	0	0	0	0	0	0	181	9	0	0	190	1,466	2			650	2.0	0.13	Williams Lake T.S.	Hwy 97	25	60	932
Horsefly Transfer Station	F	595	0.63	375	0	0	0	0	0	0	0	45	5	0	0	50	425	2			208	1.8	0.12	Williams Lake T.S.	Horsefly Rd	70	60	610
Alexis Creek Transfer Station	K	459	0.63	285	0	0	0	0	0	0	0	0	4	0	0	4	289	2			95	3.0	0.20	Williams Lake T.S.	Hwy 20	120	60	437
Riske Creek Transfer Station	K	419	0.63	147	0	0	0	0	0	0	0	0	3	0	0	3	150	1			160	0.9	0.06	Williams Lake T.S.	Hwy 20	55	60	389
Eagle Creek Transfer Station	H	633	0.77	101	0	0	0	0	0	0	0		5	0	0	5	106	1			109	0.9	0.06	100 Mile Housel L.F.	Canim Lake Rd	50	60	247
Forest Grove Transfer Station	H	1,382	0.77	1,051	0	0	0	0	0	0	0	12	11	0	0	23	1,074	2			390	2.7	0.18	100 Mile Housel L.F.	Canim Lake Rd	30	60	624
Lac La Hache Transfer Station	G	3,715	0.77	2,823	0	0	0	0	0	0	15		30	0	0	45	2,868	3			*807*	3.5	0.23	100 Mile Housel L.F.	Hwy 97	25	75	1,022
Lone Butte Transfer Station	L	1,173	0.77	892	0	0	0	0	0	0	0		10	0	0	10	902	2			*255*	3.5	0.23	100 Mile Housel L.F.	Horse Lake Rd	50	60	578
RURAL LANDFILLS																											
Nazko Landfill	I	392	0.63	245	0	0	0	0	0	0	0		3	0	0	3	248							Nazko LF	Nazko Rd			
Likely Landfill	F	528	0.62	290	0	0	0	0	0	0	0	35	4	0	0	39	329							Likely LF	Likely Rd			
Big Lake Landfill	F	554	0.62	304	0	0	0	0	0	0	0	37	4	0	0	41	346							Big Lake LF	Likely Rd			
Mahood Lake Landfill	H	84	1.27	53	0	0	0	0	0	0	0		1	0	0	1	53							Mahood Lake LF	Horse Lake Rd			
Inter-Lakes aka Sheriden Landfill	L	2,523	1.27	1,575	0	0	0	0	0	0	20	1,081	20	0	0	1,121	2,696							Inter-Lakes aka Sheriden LF	Horse Lake Rd			
Watch Lake Landfill	L	445	1.27	277	0	0	0	0	0	0	20	198	4	0	0	221	499							Watch Lake Landfill	Watch Lake Rd			
West Chilcotin aka Anahim/Nimpo Landfill	J	348	0.62	217	0	0	0	0	0	0	0	26	3	0	0	29	246							West Chilcotin LF	Hwy 20			
Kleana Kleene Landfill	J	140	0.62	88	0	0	0	0	0	0	0		1	0	0	1	89							Kleana Kleene LF	Hwy 20			
Tatla Lake Landfill	J	146	0.62	91	0	0	0	0	0	0	0		1	0	0	1	92							Tatla Lake LF	Hwy 20			
Cochin Lake Landfill	J	90	0.62	56	0	0	0	0	0	0	0		1	0	0	1	57							Cochin LF	Hwy 20			
Puntzi Lake Landfill	J	552	0.62	345	0	0	0	0	0	0	0		4	0	0	4	349							Puntzi Lake LF	Hwy 20			
Nemiah Valley Landfill	J	236	0.62	147	0	0	0	0	0	0	0		2	0	0	2	149							Nemiah Valley LF	Hwy 20			
REGIONAL LANDFILLS																											
Quesnel Landfill		22,031	0.77	10,277	3,214	2,464	1,500	1,036	0	0	0	1,745	1,648	1,524	102	6,054	23,510											
Gibraltar Landfill		24,242	0.75	13,115	0	0	0	0	0	0	0	0	0	0	0	0	13,115											
Williams Lake DLC Landfill		15,349		0	2,492	1,910	5,188	459	0	0	0	1,353	123	1,067	63	3,065	12,654											
100 Hundred Mile House Landfill		10,207	1.06	8,581	672	1,237	1,672	103	0	0	77	568	27	700	30	1,505	13,667											
CONSULTING																											
CRD DEBT PAYMENT																											
CRD RDFFG TIPPING FEE																											
CRD MANAGEMENT COST																											
CRD RECYCLING EDUCATION																											
CRD WINTER ROAD MAINTENANCE																											
Totals Entire System		**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**1,597**	**0**	**0**	**132**	**5,874**	**1,984**	**3,291**	**195**	**13,074**	**69,085**				**4,910**							
Total Urban Centre Transfer Station and Landfill		**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**1,597**	**0**	**0**	**77**	**3,666**	**1,798**	**3,291**	**195**	**10,624**	**52,042**											
Total Small Landfills		**6,039**		**3,689**	**0**	**0**	**0**	**0**	**0**	**0**	**40**	**1,375**	**49**	**0**	**0**	**1,464**	**5,153**											
Totals Satelite Transfer Stations		**16,945**		**10,904**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**833**	**138**	**0**	**0**	**986**	**11,890**											

Table E1 (right). Model of CRD's Current Solid Waste System

Site Name	Costs													
	Estimated Annual Haul Cost ($/year)	CRD Budget Haul Cost ($/year)	CRD Budget Landfill/Ops. Contract	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM														
City of Quesnel Urban			$391,786											$391,786
Williams Lake Urban			$75,000											$75,000
100 Mile House Urban			$39,000											$39,000
108 Mile House Residential Collection			$68,000											$68,000
Regional District of Fraser Fort George			$13,243											$13,243
														$587,029
URBAN TRANSFER STATION SYSTEM														
Williams Lake Urban Transfer Station		$341,000	$232,314		$1,500	$15,078		$93,000	$70,000		$11,722	$97,000		$861,614
														$861,614
RURAL TRANSFER STATIONS														
Alexandria Transfer Station	$ 17,400	$ 15,345	$ -	$ 2,000	$ 150	$ 1,100	$ -	$ -	$ -	$ -	$ 1,569			$ 20,164
Baker Creek Transfer Station	$ 29,813	$ 51,920	$ -	$ 3,500	$ 1,650	$ 1,850	$ 12,669	$ 10,200	$ 5,000	$ 290	$ 7,384			$ 94,463
Cottonwood Transfer Station	$ 19,607	$ 14,157	$ -	$ 1,000	$ 100	$ 1,000	$ -	$ -	$ -	$ 1,200	$ 831	$ 1,000		$ 19,288
Wells Transfer Station	$ 16,232	$ 16,418	$ -	$ 2,000	$ 300	$ 3,450	$ 8,000	$ 10,500	$ -	$ -	$ 1,138			$ 41,806
Titetown Transfer Station	$ 14,507	$ 10,200	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -			$ 10,200
McLeese Lake Transfer Station	$ 28,305	$ 11,901	$ -	$ 1,200	$ 1,000	$ 7,474	$ -	$ 10,375	$ -	$ -	$ 793			$ 32,743
Wildwood Transfer Station	$ 47,250	$ 77,446	$ -	$ -	$ 600	$ 15,211	$ -	$ 36,200	$ 710	$ 5,000	$ 5,613	$ 7,000		$ 147,780
Frost Creek Transfer Station	$ 50,903	$ 74,552	$ -	$ 8,700	$ 500	$ 1,800	$ -	$ 21,150	$ -	$ 500	$ 8,470			$ 115,672
Chimney Lake Transfer Station	$ 18,600	$ 11,610	$ -	$ -	$ 349	$ 1,200	$ -	$ 8,950	$ -	$ 1,200	$ 1,223			$ 24,532
150 Mile Transfer Station	$ 69,875	$ 85,892	$ -	$ -	$ 500	$ 1,900	$ -	$ 27,300	$ -	$ 4,451	$ 12,000	$ 7,000		$ 139,043
Horsefly Transfer Station	$ 45,760	$ 32,604	$ -	$ 1,000	$ 600	$ 7,290	$ 2,000	$ 13,900	$ -	$ -	$ 674	$ 4,500		$ 62,568
Alexis Creek Transfer Station	$ 32,775	$ 11,059	$ -	$ 1,441	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -	$ 3,000		$ 18,000
Riske Creek Transfer Station	$ 29,200	$ 23,837	$ -	$ 3,000	$ -	$ 7,446	$ -	$ -	$ -	$ -	$ 1,589			$ 35,872
Eagle Creek Transfer Station	$ 30,883	$ 6,339	$ -	$ 500	$ 300	$ 1,000				$ 1,200	$ 768			$ 10,107
Forest Grove Transfer Station	$ 78,000	$ 53,392	$ -	$ 3,500	$ 300	$ 1,800	$ 10,700	$ 38,000	$ 500	$ 893	$ 4,000	$ 5,000		$ 118,085
Lac La Hache Transfer Station	$ 127,707	$ 157,950	$ -	$ 3,500	$ -	$ 3,500	$ 8,560	$ -	$ -	$ 1,500	$ 7,000	$ 10,500		$ 192,510
Lone Butte Transfer Station	$ 72,210	$ 92,943	$ -	$ -	$ -	$ 1,500	$ -	$ -	$ -	$ 2,300	$ 6,000	$ 6,000		$ 108,743
														$ 1,191,576
RURAL LANDFILLS														
Nazko Landfill			$ 20,964		$ 100	$ 2,421					$ 3,851	$ 15,000	$ 10,000	$ 52,336
Likely Landfill			$ 32,750		$ 500	$ 1,380		$ 18,150				$ 3,000		$ 55,780
Big Lake Landfill			$ 38,377	$ 350	$ 700	$ 2,850	$ 13,000	$ 8,925			$ 2,000	$ 8,000		$ 74,202
Mahood Lake Landfill			$ 12,000	$ 1,000	$ 200							$ 70,000		$ 83,200
Inter-Lakes aka Sheriden Landfill			$ 58,714	$ -	$ 750	$ 2,700		$ 113,996			$ 3,652			$ 179,812
Watch Lake Landfill			$ 27,226		$ 1,000	$ 2,730		$ 26,000			$ 1,209			$ 58,165
West Chilcotin aka Anahim/Nimpo Landfill			$ 31,900		$ 200	$ 2,500		$ 9,425			$ 7,576	$ 3,000		$ 54,601
Kleana Kleene Landfill			$ 13,960		$ 420							$ 50,000		$ 64,380
Tatla Lake Landfill			$ 13,960		$ 200						$ 1,000	$ 55,000		$ 70,160
Cochin Lake Landfill			$ 13,960		$ 250	$ 1,885								$ 16,095
Puntzi Lake Landfill			$ 27,920		$ 300							$ 70,000		$ 98,220
Nemiah Valley Landfill			$ 24,440		$ 395	$ 2,310					$ 3,794	$ 3,000		$ 33,939
														$ 840,890
REGIONAL LANDFILLS														
Quesnel Landfill			$ 386,793									$ 98,157	$ 25,000	$ 509,950
Gibraltar Landfill			$ 429,686									$ 214,843	$ 170,000	$ 814,529
Williams Lake DLC Landfill			$ 10,000											$ 10,000
100 Hundred Mile House Landfill			$ 272,385		$ 13,224	$ 14,716		$ 48,052			$ 4,500	$ 75,000	$ 25,500	$ 453,377
														$ 1,787,856
CONSULTING			71,000			22,000								**$ 93,000**
CRD DEBT PAYMENT												178000		**$ 178,000**
CRD RDFFG TIPPING FEE			13343											**$ 13,343**
CRD MANAGEMENT COST			309321											**$ 309,321**
CRD RECYCLING EDUCATION			148974											**$ 148,974**
CRD WINTER ROAD MAINTENANCE					46092									**$ 46,092**
														**$ - **
														**$ - **
Totals Entire System	**729,026**	**1,088,565**	**2,777,016**	**32,691**	**72,180**	**130,591**	**54,929**	**494,123**	**76,210**	**18,534**	**98,356**	**984,000**	**230,500**	**6,057,695**
Total Urban Centre Transfer Station and Landfill		**341,000**												
Total Small Landfills	**0**	**0**												
Totals Satelite Transfer Stations	**729,026**	**747,565**												

Table E1-S. Summary - Model of CRD's Current Solid Waste System

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		13,074	
Total Tonnage of Residuals Landfilled		56,011	
Diversion Percentage		18.9%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Tonnage in			
Total System Cost	$ 6,057,695	69,085	$ 88
Cost of Urban Collection	$ 587,029	52,042	$ 11
Cost of Rural Transfer Stations	$ 444,011	11,890	$ 37
Cost or Rural Hauling	$ 747,565	11,890	$ 63
Cost of Transfer and Haul to Gibraltar	$ 861,614	13,115	$ 66
Cost of Regional Landfills	$ 1,787,856	62,946	$ 28
Cost of Rural Landfills	$ 840,890	5,153	$ 163
Cost of CRD Program Costs	$ 788,730	69,085	$ 11
Check Sum	$ 6,057,695		
Cost of North Cariboo System	$ 1,153,236	23,891	$ 60
Cost of Central Cariboo System	$ 2,467,335	27,214	$ 102
Cost of South Cariboo System	$ 1,310,999	16,998	$ 89
Cost of Chilcotin System	$ 337,395	982	$ 355
Cost of CRD Program Costs	$ 788,730	69,085	$ 11
Check Sum	$ 6,057,695	69,085	$ 88
Cost of Recycling Programs	$ 331,338	7,200	$ 46
Cost of Wood Waste Management	$ 494,123	5,874	$ 84
Cost of Soil and Concrete Recycling	$ -	0	$ -
Cost of Landfill Disposal	$ 5,232,234	56,011	$ 93
Check Sum	$ 6,057,695	69,085	$ 88

56,011

Table E2-S. Summary - Model of Option A Without Composting

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		36,205	
Total Tonnage of Residuals Landfilled		32,880	
Diversion Percentage		52.41%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,782,289	69,085	$ 98
Cost of Urban Collection	$ 808,004	52,042	$ 16
Cost of Rural Transfer Stations	$ 1,012,218	11,890	$ 85
Cost or Rural Hauling	$ 192,637	11,890	$ 16
Cost of Transfer and Haul to Gibraltar	$ 760,695	13,115	$ 58
Cost of Regional Landfills	$ 1,889,052	62,946	$ 30
Cost of Rural Landfills	$ 785,368	5,153	$ 152
Net Cost of Regional Eco Depots	$ 535,514	12,712	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,782,289	0	$ -
Cost of North Cariboo System	$ 1,456,432	23,891	$ 3,569
Cost of Central Cariboo System	$ 2,671,543	27,214	$ 3,606
Cost of South Cariboo System	$ 1,668,087	16,998	$ 3,606
Cost of Chilcotin System	$ 187,426	982	$ 3,699
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,782,289	69,085	$ 98
Net Cost of Discard Recycling Programs	$ 805,455	16,361	$ 49
Cost of Wood Waste Management	$ 494,123	5,874	$ 84
Cost of Concrete and Soil Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,261,736	32,880	$ 160
0	$ 6,782,289	69,085	$ -

Table E2 (left). Model of Option A Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins at Unmanned Sites - No Extra Organics Management

		Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type												
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contam. Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Comm. Cardboard	Percent Increase Glass	Percent Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																														
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	75%	5%	0%	0%	*2%*	0%	2%	16%	0%	100%	1,762	0	0	291	1,745	1,939	3,850	*2,464*	*1,500*	102	13,653	8,439	5,225	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	1,103	0	0	258	1,353	*381*	3,131	1,910	5,188	63	13,387	7,763	5,272	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	384	0	0	77	568	*27*	700	1,237	1,672	30	4,695	4,105	3,433	8,800
108 Mile House Residential Collection							0																							
Regional District of Fraser Fort George																														
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station																														
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	804	0.66	220	0	0	0	220	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*7*	0			0	13	213	213	227
Baker Creek Transfer Station	762	0.66	479	0	0		479	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	77	0	0	10	57	*6*	0			0	150	393	393	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	5	0	0	0	0	*1*	0			0	6	148	148	154
Wells Transfer Station	287	0.66	477	0	0	0	477	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	14	0	0	0	57	*2*	0			0	74	463	463	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	3	0	0	0	0	*2*	0			0	4	86	86	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	26	*8*	0			0	41	213	213	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0		1,134	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	181	0	0	23	185	*16*	0			0	406	930	930	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0		1,046	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	167	0	0	21	252	*16*	0			0	456	858	858	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	16	*2*	0			0	22	132	132	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0		1,276	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	204	0	0	26	181	*9*	0			0	420	1,046	1,046	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	11	0	0	0	45	*5*	0			0	61	364	364	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	9	0	0	0	0	*4*	0			0	12	276	276	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	0	*3*	0			0	8	143	143	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	3	0	0	0	0	*5*	0			0	8	98	98	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0		1,051	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	168	0	0	21	12	*11*	0			0	213	862	862	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0		2,823	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	452	0	0	*71*	0	*30*	0			0	553	2,315	2,315	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0		892	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	143	0	0	18	0	*10*	0			0	170	731	731	902
RURAL LANDFILLS																														
Nazko Landfill	392	0.63	245	0	0	0	245	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*3*	0			0	11	238	238	248
Likely Landfill	528	0.62	290	0	0	0	290	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	9	0	0	0	35	*4*	0			0	48	282	282	329
Big Lake Landfill	554	0.62	304	0	0	0	304	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	9	0	0	0	37	*4*	0			0	50	295	295	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	2	0	0	0	0	*1*	0			0	2	51	51	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0		1,575	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	252	0	0	*51*	1,081	*20*	0			0	1,405	1,291	1,291	2,696
Watch Lake Landfill	445	1.27	277	0	0		277	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	44	0	0	*26*	198	*4*	0			0	271	228	228	499
West Chilcotin aka Anahim/Nimpo LF	348	0.62	217	0	0	0	217	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	26	*3*	0			0	35	211	211	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	3	0	0	0	0	*1*	0			0	4	85	85	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	3	0	0	0	0	*1*	0			0	4	88	88	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	2	0	0	0	0	*1*	0			0	2	55	55	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	10	0	0	0	0	*4*	0			0	15	334	334	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	97%	3%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	0	*2*	0			0	6	143	143	149
REGIONAL LANDFILLS																														
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	6,529	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	9,234	13,115
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	0	0	258	1,353	0	0			0	1,611	11,043	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	0	0	77	568	0	0			0	645	13,022	0	13,667
REGIONAL ECO DEPOTS																														
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,875						3,850				5,725	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,709						3,131				4,840	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,448						700				2,148	0	0	0
CONSULTING																														
CRD DEBT PAYMENT																														
CRD RDFFG TIPPING FEE																														
CRD MANAGEMENT COST																														
CRD RECYCLING EDUCATION																														
CRD WINTER ROAD MAINTENANCE																														
CRD BYLAW ENFORCEMENT OFFICER																														
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,060**	**0**	**0**	**892**	**5,874**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**36,205**	**32,880**	**26,502**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**0**	**0**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**31,734**	**20,307**	**13,929**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**351**	**0**	**0**	**77**	**1,375**	**49**	**0**	**0**	**0**	**0**	**1,853**	**3,301**	**3,301**	**5,153**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,458**	**0**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,618**	**9,272**	**9,272**	**11,890**

Table E2 (right). Model of Option A Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins at Unmanned Sites - No Extra Organics Management

	Bin Service and Hauling Cost Analysis												Costs													
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																													
City of Quesnel Urban									Quesnel L.F.		0					$391,786						$49,279	$6,000							$447,065
Williams Lake Urban									Williams Lake T.S.		0					$75,000						$38,200	$96,073							$209,273
100 Mile House Urban									100 Mile Housel L.F.		0					$39,000						$24,735	$6,688							$70,423
108 Mile House Residential Collection									100 Mile Housel L.F.							$68,000						$0								$68,000
Regional District of Fraser Fort George																$13,243						$0								$13,243
																														$808,004
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station									Gibraltar L.F.		0			$341,000	$240,081	$232,314			$1,500	$15,078				$93,000	$70,000		$11,722	$97,000		$760,695
																														$760,695
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	0	2		0.23	16	0.13	2	18	Quesnel L.F.	Hwy 97	40	80	36	$ 15,345	$ 3,060	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -	$ -	$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,380
Baker Creek Transfer Station	0	2		0.23	29	0.13	20	49	Quesnel L.F.	Nazko Rd	35	60	106	$ 51,920	$ 9,024	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669	$ -	$ -	$ 10,200	$ 5,000	$ 290	$ 7,384	$ 3,508		$ 108,997
Cottonwood Transfer Station	0	1		0.23	22	0.13	2	24	Quesnel L.F.	Barkerville Hwy	40	70	51	$ 14,157	$ 4,371	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -	$ -	$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,388
Wells Transfer Station	0	2		0.23	34	0.13	4	38	Quesnel L.F.	Barkerville Hwy	80	70	125	$ 16,418	$ 10,613	$ 14,336	$ 20,000	$ -	$ -	$ 3,450	$ 8,000	$ -	$ -	$ 10,500	$ -	$ -	$ 1,138	$ 4,525		$ 32,562
Titetown Transfer Station	0	1		0.23	13	0.13	1	14	Quesnel L.F.	Nazko Rd	145	60	82	$ 10,200	$ 6,942	$ 5,343	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,668		$ 13,953
McLeese Lake Transfer Station	0	2		0.23	16	0.13	2	18	Williams Lake T.S.	Hwy 97	50	80	41	$ 11,901	$ 3,443	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -	$ -	$ -	$ 10,375	$ -	$ -	$ 793	$ 4,525		$ 37,140
Wildwood Transfer Station	0	2		0.23	67	0.13	46	113	Williams Lake T.S.	Hwy 97	12	60	158	$ 77,446	$ 13,447	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -	$ -	$ -	$ 36,200	$ 710	$ 5,000	$ 5,613	$ 3,508		$ 149,161
Frost Creek Transfer Station	0	2		0.23	62	0.13	43	105	Williams Lake T.S.	Dog Creek Rd	15	60	158	$ 74,552	$ 13,388	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -	$ -	$ -	$ 21,150	$ -	$ 500	$ 8,470	$ 3,508		$ 118,288
Chimney Lake Transfer Station	0	1		0.23	19	0.13	2	21	Williams Lake T.S.	Dog Creek Rd	30	60	42	$ 11,610	$ 3,570	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -	$ -	$ -	$ 8,950	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,911
150 Mile Transfer Station	0	2		0.23	75	0.13	52	127	Williams Lake T.S.	Hwy 97	25	60	233	$ 85,892	$ 19,791	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -	$ -	$ -	$ 27,300	$ -	$ 4,451	$ 12,000	$ 3,508		$ 138,422
Horsefly Transfer Station	0	2		0.23	26	0.13	3	29	Williams Lake T.S.	Horsefly Rd	70	60	97	$ 32,604	$ 8,217	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000	$ -	$ -	$ 13,900	$ -	$ -	$ 674	$ 4,525		$ 62,372
Alexis Creek Transfer Station	0	2		0.23	20	0.13	3	23	Williams Lake T.S.	Hwy 20	120	60	115	$ 11,059	$ 9,775	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,508		$ 29,277
Riske Creek Transfer Station	0	1		0.23	21	0.13	2	23	Williams Lake T.S.	Hwy 20	55	60	65	$ 23,837	$ 5,539	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,618
Eagle Creek Transfer Station	0	1		0.23	14	0.13	1	15	100 Mile Housel L.F.	Canim Lake Rd	50	60	40	$ 6,339	$ 3,400	$ 10,218	$ -	$ -	$ -	$ 1,000						$ 1,200	$ 768	$ 2,550		$ 19,136
Forest Grove Transfer Station	0	2		0.23	62	0.13	43	105	100 Mile Housel L.F.	Canim Lake Rd	30	60	210	$ 53,392	$ 17,850	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 38,000	$ 500	$ 893	$ 4,000	$ 3,508		$ 146,723
Lac La Hache Transfer Station	0	2		0.23	166	0.13	115	281	100 Mile Housel L.F.	Hwy 97	25	75	468	$ 157,950	$ 39,808	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560		$ -	$ -	$ 1,500	$ 7,000	$ 3,508		$ 146,348
Lone Butte Transfer Station	0	2		0.23	53	0.13	37	90	100 Mile Housel L.F.	Horse Lake Rd	50	60	240	$ 92,943	$ 20,400	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -		$ -	$ -	$ 2,300	$ 6,000	$ 3,508		$ 103,180
							378.00							**$ 747,565**	**$ 42,417**														$ 1,204,855
RURAL LANDFILLS																														
Nazko Landfill							2	2	Nazko LF	Nazko Rd	90	60	7		$ 612	$ 20,964			$ 100	$ 2,421						$ 3,851	$ 4,758	$ 1,189	$ 33,895
Likely Landfill							3	3	Likely LF	Likely Rd	110	60	13		$ 1,088	$ 32,750			$ 500	$ 1,380				$ 18,150			$ 5,630	$ 1,408	$ 60,906
Big Lake Landfill							3	3	Big Lake LF	Likely Rd	55	60	7		$ 621	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 8,925			$ 2,000	$ 5,907	$ 1,477	$ 74,206
Mahood Lake Landfill							1	1	Mahood Lake LF	Horse Lake Rd	70	60	3		$ 249	$ 12,000		$ 1,000	$ 200								$ 1,021	$ 255	$ 14,725
Inter-Lakes aka Sheriden Landfill							64	64	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	124		$ 10,517	$ 121,771		$ -	$ 750	$ 2,700				$ 113,996			$ 3,652	$ 25,825	$ 6,456	$ 285,667
Watch Lake Landfill							12	12	Watch Lake Landfill	Watch Lake Rd	30	60	19		$ 1,632	$ 90,283		$ -	$ 1,000	$ 2,730				$ 26,000			$ 1,209	$ 4,550	$ 1,138	$ 128,542
West Chilcotin aka Anahim/Nimpo Landfill							2	2	West Chilcotin LF	Hwy 20	330	60	23		$ 1,972	$ 31,900			$ 200	$ 2,500				$ 9,425			$ 7,576	$ 4,210	$ 1,053	$ 58,836
Kleana Kleene Landfill							1	1	Kleana Kleene LF	Hwy 20	280	60	10		$ 844	$ 13,960			$ 420								$ 1,699	$ 425	$ 17,348
Tatla Lake Landfill							1	1	Tatla Lake LF	Hwy 20	240	60	9		$ 731	$ 13,960			$ 200							$ 1,000	$ 1,769	$ 442	$ 18,102
Cochin Lake Landfill							1	1	Cochin LF	Hwy 20	260	60	9		$ 788	$ 13,960			$ 250	$ 1,885							$ 1,096	$ 274	$ 18,252
Puntzi Lake Landfill							3	3	Puntzi Lake LF	Hwy 20	210	60	23		$ 1,938	$ 27,920			$ 300								$ 6,687	$ 1,672	$ 38,517
Nemiah Valley Landfill							2	2	Nemiah Valley LF	Hwy 20	310	60	22		$ 1,858	$ 24,440			$ 395	$ 2,310						$ 3,794	$ 2,858	$ 714	$ 36,370
																														$ 785,368
REGIONAL LANDFILLS																														
Quesnel Landfill																$ 472,214											$ 98,157	$ 25,000	$ 595,371
Gibraltar Landfill																$ 327,828											$ 214,843	$ 170,000	$ 712,671
Williams Lake DLC Landfill																$ 110,435													$ 110,435
100 Hundred Mile House Landfill																$ 289,583			$ 13,224	$ 14,716				$ 48,052			$ 4,500	$ 75,000	$ 25,500	$ 470,575
																														$ 1,889,052
REGIONAL ECO DEPOTS			No of 53' trailers																											
Quesnel EcoDepot			287					287	Urban Impact, Rich.	Hwy 97	672	85	2,441		244,119	$ 206,332	$ (507,859)								$ 228,986					$ 171,578
Williams Lake EcoDepot			242					242	Urban Impact, Rich.	Hwy 97	548	85	1,705		170,539	$ 206,332	$ (421,298)								$ 193,597					$ 149,170
100 Mile House EcoDepot			108					108	Urban Impact, Rich.	Hwy 97	458	85	647		64,673	$ 206,332	$ (142,144)								$ 85,906					$ 214,767
																														$ 535,514
CONSULTING																$ 71,000				$ 22,000										$ 93,000
CRD DEBT PAYMENT																											**$ 178,000**			**$ 178,000**
CRD RDFFG TIPPING FEE																$ 13,443														**$ 13,443**
CRD MANAGEMENT COST																$ 309,321														**$ 309,321**
CRD RECYCLING EDUCATION																$ 75,000														**$ 75,000**
CRD WINTER ROAD MAINTENANCE																			$ 46,092											**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																$ 83,944														**$ 83,944**
																														$ -
Totals Entire System					**715**		**851**	**1,825**					**7,328**	**1,088,565**	**$ 934,900**	**$ 4,245,259**	**-$1,091,302**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 494,123**	**$ 584,698**	**$ 18,534**	**$ 98,356**	**$ 787,042**	**$ 237,003**	**$ 6,782,289**
Total Urban Centre Transfer Station and LF														**341,000**	**$ 240,081**															
Total Small Landfills														**0**	**$ 22,851**															
Totals Satelite Transfer Stations														**747,565**	**$ 192,637**						**$54,929**				**$76,210**	**$18,534**				

Table E3-S. Summary - Model of Option B Without Composting

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		36,407	
Total Tonnage of Residuals Landfilled		32,678	
Diversion Percentage		52.70%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,804,644	69,085	$ 98
Cost of Urban Collection	$ 808,004	52,042	$ 16
Cost of Rural Transfer Stations	$ 945,498	11,890	$ 80
Cost or Rural Hauling	$ 238,815	11,890	$ 20
Cost of Transfer and Haul to Gibraltar	$ 759,183	9,175	$ 83
Cost of Regional Landfills	$ 1,886,587	59,006	$ 32
Cost of Rural Landfills	$ 826,941	5,153	$ 160
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,804,644	0	$ -
Cost of North Cariboo System	$ 1,463,615	23,891	$ 3,569
Cost of Central Cariboo System	$ 2,672,188	27,214	$ 3,606
Cost of South Cariboo System	$ 1,650,335	16,998	$ 3,605
Cost of Chilcotin System	$ 219,706	982	$ 3,732
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,804,644	69,085	$ 98
Cost of Recycling Programs	$ 812,209	16,563	$ 49
Cost of Wood Waste Management	$ 494,123	5,874	$ 84
Cost of Concrete and Soil Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,277,338	32,678	$ 161
	$ 6,804,644	69,085	

Table E3 (left). Model of Option B Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites with Recycling Bins, Trailer Recycling at Small Sites

		Source Tonnage Residual Waste by Material Type																	Tonnage Recyclables by Material Type															
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																																	
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	75%	5%	0%	0%	*2%*	0%	*2%*	16%	0%	100%	1,762	0	0	291	1,745	1,939	3,850	*2,464*	*1,500*	102	13,653	8,439	5,225	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	1,103	0	0	258	1,353	*381*	3,131	1,910	5,188	63	13,387	7,763	5,272	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	384	0	0	77	568	*27*	700	1,237	1,672	30	4,695	4,105	3,433	8,800
108 Mile House Residential Collection							0																										
Regional District of Fraser Fort George																																	
URBAN TRANSFER STATION SYSTEM																																	
Williams Lake Urban Transfer Station																																	
RURAL TRANSFER STATIONS																																	
Alexandria Transfer Station	804	0.66	220	0	0	0	220	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	18	0	0	0	0	*7*	0			0	24	202	202	227
Baker Creek Transfer Station	762	0.66	479	0	0	0	479	82%	16%	0%	0%	2%	0%	0%	0%	0%	100%	77	0	0	10	57	*6*	0			0	150	393	393	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	12	0	0	0	0	*1*	0			0	13	141	141	154
Wells Transfer Station	287	0.66	477	0	0	0	477	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	38	0	0	0	57	*2*	0			0	98	439	439	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	7	0	0	0	0	*2*	0			0	9	82	82	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	18	0	0	0	26	*8*	0			0	52	202	202	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0	0	1,134	82%	16%	0%	0%	2%	0%	0%	0%	0%	100%	181	0	0	23	185	*16*	0			0	406	930	930	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0	0	1,046	82%	16%	0%	0%	2%	0%	0%	0%	0%	100%	167	0	0	21	252	*16*	0			0	456	858	858	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	11	0	0	0	16	*2*	0			0	29	125	125	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0	0	1,276	82%	16%	0%	0%	2%	0%	0%	0%	0%	100%	204	0	0	26	181	*9*	0			0	420	1,046	1,046	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	30	0	0	0	45	*5*	0			0	80	345	345	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	23	0	0	0	0	*4*	0			0	27	262	262	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	12	0	0	0	0	*3*	0			0	15	135	135	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	8	0	0	0	0	*5*	0			0	13	93	93	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0	0	1,051	82%	16%	0%	0%	2%	0%	0%	0%	0%	100%	168	0	0	21	12	*11*	0			0	213	862	862	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0	0	2,823	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	452	0	0	*71*	0	*30*	0			0	553	2,315	2,315	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0	0	892	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	143	0	0	18	0	*10*	0			0	170	731	731	902
RURAL LANDFILLS																																	
Nazko Landfill	392	0.63	245	0	0	0	245	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	20	0	0	0	0	*3*	0			0	23	226	226	248
Likely Landfill	528	0.62	290	0	0	0	290	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	35	*4*	0			0	62	267	267	329
Big Lake Landfill	554	0.62	304	0	0	0	304	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	24	0	0	0	37	*4*	0			0	65	280	280	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	4	0	0	0	0	*1*	0			0	5	48	48	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0	0	1,575	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	252	0	0	*51*	1,081	*20*	0			0	1,405	1,291	1,291	2,696
Watch Lake Landfill	445	1.27	277	0	0	0	277	82%	16%	0%	*0%*	2%	0%	0%	0%	0%	100%	44	0	0	*26*	198	*4*	0			0	271	228	228	499
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	17	0	0	0	26	*3*	0			0	46	200	200	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	81	81	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	84	84	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	5	0	0	0	0	*1*	0			0	5	52	52	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	28	0	0	0	0	*4*	0			0	32	317	317	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	92%	8%	0%	0%	0%	0%	0%	0%	0%	100%	12	0	0	0	0	*2*	0			0	14	136	136	149
REGIONAL LANDFILLS																																	
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	6,482	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	9,175	9,175
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	0	0	258	1,353	0	0			0	1,611	11,043	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	0	0	77	568	0	0			0	645	13,022	0	13,667
REGIONAL ECO DEPOTS																																	
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,934						3,850				5,784	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,797						3,131				4,928	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,455						700				2,155	0	0	0
CONSULTING																																	
CRD DEBT PAYMENT																																	
CRD RDFFG TIPPING FEE																																	
CRD MANAGEMENT COST																																	
CRD RECYCLING EDUCATION																																	
CRD WINTER ROAD MAINTENANCE																																	
CRD BYLAW ENFORCEMENT OFFICER																																	
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**0**	**0**	**892**	**5,874**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**36,407**	**32,678**	**26,300**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**0**	**0**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**31,734**	**20,307**	**13,929**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**0**	**0**	**77**	**1,375**	**49**	**0**	**0**	**0**	**0**	**1,945**	**3,209**	**3,209**	**5,153**
Totals Satellite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**0**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,728**	**9,162**	**9,162**	**11,890**

Table E3 (right). Model of Option B Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites with Recycling Bins, Trailer Recycling at Small Sites

Bin Service and Hauling Cost Analysis															Costs														
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Recycle Bin or Trailer Serv. per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Haul Time MSW Truck (hours)	Haul Time Recycle Trailer (hours)	Historic Budget Haul Cost ($/year)	Annual Haul Cost MSW Truck ($/year)	Annual Haul Cost Recycle Tr. ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban									Quesnel L.F.		0							$391,786						$49,279	$6,000						$447,065
Williams Lake Urban									Williams Lake T.S.		0							$75,000						$38,200	$96,073						$209,273
100 Mile House Urban									100 Mile Housel L.F.		0							$39,000						$24,735	$6,688						$70,423
108 Mile House Residential Collection									100 Mile Housel L.F.									$68,000						$0							$68,000
Regional District of Fraser Fort George																		$13,243						$0							$13,243
																															$808,004
URBAN TRANSFER STATION SYSTEM																															
Williams Lake Urban Transfer Station									Gibraltar L.F.		0				$341,000	$238,569		$232,314			$1,500	$15,078				$93,000	$70,000		$11,722	$97,000		$759,183
																															$759,183
RURAL TRANSFER STATIONS																															
Alexandria Transfer Station	0	2		0.23	15	0.07	20	35	Quesnel L.F.	Hwy 97	40	80	24	30	$ 15,345	$ 2,040	$ 1,500	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,860
Baker Creek Transfer Station	0	2		0.23	29	0.13	20	49	Quesnel L.F.	Nazko Rd	35	60	51	33	$ 51,920	$ 4,355	$ 2,833	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 10,200	$ 5,000	$ 290	$ 7,384	$ 3,508		$ 107,161
Cottonwood Transfer Station	0	1		0.23	21	0.07	14	35	Quesnel L.F.	Barkerville Hwy	40	70	37	23	$ 14,157	$ 3,111	$ 1,150	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,278
Wells Transfer Station	0	2		0.23	32	0.07	43	75	Quesnel L.F.	Barkerville Hwy	80	70	92	120	$ 16,418	$ 7,849	$ 5,989	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 10,500	$ -	$ -	$ 1,138	$ 4,525		$ 35,787
Tittetown Transfer Station	0	1		0.23	*12*	0.07	9	21	Quesnel L.F.	Nazko Rd	145	60	65	48	$ 10,200	$ 5,542	$ 2,400	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ 1,668		$ 14,953
McLeese Lake Transfer Station	0	2		0.23	15	0.07	20	35	Williams Lake T.S.	Hwy 97	50	80	28	35	$ 11,901	$ 2,359	$ 1,750	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ 793	$ 4,525		$ 37,806
Wildwood Transfer Station	0	2		0.23	67	0.13	46	113	Williams Lake T.S.	Hwy 97	12	60	67	41	$ 77,446	$ 5,695	$ 3,519	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 5,000	$ 5,613	$ 3,508		$ 144,928
Frost Creek Transfer Station	0	2		0.23	62	0.13	43	105	Williams Lake T.S.	Dog Creek Rd	15	60	68	43	$ 74,552	$ 5,797	$ 3,655	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 500	$ 8,470	$ 3,508		$ 114,352
Chimney Lake Transfer Station	0	1		0.23	18	0.07	13	31	Williams Lake T.S.	Dog Creek Rd	30	60	29	20	$ 11,610	$ 2,448	$ 975	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,764
150 Mile Transfer Station	0	2		0.23	75	0.13	52	127	Williams Lake T.S.	Hwy 97	25	60	108	69	$ 85,892	$ 9,138	$ 5,893	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 4,451	$ 12,000	$ 3,508		$ 133,662
Horsefly Transfer Station	0	2		0.23	25	0.07	34	59	Williams Lake T.S.	Horsefly Rd	70	60	73	96	$ 32,604	$ 6,233	$ 4,817	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ 674	$ 4,525		$ 65,205
Alexis Creek Transfer Station	0	2		0.23	19	0.07	26	45	Williams Lake T.S.	Hwy 20	120	60	87	117	$ 11,059	$ 7,429	$ 5,850	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ 3,508		$ 32,781
Riske Creek Transfer Station	0	1		0.23	20	0.07	14	34	Williams Lake T.S.	Hwy 20	55	60	49	33	$ 23,837	$ 4,137	$ 1,633	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,849
Eagle Creek Transfer Station	0	1		0.23	14	0.07	10	24	100 Mile Housel L.F.	Canim Lake Rd	50	60	32	22	$ 6,339	$ 2,697	$ 1,083	$ 10,218	$ -	$ -	$ -	$ 1,000						$ 1,200	$ 768	$ 2,550		$ 19,517
Forest Grove Transfer Station	0	2		0.23	62	0.13	43	105	100 Mile Housel L.F.	Canim Lake Rd	30	60	99	65	$ 53,392	$ 8,432	$ 5,483	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 38,000	$ 500	$ 893	$ 4,000	$ 3,508		$ 142,788
Lac La Hache Transfer Station	0	2		0.23	*166*	0.13	115	281	100 Mile Housel L.F.	Hwy 97	25	75	210	134	$ 157,950	$ 17,873	$ 11,404	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 1,500	$ 7,000	$ 3,508		$ 135,817
Lone Butte Transfer Station	0	2		0.23	*53*	0.13	37	90	100 Mile Housel L.F.	Horse Lake Rd	50	60	120	80	$ 92,943	$ 10,211	$ 6,814	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 2,300	$ 6,000	$ 3,508		$ 99,806
																															$ 1,184,313
RURAL LANDFILLS																															
Nazko Landfill						0.07	23	23	Nazko LF	Nazko Rd	90	60	0	81		0	4,028	$ 20,964			$ 100	$ 2,421						$ 3,851	$ 4,513	$ 1,128	$ 37,002
Likely Landfill						0.07	27	27	Likely LF	Likely Rd	110	60	0	113		0	5,625	$ 32,750			$ 500	$ 1,380				$ 18,150			$ 5,340	$ 1,335	$ 65,080
Big Lake Landfill						0.07	28	28	Big Lake LF	Likely Rd	55	60	0	65		0	3,267	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 8,925		$ 2,000	$ 5,602	$ 1,401	$ 76,472
Mahood Lake Landfill						0.07	5	5	Mahood Lake LF	Horse Lake Rd	70	60	0	14		0	708	$ 12,000		$ 1,000	$ 200								$ 968	$ 242	$ 15,118
Inter-Lakes aka Sheriden Landfill						0.13	64	64	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	0	117		0	$ 9,973	$ 121,771		$ -	$ 750	$ 2,700				$ 113,996		$ 3,652	$ 25,825	$ 6,456	$ 285,123
Watch Lake Landfill						0.13	12	12	Watch Lake Landfill	Watch Lake Rd	30	60	0	18		0	$ 1,530	$ 90,283			$ 1,000	$ 2,730				$ 26,000		$ 1,209	$ 4,550	$ 1,138	$ 128,440
West Chilcotin aka Anahim/Nimpo Landfill						0.07	20	20	West Chilcotin LF	Hwy 20	330	60	0	230		0	11,500	$ 31,900			$ 200	$ 2,500				$ 9,425		$ 7,576	$ 3,993	$ 998	$ 68,093
Kleana Kleene Landfill						0.07	8	8	Kleana Kleene LF	Hwy 20	280	60	0	79		0	3,933	$ 13,960			$ 420								$ 1,612	$ 403	$ 20,328
Tatla Lake Landfill						0.07	9	9	Tatla Lake LF	Hwy 20	240	60	0	77		0	3,829	$ 13,960			$ 200							$ 1,000	$ 1,678	$ 419	$ 21,082
Cochin Lake Landfill						0.07	6	6	Cochin LF	Hwy 20	260	60	0	55		0	2,750	$ 13,960			$ 250	$ 1,885							$ 1,039	$ 260	$ 20,144
Puntzi Lake Landfill						0.07	32	32	Puntzi Lake LF	Hwy 20	210	60	0	240		0	12,000	$ 27,920			$ 300								$ 6,343	$ 1,586	$ 48,148
Nemiah Valley Landfill						0.07	14	14	Nemiah Valley LF	Hwy 20	310	60	0	152		0	7,583	$ 24,440			$ 395	$ 2,310						$ 3,794	$ 2,711	$ 678	$ 41,911
																															$ 826,941
REGIONAL LANDFILLS																															
Quesnel Landfill																		$ 471,275											$ 98,157	$ 25,000	$ 594,432
Gibraltar Landfill																		$ 326,302											$ 214,843	$ 170,000	$ 711,145
Williams Lake DLC Landfill																		$ 110,435													$ 110,435
100 Hundred Mile House Landfill																		$ 289,583			$ 13,224	$ 14,716				$ 48,052		$ 4,500	$ 75,000	$ 25,500	$ 470,575
																															$ 1,886,587
REGIONAL ECO DEPOTS			No of 53' trailers																												
Quesnel EcoDepot			290					290	Urban Impact, Rich.	Hwy 97	672	85	2,467			246,671		$ 206,332	$ (510,524)								$ 231,354					$ 173,833
Williams Lake EcoDepot			247					247	Urban Impact, Rich.	Hwy 97	548	85	1,741			174,062		$ 206,332	$ (425,253)								$ 197,112					$ 152,254
100 Mile House EcoDepot			108					108	Urban Impact, Rich.	Hwy 97	458	85	647			64,673		$ 206,332	$ (142,490)								$ 86,213					$ 214,729
																															$ 540,816
CONSULTING																		$ 71,000				$ 22,000									**$ 93,000**
CRD DEBT PAYMENT																													$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																		$ 13,443													**$ 13,443**
CRD MANAGEMENT COST																		$ 309,321													**$ 309,321**
CRD RECYCLING EDUCATION																		$ 75,000													**$ 75,000**
CRD WINTER ROAD MAINTENANCE																					$ 46,092										**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																		$ 83,944													**$ 83,944**
																															$ -
Totals Entire System					**705**		**807**	**2,157**					**6,093**	**2,249**	**1,088,565**	**$ 829,321**	**$ 133,469**	**$ 4,242,794**	**$ (1,098,267)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 494,123**	**$ 590,890**	**$ 18,534**	**$ 98,356**	**$ 785,205**	**$ 236,543**	**$6,804,644**
Total Urban Centre Transfer Station and LF					**0**			**645**					**4,854**	**0**	**341,000**	**$ 238,569**	**$ -**															
Total Small Landfills					**0**		**248**	**248**					**0**	**1,240**	**0**	**$ -**	**$ 66,720**															
Totals Satelite Transfer Stations					**705**		**559**	**1,264**					**1,239**	**1,009**	**747,565**	**$ 105,346**	**$ 66,749**															

Table E4-S. Summary - Model of Option C Without Composting				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	0
Total Tonnage Recycled			35,563	0
Total Tonnage of Residuals Landfilled			33,522	0
Diversion Percentage			51.48%	0
Tonnage in Rural Transfer System			11,890	0
Tonnage in Rural Landfills			5,153	0
Tonnage in Urban Transfer System			52,042	0
Checksum			69,085	0
Total System Cost	$	6,847,349	69,085	$ 99
Cost of Urban Collection	$	808,004	52,042	$ 16
Cost of Rural Transfer Stations	$	942,110	11,890	$ 79
Cost or Rural Hauling	$	285,521	11,890	$ 24
Cost of Transfer and Haul to Gibraltar	$	766,372	9,452	$ 81
Cost of Regional Landfills	$	1,894,609	59,283	$ 32
Cost of Rural Landfills	$	834,033	5,153	$ 162
Cost of Regional Eco Depots	$	517,900	12,023	$ 43
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,847,349		
Cost of North Cariboo System	$	1,467,779	23,891	$ 3,569
Cost of Central Cariboo System	$	2,695,092	27,214	$ 3,607
Cost of South Cariboo System	$	1,665,971	16,998	$ 3,606
Cost of Chilcotin System	$	219,706	982	$ 3,732
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,847,349	69,085	$ 99
Cost of Recycling Programs	$	792,682	15,718	$ 50
Cost of Wood Waste Management	$	494,123	5,874	$ 84
Cost of Soil and Concrete Recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,339,569	33,522	$ 159
Check Sum	$	6,847,349	69,085	$ 99.12

Table E4 (left). Model of Option C Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites no Recycling Bins, Trailer Recycling at all Transfer Sites

			Source Tonnage Residual Waste by Material Type															Tonnage Recyclables by Material Type												
Site Name	Electoral Area	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban		19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	75%	5%	0%	0%	*2%*	0%	2%	16%	0%	100%	1,762	0	0	291	1,745	1,939	3,850	*2,464*	*1,500*	102	13,653	8,439	5,225	22,092
Williams Lake Urban		15,349	1.00	8,496	2,492	1,910	5,188	12,898	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	1,103	0	0	258	1,353	*381*	3,131	1,910	5,188	63	13,387	7,763	5,272	21,150
100 Mile House Urban		3,304	1.52	3,714	672	1,237	1,672	5,623	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	384	0	0	77	568	*27*	700	1,237	1,672	30	4,695	4,105	3,433	8,800
108 Mile House Residential Collection								0																							
Regional District of Fraser Fort George																															
URBAN TRANSFER STATION SYSTEM																															
Williams Lake Urban Transfer Station																															
RURAL TRANSFER STATIONS																															
Alexandria Transfer Station	A	804	0.66	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	0	*7*	0			0	24	202	202	227
Baker Creek Transfer Station	B	762	0.66	479	0	0	0	479	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	100%	38	0	0	10	57	*6*	0			0	112	431	431	543
Cottonwood Transfer Station	C	153	0.66	153	0	0	0	153	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*1*	0			0	13	141	141	154
Wells Transfer Station	Wells	287	0.66	477	0	0	0	477	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	38	0	0	0	57	*2*	0			0	98	439	439	537
Titetown Transfer Station	I	224	0.66	89	0	0	0	89	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*2*	0			0	9	82	82	91
McLeese Lake Transfer Station	D	998	0.63	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	26	*8*	0			0	52	202	202	255
Wildwood Transfer Station	D	2,021	0.63	1,134	0	0	0	1,134	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	91	0	0	23	185	*16*	0			0	315	1,021	1,021	1,336
Frost Creek Transfer Station	E	1,908	0.63	1,046	0	0	0	1,046	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	84	0	0	21	252	*16*	0			0	372	941	941	1,314
Chimney Lake Transfer Station	E	248	0.63	136	0	0	0	136	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	11	0	0	0	16	*2*	0			0	29	125	125	154
150 Mile Transfer Station	F	1,164	0.63	1,276	0	0	0	1,276	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	102	0	0	26	181	*9*	0			0	318	1,148	1,148	1,466
Horsefly Transfer Station	F	595	0.63	375	0	0	0	375	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	30	0	0	0	45	*5*	0			0	80	345	345	425
Alexis Creek Transfer Station	K	459	0.63	285	0	0	0	285	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	0	*4*	0			0	27	262	262	289
Riske Creek Transfer Station	K	419	0.63	147	0	0	0	147	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*3*	0			0	15	135	135	150
Eagle Creek Transfer Station	H	633	0.77	101	0	0	0	101	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	8	0	0	0	0	*5*	0			0	13	93	93	106
Forest Grove Transfer Station	H	1,382	0.77	1,051	0	0	0	1,051	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	84	0	0	21	12	*11*	0			0	128	946	946	1,074
Lac La Hache Transfer Station	G	3,715	0.77	2,823	0	0	0	2,823	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	226	0	0	*71*	0	*30*	0			0	327	2,541	2,541	2,868
Lone Butte Transfer Station	L	1,173	0.77	892	0	0	0	892	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	71	0	0	18	0	*10*	0			0	99	803	803	902
RURAL LANDFILLS																															
Nazko Landfill	I	392	0.63	245	0	0	0	245	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	20	0	0	0	0	*3*	0			0	23	226	226	248
Likely Landfill	F	528	0.62	290	0	0	0	290	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	35	*4*	0			0	62	267	267	329
Big Lake Landfill	F	554	0.62	304	0	0	0	304	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	24	0	0	0	37	*4*	0			0	65	280	280	346
Mahood Lake Landfill	H	84	1.27	53	0	0	0	53	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	0	*1*	0			0	5	48	48	53
Inter-Lakes aka Sheriden Landfill	L	2,523	1.27	1,575	0	0	0	1,575	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	126	0	0	*51*	1,081	*20*	0			0	1,279	1,417	1,417	2,696
Watch Lake Landfill	L	445	1.27	277	0	0	0	277	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	22	0	0	*26*	198	*4*	0			0	249	250	250	499
West Chilcotin aka Anahim/Nimpo Landfill	J	348	0.62	217	0	0	0	217	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	17	0	0	0	26	*3*	0			0	46	200	200	246
Kleana Kleene Landfill	J	140	0.62	88	0	0	0	88	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	81	81	89
Tatla Lake Landfill	J	146	0.62	91	0	0	0	91	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	84	84	92
Cochin Lake Landfill	J	90	0.62	56	0	0	0	56	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	5	0	0	0	0	*1*	0			0	5	52	52	57
Puntzi Lake Landfill	J	552	0.62	345	0	0	0	345	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	28	0	0	0	0	*4*	0			0	32	317	317	349
Nemiah Valley Landfill	J	236	0.62	147	0	0	0	147	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*2*	0			0	14	136	136	149
REGIONAL LANDFILLS																															
Quesnel Landfill		22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	6,520	23,510
Gibraltar Landfill		24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	9,452	9,452
Williams Lake DLC Landfill		15,349		0	2,492	1,910	5,188	4,402											0	0	0	258	1,353	0	0			0	1,611	11,043	0	12,654
100 Hundred Mile House Landfill		10,207	1.06	8,581	672	1,237	1,672	10,490											0	0	0	77	568	0	0			0	645	13,022	0	13,667
REGIONAL ECO DEPOTS																															
Quesnel EcoDepot		22,031	0.00	0	0	0	0												1,896						3,850				5,746	0	0	0
Williams Lake EcoDepot		24,242	0.00	0	0	0	0												1,521						3,131				4,651	0	0	0
100 Mile House EcoDepot		10,207	0.00	0	0	0	0												926						700				1,626	0	0	0
CONSULTING																															
CRD DEBT PAYMENT																															
CRD RDFFG TIPPING FEE																															
CRD MANAGEMENT COST																															
CRD RECYCLING EDUCATION																															
CRD WINTER ROAD MAINTENANCE																															
CRD BYLAW ENFORCEMENT OFFICER																															
Totals Entire System		**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**4,417**	**0**	**0**	**892**	**5,874**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**35,563**	**33,522**	**27,144**	**69,085**
Total Urban Centre Transfer Station and LF		**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**0**	**0**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**31,734**	**20,307**	**13,929**	**52,042**
Total Small Landfills		**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**295**	**0**	**0**	**77**	**1,375**	**49**	**0**	**0**	**0**	**0**	**1,797**	**3,357**	**3,357**	**5,153**
Totals Satellite Transfer Stations		**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**872**	**0**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,032**	**9,858**	**9,858**	**11,890**

Table E4 (right). Model of Option C Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites no Recycling Bins, Trailer Recycling at all Transfer Sites

Bin Service and Hauling Cost Analysis															Costs																				
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Recycle Trailer Serv. per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Haul Time MSW Truck (hours)	Haul Time Recycle Trailer (hours)	Historic Budget Haul Cost ($/year)	Annual Haul Cost MSW Truck ($/year)	Annual Haul Cost Recycle Tr. ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																																		
City of Quesnel Urban									Quesnel L.F.		0							$391,786						$49,279	$6,000							$447,065
Williams Lake Urban									Williams Lake T.S.		0							$75,000						$38,200	$96,073							$209,273
100 Mile House Urban									100 Mile Housel L.F.		0							$39,000						$24,735	$6,688							$70,423
108 Mile House Residential Collection									100 Mile Housel L.F.									$68,000						$0								$68,000
Regional District of Fraser Fort George																		$13,243						$0								$13,243
																																$808,004
URBAN TRANSFER STATION SYSTEM																																		
Williams Lake Urban Transfer Station									Gibraltar L.F.		0				$341,000	$245,758		$232,314			$1,500	$15,078				$93,000	$70,000		$11,722	$97,000		$766,372
																																$766,372
RURAL TRANSFER STATIONS																																		
Alexandria Transfer Station	0	2		0.23	15	0.07	20	35	Quesnel L.F.	Hwy 97	40	80	30	30	$ 15,345	$ 2,550	$ 1,500	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ 1,569	$ 4,525		$ 20,370
Baker Creek Transfer Station	0	2		0.23	31	0.07	44	75	Quesnel L.F.	Nazko Rd	35	60	67	73	$ 51,920	$ 5,709	$ 3,667	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 10,200	$ 5,000	$ 290	$ 7,384	$ 3,508		$ 109,349
Cottonwood Transfer Station	0	1		0.23	21	0.07	14	35	Quesnel L.F.	Barkerville Hwy	40	70	45	23	$ 14,157	$ 3,825	$ 1,150	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,992
Wells Transfer Station	0	2		0.23	32	0.07	43	75	Quesnel L.F.	Barkerville Hwy	80	70	105	120	$ 16,418	$ 8,937	$ 5,988	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 10,500	$ -	$ -	$ 1,138	$ 4,525		$ 36,875
Tittetown Transfer Station	0	1		0.23	*12*	0.07	9	21	Quesnel L.F.	Nazko Rd	145	60	70	48	$ 10,200	$ 5,950	$ 2,400	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ 1,668		$ 15,361
McLeese Lake Transfer Station	0	2		0.23	15	0.07	20	35	Williams Lake T.S.	Hwy 97	50	80	34	35	$ 11,901	$ 2,869	$ 1,750	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ 793	$ 4,525		$ 38,316
Wildwood Transfer Station	0	2		0.23	73	0.07	103	176	Williams Lake T.S.	Hwy 97	12	60	102	93	$ 77,446	$ 8,687	$ 4,635	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 5,000	$ 5,613	$ 3,508		$ 149,036
Frost Creek Transfer Station	0	2		0.23	68	0.07	95	163	Williams Lake T.S.	Dog Creek Rd	15	60	102	95	$ 74,552	$ 8,670	$ 4,750	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 500	$ 8,470	$ 3,508		$ 118,320
Chimney Lake Transfer Station	0	1		0.23	18	0.07	13	31	Williams Lake T.S.	Dog Creek Rd	30	60	36	20	$ 11,610	$ 3,060	$ 975	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ 1,200	$ 1,223	$ 2,550		$ 29,376
150 Mile Transfer Station	0	2		0.23	83	0.07	115	198	Williams Lake T.S.	Hwy 97	25	60	152	153	$ 85,892	$ 12,934	$ 7,667	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 4,451	$ 12,000	$ 3,508		$ 139,232
Horsefly Transfer Station	0	2		0.23	25	0.07	34	59	Williams Lake T.S.	Horsefly Rd	70	60	83	96	$ 32,604	$ 7,083	$ 4,817	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ 674	$ 4,525		$ 66,055
Alexis Creek Transfer Station	0	2		0.23	19	0.07	26	45	Williams Lake T.S.	Hwy 20	120	60	95	117	$ 11,059	$ 8,075	$ 5,850	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ 3,508		$ 33,427
Riske Creek Transfer Station	0	1		0.23	20	0.07	14	34	Williams Lake T.S.	Hwy 20	55	60	57	33	$ 23,837	$ 4,817	$ 1,633	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ 1,589	$ 2,550		$ 31,529
Eagle Creek Transfer Station	0	1		0.23	14	0.07	10	24	100 Mile Housel L.F.	Canim Lake Rd	50	60	37	22	$ 6,339	$ 3,173	$ 1,083	$ 10,218	$ -	$ -	$ -	$ 1,000						$ 1,200	$ 768	$ 2,550		$ 19,993
Forest Grove Transfer Station	0	2		0.23	68	0.07	95	163	100 Mile Housel L.F.	Canim Lake Rd	30	60	136	143	$ 53,392	$ 11,560	$ 7,125	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 38,000	$ 500	$ 893	$ 4,000	$ 3,508		$ 147,558
Lac La Hache Transfer Station	0	2		0.23	*182*	0.07	254	436	100 Mile Housel L.F.	Hwy 97	25	75	303	296	$ 157,950	$ 25,783	$ 14,817	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 1,500	$ 7,000	$ 3,508		$ 147,140
Lone Butte Transfer Station	0	2		0.23	*59*	0.07	81	139	100 Mile Housel L.F.	Horse Lake Rd	50	60	155	176	$ 92,943	$ 13,147	$ 8,775	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 2,300	$ 6,000	$ 3,508		$ 104,702
																																$ 1,227,630
RURAL LANDFILLS																																		
Nazko Landfill						0.07	23	23	Nazko LF	Nazko Rd	90	60	0	81		$ -	$ 4,025	$ 20,964			$ 100	$ 2,421							$ 3,851	$ 4,513	$ 1,128	$ 37,002
Likely Landfill						0.07	27	27	Likely LF	Likely Rd	110	60	0	113		$ -	$ 5,625	$ 32,750			$ 500	$ 1,380				$ 18,150				$ 5,340	$ 1,335	$ 65,080
Big Lake Landfill						0.07	28	28	Big Lake LF	Likely Rd	55	60	0	65		$ -	$ 3,257	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 8,925			$ 2,000	$ 5,602	$ 1,401	$ 76,472
Mahood Lake Landfill						0.07	5	5	Mahood Lake LF	Horse Lake Rd	70	60	0	14		$ -	$ 708	$ 12,000		$ 1,000	$ 200									$ 968	$ 242	$ 15,118
Inter-Lakes aka Sheriden Landfill						0.07	142	142	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	0	260		$ -	$ 13,017	$ 121,771		$ -	$ 750	$ 2,700				$ 113,996			$ 3,652	$ 28,344	$ 7,086	$ 291,316
Watch Lake Landfill						0.07	25	25	Watch Lake Landfill	Watch Lake Rd	30	60	0	38		$ -	$ 1,875	$ 90,283			$ 1,000	$ 2,730				$ 26,000			$ 1,209	$ 4,994	$ 1,249	$ 129,340
West Chilcotin aka Anahim/Nimpo Landfill						0.07	20	20	West Chilcotin LF	Hwy 20	330	60	0	230		$ -	$ 11,500	$ 31,900			$ 200	$ 2,500				$ 9,425			$ 7,576	$ 3,993	$ 998	$ 68,093
Kleana Kleene Landfill						0.07	8	8	Kleana Kleene LF	Hwy 20	280	60	0	79		$ -	$ 3,933	$ 13,960			$ 420									$ 1,612	$ 403	$ 20,328
Tatla Lake Landfill						0.07	9	9	Tatla Lake LF	Hwy 20	240	60	0	77		$ -	$ 3,825	$ 13,960			$ 200								$ 1,000	$ 1,678	$ 419	$ 21,082
Cochin Lake Landfill						0.07	6	6	Cochin LF	Hwy 20	260	60	0	55		$ -	$ 2,750	$ 13,960			$ 250	$ 1,885								$ 1,039	$ 260	$ 20,144
Puntzi Lake Landfill						0.07	32	32	Puntzi Lake LF	Hwy 20	210	60	0	240		$ -	$ 12,000	$ 27,920			$ 300									$ 6,343	$ 1,586	$ 48,148
Nemiah Valley Landfill						0.07	14	14	Nemiah Valley LF	Hwy 20	310	60	0	152		$ -	$ 7,583	$ 24,440			$ 395	$ 2,310							$ 3,794	$ 2,711	$ 678	$ 41,911
																																$ 834,033
REGIONAL LANDFILLS																																		
Quesnel Landfill																		$ 472,041												$ 98,157	$ 25,000	$ 595,198
Gibraltar Landfill																		$ 333,557												$ 214,843	$ 170,000	$ 718,400
Williams Lake DLC Landfill																		$ 110,435														$ 110,435
100 Hundred Mile House Landfill																		$ 289,583			$ 13,224	$ 14,716				$ 48,052			$ 4,500	$ 75,000	$ 25,500	$ 470,575
																																$ 1,894,609
REGIONAL ECO DEPOTS			No of 53' trailers																															
Quesnel EcoDepot			288					288	Urban Impact, Rich.	Hwy 97	672	85	2,450			$ 244,969		$ 206,332	$ (508,799)								$ 229,822					$ 172,324
Williams Lake EcoDepot			233					233	Urban Impact, Rich.	Hwy 97	548	85	1,642			$ 164,196		$ 206,332	$ (412,812)								$ 186,053					$ 143,770
100 Mile House EcoDepot			82					82	Urban Impact, Rich.	Hwy 97	458	85	491			$ 49,104		$ 206,332	$ (118,664)								$ 65,035					$ 201,806
																																$ 517,900
CONSULTING																		$ 71,000				$ 22,000											**$ 93,000**
CRD DEBT PAYMENT																															$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																		$ 13,443															**$ 13,443**
CRD MANAGEMENT COST																		$ 309,321															**$ 309,321**
CRD RECYCLING EDUCATION																		$ 75,000															**$ 75,000**
CRD WINTER ROAD MAINTENANCE																					$ 46,092												**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																		$ 83,944															**$ 83,944**
																																	$ -
Totals Entire System					**754**		**1,329**	**2,686**						**6,192**	**2,974**	**1,088,565**	**$ 840,857**	**$ 148,691**	**$ 4,250,815**	**$ (1,060,275)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 494,123**	**$ 557,120**	**$ 18,534**	**$ 98,356**	**$ 788,169**	**$ 237,284**	**$ 6,847,349**
Total Urban Centre Transfer Station and LF					**0**			**603**						**4,583**	**0**	**341,000**	**$ 245,758**	$ -															
Total Small Landfills					**0**		**339**	**339**						**0**	**1,402**	**0**	**$ -**	**$ 70,108**															
Totals Satellite Transfer Stations					**754**		**990**	**1,744**						**1,610**	**1,572**	**747,565**	**$ 136,830**	**$ 78,583**															

Table E5-S. Summary - Model of Option D Without Composting				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	0
Total Tonnage Recycled			28,423	0
Total Tonnage of Residuals Landfilled			40,662	0
Diversion Percentage			41.14%	0
Tonnage in Rural Transfer System			11,890	0
Tonnage in Rural Landfills			5,153	0
Tonnage in Urban Transfer System			52,042	0
Checksum			69,085	0
Total System Cost	$	6,528,307	69,085	$ 94
Cost of Urban Collection	$	808,004	52,042	$ 16
Cost of Rural Transfer Stations	$	942,110	11,890	$ 79
Cost or Rural Hauling	$	259,885	11,890	$ 22
Cost of Transfer and Haul to Gibraltar	$	850,209	12,676	$ 67
Cost of Regional Landfills	$	2,054,484	62,507	$ 33
Cost of Rural Landfills	$	834,033	5,153	$ 162
Cost of Regional Eco Depots	$	(19,217)	5,980	$ (3)
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,528,307		
Cost of North Cariboo System	$	1,366,675	23,891	$ 3,565
Cost of Central Cariboo System	$	2,701,414	27,214	$ 3,607
Cost of South Cariboo System	$	1,441,713	16,998	$ 3,593
Cost of Chilcotin System	$	219,706	982	$ 3,732
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,528,307	69,085	$ 94
Cost of Recycling Programs	$	255,564	8,578	$ 30
Cost of Wood Waste Management	$	494,123	5,874	$ 84
Cost of Soil and Concrete Recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,557,646	40,662	$ 137
0	$	6,528,307	69,085	$ 94.50

Table E5 (left). Model of Option D Recycling Program: 3 Eco Depots, All Rural Sites Unattended no Recycling Bins, Trailer Recycling at all Transfer Sites

			Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type											
Site Name	Electoral Area	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban		19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	100%	0%	0%	0%	*0%*	0%	0%	0%	0%	100%	1,036	0	0	0	1,745	1,648	1,524	*2,464*	*1,500*	102	10,018	12,074	8,859	22,092
Williams Lake Urban		15,349	1.00	8,496	2,492	1,910	5,188	12,898	100%	0%	0%	0%	0%	*0%*	0%	0%	0%	100%	459	0	0	0	1,353	*123*	1,067	1,910	5,188	63	10,163	10,988	8,496	21,150
100 Mile House Urban		3,304	1.52	3,714	672	1,237	1,672	5,623	100%	0%	0%	0%	0%	*0%*	0%	0%	0%	100%	103	0	0	77	568	*27*	700	1,237	1,672	30	4,414	4,386	3,714	8,800
108 Mile House Residential Collection								0																							
Regional District of Fraser Fort George																															
URBAN TRANSFER STATION SYSTEM																															
Williams Lake Urban Transfer Station																															
RURAL TRANSFER STATIONS																															
Alexandria Transfer Station	A	804	0.66	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	0	*7*	0			0	24	202	202	227
Baker Creek Transfer Station	B	762	0.66	479	0	0	0	479	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	100%	38	0	0	10	57	*6*	0			0	112	431	431	543
Cottonwood Transfer Station	C	153	0.66	153	0	0	0	153	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*1*	0			0	13	141	141	154
Wells Transfer Station	Wells	287	0.66	477	0	0	0	477	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	38	0	0	0	57	*2*	0			0	98	439	439	537
Titetown Transfer Station	I	224	0.66	89	0	0	0	89	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*2*	0			0	9	82	82	91
McLeese Lake Transfer Station	D	998	0.63	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	26	*8*	0			0	52	202	202	255
Wildwood Transfer Station	D	2,021	0.63	1,134	0	0	0	1,134	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	91	0	0	23	185	*16*	0			0	315	1,021	1,021	1,336
Frost Creek Transfer Station	E	1,908	0.63	1,046	0	0	0	1,046	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	84	0	0	21	252	*16*	0			0	372	941	941	1,314
Chimney Lake Transfer Station	E	248	0.63	136	0	0	0	136	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	11	0	0	0	16	*2*	0			0	29	125	125	154
150 Mile Transfer Station	F	1,164	0.63	1,276	0	0	0	1,276	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	102	0	0	26	181	*9*	0			0	318	1,148	1,148	1,466
Horsefly Transfer Station	F	595	0.63	375	0	0	0	375	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	30	0	0	0	45	*5*	0			0	80	345	345	425
Alexis Creek Transfer Station	K	459	0.63	285	0	0	0	285	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	0	*4*	0			0	27	262	262	289
Riske Creek Transfer Station	K	419	0.63	147	0	0	0	147	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*3*	0			0	15	135	135	150
Eagle Creek Transfer Station	H	633	0.77	101	0	0	0	101	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	8	0	0	0	0	*5*	0			0	13	93	93	106
Forest Grove Transfer Station	H	1,382	0.77	1,051	0	0	0	1,051	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	84	0	0	21	12	*11*	0			0	128	946	946	1,074
Lac La Hache Transfer Station	G	3,715	0.77	2,823	0	0	0	2,823	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	226	0	0	*71*	0	*30*	0			0	327	2,541	2,541	2,868
Lone Butte Transfer Station	L	1,173	0.77	892	0	0	0	892	92%	8%	0%	0%	2%	*0%*	0%	0%	0%	102%	71	0	0	18	0	*10*	0			0	99	803	803	902
RURAL LANDFILLS																															
Nazko Landfill	I	392	0.63	245	0	0	0	245	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	20	0	0	0	0	*3*	0			0	23	226	226	248
Likely Landfill	F	528	0.62	290	0	0	0	290	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	35	*4*	0			0	62	267	267	329
Big Lake Landfill	F	554	0.62	304	0	0	0	304	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	24	0	0	0	37	*4*	0			0	65	280	280	346
Mahood Lake Landfill	H	84	1.27	53	0	0	0	53	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	0	*1*	0			0	5	48	48	53
Inter-Lakes aka Sheriden Landfill	L	2,523	1.27	1,575	0	0	0	1,575	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	126	0	0	*51*	1,081	*20*	0			0	1,279	1,417	1,417	2,696
Watch Lake Landfill	L	445	1.27	277	0	0	0	277	92%	8%	0%	*0%*	2%	*0%*	0%	0%	0%	102%	22	0	0	*26*	198	*4*	0			0	249	250	250	499
West Chilcotin aka Anahim/Nimpo Landfill	J	348	0.62	217	0	0	0	217	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	17	0	0	0	26	*3*	0			0	46	200	200	246
Kleana Kleene Landfill	J	140	0.62	88	0	0	0	88	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	81	81	89
Tatla Lake Landfill	J	146	0.62	91	0	0	0	91	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*1*	0			0	8	84	84	92
Cochin Lake Landfill	J	90	0.62	56	0	0	0	56	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	5	0	0	0	0	*1*	0			0	5	52	52	57
Puntzi Lake Landfill	J	552	0.62	345	0	0	0	345	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	28	0	0	0	0	*4*	0			0	32	317	317	349
Nemiah Valley Landfill	J	236	0.62	147	0	0	0	147	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*2*	0			0	14	136	136	149
REGIONAL LANDFILLS																															
Quesnel Landfill		22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	0	1,745	0	0			0	1,745	21,765	10,154	23,510
Gibraltar Landfill		24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	12,676	12,676
Williams Lake DLC Landfill		15,349		0	2,492	1,910	5,188	4,402											0	0	0	0	1,353	0	0			0	1,353	11,301	0	12,654
100 Hundred Mile House Landfill		10,207	1.06	8,581	672	1,237	1,672	10,490											0	0	0	77	568	0	0			0	645	13,022	0	13,667
REGIONAL CONSOLIDATION																															
Quesnel Recycle Centre		22,031	0.00	0	0	0	0												1,169						1,524				2,693	0	0	0
Central Cariboo Disposal		24,242	0.00	0	0	0	0												876						1,067				1,943	0	0	0
Gold Trail Recycling		10,207	0.00	0	0	0	0												645						700				1,345	0	0	0
CONSULTING																															
CRD DEBT PAYMENT																															
CRD RDFFG TIPPING FEE																															
CRD MANAGEMENT COST																															
CRD RECYCLING EDUCATION																															
CRD WINTER ROAD MAINTENANCE																															
CRD BYLAW ENFORCEMENT OFFICER																															
Totals Entire System		**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**2,765**	**0**	**0**	**343**	**5,874**	**1,984**	**3,291**	**5,611**	**8,360**	**195**	**28,423**	**40,662**	**34,284**	**69,085**
Total Urban Centre Transfer Station and LF		**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**1,597**	**0**	**0**	**77**	**3,666**	**1,798**	**3,291**	**5,611**	**8,360**	**195**	**24,595**	**27,447**	**21,069**	**52,042**
Total Small Landfills		**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**295**	**0**	**0**	**77**	**1,375**	**49**	**0**	**0**	**0**	**0**	**1,797**	**3,357**	**3,357**	**5,153**
Totals Satelite Transfer Stations		**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**872**	**0**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,032**	**9,858**	**9,858**	**11,890**

Table E5 (right). Model of Option D Recycling Program: 3 Eco Depots, All Rural Sites Unattended no Recycling Bins, Trailer Recycling at all Transfer Sites

Bin Service and Hauling Cost Analysis															Costs														
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Recycle Trailer Serv. per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Haul Time MSW Truck (hours)	Haul Time Recycle Trailer (hours)	Historic Budget Haul Cost ($/year)	Annual Haul Cost MSW Truck ($/year)	Annual Haul Cost Recycle Tr. ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban									Quesnel L.F.		0							$391,786						$49,279	$6,000							$447,065
Williams Lake Urban									Williams Lake T.S.		0							$75,000						$38,200	$96,073							$209,273
100 Mile House Urban									100 Mile Housel L.F.		0							$39,000						$24,735	$6,688							$70,423
108 Mile House Residential Collection									100 Mile Housel L.F.									$68,000						$0								$68,000
Regional District of Fraser Fort George																		$13,243						$0								$13,243
																																$808,004
URBAN TRANSFER STATION SYSTEM																																
Williams Lake Urban Transfer Station									Gibraltar L.F.		0				$341,000	$329,595		$232,314			$1,500	$15,078				$93,000	$70,000		$11,722	$97,000		$850,209
																																$850,209
RURAL TRANSFER STATIONS																																
Alexandria Transfer Station	0	2		0.23	15	0.07	20	35	Quesnel L.F.	Hwy 97	40	80	24	30	$ 15,345	$ 2,040	$ 1,500	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,860
Baker Creek Transfer Station	0	2		0.23	31	0.07	44	75	Quesnel L.F.	Nazko Rd	35	60	55	73	$ 51,920	$ 4,655	$ 3,667	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 10,200	$ 5,000	$ 290	$ 7,384	$ 3,508		$ 108,295
Cottonwood Transfer Station	0	1		0.23	21	0.07	14	35	Quesnel L.F.	Barkerville Hwy	40	70	37	23	$ 14,157	$ 3,111	$ 1,150	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,278
Wells Transfer Station	0	2		0.23	32	0.07	43	75	Quesnel L.F.	Barkerville Hwy	80	70	92	120	$ 16,418	$ 7,849	$ 5,989	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 10,500	$ -	$ -	$ 1,138	$ 4,525		$ 35,787
Tetetown Transfer Station	0	1		0.23	*12*	0.07	9	21	Quesnel L.F.	Nazko Rd	145	60	65	48	$ 10,200	$ 5,542	$ 2,400	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ 1,668		$ 14,953
McLeese Lake Transfer Station	0	2		0.23	15	0.07	20	35	Williams Lake T.S.	Hwy 97	50	80	28	35	$ 11,901	$ 2,359	$ 1,750	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ 793	$ 4,525		$ 37,806
Wildwood Transfer Station	0	2		0.23	73	0.07	103	176	Williams Lake T.S.	Hwy 97	12	60	73	93	$ 77,446	$ 6,205	$ 4,635	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 5,000	$ 5,613	$ 3,508		$ 146,554
Frost Creek Transfer Station	0	2		0.23	68	0.07	95	163	Williams Lake T.S.	Dog Creek Rd	15	60	75	95	$ 74,552	$ 6,358	$ 4,750	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 500	$ 8,470	$ 3,508		$ 116,008
Chimney Lake Transfer Station	0	1		0.23	18	0.07	13	31	Williams Lake T.S.	Dog Creek Rd	30	60	29	20	$ 11,610	$ 2,448	$ 975	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,764
150 Mile Transfer Station	0	2		0.23	83	0.07	115	198	Williams Lake T.S.	Hwy 97	25	60	119	153	$ 85,892	$ 10,112	$ 7,667	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 4,451	$ 12,000	$ 3,508		$ 136,410
Horsefly Transfer Station	0	2		0.23	25	0.07	34	59	Williams Lake T.S.	Horsefly Rd	70	60	73	96	$ 32,604	$ 6,233	$ 4,817	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ 674	$ 4,525		$ 65,205
Alexis Creek Transfer Station	0	2		0.23	19	0.07	26	45	Williams Lake T.S.	Hwy 20	120	60	87	117	$ 11,059	$ 7,429	$ 5,850	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ 3,508		$ 32,781
Riske Creek Transfer Station	0	1		0.23	20	0.07	14	34	Williams Lake T.S.	Hwy 20	55	60	49	33	$ 23,837	$ 4,137	$ 1,633	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,849
Eagle Creek Transfer Station	0	1		0.23	14	0.07	10	24	100 Mile Housel L.F.	Canim Lake Rd	50	60	32	22	$ 6,339	$ 2,697	$ 1,083	$ 10,218	$ -	$ -	$ -	$ 1,000						$ 1,200	$ 768	$ 2,550		$ 19,517
Forest Grove Transfer Station	0	2		0.23	68	0.07	95	163	100 Mile Housel L.F.	Canim Lake Rd	30	60	109	143	$ 53,392	$ 9,248	$ 7,125	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 38,000	$ 500	$ 893	$ 4,000	$ 3,508		$ 145,246
Lac La Hache Transfer Station	0	2		0.23	*182*	0.07	254	436	100 Mile Housel L.F.	Hwy 97	25	75	231	296	$ 157,950	$ 19,595	$ 14,817	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 1,500	$ 7,000	$ 3,508		$ 140,952
Lone Butte Transfer Station	0	2		0.23	*58*	0.07	81	139	100 Mile Housel L.F.	Horse Lake Rd	50	60	131	176	$ 92,943	$ 11,175	$ 8,775	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 2,300	$ 6,000	$ 3,508		$ 102,730
																																$ 1,201,994
RURAL LANDFILLS																																
Nazko Landfill						0.07	23	23	Nazko LF	Nazko Rd	90	60	0	81		$ -	$ 4,625	$ 20,964			$ 100	$ 2,421							$ 3,851	$ 4,513	$ 1,128	$ 37,002
Likely Landfill						0.07	27	27	Likely LF	Likely Rd	110	60	0	113		$ -	$ 5,625	$ 32,750			$ 500	$ 1,380				$ 18,150				$ 5,340	$ 1,335	$ 65,080
Big Lake Landfill						0.07	28	28	Big Lake LF	Likely Rd	55	60	0	65		$ -	$ 3,267	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 8,925			$ 2,000	$ 5,602	$ 1,401	$ 76,472
Mahood Lake Landfill						0.07	5	5	Mahood Lake LF	Horse Lake Rd	70	60	0	14		$ -	$ 708	$ 12,000		$ 1,000	$ 200									$ 968	$ 242	$ 15,118
Inter-Lakes aka Sheriden Landfill						0.07	142	142	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	0	260		$ -	$ 13,017	$ 121,771		$ -	$ 750	$ 2,700				$ 113,996			$ 3,652	$ 28,344	$ 7,086	$ 291,316
Watch Lake Landfill						0.07	25	25	Watch Lake Landfill	Watch Lake Rd	30	60	0	38		$ -	$ 1,875	$ 90,283			$ 1,000	$ 2,730				$ 26,000			$ 1,209	$ 4,994	$ 1,249	$ 129,340
West Chilcotin aka Anahim/Nimpo Landfill						0.07	20	20	West Chilcotin LF	Hwy 20	330	60	0	230		$ -	$ 11,500	$ 31,900			$ 200	$ 2,500				$ 9,425			$ 7,576	$ 3,993	$ 998	$ 68,093
Kleana Kleene Landfill						0.07	8	8	Kleana Kleene LF	Hwy 20	280	60	0	79		$ -	$ 3,933	$ 13,960			$ 420									$ 1,612	$ 403	$ 20,328
Tatla Lake Landfill						0.07	9	9	Tatla Lake LF	Hwy 20	240	60	0	77		$ -	$ 3,825	$ 13,960			$ 200								$ 1,000	$ 1,678	$ 419	$ 21,082
Cochin Lake Landfill						0.07	6	6	Cochin LF	Hwy 20	260	60	0	55		$ -	$ 2,750	$ 13,960			$ 250	$ 1,885								$ 1,039	$ 260	$ 20,144
Puntzi Lake Landfill						0.07	32	32	Puntzi Lake LF	Hwy 20	210	60	0	240		$ -	$ 12,000	$ 27,920			$ 300									$ 6,343	$ 1,586	$ 48,148
Nemiah Valley Landfill						0.07	14	14	Nemiah Valley LF	Hwy 20	310	60	0	152		$ -	$ 7,583	$ 24,440			$ 395	$ 2,310							$ 3,794	$ 2,711	$ 678	$ 41,911
																																$ 834,033
REGIONAL LANDFILLS																																
Quesnel Landfill																		$ 544,729												$ 98,157	$ 25,000	$ 667,886
Gibraltar Landfill																		$ 418,166												$ 214,843	$ 170,000	$ 803,009
Williams Lake DLC Landfill																		$ 113,014														$ 113,014
100 Hundred Mile House Landfill																		$ 289,583			$ 13,224	$ 14,716				$ 48,052			$ 4,500	$ 75,000	$ 25,500	$ 470,575
																																$ 2,054,484
REGIONAL CONSOLIDATION			No of 53' trailers																													
Quesnel Recycle Centre			135					135	Urban Impact, Rich.	Hwy 97	672	85	1,148			$ 114,829		$ -	$ (220,230)								$ 107,706					$ 2,306
Central Cariboo Disposal			98					98	Urban Impact, Rich.	Hwy 97	548	85	691			$ 69,061		$ -	$ (156,794)								$ 77,713					$ (10,020)
Gold Trail Recycling			68					68	Urban Impact, Rich.	Hwy 97	458	85	407			$ 40,720		$ -	$ (106,013)								$ 53,790					$ (11,504)
																																$ (19,217)
CONSULTING																		$ 71,000				$ 22,000										**$ 93,000**
CRD DEBT PAYMENT																														$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																		$ 13,443														**$ 13,443**
CRD MANAGEMENT COST																		$ 309,321														**$ 309,321**
CRD RECYCLING EDUCATION																		$ 75,000														**$ 75,000**
CRD WINTER ROAD MAINTENANCE																					$ 46,092											**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																		$ 83,944														**$ 83,944**
																																$ -
Totals Entire System					**754**		**1,329**	**2,384**					**3,554**	**2,974**	**1,088,565**	**$ 665,399**	**$ 148,691**	**$ 3,791,694**	**$ (503,037)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 494,123**	**$ 315,419**	**$ 18,534**	**$ 98,356**	**$ 788,169**	**$ 237,284**	**$ 6,528,307**
Total Urban Centre Transfer Station and LF					**0**			**301**					**2,246**	**0**	**341,000**	**$ 329,595**	**$ -**															
Total Small Landfills					**0**		**339**	**339**					**0**	**1,402**	**0**	**$ -**	**$ 70,108**															
Totals Satelite Transfer Stations					**754**		**990**	**1,744**					**1,308**	**1,572**	**747,565**	**$ 111,194**	**$ 78,583**															

Table E6-S. Summary - Model of Option E Without Composting				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	0
Total Tonnage Recycled			36,502	0
Total Tonnage of Residuals Landfilled			32,583	0
Diversion Percentage			52.84%	0
Tonnage in Rural Transfer System			11,890	0
Tonnage in Rural Landfills			5,153	0
Tonnage in Urban Transfer System			52,042	0
Checksum			69,085	0
Total System Cost	$	6,620,114	69,085	$ 96
Cost of Urban Collection	$	808,004	52,042	$ 16
Cost of Rural Transfer Stations	$	969,518	11,890	$ 82
Cost or Rural Hauling	$	235,841	11,890	$ 20
Cost of Transfer and Haul to Gibraltar	$	759,183	9,175	$ 83
Cost of Regional Landfills	$	1,886,587	59,006	$ 32
Cost of Rural Landfills	$	621,364	5,153	$ 121
Cost of Regional Eco Depots	$	540,816	12,867	$ 42
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,620,114		
Cost of North Cariboo System	$	1,445,470	23,891	$ 3,569
Cost of Central Cariboo System	$	2,655,994	27,214	$ 3,606
Cost of South Cariboo System	$	1,518,341	16,998	$ 3,597
Cost of Chilcotin System	$	201,508	982	$ 3,713
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,620,114	69,085	$ 96
Cost of Recycling Programs	$	774,459	16,563	$ 47
Cost of Wood Waste Management	$	314,927	5,969	$ 53
Cost of soil and concrete recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,309,753	32,583	$ 163
Check Sum	$	6,620,114	69,085	$ 95.83

Table E6 (left). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins at Unmanned Sites - No Extra Organics Management - Truck and Trailer Haul

		Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type													
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	75%	5%	0%	0%	*2%*	0%	2%	16%	0%	100%	1,762	0	0	291	1,745	1,939	3,850	*2,464*	*1,500*	102	13,653	8,439	5,225	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	1,103	0	0	258	1,353	*381*	3,131	1,910	5,188	63	13,387	7,763	5,272	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	75%	5%	0%	0%	2%	*0%*	2%	16%	0%	100%	384	0	0	77	568	*27*	700	1,237	1,672	30	4,695	4,105	3,433	8,800
108 Mile House Residential Collection							0																								
Regional District of Fraser Fort George																															
URBAN TRANSFER STATION SYSTEM																															
Williams Lake Urban Transfer Station																															
RURAL TRANSFER STATIONS																															
Alexandria Transfer Station	804	0.66	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	0	*7*	0			0	24	202	202	227
Baker Creek Transfer Station	762	0.66	479	0	0		479	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	77	0	0	10	57	*6*	0			0	150	393	393	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*1*	0			0	13	141	141	154
Wells Transfer Station	287	0.66	477	0	0	0	477	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	38	0	0	0	57	*2*	0			0	98	439	439	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	7	0	0	0	0	*2*	0			0	9	82	82	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	18	0	0	0	26	*8*	0			0	52	202	202	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0		1,134	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	181	0	0	23	185	*16*	0			0	406	930	930	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0		1,046	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	167	0	0	21	252	*16*	0			0	456	858	858	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	11	0	0	0	16	*2*	0			0	29	125	125	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0		1,276	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	204	0	0	26	181	*9*	0			0	420	1,046	1,046	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	30	0	0	0	45	*5*	0			0	80	345	345	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	0	*4*	0			0	27	262	262	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	12	0	0	0	0	*3*	0			0	15	135	135	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	8	0	0	0	0	*5*	0			0	13	93	93	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0		1,051	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	168	0	0	21	12	*11*	0			0	213	862	862	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0		2,823	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	452	0	0	71	0	*30*	0			0	553	2,315	2,315	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0		892	82%	16%	0%	0%	2%	*0%*	0%	0%	0%	100%	143	0	0	18	0	*10*	0			0	170	731	731	902
RURAL LANDFILLS																															
Nazko Landfill	392	0.63	245	0	0	0	245	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	20	0	0	0	0	*3*	0			0	23	226	226	248
Likely Landfill	528	0.62	290	0	0	0	290	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	23	0	0	0	35	*4*	0			0	62	267	267	329
Big Lake Landfill	554	0.62	304	0	0	0	304	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	24	0	0	0	37	*4*	0			0	65	280	280	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	92%	8%	0%	0%	0%	*0%*	0%	0%	0%	100%	4	0	0	0	0	*1*	0			0	5	48	48	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0		1,575	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	252	0	0	*51*	1,081	*20*	0			0	1,405	1,291	1,291	2,696
Watch Lake Landfill	445	1.27	277	0	0		277	82%	16%	0%	*0%*	2%	*0%*	0%	0%	0%	100%	44	0	0	*26*	198	*4*	0			0	271	228	228	499
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	17	0	0	0	47	*3*	0			0	68	178	178	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	7	0	0	0	9	*1*	0			0	17	72	72	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	7	0	0	0	9	*1*	0			0	18	75	75	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	5	0	0	0	6	*1*	0			0	11	46	46	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	28	0	0	0	34	*4*	0			0	67	283	283	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	82%	8%	0%	0%	0%	*10%*	0%	0%	0%	100%	12	0	0	0	15	*2*	0			0	28	121	121	149
REGIONAL LANDFILLS																															
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	6,482	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	9,175	9,175
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	0	0	258	1,353	0	0			0	1,611	11,043	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	0	0	77	568	0	0			0	645	13,022	0	13,667
REGIONAL ECO DEPOTS																															
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,934						3,850				5,784	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,797						3,131				4,928	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,455						700				2,155	0	0	0
CONSULTING																															
CRD DEBT PAYMENT																															
CRD RDFFG TIPPING FEE																															
CRD MANAGEMENT COST																															
CRD RECYCLING EDUCATION																															
CRD WINTER ROAD MAINTENANCE																															
CRD BYLAW ENFORCEMENT OFFICER																															
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**0**	**0**	**892**	**5,969**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**36,502**	**32,583**	**26,205**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**0**	**0**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**31,734**	**20,307**	**13,929**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**0**	**0**	**77**	**1,470**	**49**	**0**	**0**	**0**	**0**	**2,039**	**3,114**	**3,114**	**5,153**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**0**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,728**	**9,162**	**9,162**	**11,890**

Table E6 (right). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins at Unmanned Sites - No Extra Organics Management - Truck and Trailer Haul

Bin Service and Hauling Cost Analysis															Costs												
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																													
City of Quesnel Urban									Quesnel L.F.		0					$391,786						$49,279	$6,000							$447,065
Williams Lake Urban									Williams Lake T.S.		0					$75,000						$38,200	$96,073							$209,273
100 Mile House Urban									100 Mile Housel L.F.		0					$39,000						$24,735	$6,688							$70,423
108 Mile House Residential Collection									100 Mile Housel L.F.							$68,000						$0								$68,000
Regional District of Fraser Fort George																$13,243						$0								$13,243
																														$808,004
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station									Gibraltar L.F.		0			$341,000	$238,569	$232,314			$1,500	$15,078				$93,000	$70,000		$11,722	$97,000		$759,183
																														$759,183
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	0	2		0.23	15	0.13	5	20	Quesnel L.F.	Hwy 97	40	80	40	$ 15,345	$ 3,400	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,720
Baker Creek Transfer Station	0	2		0.23	29	0.13	20	49	Quesnel L.F.	Nazko Rd	35	60	106	$ 51,920	$ 9,024	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 3,000	$ 5,000	$ 290	$ 7,384	$ 3,508		$ 101,797
Cottonwood Transfer Station	0	1		0.23	21	0.13	4	25	Quesnel L.F.	Barkerville Hwy	40	70	54	$ 14,157	$ 4,554	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,571
Wells Transfer Station	0	2		0.23	32	0.13	10	42	Quesnel L.F.	Barkerville Hwy	80	70	138	$ 16,418	$ 11,730	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 3,000	$ -	$ -	$ 1,138	$ 4,525		$ 26,179
Titetown Transfer Station	0	1		0.23	12	0.13	2	14	Quesnel L.F.	Nazko Rd	145	60	82	$ 10,200	$ 6,942	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ 1,668		$ 13,953
McLeese Lake Transfer Station	0	2		0.23	15	0.13	5	20	Williams Lake T.S.	Hwy 97	50	80	45	$ 11,901	$ 3,825	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ 793	$ 4,525		$ 37,522
Wildwood Transfer Station	0	2		0.23	67	0.13	46	113	Williams Lake T.S.	Hwy 97	12	60	158	$ 77,446	$ 13,447	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 5,000	$ 5,613	$ 3,508		$ 149,161
Frost Creek Transfer Station	0	2		0.23	62	0.13	43	105	Williams Lake T.S.	Dog Creek Rd	15	60	158	$ 74,552	$ 13,388	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 500	$ 8,470	$ 3,508		$ 118,288
Chimney Lake Transfer Station	0	1		0.23	18	0.13	3	21	Williams Lake T.S.	Dog Creek Rd	30	60	42	$ 11,610	$ 3,570	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,911
150 Mile Transfer Station	0	2		0.23	75	0.13	52	127	Williams Lake T.S.	Hwy 97	25	60	233	$ 85,892	$ 19,791	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 4,451	$ 12,000	$ 3,508		$ 138,422
Horsefly Transfer Station	0	2		0.23	25	0.13	8	33	Williams Lake T.S.	Horsefly Rd	70	60	110	$ 32,604	$ 9,350	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ 674	$ 4,525		$ 63,505
Alexis Creek Transfer Station	0	2		0.23	19	0.13	6	25	Williams Lake T.S.	Hwy 20	120	60	125	$ 11,059	$ 10,625	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ 3,508		$ 30,127
Riske Creek Transfer Station	0	1		0.23	20	0.13	3	23	Williams Lake T.S.	Hwy 20	55	60	65	$ 23,837	$ 5,539	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,618
Eagle Creek Transfer Station	0	1		0.23	14	0.13	3	17	100 Mile Housel L.F.	Canim Lake Rd	50	60	45	$ 6,339	$ 3,853	$ 10,218	$ -	$ -	$ -	$ 1,000						$ 1,200	$ 768	$ 2,550		$ 19,589
Forest Grove Transfer Station	0	2		0.23	62	0.13	43	105	100 Mile Housel L.F.	Canim Lake Rd	30	60	210	$ 53,392	$ 17,850	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 10,000	$ 500	$ 893	$ 4,000	$ 3,508		$ 118,723
Lac La Hache Transfer Station	0	2		0.23	166	0.13	115	281	100 Mile Housel L.F.	Hwy 97	25	75	468	$ 157,950	$ 39,808	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 1,500	$ 7,000	$ 3,508		$ 146,348
Lone Butte Transfer Station	0	2		0.23	53	0.13	37	90	100 Mile Housel L.F.	Horse Lake Rd	50	60	240	$ 92,943	$ 20,400	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 2,300	$ 6,000	$ 3,508		$ 103,180
															$ 45,224															**$ 1,166,614**
RURAL LANDFILLS																														
Nazko Landfill							5	5	Nazko LF	Nazko Rd	90	60	20		1,700	$ 20,964			$ 100	$ 2,421						$ 3,851	$ 4,513	$ 1,128	$ 34,677
Likely Landfill							6	6	Likely LF	Likely Rd	110	60	28		2,380	$ 32,750			$ 500	$ 1,380			$ 5,000				$ 5,340	$ 1,335	$ 48,685
Big Lake Landfill							7	7	Big Lake LF	Likely Rd	55	60	20		1,666	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000		$ 2,500			$ 2,000	$ 5,602	$ 1,401	$ 68,466
Mahood Lake Landfill							2	2	Mahood Lake LF	Horse Lake Rd	70	60	7		567	$ 12,000		$ 1,000	$ 200								$ 968	$ 242	$ 14,977
Inter-Lakes aka Sheriden Landfill							64	64	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	149		12,693	$ 121,771		$ -	$ 750	$ 2,700			$ 10,000			$ 3,652	$ 25,825	$ 6,456	$ 183,847
Watch Lake Landfill							12	12	Watch Lake Landfill	Watch Lake Rd	30	60	24		2,040	$ 90,283			$ 1,000	$ 2,730			$ 5,000			$ 1,209	$ 4,550	$ 1,138	$ 107,950
West Chilcotin aka Anahim/Nimpo Landfill							5	5	West Chilcotin LF	Hwy 20	330	60	60		5,100	$ 31,900			$ 200	$ 2,500			$ 5,000			$ 7,576	$ 3,559	$ 890	$ 56,725
Kleana Kleene Landfill							2	2	Kleana Kleene LF	Hwy 20	280	60	21		1,757	$ 13,960			$ 420				$ 2,500				$ 1,436	$ 359	$ 20,432
Tatla Lake Landfill							2	2	Tatla Lake LF	Hwy 20	240	60	18		1,530	$ 13,960			$ 200				$ 2,500			$ 1,000	$ 1,495	$ 374	$ 21,059
Cochin Lake Landfill							2	2	Cochin LF	Hwy 20	260	60	19		1,643	$ 13,960			$ 250	$ 1,885			$ 2,500				$ 926	$ 232	$ 21,396
Puntzi Lake Landfill							7	7	Puntzi Lake LF	Hwy 20	210	60	56		4,760	$ 27,920			$ 300				$ 2,500				$ 5,653	$ 1,413	$ 42,547
Nemiah Valley Landfill							3	3	Nemiah Valley LF	Hwy 20	310	60	34		2,891	$ 24,440			$ 395	$ 2,310			$ 2,500			$ 3,794	$ 2,416	$ 604	$ 39,349
																														$ 660,110
REGIONAL LANDFILLS																														
Quesnel Landfill																$ 471,275											$ 98,157	$ 25,000	$ 594,432
Gibraltar Landfill																$ 326,302											$ 214,843	$ 170,000	$ 711,145
Williams Lake DLC Landfill																$ 110,435													$ 110,435
100 Hundred Mile House Landfill																$ 289,583			$ 13,224	$ 14,716				$ 48,052		$ 4,500	$ 75,000	$ 25,500	$ 470,575
																														$ 1,886,587
REGIONAL ECO DEPOTS			No of 53' trailers																											
Quesnel EcoDepot			290					290	Urban Impact, Rich.	Hwy 97	672	85	2,467		246,671	$ 206,332	$ (510,524)								$ 231,354					$ 173,833
Williams Lake EcoDepot			247					247	Urban Impact, Rich.	Hwy 97	548	85	1,741		174,062	$ 206,332	$ (425,253)								$ 197,112					$ 152,254
100 Mile House EcoDepot			108					108	Urban Impact, Rich.	Hwy 97	458	85	647		64,673	$ 206,332	$ (142,490)								$ 86,213					$ 214,729
																														$ 540,816
CONSULTING																$ 71,000				$ 22,000										**$ 93,000**
CRD DEBT PAYMENT																											$ 178,000			**$ 178,000**
CRD RDFFG TIPPING FEE																$ 13,443														**$ 13,443**
CRD MANAGEMENT COST																$ 309,321														**$ 309,321**
CRD RECYCLING EDUCATION																$ 75,000														**$ 75,000**
CRD WINTER ROAD MAINTENANCE																			$ 46,092											**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																$ 83,944														**$ 83,944**
																														$ -
Totals Entire System					**705**		**522**	**1,872**					**7,629**	**1,088,565**	**$ 959,817**	**$ 4,242,794**	**$ (1,098,267)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 314,927**	**$ 590,890**	**$ 18,534**	**$ 98,356**	**$ 783,317**	**$ 236,071**	**$6,620,114**
Total Urban Centre Transfer Station and LF														**341,000**	**$ 238,569**															
Total Small Landfills														**0**	**$ 38,746**															
Totals Satelite Transfer Stations														**747,565**	**$ 197,096**															

Table F1-S. Summary - Model of Option E With Composting Option A				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	
Total Tonnage Recycled			37,202	
Total Tonnage of Residuals Landfilled			31,883	
Diversion Percentage			53.85%	
Tonnage in Rural Transfer System			11,890	
Tonnage in Rural Landfills			5,153	
Tonnage in Urban Transfer System			52,042	
Checksum			69,085	
Total System Cost	$	6,557,243	69,085	$ 95
Cost of Urban Collection	$	813,504	52,042	$ 16
Cost of Rural Transfer Stations	$	969,518	11,890	$ 82
Cost or Rural Hauling	$	192,628	11,890	$ 16
Cost of Transfer and Haul to Gibraltar	$	752,488	8,918	$ 84
Cost of Regional Landfills	$	1,869,481	58,749	$ 32
Cost of Rural Landfills	$	620,008	5,153	$ 120
Cost of Regional Eco Depots	$	540,816	12,867	$ 42
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,557,243	0	$ -
Cost of North Cariboo System	$	1,434,875	23,891	$ 3,568
Cost of Central Cariboo System	$	2,625,329	27,214	$ 3,604
Cost of South Cariboo System	$	1,497,792	16,998	$ 3,596
Cost of Chilcotin System	$	200,447	982	$ 3,712
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,557,243	69,085	$ 95
Cost of Recycling Programs	$	763,606	16,563	$ 46
Cost of Organics Diversion	$	5,500	700	$ 8
Cost of Wood Waste Management	$	314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,252,235	31,883	$ 165
	$	6,557,243	69,085	$ 94.92

Table F1 (left). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option A Yard Waste Backyard Composter

		Source Tonnage Residual Waste by Material Type															Tonnage Recyclables by Material Type														Bin Service and Hauling Cost Analysis												
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/Yr	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)
URBAN COLLECTION SYSTEM																																											
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	73.5%	5.0%	1.5%	0.0%	*2.0%*	0.0%	2.0%	16.0%	0.0%	100.0%	1,762	214	0	291	1,745	1,939	3,850	*2,464*	*1,500*	102	13,866	8,225	5,011	*22,092*								Quesnel L.F.		0		
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	73.5%	5.0%	1.5%	0.0%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	1,103	190	0	258	1,353	*381*	3,131	1,910	5,188	63	13,577	7,574	5,082	21,150								Williams Lake T.S.		0		
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	73.5%	5.0%	1.5%	0.0%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	384	83	0	77	568	*27*	700	1,237	1,672	30	4,778	4,022	3,350	8,800								100 Mile Housel L.F.		0		
108 Mile House Residential Collection							0			1.5%																													100 Mile Housel L.F.				
Regional District of Fraser Fort George										1.5%																																	
URBAN TRANSFER STATION SYSTEM																																											
Williams Lake Urban Transfer Station										1.5%																													Gibraltar L.F.		0		
RURAL TRANSFER STATIONS																																											
Alexandria Transfer Station	804	0.66	220	0	0	0	220	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	0	*7*	0			0	27	199	199	227	0	2		0.23	15	0.13	5	20	Quesnel L.F.	Hwy 97	40	80	32
Baker Creek Transfer Station	762	0.66	479	0	0		479	80.5%	16.0%	1.5%	0.0%	2.0%	0.0%	0.0%	0.0%	0.0%	100.0%	77	7	0	10	57	*6*	0			0	157	386	386	543	0	2		0.23	28	0.13	20	48	Quesnel L.F.	Nazko Rd	35	60	85
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*1*	0			0	16	139	139	154	0	1		0.23	20	0.13	4	24	Quesnel L.F.	Barkerville Hwy	40	70	42
Wells Transfer Station	287	0.66	477	0	0	0	477	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	38	7	0	0	57	*2*	0			0	105	432	432	537	0	2		0.23	31	0.13	10	41	Quesnel L.F.	Barkerville Hwy	80	70	118
Tittetown Transfer Station	224	0.66	89	0	0	0	89	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	0	*2*	0			0	10	81	81	91	0	1		0.23	*12*	0.13	2	14	Quesnel L.F.	Nazko Rd	145	60	76
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	26	*8*	0			0	55	199	199	255	0	2		0.23	15	0.13	5	20	Williams Lake T.S.	Hwy 97	50	80	37
Wildwood Transfer Station	2,021	0.63	1,134	0	0		1,134	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	181	17	0	23	185	*16*	0			0	422	913	913	1,336	0	2		0.23	66	0.13	46	112	Williams Lake T.S.	Hwy 97	12	60	112
Frost Creek Transfer Station	1,908	0.63	1,046	0	0		1,046	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	167	15	0	21	252	*16*	0			0	471	842	842	1,314	0	2		0.23	61	0.13	43	104	Williams Lake T.S.	Dog Creek Rd	15	60	114
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	11	2	0	0	16	*2*	0			0	31	123	123	154	0	1		0.23	18	0.13	3	21	Williams Lake T.S.	Dog Creek Rd	30	60	34
150 Mile Transfer Station	1,164	0.63	1,276	0	0		1,276	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	204	19	0	26	181	*9*	0			0	439	1,028	1,028	1,466	0	2		0.23	74	0.13	52	126	Williams Lake T.S.	Hwy 97	25	60	181
Horsefly Transfer Station	595	0.63	375	0	0	0	375	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	30	6	0	0	45	*5*	0			0	85	339	339	425	0	2		0.23	25	0.13	8	33	Williams Lake T.S.	Horsefly Rd	70	60	97
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	0	*4*	0			0	31	258	258	289	0	2		0.23	19	0.13	6	25	Williams Lake T.S.	Hwy 20	120	60	115
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*3*	0			0	17	133	133	150	0	1		0.23	20	0.13	3	23	Williams Lake T.S.	Hwy 20	55	60	56
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	8	1	0	0	0	*5*	0			0	15	91	91	106	0	1		0.23	14	0.13	3	17	100 Mile Housel L.F.	Canim Lake Rd	50	60	39
Forest Grove Transfer Station	1,382	0.77	1,051	0	0	0	1,051	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	168	15	0	21	12	*11*	0			0	228	846	846	1,074	0	2		0.23	61	0.13	43	104	100 Mile Housel L.F.	Canim Lake Rd	30	60	166
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0	0	2,823	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	452	41	0	71	0	*30*	0			0	595	2,273	2,273	2,868	0	2		0.23	*163*	0.13	115	278	100 Mile Housel L.F.	Hwy 97	25	75	352
Lone Butte Transfer Station	1,173	0.77	892	0	0	0	892	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	143	13	0	18	0	*10*	0			0	183	718	718	902	0	2		0.23	*52*	0.13	37	89	100 Mile Housel L.F.	Horse Lake Rd	50	60	202
RURAL LANDFILLS																																											
Nazko Landfill	392	0.63	245	0	0	0	245	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	20	4	0	0	0	*3*	0			0	26	222	222	248							5	5	Nazko LF	Nazko Rd	90	60	18
Likely Landfill	528	0.62	290	0	0	0	290	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	35	*4*	0			0	67	263	263	329							6	6	Likely LF	Likely Rd	110	60	26
Big Lake Landfill	554	0.62	304	0	0	0	304	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	24	4	0	0	37	*4*	0			0	70	276	276	346							7	7	Big Lake LF	Likely Rd	55	60	17
Mahood Lake Landfill	84	1.27	53	0	0	0	53	90.5%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	4	1	0	0	0	*1*	0			0	6	48	48	53							2	2	Mahood Lake LF	Horse Lake Rd	70	60	6
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0	0	1,575	80.5%	16.0%	1.5%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	252	23	0	*51*	1,081	*20*	0			0	1,428	1,268	1,268	2,696							64	64	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	124
Watch Lake Landfill	445	1.27	277	0	0	0	277	80.5%	16.0%	1.5%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	44	4	0	*26*	198	*4*	0			0	275	223	223	499							12	12	Watch Lake Landfill	Watch Lake Rd	30	60	19
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	17	3	0	0	47	*3*	0			0	71	175	175	246							5	5	West Chilcotin LF	Hwy 20	330	60	58
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	18	71	71	89							2	2	Kleana Kleene LF	Hwy 20	280	60	20
Tatla Lake Landfill	146	0.62	91	0	0	0	91	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	19	73	73	92							2	2	Tatla Lake LF	Hwy 20	240	60	17
Cochin Lake Landfill	90	0.62	56	0	0	0	56	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	5	1	0	0	6	*1*	0			0	12	45	45	57							2	2	Cochin LF	Hwy 20	260	60	19
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	28	5	0	0	34	*4*	0			0	72	278	278	349							7	7	Puntzi Lake LF	Hwy 20	210	60	53
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	80.5%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	15	*2*	0			0	31	119	119	149							3	3	Nemiah Valley LF	Hwy 20	310	60	33
REGIONAL LANDFILLS																																											
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	6,247	23,510													
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	8,918	8,918													
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	257	0	258	1,353	0	0			0	1,868	10,786	0	12,654													
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	154	0	77	568	0	0			0	799	12,867	0	13,667													
REGIONAL ECO DEPOTS																																		No of 53' trailers									
Quesnel EcoDepot	22,031	0.00	0	0	0	0	0											1,934						3,850				5,784	0	0	0				290				290	Urban Impact, Rich.	Hwy 97	672	85	2,467
Williams Lake EcoDepot	24,242	0.00	0	0	0	0	0											1,797						3,131				4,928	0	0	0				247				247	Urban Impact, Rich.	Hwy 97	548	85	1,741
100 Mile House EcoDepot	10,207	0.00	0	0	0	0	0											1,455						700				2,155	0	0	0				108				108	Urban Impact, Rich.	Hwy 97	458	85	647
CONSULTING																																											
CRD DEBT PAYMENT																																											
CRD RDFFG TIPPING FEE																																											
CRD MANAGEMENT COST																																											
CRD RECYCLING EDUCATION																																											
CRD WINTER ROAD MAINTENANCE																																											
CRD BYLAW ENFORCEMENT OFFICER																																											
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**700**	**0**	**892**	**5,969**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**37,202**	**31,883**	**25,505**	**69,085**					**694**		**522**	**1,861**					**7,120**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**486**	**0**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**32,220**	**19,821**	**13,443**	**52,042**													
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**54**	**0**	**77**	**1,470**	**49**	**0**	**0**	**0**	**0**	**2,093**	**3,060**	**3,060**	**5,153**													
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**160**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**2,888**	**9,001**	**9,001**	**11,890**													

Table F1 (right). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option A Yard Waste Backyard Composter

Site Name	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Organics Diversion	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
	Costs																	
URBAN COLLECTION SYSTEM																		
City of Quesnel Urban			$391,786						$49,279	$6,000								$447,065
Williams Lake Urban			$75,000						$38,200	$96,073			$2,200					$211,473
100 Mile House Urban			$39,000						$24,735	$6,688			$2,200					$72,623
108 Mile House Residential Collection			$68,000						$0				$1,100					$69,100
Regional District of Fraser Fort George			$13,243						$0									$13,243
																		$813,504
URBAN TRANSFER STATION SYSTEM																		
Williams Lake Urban Transfer Station	$341,000	$231,874	$232,314			$1,500	$15,078				$93,000	$70,000			$11,722	$97,000		$752,488
																		$752,488
RURAL TRANSFER STATIONS																		
Alexandria Transfer Station	$ 15,345	$ 2,720	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -		$ -	$ 1,569	$ 4,525		$ 19,040
Baker Creek Transfer Station	$ 51,920	$ 7,208	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 3,000	$ 5,000		$ 290	$ 7,384	$ 3,508		$ 99,981
Cottonwood Transfer Station	$ 14,157	$ 3,555	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -		$ 1,200	$ 831	$ 2,550		$ 19,572
Wells Transfer Station	$ 16,418	$ 10,057	$ 14,336	$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 3,000	$ -		$ -	$ 1,138	$ 4,525		$ 24,506
Tittetown Transfer Station	$ 10,200	$ 6,466	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -		$ -	$ -	$ 1,668		$ 13,477
McLeese Lake Transfer Station	$ 11,901	$ 3,145	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -		$ -	$ 793	$ 4,525		$ 36,842
Wildwood Transfer Station	$ 77,446	$ 9,520	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710		$ 5,000	$ 5,613	$ 3,508		$ 145,234
Frost Creek Transfer Station	$ 74,552	$ 9,724	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -		$ 500	$ 8,470	$ 3,508		$ 114,624
Chimney Lake Transfer Station	$ 11,610	$ 2,856	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -		$ 1,200	$ 1,223	$ 2,550		$ 28,197
150 Mile Transfer Station	$ 85,892	$ 15,351	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -		$ 4,451	$ 12,000	$ 3,508		$ 133,982
Horsefly Transfer Station	$ 32,604	$ 8,228	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -		$ -	$ 674	$ 4,525		$ 62,383
Alexis Creek Transfer Station	$ 11,059	$ 9,775	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -		$ -	$ -	$ 3,508		$ 29,277
Riske Creek Transfer Station	$ 23,837	$ 4,757	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -		$ -	$ 1,589	$ 2,550		$ 29,836
Eagle Creek Transfer Station	$ 6,339	$ 3,275	$ 10,218	$ -	$ -	$ -	$ 1,000							$ 1,200	$ 768	$ 2,550		$ 19,011
Forest Grove Transfer Station	$ 53,392	$ 14,144	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 10,000	$ 500		$ 893	$ 4,000	$ 3,508		$ 115,017
Lac La Hache Transfer Station	$ 157,955	$ 29,931	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -		$ 1,500	$ 7,000	$ 3,508		$ 136,471
Lone Butte Transfer Station	$ 92,943	$ 17,147	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -		$ 2,300	$ 6,000	$ 3,508		$ 99,927
		$ 38,350																**$ 1,127,378**
RURAL LANDFILLS																		
Nazko Landfill		1,599	$ 20,964			$ 100	$ 2,421								$ 3,851	$ 4,441	$ 1,110	$ 34,417
Likely Landfill		2,176	$ 32,750			$ 500	$ 1,380				$ 5,000					$ 5,255	$ 1,314	$ 48,374
Big Lake Landfill		1,448	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 2,500				$ 2,000	$ 5,513	$ 1,378	$ 68,116
Mahood Lake Landfill		496	$ 12,000		$ 1,000	$ 200										$ 953	$ 238	$ 14,889
Inter-Lakes aka Sheriden Landfill		10,517	$ 121,771		$ -	$ 750	$ 2,700				$ 10,000				$ 3,652	$ 25,362	$ 6,340	$ 181,092
Watch Lake Landfill		1,632	$ 90,283			$ 1,000	$ 2,730				$ 5,000				$ 1,209	$ 4,469	$ 1,117	$ 107,440
West Chilcotin aka Anahim/Nimpo Landfill		4,930	$ 31,900			$ 200	$ 2,500				$ 5,000				$ 7,576	$ 3,495	$ 874	$ 56,475
Kleana Kleene Landfill		1,689	$ 13,960			$ 420					$ 2,500					$ 1,411	$ 353	$ 20,332
Tatla Lake Landfill		1,462	$ 13,960			$ 200					$ 2,500				$ 1,000	$ 1,469	$ 367	$ 20,958
Cochin Lake Landfill		1,574	$ 13,960			$ 250	$ 1,885				$ 2,500					$ 910	$ 227	$ 21,307
Puntzi Lake Landfill		4,522	$ 27,920			$ 300					$ 2,500					$ 5,552	$ 1,388	$ 42,182
Nemiah Valley Landfill		2,760	$ 24,440			$ 395	$ 2,310				$ 2,500				$ 3,794	$ 2,373	$ 593	$ 39,193
																		$ 654,776
REGIONAL LANDFILLS																		
Quesnel Landfill			$ 466,584													$ 98,157	$ 25,000	$ 589,741
Gibraltar Landfill			$ 319,540													$ 214,843	$ 170,000	$ 704,385
Williams Lake DLC Landfill			$ 107,860															$ 107,860
100 Hundred Mile House Landfill			$ 286,499			$ 13,224	$ 14,716				$ 48,052				$ 4,500	$ 75,000	$ 25,500	$ 467,491
																		$ 1,869,481
REGIONAL ECO DEPOTS																		
Quesnel EcoDepot		246,671	$ 206,332	$ (510,524)								$ 231,354						$ 173,833
Williams Lake EcoDepot		174,062	$ 206,332	$ (425,253)								$ 197,112						$ 152,254
100 Mile House EcoDepot		64,673	$ 206,332	$ (142,490)								$ 86,213						$ 214,729
																		$ 540,816
CONSULTING			$ 71,000				$ 22,000											**$ 93,000**
CRD DEBT PAYMENT																$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE			$ 13,443															**$ 13,443**
CRD MANAGEMENT COST			$ 309,321															**$ 309,321**
CRD RECYCLING EDUCATION			$ 75,000															**$ 75,000**
CRD WINTER ROAD MAINTENANCE						$ 46,092												**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER			$ 83,944															**$ 83,944**
																		$ -
Totals Entire System	**1,088,565**	**$ 909,908**	**$ 4,225,687**	**$ (1,098,267)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 314,927**	**$ 590,890**	**$ 5,500**	**$ 18,534**	**$ 98,356**	**$ 782,232**	**$ 235,800**	**$ 6,557,243**
Total Urban Centre Transfer Station and LF	**341,000**	**$ 231,874**																
Total Small Landfills	**0**	**$ 34,768**																
Totals Satelite Transfer Stations	**747,565**	**$ 157,860**																

Table F1-S. Summary - Model of Option E With Composting Option A

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		37,202	
Total Tonnage of Residuals Landfilled		31,883	
Diversion Percentage		53.85%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,557,243	69,085	$ 95
Cost of Urban Collection	$ 813,504	52,042	$ 16
Cost of Rural Transfer Stations	$ 969,518	11,890	$ 82
Cost or Rural Hauling	$ 192,628	11,890	$ 16
Cost of Transfer and Haul to Gibraltar	$ 752,488	8,918	$ 84
Cost of Regional Landfills	$ 1,869,481	58,749	$ 32
Cost of Rural Landfills	$ 620,008	5,153	$ 120
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,557,243		
Cost of North Cariboo System	$ 1,434,875	23,891	$ 3,568
Cost of Central Cariboo System	$ 2,625,329	27,214	$ 3,604
Cost of South Cariboo System	$ 1,497,792	16,998	$ 3,596
Cost of Chilcotin System	$ 200,447	982	$ 3,712
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,557,243	69,085	$ 95
Cost of Recycling Programs	$ 763,606	16,563	$ 46
Cost of Organics Diversion	$ 5,500	700	$ 8
Cost of Wood Waste Management	$ 314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,252,235	31,883	$ 165
	$ 6,557,243	69,085	$ 94.92

Table F2-S. Summary - Model of Option E With Composting Option B				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	
Total Tonnage Recycled			40,251	
Total Tonnage of Residuals Landfilled			28,834	
Diversion Percentage			58.26%	
Tonnage in Rural Transfer System			11,890	
Tonnage in Rural Landfills			5,153	
Tonnage in Urban Transfer System			52,042	
Checksum			69,085	
Total System Cost	$	6,822,269	69,085	$ 99
Cost of Urban Collection	$	1,102,195	52,042	$ 21
Cost of Rural Transfer Stations	$	979,959	11,890	$ 82
Cost or Rural Hauling	$	257,327	11,890	$ 22
Cost of Transfer and Haul to Gibraltar	$	721,829	7,739	$ 93
Cost of Regional Landfills	$	1,799,835	57,570	$ 31
Cost of Rural Landfills	$	621,509	5,153	$ 121
Cost of Regional Eco Depots	$	540,816	12,867	$ 42
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,822,269	0	$ -
Cost of North Cariboo System	$	1,558,280	23,891	$ 3,573
Cost of Central Cariboo System	$	2,698,024	27,214	$ 3,607
Cost of South Cariboo System	$	1,560,202	16,998	$ 3,600
Cost of Chilcotin System	$	206,962	982	$ 3,719
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	6,822,269	69,085	$ 99
Cost of Recycling Programs	$	792,698	16,563	$ 48
Cost of Organics Diversion	$	306,855	3,749	$ 82
Cost of Wood Waste Management	$	314,927	5,969	$ 53
Cost of soil and concrete recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,186,814	28,834	$ 180
	$	6,822,269	69,085	$ 98.75

Table F2 (left). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option B Yard Waste Bins at Transfer Sites and Windrow Composting

		Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type												
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																														
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	65%	5.0%	6.1%	4.1%	*2.0%*	0.0%	2.0%	16.0%	0.0%	100.0%	1,762	887	596	291	1,745	1,939	3,850	*2,464*	*1,500*	102	15,135	6,956	3,742	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	65%	5.0%	6.1%	4.1%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	1,103	787	529	258	1,353	*381*	3,131	1,910	5,188	63	14,702	6,448	3,956	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	65%	5.0%	6.1%	4.1%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	384	343	231	77	568	*27*	700	1,237	1,672	30	5,268	3,531	2,859	8,800
108 Mile House Residential Collection							0																							
Regional District of Fraser Fort George																														
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station																														
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	804	0.66	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	0	*7*	0			0	27	199	199	227
Baker Creek Transfer Station	762	0.66	479	0	0	0	479	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	77	14	0	10	57	*6*	0			0	164	378	378	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*1*	0			0	16	138	138	154
Wells Transfer Station	287	0.66	477	0	0	0	477	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	38	7	0	0	57	*2*	0			0	105	432	432	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	0	*2*	0			0	10	81	81	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	26	*8*	0			0	55	199	199	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0	0	1,134	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	181	34	0	23	185	*16*	0			0	440	896	896	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0	0	1,046	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	167	31	0	21	252	*16*	0			0	487	826	826	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	11	2	0	0	16	*2*	0			0	31	123	123	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0	0	1,276	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	204	38	0	26	181	*9*	0			0	458	1,008	1,008	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	30	6	0	0	45	*5*	0			0	85	339	339	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	0	*4*	0			0	31	258	258	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*3*	0			0	17	133	133	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	8	2	0	0	0	*5*	0			0	15	91	91	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0	0	1,051	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	168	32	0	21	12	*11*	0			0	244	830	830	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0	0	2,823	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	452	85	0	*71*	0	*30*	0			0	638	2,230	2,230	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0	0	892	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	143	27	0	18	0	*10*	0			0	197	705	705	902
RURAL LANDFILLS																														
Nazko Landfill	392	0.63	245	0	0	0	245	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	20	4	0	0	0	*3*	0			0	26	222	222	248
Likely Landfill	528	0.62	290	0	0	0	290	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	35	*4*	0			0	67	263	263	329
Big Lake Landfill	554	0.62	304	0	0	0	304	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	24	5	0	0	37	*4*	0			0	70	276	276	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	4	1	0	0	0	*1*	0			0	6	48	48	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0	0	1,575	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	252	47	0	*51*	1,081	*20*	0			0	1,452	1,244	1,244	2,696
Watch Lake Landfill	445	1.27	277	0	0	0	277	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	44	8	0	*26*	198	*4*	0			0	280	219	219	499
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	17	3	0	0	47	*3*	0			0	71	175	175	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	18	71	71	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	19	73	73	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	5	1	0	0	6	*1*	0			0	12	45	45	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	28	5	0	0	34	*4*	0			0	72	277	277	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	15	*2*	0			0	31	119	119	149
REGIONAL LANDFILLS																														
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	4,970	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	7,739	7,739
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	908	0	258	1,353	0	0			0	2,519	10,136	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	487	0	77	568	0	0			0	1,133	12,534	0	13,667
REGIONAL ECO DEPOTS																														
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,934						3,850				5,784	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,797						3,131				4,928	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,455						700				2,155	0	0	0
CONSULTING																														
CRD DEBT PAYMENT																														
CRD RDFFG TIPPING FEE																														
CRD MANAGEMENT COST																														
CRD RECYCLING EDUCATION																														
CRD WINTER ROAD MAINTENANCE																														
CRD BYLAW ENFORCEMENT OFFICER																														
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**2,394**	**1,355**	**892**	**5,969**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**40,251**	**28,834**	**22,456**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**2,017**	**1,355**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**35,106**	**16,935**	**10,557**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**83**	**0**	**77**	**1,470**	**49**	**0**	**0**	**0**	**0**	**2,122**	**3,031**	**3,031**	**5,153**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**294**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**3,022**	**8,868**	**8,868**	**11,890**

Table F2 (right). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option B Yard Waste Bins at Transfer Sites and Windrow Composting

Bin Service and Hauling Cost Analysis															Costs															
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Number of Organic Waste Hauls per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Organics Diversion	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																															
City of Quesnel Urban										Quesnel L.F.		0					$391,786						$49,279	$6,000			$140,715					$587,780
Williams Lake Urban										Williams Lake T.S.		0					$75,000						$38,200	$96,073			$116,218					$325,491
100 Mile House Urban										100 Mile Housel L.F.		0					$39,000						$24,735	$6,688			$37,257					$107,680
108 Mile House Residential Collection										100 Mile Housel L.F.							$68,000						$0				$0					$68,000
Regional District of Fraser Fort George																	$13,243						$0				$0					$13,243
																																$1,102,195
URBAN TRANSFER STATION SYSTEM																															
Williams Lake Urban Transfer Station										Gibraltar L.F.		0			$341,000	$201,215	$232,314			$1,500	$15,078				$93,000	$70,000			$11,722	$97,000		$721,829
																																$721,829
RURAL TRANSFER STATIONS																															
Alexandria Transfer Station	0	2		0.23	15	0.13	5	1	21	Quesnel L.F.	Hwy 97	40	80	42	$ 15,345	$ 3,570	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,890
Baker Creek Transfer Station	0	2		0.23	28	0.13	20	4	52	Quesnel L.F.	Nazko Rd	35	60	113	$ 51,920	$ 9,577	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 3,000	$ 5,000	$ 575	$ 290	$ 7,384	$ 3,508		$ 102,924
Cottonwood Transfer Station	0	1		0.23	20	0.13	4	1	25	Quesnel L.F.	Barkerville Hwy	40	70	54	$ 14,157	$ 4,554	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 20,571
Wells Transfer Station	0	2		0.23	31	0.13	10	2	43	Quesnel L.F.	Barkerville Hwy	80	70	141	$ 16,418	$ 12,009	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 3,000	$ -	$ -	$ -	$ 1,138	$ 4,525		$ 26,458
Titetown Transfer Station	0	1		0.23	12	0.13	2	1	15	Quesnel L.F.	Nazko Rd	145	60	88	$ 10,200	$ 7,438	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ 1,668		$ 14,449
McLeese Lake Transfer Station	0	2		0.23	15	0.13	5	1	21	Williams Lake T.S.	Hwy 97	50	80	47	$ 11,901	$ 4,016	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ -	$ 793	$ 4,525		$ 37,713
Wildwood Transfer Station	0	2		0.23	64	0.13	46	9	119	Williams Lake T.S.	Hwy 97	12	60	167	$ 77,446	$ 14,161	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 1,361	$ 5,000	$ 5,613	$ 3,508		$ 151,236
Frost Creek Transfer Station	0	2		0.23	60	0.13	43	8	111	Williams Lake T.S.	Dog Creek Rd	15	60	167	$ 74,552	$ 14,153	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 1,255	$ 500	$ 8,470	$ 3,508		$ 120,308
Chimney Lake Transfer Station	0	1		0.23	18	0.13	3	1	22	Williams Lake T.S.	Dog Creek Rd	30	60	44	$ 11,610	$ 3,740	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ -	$ 1,200	$ 1,223	$ 2,550		$ 29,081
150 Mile Transfer Station	0	2		0.23	73	0.13	52	10	135	Williams Lake T.S.	Hwy 97	25	60	248	$ 85,892	$ 21,038	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 1,531	$ 4,451	$ 12,000	$ 3,508		$ 141,200
Horsefly Transfer Station	0	2		0.23	25	0.13	8	2	35	Williams Lake T.S.	Horsefly Rd	70	60	117	$ 32,604	$ 9,917	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ -	$ 674	$ 4,525		$ 64,072
Alexis Creek Transfer Station	0	2		0.23	19	0.13	6	2	27	Williams Lake T.S.	Hwy 20	120	60	135	$ 11,059	$ 11,475	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ -	$ 3,508		$ 30,977
Riske Creek Transfer Station	0	1		0.23	20	0.13	3	1	24	Williams Lake T.S.	Hwy 20	55	60	68	$ 23,837	$ 5,780	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,859
Eagle Creek Transfer Station	0	1		0.23	14	0.13	3	1	18	100 Mile Housel L.F.	Canim Lake Rd	50	60	48	$ 6,339	$ 4,080	$ 10,218	$ -	$ -	$ -	$ 1,000						$ -	$ 1,200	$ 768	$ 2,550		$ 19,816
Forest Grove Transfer Station	0	2		0.23	60	0.13	43	8	111	100 Mile Housel L.F.	Canim Lake Rd	30	60	222	$ 53,392	$ 18,870	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 10,000	$ 500	$ 1,261	$ 893	$ 4,000	$ 3,508		$ 121,004
Lac La Hache Transfer Station	0	2		0.23	160	0.13	115	22	297	100 Mile Housel L.F.	Hwy 97	25	75	495	$ 157,950	$ 42,075	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 3,388	$ 1,500	$ 7,000	$ 3,508		$ 152,003
Lone Butte Transfer Station	0	2		0.23	51	0.13	37	7	95	100 Mile Housel L.F.	Horse Lake Rd	50	60	253	$ 92,943	$ 21,533	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 1,070	$ 2,300	$ 6,000	$ 3,508		$ 105,384
																$ 52,867															**$ 1,187,943**
RURAL LANDFILLS																															
Nazko Landfill							5	1	6	Nazko LF	Nazko Rd	90	60	24		2,640	$ 20,964			$ 100	$ 2,421						$ -		$ 3,851	$ 4,439	$ 1,110	$ 34,925
Likely Landfill							6	2	8	Likely LF	Likely Rd	110	60	37		3,171	$ 32,750			$ 500	$ 1,380				$ 5,000		$ -			$ 5,253	$ 1,313	$ 49,370
Big Lake Landfill							7	2	9	Big Lake LF	Likely Rd	55	60	26		2,166	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 2,500		$ -		$ 2,000	$ 5,511	$ 1,378	$ 68,833
Mahood Lake Landfill							2	1	3	Mahood Lake LF	Horse Lake Rd	70	60	10		850	$ 12,000		$ 1,000	$ 200							$ -			$ 952	$ 238	$ 15,240
Inter-Lakes aka Sheriden Landfill							64	12	76	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	177		15,073	$ 121,771		$ -	$ 750	$ 2,700				$ 10,000		$ 1,890		$ 3,652	$ 24,880	$ 6,220	$ 186,936
Watch Lake Landfill							12	3	15	Watch Lake Landfill	Watch Lake Rd	30	60	30		2,550	$ 90,283			$ 1,000	$ 2,730				$ 5,000		$ 333		$ 1,209	$ 4,384	$ 1,096	$ 108,585
West Chilcotin aka Anahim/Nimpo Landfill							5	1	6	West Chilcotin LF	Hwy 20	330	60	72		6,120	$ 31,900			$ 200	$ 2,500				$ 5,000		$ -		$ 7,576	$ 3,494	$ 874	$ 57,664
Kleana Kleene Landfill							2	1	3	Kleana Kleene LF	Hwy 20	280	60	31		2,535	$ 13,960			$ 420					$ 2,500		$ -			$ 1,410	$ 353	$ 21,278
Tatla Lake Landfill							2	1	3	Tatla Lake LF	Hwy 20	240	60	27		2,295	$ 13,960			$ 200					$ 2,500		$ -		$ 1,000	$ 1,468	$ 367	$ 21,790
Cochin Lake Landfill							2	1	3	Cochin LF	Hwy 20	260	60	29		2,465	$ 13,960			$ 250	$ 1,885				$ 2,500		$ -			$ 909	$ 227	$ 22,197
Puntzi Lake Landfill							7	2	9	Puntzi Lake LF	Hwy 20	210	60	72		6,120	$ 27,920			$ 300					$ 2,500		$ -			$ 5,550	$ 1,387	$ 43,777
Nemiah Valley Landfill							3	1	4	Nemiah Valley LF	Hwy 20	310	60	45		3,852	$ 24,440			$ 395	$ 2,310				$ 2,500		$ -		$ 3,794	$ 2,372	$ 593	$ 40,257
																																$ 670,851
REGIONAL LANDFILLS																															
Quesnel Landfill																	$ 441,049												$ 98,157	$ 25,000	$ 564,206
Gibraltar Landfill																	$ 288,604												$ 214,843	$ 170,000	$ 673,447
Williams Lake DLC Landfill																	$ 101,356														$ 101,356
100 Hundred Mile House Landfill																	$ 279,834			$ 13,224	$ 14,716				$ 48,052				$ 4,500	$ 75,000	$ 25,500	$ 460,826
																																$ 1,799,835
REGIONAL ECO DEPOTS			No of 53' trailers																												
Quesnel EcoDepot			290						290	Urban Impact, Rich.	Hwy 97	672	85	2,467		246,671	$ 206,332	$ (510,524)									$ 231,354						$ 173,833
Williams Lake EcoDepot			247						247	Urban Impact, Rich.	Hwy 97	548	85	1,741		174,062	$ 206,332	$ (425,253)									$ 197,112						$ 152,254
100 Mile House EcoDepot			108						108	Urban Impact, Rich.	Hwy 97	458	85	647		64,673	$ 206,332	$ (142,490)									$ 86,213						$ 214,729
																																$ 540,816
CONSULTING																	$ 71,000				$ 22,000										**$ 93,000**
CRD DEBT PAYMENT																													$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																	$ 13,443														**$ 13,443**
CRD MANAGEMENT COST																	$ 309,321														**$ 309,321**
CRD RECYCLING EDUCATION																	$ 75,000														**$ 75,000**
CRD WINTER ROAD MAINTENANCE																				$ 46,092											**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																	$ 83,944														**$ 83,944**
																																$ -
Totals Entire System					685		522	109	1,961					7,881	1,088,565	$ 943,947	$ 4,156,041	$ (1,098,267)	$ 1,350	$ 65,831	$ 130,591	$ 54,929	$ 112,214	$ 108,761	$ 314,927	$ 590,890	$ 306,855	$ 18,534	$ 98,356	$ 781,654	$ 235,656	$ 6,822,269
Total Urban Centre Transfer Station and LF															341,000	$ 201,215																
Total Small Landfills															0	$ 49,343																
Totals Satelite Transfer Stations															747,565	$ 207,984																

Table F3-S. Summary - Model of Option E With Composting Option C				
	Cost		Tonnage	Cost per Tonne
Total System Tonnage			69,085	
Total Tonnage Recycled			42,532	
Total Tonnage of Residuals Landfilled			26,553	
Diversion Percentage			61.56%	
Tonnage in Rural Transfer System			11,890	
Tonnage in Rural Landfills			5,153	
Tonnage in Urban Transfer System			52,042	
Checksum			69,085	
Total System Cost	$	8,764,383	69,085	$ 127
Cost of Urban MSW Collection	$	2,108,211	52,042	$ 41
Cost of Urban Organics Collection	$	1,022,068	4,262	$ 240
Cost of Rural Transfer Stations	$	1,000,842	11,890	$ 84
Cost or Rural Hauling	$	212,583	11,890	$ 18
Cost of Transfer and Haul to Gibraltar	$	698,690	6,849	$ 102
Cost of Regional Landfills	$	1,756,421	56,680	$ 31
Cost of Rural Landfills	$	625,954	5,153	$ 121
Cost of Regional Eco Depots	$	540,816	12,867	$ 42
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	8,764,383	0	$ -
Cost of North Cariboo System	$	2,536,747	23,891	$ 3,614
Cost of Central Cariboo System	$	3,446,643	27,214	$ 3,635
Cost of South Cariboo System	$	1,776,183	16,998	$ 3,612
Cost of Chilcotin System	$	206,010	982	$ 3,718
Cost of CRD Program Costs	$	798,800	69,085	$ 12
Check Sum	$	8,764,383	69,085	$ 127
Cost of Recycling Programs	$	777,648	16,563	$ 47
Cost of Organics Diversion	$	2,360,266	6,030	$ 391
Cost of Wood Waste Management	$	314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$	220,975	13,971	$ 16
Cost of Landfill Disposal	$	5,090,568	26,553	$ 192
	$	8,764,383	69,085	$ 126.86

Table F3 (left). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option C Urban In Vessel, Yard Waste Bins at Transfer Sites and Windrow Composting

		Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type												
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																														
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	58%	5.0%	6.1%	11.0%	*2.0%*	0.0%	2.0%	16.0%	0.0%	100.0%	1,762	887	1,599	291	1,745	1,939	3,850	*2,464*	*1,500*	102	16,138	5,953	2,739	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	58%	5.0%	6.1%	11.0%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	1,103	787	1,419	258	1,353	*381*	3,131	1,910	5,188	63	15,592	5,558	3,066	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	58%	5.0%	6.1%	11.0%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	384	343	619	77	568	*27*	700	1,237	1,672	30	5,656	3,143	2,471	8,800
108 Mile House Residential Collection							0																							
Regional District of Fraser Fort George																														
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station																														
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	804	0.66	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	0	*7*	0			0	27	199	199	227
Baker Creek Transfer Station	762	0.66	479	0	0	0	479	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	77	14	0	10	57	*6*	0			0	164	378	378	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*1*	0			0	16	138	138	154
Wells Transfer Station	287	0.66	477	0	0	0	477	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	38	7	0	0	57	*2*	0			0	105	432	432	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	0	*2*	0			0	10	81	81	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	26	*8*	0			0	55	199	199	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0	0	1,134	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	181	34	0	23	185	*16*	0			0	440	896	896	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0	0	1,046	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	167	31	0	21	252	*16*	0			0	487	826	826	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	11	2	0	0	16	*2*	0			0	31	123	123	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0	0	1,276	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	204	38	0	26	181	*9*	0			0	458	1,008	1,008	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	30	6	0	0	45	*5*	0			0	85	339	339	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	0	*4*	0			0	31	258	258	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*3*	0			0	17	133	133	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	8	2	0	0	0	*5*	0			0	15	91	91	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0	0	1,051	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	168	32	0	21	12	*11*	0			0	244	830	830	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0	0	2,823	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	452	85	0	*71*	0	*30*	0			0	638	2,230	2,230	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0	0	892	79%	16.0%	3.0%	0.0%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	143	27	0	18	0	*10*	0			0	197	705	705	902
RURAL LANDFILLS																														
Nazko Landfill	392	0.63	245	0	0	0	245	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	20	4	0	0	0	*3*	0			0	26	222	222	248
Likely Landfill	528	0.62	290	0	0	0	290	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	35	*4*	0			0	67	263	263	329
Big Lake Landfill	554	0.62	304	0	0	0	304	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	24	5	0	0	37	*4*	0			0	70	276	276	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	4	1	0	0	0	*1*	0			0	6	48	48	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0	0	1,575	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	252	47	0	*51*	1,081	*20*	0			0	1,452	1,244	1,244	2,696
Watch Lake Landfill	445	1.27	277	0	0	0	277	79%	16.0%	3.0%	*0.0%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	44	8	0	*26*	198	*4*	0			0	280	219	219	499
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	17	3	0	0	47	*3*	0			0	71	175	175	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	18	71	71	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	19	73	73	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	5	1	0	0	6	*1*	0			0	12	45	45	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	28	5	0	0	34	*4*	0			0	72	277	277	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	15	*2*	0			0	31	119	119	149
REGIONAL LANDFILLS																														
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	3,967	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	6,849	6,849
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	908	0	258	1,353	0	0			0	2,519	10,136	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	487	0	77	568	0	0			0	1,133	12,534	0	13,667
REGIONAL ECO DEPOTS																														
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,934						3,850				5,784	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,797						3,131				4,928	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,455						700				2,155	0	0	0
CONSULTING																														
CRD DEBT PAYMENT																														
CRD RDFFG TIPPING FEE																														
CRD MANAGEMENT COST																														
CRD RECYCLING EDUCATION																														
CRD WINTER ROAD MAINTENANCE																														
CRD BYLAW ENFORCEMENT OFFICER																														
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**2,394**	**3,636**	**892**	**5,969**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**42,532**	**26,553**	**20,175**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**2,017**	**3,636**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**37,387**	**14,654**	**8,276**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**83**	**0**	**77**	**1,470**	**49**	**0**	**0**	**0**	**0**	**2,122**	**3,031**	**3,031**	**5,153**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**294**	**0**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**3,022**	**8,868**	**8,868**	**11,890**

Table F3 (right). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option C Urban In Vessel, Yard Waste Bins at Transfer Sites and Windrow Composting

Bin Service and Hauling Cost Analysis															Costs																
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Number of Organic Waste Hauls per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Organics Diversion	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM								# homes																							
City of Quesnel Urban								8,016		Quesnel L.F.		0				$526,283	$391,786						$49,279	$6,000			$617,320					$1,590,668
Williams Lake Urban								6,214		Williams Lake T.S.		0				$407,964	$75,000						$38,200	$96,073			$512,444					$1,129,680
100 Mile House Urban								1,338		100 Mile Housel L.F.		0				$87,820	$39,000						$24,735	$6,688			$170,444					$328,688
108 Mile House Residential Collection										100 Mile Housel L.F.							$68,000						$0				$0					$68,000
Regional District of Fraser Fort George																	$13,243						$0				$0					$13,243
																																$3,130,279
URBAN TRANSFER STATION SYSTEM																																
Williams Lake Urban Transfer Station										Gibraltar L.F.		0			$341,000	$178,076	$232,314			$1,500	$15,078				$93,000	$70,000			$11,722	$97,000		$698,690
																																$698,690
RURAL TRANSFER STATIONS																																
Alexandria Transfer Station	0	2		0.23	15	0.13	5	1	21	Quesnel L.F.	Hwy 97	40	80	34	$ 15,345	$ 2,856	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -				$ -	$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,176
Baker Creek Transfer Station	0	2		0.23	28	0.13	20	4	52	Quesnel L.F.	Nazko Rd	35	60	92	$ 51,920	$ 7,809	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669				$ 3,000	$ 5,000	$ 1,724	$ 290	$ 7,384	$ 3,508		$ 102,306
Cottonwood Transfer Station	0	1		0.23	20	0.13	4	1	25	Quesnel L.F.	Barkerville Hwy	40	70	44	$ 14,157	$ 3,704	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -				$ -	$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 19,721
Wells Transfer Station	0	2		0.23	31	0.13	10	2	43	Quesnel L.F.	Barkerville Hwy	80	70	124	$ 16,418	$ 10,547	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000				$ 3,000	$ -	$ -	$ -	$ 1,138	$ 4,525		$ 24,996
Titetown Transfer Station	0	1		0.23	*12*	0.13	2	1	15	Quesnel L.F.	Nazko Rd	145	60	82	$ 10,200	$ 6,928	$ 5,343	$ -	$ -	$ -	$ -	$ -				$ -	$ -	$ -	$ -	$ -	$ 1,668		$ 13,939
McLeese Lake Transfer Station	0	2		0.23	15	0.13	5	1	21	Williams Lake T.S.	Hwy 97	50	80	39	$ 11,901	$ 3,302	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -				$ 10,375	$ -	$ -	$ -	$ 793	$ 4,525		$ 36,999
Wildwood Transfer Station	0	2		0.23	64	0.13	46	9	119	Williams Lake T.S.	Hwy 97	12	60	119	$ 77,446	$ 10,115	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -				$ 36,200	$ 710	$ 4,082	$ 5,000	$ 5,613	$ 3,508		$ 149,911
Frost Creek Transfer Station	0	2		0.23	60	0.13	43	8	111	Williams Lake T.S.	Dog Creek Rd	15	60	122	$ 74,552	$ 10,379	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -				$ 21,150	$ -	$ 3,766	$ 500	$ 8,470	$ 3,508		$ 119,044
Chimney Lake Transfer Station	0	1		0.23	18	0.13	3	1	22	Williams Lake T.S.	Dog Creek Rd	30	60	35	$ 11,610	$ 2,992	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -				$ 8,950	$ -	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,333
150 Mile Transfer Station	0	2		0.23	73	0.13	52	10	135	Williams Lake T.S.	Hwy 97	25	60	194	$ 85,892	$ 16,448	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -				$ 27,300	$ -	$ 4,594	$ 4,451	$ 12,000	$ 3,508		$ 139,672
Horsefly Transfer Station	0	2		0.23	25	0.13	8	2	35	Williams Lake T.S.	Horsefly Rd	70	60	103	$ 32,604	$ 8,727	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000				$ 13,900	$ -	$ -	$ -	$ 674	$ 4,525		$ 62,882
Alexis Creek Transfer Station	0	2		0.23	19	0.13	6	2	27	Williams Lake T.S.	Hwy 20	120	60	124	$ 11,059	$ 10,557	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -				$ -	$ -	$ -	$ -	$ -	$ 3,508		$ 30,059
Riske Creek Transfer Station	0	1		0.23	20	0.13	3	1	24	Williams Lake T.S.	Hwy 20	55	60	58	$ 23,837	$ 4,964	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -				$ -	$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,043
Eagle Creek Transfer Station	0	1		0.23	14	0.13	3	1	18	100 Mile Housel L.F.	Canim Lake Rd	50	60	41	$ 6,339	$ 3,468	$ 10,218	$ -	$ -	$ -	$ 1,000							$ -	$ 1,200	$ 768	$ 2,550		$ 19,204
Forest Grove Transfer Station	0	2		0.23	60	0.13	43	8	111	100 Mile Housel L.F.	Canim Lake Rd	30	60	178	$ 53,392	$ 15,096	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700				$ 10,000	$ 500	$ 3,784	$ 893	$ 4,000	$ 3,508		$ 119,753
Lac La Hache Transfer Station	0	2		0.23	*160*	0.13	115	22	297	100 Mile Housel L.F.	Hwy 97	25	75	376	$ 157,950	$ 31,977	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560				$ -	$ -	$ 10,163	$ 1,500	$ 7,000	$ 3,508		$ 148,680
Lone Butte Transfer Station	0	2		0.23	*51*	0.13	37	7	95	100 Mile Housel L.F.	Horse Lake Rd	50	60	215	$ 92,943	$ 18,303	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -				$ -	$ -	$ 3,211	$ 2,300	$ 6,000	$ 3,508		$ 104,295
																$ 42,747															**$ 1,169,012**
RURAL LANDFILLS																																
Nazko Landfill							5	1	6	Nazko LF	Nazko Rd	90	60	22		1,838	$ 20,964			$ 100	$ 2,421						$ -		$ 3,851	$ 4,439	$ 1,110	$ 34,721
Likely Landfill							6	2	8	Likely LF	Likely Rd	110	60	34		2,901	$ 32,750			$ 500	$ 1,380				$ 5,000		$ -			$ 5,253	$ 1,313	$ 49,098
Big Lake Landfill							7	2	9	Big Lake LF	Likely Rd	55	60	22		1,862	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 2,500		$ -		$ 2,000	$ 5,511	$ 1,378	$ 68,527
Mahood Lake Landfill							2	1	3	Mahood Lake LF	Horse Lake Rd	70	60	9		748	$ 12,000		$ 1,000	$ 200							$ -			$ 952	$ 238	$ 15,138
Inter-Lakes aka Sheriden Landfill							64	12	76	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	147		12,489	$ 121,771		$ -	$ 750	$ 2,700				$ 10,000		$ 5,669		$ 3,652	$ 24,880	$ 6,220	$ 188,131
Watch Lake Landfill							12	3	15	Watch Lake Landfill	Watch Lake Rd	30	60	24		2,046	$ 90,283			$ 1,000	$ 2,730				$ 5,000		$ 999		$ 1,209	$ 4,384	$ 1,096	$ 108,741
West Chilcotin aka Anahim/Nimpo Landfill							5	1	6	West Chilcotin LF	Hwy 20	330	60	70		5,918	$ 31,900			$ 200	$ 2,500				$ 5,000		$ -		$ 7,576	$ 3,494	$ 874	$ 57,460
Kleana Kleene Landfill							2	1	3	Kleana Kleene LF	Hwy 20	280	60	30		2,533	$ 13,960			$ 420					$ 2,500		$ -			$ 1,410	$ 353	$ 21,176
Tatla Lake Landfill							2	1	3	Tatla Lake LF	Hwy 20	240	60	26		2,195	$ 13,960			$ 200					$ 2,500		$ -		$ 1,000	$ 1,468	$ 367	$ 21,688
Cochin Lake Landfill							2	1	3	Cochin LF	Hwy 20	260	60	28		2,363	$ 13,960			$ 250	$ 1,885				$ 2,500		$ -			$ 909	$ 227	$ 22,095
Puntzi Lake Landfill							7	2	9	Puntzi Lake LF	Hwy 20	210	60	68		5,814	$ 27,920			$ 300					$ 2,500		$ -			$ 5,550	$ 1,387	$ 43,471
Nemiah Valley Landfill							3	1	4	Nemiah Valley LF	Hwy 20	310	60	44		3,717	$ 24,440			$ 395	$ 2,310				$ 2,500		$ -		$ 3,794	$ 2,372	$ 593	$ 40,121
																																$ 670,366
REGIONAL LANDFILLS																																
Quesnel Landfill																	$ 420,988													$ 98,157	$ 25,000	$ 544,145
Gibraltar Landfill																	$ 265,252													$ 214,843	$ 170,000	$ 650,095
Williams Lake DLC Landfill																	$ 101,356															$ 101,356
100 Hundred Mile House Landfill																	$ 279,834			$ 13,224	$ 14,716				$ 48,052				$ 4,500	$ 75,000	$ 25,500	$ 460,826
																																$ 1,756,421
REGIONAL ECO DEPOTS			No of 53' trailers																													
Quesnel EcoDepot			290						290	Urban Impact, Rich.	Hwy 97	672	85	2,467		246,671	$ 206,332	$ (510,524)									$ 231,354						$ 173,833
Williams Lake EcoDepot			247						247	Urban Impact, Rich.	Hwy 97	548	85	1,741		174,062	$ 206,332	$ (425,253)									$ 197,112						$ 152,254
100 Mile House EcoDepot			108						108	Urban Impact, Rich.	Hwy 97	458	85	647		64,673	$ 206,332	$ (142,490)									$ 86,213						$ 214,729
																																$ 540,816
CONSULTING																	$ 71,000				$ 22,000											**$ 93,000**
CRD DEBT PAYMENT																														$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																	$ 13,443															**$ 13,443**
CRD MANAGEMENT COST																	$ 309,321															**$ 309,321**
CRD RECYCLING EDUCATION																	$ 75,000															**$ 75,000**
CRD WINTER ROAD MAINTENANCE																				$ 46,092												**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																	$ 83,944															**$ 83,944**
																																$ -
Totals Entire System					**685**		**522**	**15,677**	**1,961**					**7,355**	**1,088,565**	**$1,898,132**	**$ 4,112,627**	**$ (1,098,267)**	**$ 1,350**	**$ 65,831**	**$ 130,591**	**$ 54,929**	**$ 112,214**	**$ 108,761**	**$ 314,927**	**$ 590,890**	**$ 1,338,199**	**$ 18,534**	**$ 98,356**	**$ 781,654**	**$ 235,656**	**$ 8,764,383**
Total Urban Centre Transfer Station and LF															**341,000**	**$ 178,076**																
Total Small Landfills															**0**	**$ 44,413**																
Totals Satelite Transfer Stations															**747,565**	**$ 168,170**																

Table F4-S. Summary - Model of Option E With Composting Option D

	Cost	Tonnage	Cost per Tonne
Total System Tonnage		69,085	
Total Tonnage Recycled		38,514	
Total Tonnage of Residuals Landfilled		30,571	
Diversion Percentage		55.75%	
Tonnage in Rural Transfer System		11,890	
Tonnage in Rural Landfills		5,153	
Tonnage in Urban Transfer System		52,042	
Checksum		69,085	
Total System Cost	$ 6,611,841	69,085	$ 96
Cost of Urban Collection	$ 873,008	52,042	$ 17
Cost of Rural Transfer Stations	$ 984,832	11,890	$ 83
Cost or Rural Hauling	$ 211,265	11,890	$ 18
Cost of Transfer and Haul to Gibraltar	$ 739,685	8,426	$ 88
Cost of Regional Landfills	$ 1,841,538	58,256	$ 32
Cost of Rural Landfills	$ 621,898	5,153	$ 121
Cost of Regional Eco Depots	$ 540,816	12,867	$ 42
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,611,841	0	$ -
Cost of North Cariboo System	$ 1,456,981	23,891	$ 3,569
Cost of Central Cariboo System	$ 2,631,015	27,214	$ 3,605
Cost of South Cariboo System	$ 1,519,035	16,998	$ 3,597
Cost of Chilcotin System	$ 206,010	982	$ 3,718
Cost of CRD Program Costs	$ 798,800	69,085	$ 12
Check Sum	$ 6,611,841	69,085	$ 96
Cost of Recycling Programs	$ 779,022	16,563	$ 47
Cost of Organics Diversion	$ 83,578	2,013	$ 42
Cost of Wood Waste Management	$ 314,927	5,969	$ 53
Cost of Soil and Concrete Recycling	$ 220,975	13,971	$ 16
Cost of Landfill Disposal	$ 5,213,339	30,571	$ 171
	$ 6,611,841	69,085	$ 95.71

Table F4 (left). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option D Yard Waste Bin Drop off at Transfer Sites and Windrow Composting

		Source Tonnage Residual Waste by Material Type																Tonnage Recyclables by Material Type												
Site Name	Service Population	Per Capita Residual MSW Tonnes/yr	Actual MSW only Tonnage Tonnes/yr	Actual DLC Waste Tonnage Tonnes/yr	Actual Concrete Tonnes/yr	Actual Contaminated Soil Tonnes/yr	Total MSW exc. Soil Tonnes/yr	Percent of Waste as Residual	Percent Increase Single Stream	Percent Increase Yard Waste	Percent Increase Food Waste	Percent Increase Scrap Metal	Percent Increase Wood Waste	Percent Increase EPR	Percent Increase Commercial Cardboard	Percent Increase Glass	Percentage Check Sum	Actual Tonnage Single Steam Tonnes/yr	Actual Tonnage Y&G Waste Tonnes/yr	Actual Tonnage Food Waste Tonnes/yr	Actual Tonnage Scrap Tonnes/yr	Actual Wood Waste Tonnes/yr	Actual Tonnage EPR Tonnes/yr	Actual Tonnage Cardboard Tonnes/Yr	Annual Tonnage Crushed Concrete	Actual Tonnage Cont Soil Cover	Actual Tonnage Glass Tonnes/Yr	Total Tonnage Recycled Tonnes/yr	Total Residual Remaining Tonnes/Yr	Total MSW Only Remaining Tonnes/Yr	Total Tonnage of MSW Tonnes/yr
URBAN COLLECTION SYSTEM																														
City of Quesnel Urban	19,801	0.77	8,859	*3,214*	*2,464*	*1,500*	*14,538*	71%	5.0%	3.1%	1.4%	*2.0%*	0.0%	2.0%	16.0%	0.0%	100.0%	1,762	451	204	291	1,745	1,939	3,850	*2,464*	*1,500*	102	14,307	7,785	4,571	22,092
Williams Lake Urban	15,349	1.00	8,496	2,492	1,910	5,188	12,898	71%	5.0%	3.1%	1.4%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	1,103	400	181	258	1,353	*381*	3,131	1,910	5,188	63	13,967	7,183	4,691	21,150
100 Mile House Urban	3,304	1.52	3,714	672	1,237	1,672	5,623	71%	5.0%	3.1%	1.4%	2.0%	*0.0%*	2.0%	16.0%	0.0%	100.0%	384	174	79	77	568	*27*	700	1,237	1,672	30	4,948	3,852	3,180	8,800
108 Mile House Residential Collection							0																							
Regional District of Fraser Fort George																														
URBAN TRANSFER STATION SYSTEM																														
Williams Lake Urban Transfer Station																														
RURAL TRANSFER STATIONS																														
Alexandria Transfer Station	804	0.66	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	0	*7*	0			0	27	199	199	227
Baker Creek Transfer Station	762	0.66	479	0	0		479	78%	16.0%	3.0%	1.4%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	77	14	7	10	57	*6*	0			0	171	372	372	543
Cottonwood Transfer Station	153	0.66	153	0	0	0	153	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*1*	0			0	16	138	138	154
Wells Transfer Station	287	0.66	477	0	0	0	477	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	38	7	0	0	57	*2*	0			0	105	432	432	537
Titetown Transfer Station	224	0.66	89	0	0	0	89	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	0	*2*	0			0	10	81	81	91
McLeese Lake Transfer Station	998	0.63	220	0	0	0	220	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	18	3	0	0	26	*8*	0			0	55	199	199	255
Wildwood Transfer Station	2,021	0.63	1,134	0	0	0	1,134	78%	16.0%	3.0%	1.4%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	181	34	16	23	185	*16*	0			0	456	880	880	1,336
Frost Creek Transfer Station	1,908	0.63	1,046	0	0	0	1,046	78%	16.0%	3.0%	1.4%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	167	31	15	21	252	*16*	0			0	502	812	812	1,314
Chimney Lake Transfer Station	248	0.63	136	0	0	0	136	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	11	2	0	0	16	*2*	0			0	31	123	123	154
150 Mile Transfer Station	1,164	0.63	1,276	0	0		1,276	78%	16.0%	3.0%	1.4%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	204	38	18	26	181	*9*	0			0	476	990	990	1,466
Horsefly Transfer Station	595	0.63	375	0	0	0	375	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	30	6	0	0	45	*5*	0			0	85	339	339	425
Alexis Creek Transfer Station	459	0.63	285	0	0	0	285	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	0	*4*	0			0	31	258	258	289
Riske Creek Transfer Station	419	0.63	147	0	0	0	147	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	0	*3*	0			0	17	133	133	150
Eagle Creek Transfer Station	633	0.77	101	0	0	0	101	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	8	2	0	0	0	*5*	0			0	15	91	91	106
Forest Grove Transfer Station	1,382	0.77	1,051	0	0	0	1,051	78%	16.0%	3.0%	1.4%	*2.0%*	*0.0%*	0.0%	0.0%	0.0%	100.0%	168	32	15	21	*12*	*11*	0			0	259	816	816	1,074
Lac La Hache Transfer Station	3,715	0.77	2,823	0	0	0	2,823	78%	16.0%	3.0%	*1.4%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	452	85	40	*71*	0	*30*	0			0	678	2,191	2,191	2,868
Lone Butte Transfer Station	1,173	0.77	892	0	0	0	892	78%	16.0%	3.0%	1.4%	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	143	27	12	18	0	*10*	0			0	209	692	692	902
RURAL LANDFILLS																														
Nazko Landfill	392	0.63	245	0	0	0	245	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	20	4	0	0	0	*3*	0			0	26	222	222	248
Likely Landfill	528	0.62	290	0	0	0	290	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	23	4	0	0	35	*4*	0			0	67	263	263	329
Big Lake Landfill	554	0.62	304	0	0	0	304	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	24	5	0	0	37	*4*	0			0	70	276	276	346
Mahood Lake Landfill	84	1.27	53	0	0	0	53	91%	8.0%	1.5%	0.0%	0.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	4	1	0	0	0	*1*	0			0	6	48	48	53
Inter-Lakes aka Sheriden Landfill	2,523	1.27	1,575	0	0	0	1,575	78%	16.0%	3.0%	*1.4%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	252	47	22	*51*	1,081	*20*	0			0	1,474	1,222	1,222	2,696
Watch Lake Landfill	445	1.27	277	0	0	0	277	78%	16.0%	3.0%	*1.4%*	2.0%	*0.0%*	0.0%	0.0%	0.0%	100.0%	44	8	4	*26*	198	*4*	0			0	283	215	215	499
West Chilcotin aka Anahim/Nimpo Landfill	348	0.62	217	0	0	0	217	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	17	3	0	0	47	*3*	0			0	71	175	175	246
Kleana Kleene Landfill	140	0.62	88	0	0	0	88	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	18	71	71	89
Tatla Lake Landfill	146	0.62	91	0	0	0	91	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	7	1	0	0	9	*1*	0			0	19	73	73	92
Cochin Lake Landfill	90	0.62	56	0	0	0	56	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	5	1	0	0	6	*1*	0			0	12	45	45	57
Puntzi Lake Landfill	552	0.62	345	0	0	0	345	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	28	5	0	0	34	*4*	0			0	72	277	277	349
Nemiah Valley Landfill	236	0.62	147	0	0	0	147	81%	8.0%	1.5%	0.0%	0.0%	*10.0%*	0.0%	0.0%	0.0%	100.0%	12	2	0	0	15	*2*	0			0	31	119	119	149
REGIONAL LANDFILLS																														
Quesnel Landfill	22,031	0.77	10,277	3,214	2,464	1,500	15,956											0	0	0	291	1,745	0	0			0	2,036	21,474	5,792	23,510
Gibraltar Landfill	24,242	0.75	13,115	0	0	0	13,115											0	0	0	0	0	0	0			0	0	0	8,426	8,426
Williams Lake DLC Landfill	15,349		0	2,492	1,910	5,188	4,402											0	521	0	258	1,353	0	0			0	2,132	10,523	0	12,654
100 Hundred Mile House Landfill	10,207	1.06	8,581	672	1,237	1,672	10,490											0	319	0	77	568	0	0			0	964	12,703	0	13,667
REGIONAL ECO DEPOTS																														
Quesnel EcoDepot	22,031	0.00	0	0	0	0												1,934						3,850				5,784	0	0	0
Williams Lake EcoDepot	24,242	0.00	0	0	0	0												1,797						3,131				4,928	0	0	0
100 Mile House EcoDepot	10,207	0.00	0	0	0	0												1,455						700				2,155	0	0	0
CONSULTING																														
CRD DEBT PAYMENT																														
CRD RDFFG TIPPING FEE																														
CRD MANAGEMENT COST																														
CRD RECYCLING EDUCATION																														
CRD WINTER ROAD MAINTENANCE																														
CRD BYLAW ENFORCEMENT OFFICER																														
Totals Entire System	**61,437**		**35,662**	**6,378**	**5,611**	**8,360**	**47,651**											**5,262**	**1,402**	**611**	**892**	**5,969**	**2,533**	**7,681**	**5,611**	**8,360**	**195**	**38,514**	**30,571**	**24,193**	**69,085**
Total Urban Centre Transfer Station and LF	**38,454**		**21,069**	**6,378**	**5,611**	**8,360**	**33,058**											**3,250**	**1,025**	**463**	**626**	**3,666**	**2,346**	**7,681**	**5,611**	**8,360**	**195**	**33,222**	**18,820**	**12,442**	**52,042**
Total Small Landfills	**6,039**		**3,689**	**0**	**0**	**0**	**3,689**											**443**	**83**	**26**	**77**	**1,470**	**49**	**0**	**0**	**0**	**0**	**2,148**	**3,005**	**3,005**	**5,153**
Totals Satelite Transfer Stations	**16,945**		**10,904**	**0**	**0**	**0**	**10,904**											**1,568**	**294**	**122**	**189**	**833**	**138**	**0**	**0**	**0**	**0**	**3,144**	**8,746**	**8,746**	**11,890**

Table F4 (right). Model of Option E Recycling Program: 3 Eco Depots, 9 Manned Transfer Sites, Recycling Bins in Town - With Option D Yard Waste Drop Off at Transfer Sites and Windrow Composting

Bin Service and Hauling Cost Analysis															Costs																	
Site Name	Number of Transtor Bins	Number of 40 Yd Roll-Offs	Number of Oversize 40 Yd	Target Density per Service	Number of MSW Bin Services per Year	Average Density of Waste	Number of Single Stream Bin Services per Year	Number of Organic Waste Hauls per Year	Total Number of Hauls per Year	Residual Waste Destination	Haul Route	Haul Distance (one way)	Estimated Trave Speed (KPH)	Annual Haul Time (hours)	Historic Budget Haul Cost ($/year)	Estimated Annual Haul Cost ($/year)	CRD Budget Facility Ops. Contract	CRD Projected Recyle Revenues	CRD Budget Clean-Up	CRD Budget Grading & Snowplow	CRD Budget Maintenance & Monitoring	Marshalling Yard Contract	CRD Budget Concrete Crushing	CRD Budget Cont. Soil Hauling	CRD Budget Incineration or Chipping	CRD Budget Metal and Recycling	CRD Budget Organics Diversion	CRD Budget Share Shed	CRD Budget Contingency	CRD Budget Capital Projects 2009	CRD Budget Landfill Reclamation	Total Transfer Station and Haul Budget
URBAN COLLECTION SYSTEM																																
City of Quesnel Urban										Quesnel L.F.		0					$391,786						$49,279	$6,000			$28,368					$475,432
Williams Lake Urban										Williams Lake T.S.		0					$75,000						$38,200	$96,073			$25,416					$234,688
100 Mile House Urban										100 Mile Housel L.F.		0					$39,000						$24,735	$6,688			$11,221					$81,644
108 Mile House Residential Collection										100 Mile Housel L.F.							$68,000						$0				$0					$68,000
Regional District of Fraser Fort George																	$13,243						$0				$0					$13,243
																																$873,008
URBAN TRANSFER STATION SYSTEM																																
Williams Lake Urban Transfer Station										Gibraltar L.F.		0			$341,000	$219,071	$232,314			$1,500	$15,078				$93,000	$70,000			$11,722	$97,000		$739,685
																																$739,685
RURAL TRANSFER STATIONS																																
Alexandria Transfer Station	0	2		0.23	15	0.13	5	1	21	Quesnel L.F.	Hwy 97	40	80	34	$ 15,345	$ 2,856	$ 9,126	$ -	$ -	$ -	$ 1,100	$ -			$ -	$ -	$ -	$ -	$ 1,569	$ 4,525		$ 19,176
Baker Creek Transfer Station	0	2		0.23	27	0.13	20	4	51	Quesnel L.F.	Nazko Rd	35	60	90	$ 51,920	$ 7,659	$ 59,072	$ -	$ -	$ -	$ 1,850	$ 12,669			$ 3,000	$ 5,000	$ 843	$ 290	$ 7,384	$ 3,508		$ 101,275
Cottonwood Transfer Station	0	1		0.23	20	0.13	4	1	25	Quesnel L.F.	Barkerville Hwy	40	70	44	$ 14,157	$ 3,704	$ 10,436	$ -	$ -	$ -	$ 1,000	$ -			$ -	$ -	$ -	$ 1,200	$ 831	$ 2,550		$ 19,721
Wells Transfer Station	0	2		0.23	31	0.13	10	2	43	Quesnel L.F.	Barkerville Hwy	80	70	124	$ 16,418	$ 10,547	$ 14,336	-$ 20,000	$ -	$ -	$ 3,450	$ 8,000			$ 3,000	$ -	$ -	$ -	$ 1,138	$ 4,525		$ 24,996
Titetown Transfer Station	0	1		0.23	12	0.13	2	1	15	Quesnel L.F.	Nazko Rd	145	60	82	$ 10,200	$ 6,928	$ 5,343	$ -	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ 1,668		$ 13,939
McLeese Lake Transfer Station	0	2		0.23	15	0.13	5	1	21	Williams Lake T.S.	Hwy 97	50	80	39	$ 11,901	$ 3,302	$ 10,530	$ -	$ -	$ -	$ 7,474	$ -			$ 10,375	$ -	$ -	$ -	$ 793	$ 4,525		$ 36,999
Wildwood Transfer Station	0	2		0.23	63	0.13	46	9	118	Williams Lake T.S.	Hwy 97	12	60	118	$ 77,446	$ 10,030	$ 69,472	$ -	$ -	$ -	$ 15,211	$ -			$ 36,200	$ 710	$ 1,996	$ 5,000	$ 5,613	$ 3,508		$ 147,740
Frost Creek Transfer Station	0	2		0.23	58	0.13	43	8	109	Williams Lake T.S.	Dog Creek Rd	15	60	120	$ 74,552	$ 10,192	$ 69,472	$ -	$ -	$ -	$ 1,800	$ -			$ 21,150	$ -	$ 1,841	$ 500	$ 8,470	$ 3,508		$ 116,932
Chimney Lake Transfer Station	0	1		0.23	18	0.13	3	1	22	Williams Lake T.S.	Dog Creek Rd	30	60	35	$ 11,610	$ 2,992	$ 10,218	$ -	$ -	$ -	$ 1,200	$ -			$ 8,950	$ -	$ -	$ 1,200	$ 1,223	$ 2,550		$ 28,333
150 Mile Transfer Station	0	2		0.23	71	0.13	52	10	133	Williams Lake T.S.	Hwy 97	25	60	191	$ 85,892	$ 16,204	$ 69,472	$ -	$ -	$ -	$ 1,900	$ -			$ 27,300	$ -	$ 2,246	$ 4,451	$ 12,000	$ 3,508		$ 137,081
Horsefly Transfer Station	0	2		0.23	25	0.13	8	2	35	Williams Lake T.S.	Horsefly Rd	70	60	103	$ 32,604	$ 8,727	$ 25,766	$ -	$ -	$ -	$ 7,290	$ 2,000			$ 13,900	$ -	$ -	$ -	$ 674	$ 4,525		$ 62,882
Alexis Creek Transfer Station	0	2		0.23	19	0.13	6	2	27	Williams Lake T.S.	Hwy 20	120	60	124	$ 11,059	$ 10,557	$ 13,494	$ -	$ -	$ -	$ 2,500	$ -			$ -	$ -	$ -	$ -	$ -	$ 3,508		$ 30,059
Riske Creek Transfer Station	0	1		0.23	20	0.13	3	1	24	Williams Lake T.S.	Hwy 20	55	60	58	$ 23,837	$ 4,964	$ 13,494	$ -	$ -	$ -	$ 7,446	$ -			$ -	$ -	$ -	$ -	$ 1,589	$ 2,550		$ 30,043
Eagle Creek Transfer Station	0	1		0.23	14	0.13	3	1	18	100 Mile Housel L.F.	Canim Lake Rd	50	60	41	$ 6,339	$ 3,468	$ 10,218	$ -	$ -	$ -	$ 1,000						$ -	$ 1,200	$ 768	$ 2,550		$ 19,204
Forest Grove Transfer Station	0	2		0.23	59	0.13	43	8	110	100 Mile Housel L.F.	Canim Lake Rd	30	60	176	$ 53,392	$ 14,960	$ 69,472	$ -	$ -	$ -	$ 1,800	$ 10,700			$ 10,000	$ 500	$ 1,850	$ 893	$ 4,000	$ 3,508		$ 117,683
Lac La Hache Transfer Station	0	2		0.23	157	0.13	115	22	294	100 Mile Housel L.F.	Hwy 97	25	75	372	$ 157,950	$ 31,654	$ 82,472	$ -	$ -	$ -	$ 3,500	$ 8,560			$ -	$ -	$ 4,968	$ 1,500	$ 7,000	$ 3,508		$ 143,162
Lone Butte Transfer Station	0	2		0.23	50	0.13	37	7	94	100 Mile Housel L.F.	Horse Lake Rd	50	60	213	$ 92,943	$ 18,111	$ 69,472	$ -	$ -	$ -	$ 1,500	$ -			$ -	$ -	$ 1,570	$ 2,300	$ 6,000	$ 3,508		$ 102,461
																$ 44,121																**$ 1,151,685**
RURAL LANDFILLS																																
Nazko Landfill							5	1	6	Nazko LF	Nazko Rd	90	60	22		1,836	$ 20,964			$ 100	$ 2,421					$ -		$ 3,851	$ 4,439	$ 1,110	$ 34,721
Likely Landfill							6	2	8	Likely LF	Likely Rd	110	60	34		2,901	$ 32,750			$ 500	$ 1,380			$ 5,000		$ -			$ 5,253	$ 1,313	$ 49,098
Big Lake Landfill							7	2	9	Big Lake LF	Likely Rd	55	60	22		1,862	$ 38,377		$ 350	$ 700	$ 2,850	$ 13,000			$ 2,500		$ -		$ 2,000	$ 5,511	$ 1,378	$ 68,527
Mahood Lake Landfill							2	1	3	Mahood Lake LF	Horse Lake Rd	70	60	9		740	$ 12,000		$ 1,000	$ 200										$ 952	$ 238	$ 15,138
Inter-Lakes aka Sheriden Landfill							64	12	76	Inter-Lakes aka Sheriden LF	Horse Lake Rd	40	60	147		12,489	$ 121,771		$ -	$ 750	$ 2,700				$ 10,000		$ 2,771		$ 3,652	$ 24,439	$ 6,110	$ 184,682
Watch Lake Landfill							12	3	15	Watch Lake Landfill	Watch Lake Rd	30	60	24		2,040	$ 90,283			$ 1,000	$ 2,730				$ 5,000		$ 488		$ 1,209	$ 4,306	$ 1,077	$ 108,133
West Chilcotin aka Anahim/Nimpo Landfill							5	1	6	West Chilcotin LF	Hwy 20	330	60	70		5,916	$ 31,900			$ 200	$ 2,500				$ 5,000		$ -		$ 7,576	$ 3,494	$ 874	$ 57,460
Kleana Kleene Landfill							2	1	3	Kleana Kleene LF	Hwy 20	280	60	30		2,533	$ 13,960			$ 420					$ 2,500		$ -			$ 1,410	$ 353	$ 21,176
Tatla Lake Landfill							2	1	3	Tatla Lake LF	Hwy 20	240	60	26		2,193	$ 13,960			$ 200					$ 2,500		$ -		$ 1,000	$ 1,468	$ 367	$ 21,688
Cochin Lake Landfill							2	1	3	Cochin LF	Hwy 20	260	60	28		2,363	$ 13,960			$ 250	$ 1,885				$ 2,500		$ -			$ 909	$ 227	$ 22,095
Puntzi Lake Landfill							7	2	9	Puntzi Lake LF	Hwy 20	210	60	68		5,814	$ 27,920			$ 300					$ 2,500		$ -			$ 5,550	$ 1,387	$ 43,471
Nemiah Valley Landfill							3	1	4	Nemiah Valley LF	Hwy 20	310	60	44		3,717	$ 24,440			$ 395	$ 2,310				$ 2,500		$ -		$ 3,794	$ 2,372	$ 593	$ 40,121
																																$ 666,310
REGIONAL LANDFILLS																																
Quesnel Landfill																	$ 457,488												$ 98,157	$ 25,000	$ 580,645
Gibraltar Landfill																	$ 306,625												$ 214,843	$ 170,000	$ 691,468
Williams Lake DLC Landfill																	$ 105,225														$ 105,225
100 Hundred Mile House Landfill																	$ 283,207			$ 13,224	$ 14,716				$ 48,052				$ 4,500	$ 75,000	$ 25,500	$ 464,199
																																$ 1,841,538
REGIONAL ECO DEPOTS			No of 53' trailers																													
Quesnel EcoDepot			290						290	Urban Impact, Rich.	Hwy 97	672	85	2,467		246,671	$ 206,332	$ (510,524)									$ 231,354						$ 173,833
Williams Lake EcoDepot			247						247	Urban Impact, Rich.	Hwy 97	548	85	1,741		174,062	$ 206,332	$ (425,253)									$ 197,112						$ 152,254
100 Mile House EcoDepot			108						108	Urban Impact, Rich.	Hwy 97	458	85	647		64,673	$ 206,332	$ (142,490)									$ 86,213						$ 214,729
																																$ 540,816
CONSULTING																	$ 71,000				$ 22,000											**$ 93,000**
CRD DEBT PAYMENT																														$ 178,000		**$ 178,000**
CRD RDFFG TIPPING FEE																	$ 13,443															**$ 13,443**
CRD MANAGEMENT COST																	$ 309,321															**$ 309,321**
CRD RECYCLING EDUCATION																	$ 75,000															**$ 75,000**
CRD WINTER ROAD MAINTENANCE																				$ 46,092												**$ 46,092**
CRD BYLAW ENFORCEMENT OFFICER																	$ 83,944															**$ 83,944**
																																$ -
Totals Entire System					674		522	109	1,950					7,340	1,088,565	$ 915,742	$ 4,197,744	$ (1,098,267)	$ 1,350	$ 65,831	$ 130,591	$ 54,929	$ 112,214	$ 108,761	$ 314,927	$ 590,890	$ 83,578	$ 18,534	$ 98,356	$ 781,136	$ 235,526	$ 6,611,841
Total Urban Centre Transfer Station and LF															341,000	$ 219,071																
Total Small Landfills															0	$ 44,413																
Totals Satelite Transfer Stations															747,565	$ 166,853																

Table G1. Model Assumptions for density, labour costs and service times

No. of Residents/Household	3.92		
Waste Generation Rate (household refuse)	400.00	Kg/year	
Waste Generation Rate (bulky refuse/oversize)	100.00	Kg/year	
Density of Waste at Curbside	92.76	Kg/m3	Carney's No.
Density of Waste in 6 Yd. Loose Bin	75.00	Kg/m3	Carney's No. (was 87.13 in Nass, but new 2010 No here)
Density of Waste in 6 Yd. Front Load Haul All Bin	55.00	Kg/m3	Actual PRRD Data
Density of Waste in Compactor Truck	324.68	Kg/m3	Mid way between Carney's & Haul-All
Density of Waste in Haul-All Model 18	166.98	Kg/m3	Slightly less than Haul All No. (170.34)
Density of Waste in Haul-All AugPac	324.68	Kg/m3	Mid way between Carney's and Haul-All
Density of Waste in 40 or 50 yd. Roll-Off Uncompacted	105.26	Kg/m3	Carney's Actuals
Density of Waste in 40 or 50 yd. Roll-Off Tamped	184.21	Kg/m3	Carney's Actuals
Density of Single Stream Recyclables in 40 yd. Uncomp.	65.00	Kg/m3	SHA Estimate
Density of Single Stream Recyclables in 40 yd. Tamped	130.00	Kg/m3	SHA Estimate
Density of Waste in 25 Yd Haul-All Transtor	75.00	Kg/m3	PRRD Actual
Density of Waste in 40 Yd Haul-All Transtor	75.00	Kg/m3	PRRD Actual
Density of Waste in 50 Yd Haul-All Transtor	75.00	Kg/m3	PRRD Actual
Density of Waste in Compactor Bin	296.85	Kg/m3	Carney's No.
Density of Uncompacted Waste in Transtor	75.00	Kg/m3	PRRD Actual
Density of Bulky Waste / Scrap at Sorting Area	300.00	Kg/m3	SHA Estimate
Density of Loose Recyclables	65.00	Kg/m3	SHA Estimate
Density of Baled Recyclables	207.11	Kg/m3	Based on 11.26 tonnes in 40' trailer
Density of Baled Recyclables	277.63	Kg/m3	Eco Depot 20 tonnes in 53' trailer
Weight of Baled Recylables	1350.00	Kg	1200 to 1500 KG per bale (actual number)
Minimum Wage	$7.50	/hour	
Truck Operator Wage	$33.00	/hour	
Labourer Wage	$20.00	/hour	
Landfill Attendant Wage	$20.00	/hour	
Mileage Rate for Personal Vehicle	$0.85	/km	
Time to Pick-up Garbage Cans Haul-All	1.5	min	
Time to Pick-up Garbage Cans Rear Loader, 2 Operators	1.2	min	
Time to Pick-up Garbage Cans Rear Loader, 1 Operator	1.7	min	
Time to Pick-up Garbage Cans Front Loader	1.5	min	
Time to Pick-up Tote with Automated Top Load	2	min	
Time to Pick-up Totes with Haul-All	2	min	
Time to Pick-up Totes with Rear Loader	2	min	
Time to Pick-up Totes with Front Loader	2	min	
Time to empty Haul All Bins with Haul-All Side Load	8	min	Actual Graydon Cont. Number
Time to empty Haul All Bins into Front Load Packer Tray	5	min	Actual Graydon Cont. Number
Time to empty Bins with Rear Loader	4	min	
Time to empty Bins with Front Loader	2	min	
Time to pick-up Bulky Waste with Bin Truck	3	min	

Table G2. TRUCK OPERATING COST ANALYSIS

Truck Type *Operating Cost ($/hour/tonne)*	Truck Capacity (m^3) *(tonnes)*	Truck Purchase ($)	Annual Payment ($)	Service Life (years)	Resale Value ($)	Annual Maintenance ($/year)	Operator Cost ($/hour)	Fuel Cost ($/hour)	Insurance Cost ($/year)	Operating Cost 20 hrs. ($/year) *($/hour)*	Operating Cost 30 hrs. ($/year) *($/hour)*	Operating Cost 40 hrs. ($/year) *($/hour)*
Collection Pick-Up and Operator	4.5	$50,000	$9,000	7	$12,500	$4,500	$25	$15	$2,000	$55,314	$76,114	$96,914
$143.59	*0.3*									*$53*	*$49*	*$47*
Recycle Horse Trailer	13.7	$30,000	$5,400	7	$7,500	$2,700	$25	$20	$2,500	$56,329	$79,729	$103,129
$57.48	*0.9*									*$54*	*$51*	*$50*
Cube Van 16' and Operator	21.7	$60,000	$10,800	7	$15,000	$5,400	$25	$20	$2,500	$63,357	$86,757	$110,157
$34.10	*1.6*									*$61*	*$56*	*$53*
Haul-All Model 18 and Operator	13.7	$180,000	$32,400	7	$45,000	$16,200	$33	$20	$3,000	$100,291	$127,851	$155,411
$35.88	*2.3*									*$96*	*$82*	*$75*
Haul-All RP 235 and Operator	20.5	$210,000	$37,800	7	$52,500	$18,900	$33	$20	$3,000	$107,320	$134,880	$162,440
$25.23	*3.4*									*$103*	*$86*	*$78*
Haul-All Aug Pac 3000 and Operator	14.5	$245,000	$44,100	7	$61,250	$22,050	$33	$20	$3,000	$115,520	$143,080	$170,640
$19.45	*4.7*									*$111*	*$92*	*$82*
Propack Rear-End Loader Two Operators	15.3	$170,000	$30,600	7	$42,500	$15,300	$53	$30	$3,500	$129,649	$172,809	$215,969
$22.31	*5.0*									*$125*	*$111*	*$104*
Propack Rear-End Loader One Operator	15.3	$170,000	$30,600	7	$42,500	$15,300	$33	$30	$3,500	$108,849	$141,609	$174,369
$18.28	*5.0*									*$105*	*$91*	*$84*
Front End Bin Loader and Operator	30.0	$337,500	$60,750	7	$84,375	$30,375	$33	$40	$4,000	$158,991	$196,951	$234,911
$12.96	*9.7*									*$153*	*$126*	*$113*
Front End Bin Loader Operator & Swamper	30.0	$337,500	$60,750	7	$84,375	$30,375	$53	$40	$4,000	$179,791	$228,151	$276,511
$15.02	*9.7*									*$173*	*$146*	*$133*
Compactor Truck for Servicing Bins	30.4	$315,000	$56,700	7	$78,750	$28,350	$33	$40	$4,000	$153,720	$191,680	$229,640
$13.62	*9.0*									*$148*	*$123*	*$110*
Uncomp. Roll-off Truck and Trailer for Bins	76.0	$277,500	$49,950	7	$69,375	$24,975	$33	$50	$5,000	$156,334	$199,494	$242,654
$15.99	*8.0*									*$150*	*$128*	*$117*
Tamped Roll-off Truck and Trailer for Bins	76.0	$277,500	$49,950	7	$69,375	$24,975	$33	$50	$5,000	$156,334	$199,494	$242,654
$9.13	*14.0*									*$150*	*$128*	*$117*
Roll-off Truck and Trailer for Compacted Bins	60.8	$277,500	$49,950	7	$69,375	$24,975	$33	$50	$5,000	$156,334	$199,494	$242,654
$7.09	*18.0*									*$150*	*$128*	*$117*
Walking Floor Tractor and Trailer	*152.0*	$315,000	$56,700	7	$78,750	$28,350	$33	$50	$5,000	*$165,120*	*$208,280*	*$251,440*
$8.34	*16.0*									*$159*	*$134*	*$121*
Walking Floor Tractor and Trailer, Tamped	152.0	$315,000	$56,700	7	$78,750	$28,350	$33	$50	$5,000	$165,120	$208,280	$251,440
$4.77	*28.0*									*$159*	*$134*	*$121*
Tractor and Tander Trailer 40'	*54.4*	$275,000	$49,500	7	$68,750	$24,750	$33	$50	$5,000	*$155,749*	*$198,909*	*$242,069*
$8.45	*15.1*									*$150*	*$128*	*$116*
Tractor and Tri-Axle Trailer 53'	*72.0*	$275,000	$49,500	7	$68,750	$24,750	$33	$50	$5,000	$155,749	$198,909	$242,069
$6.38	*20.0*									*$150*	*$128*	*$116*

Assumptions:

Interest rate	8%
Resale Value	25%
Self Haul @ 0.50/Km plus $8.00/hour	
Assumptions, 7 year ammortization:	
Interest rate	6%
Payment Plus Interest (7 year term)	18.0%

Year	Principal	Interest	Payment	Balance
1	$1,000	60.00	180	$880
2	$880	52.80	180	$753
3	$753	45.17	180	$618
4	$618	37.08	180	$475
5	$475	28.50	180	$324
6	$324	19.41	180	$163
7	$163	9.78	180	-$7
8	-$7	-0.44	180	-$188
9	-$188	-11.26	180	-$379
10	-$379	-22.74	180	-$582

Table G3. BIN OPERATING COST ANALYSIS

A

	Bin Purchase ($)	Annual Payment ($)	Service Life (years)	Resale Value ($)	Annual Maintenance ($/year)	Capacity (m3)	Weekly Capacity (Kg)	Annual Capacity (tonnes)	Operating Cost ($/year)	Operating Cost ($/week)	Operating Cost ($/tonne)
Garbage Can	$20	$13	2	$0	$5	0.10	9	0.5	$18	$0.34	**$36**
Roll-Out Tote	$100	$24	5	$0	$10	0.38	35	1.8	$34	$0.65	**$19**
Haul-Aull Bin (3 cu.yd.)	$4,000	$720	7	$0	$200	2.28	171	8.9	$920	$17.69	**$103**
Haul-All Bin (6 cu. yd.)	$5,000	$900	7	$0	$200	4.56	342	17.8	$1,100	$21.15	**$62**
Rear Load Bin (3 cu. yd.)	$1,000	$240	5	$0	$100	2.28	171	8.9	$340	$6.54	**$38**
Rear Load Bin (6 cu. yd.)	$1,500	$360	5	$0	$100	4.56	342	17.8	$460	$8.85	**$26**
Front Load Bin (3 cu. yd.)	$1,200	$288	5	$0	$100	2.28	171	8.9	$388	$7.46	**$44**
Front Load Bin (6 cu. yd.)	$1,500	$360	5	$0	$100	4.56	342	17.8	$460	$8.85	**$26**
Front Load Bear Bin (6 cu. yd.)	$2,400	$576	5	$0	$100	4.56	342	17.8	$676	$13.00	**$38**
40 Yd. Roll Off Bear Bin	$10,000	$1,400	10	$0	$200	30.40	3,200	166.4	$1,600	$30.77	**$10**
50 Yd. Roll Off Bear Bin	$12,000	$1,680	10	$0	$200	38.00	4,000	208.0	$1,880	$36.15	**$9**
40 Yd. Roll Off Bear Bin Tamped	$10,000	$1,400	10	$0	$200	30.40	5,600	291.2	$1,600	$30.77	**$5**
50 Yd. Roll Off Bear Bin Tamped	$12,000	$1,680	10	$0	$200	38.00	7,000	364.0	$1,880	$36.15	**$5**
40 Yd. Roll Off Single Stream Recycle	$10,000	$1,400	10	$0	$200	30.40	1,976	102.8	$1,600	$30.77	**$16**
40 Yd. Roll Off Single Stream Rec. Tamped	$10,000	$1,400	10	$0	$200	30.40	3,952	205.5	$1,600	$30.77	**$8**
Haul-All Transtor (40 cu. yd.)	$90,000	$9,270	15	$0	$2,000	30.40	2,280	118.6	$11,270	$216.73	**$95**
Haul-All Transtor (50 cu. yd.)	$110,000	$11,330	15	$0	$2,000	38.00	2,850	148.2	$13,330	$256.35	**$90**
On-Site Bin Compactor System	$30,000	$3,090	15	$0	$2,700	30.40	9,024	469.3	$5,790	$111.35	**$12**
1 m3 Chicken Cage for Agri Bag	$500	$52	10	$0	$50	1.00	75	3.9	$102	$1.95	**$26**
Compartmentalized 30 yd. Recycle Bin	$16,000	$2,880	7	$0	$500	22.80	1,710	88.9	$3,380	$65.00	**$38**
Compartmentalized 40 yd. Recycle Bin	$18,000	$3,240	7	$0	500	30.40	2,280	118.6	$3,740	$71.92	**$32**

Assumptions:

Interest rate	6%	
Loose refuse density	75.00	Kg/m3
All bins emptied once per week		
Bins have no resale value		

Assumptions, 7 year ammortization:

Interest rate	6%
Payment Plus Interest (5 year term)	24%
Payment Plus Interest (7 year term)	18%
Payment Plus Interest (10 year term)	14%
Payment Plus Interest (15 year term)	10%

Year	Principal	Interest	Payment	Balance
1	$1,000	60.00	$103	$957
2	$957	57.42	$103	$911
3	$911	54.69	$103	$863
4	$863	51.79	$103	$812
5	$812	48.71	$103	$758
6	$758	45.46	$103	$700
7	$700	42.00	$103	$639
8	$639	38.34	$103	$574
9	$574	34.46	$103	$506
10	$506	30.35	$103	$433
11	$433	25.99	$103	$356
12	$356	21.37	$103	$275
13	$275	16.48	$103	$188
14	$188	11.28	$103	$96
15	$96	5.78	$103	-$1

Table G4. TRANSFER STATION OPERATING COST ANALYSIS (excluding collection)

	Bin Cost Annual ($)	Lock Block Wall Cost ($)	Fencing Cost ($)	Access Road Cost ($)	Wheel Backhoe ($)	Total Capital Cost	Service Life (years)	Annual Payment ($)	Attendant Cost ($/year)	Capacity (m3)	Capacity tonnes/wk	Operating Cost ($/year)	Operating Cost ($/week)	Operating Cost ($/tonne)
Unattended PL6 Site 1 Bin	$1,100	$0	$0	$0		$0	25	$0	$0	4.6	0.3	$1,100	$21.15	$61.85
Unattended PL6 Site 2 Bins	$2,200	$0	$0	$0		$0	25	$0	$0	9.1	0.7	$2,200	$42.31	$61.85
Unattended PL6 Site 3 Bins	$3,300	$0	$0	$0		$0	25	$0	$0	13.7	1.0	$3,300	$63.46	$61.85
Unattended PL6 Site 4 Bins	$4,400	$0	$12,000	$0		$12,000	25	$948	$0	18.2	1.4	$5,348	$102.85	$75.18
Unattended PL6 Site 5 Bins	$5,500	$0	$12,000	$0		$12,000	25	$948	$0	22.8	1.7	$6,448	$124.00	$72.51
Unattended PL6 Site 6 Bins	$6,600	$0	$12,000	$0		$12,000	25	$948	$0	27.4	2.1	$7,548	$145.15	$70.74
Unattended PL6 Site 8 Bins	$8,800	$0	$12,000	$0		$12,000	25	$948	$0	36.5	2.7	$9,748	$187.46	$68.52
Unattended PL6 Site 8 Bins	$9,900	$0	$12,000	$0		$12,000	25	$948	$0	41.0	3.1	$10,848	$208.62	$67.78
Unattended PL6 Site 12 Bins	$13,200	$0	$12,000	$0		$12,000	25	$948	$0	54.7	4.1	$14,148	$272.08	$66.30
Unattended PL6 Site 16 Bins	$17,600	$0	$12,000	$0		$12,000	25	$948	$0	73.0	5.5	$18,548	$356.69	$65.18
Unattended PL6 Site 20 Bins	$22,000	$0	$12,000	$0		$12,000	25	$948	$0	91.2	6.8	$22,948	$441.31	$64.52
Attended PL6 Site 6 Bins 1 Recycle	$10,340	$0	$12,000	$0		$12,000	25	$948	$41,600	82.1	6.2	$52,888	$1,017.08	$165.22
Unattended 6 yd. Bin Site 3 bins	$2,028	$0	$8,000	$0		$8,000	25	$632	$0	13.7	1.0	$2,660	$51.15	$49.86
Unattended 6 yd. Bin Site 11 bins	$7,436	$0	$8,000	$0		$8,000	25	$632	$0	50.2	3.8	$8,068	$155.15	$41.24
Unattended 6 yd. Bin Site 18 bins	$12,168	$0	$8,000	$0		$8,000	25	$632	$0	82.1	6.2	$12,800	$246.15	$39.99
Unattended BR6 Site 1 Bin	$676	$0	$0	$0		$0	25	$0	$0	4.6	0.3	$676	$13.00	$38.01
Unattended BR6 Site 2 Bins	$1,352	$0	$0	$0		$0	25	$0	$0	9.1	0.7	$1,352	$26.00	$38.01
Unattended BR6 Site 3 Bins	$2,028	$0	$0	$0		$0	25	$0	$0	13.7	1.0	$2,028	$39.00	$38.01
Unattended BR6 Site 4 Bins 1 Recycle	$6,444	$0	$12,000	$12,000		$24,000	25	$1,896	$0	18.2	1.4	$8,340	$160.38	$117.24
Unattended BR6 Site 6 Bins 1 Recycle	$7,796	$0	$12,000	$12,000		$24,000	25	$1,896	$0	27.4	2.1	$9,692	$186.38	$90.83
Unattended BR6 Site 8 Bins 1 Recycle	$9,148	$0	$12,000	$12,000		$24,000	25	$1,896	$0	36.5	2.7	$11,044	$212.38	$77.63
Unattended BR6 Site 10 Bins 1 Recycle	$10,500	$0	$12,000	$12,000		$24,000	25	$1,896	$0	45.6	3.4	$12,396	$238.38	$69.70
Unattended BR6 Site 12 Bins 1 Recycle	$11,852	$0	$12,000	$12,000		$24,000	25	$1,896	$0	54.7	4.1	$13,748	$264.38	$64.42
Unattended BR6 Site 14 Bins 1 Recycle	$13,204	$0	$12,000	$12,000		$24,000	25	$1,896	$0	63.8	4.8	$15,100	$290.38	$60.65
Unattended BR6 Site 16 Bins 1 Recycle	$14,556	$0	$12,000	$12,000		$24,000	25	$1,896	$0	73.0	5.5	$16,452	$316.38	$57.82
Supervised BR6 Site 8 Bins 1 Recycle	$9,148	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	36.5	2.7	$52,644	$1,012.38	$370.02
Supervised BR6 Site 10 Bins 1 Recycle	$10,500	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	45.6	3.4	$53,996	$1,038.38	$303.62
Supervised BR6 Site 12 Bins 1 Recycle	$11,852	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	54.7	4.1	$55,348	$1,064.38	$259.35
Supervised BR6 Site 14 Bins 1 Recycle	$13,204	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	63.8	4.8	$56,700	$1,090.38	$227.73
Supervised BR6 Site 16 Bins 1 Recycle	$14,556	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	73.0	5.5	$58,052	$1,116.38	$204.02
Supervised BR6 Site 20 Bins 1 Recycle	$17,260	$0	$12,000	$12,000		$24,000	25	$1,896	$41,600	91.2	6.8	$60,756	$1,168.38	$170.82
Attended Transfer Station (50 yd.) 1 Recycle	$5,620	$20,000	$15,000	$24,000		$59,000	25	$4,661	$41,600	38.0	4.0	$51,881	$997.71	$249.43
Attended Transfer Station (100 yd.) 1 Recycle	$7,500	$35,000	$15,000	$24,000		$74,000	25	$5,846	$41,600	76.0	8.0	$54,946	$1,056.65	$132.08
Attended Transfer Station (150 yd.) 1 Recycle	$9,380	$50,000	$15,000	$24,000		$89,000	25	$7,031	$41,600	114.0	12.0	$58,011	$1,115.60	$92.97
Attended Transfer Station (200 yd.) 1 Recycle	$11,260	$65,000	$15,000	$24,000		$104,000	25	$8,216	$41,600	152.0	16.0	$61,076	$1,174.54	$73.41
Attended Transfer Station (300 yd.) 1 Recycle	#REF!	$80,000	$15,000	$24,000		$119,000	25	$9,401	$41,600	228.0	24.0	#REF!	#REF!	#REF!
Attended Transfer Stn Tamped (50 yd.) 1 Recycle	$5,620	$20,000	$15,000	$24,000	$70,000	$129,000	25	$10,191	$41,600	38.0	7.0	$57,411	$1,104.06	$157.72
Attended Transfer Stn Tamped (100 yd.) 1 Recycle	$7,500	$35,000	$15,000	$24,000	$70,000	$144,000	25	$11,376	$41,600	76.0	14.0	$60,476	$1,163.00	$83.07
Attended Transfer Stn Tamped (150 yd.) 1 Recycle	$9,380	$50,000	$15,000	$24,000	$70,000	$159,000	25	$12,561	$41,600	114.0	21.0	$63,541	$1,221.94	$58.19
Attended Transfer Stn Tamped (200 yd.) 1 Recycle	$11,260	$65,000	$15,000	$24,000	$70,000	$174,000	25	$13,746	$41,600	152.0	28.0	$66,606	$1,280.88	$45.75
Compactor Plus 1 Bin (40 yd.) 1 Recycle	$9,530	$5,000	$15,000	$24,000		$44,000	25	$3,476	$41,600	30.4	9.0	$54,606	$1,050.12	$116.37
Compactor Plus 2 Bins (40 yd.) 1 Recycle	$15,320	$5,000	$15,000	$24,000		$44,000	25	$3,476	$41,600	60.8	18.0	$60,396	$1,161.46	$64.35
Haul-All Transtor System (40 yd.)	$11,270	$20,000	$15,000	$24,000		$59,000	25	$4,661	$41,600	30.4	2.3	$57,531	$1,106.37	$485.25
Haul-All Transtor System (50 yd.)	$13,330	$30,000	$15,000	$24,000		$69,000	25	$5,451	$41,600	38.0	2.9	$60,381	$1,161.17	$407.43
Haul-All Transtor 2 Bins (50 yd.) 2 Bins	$26,660	$50,000	$15,000	$24,000		$89,000	25	$7,031	$41,600	76.0	5.7	$75,291	$1,447.90	$254.02
Haul-All Transtor 2 Bins (50 yd.) 3 Bins	$39,990	$70,000	$15,000	$24,000		$109,000	25	$8,611	$41,600	114.0	8.6	$90,201	$1,734.63	$202.88
Scrap Metal / Bulky Material Sort	$1,880	$20,000	$15,000	$2,000		$37,000	25	$2,923	$41,600	50.0	3.8	$46,403	$892.37	$237.96

Assumptions:

Interest rate		
Payment Plus Interest (25 year term)	6%	
Percent of Capital Paid each year	7.90%	
Transfer Station Attendant Hours	40	hrs/wk
Loose refuse density	40	hrs/wk
All bins emptied once per week	75	Kg/m3
Bins have no resale value		

Year	Principal	Interest	Payment	Balance
1	$1,000	60.00	79	$981
2	$981	58.86	79	$961
3	$961	57.65	79	$940
4	$940	56.37	79	$917
5	$917	55.01	79	$893
6	$893	53.57	79	$867
7	$867	52.05	79	$841
8	$841	50.43	79	$812
9	$812	48.72	79	$782
10	$782	46.90	79	$750
11	$750	44.97	79	$716
12	$716	42.93	79	$679
13	$679	40.77	79	$641
14	$641	38.47	79	$601
15	$601	36.04	79	$558
16	$558	33.47	79	$512
17	$512	30.73	79	$464
18	$464	27.84	79	$413
19	$413	24.77	79	$359
20	$359	21.51	79	$301
21	$301	18.06	79	$240
22	$240	14.41	79	$176
23	$176	10.53	79	$107
24	$107	6.42	79	$35
25	$35	2.07	79	-$42
26	-$42	-2.55	79	-$124
27	-$124	-7.44	79	-$210
28	-$210	-12.62	79	-$302
29	-$302	-18.12	79	-$399
30	-$399	-23.95	79	-$502

Table G.5 Projected Costs of Bylaw Enforcement

Projected Costs		
Bylaw Enforcement Officer Salary (1820 hrs)	$	68,141
Bylaw Enforcement 4x4 Truck (5 Year Ammortize)	$	12,000
Truck Fuel (assume 50,000 km/year)	$	4,375
Truck Maintenance	$	5,000
Staff Training	$	3,000
Notebook Computer	$	500
Communications	$	6,000
Administration Support	$	6,000
Supplies	$	2,400
		$107,416
Projected Revenues		
Number of Violation Tickets per day		2
Value of Each Ticket		$50
2 Violation Tickets Per Day (@$50/ticket)		$23,471
Net Cost of Bylaw Enforcement Officer		**$83,944**

G6. Cost Projection for Basic Lock Block Transfer Station

Input Parameters		
No. of MSW Bins	1	
Volume of Refuse Bin	50	cu.yds
No. of Recycle Bins	1	
Volume of Recycle Bin	40	
No. of Oversize Bins	1	
Volume of Oversize Bins	40	
Hours of Operation per Week	40	
Capital Cost of MSW Bin	12000	
Capital Cost of Single Stream Bin	10000	
Capital Cost of Oversize Bin	10000	
Lock Block Wall Length	144	ft
	43.8912	m
Earthworks Volume	877.824	m3
Earthworks Rate	15	per m3
Earthworks Cost	$13,167.36	
Number of Blocks	88	
Price of Blocks (installed)	$200.00	
Total Cost of Blocks	$17,600.00	
Price Safety Railing	$5,000.00	
Surface Area of T.S.	12040.23398	m2
Volume of Gravel Surfacing	2408.046797	m3
Cost of Gravel Placed	$35.00	per m3
Cost of Gravel	$84,281.64	
Area of Concrete	702.2592	m2
Volume of Concrete	210.67776	m3
Cost of Concrete	$100	m3
Cost of Concrete Pad	$21,067.78	
Locking Gate Cost	$5,000.00	
Total Cost for T.S.	$168,116.77	
Engineering @25%	42029.19347	
Contingency @25%	52536.49184	
Total Cost for T.S.	$262,682.46	

Principal Value	$262,682.46
Payment Plus Interest (25 year term)	6%
Percent of Capital Paid each year	7.30%
Capital Annual Payment Required	**$19,176**
Bins have no resale value	

Year	Principal	Interest	Payment	Balance
1	$262,682	15760.95	19175.82	$259,268
2	$259,268	15556.06	19175.82	$255,648
3	$255,648	15338.87	19175.82	$251,811
4	$251,811	15108.65	19175.82	$247,744
5	$247,744	14864.62	19175.82	$243,433
6	$243,433	14605.95	19175.82	$238,863
7	$238,863	14331.76	19175.82	$234,019
8	$234,019	14041.11	19175.82	$228,884
9	$228,884	13733.03	19175.82	$223,441
10	$223,441	13406.47	19175.82	$217,672
11	$217,672	13060.30	19175.82	$211,556
12	$211,556	12693.37	19175.82	$205,074
13	$205,074	12304.43	19175.82	$198,202
14	$198,202	11892.14	19175.82	$190,919
15	$190,919	11455.12	19175.82	$183,198
16	$183,198	10991.88	19175.82	$175,014
17	$175,014	10500.84	19175.82	$166,339
18	$166,339	9980.35	19175.82	$157,144
19	$157,144	9428.62	19175.82	$147,396
20	$147,396	8843.78	19175.82	$137,064
21	$137,064	8223.86	19175.82	$126,112
22	$126,112	7566.75	19175.82	$114,503
23	$114,503	6870.20	19175.82	$102,198
24	$102,198	6131.86	19175.82	$89,154
25	$89,154	5349.23	19175.82	$75,327
26	$75,327	4519.63	19175.82	$60,671
27	$60,671	3640.26	19175.82	$45,135
28	$45,135	2708.13	19175.82	$28,668
29	$28,668	1720.06	19175.82	$11,212
30	$11,212	672.72	19175.82	-$7,291

G7. Cost Projection for Controlled Lock Block Transfer Station

Input Parameters		
No. of MSW Bins	1	
Volume of Refuse Bin	50	cu.yds
No. of Recycle Bins	1	
Volume of Recycle Bin	40	
No. of Oversize Bins	1	
Volume of Oversize Bins	40	
Hours of Operation per Week	40	
Capital Cost of MSW Bin	12000	
Capital Cost of Single Stream Bin	10000	
Capital Cost of Oversize Bin	10000	
Lock Block Wall Length	144	ft
	43.8912	m
Earthworks Volume	877.824	m3
Earthworks Rate	15	per m3
Earthworks Cost	$13,167.36	
Number of Blocks	88	
Price of Blocks (installed)	$200.00	
Total Cost of Blocks	$17,600.00	
Price Safety Railing	$5,000.00	
Surface Area of T.S.	12040.234	m2
Volume of Gravel Surfacing	2408.0468	m3
Cost of Gravel Placed	$35.00	per m3
Cost of Gravel	$84,281.64	
Area of Concrete	702.2592	m2
Volume of Concrete	210.67776	m3
Cost of Concrete	$100	m3
Cost of Concrete Pad	$21,067.78	
Locking Gate Cost	$5,000.00	
Attendant Shelter Cost (Sea Can)	$20,000.00	
Total Cost for T.S.	$188,116.77	
Engineering @25%	47029.1935	
Contingency @25%	58786.4918	
Total Cost for T.S.	$293,932.46	
Attendant Hourly Salary	$20.00	
Annual Salary Cost	$41,600.00	
Total Transfer Station Cost	**$63,057.07**	

Principal Value	$293,932.46
Payment Plus Interest (25 year term)	6%
Percent of Capital Paid each year	7.30%
Capital Annual Payment Required	**$21,457**
Bins have no resale value	

Year	Principal	Interest	Payment	Balance
1	$293,932	17635.95	21457.07	$290,111
2	$290,111	17406.68	21457.07	$286,061
3	$286,061	17163.66	21457.07	$281,768
4	$281,768	16906.05	21457.07	$277,217
5	$277,217	16632.99	21457.07	$272,392
6	$272,392	16343.55	21457.07	$267,279
7	$267,279	16036.73	21457.07	$261,859
8	$261,859	15711.51	21457.07	$256,113
9	$256,113	15366.78	21457.07	$250,023
10	$250,023	15001.36	21457.07	$243,567
11	$243,567	14614.02	21457.07	$236,724
12	$236,724	14203.44	21457.07	$229,470
13	$229,470	13768.22	21457.07	$221,782
14	$221,782	13306.89	21457.07	$213,631
15	$213,631	12817.88	21457.07	$204,992
16	$204,992	12299.53	21457.07	$195,835
17	$195,835	11750.08	21457.07	$186,128
18	$186,128	11167.66	21457.07	$175,838
19	$175,838	10550.29	21457.07	$164,931
20	$164,931	9895.88	21457.07	$153,370
21	$153,370	9202.21	21457.07	$141,115
22	$141,115	8466.92	21457.07	$128,125
23	$128,125	7687.51	21457.07	$114,356
24	$114,356	6861.34	21457.07	$99,760
25	$99,760	5985.60	21457.07	$84,288
26	$84,288	5057.31	21457.07	$67,889
27	$67,889	4073.32	21457.07	$50,505
28	$50,505	3030.30	21457.07	$32,078
29	$32,078	1924.69	21457.07	$12,546
30	$12,546	752.75	21457.07	-$8,159

TABLE G-8
ECODEPOT ESTIMATED CAPITAL AND OPERATING COSTS

Operating Costs			
Full Time Staff (1)		$	49,340
Plant Supervisor (33% allocation)		$	22,486
Part Time Staff		$	12,335
Staff Memberships		$	500
Staff Training		$	300
Staff Travel		$	1,000
Computer		$	300
Communications		$	1,000
Depot Capital		$	-
Depot Maintenance		$	3,000
Depot Operation		$	10,000
Depot Utilities		$	10,000
Property Rent		$	18,000
Disposal Charges - Batteries		$	5,000
Equipment Lease		$	20,000
Equipment Maintenance		$	15,000
Freight		$	-
Insurance		$	5,000
Miscellanenous		$	4,000
Promotion		$	-
Supplies		$	3,000
Tipping Fees		$	-
Administration		$	5,000
			185,261.71

Capital Costs			
Bins (5)	5	$75,000.00	
Compactor 4 CC	1	$30,000.00	
Compactor 2 CC	1	$20,000.00	
Electrical Wiring	1	$10,000.00	
BobCat	1	$25,000.00	
Total Recycling Capital		$160,000.00	

Principal Payment (10 years)			$13,326.55
Interest Payment at 4% (MFA 1)			$7,744.00
			$21,070.55
Total Cost of Eco Depot			**$206,332.27**
	Quesnel	5,725	**$36.04**
	Williams Lk.	4,840	**$42.63**
	100 Mile House	2,148	**$96.07**

Yard Waste Collection Program

126.2509	All in truck operating costs (based on automated front load packer for organic bins)
800	Number of homes serviced per 8 hour day
1.262509	Service cost per home per week
65.65048	Service Cost per Home per Year

MFA Loan Model 1 - Capital Financing for Eco Depots
B.C. Municipal Finance Authority Interest Calculation Spreadsheet

10 Year Term 4% Capitalization Rate

Principal: **160,000.00** Interest Rate: **4.84%** S/F Factor: 0.083290944

	Principal Pymnt	Interest Pymnt	Total Pymnt	Actuarial	Reducing Balance
					160,000.00
Yr 1 Semi Annual		3,872.00	3,872.00		160,000.00
Yr 1 Annual	13,326.55	3,872.00	17,198.55		146,673.45
Yr 2 Semi Annual		3,872.00	3,872.00		146,673.45
Yr 2 Annual	13,326.55	3,872.00	17,198.55	533.06	132,813.84
Yr 3 Semi Annual		3,872.00	3,872.00		132,813.84
Yr 3 Annual	13,326.55	3,872.00	17,198.55	1,087.45	118,399.84
Yr 4 Semi Annual		3,872.00	3,872.00		118,399.84
Yr 4 Annual	13,326.55	3,872.00	17,198.55	1,664.01	103,409.28
Yr 5 Semi Annual		3,872.00	3,872.00		103,409.28
Yr 5 Annual	13,326.55	3,872.00	17,198.55	2,263.63	87,819.10
Yr 6 Semi Annual		3,872.00	3,872.00		87,819.10
Yr 6 Annual	13,326.55	3,872.00	17,198.55	2,887.24	71,605.31
Yr 7 Semi Annual		3,872.00	3,872.00		71,605.31
Yr 7 Annual	13,326.55	3,872.00	17,198.55	3,535.79	54,742.98
Yr 8 Semi Annual		3,872.00	3,872.00		54,742.98
Yr 8 Annual	13,326.55	3,872.00	17,198.55	4,210.28	37,206.14
Yr 9 Semi Annual		3,872.00	3,872.00		37,206.14
Yr 9 Annual	13,326.55	3,872.00	17,198.55	4,911.75	18,967.84
Yr 10 Semi Annual		3,872.00	3,872.00		18,967.84
Yr 10 Annual	13,326.55	3,872.00	17,198.55	5,641.29	-0.00
TOTALS:	133,265.51	77,440.00	210,705.51	26,734.49	

Total Annual Payment to be made: $21,070.55

Total principal repaid plus total actuarial earnings equal amount originally borrowed

NOTE: This schedule of payments is calculated on an estimate of rates based on today's rate.

Cariboo Regional District

Regional Solid Waste Management Plan Review
STAGE 2 – RURAL LANDFILL EFFICIENCY

Cariboo Regional District

Let's talk trash!

Sperling Hansen Associates

Jan enns communications
CONSULTING · TRAINING

Maura Walker & Associates
ENVIRONMENTAL CONSULTANTS

Carney's Waste Systems

RURAL LANDFILL EFFICIENCY ANALYSIS

Historically the Cariboo Regional District (CRD) operated 28 rural landfills. Over the past several years the CRD closed 16 of these sites and created transfer station where it was either more financially feasible to do so or an existing landfill did not meet the environmental requirements. At this time 12 rural landfills are in operation. During the recent solid waste management plan review Sperling Hansen and Associates determined that the cost per tonne to operate the rural landfills was high as compared to larger urban sites and suggested that a review should occur to determine the feasibility of converting these sites to transfer stations.

District staff completed an assessment of 4 representative sites at Nazko, West Chilcotin, Tatla Lake and Inter-Lakes which are geographically distributed throughout the district. The analysis revealed that current land filling practices are still financially more feasible then a transfer station. In the scenarios that follow the use of tamped bins with a density of 7 tonnes versus a mechanical compaction unit with a density of 9 tonnes was chosen. The tamped bins would provide for greater flexibility to accept larger waste materials, do not require constant supervise, no mechanical maintenance issues, no potential freezing issues associated with wet materials and the tamping equipment (small tractor or excavator) can be used on the site for sorting and piling metals and wood waste as well as snow removal and minor road work. The details of the analysis are as follows:

NAZKO LANDFILL

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Existing electric fencing would prevent bears from being attracted to the site. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		277
Seasonal tonnage:	May to October	208 (1.15 t per day)
	Nov. to April	69 (0.4 t per day)
		277

Trucking

Number of hauling events per year:	20 (277 tonnes /14 tonnes per load)
Truck travel time return trip:	2.6 hrs.
Loading time:	1.0 hrs.
Total Process Time	3.6 hrs.
Trucking Cost:	$6,120 ($85/hr x 3.6 hr x 20 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment hauling cost:	$3,276 ($1.4 x 30km x 78)
Tractor cost:	$3,900 ($50 x 78 hrs)

Total Maintenance: $9,126

Capital Improvements

2 bins	$24,000
60 foot retaining wall	$15,000
Landing/Roads	$14,000
Concrete pad	$1,021
Safety rail	$5,000
Total	$59,021

Total Operating Costs

Trucking:	$6,120	
Maintenance:	$9,120	
Capital Finance:	$4,002	(30 years @ 5%)
Landfill fees:	$11,080	($40 x 277)
Total	$30,322	

Conclusion

The current landfill is open 7 days per week 24 hours per day and is serviced once per week whereby all waste is compacted and covered. The annual cost of this operation is $27,011. The site is able to accept large waste discharges, such as home demolitions when they occur. Capital costs for the site involves expanding the bear fencing, landfill area and roads every 10 years at a cost of approximately $20,000.

The site should remain as a landfill at this time as the operating costs are similar and a higher level of community service can be provided. .

TATLA LAKE

Operating conditions: The site would utilize 1 open top 40 cubic yard bin, with a manual lid that the operator opens and closes. Two bins are not recommended for low volume sites due to the fact that waste would stay in the bins for a long time before being removed for landfill. The decomposing waste would create sever odour problems. The lid is required to prevent scatter from wind, birds and during transport. Existing electric fencing would prevent bears from being attracted to the site. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		101
Seasonal tonnage:	May to October	76 (0.42 t per day)
	Nov. to April	25 (0.14 t per day)
		101

Trucking

Number of hauling events per year:	15 (101 tonnes /7 tonnes per load)
Truck travel time return trip:	7.0 hrs.
Loading time:	1.0 hrs.
Total Process Time	8.0 hrs.
Trucking Cost:	$10,200 ($85/hr x 8.0 hr x 15 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment Hauling Costs:	$4,368 ($1.40 x 40 km x 78 visits)
Tractor cost:	$3,900 ($50 x 78 hrs)
Total Maintenance:	$10,218

Landfill Fees

Gibraltar landfill rate: $58/tonne

Landfill cost: $5,858 (101 tonnes x $58)

Capital Improvements

1 bin	$12,000
30 foot retaining wall	$7,500
Landing/Roads	$11,000
Concrete pad	$1,021
Safety rail	$5,000
Total	$36,521

Total Operating Costs

Trucking:	$10,200	
Maintenance:	$10,218	
Capital Finance:	$2,476	(30 years @ 5%)
Landfill fees:	$5,858	
Total	$28,752	

Conclusion

The current landfill is open 7 days per week 24 hours per day and is serviced once per week whereby all waste is compacted and covered. The annual cost of this operation is $15,495. The site is able to accept large waste discharges, such as home demolitions when they occur. Capital cost for the site involves expanding the bear fencing, land fill area and roads every 20 years at a cost of approximately $20,000.

The site should remain as a landfill at this time as the operating costs are lower and a higher level of community service can be provided.

WEST CHILCOTIN

Operating conditions: The site would utilize 2 open top 40 cubic yard bins, with a manual lid that the operator opens and closes. The lid is required to prevent scatter from wind, birds and during transport. Existing electric fencing would prevent bears from being attracted to the site. The site would be open on a continuous basis. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas. The site would be serviced 2 days per week in the summer and once per week in the winter.

Tonnage

Estimate MSW Annual Tonnage:		350
Seasonal tonnage:	May to October	262 (1.4 t per day)
	Nov. to April	88 (0.5 t per day)
		350

Trucking

Number of hauling events per year:	25 (350 tonnes /14 tonnes per load)
Truck travel time return trip:	12.0 hrs.
Loading time:	1.0 hrs.
Total Process Time	13.0 hrs.
Trucking Cost:	$27,625 ($85/hr x 13 hr x 25 trips)

Maintenance/Attendant

Labour Rate	$25/hr
Mileage	$1.40/km
Tractor	$50/hr

Labour cost:	$1,950 ($25 x 2 hr/week x 26 weeks) + ($25 x 1 hrs/ week x 26 weeks)
Equipment hauling cost:	$3,276 ($1.4 x 30km x 78)
Tractor cost:	$3,900 ($50 x 78 hrs)
Total Maintenance:	$9,126

Landfill Fees

Gibraltar landfill rate: $58/tonne

Landfill cost: $20,300 (350 tonnes x $58)

Capital Improvements

2 bins	$24,000
60 foot retaining wall	$15,000
Landing/Roads	$14,000
Concrete pad	$1,021
Safety rail	$5,000
Total	$59,021

Total Operating Costs

Trucking:	$27,625
Maintenance:	$9,126
Capital Finance:	$4,002
Land fill fees:	$20,300
Total	$61,053

Conclusion

The current landfill is open 7 days per week 24 hours per day and is serviced twice per week whereby all waste is compacted and covered. The annual cost of this operation is $37,600. The site is able to accept large waste discharges, such as home demolitions when they occur. Capital cost for the site involves expanding the bear fencing, land fill area and roads every 10 years at a cost of approximately $20,000. The site should remain as a landfill at this time as the operating costs are lower and a higher level of community service can be provided.

INTER-LAKES LANDFILL

Operating conditions: The site would utilize 4 open top 40 cubic yard bins, with a manual lid that the operator opens and closes at the start and close of each day. The lid is required to prevent scatter from wind and birds, which is a requirement of the Ministry of Environment. The site would be open five days per week. The attendant would supervise the site for the enter day. A contracting attendant would provide a small tractor/excavator for tamping of the bins to increase density to 7 tonnes per bin as well as for snow removal and sorting of metals and wood waste areas.

Tonnage

Estimate Annual Tonnage:		1,589
Seasonal tonnage:	May to October	1,192 (6.6 t per day)
	Nov. to April	397 (2.1 t pr day)
		1,589

Trucking

Number of hauling events per year:	114 (1,589 tonnes /14 tonnes per load)
Truck travel time return trip:	2.0 hours
Loading Time:	1.0 hours
Total Processing	3.0
Trucking Cost:	$29,070 ($85/hr x 3 hrs x 114 trips)

Maintenance

Labour Rate	$25/hr
Mileage	$0.60/km
Tractor	$50/hr
Labour cost:	$52,000 ($25 x 40 hrs/week x 52 weeks)
Travel cost:	$1,872 ($0.60 x 60 km / week x 52 weeks)
Tractor cost:	$15,600 ($50 x 6 hrs/week x 52 weeks)
Total Maintenance:	$69,472

Landfill Fees

100 Mile landfill rate: $48/tonne

Landfill cost: $76,272 (1,589 tonnes x $48)

Capital Improvements

4 bins	$48,000
100 foot retaining wall	$25,000
Landing/Roads	$24,000
Concrete pad	$2,021
Gate	$5,000
Safety rail	$10,000
Shelter Sea Can	$4,500
Total	$118,521

Total Operating Costs

Trucking:	$29,070	
Maintenance:	$69,472	
Land fill fees:	$76,272	
Capital Finance:	$8,037	(30 years at 5%)
Wood Waste Piling:	$10,000	
Total	$192,851	

Conclusion

The current landfill is open 7 days per week 24 hours per day and is serviced three times per week whereby all waste is compacted and covered. The annual cost of the associated aspects of this operation is $103,013. The site is able to accept large waste discharges, such as home demolitions when they occur. Capital costs for the site involves expanding the bear fencing, land fill area and roads every 5 years at a cost of approximately $20,000. This site is recommended to be a controlled site for an additional cost of $52,000. With this additional cost the overall costs to operate the landfill would be less than a transfer station facility by $37,000.

The site should remain as a landfill at this time as the operating costs are lower and a higher level of community service can be provided.