Powell River Regional District

June 14th | 2012

Organic Processing Facility Feasibility Analysis:

Final Report

Prepared for:
Powell River Regional District
5776 Marine Avenue
Powell River, British Columbia
V8A 2M4

Submitted by:
Net Zero Waste Inc. in Partnership with Upland Consulting

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Powell River Regional District
5776 Marine Avenue
Powell River, British Columbia
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Attention: Mr. Sean McGinn, Manager of Community Services

Re: Final Report – Organic Processing Facility Feasibility Analysis

Please find enclosed the final report for the above mentioned project which outlines the results of our on-site investigation, as well as provides you with the necessary information you require to evaluate your options moving forward. Our team has compared your existing waste management situation to forecasted capital and operating costs associated with the development and operation of your own facility and the option of disposal of your organic waste at an existing "local" facility. In doing so, the Powell River Regional District (PRRD) can now make an "apples to apples" comparison of the options available and make an informed decision on how best to move forward with organic waste diversion for its citizens.

Information was provided and discussions were held so as to evaluate the different composting technologies available. This included tours taken to view some of these systems who are operating successfully in the region. Unfortunately, few commercial facilities operate at a scale less than 10,000 TPA as the costs per tonne rise quickly below this capacity. An analysis of these systems has been provided in this report. The review demonstrated that the Gore Cover System represented the lowest risk option for implementation at the scale required by the PRRD. An estimate of the costs associated with the construction and operation of a small scale model of this type of system was provided. A suitable site would need to utilize existing infrastructure and labour to be cost competitive with existing disposal options. As no site has been identified, the cost of the land has been excluded from this financial evaluation. Time would also be required to obtain necessary permitting and public approval before local facility siting could be considered as a possibility should this be the desire of the Compost Advisory Committee.

Steps can still be taken to divert additional organic materials now. The result will be a small reduction in waste costs today with additional savings in the future as transportation and landfill costs continue to rise. A curbside food and yard waste program will provide additional opportunities to divert commercial organics or expand the program to multi-family units or schools resulting in drastic improvements in waste diversion rates for the region. With data on the actual volumes diverted, and time to correct any issues with contamination or collection, the PRRD can then decide if and when the timing is right for the construction of a local facility. While additional site work and permitting would still be required before this could be a possibility you can now move forward with an understanding of the costs and responsibilities associated with a privately owned facility. We would be pleased to have the opportunity to work with you and your team again as you progress with the next phase of your project and remain at your service should you need support moving forward.

Very truly yours,

NET ZERO WASTE INC.
Per:

Mateo Ocejo, P.Eng.
Director

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1 Executive Summary

The Powell River Regional District recently commissioned Net Zero Waste Inc. to evaluate options for the management of organic materials produced regionally. Representing the largest recyclable fraction of the waste stream, diverting organics from the waste being trucked to the landfill in central Washington State, is expected to immediately lower disposal costs (once competitive bids can be produced). Furthermore, development of a source-separated organics program will also limit exposure and long term liability associated with rising waste disposal rates in the future. Finally, source separating organics will significantly increase the environmental sustainability of the PRRD in terms of reducing greenhouse gas emissions and capturing valuable nutrition for agriculture and landscaping applications. It is important to recognize that while other initiatives such as backyard composting will continue to play a role for some people in the community, broad based support is likely only attainable through a curbside food waste collection program. Centralized processing will allow a higher quality end product to be manufactured than possible from the back yard and allow diversion of materials from meat and bones to commercial food waste and agricultural organics not possible with the much simpler systems designed for back yard use. Source separated organics at the curbside for Single Family Units is the first step to unlocking an integrated organics management and nutrient recovery strategy for the region.

NZW has worked with the project team to study the financial and operational evaluation of two different options for the future management of organics and compared them to the existing waste management system. The two scenarios evaluated were:

- The Regional District implements a Source Separated Organics Program (SSO) to divert approximately 35% - 45% of the existing MSW waste stream (participation rates will increase over time) to an existing local (and suitably licensed) organic composting facility.
- The Regional District build and operate (or sub-contract the operation of) their own facility. This will only be possible provided a suitable site can be located and that capital exists to fund such a project. For the purposes of this report a publicly funded design, build, own and operate facility has been assumed.

Table 1-1: Summary of Organic Management Program Options

	Current Disposal Option	Existing Composting Option	PRRD Composting Facility
Transfer Station Fee	**$ 28/tonne**	**$ 28/tonne**	
Roosevelt Landfill Tip Fee including freight to Washington (770km) Augusta & Rabanco Disposal Corporation. Includes exchange rate and freight savings (5 Years & Avg. of 4877 tonnes)	**$ 134/tonne**		
Freight to Local Composter (104km)		**$ 41/tonne**	
Tip Fee at "Local" Composter for Curbside & Commercial Organics (5yr Contract)		**$ 79/tonne**	
Operating Cost PRRD Facility (Curbside, Depot & Commercial Organics) assuming 1,563 tonnes at high tip can be captured			**$117/tonne**
Capital Cost of PRRD Facility – ($62,800/year amortized over 20 years for 2,500 tonnes of processing capacity)			**$25/tonne**
TOTAL	**$ 162/tonne**	**$ 148/tonne**	**$ 142/tonne**

This report has excluded one time capital costs such as those associated with a new truck shown in the SWMP of $175,000. Through consultation with City of Powell River staff we have instead suggested the purchase of a split bin and modification of an existing truck which has been estimated at $14,000 by City staff. The exportation of waste does not require a guaranteed minimum tonnage; however the financial evaluation associated with investing capital in a local facility does require significant assumptions on the volume of waste that will be collected (especially from outlying communities). Some of these areas will have to utilize self-collection and drop off sites which *can* be successful with an engaged public and educational campaign but also can present collection challenges. Pricing shown in the SWMP provided an estimate of costs associated with the one-time purchase of bins, delivery, roll out of the program and additional educational and promotional costs associated with start-up of $64/household. Based on 5685 households this would represent an additional $363,840 in up-front one time program implementation costs which could be covered through a single payment or through financing over the term of the processing contract. Should a decision to implement a program be initiated immediately with processing completed at an existing facility, the volume of tonnes collected could be confirmed, eliminating the largest risk associated with construction of a local facility.

2 Evaluation of Current Waste Management System

2.1 Description of current Waste Management System

The Powell River Regional District currently receives MSW and Recyclables:

- Weekly curbside collection and disposal of MSW from approximately 5,936 municipal households within the City of Powell River.
- Bi-Weekly curbside collection of recycling within the City of Powell River; there is no recycling pick-up (or collection) for electoral areas
- Within the municipality, MSW and recycling is delivered to a transfer station contracted by the PRRD (currently to Augusta Recyclers)
- Within rural areas private contractors collect MSW or residents self-haul to a transfer station

Residents in electoral areas, have the following options for recycling:

- Free drop off at one of six green bins located within the Powell River Regional District
- Free drop off at Augusta Recyclers or Sunshine Disposal and Recycling (paper only)
- Large item collection and disposal for one week in both Spring and Fall operated by PRRD
- Annual household hazardous waste roundup through PRRD

Yard waste and land clearing debris is prohibited from disposal as MSW and can be dropped off at Augusta Recyclers for:

- $45/tonne for yard waste (branches, grass clippings, leaves)
- $150/tonne for land clearing debris (stumps and trees over 1 ft. in diameter)

Though backyard composting is encouraged within the PRRD, the majority of compostable household organics remain within the MSW stream. In order to facilitate a source-separated organics collection program, participants will need to acquire suitable carts for the collection of wet and odourous organics for automated transfer. It is expected that the industry-standard, 60-gallon bins will be purchased and provided to each household. The costs associated with the financing of this purchase, could either be incorporated into the service fees charged to each household and paid down over time or through a single charge with the ownership and responsibility of the bin then residing with the homeowner. A single charge could be as high as $70/household, however if financed over the term of the collection / processing contract the curbside bin and “kitchen catcher” could represent a much smaller impact to the taxpayer with future maintenance and replacement costs the responsibility of the resident.

Costs could be further reduced by utilizing a smaller 26-32 Gal bin for standard weekly pick-up and to request homeowners to utilize paper bags (or other appropriately labeled and self-provided containers) during periods of high green waste production (spring and fall). Paper bags can now be purchased both for use in large green waste storage at the curb and for use as a water tight kitchen catcher with a cellulose liner. Cellulose is an odourless, tasteless, 100% biodegradable substance found in the cell wall of green plants. The cost associated with purchasing these bags (the responsibility of the homeowner) is approximately 40₵ to 50₵ each.

The largest cost component of a new organics program could most definitely be the costs associated with the collection of a new waste stream. These costs can be minimized if the collection can piggy back on existing collection requirements through the use of split collection vehicles. If this is not possible and an entirely new pick-up is required then additional costs of approximately $2 - $4/household/pick-up can be expected depending on the materials included and the frequency of the pick-up.

Often subsequent savings can be realized with the garbage disposal pricing as it is important to realize that no “new” waste is being produced. Additional waste provided in the organics program will simply result in less material travelling to landfill in the MSW program. The most cost effective solution is co-collection for Garbage/Organics and Recyclables/Organics alternating every week or possibly extended to collection every two weeks.

Administration of the waste management system, including public education/awareness and program development is also a part of the Regional District’s responsibility with respect to the solid waste management function.

2.2 Financial Evaluation

The first task undertaken was a cost analysis of the current waste management system to provide a baseline cost profile. The development of this baseline cost profile included the consolidation and review of waste tonnages by category, a review of existing waste collection and disposal services and costs, and the development of a waste management cost profile on a “**cost per tonne of waste managed**” basis.

As the average cost per tonne of MSW has historically been calculated annually it was evident that a significant variation is seen year to year independent of the total tones processed. This can be seen in the latest version of the PRRD Waste Export Costs Report and Annual Summary

(2011). As a result, the average of the last 5 years of costs provides a more representative comparison as the base case model for the status quo disposal option. It was assumed, based on the information given, that Augusta Recyclers currently charges approximately $28/T MSW for handling (transfer station and barge-loading). An additional $134/T is paid for freight (shipment to Washington approximately 770 km) and disposal at RDC (Roosevelt Development Corporation), the operators of Rabanco Landfill. The total average cost of disposal over the last five years is approximately $162/T for MSW. This does not include green waste which is collected and processed separately at a tip fee of $45/tonne (excluding stumps > 1’ dia).

In order to determine the fraction of the waste which can be included in the calculation used to compare the current cost for disposal and the options for exportation to an existing facility or self-processing within the PRRD, review of the regional Solid Waste Management Plan is required. Specifically the waste composition study of the MSW waste stream which was completed in 2008 should be considered and some assumptions made on the participation of the public at large with the new program. As shown in the figure below (pulled from the June 2011 update of the SWMP) approximately 43% of the Municipal solid waste stream could be classified as compostable. For the purposes of this report we have assumed that of the 43% of the MSW stream that can be composted, initially we can forecast a target of a 65% participation rate which should grow in the years following implementation by approximately 3-5% per year. With an average of 4,877 tonnes collected over the last 5 years, this works out to a total of approximately 1363 tonnes which we can expect to capture with the role out of a new program.

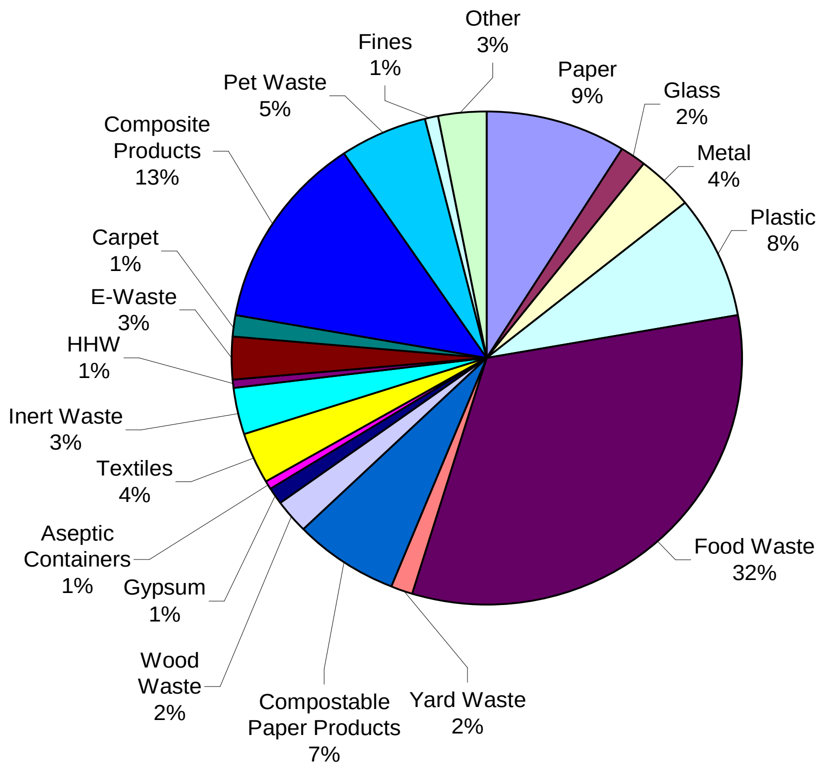


Figure 1: Estimated Composition of MSW Disposed of at the Transfer Station (2008)

It is also possible that some waste may be currently travelling outside of the current data collected for the SWMP as it does not pass through the transfer station and instead goes directly to disposal at an approved alternative facility. This is currently the case with fish waste which is generated at a commercial farm at Lois Lake and travels to an existing facility located on the Lower Sunshine Coast. It can be assumed that there may be as much as 200 tonnes of additional single source commercial organic materials that may be disposed of directly that would also likely contribute to the total available organic tonnes for composting if a competitive tip fee was offered. Clean construction waste has not been included in the totals as other markets exist for this material that is more cost competitive than composting. In many cases this material already has value as a fuel and would not be likely to collect a competitive tip fee at the composting facility. The same is the case for clean yard and garden waste which is not co-mingled with food waste. This will come from commercial generators or from homeowners directly as this waste stream is largely seasonal following spring and fall clean-ups. This material will also not command the same tip fee as the MSW fraction as it is much easier to process which is why it is currently disposed of for only $45/tonne. For the purposes of consistency with the existing disposal option for this material we have kept the tip fee for green waste independent of the materials we are targeting through the curbside and commercial organics program.

Table 2-1: Summary Estimate of Available Composting Feedstock Used for Facility Capacity Sizing and Financial Evaluation

Waste Break Down of Assumed Initial Design Capacity	Total Tonnes Expected/Yr
Organics Collected from MSW Fraction	**1,300 - 1,500**
Commercial Organics Outside of SWMP Data	**200**
Yard Waste (Focus will be on wet waste as other markets may pull select waste to be utilized as fuel)	**300 – 1,400**
TOTAL	**1,800 – 3,100**

2.3 Operational Evaluation

The current structure of the solid waste management system is straightforward; however with the rising cost of fuel and transportation, there is no guaranteed rate stability. It is estimated that the cost of fuel will more than double in the coming decade and this will likely have a negative impact on the cost of disposal for regional MSW due to the additional distance this material is required to travel. This has already become evident in larger markets including the Lower Mainland where tip fees have climbed from $65/T to more than $100/T over the past decade and are expected to exceed $200/T in the near future as existing landfills reach capacity. While rates can be lowered through the implementation of multi-year contract terms with fixed rates per household minimizing escalation risk, the same discounts can be provided for organics with significantly lower transportation costs for disposal.

The City of Powell River manages the operation of its own collection vehicle fleet and while there will be some operational challenges to face with the implementation of a source separated program, the close proximity of the residents and the existing waste/recycling collection programs would make the addition of organics collection the easiest to implement. Currently the waste material is disposed of at the Rabanco landfill and no effort is required for the running of a business or the distribution and marketing of an end product. The same hands off / low risk approach could be maintained if the processing of organics was outsourced to a private business which is typically the preferred delivery method for municipalities within North America.

3 Project Background

Net Zero Waste Inc. (NZW) was contracted by the Powell River Regional District (PRRD) to undertake an evaluation and comparison of the financial and operational implications associated with running their own composting facility when compared to other disposal or recycling options. The overall goal is to increase both the financial and environmental accountability and sustainability of the PRRD's organics management. The scope of work included a presentation on the range and suitability of the technology available, tours of existing operating facilities within the local area and an overall evaluation of processing and disposal options. As a result, this evaluation will provide additional tools to enable the PRRD to invest wisely in a new organic waste management solution.

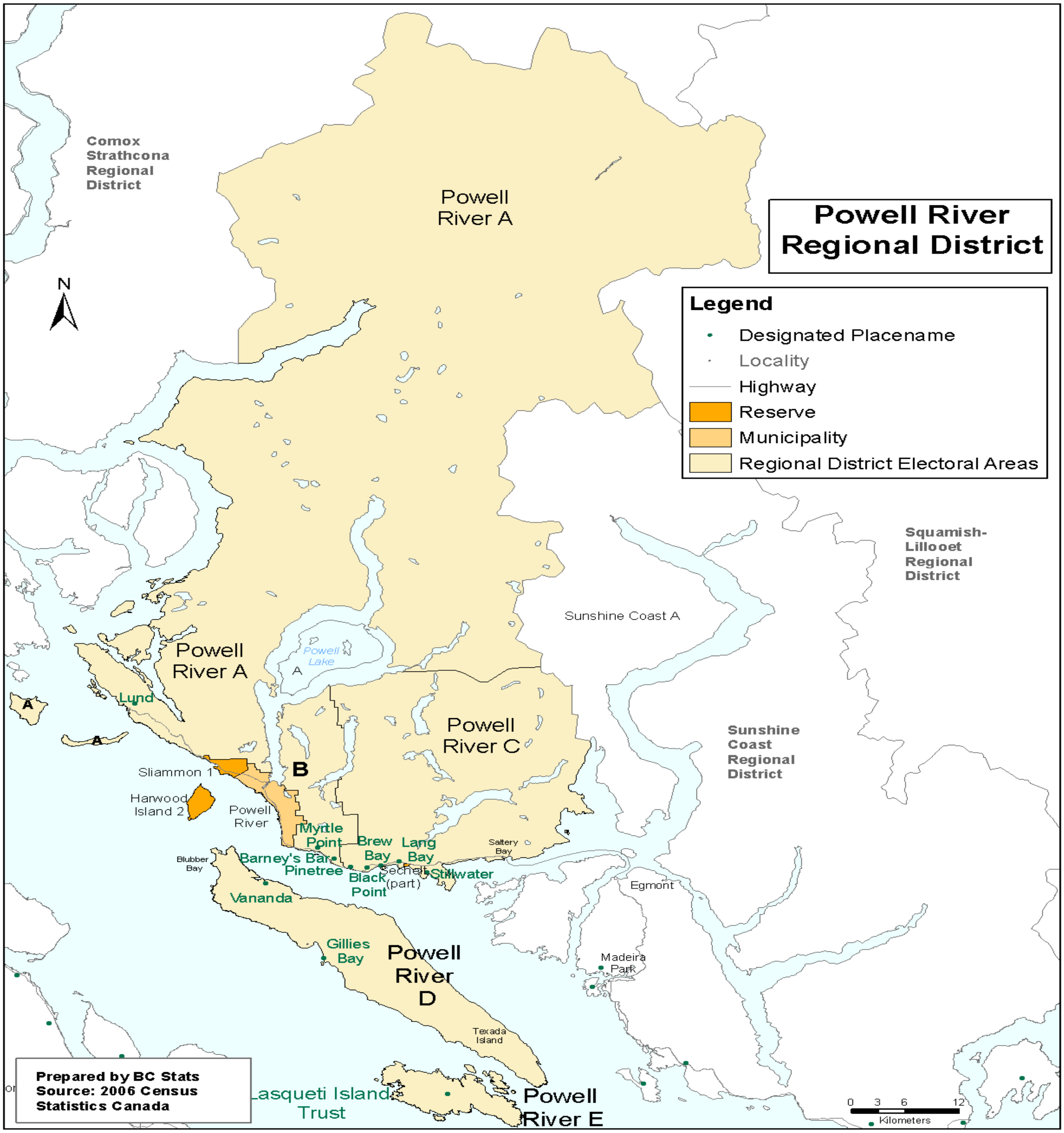
The various options were graded against one another on a cost per tonne basis, which highlights the impact the total tonnage diverted has on the camparison. For the purpose of this report a facility design capacity has been estimated at 2,500 tonnes per annum (TPA). This capacity will provide a good starting point for a blended processing of collected curbside organics co-mingled with yard and garden waste (at a lower tip fee). The price per tonne also has the potential to be considerably reduced, if additional organic material above the 2,500 tonnes/year is accepted for composting.

While it will be advantageous for the Regional District to explore options for securing additional materials for composting, it must be remembered that this potential will be limited by competition provided by existing processing facilities (Cumberland / Comox and Sechelt) which are also targeting the same organic inputs. A wide range of materials exist locally from bio-solids to fish-waste to food waste, however with a system of the small capacity required by the PRRD, it will be difficult to process different materials independently. This can present a challenge for small scale facilities who desire to process bio-solids separately from food waste so as to produce two distinct end products (one tailored to landscaping applications and the other for food production). Comingling the waste streams and a less desirable end product may also be a necessary sacrifice to consider as a potential reality should the local processing option be determined as the best path forward. For the purposes of this report we have not allowed for the inclusion of bio-solids in the organic waste managed at the facility.

It is anticipated that other factors will influence the final decision with respect to the Regional District's organics management approach. Principle among these factors will be the ability of the Regional District to secure a long term waste transfer and processing contract to an existing facility with pricing that is below the other options. Preliminary pricing has been provided with the most competitive price option provided by the newly expanded facility in Sechelt. As the Regional District takes further steps to increase the levels of waste diversion from landfill, the composting of organic material will likely be an important factor to achieve these targets. While the construction, implementation and operation of its own composting program could greatly enhance its diversion rate; if insufficient tonnes are captured this could come with potentially prohibitive facility operating and maintenance costs. As a first step, the diversion of low hanging fruit to an existing facility provides the lowest risk solution, and would allow the region to gain an understanding of how much waste is available to be recycled before risking an investment of an additional $700,000 in infrastructure / facility development costs. Despite where the waste is processed, additional costs associated with the implementation of an organics diversion program will also include the addition of modified collection routes and potentially the purchase and maintenance of a new split collection truck or a modified version of an existing truck out-fitted for organics collection. There is also the cost of organic curb side bins and kitchen catchers and the need for additional bylaw enforcement and community education until contamination is no longer an issue. Some of these costs can be offset by equivalent reductions in service for waste collection and or a higher tip fee for waste dropped off to subsidize the organic fraction and encourage participation.

Finally, there is inherent risk to operating a publicly owned facility associated with public appeal and permitting. This report serves to outline the options available to the Regional District so that an educated and balanced approach can be utilized for implementation so as to optimize funding to areas that will provide the best value to residents and tax payers of the region.

Figure 2.. PRRD Map



4 Approach

Net Zero Waste undertook a comprehensive cost and operational evaluation of the two options outlined above, and compared the results to the existing waste management system. This comparison was based on an assessment of:

- tonnages handled through the waste management system
- range and level of services provided
- administrative and other overheads associated with the solid waste management program
- additional costs and operational considerations related to the two options evaluated

Several discussions have been held with staff and members of the Composting Advisory Committee in order to establish and understand the specific areas of interest, as well as to collect data on the potential sites which exist for the proposed composting facility. Following the project kick off meeting which was held at the Powell River Regional District office, potential facility sites were visited. Various key parameters were investigated, including potential site synergies with existing infrastructure, utilities, potential processing building placement on site (facility dimensions), layout, buffers and the hauling distances from the primary waste sources to the site.

Members of the Compost Advisory Committee also travelled to view existing compost operations of comparable capacity so as to gain a comprehensive understanding of the scale and scope required for handling this type of waste stream. A biosolids facility was visited in Chemainus, which processes approximately 12,000 TPA of comingled bio-solids, dairy waste and grease trap waste with recycled green waste. They have expanded their capacity three times since opening and remain sold out of their Class “A” compost end product every year. A food waste and green waste facility was toured in Nanaimo with a capacity of more than 100 tonnes per day. This facility has successfully processed food waste for the Regional District of Nanaimo since April 1st, 2004. Finally a bio-solids facility at the Pigeon Lake Landfill / Comox Valley Waste Management Center (Cumberland, BC) was toured. This site utilizes a combination of a concrete tunnel / bunker type controlled processing system with aerated static pile finishing and open windrow curing to manufacture a “sky rocket” soil product. They are sold out of this compost annually (see growth comparison shown below)

August 2009 Report
Skyrocket Comparative Beds

Top Soil | Fish Compost | SkyRocket

As all of the facilities toured were much larger than what can be utilized with the waste volumes produced within the PRRD, it was determined that a much smaller facility be toured in Sechelt, BC. At that location a pilot project has been in operation for 18 months whereby approximately 500 tonnes of fish waste are mixed with 2,000 tonnes of green waste. This facility is currently in the process of expansion to a capacity of approximately 10,000 TPA which will allow them to process organics at a competitive price point. Once the requirements of the compost facility are established, a preliminary conceptual design can be developed, and a preliminary opinion of probable cost completed. As many of these costs are site specific and can be minimized depending on the location selected, only a generic capital cost estimate was available at this time as a site has not yet been selected. The details of the evaluation process are discussed in the following section.

5 Technology Review

There is a significant difference between the use of a proven / advanced technology and a new and emerging technology. There are many new and emerging technologies which may be successful at processing organics but which have not yet been constructed commercially on a wide scale. While these systems may provide valuable solutions for source separated organics in the future, the level of risk associated with implementation of technologies of this nature is significant enough for us to only consider proven systems. A proven system is one which has been implemented in numerous locations and utilized with a variety of feed stocks successfully.

All of the proven systems selected were compared to an Open Windrow model which would operate on an impervious pad. While this type of facility is limited by precipitation, temperatures achieved and other environmental influences, it provides the simplest solution and historically the lowest cost for processing. A facility of this type has limited leachate control, which typically limits which types of wastes can be processed. While some developing nations still allow this type of processing at certain locations (eg. near landfills), most operations within North America limit open windrow processing to green waste feed stocks. Operating costs are in the neighborhood of $20-$25/tonne for a facility with a capacity of at least 20,000 TPA or more.

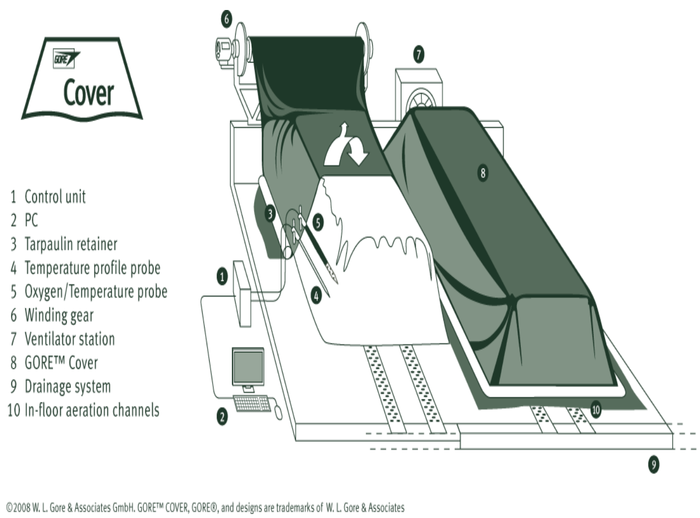
Uncovered Aerated Static Piles were included in the comparison as they are aerated and have improved temperature and moisture control. Blowers are used to ensure aerobic conditions within the pile however this also has the negative side effect of increasing odours. These facilities are more space efficient in terms of material processing due to a reduced process duration however there are only minor capital cost savings. It can be expected that operating costs for a facility of this nature will be approximately $35-$40/tonne however with significant limitations associated with vector and odour control, this technology is typically not utilized for the processing of food waste or other difficult to handle organics considered in this report.

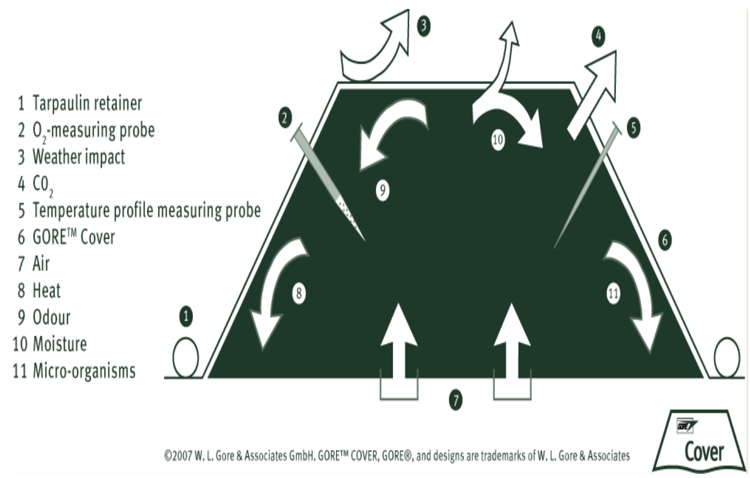
5.1 Gore Cover System Technology

The GORE™ Cover System, manufactured by W. L. Gore & Associates, utilizes a specially designed cover to create an enclosed system that optimizes the composting process. Today, their enterprise is comprised of approximately 7,500 associates in 45 locations around the world. Annual revenues top $3 billion USD.

As the GORE™ Cover System composting process has no moving parts itself and is not very sensitive to contamination this system is flexible and can cope with widely differing waste streams. The GORE™ Cover System provides the environmental and odour control benefits of a typical "in-vessel" system without the cost of a permanent structure or the need for bio-filtration of process air. The typical components and equipment utilized in the GORE™ Cover System facilities is as follows.

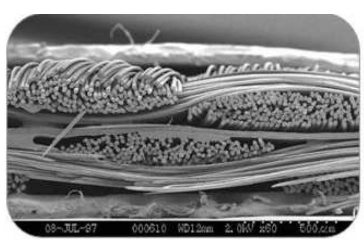
- GORE™ Covers
- Aeration System: Trench/Pipes & Aeration Blowers (1 per heap)
- Control System complete with Oxygen and Temperature Sensors
- Control Units plus Computer and Software

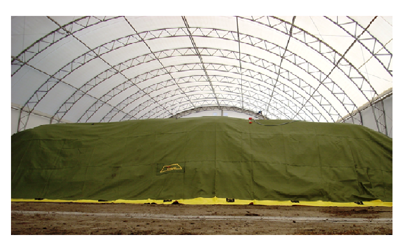




Positive aeration drastically reduces utility operational costs (less than 1kWh of electricity per tonne of compost). The Gore Cover 2Hp blowers are on for approximately 2 minutes every 10. In comparison, "Negative Aeration Systems" must have their blowers on 24 hours a day 7 days a week to prevent negative odour events. Compact design results in a drastically reduced facility footprint and a 400% improvement in throughput from conventional windrow systems. Installed in more than 200 plants in 26 countries worldwide, the benefits of the Gore Cover System have been realized by a growing number of facilities.

GORE
Creative Technologies Worldwide





5.2 Orca Drum In- Vessel Composting System

This system incorporates the use of an Orca drum technology (at 4 RPH) to mix and prepare the material prior to moving the compost outdoors for processing. Negative operating impacts associated with the drums can include pitting due to corrosion affects associated with the waste. There is also the maintenance of the drive shaft and motors that rotate the drums and regular oil changes and servicing that must accompany this system. Due to the experience seen at the facility in Nanaimo it is expected that the drums will need to be replaced every 6 - 8 years at a cost of up to ($250,000/drum).

Orca drums are manufactured to 10’ x 50’ and 15’ x 75’ lengths. The large drums can process 100 Tonnes per day, and the small drums 30 tonnes/day. Typically the drums hold the material for 3 – 5 days at the start of the composting process. The drums are held on saddles and use a friction reduction plastic (UHMW) to be rotated about their longitudinal axis. Polyurethane foam is then sprayed on the drum surface to help maintain the temperatures within. The Drum itself is driven by a 10 horse power variable speed motor. Maximum speed is four revolutions per hour (typical is 1/hour).

Material comes out of the drum and is deposited into a subsequent negatively aerated bay. This presents a potential bottleneck for the site as material coming out of the drum after only approximately 3 days at temperature will be odourous and will need to be managed under negative air to avoid fugitive odour emissions. Negative air systems need to be run continuously to minimize off gassing which can also represent a significant power draw on the overall facility. The exhaust system that is attached to the rear of the composter collects process gasses through suction which is then processed through a 15x40’x4’deep bio-filter. Following the negative air “finishing” phase material is moved to an outdoor, aerated static pile curing area. ICC uses a dual screw supreme 700 mixer for front end processing of commercial organics and a slow speed grinder for the pre-processing of green waste. This system has been successfully composting organic waste since 2004 and is currently being marketed to other communities around the world. While competitive on a larger scale, even a single small drum will far exceed the processing requirements of the PRRD. As all material must travel through the drum where temperature controls and data can be logged to ensure compliance with the OMRR (Organic Matter Recycling Regulation of BC). It should also be noted that the separation of different waste types would not be possible which is also not ideal when evaluating the viability of a small market system.

5.3 In-Vessel - Christiaens Controls Group

While examples of this technology are difficult to locate on a small scale, one of the smallest has been constructed locally in Comox, BC and is successfully operating at capacity processing Comox Valley Regional District (CVRD) bio-solids and producing a soil product ('Sky Rocket') which is selling in high demand. On a larger scale the design and construction of a facility for Hamilton was completed for approximately $31.5 million CAD (60,000 TPA Capacity). This included over $5.2 million in Millennium funding from the Province of Ontario. Most systems of this kind will require 14 days in phase 1 and 14 days in phase 2. This process does not produce any wastewater and uses very little domestic cold water. Christiaens is able to process bio-solids (sewage sludge), household waste and yard and garden waste however as in the previous example all items would need to be comingled during processing for a small scale system.

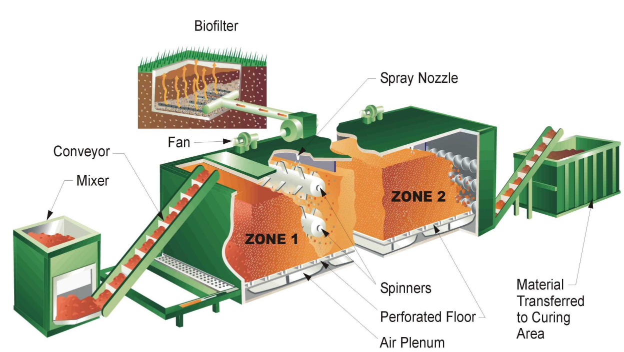
The technology utilizes a servomotor to control airflow, with exhaust air transported to the odour control system. The system measures and records oxygen consumption, water evaporation, total emitted energy, total circulated air and the water content of composting material. Water management systems are used to humidify the process air using an acid scrubber prior to sending it to the bio-filter. Process water is also used to moisturize the compost within the tunnels to ensure optimal decomposition.

5.4 Wright Environmental

While this technology was not visited during the site tours due to the logistics of travelling to the nearest BC facilities (located at the UBC Campus or near Whistler in the Callahan Valley). This technology remains one of the best systems available on the market for managing small volumes of waste in a controlled environment.

It is comprised of a fully enclosed flow-through tunnel system which is able to transform organic wastes such as meats, fish, dairy products, fruits, bio-solids, wood and paper wastes into a fine soil-like material in a 14-day period. (with 4 week minimum aerated curing post processing)

This system is considered In-vessel and is designed to be fed continuously. Each tunnel is lined with stainless steel and is comprised of nine sections; a loading section, three common sections, a spinner section with rotating spinners to blend materials, three more common areas and a discharge section with a series of breaker bars and an auger to remove materials from the tunnel onto a discharge conveyor (below). The exhaust fan is located right on top of zone 1 and the system is a negative air system. Air is always moving from the back to the front of the system (additional spore contamination control). This system comes complete with a fully automated control system, with air and water recirculation and data capture.



The stainless steel spinners are fast moving at up to 250 rpm and leave a void after the material passes. A hydraulic ram pushes one of 12 4'x8' perforated floor sections forward at 2"/min. The roof of the vessel has a sliding door, which is used to load incoming feedstock. Leachate drains through the floor sections allowing processing of rich waste streams. It is then pumped to the top of each respective zone to prevent cross contamination. This system also has the added benefit of being able to produce a bio-fuel through the use of an air to air heat exchanger. This additional end product is very effective in removing the seasonality of the compost market.

5.5 Technology Review Conclusions

A series of evaluation criteria were utilized to provide a comparison between each of the various systems which were either reviewed locally and or determined as proven technologies suitable for comparison in the below matrix. Each system was reviewed based on a qualitative approach and through experiences gained when visiting existing and operating facilities. It should be noted that there has been no weighting of any of the evaluation criteria and each line item carries the same potential of a maximum of +2 points and a minimum ranking of -2 points.

The first section of criteria is associated with costs related to the proposed technology. These costs have been separated into capital, operating and land based requirements which will impact either the size of lot required to be purchased or the lease rate of the future facility (based on number of acres required for processing). A range of operating costs for each type of technology was considered at the desired capacity of 2,500 tonnes which is important to note as some systems have higher upfront infrastructure costs yet become cost competitive at higher capacities. Specifically, it was analyzed how the costs associated with each type of system compared to the other technologies being evaluated.

While each of the systems reviewed has been implemented on a commercial scale in North America, the likelihood of opposition to siting a waste management process within the community was considered. This includes the type and complexity of the equipment required for operation and the likelihood that skilled and qualified mechanical servicing is likely to be available in a remote location such as Powell River. Any technology which contains a large number of moving parts will inherently require additional maintenance and servicing which adds a level of risk to the operation, especially over the medium to long term.

Most advanced and proven composting systems have either got experience with the feedstocks discussed in this report or would be able to handle them provided the appropriate porosity, C:N ratio and moisture content are maintained. Expansion must also be considered as it inevitably could occur at almost every successfully operating compost facility over time as populations, participation and capture groups increase. It must be possible to expand a system while maintaining the existing operation and process flow. This can be more difficult for “in-building” systems with fixed walls and usually results with an oversized design capacity at inception. This is often related to the minimum throughput required in order to make a system of this kind viable. The process simplicity and costs evaluation criteria should likely have held a higher weighting than some of the other categories as these areas appeared to be a priority for the PRRD, however the end result would have remained the same with the <u>Gore Cover System</u> earning more points than any other technology.

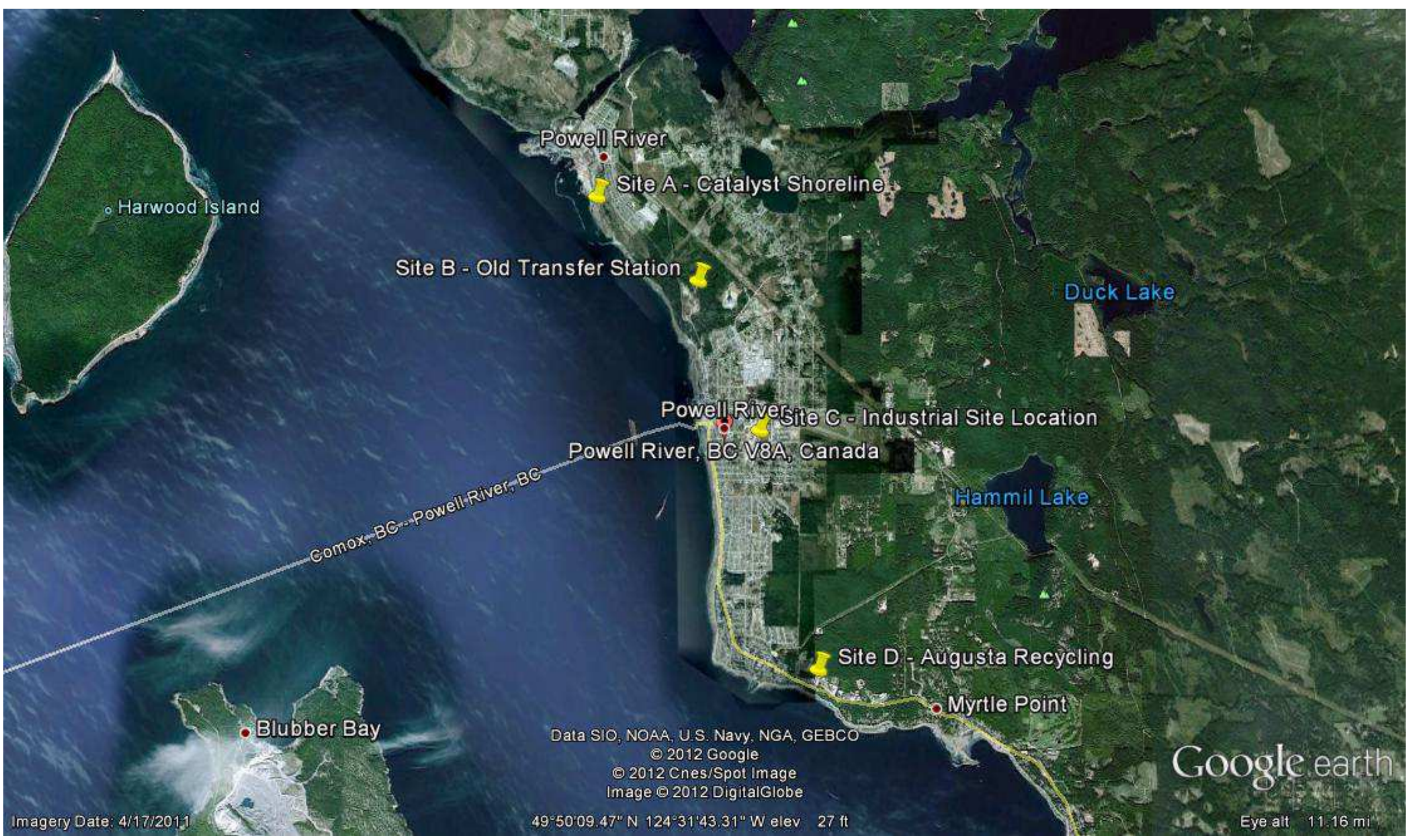
LEGEND	(no color = 0 points)		
[red]	2 points	[grey stripes]	-1 point
[red stripes]	1 point	[black]	-2 points

	Evaluation Criteria	Static Pile / Turned Windrow	Uncovered Aerated Static Pile	GORE™ Cover: Chemainus System	Concrete Bunker / Biofilter: Comox	ICC (Orca Drum Technology): Nanimo	Wright Environmental System: Whistler
Cost	Capital cost	2	1	0	-1	-1	-2
	Operating cost	0	1	1	-1	-1	-2
	Land base requirements	-2	0	1	0	2	1
Public Acceptance	Ease of Siting	-2	-2	1	1	1	1
	Reputation	-2	-1	2	2	1	0
	Proven	2	2	2	2	2	2
Process Simplicity	Process Duration (To Sale)	-2	0	1	1	1	1
	Front end processing req'd	2	1	1	1	0	-1
Products	Process control	0	-1	2	1	1	1
	Product quality	0	1	2	2	2	2
	Market value of product	0	1	2	1	1	1
Feedstock Variability	Yard and Garden	2	2	2	2	2	2
	Food Waste	-2	1	2	2	2	1
	Bio-solids / Manure / Mortalities	-2	-2	2	2	1	2
	Mixed MSW	-2	-2	2	1	0	-2
Flexibility	Adaptable to seasonal variations	-2	-1	0	1	2	2
	Ability to expand	2	2	1	0	-1	0
Environmental control	Leachate control	-1	-1	1	1	0	1
	Odour control	-2	-1	1	1	0	1
	Vector control	-2	-2	1	2	2	2
	Overall Rating	-2	-1	2	1	1	0
	TOTAL POINTS SCORED	-11	-1	27	20	18	15

6 Potential Local Site Availability (Site Review)

As no site has been officially selected by the PRRD for the home of a future composting facility at this time, significantly more work is still required before a site *can* be selected. Site selection often involves the review of multiple locations and the investigation into the suitability of potential land and existing structures. Once an ideal site has been selected, a re-zoning process will need to be pursued which will include public hearings and an educational campaign. Following the successful approval from all parties involved in the process, a facility design would need to be finalized and a contractor selected for construction. A notice to operate would also need to be filed with the Ministry of the Environment no less than 90 days prior to commencing operations. No less than 1 year should be budgeted as a reasonable implementation of this site selection process should the PRRD wish to pursue the construction of a local facility.

In the following section, a number of sites were presented to NZW during a single visit to the PRRD in February 2012 for consideration in this report. These 4 sites have been outlined below with the advantages and disadvantages of each highlighted for consideration. A similar discussion and comparison should be held when a more comprehensive site evaluation is completed that also includes any future site options presented in the months and years ahead.



6.1 Site A - The Catalyst Paper Shoreline Location

Advantages

This site provides adequate capacity (2-3 acres) with the added benefit of existing asphalt and utilities in place. Finding this type of existing infrastructure can drastically increase the viability of the implementation of a small scale facility by lowering the capital required for construction. At this location, additional provisions could be taken to enclose the entire system through the erection of a building with a biofilter which would also ensure that no odour impacts are felt by the adjacent community. The installation of a small scale system at this location would be much more cost effective than at a “greenfield” site where no infrastructure exists. There appears to be power, which further limits infrastructure costs required for a facility to be constructed. Additional site advantages / synergies could include; site security, fencing, office space and potentially the use of an existing scale. A significant stockpile of wood waste also existed on site presumably for use in the adjacent Mill. Any wood or other organic waste produced on the same site could be included in the financial model and save any hauling costs associated with disposal at another location. A compost operation may also present a unique opportunity to partner with the mill to limit liability associated with wood or other organic waste stored on site.

Disadvantages

This site location is on the waterfront which is not ideal for wind borne odour propagation. While the mill was known to have previously produced a foul odour in the past, the community may elect to redevelop this site or other waterfront areas nearby for commercial or residential uses. Confirmation from the City of Powell River Planning Department and public support for organics processing at this site are paramount prior to its consideration. Access to the site could conflict with other operations which may be planned for the site (which is considerable in size). It was not possible to evaluate the potential road access to the site as it was not determined how vehicle traffic would arrive at the facility. The road that did exist was in poor condition and would need to be upgraded before accepting waste vehicles and public drop off traffic.

6.2 Site B - Old Transfer Station Site

Advantages

This site appears to be of more than adequate size to house a composting facility of the capacity required. As outlined in the financial evaluation section of the proposal it was determined that approximately 2 acres would be required for processing and storage of finished compost and there are numerous areas on the site that would allow both a compost facility and other selected uses to operate on the same site. A large paved area also exits on site which would serve as an ideal screening and load out area. Adjacent to the paved area there is a raised loading platform which was previously used to upload waste transfer vehicles and could now be used to load out compost. The site is ideally located in the center of the City minimizing the disposal hauling costs, however if split collection vehicles are utilized, half full vehicles would still need to travel to Augusta for uploading the remaining municipal solid waste to the Washington State landfill unless this task was also relocated to this site.

Disadvantages

While the site does present a centralized location with some natural buffers and vegetation, it will present a high potential risk for numerous communities with people impacted in almost any wind direction. Additional design considerations can always be implemented to minimize the potential risk of odours generated from site however there will always remain risks associated with operational disruptions or "human error". While errors of this nature occur very infrequently, each community has its own level of tolerance for these violations. While it may be possible to combine a compost operation with a greenhouse (heated with waste heat energy generated during composting) on this site, public hearing and a re-zoning would need to occur to determine public acceptance before moving forward. The possible implementation of a pilot / demonstration program could take place to show the public there will be no negative impacts.

6.3 Industrial Site Location PRRD Core

Advantages

This site is centrally located and of suitable size (2 acres or more) for a facility of the required capacity. It already has site fencing, some office space and a small covered and paved section. While the building is in poor repair, the partially covered area could be used for processing with some minor modifications made to allow for suitable drainage and slope. The benefit provided by the existing infrastructure comes at a cost as this location is surrounded by other operating businesses. Typically compost facilities are located away from neighboring businesses as there can be impacts when no buffer is in place. There may be some synergies with other businesses in the area to aid in the operation of a pilot project for a fee. The volume of waste expected to be received by the PRRD facility is so small that a full time operator is not necessary. One person will likely need to be tasked with many roles and need to be responsible for the weigh scale, answering the phone and operating the equipment. A couple of part-time staff will need to be available for select assignments or during high volume periods. It may be possible to lower operating costs through a partnership with an existing business (i.e. Sunshine Disposal) in the area that has a small operation, flexible work hours, staff synergies and similar equipment however further investigation is required.

Disadvantages

The largest and most significant disadvantage of the site is its lack of any buffers. It is located in an industrial setting with operating businesses on all sides. The site is not particularly large and while it would meet the needs of the compost operation, additional space for storage of amendment, curing and blending compost is always a benefit when possible. Should a program become successful and wish to expand capacity, this site may ultimately prove to be constrained by its inability to expand beyond its borders. Expansion and a lack of excess space often impacts operations and can result in the production of odours as piles are forced to be relocated (congested site organization) prior to when they are finished curing or when ideal ambient conditions do not exist.

6.4 Site D - Augusta Recyclers (Processing / Transfer)

Advantages

Of all the sites reviewed this location contained the most synergies with existing operations and seemed the best option available. The site currently functions as an uploading / transfer station and also currently handles the yard/green waste collected in the area. Suitable equipment exists on site for handling large volumes of material and this equipment could manage a compost operation with only a few additional components required. A more detailed investigation would be required with the consent and mutual agreement of the owners on a plausible path forward, however in only a short time provided on site, numerous site design options were considered. A small building located on a paved pad exists in the upper elevation of the site which could provide a suitable location for processing. This simple structure could be extended and provide the covered processing area required to operate a small facility suitable for the regions organic waste. Some existing equipment may need to be relocated and some minor leachate considerations may be required, however these are not expected to be excessively large costs.

As all of the MSW waste currently travels through the Augusta site, it also provides the added benefit of a single drop off point for split collection vehicles. This will help to ensure that minimal costs are added to the current collection system.

Disadvantages

Craig Long of Augusta Recyclers was contacted and asked about the suitability on this site. A previous experience already exists for this site as it was previously suggested as a possible location for processing / handling of bio-solids. While this is a much more difficult feedstock to handle, the proposal received significant opposition at the public hearing including concerned residents from neighboring Toba Street and up to 200 protestors. The role out of this site as a possible processing location would need to be handled with care and a processing “pilot” project considered to ensure support while demonstrating no negative impacts to the community.

7 Project Objectives

Based on the project requirements and discussion with the PRRD Compost Advisory Committee, two options were identified for evaluation from a financial and operations perspective and were compared against the existing cost model for disposal which is estimated at $162/T for Municipal Solid Waste (MSW) averaged over the past 5 years.

Currently, the region disposes its organic waste as a component of the MSW stream, co-mingled with the remainder of municipal waste which is sent to the Rabanco landfill located in South Central Washington. Waste is barged down to the Mainland where it is loaded onto trucks and long hauled by train to the site. Yard and Green Waste is currently received at the Augusta site where dry material is ground and exported as bio-fuel. Wet Green waste which accounts for approximately 20% of the total green waste collected has caused a problem recently as it is too wet for use as a bio-fuel. This green waste could be utilized within a local composting facility or could be exported along with other SSO pulled from the MSW waste stream to be processed at at an existing facility. The two options evaluated were as follows:

7.1 Option 1 – Potential Contract for Organics Export to Existing Facility

PRRD will consider a contract with one of the existing compost facilities located close to Powell River. Quotations will be obtained from each of the potential facilities and the hauling cost calculated to determine an approximate all in cost of disposal. Specific terms which may make this option more desirable for the needs of the community include the quality and efficiency of the composting operation as well as the provision included for competitively-priced compost availability to the PRRD.

7.2 Option 2 – Construction and Operation of a Regionally (PRRD) Owned Composting Facility

The Regional District would like to evaluate the option of constructing and operating its own organics composting facility or to co-develop one in partnership with a local business. In order for a full consideration of this option, a potential site has to first be identified so that a more accurate preliminary cost estimate and design concept can be developed.

In addition to the two options identified above, the current waste management services contract was also discussed and is a variable which must be considered as the baseline for which other options are compared on a per tonne basis. The Regional District would like to factor in potential changes to contract pricing as part of the evaluation, and also identify areas where changes to the contract services could better support their organics management strategy.

8 Evaluation of Potential Contract for Organics Export

8.1 Description of Proposed New Contract Services

As noted above, the PRRD is interested in pursuing other available options for the processing of Source Separated Organics. Quotations have been requested for budgeting purposes at each of the potential organic processors identified within the local area. These facilities include two existing food waste composting facilities at International Composting Inc (Nanaimo) and Salish Soils (Sechelt) and one bio-solids processor who has recently expanded to allow the processing of food waste (Chemainus). This study has not included an evaluation beyond these “local” small scale facilities, however other options including the potential for export to Metro Vancouver by Barge should be considered through a competitive bid process. The below terms have been consistent for each request and should be included in any binding contract negotiations.

- A five year contract term with option to expand to 10 year term
- A single charge per tonne for organics, uncontaminated by significant quantities of plastics or metals
- Unacceptable contamination is considered more than 20% by volume or 3% by weight
- A charge of $0/tonne for contamination removed by the processor, provided contamination levels are not exceeded.

It has been suggested that the PRRD request (as an option) to have a right of first refusal to utilize approximately 0.25 - 0.5 yards of compost (re-purchased) for each tonne of organics brought to the facility at a pre-determined and negotiated rate. This will allow the implementation of local community initiatives from gardens to greenhouses as well as provide soil for use in local parks and by city crews. Soil repurchase programs allow the regions participants and local communities to reap some of the fruit of their labour by utilizing the high quality end product possible through their recycling efforts. Pricing should be requested at the time of negotiation for the disposal contract to ensure the best rate per yard is provided.

Compost to be supplied to the Regional District can be assumed to be screened and tested and essentially ready for sale, manufactured to specification. Soil would likely be provided annually at the beginning of the growing season to minimize the need for excessive local storage by the Regional District.

8.2 Financial Evaluation

The changes to the tipping fees resulting through the disposal of organics at various locations in the region was evaluated and applied to the baseline cost profile. Not included in the below analysis is any additional cost associated with hauling finished compost from each location back to a suitable site in Powell River. It may be possible to have these costs minimized through the use of a backhaul (possibly in the cleaned out trucks which were utilized to deliver the waste). All costs were converted to a “cost per tonne of waste managed” basis for ease of comparison. Table 8-1 summarizes the different options associated with each disposal site. Apart from some other program implementation costs omitted from this comparison which still need to be determined; it appears that the potential exists for immediate savings through the implementation of an SSO program. By providing a lower cost of disposal for organics both through the tip fee and a reduced haul, the region can improve diversion while optimizing the total waste management system costs.

Table 8-1: Cost Profile for New Organics Management Contract (Pricing Options)

ITEMS (PRICED PER TONNE)	**ORGANICS COSTS (SALISH SOILS)**	**ORGANICS COSTS (CHEMAINUS)**	**ORGANICS COSTS (ICC)**
Estimated Tip Fee	$79	$85	$90
Transfer Costs	$28	$28	$28
Hauling Costs, Admin, OH	$25	$30	$25
Ferry Cost to Disposal Site	$16	$32	$32
Overall Annual Cost/tonne	**$ 148/tonne**	**$ 175/tonne**	**$175/tonne**

The cost estimate provided by City Transfer to complete the haul to Sechelt was $1,100 for a 27 tonne fully loaded vehicle: $560 transport (7 hrs. round trip at $80/hr); $400 ferry cost; $140 taxes, admin, overhead and profit. Currently, City Transfer is barging MSW to Surrey where it is then trucked / train long hauled down to Southern Washington. While the waste travels significantly further to go to Washington, the major difference in cost between the current practice of transportation is associated with a regularly scheduled barge which City Transfer operates to the mainland as compared with the BC Ferries costs to Sechelt. This is also what adds significant costs when considering a trip to Vancouver Island for processing as the ferry cost must be added for both directions of travel.

While the scope of this study did not allow for detailed investigation into alternative transportation routes, the potential exists to drastically lower the cost of transport to Sechelt, which may exist through a similar barge-transportation option from the PRRD to the Mountain View Terminal in Sechelt only blocks away from the Salish Soils processing facility. Key to this process would be to determine a suitable backhaul which would help lower the overall delivery cost per tonne. As the transportation costs equate to nearly half of the disposal cost, the potential also exists to lower costs through investment in transportation equipment which can be easily divested if a program modification and local processing is determined as a preferred option at a point in the future. With an investment into a truck and walking floor container, it may be possible to decrease hauling costs from $41/Tonne to as little as $30/Tonne, however fixed costs would remain for the driver, fuel and ferry. A similar savings could also be expected for the transfer station costs currently carried at $28/tonne, if some of the improvements required for organics processing were paid for by the Regional District. This could result in a long term partnership with Augusta for organics transfer at a reduced rate of $15 - $20/tonne. These types of investments could lower the total cost of disposal to below $129/tonne. Conversely, an increase in pricing rates at BC Ferries also provides the potential to negatively impact the cost of disposal. Dry green waste and clean construction waste has not been considered in this program as it is currently disposed of locally and utilized as a fuel source at a much lower disposal cost. Contaminated Construction and Demolition Waste has not been included in this program as it is unsuitable for composting. It is also exported to the Rabanco landfill in Washington State at a premium of approximately $200/Tonne.

There may be limits associated with such a small market and the lack of strong competition in a competitive bid, however savings of some kind will likely be obtainable through a combined back-hauling of finished compost or mine products produced at Lehigh for use by the PRRD. This capital expenditure model could be explored in further detail and a more detailed evaluation of the volume of soil and mine products that could be utilized within the region and the additional benefits this would provide through a highly discounted delivery. Some costs would have to be included in the back-haul so as to cover for the cleaning out of the vehicle to limit cross contamination from unprocessed organic wastes before loading with soil or mine products.

If the current pricing quoted for freight and tipping is used and if the cost of the transfer station fee is equalized between both disposal scenarios, it appears that current “cost of disposal” (transportation and tipping) averaged over the last five years is approximately $162/Tonne using the current disposal model. The closest disposal option for organics is at Salish Soils where curbside organics can be disposed for approximately $79/Tonne. The price of freight to and tipping at Salish Soils are opinions of probable cost provided by City Transfer and Salish Soils respectively and should be used as budgetary pricing only as firm lump sum pricing is still required. There are several mechanisms which should be utilized to obtain more competitive pricing including an Expression of Interest (EOI) and ultimately a competitive bid / RFP for both collection and processing so as to finalize the PRRD's organics recycling program. There is also the potential for cost cutting through capital expenditures whereby the Regional District purchases their own long haul vehicles or contributes to the upgrades required at the transfer station so as to minimize fees in these areas. While Augusta Recyclers are currently charging $28/Tonne for transfer, a typical transfer station in the Lower Mainland charges $15/Tonne which is likely associated with the smaller volume of waste handled. It is also assumed that the quotation for the cost of transport 104 Km's to Sechelt of $41/Tonne can be made more competitive when compared to the cost of transport a considerably further distance (770 km's) to the current disposal site of RDC for $58/Tonne. These costs may be lowered by negotiating a back haul of soil or mine products which can be utilized within the PRRD or through a competitive bid process.

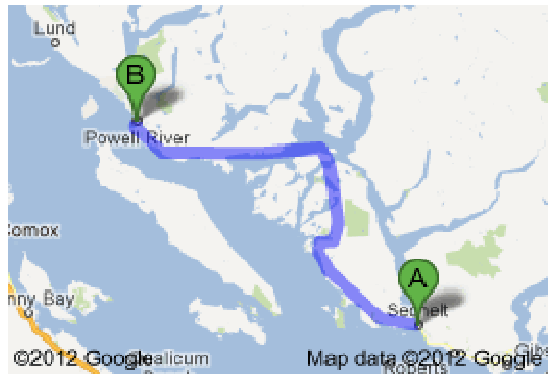


Figure 3. Land Route from PRRD to Sechelt

8.3 Operational Evaluation

As waste will continue to require disposal, a continued contractual relationship will remain between the Regional District and Rabanco. This relationship helps to maintain the current low level of operational involvement on the part of the RD. The same stress free situation would exist with the subcontracting of the processing of organic wastes to another regional facility. No negative impacts would be felt if lower than expected volumes of waste were seen out of the gate and if contamination levels were higher than expected, appropriate education of the public could be completed to ensure that these levels decrease prior to the construction of a locally funded facility by the Regional District. There is also a need to consider existing landfill disposal costs and the likelihood that these costs will continue to rise. The cost of fuel is the largest variable associated with transportation to a location so far away from the Sunshine Coast, however a variety of other impacts could also present additional costs in the future should no action be made to maximize waste diversion. Recently a significant fee was added to all waste loads trucked across the Michigan border under the guise of a “security fee” that drastically raised the cost of disposal for residents of Ontario to a point where this is no longer a financially viable option for disposal. There can also be impacts associated with exchange rate variability or new policies associated with the importation / exportation of waste which can have a drastic cost impact and can occur on relatively short notice.

The transport of organics this distance is also not preferable with regards to Green House Gas (GHG) emissions and the harmful environmental impacts associated with this release. GHG credits are not a significant revenue stream (approximately $10 - $15/tonne) and fixed upfront costs are associated with securing this revenue for the project through validation and verification protocols required by the Pacific Carbon Trust. A significant amount of calculation is required in order to determine how many tonnes of Carbon could be offset through the implementation of a program of this kind which includes the distance the waste currently travels, where the waste is currently processed and if the disposal site (Rabanco Landfill) already has landfill gas collection infrastructure in place (which it does). It should be noted however that the carbon emitted in the composting option is significantly reduced from the status quo for disposal. This will result in the earning of GHG credits for whoever processes this waste stream which would be factored into the final tip fee provided by the processor. As the volume of waste to be processed by the PRRD is minimal it is unlikely that any additional revenue could be realized from the carbon credits earned at a facility as the fees associated with the validation and verification protocol are expected to be in the range of $40,000. The exception would be if the project was aggregated with another group of similarly sized projects and the revenue generated from the first few years of operations was used to fund the expense of setting up the program.

While the power consumed by each technology is likely to vary, the power consumption of the Gore Cover System has been estimated to utilize around 1KwH per tonne processed. This is among the lowest in the composting industry for processing food waste. While the composting process does not generate significant amounts of Methane or Nitrous Oxide, it must still be assumed that some is produced and these totals are then subtracted from the credits earned for the diversion. Studies which have been previously completed for composting indicate that a value of 0.004 tonnes of CH_4 and 0.0003 tonnes of N_2O are produced for each tonne of waste composted.

Currently, the majority of organic material collected is yard waste, with only a very small amount of commercial organics being captured for recycling. The Regional District is considering enhancing the delivery of the organics program by providing kitchen and curbside bins for residents to use for depositing food waste and other household organics. This is expected to drastically boost participation and increase waste diversion from landfill and with some education and marketing, participation is expected to be approximately 65% from project inception. Food waste typically has higher levels of contamination than yard waste, which typically consists of plastic film (bags) and other hard plastics. Metals can be removed relatively easily prior to or post-processing with a magnet on the conveyor prior to the grinder or after screening. Contamination levels are likely to increase significantly from what is seen currently in yard-waste, however are expected to average less than 1% of the total volume processed by weight annually. Food waste will also present a much higher vector attraction than yard waste and as a result provisions will need to be incorporated into the upstream handling of this waste prior to delivery at a facility. This could include the provision of bear proof curbside bins which may add cost but could be considered as an option, or a bylaw to direct households not to place the bins outside prior to 7am on collection day. Once again, it is important to remember that this organic waste already exists in the waste stream and if bears are not currently a problem for residents they are unlikely to become a problem once an SSO program is implemented.

Additional upstream costs could include capital associated with transfer station improvements which would either be a direct cost or could be reflected in a transfer fee by whoever preformed this scope. In the current model, we have carried the same transfer station fee as is used for MSW as organics should command an equal or lesser transfer fee than that for waste. As discussed earlier, it may be possible to reduce the transfer station fee if upgrades are paid for by the PRRD or if a negotiated contract for a period of time is secured for a grouping of services which may include transfer, hauling and disposal.

9 Evaluation of Construction and Operation of a Regionally Owned Compost Facility

9.1 Overview of Conceptual Design

This section of the report outlines the proposed conceptual design for the facility which has been recommended to the PRRD. The scope of this report does not allow for detailed design; however our conceptual design for a facility of this scale will allow for an opinion of probable costs associated with the capital and operating expenses expected for an operation of this nature. This conceptual design was produced following a series of tours and investigations (technology evaluation) which helped determine the most suitable processing solution for this application. The conceptual design selected incorporates the use of an encapsulated aerated static pile composting system with leachate control and positive aeration so as to minimize capital cost while providing flexibility for expansion and growth into the future. This simple and cost-effective composting approach meets the needs of the region, while providing the necessary and appropriate environmental controls. The design description as outlined in this report also serves to identify facility requirements, the process flow for the system, as well as various recommendations for equipment and infrastructure. The recommended process will use forced aeration under automated temperature and oxygen control to minimize operator requirements and to ensure that hourly data is collected, documenting the history of the pile and demonstrating that the required vector and pathogen reduction limits have been met. This process control strategy will maintain an aerobic process and minimize the formation of fugitive gases. Leachate will be managed through a collection system and reused during the primary composting phase of the process. The entire composting process will be conducted under a covered building and only curing and product storage will take place outdoors.

We have elected to allow for the use of a small bio-filter for exhaust process building air as additional odour control above and beyond those provided by the technology selected. This was deemed necessary based on the proximity to residents observed at all of the potential site locations. The bio-filter can be upgraded at a later time if operations indicate this improvement is necessary. These details are all directly related to the site location selected as depending on the natural buffers that exist, additional infrastructure may be required to ensure that no negative impacts are felt by the surrounding community. Where assumptions have been made to minimize the capital costs required, these assumptions have been listed so that should additional investigation into these management practices be deemed necessary, total potential capital required for the facility can be calculated. A very basic review of some readily available sites was conducted within Powell River. The sites reviewed are discussed in the body of the report in Section 6. As none of the locations have significant buffers, it is recommended that for all of the sites currently available, the in-building design with a biofilter would be required. It should also be noted however that even when best practices are followed; it is possible to experience the occasional odour transmission to adjacent residents. This is why adequate buffers are always preferable to a dependence on additional infrastructure for 100% odour protection. For the purposes of the preliminary cost estimate and given that the waste stream to be processed will be a relatively low-concentration material (predominantly green waste with some food waste) we felt it was acceptable to proceed with the assumptions listed. Further modifications can be made in the future to provide additional odour and process control at the facility if necessary.

9.2 Conceptual Design of Compost Facility

9.2.1 Proposed Feedstock

The feedstock for the proposed facility would be organics from residential sources, composed of yard and food waste, some commercial organics and some clean green waste used to supplement the other feedstocks and fill the capacity constructed. It is important to achieve a greater economy of scale, by accepting as many commercial sources of organics available however this waste stream can add complexity to the operation and challenges when handling slurry like wastes such as those from local fish farms. The evolution of the program could also include the inclusion of multi-family units, schools and other commercial sources (restaurants).

We have not considered the addition of biosolids to the feedstock-accepted at a local facility constructed near Powell River. As the volumes of waste available to be composted are relatively small, it would be difficult to compost biosolids separately from the food waste and commercial organics collected. To process this waste separately, duplication and redundancy of infrastructure would be required which would not be cost effective (at a small scale). While it is possible to make a high quality compost from biosolids, the Compost Advisory Committee will need to determine if mixing these wastes and the soil produced still meets the needs of the community. There is often a stigma associated with bio-solids compost which often raises a host of issues when this material is considered for use in local food production.

Many communities feel that Organics must be looked at as part of a comprehensive system that connects the associated nutrients generated by a region to sustainable food production and improved food security. If the soil products manufactured from the food/yard waste are to be used in certified organic food production, they must meet all the compost guidelines set forth in the Organic Production Systems (OPS) - Permitted Substances List (CA.CGSB 32.311-2009). Please note that this will require that the compost products produced have not been mixed with or co-mingled with bio-solids or sewer sludge. Compost which includes these feedstocks will not qualify for use in “Certified Organic” food production in Canada.

Other possible (and permitted) commercial feedstocks which could be seen at a local facility in limited quantities include; Animal bedding, Brewery waste/ Winery waste, Hatchery waste, Manure, Milk processing waste (Solids), Poultry carcasses, Red meat carcasses (Excluding all SRM as outlined in Federal Regulations) and Whey.

9.3 Preferred Composting Technology and Design

Following a review of the facility sizing and design capacity it was determined that the most suitable technology for a development of this nature would be the Gore Cover System. This type of facility would utilize an aerated encapsulated static pile / turned windrow system to compost the organic material. As the Gore Cover System turned windrows are readily scalable, and are able to operate at a very small / pilot scale; the design capacity of approximately 2,500 tonnes/year can be managed through the use of 2 small covers which can be added onto over time. A design capacity of 2,500 TPA has been selected despite the potential that up to 3,100 tonnes could be received at the facility. The facility capacity utilizing the Gore Cover System can be stretched depending on the type of feedstock provided and the difference between peak and low volume periods. Should we be fortunate enough to receive more than 3,000 TPA in organics, then space within the selected technology would be optimized to curbside organics and commercial organics, which require this level of control. Excess yard waste would be composted by open windrow in another location of the site. This will drastically lower capital and operating cost requirements and allow the PRRD to review the model at a modest initial capacity and consider expansion if warranted from that point.

This scalability will be important for the Powell River Regional District, because the facility can be constructed to manage current organics tonnages, but scaled up over time as more material is made available and or new organic waste streams begin to participate in the program (commercial organics / biosolids / etc). The aerated and encapsulated Gore Cover System is also the lowest “proven technology” cost option able to process these types of wastes which has been identified as a priority for the community.

9.3.1 Site Design and Equipment

Based on the data provided and waste composition of the region, we have allowed for the construction of a facility able to process approximately 2,500 TPA of organics. The initial equipment purchased will be limited to a loader to minimize necessary capital costs with items such as screens and grinders rented as required. This equipment will be able to handle a significantly higher amount of material; however for the purposes of accurately sizing the processing technology a design capacity is necessary even if that means that most of the time the equipment will be standing idle to ensure efficient operation. We recommend a flexible layout, with a minimal infrastructure investment to provide the lowest overall cost of capital which will ultimately be reflected in the tip fee/tonne paid by the residents. The facility however, will still be designed to process food waste or other difficult to handle waste and will provide the necessary environmental and process controls to produce a top quality end product. It is also always possible to complete additional design improvements if so required in the future to further enhance operations. We have placed a priority on a preliminary design which is straightforward and cost-effective to operate, with a minimum amount of complex infrastructure. These priorities are a must if a facility of this size is to operate sustainably. Utilizing the Gore Cover System, we would recommend that the facility purchase no less than 2 covers with 3 control systems. The third control system would be uncovered and operate as an aerated static pile to minimize costs associated with the covers. Material would be removed and replaced into the next phase once/month. This would allow for a minimum of 8 weeks of processing for all materials through the facility. Additional covers could be purchased as required.

9.4 Composting Technology

While the development of an in-vessel system (such as the technology seen at ICC or Comox) may provide the highest degree of process and environmental control if managed properly, these types of systems are rarely developed for a facility with such small waste volumes due to the excessive costs associated with in ground infrastructure and development.

As a result, NZW has assumed a design for a facility which will meet the primary project parameters at the lowest possible cost. This is equivalent to what would normally be proposed as a pilot scale operation for larger municipalities. This flexible design will provide the necessary controls as dictated by the Organic Matter Recycling Regulation of BC (OMRR) as well as allow design improvements if so required in the future for additional odour and leachate controls. We have consulted with facility operators at other locations utilizing a similar design, so as to minimize the need for infrastructure, and make appropriate improvements thereby providing the highest cost benefit for the required design considerations.

We have also discussed a potential partnership between the PRRD and a local business that currently imports and sells top soil. If the right synergy is possible and a suitable site approved by the public, then sharing of mobile equipment such as loaders and optimization of infrastructure such as office space or a scale house utilized by existing operations could all help to significantly impact the potential tip fee. This could be further enhanced if operators could be utilized part time for compost operations as part time and stand-by resources are more essential than full time operations for a facility which processes only small quantities of waste. At the tonnage proposed, on-site labour will be optimized at approximately 2 - 4 hours per day. As this is not possible, one staff member will likely need to be employed full time with a couple of assistants who provide holiday relief and part time operational support as required. Food waste will likely be delivered daily due to the storage capacity of commercial generators (restaurants) and the optimization of collection vehicles (different routes daily). This then limits the ability of the facility to only receive waste and operate part-time with a batch type feedstock system that allows larger volumes of waste to be processed at the same time.

For the purposes of this report we have made an allowance for a small pre-engineered building which will separate and isolate leachate which is typically produced during feedstock preparation and the primary composting phase. The most cost effective building is one which is constructed with a durable and corrosion resistant tube frame (hot-dip galvanized) and which has been pre-engineered for the snow and wind loads of the area. Facility staff will be able to travel freely into the building for material turning, and compost can by cycled through the covered forced air phase at a rate dependent upon the amount of new material delivery to site.

One piece of grinding equipment has been suggested as a low cost option to improve front end material preparation, however ideally a slow speed grinder would be incorporated into operations so as to ensure the correct product mixture at the start of the process. Details associated with each option will be expanded on below.

9.4.1 Facility Infrastructure

The use of a simple encapsulated aerated static pile (Gore Cover System or equivalent) was felt as the lowest risk alternative to ensure improved process control and throughput while maintaining a relatively simple and non-complex facility design. Typically, the more complex a system, the higher its operational costs. Complex systems also are more prone to failure as multiple components are susceptible to wear after exposure to the effects of the harsh environment associated with in vessel composting.

Additional provisions for odour control have been made in the design, beyond those inherent in the processing technology which include the use of a small bio-filter deemed necessary by the review of available sites in the region. This biofilter and exhaust fan can always be upgraded if necessary at a later date with relative ease. The success of the facility, as well as the production of a quality end product will be possible under the existing design; however this will largely be dependent upon the operating procedures incorporated by the operator and staff. Most technologies (including the Gore Cover System) offer operator training at the facility and detailed process manuals as a component of their facility start-up, commissioning and preliminary operations package.

A typical complaint of facilities of this nature is associated with the inability to control the process and the impacts of the environmental effects associated with atmospheric moisture. In order to provide control against these issues we have recommended a structure which will provide cover and a location to undertake the first and most critical phase of the composting process. A tube frame pre-engineered building will provide exceptional corrosion protection and is utilized frequently for composting. Welded arches are fabricated from tubular steel and hot dipped galvanized after fabrication and welding. This building includes a fire retardant rated Powershield woven polyethylene fabric which comes complete with a full warranty.

In order to optimize the size of the building and the compost action which occurs under it, we have suggested the addition of an air-floor system. This system will apply positive forced air into the raw feedstock thereby accelerating the composting process and the breakdown of material. This air-floor system will double as a leachate collection system, with in-slab piping collecting and transporting leachate from below the piles when aeration is not on. Aeration will be controlled through software provided by the technology supplier. This forced aeration will also ensure that the material does not become anaerobic which can be an Occupational Health and Safety concern when operating in enclosed areas.

To add further security to this issue, an exhaust fan and small scale biofilter will ensure that air is constantly flowing through the building and minimizing condensation. This will help in keeping the work environment manageable as considerable steam and humidity will be released from the piles when the aeration system is turned on.

Should additional infrastructure such as an expanded exhaust fan and bio-filtration be required or desired at a later date, the design will facilitate the addition of such modifications. Please note that while some of the criteria associated with the slab design have been outlined in the design drawings, a detailed design effort would be required for the facility prior to the issuance of tender for the project. While it is understood that many facilities use large loaders for outdoor operations, the movement of material in the building should be confined to the use of a small skid steer loader (924 or smaller). This saves considerable costs on the thickness of the slab design, and given the size of the proposed building the use of large vehicles will not be required in order for successful operations.

Operations within the building will involve the rotation of a portion of the material on a daily basis so as to ensure that consolidation and the formation of air channels does not occur. It is expected that operations staff will see a vast improvement in the rate of decomposition using this design when compared to other open and negatively aerated designs. Slab grading will ensure that the collection and containment of all leachate generated within the system remains contained to the inside of the building while preventing the intrusion of atmospheric moisture. The leachate collection sump should be placed at one side of the receiving end of the building and include provisions for a coarse bubble diffuser to ensure this leachate remains aerobic. A small submersible pump can then be dropped into the leachate chamber when new feedstock is prepared on site and used to ensure the appropriate moisture content. This concentrated leachate will serve as an inoculant essentially kick-starting the composting process with a batch of active bacteria.

9.4.2 Allu Bucket Mixer Feedstock Preparation Unit

In order to get the feedstock mix correct, a covered and impermeable surface is required at a minimum which is why we have allowed a significant allowance for the tipping/processing building. Green waste however needs to be ground and mixed once received prior to composting. This will break open material surfaces accelerating and optimizing the compost reaction that follows. In a larger facility a slow speed grinder would be utilized to process high volumes of material quickly. These grinders add significant cost to operation and are expensive to purchase with lightly used units selling for $300,000 or more. As a result the “Allu” bucket mixer/grinder has been suggested as a lower cost solution and can be purchased new for a fraction of the cost. It will not be as quick at processing incoming material but as there will be limited volumes of material coming from the curb and the typical maximum size of wood diameters seen in a curbside program is expected to be 4 inches this unit should work well. As the material will be considerably more uniform in size, the surface area exposed to the decomposition process will also increase resulting in a higher percentage of throughput at the back end of the facility.

The density of the material is expected to be in the neighborhood of 700 kg/cubic meter once it has gone through some processing and moisture addition at the front of the process. The cost of these units starts at around $40,000 and suggested makes and models are included in the equipment section of the report.

9.4.3 Other Equipment on Site

As detailed information with regards to any existing equipment available to the facility was not available at the time of this report, we have assumed costs appropriate for a slab for the use of light weight traffic and earth moving equipment only. This significantly reduces the cost of the slab due to the thickness and reinforcing steel required. We have specified a 6" thick concrete slab with a concrete strength of 35MPa for the processing building. The slab is thickened to 12" at the edges and reinforcing bars have been used rather than structural admixtures so as to optimize construction cost and support around the in slab piping.

Lock block edge walls 2'-6" x 2'-6' (2 blocks high) have been specified for the perimeter of the slab which will tie into the building. This design works well and provides excellent value by utilizing the building walls as push walls for the material and a suitable mounting location for the blower's controllers and all electrical panels and distribution which will run along the outside of the building. The second layer of lock blocks will be required so as to provide adequate head room for vehicle traffic and equipment close to the wall due to the arched tube frame roof.

Above please find a photo of the Manitou MLT741-120LSU. This unit works well for the movement of large quantities of compost and with its relative light weight can operate without difficulty on the specified slab. This or an equivalent type of small scale loader such as a CAT 924 or similar integrated tool carrier is ideal for the workhorse piece of equipment on the site. An integrated tool carrier has the ability to have a sweeper attachment quickly replace the bucket for site clean-up and has a high pivot point to facilitate loading without the need for a ramp or raised platform. A smaller loader is also recommended for on-site operation including within the building do to the tight spaces within.

9.5 Financial Evaluation

The capital cost estimate for the composting facility is estimated below. It is important to note that this estimate does not include any allowance for the cost of land and instead the financial evaluation has assumed that a suitably sized piece of land can be leased locally for around $50,000/year. On the basis of the below preliminary conceptual design, it is estimated that the facility could be constructed for approximately $720,000, and would be capable of managing at least 2,500 tonnes of organics per year. This is a very conceptual opinion of probable cost and needs to be refined once a suitable site can be identified. As an example, we have allowed for $200,000 in site prep, concrete and asphalt paving however a site with existing pavement in place could see this number reduced significantly. Alternatively, a greenfield site with significant grading required or the need to bring power from a tie in point away from the facility location will cause budget over-runs in these respective areas. Due to the size of the facility, we have deferred the capital costs associated with equipment such as the screen and the grinder as these items can be rented quarterly as shown in the budgetary operating costs for the facility. The capital cost, when annualized and paid down over the assumed 20-year life span of the facility, equates to annual debt payments of approximately $62,800. This is based on an interest rate of 6% which when used to retire capital debt load over 20 years equates to 8.718% per year. A rate this low would only be achievable for the Regional District or other government body due to the low risk assumed by the bank for this loan. A start-up business would not be able to get a rate this low and would require somewhere between 25% - 40% of the total project costs contributed as equity towards the project. If “angel” investors are required to help assure the required “debt to equity” ratio dictated by the banks, the interest rate charged can often be 3 to 4 times higher than that provided by the banks for senior debt which has been assumed for the purposes of this report. The result is a much higher cost of capital which is ultimately reflected in the tip fee. While allowances and contingencies have been left in the estimates at this time for both operating and capital expenses, no provisions for overhead and profit have been included which again will add further costs to the model which will ultimately be reflected in the tip fee. Due to the above considerations which remain to be clarified, the below estimate can only be discussed as conceptual with further investigation required before an informed decision can be made and a program implemented.

Table 9-1: Capital Cost Estimate for small scale Gore Cover Facility (2,500 TPA)

• **Front End Loader Allowance (Used)**	**$70,000**
• **Pre-Eng Building / Biofilter (Incl. OH Doors)**	**$145,000**
• **Allu Bucket Grinder (New)**	**$50,000**
• **Concrete Lock Blocks (100 Assumed)**	**$15,000**
• **Main Power Connection (2 Pole Allowance)**	**$20,000**
• **Gore Cover System (2,500 TPA)**	**$90,000**
• **Electrical Connections / Communications**	**$20,000**
• **Paved Asphalt Surface ($40/m^2)**	**$100,000**
• **Building Concrete Channels (2/heap)**	**$50,000**
• **Site Work, Leachate Control (Minimum)**	**$40,000**
• **Office Supplies & Small Tools Allowance**	**$5,000**
• **Scale and Scale House / Office**	**$60,000**
• **Operating Capital / Contingency**	**$55,000**
• **TOTAL**	**$720,000**

The operating costs for the facility have been estimated, at $326,800 per year and these are outlined below in detail. This includes the cost of capital at a rate which assumes the PRRD is constructing the facility and would increase significantly if constructed by a private company. As a comparative it has been shown how the operating costs would vary should 4,000 TPA be processed. This was done simply to highlight the impact on the average processing cost per tonne which is lowered drastically as waste volumes processed increase. At 2,500 TPA the all in average cost per tonne is approximately $130.72/Tonne however if a successful program is able to leverage the implementation of an expanded program and 4,000 TPA processed, the average processing cost drops significantly to $100.08/Tonne.

It must be highlighted that the average price per tonne <u>is not</u> a true representation of the costs associated with the operation of a new facility as clean green waste will still continue to pay $45/tonne and that represents a significant portion of our total tonnes processed. For the purposes of this report it has been assumed that 1,563 tonnes could be received at the facility at inception (as outlined in section 8.2 - Financial Evaluation) which includes both co-mingled curbside food and yard waste collected through a curbside organics program and some percentage of commercial organics that could also be processed competitively at a higher tip fee. These tonnes of feedstock will pay one tip fee and the remaining 937 tonnes of wet green waste and yard waste will continue to pay a reduced $45/tonne rate. It is the tip fee of the 1,563 tonnes that must be used in the calculation to determine the cost per tonne of processing as this would be the minimum facility charge required at the gate (for these high tip fee wastes) in order to cover the costs of the operation. 937 tonnes at $45 per tonne would provide $42,165 in tip fee revenue; however the remaining $284,635 in operating costs would need to be covered by the 1,563 tonnes or organics. There is also some revenue generated from the sale of the compost produced. We have assumed that an average price of $25/yard could be obtained for the compost produced on site (product sales matrix shown in table 9-4). This has intentionally been priced below market as we have not allowed for a marketing program in our operation. At this price, existing soil blenders and manufacturers would likely purchase all soil produced at the facility in bulk and then increase the value of the product though their various blends and amendments before selling the compost blend at a higher price. Precedent has been set, successfully utilizing this type of sales model at other facilities in BC. The end result is a total cost per tonne for the organics collected of **$142/tonne**.

There is always risk when the design construction and operation of a facility is concerned. The largest unknown and often the largest cost associated with the construction of a facility is the price of the land utilized. For the purposes of this report we have assumed that a suitable site could be leased for a favorable rate of $50,000/year. This rate has been seen in other similar markets for a project of this size (2 acres) however again this variable cannot be understated.

Typically the best sites for processing are at landfills or transfer stations (as this is where the garbage is going already) which optimizes the collection program when split collection vehicles are utilized. Other sites which are typically selected are locations where there is potential for some odour already (near Waste Water Treatment Facilities) or large industrial businesses. In most cases including transfer stations, at the very least, a re-zoning or zoning text amendment would be required (as it is unlikely a site exists which specifically mentions commercial composting within its existing zoning). This process will require a number of readings in council and ultimately a public hearing before approval can be granted. Discussion with local businesses (discussed earlier) who have tried unsuccessfully to commence an initiative such as this one previously have provided insight into the difficulties already experienced when trying to permit a suitable “local” site location.

Agricultural land is also a possibility, however only a significant farm of approximately 100 acres would be suitable. In this situation we would also need to utilize at least 50% of the compost back on the land / farm. In order to comply with ALR legislation in BC, we would need a farm of that size as our compost operation could not occupy more than 2% of the site (2 acres mentioned previously). The PRRD could operate within these parameters and still construct a large community farm (on the remaining 98 acres) while operating the compost facility as an “on-farm” use. Unfortunately it is difficult to find suitable large parcels of farmland and when a site is located, there is often a significant increase associated with bringing utilities and services to an agricultural location.

As a suitable site has not already been selected, this is an area of focus that the PRRD will need to spend further effort identifying in the years ahead. If the community is set on constructing a processing facility locally then the attached study shows that economically this is possible. This however could take a significant amount of time and if the assumptions made in this report do not remain true, could also cost a significantly higher amount per tonne to process than what has been stated.

It is our recommendation that the early implementation of a program and the reduction of waste disposal fees for the community in the short term should not be delayed due to a lack of a suitable site location. The initiation of a program will allow the PRRD to collect hard data on the amount of waste collected and move forward with improved and expanded programs until waste volumes collected are high enough to provide optimized rates for localized processing. This will also allow a phased in approach from a capital perspective, allowing the region to first focus on the costs associated with the delivery of a new program and the provision of appropriate collection bins for residents and the improvements required to the existing drop off locations to allow for the separate collection (and processing) of organics. Developing a program now, will allow the PRRD to control where the waste goes in the future should pricing options change and the local processing solution become viable with the selection and approval of a suitable site. Operating costs for two small scale facility designs have been outlined below to provide rough order of magnitude pricing for consideration. This information is based on data collected from the operation of existing small scale privately run Gore Cover facilities.

Table 9-2: Operating Cost Estimate - Small Scale Gore Cover Facility (2,500 & 4,000 TPA)

	Design Capacity	2,500 TPA	4,000 TPA
•	Labour	$120,000	$160,000
•	Land Lease	$50,000	$50,000
•	Asphalt & Building Maintenance	$10,000	$12,000
•	Fuel, Utilities and Consumables	$10,000	$15,000
•	Compost Testing	$3,000	$4,000
•	Screening Rental	$7,000	$10,000
•	Grinder Rental	$20,000	$30,000
•	Marketing	$5,000	$7,500
•	Management Costs	$3,000	$5,000
•	Insurance (business & life)	$6,000	$6,000
•	Operating Contingency (10%)	$30,000	$38,000
•	Annual Operating Expenses	$264,000	$337,500
o	$720,000 Debt (6% - 20yrs amort.)	$62,800	$62,800
•	COSTS INCL DEBT SERVICE	$326,800	$400,300

* Expansion of processing capacity can be completed with the purchase of additional covers which will be much easier to implement through conventional business financing following a successful start-up and operation. The remainder of the capital costs will not need to be increased for the expansion as the facility will experience improved optimization of existing infrastructure. Free cash flow from the operation generated as the facility exceeds the design capacity is typically used to finance the expansion and allow the provision of additional covers.

Table 9-3: Cost Profile for PRRD-Operated Compost Facility versus current practice (Values based on Avg. of 2007 – 2011 data supplied in latest PRRD Waste Export Report)

ITEMS	Total Current Costs of Organics Disposal	Totals Costs of PRRD Organics Composting
Transfer Station Costs - Handling MSW Organics Fraction (Augusta)	$ 38,000	(Haul Direct)
Hauling Costs to Disposal Site (Augusta) / Disposal (RDC) & Other Charges (5 Year Average)	$ 183,000	
Annual Operating Costs of Facility		$ 326,800
Total Cost of Organics Management	$ 221,000	
Projected Revenue: Compost Sales		$ 62,000
Total Tonnes of Organics in MSW (Local Processing incl. Commercial)	1363	1563
Total Tonnes of Yard/Wood Waste (20% wet green waste)	1396	937*
Cost of Yard/Wood Waste Disposal	$45.00	$45.00
Revenue from Yard/Wood Waste		$42,165.00
Net Costs Organics Management	**$ 221,000**	**$ 222,635**
Overall Annual Cost/Tonne of MSW / Organics	$ 162.00	**$ 142.00**
Total Tonnes Organics Managed	**1363**	**2500**

* It is assumed that a newly constructed regional facility could capture less desirable green and yard waste with the dry / excess material continued to be used as hog fuel to existing markets

All costs associated with an additional waste stream pick up and capital costs for new equipment such as a split bin for the collection vehicle have been excluded. Costs associated with the collection can vary from being negligible if a shared disposal site exists for garbage and organics to quite significant if time is required to dispose of each waste stream in two different locations. Collection costs can represent one of the most significant costs associated with the implementation of a new program and as a result an appropriate plan must be determined and agreed upon before these costs can be summarized. Collection can be optimized with the use of a split bin truck and a change from alternating weekly pick up of garbage and recycling to a garbage/organics and recycling/organics pick up schedule. This way no additional routes are required and apart from some minor loss in efficiency experienced when one side of the bin fills up faster than the other no significant "additional" pick up costs will be seen by the haulers.

If as is sometimes the case in smaller communities, where there are limited collection vehicles there may be reasons why a split bin can not be implemented and this will drastically increase program start-up costs. This may occur in some of the smaller communities within the Regional District due to excessive capital costs associated with a vehicle upgrade, or the need to retain a single large bin which can handle the pick-up of the large garbage containers utilized by commercial businesses and larger waste producers. The additional costs associated with a split bin upgrade of a single truck within the City of Powell River has been estimated at $14,000.

9.5.1 Potential Compost Sales Revenue

The opportunity to sell compost produced by the PRRD facility could provide additional revenue to offset the cost of operation of the facility. Currently, the average value of this type of compost is projected at around $25/yard retail. Projected revenue has allowed for the sale of different end products as would typically been seen from an operation of this kind. These different products have been outlined in Table 8-4, assuming total production and sales of 2,500 cubic yards of compost annually. While 2,500 tonnes processed will not necessarily produce 2,500 yards of compost, once additional amendments have been added this can be considered a reasonable estimate of the expected compost to be produced at the facility.

Table 9-4: Current Recommended Market Pricing for Finished Compost and Soil Products

Product	Mix	Price ($/yd3)	Total Yards	Revenues ($)
Soil Amender	100% compost	$ 25	400	$ 10,000
Lawn and Turf	40% compost, 60% sand	$ 20	900	$ 18,000
Garden	70% compost, 30% sand	$ 25	1,000	$ 25,000
Potting	70% compost, sand, peat, fertilizers	$ 45	200	$ 9,000
Total			2,500	$ 62,000

9.5.2 Current Markets

The pricing given in Table 9-4 is based on the pricing structure given by the three major local vendors of soil products as well as from experience working with vendors on the Lower Sunshine Coast as well as the Lower Mainland. The compost input for this soil-less material is currently imported from Fraser Richmond Soil and Fiber Inc., located in Metro Vancouver and for a price of $20.50 per yard plus freight. Based only on total numbers provided from local vendors of soil-like media, the current market within the PRRD can support approximately 2000 yards of product sold each year to landscapers and home and garden. This total number does not include other users such as independent landscapers and farmers. Nevertheless, it has been our experience that landscaping such as turf and gardens are the major markets for top soils. Additional soils not sold through the course of the year could also be utilized for parks and other PRRD uses which currently require the importation of soils, thereby avoiding these costs. Additional information should be obtained from the City of Powell River, and if a mutually beneficial arrangement can be made, an agreement outlined for the purchase of soil from the facility for City uses. As the City is likely one of the large consumers of engineered soils in the area, providing soil at a discount will help limit the risk of an oversupply of compost produced at the facility.

An increasing public awareness associated with food security along with a growing interest in home and community gardening continues to drive a demand for high quality soils. Despite this growth, soil sold for food production remains a minority percentage of the total expected gross sales for our end product. Recent examples of food security initiatives and actions within the PRDD include the 2009 Powell River Economic Development Plan for Agriculture as well as the Vancouver Coastal Health’s Powell River Food Security Project and the Lund to Langdale Network. Despite these initiatives, there are currently only 85 farms and only 5 with revenues over $100,000 (Stats Can, 2006 Census) in the PRRD. This same data shows total gross revenues for this market of $1,921,378, however an estimated gross margin of negative $331,968. This data suggests that farming within the Powell River Regional District is currently not financially sustainable on its own, therefore in the short-term, this market will most likely not be a major consumer of our growing media unless we are able to off-set imported fertilizers or organic amendments (bone / feather meal) which are imported from the Fraser Valley. This will largely be a function of the quality of the soil produced and if it contains unfavorable items such as bio-solids or contaminants such as plastic found in some food waste composts. Nevertheless, with some active marketing it is likely that a local facility would see an expanding market. The regional overview shown in table 9-4 shows the likely potential for sales of all of the compost that could be produced with the construction of a local facility.

9.5.3 Regulatory Compliance

The facility has been designed to produce a high-quality Class A compost product which is suitable for food production and for use in Certified Organic Farms. Finished compost will meet the regulatory requirements as outlined in Schedule's 2, 3, 5 and 6 of the BC Ministry of Environment's (MOE) Organic Materials Recycling Regulations (for Class A Compost) as well as the CCME (Canadian Council Ministers of Environment) regulation. The required measures and analysis at the facility will include: vector reduction (temperature, times, C/N), pathogen reduction, compost quality (metals) and record-keeping. As stated in the Regulation "Compost that is not solely produced from yard waste or from untreated and unprocessed wood residuals and that meets the requirements of all of the following is Class A compost:"

<u>Schedule (2) (a) to (c) Vector Reduction Limits:</u>

Volatile solids must be reduced by greater than 38%; the process must remain aerobic for greater than or equal to 14 days at temperatures above 40 ^{o}C with an average of 45 ^{o}C. The carbon to nitrogen ratio (C/N) must be great than or equal to 15:1 and less than or equal to 35:1. The curing process must be at least 21 days.

<u>Schedule 3, Pathogen Reduction Limits:</u>

Finished compost must have fecal coliforms less than 1000 MPN/g dry weight and 7 samples must be analyzed every 1000 Tonnes.

<u>Schedule 5, Sampling and Analyses:</u>

The standard method of analysis must be employed and the analysis must take place every 1000 Tonnes of soil produced.

<u>Schedule 6, Record-keeping:</u>

Temperature profile records and analysis of finished compost must be maintained for 36 months and made available to a director upon request.

<u>CCME (Canadian Council Ministers of Environment) Regulation:</u>

Temperature must exceed 55 ^{o}C for three consecutive days in order to ensure pathogen reduction. Metal limits outlined within the CCME regulation may not exceed Schedule 4 for the respective residential, urban, commercial, industrial, or agricultural use intended.

9.6 Operational Evaluation

9.6.1 Greater Operational Control

The operation of a community owned compost facility would represent new opportunities for the Regional District. In addition to being in control of their organics management system, the Region would also be able to consider expansion of the proposed level of service, potentially offering processing of other types of waste or expansion of the program to businesses and multi-family units in the community.

9.6.2 Opportunities for Expansion of Service

It should be noted that although the cost per tonne for managing waste increases when a Regionally owned / operated compost facility is evaluated, this cost per tonne is based on the 2012 or design tonnage of approximately 2,500 tonnes of material per year. Expansion of the facility to accept additional organic materials for processing would also improve process economics, making the operation of the Regional District's own facility more comparable from a cost perspective with outsourcing the management of organics. As mentioned previously, the addition of only 1,500 T/yr to the facility will lower operational costs significantly. An expansion can be completed simply through the purchase of an additional cover (two 25m long covers have been allowed for in the Phase design capacity). Each new cover will provide an additional 1,250 – 1,500 TPA of additional capacity which facilitates small scale growth so as to lower costs per tonne without disruption to existing operations.

Options for expanding the quantities of organic waste processed could include offering organic management services to neighboring municipalities, although few exist that could provide a significant increase in facility design capacity. Other opportunities also include providing disposal for an expanded reach of commercial customers. These businesses are very susceptible to pricing controls and competition from surrounding and existing facilities would need to be considered before any additional tonnes to those currently allowed for be considered. As the existing facility on the Southern end of the Sunshine Coast has a larger design capacity they will likely remain more competitive on a price per tonne for commercial organics. Some local wastes can still be captured (through avoided trucking / transportation charges) however expanding the reach of commercial organics collected will require a significantly lower tip fee. The largest benefit provided by commercial customers, beyond a single point of contact for what could be a significant revenue stream, is a relatively homogenous organics feedstock typically with limited contamination issues.

10 Conclusion

The PPRD has already demonstrated leadership by starting the process of evaluating the impacts associated with implementing a source separated organics collection program. Public works projects and the City of Powell River could also utilize compost produced at a local facility to lower costs in these areas while providing additional assurance that markets exist for the end product.

As the region takes further steps to increase the levels of waste diversion from landfill, the composting of organic material will likely be important to achieving these targets. The decision as to whether to construct and operate its own composting facility should take into consideration the aspects discussed in this report and the assumptions which had to be made at this time. The most significant assumptions are associated with the capital and operating costs which were developed based on a theoretical site as one does not yet exist which has been permitted for commercial composting. Secondary to that, are assumptions associated with the total tonnages received and additional information needs to be collected on the willingness for areas outside of the City of Powell River to participate fully in a program of this nature as the tonnes that they contribute will comprise an important part of the total design capacity processed. Finally there have been assumptions on the availability of funds for both the implementation of collection infrastructure (carts, truck upgrades, transfer station / drop off location improvements) and the capital costs required to build the facility. Should these funds not be available for this use, then the PRRD would need to rely on the Private Sector to construct and develop a local facility. This is highly unlikely to occur unless a Guaranteed Minimum Annual Tonnage is provided by the Regional District so that a facility sizing can be determined and appropriate financing secured for the project. This will place the liability for providing this tonnage with the Regional District and until more data is collected it is unlikely that this type of guarantee can be provided for 1,563 tonnes of commercial and curbside organics estimated in this report.

It is for this reason that we recommend that the first steps be taken to initiate a Source Separated Organics program so that additional options ARE available to the PRRD in the future. This phased approach will allow the PRRD to initially focus on the collection infrastructure and the education of the public associated with the implementation of a new program so as to minimize contamination. This will also separate the capital costs associated with the purchase of the curbside bins, kitchen catchers and collection infrastructure upgrades from the future costs associated with the development of a facility. While initially organics will be exported to an existing facility, there will be no risk associated with the total tonnes collected (the basis of a cost/tonne model for a new local facility) which will allow the RD time to analyze and collect data on the total tonnes collected. Then, provided these tonnes can support a local facility, and provided a suitable site can be identified and permitted, it will be much easier to implement a local publicly funded program.

While this report represents an important first step and provides a necessary tool for staff and members of the Compost Advisory Committee relative to the upcoming decision making process, additional and significant efforts are still required before a facility can be constructed without significant risk. This process is one which takes a considerable time to implement (particularly in smaller communities) and efforts and progress made thus far for organic diversion should be continued. Savings can be realized immediately through the implementation of a new SSO program. A competitive Request for Proposal is likely the best option to ensure all available disposal options are considered and the lowest priced contract is obtained for the PRRD. Our team remains at your service should you require additional assistance in the months and years ahead as you continue to move organic recycling forward for the region.

Sliammon First Nation
RR # 2 Sliammon Road, Powell River, BC V8A 4Z3
Phone (604) 483-9646 Facsimile (604) 483-9769
Toll-Free 1 (877) 483-9646

Salish Soils
5800 Black Bear Road
Sechelt, BC, V0N 3A3

March 30, 2012

Attn. Mr. Aaron Joe

Dear Mr. Joe:

This letter is to provide our Nation's support for Salish Soils Inc., a majority Aboriginal owned company involving Aboriginal entrepreneurs and the Sechelt First Nation.

We commend you on this environmentally responsible and sustainable green initiative that in many ways supports our traditional teachings about taking care of our land for future generations. Further, it provides inspiration for other Nations and Aboriginal entrepreneurs as to the breadth of business opportunities that do exist for our people.

The Sliammon First Nation supports your pursuit of the feedstock diversion from our area to ensure the long term survival and success of Salish Soils Inc.

Sincerely,

Chief Clint Williams

Salish Soils Inc.
5898 Sechelt Inlet Road, Sechelt, BC V0N 3A3
Tel: (604) 885-5383 Fax: 885-5389 or email: salishsoils@gmail.com

March 30, 2012

Mr. Sean McGinn
Powell River Regional District
5776 Marine Avenue
Powell River, BC V8A 2M4

Dear Mr. McGinn:

Our purpose in writing this letter is to first and foremost introduce you to Salish Soils Inc. located in Sechelt. We are a state-of-the-art composting facility utilizing Gore™ technology to produce very high quality compost. We are currently expanding our operation to accommodate up to 10,000 tonnes of feedstock that includes green waste, food waste, commercial organics and fish waste.

We are very interested in establishing a mutually beneficial strategic partnership with the Powell River Regional District (PRRD) whereby we will provide:

1. preferential pricing for PRRD commercial organics; and
2. the right of first refusal for the purchase of high quality Salish Soil at equivalent volumes to the commercial organics provided, for use in your commercial gardens and other community projects. Compost pricing will be at preferred rates and reflective of our partnership.

We are a privately owned company and have the latitude to enter into short, medium and long-term contracts with Regional Districts, Corporations and Municipalities. The length of contract will determine end pricing for the commercial organics. We anticipate the ability to provide pricing in the range of $79/tonne for a 5-year contract with larger discounts for a 10-year contract.

Our operational efficiencies are based on the quality of commercial organics received. We strive to work with our partners to ensure that we receive commercial organic loads that have contaminants of 1% or less or 10% by volume. Anything over this threshold would be deemed contaminated and either not accepted or up charged accordingly.

We have attached for your information, a Sliammon First Nation support letter indicating their full support for Salish Soils and the diversion of waste from Powell River to our facility.

We look forward to the opportunity to meet with you to discuss this exciting partnership opportunity.

Respectfully Yours,

SALISH SOILS INC.

Aaron Joe, CEO

Mateo Ocejo

From: Mateo Ocejo <mateo@netzerowaste.com>
Sent: Tuesday, March 27, 2012 9:00 PM
To: 'Jeff Coleman'
Cc: 'greg.ball@iccgroup.ca'
Subject: RE: PRRD Tour Dates - February 28th, 29th or 30th

Jeff,

Any luck on providing a price to the PRRD for processing of approximately 2,000 tonnes/year of SSO? I would like to include your facility in my report as a possible option for disposal.

I look forward to hearing from you,

Mateo Ocejo; P.Eng
(604)868-6075
www.netzerowaste.com

From: Mateo Ocejo [mailto:mateo@netzerowaste.com]
Sent: Friday, March 02, 2012 11:07 AM
To: 'Jeff Coleman'
Cc: 'greg.ball@iccgroup.ca'
Subject: RE: PRRD Tour Dates - February 28th, 29th or 30th

Thanks for the tour Jeff – Everyone enjoyed the information provided by you and Greg and I was impressed with all of the improvements you have made since I was last there. You are running a tight ship and moving a lot more material than I expected. If you can please provide me with your total tonnes processed for the last couple of years and the breakdown of the waste (%age commercial food waste, green waste, curbside food waste, etc). I would like to include a short paragraph about your facility in the report with some photos so any other information "highlights" from your history that you can send over would be appreciated for me to include in the report.

As discussed on the tour, one of the options I will be providing the RD is to ship their SSO to a facility in the region. You would qualify as a possible fit for them as long hauling costs would be similar to you or to a site in Sechelt as it is unlikely that the other "bio-solid" facilities will want to co-mingle waste streams (as they will be adding plastic to their process). While a formal contract would have to be established later, for the purposes of this report, could you please advise (in the form of a letter) how much you would charge for approximately 2,000 tonnes/year of SSO. Please include any discounts that would be provided as the community reaches 3,000 TPA or 4,000 TPA (which would likely be close to the limit expected). Also please outline if any discounts would be provided for a longer term contract if this was considered (5yr – 10yr).

Feel free to give me a call with any questions or concerns. Have a great weekend,

Mateo

From: Jeff Coleman [mailto:Jeff.Coleman@iccgroup.ca]
Sent: Tuesday, February 28, 2012 8:11 AM
To: Mateo Ocejo
Subject: RE: PRRD Tour Dates - February 28th, 29th or 30th

Mateo Ocejo

From: Jeff Coleman <jeff.coleman@iccgroup.ca>
Sent: Tuesday, April 03, 2012 4:59 PM
To: 'Mateo Ocejo'
Cc: Dave Knox
Subject: RE: PRRD Tour Dates - February 28th, 29th or 30th

Hi Mateo,

Sorry that this has taken so long to get to you. We have had to have some discussions here, as we are not typically a facility that receives co-mingled waste and there are some pricing politics surrounding us putting an offer out to receive the co-mingled loads from Powell River.

Here is what ICC is offering for the waste from Powell River at this time:

Option 1: Separated Waste Streams – (Minimum 1Yr Contract desired)
If Powell River is able to collect residential food waste separately from Y&G waste then ICC will charge the following tip fees:

- Food Waste/Residential Separated Organics: $90.00/tonne
- Yard and Garden Waste / Green Waste: $45.00/tonne

Option 2: Co-Mingled Waste Streams – (Minimum 1Yr Contract desired)
If Powell River RD collects Source Separated Organic waste in a co-mingled fashion then ICC will charge the following Tip fees:

- Co-Mingled Source Separated Organics and Green Waste: $90.00/tonne

Option 3: Co-Mingled Waste Streams with 5 Year (+ 5 Renewable) Contract
If the above material is to be delivered based on the signing of a 5yr contract (or larger), then ICC is willing to undergo infrastructure upgrades to allow us to more efficiently handle the co-mingled waste stream. This should allow a decrease the tipping fee from $90.00/tonne (although yet to be determined, estimated discount on the order of $5 to 10/tonne).

Notes:

- The above pricing is based on the materials not exceeding agreed upon contaminant levels.
- Further information on contaminants is available on our website.
- ICC has option to increase tipping fees annually based on CPI Canada

Thanks,
Jeff

From: Mateo Ocejo [mailto:mateo@netzerowaste.com]
Sent: Tuesday, March 27, 2012 9:00 PM
To: 'Jeff Coleman'
Cc: greg.ball@iccgroup.ca
Subject: RE: PRRD Tour Dates - February 28th, 29th or 30th

Jeff,

Mateo Ocejo

From: Mateo Ocejo <mateo@netzerowaste.com>
Sent: Monday, March 19, 2012 7:47 AM
To: FGR@christiaens.com
Subject: PRRD Composting Feasibility Study

Frank,

I am currently doing a composting feasibility study for the Powell River Regional District (Sunshine Coast, BC) and I need to get some pricing information from you. They have asked me to provide guidance or ROM (rough order of magnitude) pricing for an approximately 4,000 TPA facility. I also have a few questions concerning this project:

Please provide any information you may have on other facilities you have constructed of this scale

Please advise any challenges you foresee with a plant of this scale (Will it be necessary to mix bio-solids and food waste if they comprise the waste stream)

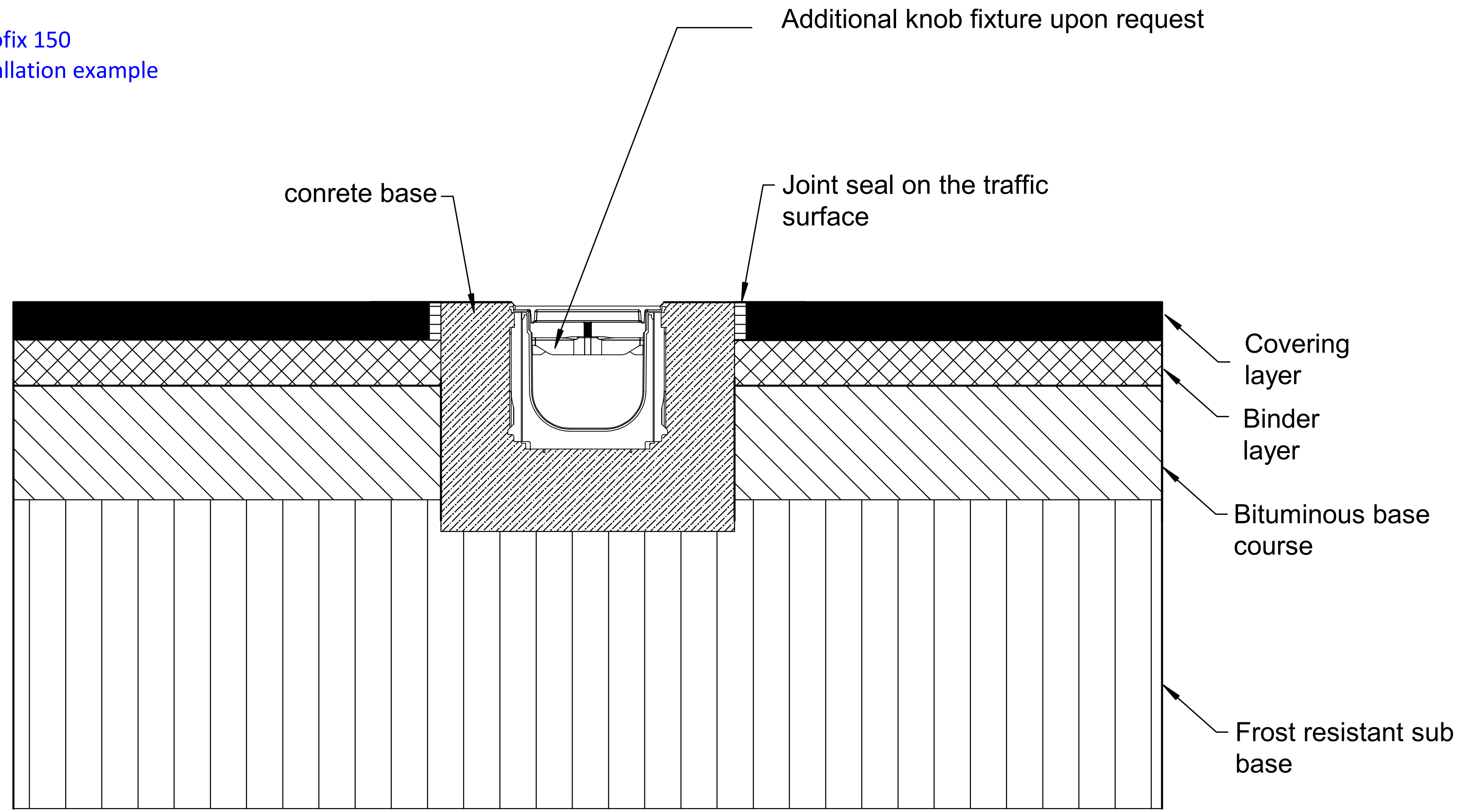
Please provide a ROM pricing guide (excluding site development and land costs)

Any other corporate information or success stories that I can include with your system would be helpful. Please try and keep this additional material only to a couple of pages (in the interest of controlling the size of the report).

I look forward to talking with you / communicating by email soon,

Mateo Ocejo; P.Eng
(604)868-6075
www.netzerowaste.com

Aerofix 150
Installation example



Email: t.schlien@kompostanlagen.de Date: 06.07.2012 Project: Abbotsford

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Compost Facility Guidelines

The Natural Resources Conservation Services (NRCS) has composed guidelines to ensure composting facilities remain environmentally safe, efficient and economical. Below is a comparison between NRCS guidelines and ClearSpan Fabric Structures' features and benefits.

NRCS REQUIREMENTS AND HOW CLEARSPAN MEETS ALL THE GUIDELINES

NRCS	ClearSpan
Locate facility on soils having slow to moderate permeability; minimize seepage of dissolved substances into the soil profile and movement toward ground water.	Minimal foundation requirements are necessary with a ClearSpan Fabric Structure - can be built on or over almost any surface.
Specific moisture and temperature conditions are needed to avoid flies and odor.	Our polyethylene fabric allows natural light to permeate though our covers, creating moisture control and temperate stability, and also contains odor.
Appropriate equipment must be available for initial mixing, turning and hauling of composted material and carbonaceous material.	No internal supports or columns allow for large equipment to move with ease for their appropriate use.
Benefits associated with the ultimate use of the composed material should be compared to the capital expenditure and operating costs. Benefits can include environmental protection and odor control.	ClearSpan buildings have low cost per square foot, low construction costs and no regular required maintenance. Also, they are environmentally friendly and provide odor blockage.
Storage diverts run-off with drainage and protects composted material from the weather by roofs or other suitable covers.	Our fabric covers protect compost piles from precipitation, eliminating harmful run-off; however, drainage can be added, if desired.
Facility size must be appropriate for type of compost and storage period.	ClearSpan offers total customization and our buildings are available from 20'-300' wide, at any length.
Aeration is needed for the composting process to proceed correctly.	We provide many options and accessories such as ventilation, heaters, fans, open ends and roll-up sides.

University of Connectitcut Compost Facility Mansfield, CT

Challenge – **Durable, covered compost facilty**
Solution – **Hercules Truss Arch Building**
Size – **83' wide x 120' long**
Application – **Compost building**

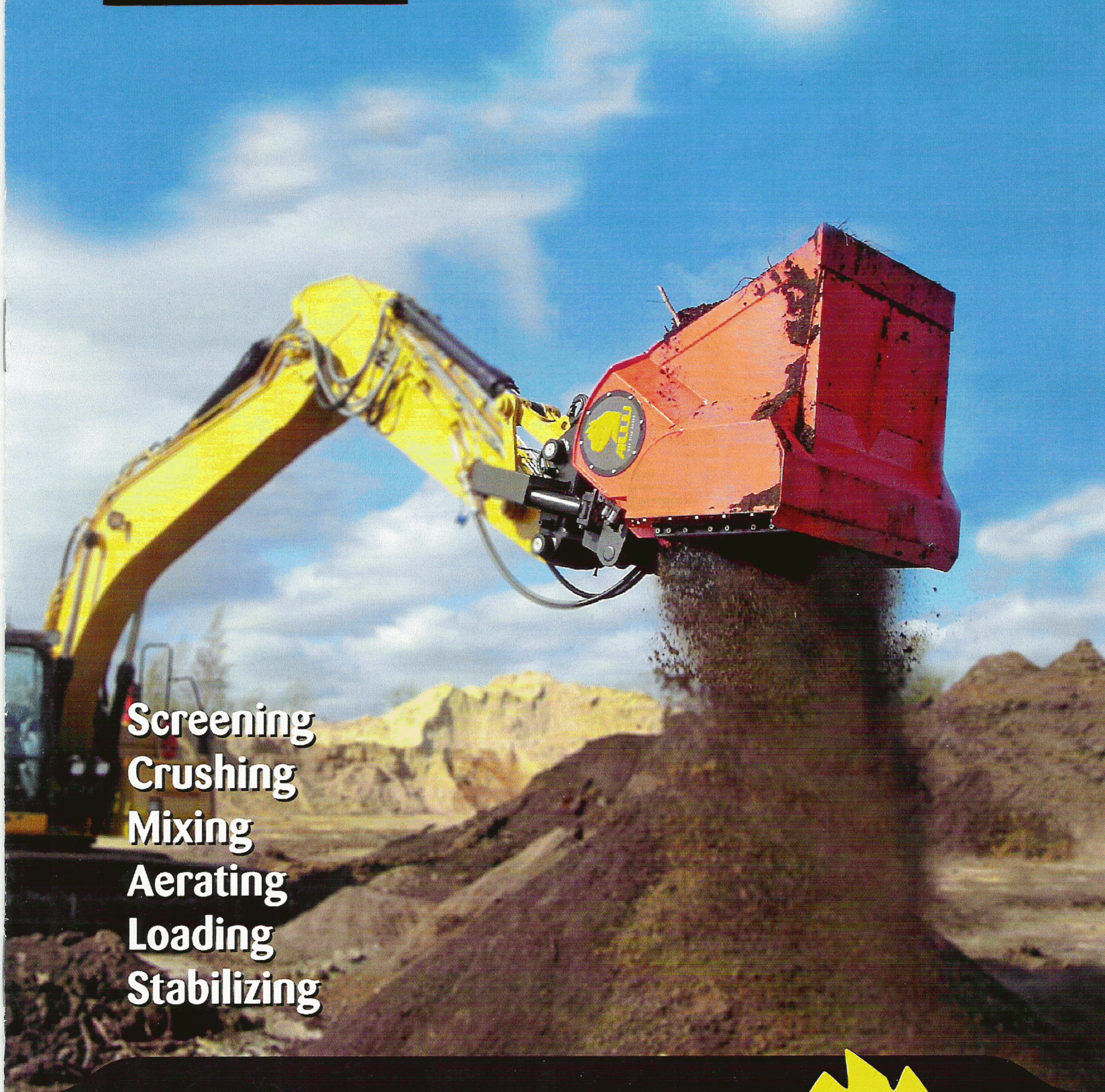
ClearSpan Fabric Structures is the proud manufacturer of the University of Connecticut's newly completed 83'W x 120'L composting facility. UConn is known for its continual effort to enhance its facilities and further its students' education with the latest technology and most up-to-date environmental regulations. According to UConn's Office of Environmental Policy, the facility and location was "sited by a Compost Facility Site Advisory Committee which considered hydrography, aquifer protection, the slope of the land and population density in the siting process."

The facility, at maximum capacity, has four 110' windrows that each contains approximately 80 tons of livestock waste, 15 yards of landscape waste and 1,000 to 3,000 gallons of liquid manure. The liquid manure is added to get the proper level of moisture in the windrow and to add nitrogen. The windrows are combined when the reduction in material allows for two rows to form one. The windrows are moved out of the building and onto a curing pad after approximately 12 weeks. They are covered with a compost blanket during the curing process. The University expects to handle 30 to 40% of its livestock waste and most of its leaves, grass clippings and some wood chips.

ClearSpan recognizes the importance of partnering with the community on environmental projects and looks forward to the opportunity of working with UConn again.

For more information about UConn's Compost Facility, please contact Paul Ferri, project coordinator, at 860.486.9295.

ALLU
One Step Ahead



Screening
Crushing
Mixing
Aerating
Loading
Stabilizing

ALLU® D - Series

Screener Crusher

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Numerous ALLU® applications worldwide

The wide ALLU®-product range can be easily installed on almost any base machine, creating an effective screening/crushing unit, which can replace expensive specialized machinery. Here you will find some applications.

1. Screening of peat e.g. separation of stumps from fuel peat.

2. Aeration of sludge and other compost speeds up the composting process.

3. Bio waste and a bulking agent can be crushed and mixed in one step.

4. Pre-screening, aerating and loading directly into the truck in one step.

5. Construction waste can be screened and crushed.

6. Screening of aggregate back into the pipe ditch speeds up the filling process.

7. ALLU® separates the fine from oversized materials.

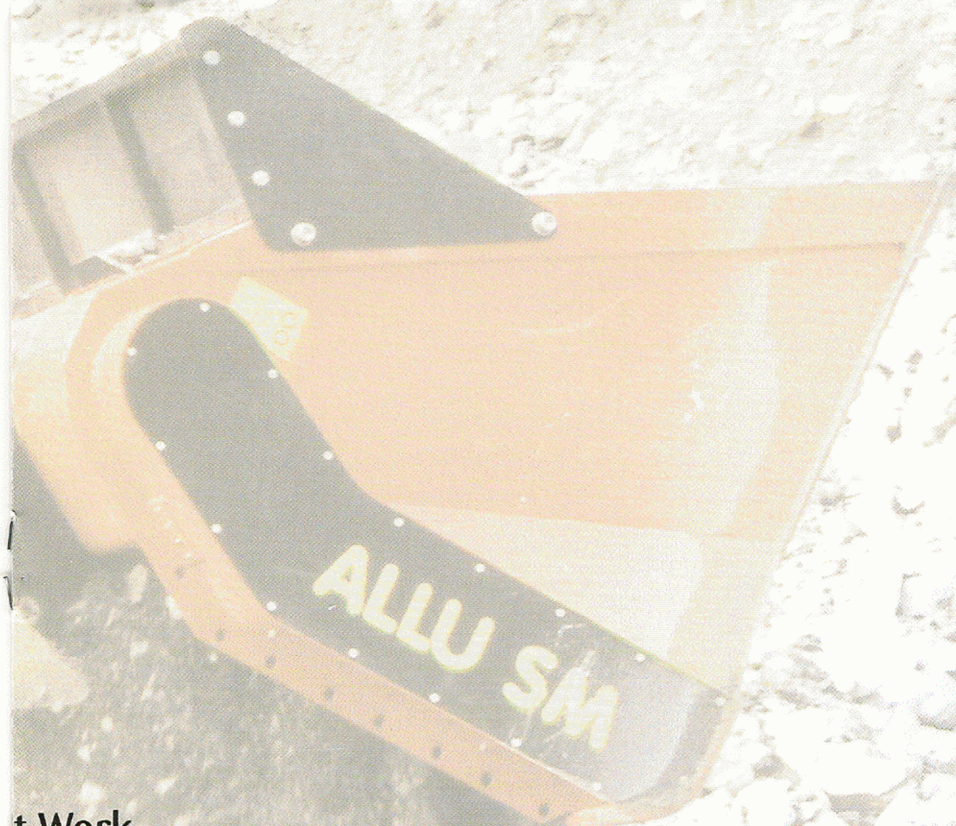
How Does

The ALLU® attachm
operated machine
wheel loaders and
to the host machin

The ALLU® is an a
place of a bucket c
place of the bottom
with hammers that
After loading the b
auxiliary hydraulic

8. Screening and p

9. Pulverization of
mining/fertilizer
calcified salt.



t Work

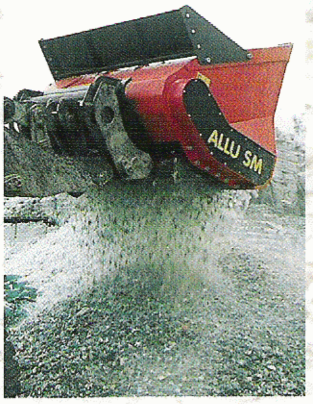
ıent is designed for hydraulically
such as skidsteers, backhoe/
excavators. The ALLU® is attached
e by a bracket or quick coupler.

tachment, which is installed in
n either a loader or excavator. In
, the ALLU® has rotating discs
pulverize and size material.
ucket, the operator activates the
controls, which rotate the drums

breaking up soft materials and screening fines out by gravity.

Once all fines have come out, the operator dumps the oversized to another location. The cycle is fast, reliable and extremely cost-effective. Variable speed and direction, forward or reverse, are controlled by the hydraulic oil pressure provided by the host machine carrier and operated by a joystick (3rd valve) in the cab of the machine.

11. Easy way to make different soil mixtures.



12. Crushing of glass.

13. Crushing of lightweight concrete.

ulverizing of any soil.

frozen soil or materials in the
industry e.g. ore concentrate

10. Stabilization of clay and contaminated soil.

14. Crushing of bark.

ALLU® is patented worldwide.

924Hz
Wheel Loader

CATERPILLAR®

Cat® C6.6 Engine with ACERT™ Technology		
Net power (SAE J1349)	96 kW	128 hp
EPA Tier 3, EU Stage III Compliant		
Weight		
Operating Weight	10 968 kg	24,180 lb
Buckets		
Bucket Capacity	1.7-2.1 m^3	2.2-2.7 yd^3

			Pin-on Buckets					
			With Bolt-On Cutting Edge		With Bolt-On Teeth & Segments*		With Bolt-On Teeth*	
	Rated bucket capacity (§)	m^3	1.8	2.1	1.8	2.1	1.7	2.0
		yd^3	2.4	2.7	2.4	2.7	2.2	2.6
	Struck capacity (§)	m^3	1.5	1.7	1.5	1.7	1.4	1.6
		yd^3	2.0	2.2	2.0	2.2	1.8	2.1
	Bucket width	mm	2550	2550	2620	2620	2620	2620
		ft/in	8'4"	8'4"	8'7"	8'7"	8'7"	8'7"
10	Dump clearance at full lift and 45° discharge (§)	mm	2826	2757	2722	2653	2722	2653
		ft/in	9'3"	9'1"	8'11"	8'8"	8'11"	8'8"
14	Reach at full lift and 45° discharge (§)	mm	791	859	894	962	894	962
		ft/in	2'7"	2'10"	2'11"	3'2"	2'11"	3'2"
	Reach at 45° discharge and 2130 mm (7'0") clearance (§)	mm	1318	1350	1365	1392	1365	1392
		ft/in	4'4"	4'5"	4'6"	4'7"	4'6"	4'7"
	Reach with lift arms horizontal and bucket level	mm	2059	2156	2205	2302	2205	2302
		ft/in	6'9"	7'1"	7'3"	7'7"	7'3"	7'7"
20	Digging depth (§)	mm	43	51	56	64	56	64
		in	1.7"	2.0"	2.2"	2.5"	2.2"	2.5"
6	Overall length	mm	6898	7001	7044	7147	7023	7127
		ft/in	22'8"	23'0"	23'1"	23'5"	23'1"	23'5"
13	Overall height with bucket at full raise (§)	mm	4809	4936	4809	4936	4809	4936
		ft/in	15'9"	16'2"	15'9"	16'2"	15'9"	16'2"
24	Loader clearance radius with bucket in carry position (§)	mm	5616	5646	5692	5722	5689	5719
		ft/in	18'5"	18'6"	18'8"	18'9"	18'8"	18'9"
	Static tipping load straight (§)	kg	8816	8732	8653	8565	8757	8671
		lb	19,437	19,251	19,077	18,884	19,306	19,117
	Static tipping load full 40° turn (§)	kg	7640	7560	7477	7393	7581	7499
		lb	16,844	16,667	16,484	16,299	16,713	16,533
	Breakout force (§)	kg	9954	8975	9833	8854	10 734	9604
		lb	21,945	19,787	21,678	19,520	23,665	21,173
	Operating weight	kg	10 968	11 021	11 104	11 156	11 018	11 071
		lb	24,180	24,297	24,480	24,595	24,291	24,408

Specifications shown are for 924Hz with cab with A/C, optional counterweight, limited slip axles, heavy duty rear brakes, additional guarding, sound suppression, work tool, 80 kg (176 lb) operator and Michelin 20.5 R25 L3 XHA tires.

* Dimensions are measured to the tip of the bucket teeth to provide accurate clearance data. SAE standards specifies the cutting edge.

(§) Specifications and ratings conform to all applicable standards recommended by the Society of Automotive Engineers (SAE), including SAE-Standards J732 JUN92 and J742 FEB85 governing ratings.

Other Ground Engaging Tools available, consult your Cat dealer.

	F.O.B LA	F.O.B VA	F.O.B CA	Stock Number	Nominal Capacity	Approx. O.D.	Approx. Overall Height	Lid Size	Ladder Height
	4			2008700					
	4			2110150					
•				Assembly	8,700	11'-11"	14'-6"	24"	14'
	4		1	2006650					
	4		1	2107450					
•				Assembly	6,650	10'-2"	14'-3"	24"	14'
	4			2005400					
	4			2106300					
•				Assembly	5,400	11'-11"	9'-9"	24"	10'
		7	1	2004400					
		7	1	2104950					
•				Assembly	4,400	10'-2"	9'-10"	24"	10'
	4			2003150					
	4			2103550					
•				Assembly	3,150	10'-2"	7'-7"	24"	7'
			1	2002500					
			1	2103100					
•				Assembly	2,500	8'-0"	9'-11"	19"	10'
	4			2001550					
	4			2101950					
•				Assembly	1,550	8'-0"	6'-11"	19"	7'
		7	1	2001000					
		7	1	2101200					
•				Assembly	1,000	6'-5"	6'-7"	19"	6'
	4			2000540					
	4			2100655					
•				Assembly	540	6'-5"	4'-0"	19"	
		7		2000405					
		7		2100445					
				Assembly	405	4'-0"	5'-9"	5"	
	4	7	1	2000160					
	4	7	1	2100220					
				Assembly	160	3'-0"	4'-11"	5"	
	4	7	1	2000105					
	4	7	1	2100150					
				Assembly	105	3'-0"	3'-6"	5"	
	4	7	1	2000055					
	4	7	1	2100085					
				Assembly	55	3'-0"	2'-5"	5"	

• = Molded-in Lifting Lugs

High Density Crosslinked Polyethylene

Double-Wall Containment "Tank within a Tank"

Molded-in Lifting Lugs
Standard on Tank Sizes > 500 Gallons

See page 4 for more information

SAFE-TANK® Leak Detection Devices

Sensor Type	PP	PFA*
OPTICAL	7469	7470
ULTRASONIC	7460	7461

* PFA (PFA Teflon®) - offers superior stress and crack resistance

Control Box Stand

Stock # 7589

Tank Drawings available on website

SAFE-TANK® PVC Secondary Transition Fittings

SIZE	BOLT TYPE	STOCK # EPDM GASKET	STOCK # VITON GASKET
1"	316 SS	3281	3282
	TITANIUM	3283	3284
	Hastelloy	3285	3286
2"	316 SS	3287	3288
	TITANIUM	3289	3290
	Hastelloy	3291	3292
3"	316 SS	3293	3294
	TITANIUM	3295	3296
	Hastelloy	3297	3298

SAFE-TANK® Double-Wall Systems

ODOWATCH

O-CEMS
Odour Continuous Emission
Monitoring System

24/7 Odour Emission Tracking • Real-Time Odour Plume • Real-Time Site Odour Information

OdoWatch® System Components

- 1 or more Electronic Noses
- Weather Tower
- Pre-configured Computer
- OdoWatch® software with AERMOD
- Communication System

The e-noses are positioned near the odour sources of the site and measure the odour continuously. The odour data from the e-noses and the weather data from the weather tower are sent to the OdoWatch® software, which models the atmospheric dispersion and displays the site's odour plume.

OdoWatch® is calibrated to recognize and quantify (in odour units) the odours of each site.

The standards used for the measurements are ASTM E-679-91 and European Standard EN 13725.

OdoWatch® provides

- Automated central monitoring of odour emissions
- Display of odour concentration (intensity)
- Display of real-time weather data
- Odour atmospheric dispersion modeling
- 24/7 real-time odour plume display
- Programmable odour alerts at grid points selected by the user (Floating Impact Point)
- Data log, odour dispersion history (archive)

For more information, consult our web site: www.odotech.com

Odotech
Odor Experts

ODOWATCH

O-CEMS
Odour Continuous Emission
Monitoring System

Advantages

- Right-size odour abatement equipment
- Set odour management priorities
- Reduce odour neutralizer volume
- Save on investigations and government reporting
- Facilitate community relations
- Facilitate site Certificate of Approval
- Reduce documentation cost
- Eliminate current onsite sampling & measurement campaigns
- Prove good corporate citizenship

- Main (Drop) Menu
- Operating Menu
  Save - Printer - Center - Zoom
  Simulation - Options
- Alert
  This button is normally green ;
  it will turn red when a preset odour alert treshold at a FIP is reached.
- Odour Scale
- Odour Plume (Color-coded according to odour scale)
- Floating Impact Point (FIP)
- **Site Map Window**
- **E-Nose Odour Data Window**
- Meteorological Options
- **Weather Window**
- **Alert Window**

Composting • Landfills • Waste Water Treatment Plants • Rendering • Agribusiness • Food Processing • Refineries • Petrochemicals • Breweries • Methanisation Plants • Biofuel • Chemical Plants • Pulp & Paper Mills

Odotech
Odor Experts

Odotech inc. is a leading designer and producer of odour mesuring and monitoring systems. It carries out odour impact and other related studies as for governments, waste disposal and waste water treatment operators, industries and other organizations facing odour issues, worldwide.

3333 Queen Mary Road, Suite 301, Montreal, QC, Canada H3V 1A2 Tel.: 514 340-5250 Fax: 514 340-5211 **www.odotech.com**

Used heavy equipment, parts, engines and attachments from your Cat dealer.

SPECIFICATIONS FOR 2000 CATERPILLAR 924G WHEEL LOADERS/INTEGRATED TOOLCARRIERS

More Photos »

CatUsed.com®

2000 CATERPILLAR 924G
WHEEL LOADERS/INTEGRATED TOOLCARRIERS

Retail[1]: $53,000 USD
$54,280 CAD [2]

Location: SEATTLE, Washington, United States
Catalog #: CU1387749
Serial #: 9SW00722
SMU/Hrs: 16457
Condition:

For availability and purchasing information, contact your local Caterpillar dealer.

Telephone
Email

[1] **Contact your local Caterpillar dealer** for pricing details as additional charges may apply, including freight, taxes, duties, tariffs, quarantine, etc.

FEATURES

- LIGHTS, AUX. FRONT
- COUNTERWEIGHT, EXTRA
- ALTERNATOR, HIGH OUTPUT, 70AMP
- DOORS, CAB,FIXED GLASS
- HYDRAULICS, 3 VALVE 2 LEVER
- OIL COOLER, HYDRAULIC
- HEATER, ENGINE COOLANT,120V
- BUCKET, 3.5 CYD (HO)
- RIDE CONTROL
- INSTRUCTIONS, ENGLISH
- INSTALLATION GROUP, RADIO 12V
- LINKAGE, HIGH LIFT
- SEAT, FABRIC,SUSPENSION
- DIFFERENTIAL,LIMITED SLIP,FRNT
- LINES, HIGH LIFT
- TIRES, 550/65-R25 L3
- COUPLER, HI-LIFT
- MIRRORS, EXTERIOR
- CUTTING EDGE, BOLT ON(4 PIECE)
- MICHELIN TIRES

Prices subject to change without notice
Additional charges may apply, including freight, taxes, duties, tariffs, quarantine, etc.
[2]Currency conversions have been made where indicated.
Equipment prices may vary due to fluctuations in **Current Conversion Rates**

Used Equipment
» By Product Family
» By Manufacturer
» Advanced Search
» Recently Listed

Used CAT Parts
» Parts Search

Your Local Dealer:

Local Dealer not set.

» Set Local Dealer

Other Resources from Cat.com
» Find a Dealer
» Machine Specs
» Attachment Specs
» Engine Specs
» Power System Specs
» Financial Services
» Loan Calculator
» Build & Quote
» Cat Auction Services
» Cat® Classic™ Parts

Used heavy equipment, parts, engines and attachments from your Cat dealer.

SPECIFICATIONS FOR 2004 CATERPILLAR 924G WHEEL LOADERS/INTEGRATED TOOLCARRIERS

More Photos »

CatUsed.com®

2004 CATERPILLAR 924G
WHEEL LOADERS/INTEGRATED TOOLCARRIERS

Retail[1]: $60,000 USD
$61,553 CAD [2]

Location: Colorado, United States
Catalog #: CU1690293
Serial #: DDA00919
SMU/Hrs: 15692
Condition:

For availability and purchasing information, contact your local Caterpillar dealer.

Telephone
Email

[1] Contact your local Caterpillar dealer for pricing details as additional charges may apply, including freight, taxes, duties, tariffs, quarantine, etc.

FEATURES

- AIR CONDITIONER
- 3056 ENGINE
- LINKAGE, STANDARD
- FENDERS, STANDARD
- CAB, SLIDING GLASS
- SEAT, AIR SUSPENSION
- FAN, STANDARD
- DIFFERENTIAL,LIMITED SLIP,FRNT
- HYDRAULICS,3 VALVE 2 LEVER FNR
- INSTRUCTIONS, ENGLISH
- TIRES, 550/65-R25 XLD * L3
- LIGHTS, FLOOD
- GUARD, CRANKCASE
- INSTALLATION GROUP, RADIO 12V
- SUN VISOR, FRONT
- HEATER, ENGINE COOLANT,120V
- RIDE CONTROL
- AM/FM RADIO / CD PLAYER
- RIDE CONTROL
- BUCKET, GP 100"
- RADIATOR, STANDARD
- ALTERNATOR, STANDARD, 80AMP
- AIR CONDITIONER
- EMISSIONS PKG, TIER2 COMPLIANT
- TRANSMISSION, STANDARD
- PRECLEANER, DUSTBOWL
- OIL COOLER, HYDRAULIC
- DIFFERENTIAL, LS, HD BRAKES
- MIRRORS, OUTSIDE MOUNTED
- COUNTERWEIGHT, EXTRA
- GUARD, POWERTRAIN
- LINES, 3RD, FRONT, COUPL READY
- STEERING, STANDARD
- QUICK COUPLER, STANDARD
- PARTS BOOK, PAPER

Prices subject to change without notice
Additional charges may apply, including freight, taxes, duties, tariffs, quarantine, etc.
[2]Currency conversions have been made where indicated.
Equipment prices may vary due to fluctuations in **Current Conversion Rates**

Used heavy equipment, parts, engines and attachments from your Cat dealer.

SPECIFICATIONS FOR 2009 CATERPILLAR 906H WHEEL LOADERS/INTEGRATED TOOLCARRIERS

More Photos »

CatUsed.com®

2009 CATERPILLAR 906H
WHEEL LOADERS/INTEGRATED TOOLCARRIERS

Retail[1]: $63,800 CAD
Location: STONEY CREEK, Ontario, Canada
Catalog #: CU1705400
Serial #: SDH00172
SMU/Hrs: 448
Condition:
Dealer Certified

For availability and purchasing information, contact your local Caterpillar dealer.

Telephone
Email

[1] Contact your local Caterpillar dealer for pricing details as additional charges may apply, including freight, taxes, duties, tariffs, quarantine, etc.

FEATURES

- EROPS
- RIDE CONTROL
- COUNTERWEIGHT
- DIFF LOCK/UNLOC
- LIGHTING SYSTEM
- C/W CARRAIGE & 48" FORKS
- AIR CONDITIONER
- COUPLER, QUICK
- AUXILIARY HYDRAULICS
- AUTO SHIFT
- C/W 1.0 CYD GP BUCKET
- STANDARD 12 MONTHS / 1000 HOUR POWERTRAIN & HYDRAULICS WARRANTY - NORTH AMERICA ONLY

CONDITION

●●●●●	●●●●○	●●●○○	●●○○○	●○○○○
New	Very Good	Good	Fair	Poor

GENERAL APPEARANCE

Steps / Ladder	●●●○○	**Cab or Canopy**	●●●○○
Fenders	●●●○○ ADJUSTED INTO PROPER POSITIONS	**Fuel Tank**	●●●○○
		Paint	●●●○○
Eng. Enclose Hood / Stack	●●●○○ ADJUSTED ALIGNMENT	**Bumper**	●●●○○
Radiator Grill & Shroud	●●●○○	**Rear Frame**	●●●○○
Differential Supports	●●●○○	**Crankcase Guard / Battery Box**	●●●○○
Front Frame	●●●○○	**Counterweight**	●●○○○ SMALL CHUNK MISSING
Pre-Cleaner Bowl	●●●○○	**Sheet Metal**	●●●○○
Grab Irons	●●●○○		

Cleaning Required	No	**S.O.S. Taken**	No

Notes	REPLACED REAR 906H DECALS

SAFETY ITEMS

Horn	●●●○○

Safety Decals In Place	Yes	**Safety Decals Legible**	Yes
ROPS	Yes		

GAUGES, OPERATOR STATION, CONSOLE

Air Conditioner	●●●○○	**Windshield Wipers**	●●●○○
Switches	●●●○○	**Interior Lights**	●●●○○


Vancouver Island
Strait of Georgia
Burrard Inlet
Salish Sea
Washington
Franklin D Roosevelt La
Koote
Cascade Range
2
405
5
101
12
90
97
82
395
182
84
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Google earth
miles
200
km
300

WASTE EXPORT ANNUAL COSTS SUMMARY

COSTS	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
LOADING [1]	124,661	136,342	141,139	135,390	135,912	128,541	125,170	146,538	163,665	158,705	171,435	168,924
DISPOSAL, incl freight [2]	542,369	567,927	784,222	700,275	693,205	651,545	574,923	563,798	565,274	581,565	615,494	567,654
FREIGHT SAVINGS		0	-10,500	-10,500	-10,150	-8,400	-8,400	-6,400	-4,000			
MISC. WORK [3]								4,000		322		
(GAIN)/LOSS US EXCH [4]	-10,802	11,549										
TOTAL	656,228	715,818	914,861	825,166	818,967	771,686	691,693	707,936	724,939	740,592	786,929	736,578
TIPPING FEE REV.	972,288	998,974	1,005,849	861,659	875,552	789,492	741,397	744,686	749,982	780,090	783,908	795,288
SURPLUS (DEFICIT)	**316,060**	**283,156**	**90,989**	**36,493**	**56,585**	**17,806**	**49,704**	**36,750**	**25,043**	**39,497**	**-3,021**	**58,710**
TONNES EXPORTED	4,533	4,703	5,003	5,045	5,100	4,955	4,758	4,918	5,078	5,242	5,254	5,283
COST/TONNE	**144.76**	**152.22**	**182.88**	**163.55**	**160.57**	**155.72**	**145.36**	**143.13**	**142.76**	**141.29**	**149.79**	**139.42**

1 Loading contractor changed from City of Powell River to Augusta Recyclers in Jul-04

2 Disposal contractor changed from Rabanco to GVS&DD [GVRD] Mar-01.

3 Misc. work expense in 2004 was prorated reimbursement to GVS&DD for its cost to upgrade City's transfers site in 2001. Cost [$4,000] was not included in per tonne calculation as it was not directly related to the contract services

4 Disposal contractor changed from GVS&DD [GVRD] to Regional Disposal Company Jan, 2010. A gain or loss on US exchange is needed to convert the US$ held to Cdn$.

POWELL RIVER REGIONAL DISTRICT
2011 WASTE EXPORT COSTS

COSTS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total to Date 2011	2010	Average $/t. 2011	2010
															to date	to date
HANDLING (AUGUSTA)	10,753	9,520	10,633	10,667	9,990	10,113	11,033	11,367	10,710	10,207	9,654	10,012	**124,661**	**136,342**	**27.50**	**28.99**
TRANSPORTATION (AUGUSTA)	20,438	18,066	20,864	20,101	20,433	21,194	24,305	23,175	22,256	19,131	20,146	21,289	**251,398**	**256,901**	**55.46**	**54.63**
TRANSPORT/DISPOSAL (RDC)	23,465	20,337	23,465	23,465	23,465	25,030	28,158	26,594	25,030	21,901	26,594	23,465	**290,971**	**322,575**	**64.18**	**68.60**
(GAIN)/LOSS ON US EXCHANGE		5,604	7,162									- 23,568	**-10,802**	**0**	**-2.38**	**0.00**
SUBTOTAL TRANSPORTATIO	**43,903**	**44,007**	**51,492**	**43,566**	**43,899**	**46,224**	**52,463**	**49,769**	**47,286**	**41,032**	**46,740**	**21,186**	**531,567**	**579,476**	**117.26**	**123.23**
TOTAL COSTS	54,656	53,527	62,125	54,233	53,889	56,337	63,497	61,136	57,995	51,239	56,394	31,199	**656,228**	**715,818**	**144.76**	**152.22**
TIPPING FEE REV.	77,207	68,503	76,641	78,619	78,910	82,198	89,641	95,555	85,935	81,431	75,998	81,650	**972,288**	**998,974**		
SURPLUS (DEFICIT)	22,551	14,976	14,515	24,385	25,021	25,861	26,144	34,419	27,939	30,192	19,604	50,452	**316,060**	**283,156**		
TONNES EXPORTED	**369**	**326**	**376**	**362**	**368**	**382**	**438**	**418**	**401**	**345**	**363**	**384**	**4,533**	**4,703**		
(prior yr figures)	**380**	**340**	**418**	**379**	**372**	**420**	**421**	**456**	**402**	**372**	**355**	**388**				
* COST/TONNE	148.12	164.30	165.23	149.62	146.25	147.41	144.98	146.29	144.50	148.52	155.23	81.27	**144.76**	**152.22**		
Tonnes Handled 2011	367.44	325.33	363.37	364.53	341.40	345.60	377.04	388.45	365.98	348.79	329.90	342.15	**4,260**	**4,698**		
Tonnes Handled 2010	383.69	317.82	378.31	377.06	383.52	430.07	432.56	449.71	402.69	388.80	357.63	396.33				
Collected/Tonne	210.12	210.56	210.92	215.67	231.14	237.84	237.75	245.99	234.81	233.47	230.37	238.64				

* The RD recognized a loss on US exchange in February and March resulting in a higher cost/ tonne in those months.
* The RD recognized a gain on US exchange in December resulting in a lower cost/ tonne in that month.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total 2011	2010
COST/TONNE (W/O EXCHANGE LOSS)		147.10	147.61									142.66		
Diff Tonnes Exported/Handled	1.56	0.45	12.63	-2.05	27.08	36.59	60.93	29.46	35.36	-3.80	33.40	41.75	273.36	4.34