

ALBERNI VALLEY LANDFILL
2013 OPERATIONS AND MONITORING REPORT

Submitted To: British Columbia Ministry of Environment

Prepared By: McGill & Associates Engineering Ltd. (File #2771)

On behalf of the Alberni-Clayoquot Regional District

Date: October 2014

EXECUTIVE SUMMARY

The Alberni-Clayoquot Regional District (ACRD) operates the Alberni Valley Landfill (AVL) under Operational Certificate MR-00524. The AVL has operated as a landfill since the 1970's and accepts solid waste generated from the City of Port Alberni, ACRD Electoral Areas within the Alberni Valley and Bamfield and First Nations Communities Tseshah, Hupacasath, Huu-ay-aht and Uchucklesaht. This report is intended to meet the annual reporting requirements for the 2013 operating year, as required by the operational certificate and the *Landfill Criteria for Municipal Solid Waste* published by the BC Ministry of Environment (MoE) in 1993.

An estimated 18,155 tonnes of solid waste was landfilled at the AVL in 2013. Filling activities continued within the east and northeast expansion areas. Scale records and topographic surveys of the landfill face indicate a filling density of about 0.46 tonnes/m³ is being achieved. There is an estimated landfill volume of 2,560,000 m³ remaining at the AVL. Using an annual filling rate of 20,500 tonnes and a filling density of 0.56 tonnes/m³ (five year average), it is estimated that the earliest the AVL will reach capacity is approximately 2085.

Expenditures for the 2013 operating year totaled about \$1,722,000 and include a capital cost contribution and funds allocated for closure and post-closure requirements.

In 2013, the quarterly water quality monitoring program continued at the AVL. The results were considered satisfactory and no immediate measures were recommended. Recommendations included in the attached Piteau report, include continuing water quality monitoring, process data for leachate interception wells quarterly, report climate data, continuing to monitor water levels in the south expansion area, installing two new wells in the same area to provide redundancy and additional hydraulic backup to PW-1 and PW-2 and installation of monitoring wells near the northeast expansion area. Leachate is transported via underground pipeline to the City of Port Alberni municipal sewage lagoon for treatment. In 2013, approximately 482,222 m³ of leachate was treated at the municipal sewage lagoon.

A landfill gas generation assessment was completed in March 2011. The assessment estimated that less than 1,000 tonnes of methane was generated annually at the AVL, with future projections indicating that it may produce greater than 1,000 tonnes in the 2012 operating year. The landfill gas generation model was updated with current characterization data for the 2013 operating year and indicated that the AVL may generate greater than 1,000 tonnes of methane in the 2015 calendar year. Should actual generation rates be similar to those predicted, a landfill gas management design plan must be submitted to MoE by May 1, 2017.

There were no deviations from the operating plan during 2013. Projects included starting expansion into the northeast expansion area, installing water quality monitoring wells outside of the northeast expansion area, evaluating operation of leachate interception wells, working towards acquiring ownership or long term tenure of the landfill property, and completing maintenance work on existing monitoring wells.



Work proposed for 2014 includes continuing to fill in the northeast expansion area, putting out a request for proposals for a new landfill operations contract, completing repairs on the electric bear fence, continuing to work towards acquiring ownership or long term tenure of the landfill property, updating the regional solid waste management plan, continuing to plan an expansion to the transfer station area, improving the SCADA system and doing some upgrades to the McCoy Lake pumphouse building.

Contingency measures for power outages, accidents and leachate excursion have been discussed. The AVL is operating as designed and there are no immediate concerns with the AVL.

The Design, Operations and Closure Report estimates the financial security needed for closure and post-closure activities to be approximately \$11,500,000. With over \$1,444,000 in the current fund, an annual contribution of \$120,000 to the closure and post-closure fund is considered appropriate at this time. As it is extremely difficult to predict costs and design practices 70 to 90 years into the future, the preliminary design and associated costs should be reviewed regularly.



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Piteau Associates Engineering Ltd., August 2014

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1. INTRODUCTION

The Alberni-Clayoquot Regional District (ACRD) operates the Alberni Valley Landfill (AVL) under the British Columbia Waste Management Act Operational Certificate Number MR-00524, issued June 29, 2004. A copy of the operational certificate is attached in Appendix A. The operational certificate provides the conditions for which the AVL is authorized to manage recyclable material and waste from the ACRD. The known areas disposing of waste at the AVL include the City of Port Alberni, ACRD Electoral Areas within the Alberni Valley and Bamfield and First Nations communities Tseshah, Hupacasath, Huu-ay-aht and Uchucklesaht.

The AVL has operated as a landfill since the early 1970's. It is located approximately 5 km west of Port Alberni. The landfill is accessed via McCoy Lake Road, through the Tseshah First Nation reserve land. A site location plan is attached as Figure 1. The landfill accepts various forms of solid waste including municipal solid waste, residential and commercial demolition materials (including roofing and gyproc), compost and stumps, and limited quantities of asbestos and contaminated soils. The landfill also accepts recyclables that are subsequently transferred from the landfill by Sunbird Disposal for recycling.

This report is intended to meet the 2013 annual reporting requirements for operations and monitoring at the AVL, as required by the operational certificate section 3.2 and the *Landfill Criteria for Municipal Solid Waste* published by BC Ministry of Environment (MoE) in 1993. Therefore, this report includes discussion of:

- Total volume and/or tonnage of waste discharged into the landfill for the year;
- Approved design volume;
- Remaining site life and capacity;
- Operational plans for the next 12 months;
- Operation and maintenance expenditures;
- Leachate, water quality and landfill gas monitoring data and interpretation;
- Amounts of leachate collected, treated and disposed;
- Any changes from approved reports, plans and specifications;
- An up to date contingency plan, noting any amendments made to the plan during the year;
- Amount of landfill gas collected and its disposition; and,
- Review of the closure plan and associated estimated costs.



2. SOLID WASTE QUANTIFICATION AND LANDFILL CAPACITY

A Solid Waste Management Plan (SWMP) was prepared for the ACRD by Gartner Lee Limited in 2007. The objective of the report was to update the 1996 Regional Solid Waste Management Plan to reflect the current status of solid waste operations and the current public and political direction. The SWMP outlines how the ACRD will comply with relevant regulations and operational certificates. Since the SWMP was prepared, several programs are being implemented to reduce the amount of solid waste entering the landfill. Some of these programs include a composting program and curbside recycling program.

Throughout 2013, the AVL accepted waste and charged tipping fees according to ACRD Bylaw No. R1006-4. A copy of ACRD Bylaw No. R1006-4 is attached in Appendix B. The weight of solid waste entering the landfill in 2013 is summarized in Table 1 below.

Table 1: Measured Weight of Solid Waste Entering the AVL in 2013

Item	Weight (tonnes)
Residential Mixed Solid Waste	8,510
Commercial Mixed Solid Waste	6,362
Tires (# of tires)	143
Compost	568
Outgoing Steel	252
Incoming Cover Material	0
Asbestos	214
Special Waste	0
Roofing	1092
Gyproc	99
Mixed Construction Demolition	1,876
Service Road Cleanup	0

Of the listed weights, only the mixed solid waste, asbestos, special waste, roofing, gyproc, demo materials and service road cleanup become landfilled. Any incoming cover material is used as intermediate cover and is not considered solid waste. The tires are stockpiled near the transfer station, before being removed by a recycling company. All separated recycled material (cans, glass, newspaper, cardboard, plastic and steel) is stockpiled at the transfer area near the entrance is subsequently removed by a commercial recycling company. Any asbestos received is buried in a designated section near the east expansion areas. Compost material is stockpiled onsite and removed by a private composting company.

The data for the 2013 operating year was provided by the ACRD and is based on categorized scale records. When available, the direct weight of the categorized material was used. The amount of solid waste dropped off by individuals to the landfill site was provided based on the number of bags of garbage, as this is how payment is calculated. This is different from data



provided for past years, where the weight of solid waste in the transfer bins was used. In order to convert the number of bags of garbage to a representative weight, an average weight of 7.5 kg per bag was used (based on information provided in an Ergonomic Assessment study completed by the University of Ontario and the Transportation Health and Safety Association of Ontario). Where the number of bags is not specified (due to a maximum charge), it has been assumed that the load contains the maximum weight of 84 kg, as specified in ACRD Bylaw No. R1006-4. The amount of material landfilled during 2013 was approximately 18,155 tonnes. Therefore, the total estimated quantity of solid waste at the AVL is about 703,000 tonnes. A table of the estimated historic weights from 1975 to 2013 is attached included in Appendix C.

Throughout 2013, landfilling continued within the east and northeast expansion area. The filling area and other site features are shown on Figure 2. The latest topographic surveys of the landfill face were conducted on February 7, 2013 and January 15, 2014. The volume difference between these dates is approximately 37,400 m³. Based on the monthly landfill reports from this period, approximately 17,200 tonnes of waste was landfilled. Using these values, the waste is being filled at an estimated rate of about 0.46 tonnes/m³. Filling densities have ranged from 0.41 tonnes/m³ in 2008 to 0.66 tonnes/m³ in 2010.

Property setbacks vary throughout the site. The western limit of the site adopts the 50 m setback. On the north boundary, the setback requirement of 50 m has been relaxed to 30 m, to accommodate the existing landfill toe. The current design criteria includes 15 m setbacks on the east and south edges, finished slopes of 3H to 1V and a finished elevation of 106 m. As of January 15, 2014 there is an estimated 2,560,000 m³ available before the landfill reaches full capacity. Further detail on the proposed filling plan can be found in the *Design, Operations and Closure Report* for the Alberni Valley Landfill.

While there will likely be a population increase in future years, it is anticipated that the reduction of solid waste material will balance this, if not decrease it. Therefore, an annual filling rate of 20,500 (the average filling rate from the last five years) has been used to estimate projected annual tonnages. The filling density has varied over the past years. In order to evaluate the remaining capacity, an average (five year average) density of 0.56 tonnes/m³ was used. Therefore, it is estimated that the earliest the landfill will reach capacity is in around the year 2085. It should be noted that based on annual filling rates and densities, this value can vary significantly.

3. OPERATION AND MAINTENANCE EXPENDITURES FOR 2013

The AVL operated as usual throughout 2013. Funds in 2013 were used to continue to investigate potential cover material sources, planning and development of the northeast expansion area, maintenance on groundwater monitoring wells, and starting design for a transfer station expansion.



A summary of the 2013 expenditures are provided in Table 2 below.

Table 2: 2013 Operation and Maintenance Expenditures

Item	Approximate Cost
Daily Operations (Staff, utilities, equipment)	\$816,200
Miscellaneous Operations Costs (promotional/educational materials, recycling programs)	\$19,700
Administration	\$121,700
Capital Cost Contribution	\$589,200
Engineering, Monitoring & Consulting Fees	\$38,200
Landfill Closure & Post-Closure Fund Allocation	\$137,000
Total	\$1,722,000

The above table does not include costs associated with the Bamfield Transfer Station, recycling depot operations and residential recycling pick up.

The 2013 expenditures for the AVL are within the original budgeted amount submitted by the ACRD.

4. MONITORING DATA AND INTERPRETATION

Water quality monitoring is conducted on a quarterly basis at the AVL and reported annually. Landfill gas assessments are conducted every five years as the AVL was shown to produce less than 1,000 tonnes of methane annually, however this report includes the required annual landfill gas reporting requirements. Water quality monitoring, leachate quantities and landfill gas are discussed in the sections below.

4.1. Leachate & Water Quality

The quarterly water quality monitoring program continued throughout 2013. Piteau Associates Engineering Ltd. prepared and submitted a report entitled “*Water Quality Monitoring Program to December 2013, Alberni Valley Landfill*”, dated August 2014 with the final report being received October 21, 2014. The report provides the monitoring data and interpretation of results from the surface water, groundwater and leachate samples. A summary of the results are as follows:

- Groundwater flow beneath the existing landfill is to the north, northeast and east. Groundwater flow in the south expansion area is to the east and southeast. Flow rates and quantities are low due to limited thickness of permeable sediments and low permeability of bedrock. Construction of the berm and drain in the south expansion area appear to have controlled migration of seepage west towards Heath Creek.
- Leachate discharging from the base of the existing landfill suggests that the drain water is diluted by about 2:1 or less. Current leachate indicator concentrations are considered to be typical for a landfill of this size and age. Samples from the proposed south expansion area indicate no significant landfill effects have occurred to date, with the exception of slightly increased ammonia concentrations.



- Any potential historic leachate impacts in the southwest corner of the landfill appear to have been mitigated with the construction of the drain in the south expansion area.
- Chloride concentrations in surficial sediments on the north side of the landfill rose until it peaked in 1999 before leveling off and decreasing. Ammonia concentrations have increased in the past years, likely the result of retardation and are therefore expected to follow the chloride concentration and begin to decrease, meaning the peak leachate generation rates have already occurred.
- Since the construction of the north leachate interception trench, only very slight leachate impacts have been observed north of the leachate interception trench.
- Bedrock well monitoring data indicates that no leachate impacts have occurred to the south and only very slight leachate impacts have occurred to the west, north and northeast of the present landfill footprint. Monitoring data for bedrock wells around the landfill site perimeter are well within drinking water criteria, except for iron, manganese and arsenic, which are attributed to the naturally occurring mineralogy of the bedrock in the area.
- Leachate impacts have not been detected in McCoy, Heath and Norris Creeks in 2013
- Slight leachate impacts have been detected in Stevens Creek, north of the landfill boundary. Recent water quality in Stevens Creek has met the receiving water criteria with the exception of cadmium, manganese and iron in 2013 which has slightly exceeded the freshwater aquatic life criteria. The cadmium is attributed to background sources.
- Christie Creek received discharge from the leachate lagoon until 1998 and leachate impacts have since been drastically reduced since the pipeline was commissioned. The water quality met water quality criteria with the exception of total iron, manganese and zinc. The iron and manganese criteria are based on aesthetic objectives and the zinc exceedance is likely from a background source.
- Chemistry for two leachate interception wells indicated that they were intercepting leachate and controlling the migration of leachate towards Christie Creek. It appears that groundwater flows periodically exceeded the capacity of the interception wells. Recently, it was found that one of the pumps was not maintaining a low enough level to control migration

The report provided the following monitoring program recommendations:

- Continue the quarterly monitoring program;
- Process leachate flow data annually and operational data (water levels and cumulative flows) for the leachate interception wells quarterly;
- Report climate (precipitation) data;



- Monitor water levels in the 13 shallow piezometers in the south expansion area during sampling events;
- Add the cut down BH00-1C to the 2014 testing program.
- Include the two new monitoring wells outside of the northeast expansion area to the testing program;
- Add hardness testing to the creek samples to provide better assessment of the exceedance events.

In addition, the report recommended several design modifications and mitigative measures that include:

- Provide a mechanical backup for interception wells PW-1 and PW-2 in 2015;

Further detail and interpretation can be found in the water quality monitoring report, attached in Appendix D.

4.2. Leachate Collection System

Leachate is collected from the landfill and transported via underground pipeline to the City of Port Alberni municipal sewage lagoon. The volume of leachate received at the sewage lagoon is measured by the City of Port Alberni. The table below summarizes the monthly leachate flows throughout 2013.

Table 3: Monthly Leachate Flows for 2013

Month	Total Volume (m ³)	Average Daily Volume (m ³)	Max Daily Volume (m ³)	Min Daily Volume (m ³)
January	47,136	1,521	4,658	848
February	42,840	1,530	4,450	726
March	69,755	2,250	4,769	896
April	23,656	789	1,463	432
May	9,941	321	433	0
June	333	11	331	0
July	0	0	0	0
August	16	1	16	0
September	6,364	212	3,395	0
October	23,532	759	2,025	2
November	29,913	997	2,984	0
December	11,764	379	972	0
Total =	482,222			



Based on the measured flow data, approximately 482,222 m³ of leachate was transported to the City of Port Alberni sewage lagoon for treatment in 2013. The monthly leachate flows for the past 7 years are plotted in the following chart.

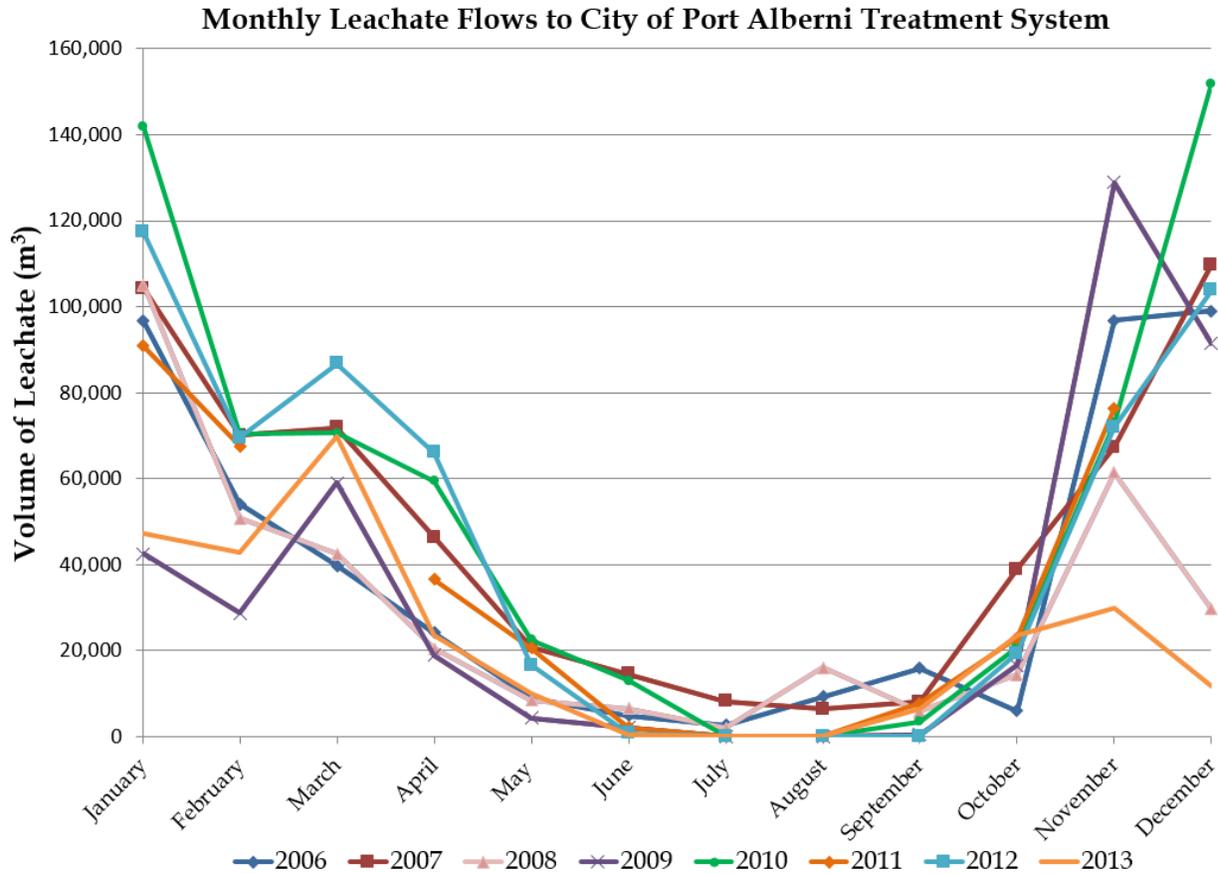


Chart 1: Monthly Leachate Volumes from 2006 to 2013

Flows follow the local precipitation patterns with increased flows during the wet winter months and lower flows during the dry summer months.

4.3. Landfill Gas

The following sections summarize the annual reporting requirements of the *Landfill Gas Regulation*.

4.3.1. Introduction

The following section has been prepared in accordance with the requirements of the British Columbia Ministry of Environment’s Landfill Gas Management Regulation (Regulation), approved and ordered on December 8, 2008, and in accordance with the Landfill Gas Generation Assessment Procedure Guidance Report, as prepared for the British Columbia Ministry of Environment (MOE) by Conestoga-Rovers & Associates (CRA), dated March 2009.



This section has been prepared by a qualified professional and meets the requirements of Section 4(3)(e) of the Regulation.

4.3.2. Records

The following section presents the information required under Section 12(3), 13, and 14(1)(a) of the Regulation.

The Alberni-Clayoquot Regional District certifies that all records required under Section 12(3) of the British Columbia Ministry of Environment Landfill Gas Management Regulation are retained for a period of at least 10 years after they are made. Furthermore, the records will be produced for inspection or copying, upon written request from the director, in the time period specified by the director as required in Section 13 of the Regulation.

4.3.3. Quantity, Source and Composition of Municipal Waste Received

The following section presents the information required under Sections 12(1)(a), 12(1)(b), 12(1)(c), 14(1)(a) and 14(2)(g) of the Regulation and as described in Section 5.1 of the Guidelines.

A breakdown of the quantity and type of solid waste entering the AVL in 2013 has been provided in Section 2. The waste composition has been categorized and a summary is provided in Appendix E. This table includes the measured waste categorization from 1995 to 2013.

As no solid waste categorization studies have been completed, the solid waste composition was based on a combination of scale records and the *British Columbia's Solid Waste Flow Report, 2006 Summary Report* prepared for MoE by BC Stats in February 2010. Further discussion on the methodology used can be found in the *Alberni Valley Landfill, Landfill Gas Generation Assessment*, prepared by McGill & Associates Engineering Ltd. in March 2011.

Using the same analysis and assumptions as the *Alberni Valley Landfill, Landfill Gas Generation Assessment*, in 2013, the AVL received 6,778 tonnes (37.3%) of relatively inert material, 5,277 tonnes (29.1%) of moderately decomposable material, and 6,100 tonnes (33.6%) of decomposable material. A table showing the breakdown of the waste composition for 2013 has been included in Appendix E.

4.3.4. Waste Diversion

The following section presents the information required under Section 14(1)(b) of the Regulation.

The SWMP prepared in 2007 estimated that the ACRD had a recycling rate of 15%. This rate was based on scale records from 2005, before a curbside recycling program was implemented. The City of Port Alberni and Beaver Creek Electoral Area now have curbside recycling programs and recycling depots are located in the City of Port Alberni and at the AVL.



There is currently no formal organics waste diversion program within the ACRD or City of Port Alberni. Backyard composting of organic waste is encouraged through distribution of backyard composters and educational material on the ACRD website.

The AVL accepts yard waste compost free of charge. The compost is stored onsite and subsequently removed by an outside contractor. The 2007 SWMP recommends several organic waste diversion programs such as establishing a yard waste depot within the City of Port Alberni, setting up a yard waste composting facility at the AVL or an alternate location, and completing a composting feasibility study. None of these programs have been implemented yet.

4.3.5. Landfill Gas Generation Model Results

As found in the *Alberni Valley Landfill Gas Generation Assessment* finalized in 2011, the AVL is nearing 1,000 tonnes of methane production annually. Therefore, the *Landfill Gas Generation Estimation Tool* was used to update previous estimates of methane production. In updating the spreadsheet, the same assumptions were made as stated in the *Landfill Gas Generation Assessment Report for the Alberni Valley Landfill*, March 2011. The estimation tool spreadsheet results are attached in Appendix F and a summary of the landfill gas generation model results are presented in the table below.

Table 4: Landfill Gas Generation Model Results

	Year	Mass of Methane Generated (tonnes)
Estimated Quantity of Methane Produced in year Preceding the Assessment	2013	986
Estimated Quantity of Methane Produced in Year of the Assessment	2014	994
Estimated Quantity of Methane Produced One year after the Assessment	2015	1,002
Estimated Quantity of Methane Produced Two Years after the Assessment	2016	1,010
Estimated Quantity of Methane Produced Three Years after the Assessment	2017	1,017
Estimated Quantity of Methane Produced Four Years after the Assessment	2018	1,025

The model results indicate that the first year the AVL may produce greater than 1,000 tonnes of methane is in the year 2015.

Should future generation rates be similar to those projected, the annual landfill gas report for the 2015 year (submitted to MoE by May 1, 2016) may indicate that a Landfill Gas Management Design Plan be prepared and submitted to MoE by May 1, 2017.



5. REVIEW OF OPERATING PLAN

In 2013, the landfill followed the same operating procedures as past years. Landfilling continued within east and northeast expansion area and there were no major changes to the quarterly water quality monitoring program. Notable work related to AVL operations in 2013 included:

- Developing plans and starting expansion into the northeast corner of the landfill;
- Installing two nested piezometers outside of the northeast expansion area to add to the water quality monitoring program;
- Evaluating the operation of the existing leachate interception wells adjacent to the lagoon;
- Investigating future sources of cover material;
- Working towards acquiring ownership or long term tenure of the landfill property;
- Doing maintenance work (extending and shortening) of water quality monitoring wells; and,
- Starting preliminary plans for expansion of the transfer station.

In 2013 there were no major deviations from the operating plan.

6. 2014 OPERATIONAL PLAN

In 2014, will continue in the northeast expansion area (Cell B). Filling operations will continue as described in the *Alberni Valley Landfill Design, Operations and Closure Report* (dated February 2012).

Plans for 2014 include:

- Continuing to develop portions of the northeast expansion area see Figure 3;
- Putting out a landfill operations Request for Proposals in order to enter into a new operations contract;
- Completing repairs on the electric bear fence;
- Continuing to work towards acquiring ownership or long term tenure of the landfill property;
- Updating the regional solid waste management plan;



- Continuing to plan an expansion to the transfer station area to accommodate proposed MMBC requirements;
- Improving the current SCADA system; and,
- Planning for some upgrades to the McCoy Lake Road pumphouse building (that pumps water to the landfill reservoir).

Cover material was extracted from nearby DL 307 and has been stockpiled in the southern area of the landfill. It is estimated that it will take approximately one and a half to two years to deplete the stockpiled material. Additional sources of cover material will continue to be investigated as the current sources are limited.

Also in 2014, the ACRD will be entering into an agreement with Multi-Material British Columbia to coordinate the collection of residential recycling services. The AVL will become a depot and accept recycling materials that will then be collected by a MMBC contractor. The details of this arrangement will be worked out in 2014.

7. CONTINGENCY PLAN

A contingency plan has been developed to make provision for any unplanned events that may disrupt landfill operations. Various contingency measures have been discussed below.

In the event of a power outage, a backup generator is located onsite and capable of restoring power to the scale, scale shed, maintenance building, caretakers residence and leachate pumps at the transfer bin area.

Vehicles onsite are equipped with radios that communicate with the maintenance building and the scale shed. Should there be an accident or emergency, emergency vehicles can be called from the telephone at either the maintenance building or scale shed. In addition, the AVL has been added to the Sproat Lake Fire Department service area which offers first responder services and fire fighting services to onsite buildings and structures.

While monitoring wells are located to allow early identification of potential leachate problems, several contingency measures have been developed in the event that leachate excursion is found and these include:

- Drilling interception wells and installing pumps to intercept leachate flows and direct them into the leachate collection system;
- Excavating a deep sump to intercept flows destined for surface water bodies; and,
- Constructing a clay and/or bentonite berm to block groundwater flow.

A clay source is available locally and the landfill operators have the machinery available onsite for any construction needed.



8. CLOSURE PLAN

An *Alberni Valley Landfill Design, Operations and Closure Report* has been prepared for the AVL. The report outlines the proposed closure design for the AVL and the estimated post-closure requirements. No changes have been made to the closure design. As indicated previously the landfill is estimated to have around 70 years of remaining life before closure is required.

As per the report, the closure and post-closure costs have been estimated at approximately \$11,500,000. There is currently just over \$1,444,000 in the current closure and post-closure fund. In 2013, an additional \$120,000 was put into the closure fund. In addition, interest was added to the fund making the total amount added to the closure fund in 2013 to be \$136,969.42. The 2014 budget indicates that an additional \$120,000 will be added to the closure fund in 2014, in order to continue to build up the financial security and establish the funds needed for closure and post-closure activities. While several assumptions have been made in the preparation of the estimate (see *AVL Design, Operations and Closure Report, 2012*), it should be noted that the estimate is based on 70 to 90 years of life remaining at the AVL and current design practices. It is extremely difficult to predict costs and design practices that far into the future, therefore the closure design and associated costs should be reviewed regularly.

9. COMPLIANCE REVIEW

The last compliance review was completed with a Ministry of Environment representative on November 15, 2012. A compliance review was not completed during 2013.



10. LIMITATIONS

This document was prepared by McGill & Associates Engineering Ltd. for the Ministry of Environment, on behalf of the Alberni-Clayoquot Regional District. Its material, recommendations and conclusions represent the best material available to McGill & Associates Engineering Ltd. at the time of the report preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. McGill & Associates Engineering Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Yours truly,

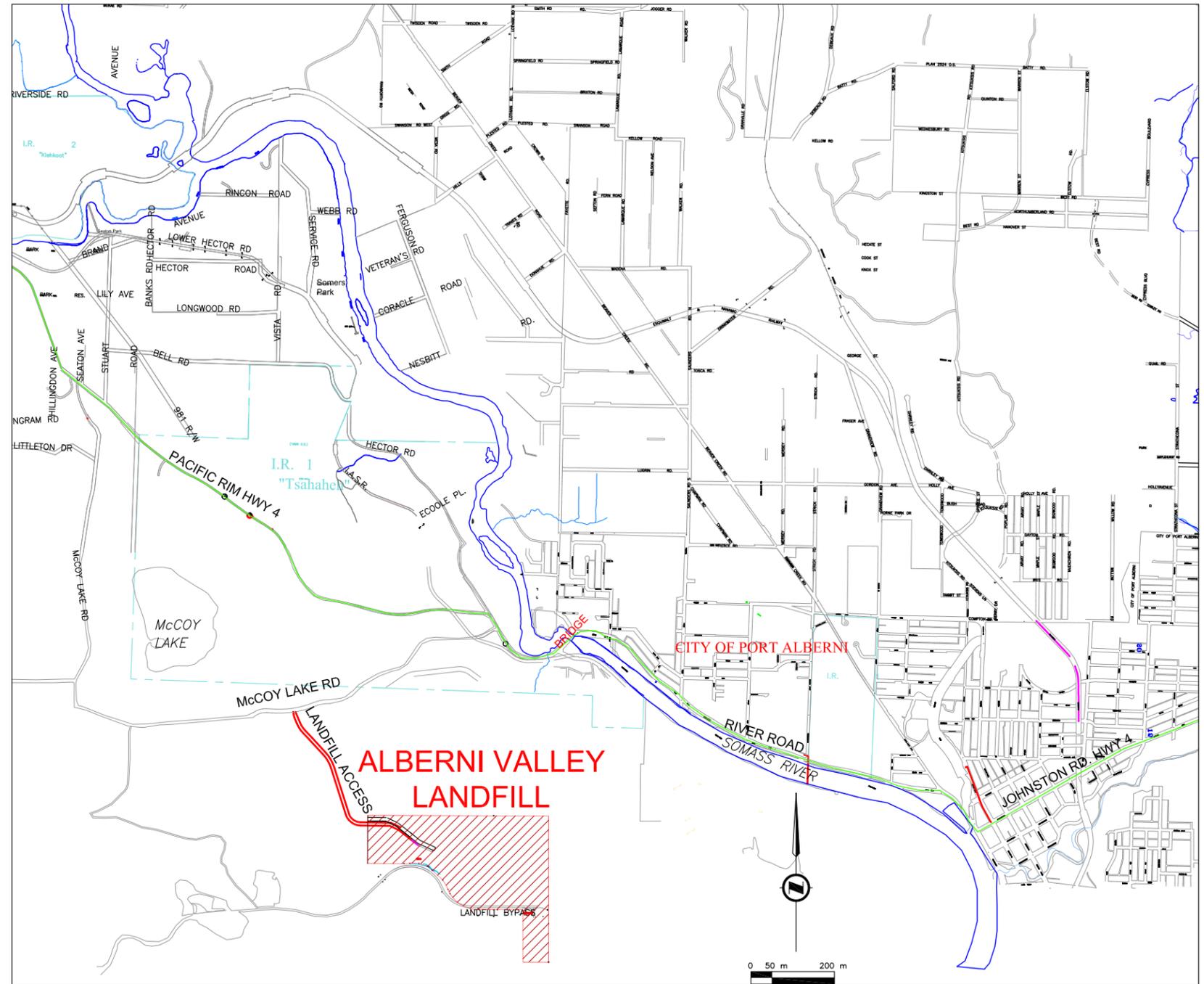
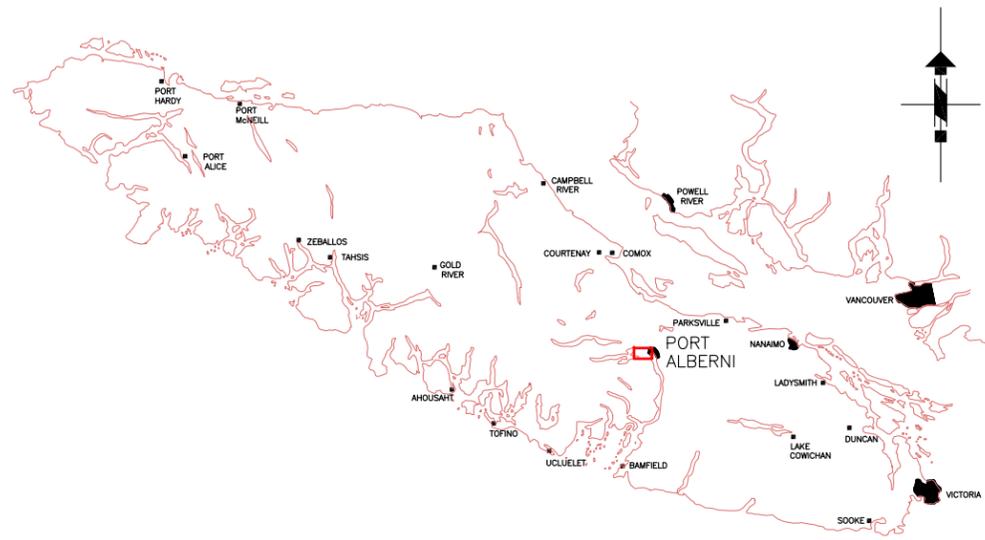
for **McGill & Associates Engineering Ltd.**

Alan McGill, P. Eng.



FIGURES





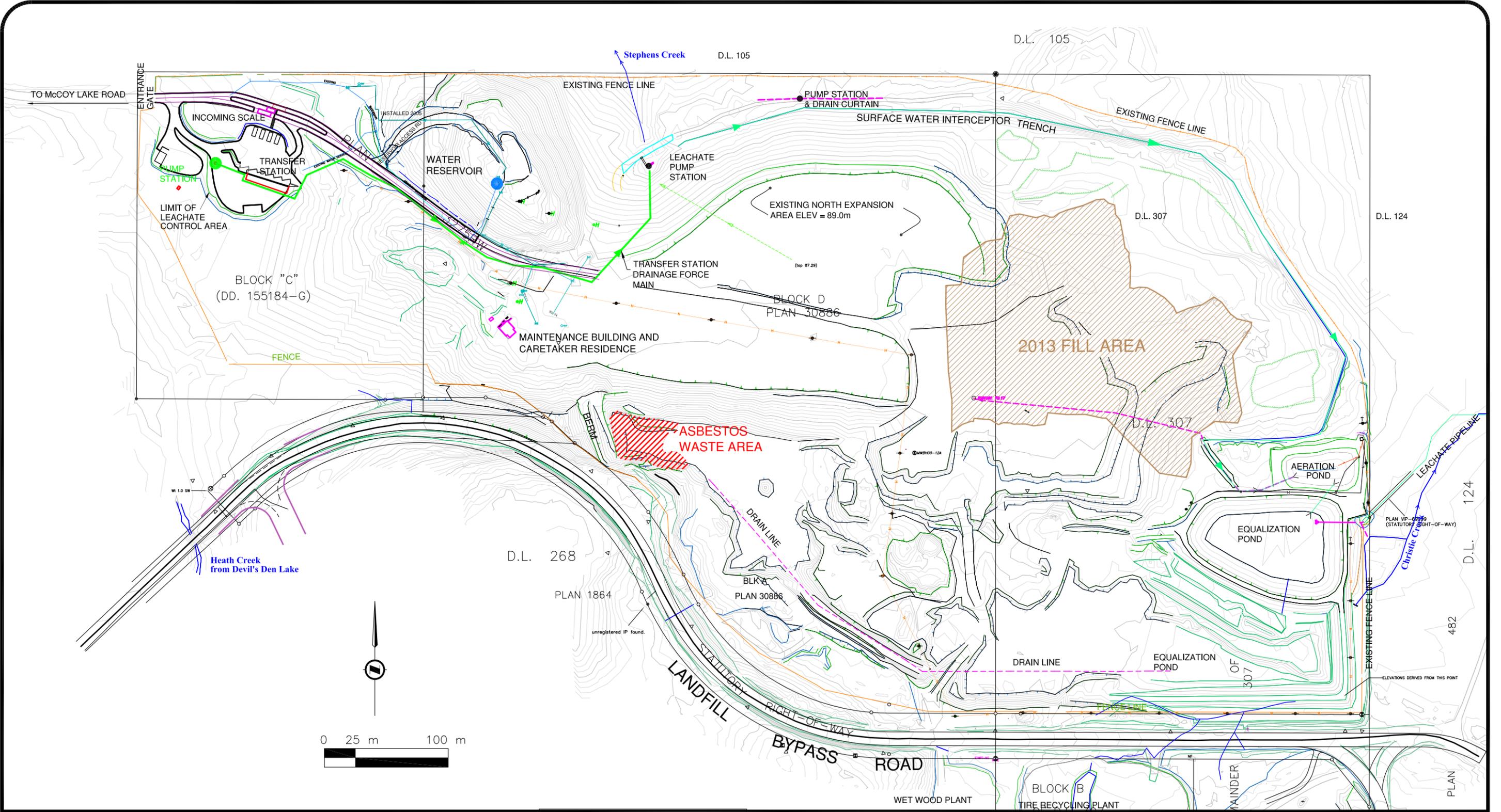
JUNE 2014

ALBERNI CLAYOQUOT REGIONAL DISTRICT
 ALBERNI VALLEY LANDFILL - 2013 OPERATIONS & MONITORING REPORT
 SITE LOCATION PLAN

FIGURE 1



S:\2771 ACRD AVL Annual Reporting\2013 Annual Report\Figures - pdfs in final report folder\FIGURE 2 - General Site Plan.dwg Nov 19, 2014 3:16:57pm

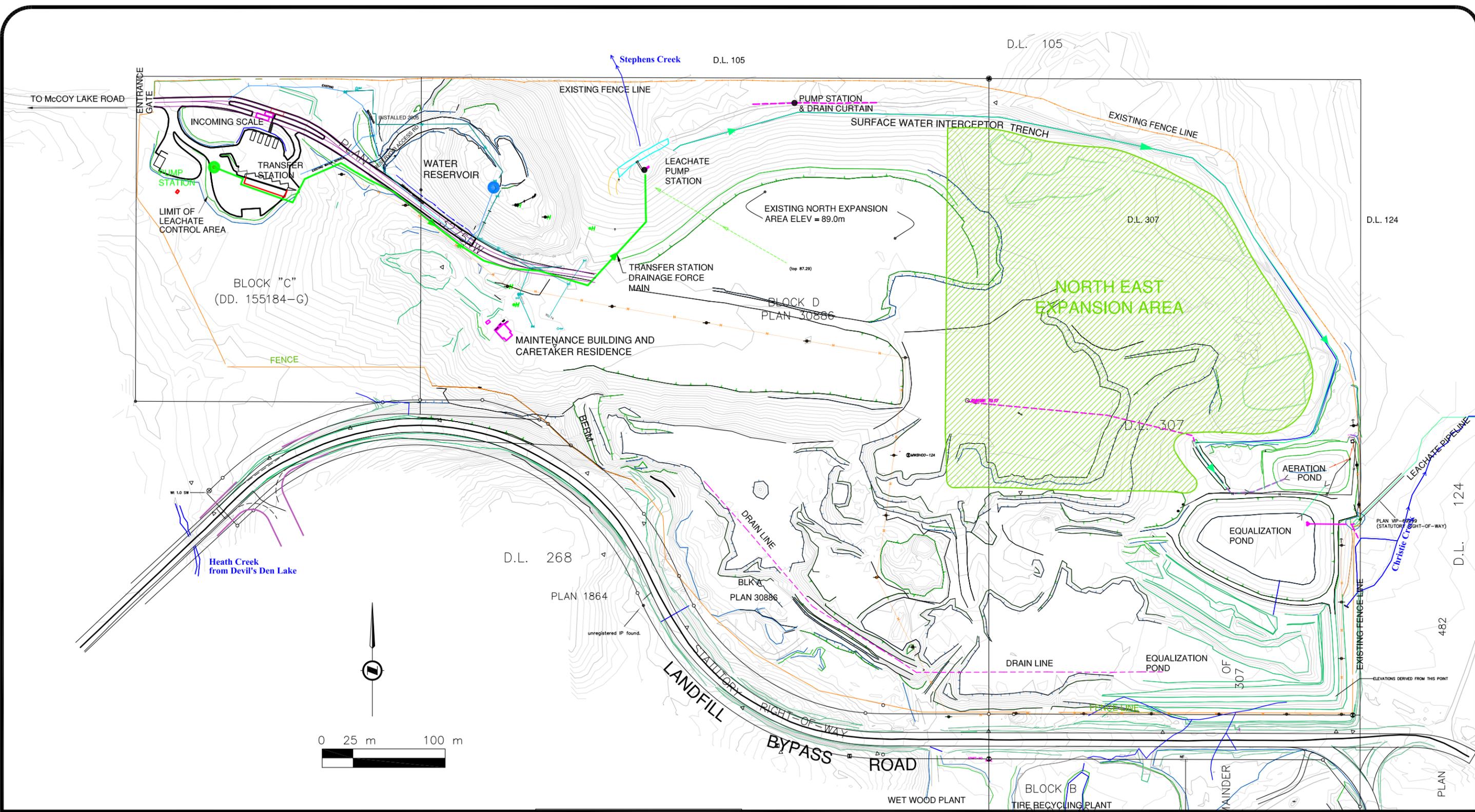


JUNE 2014

ALBERNI CLAYOQUOT REGIONAL DISTRICT
 ALBERNI VALLEY LANDFILL - 2013 OPERATIONS AND MONITORING REPORT
 GENERAL SITE PLAN

FIGURE 2





NOVEMBER 2014

ALBERNI CLAYOQUOT REGIONAL DISTRICT
 ALBERNI VALLEY LANDFILL - 2013 OPERATIONS AND MONITORING REPORT
 NORTH EAST EXPANSION AREA

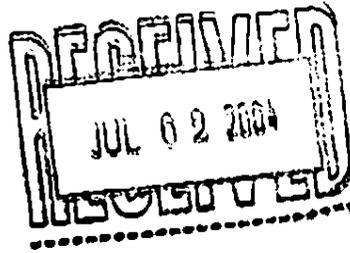
FIGURE 3



APPENDIX A

Alberni Valley Landfill Operational Certificate MR-524





File: MR-00524

Date: JUN 29 2004

REGISTERED MAIL

Alberni-Clayoquot Regional District
3008 Fifth Ave
Port Alberni BC V9Y 2E3

Dear Operational Certificate Holder:

Enclosed is Operational Certificate MR-00524 issued under the provisions of the *Waste Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the Operational Certificate.

This Operational Certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the Operational Certificate Holder. It is also the responsibility of the Operational Certificate Holder to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 7 of the *Waste Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given, in accordance with the practices, procedures and forms prescribed by regulation under the *Environment Management Act*. For further information, please contact the Environmental Appeal Board at 250 387 3464.

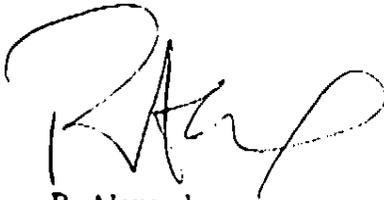
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orig - agreements file
cc - Sean

- 2 -

Administration of this Operational Certificate will be carried out by staff from the Vancouver Island Region office. Plans, data and reports pertinent to the Operational Certificate are to be submitted to the Regional Waste Manager at Ministry of Water, Land and Air Protection, Regional Operations, Vancouver Island Region, 2080 Labieux Road, Nanaimo, British Columbia, V9T 6J9.

Yours truly,

A handwritten signature in black ink, appearing to read 'R. Alexander', written in a cursive style.

R. Alexander
Regional Waste Manager
Vancouver Island Region

Enclosure (Copy of signed legal Operational Certificate)

cc: Environment Canada



MINISTRY OF WATER, LAND
AND AIR PROTECTION

Vancouver Island Region
Environmental Protection
2000-A Lableux Road
Nanaimo, British Columbia
V9T 6J9
Telephone: (250) 751-3100
Fax: (250) 751-3103

OPERATIONAL CERTIFICATE

MR-00524

Under the Provisions of the Waste Management Act

Regional District of Alberni-Clayoquot

3008 Fifth Avenue

Port Alberni, British Columbia

V9Y 2E3

is authorised to manage recyclable material and waste from the Regional District of Alberni-Clayoquot and environs at the Alberni Valley landfill located near Port Alberni, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

1. MANAGEMENT OF WASTE AND RECYCLABLE MATERIAL

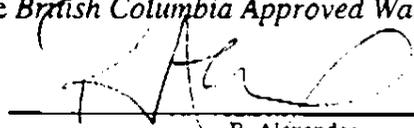
1.1. Sanitary Landfill

- 1.1.1. This subsection applies to the discharge of waste to a sanitary landfill.
- 1.1.2. Waste may be discharged to the sanitary landfill shown on attached Site Plan A.
- 1.1.3. The characteristics of the discharge must be municipal solid waste as defined under the *Waste Management Act* and other wastes as approved in writing by the Regional Waste Manager.
- 1.1.4. The authorised works are a sanitary landfill, and related appurtenances approximately located as shown on attached Site Plan A.
- 1.1.5. The authorised works must be complete and in operation on and from the date of this operational certificate.

1.2. Leachate

- 1.2.1. This subsection applies to the management of leachate from the landfill.
- 1.2.2. The characteristics of the surface water and groundwater at the property boundary must not exceed concentrations set in the *British Columbia Approved Water*

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R. Alexander
Regional Waste Manager

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Quality Guidelines (Criteria) and A Compendium of Working Water Quality Guidelines for British Columbia. Where natural background water quality concentrations exceed the aforementioned guidelines, characteristics of the surface water and groundwater must not exceed background concentrations.

- 1.2.3. The authorized works are a leachate collection and conveyance system, leachate treatment works, lift station and related appurtenances approximately located as shown on Site Plan A.
- 1.2.4. Leachate must be collected, treated and conveyed to the City of Port Alberni sewage treatment system.
- 1.2.5. The authorized works must be complete and in operation on and from the date of this operational certificate.

1.3. Location of authorised facilities

The location of the facilities for the management of recyclable material and waste to which this operational certificate is applicable is Block D of Lot 268, Alberni Land District, approximately located as shown on attached Site Plan A. The location of the leachate treatment facility is Lot 307, Alberni Land District approximately located as shown on attached Site Plan A.

2. GENERAL REQUIREMENTS

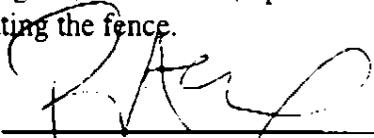
2.1. Entrance facilities

- 2.1.1. The authorised facilities are signs, weigh scales, recyclable material and waste drop-off and storage facilities and related appurtenances approximately located as shown on attached Site Plan A.
- 2.1.2. The authorised facilities must be complete and in operation on and from the date of this operational certificate.

2.2. Bear-Proof Facilities

- 2.2.1. Bears must not access putrescible waste at the landfill facility. All putrescible waste that arrives at the landfill facility must be immediately contained within a bear-proof bin or an area enclosed by a bear-proof electric fence. Grass, leaves, weeds, branches and woodwaste are exempt from bear-proofing requirements.
- 2.2.2. A bear-proof electric fence must be installed around the landfill.
- 2.2.3. The bear-proof electric fence must be designed, constructed, operated and maintained to prevent bears from penetrating the fence.

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R. Alexander.
Regional Waste Manager

2.2.4. The bear-proof electric fence must be complete and in operation on and from the date of this operational certificate.

2.3. Qualified Professionals

All facilities and information, including works, plans, assessments, investigations, surveys, programs and reports, must be certified by qualified professionals.

2.4. Plans

- 2.4.1. Site development, operating, leachate management, closure and post closure plans must be submitted to the Regional Waste Manager by October 31, 2004.
- 2.4.2. The plans must address, but not be limited to, each of the subsections in the *Landfill Criteria for Municipal Solid Waste* including performance, siting, design, operational and closure and post-closure criteria.
- 2.4.3. The facilities must be developed, operated and closed in accordance with the plans.

2.5. Landfill Gas

- 2.5.1. When 100,000 tonnes of waste have been discharged at the landfill, an assessment of the potential for landfill gas generation must be submitted to the Regional Waste Manager.
- 2.5.2. The landfill gas assessment must address, but is not limited to, subsections 4.2 and 6.4 of the *Landfill Criteria for Municipal Solid Waste* and section 6 of the *Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills*.
- 2.5.3. The potential for landfill gas generation is to be re-assessed at least once every 5 years after the initial assessment.

2.6. Seismic and Fault Activity

A report that assesses the risk from seismic and fault activity must be submitted to the Regional Waste Manager by October 31, 2004.

2.7. Additional Facilities or Works

The Regional Waste Manager may require investigations, surveys, and the construction of additional facilities or works including, but not limited to, additional leachate and landfill gas management facilities. The Regional Waste Manager may also amend the requirements of any of the information required by this operational certificate including plans, programs, assessments and reports.

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R. Alexander
Regional Waste Manager

3. MONITORING AND REPORTING

3.1. Monitoring Program

- 3.1.1. A monitoring program must be developed to identify any impacts to the environment and public health from the landfill.
- 3.1.2. The monitoring program must address, but not be limited to, subsections 4.1, 4.2 and 7.15 of the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills*.
- 3.1.3. Monitoring must be conducted in accordance with the monitoring program.

3.2. Annual Operating and Monitoring Report

- 3.2.1. An annual operating and monitoring report for the preceding 12 month period from January 1 to December 31 must be submitted to the Regional Waste Manager by May 1 of each year.
- 3.2.2. The report must include:
 - An executive summary;
 - Tonnage of each type of waste discharged to the landfill for the year;
 - Remaining site life and capacity;
 - Review of the preceding year of operation, plans for the next year and any new information or proposed changes relating to the facilities and plans;
 - Comparison of the monitoring data with the performance criteria in section 4 of the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills*, interpretation of the monitoring data, identification and interpretation of irregularities and trends, recommendations, and any proposed changes to the monitoring program.

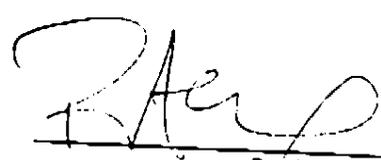
4. SITE CLOSURE

4.1. Closure and Post-Closure Fund

A closure and post-closure financial security trust fund must be built up over time. The closure and post-closure fund must ultimately meet or exceed the estimated closure and post-closure costs plus a reasonable contingency for any remediation that may be required.

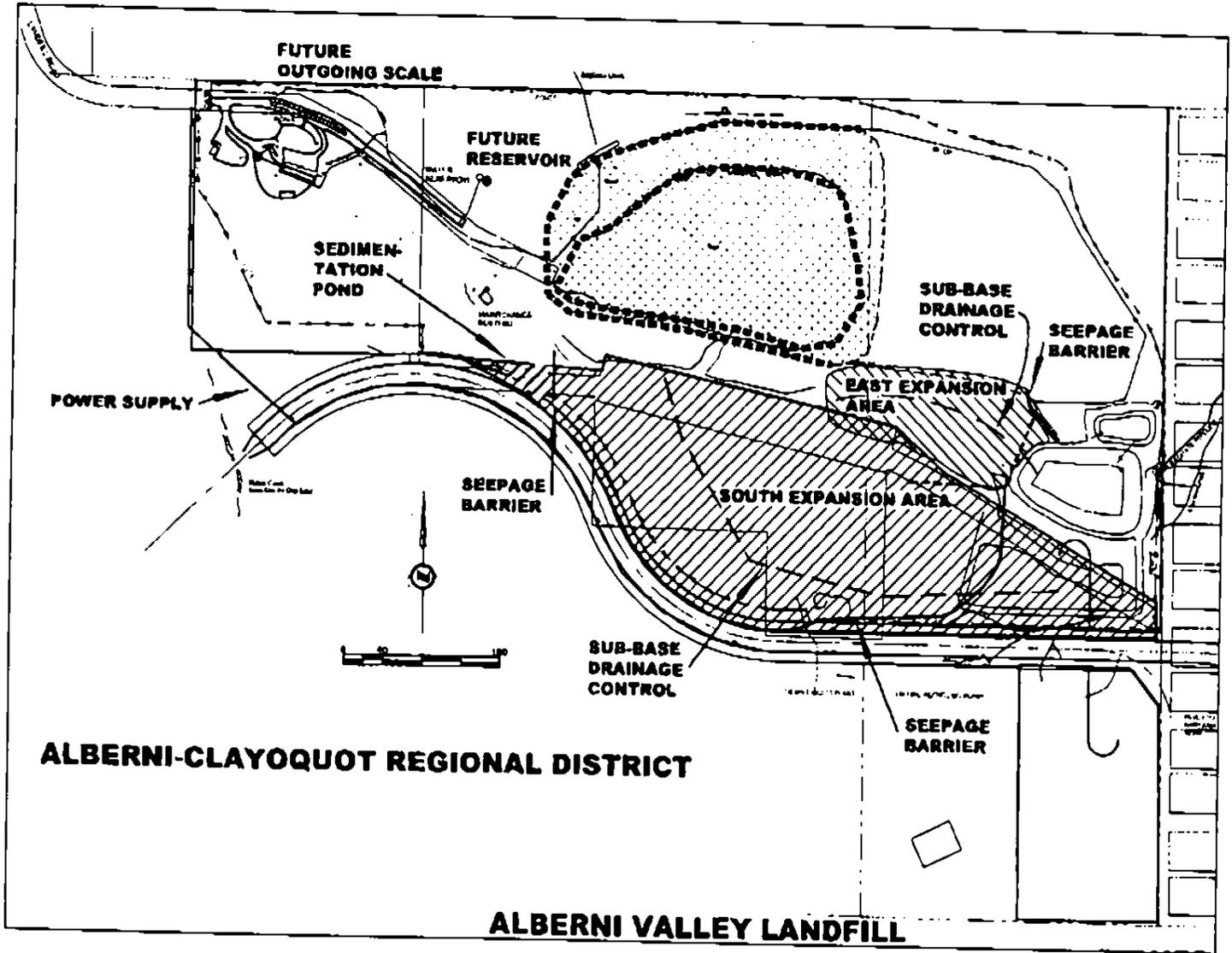
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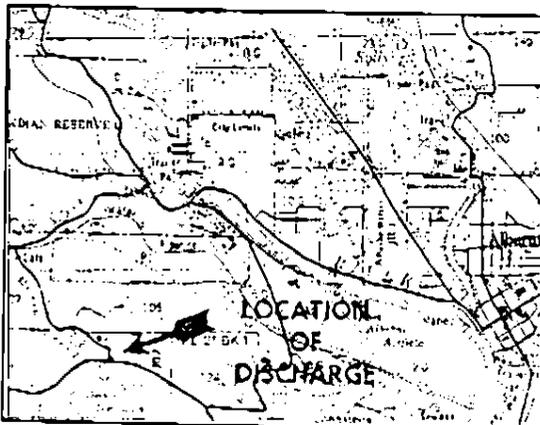


R. Alexander,
Regional Waste Manager

SITE PLAN A



Location Map



Scale: 1:2400

OPERATIONAL CERTIFICATE: MR-00524

Date: JUN 29 2004

R. Alexander
Regional Waste Manager
Vancouver Island Region

APPENDIX B

Alberni-Clayoquot Regional District Bylaw No. R1006-4



REGIONAL DISTRICT OF ALBERNI-CLAYOQUOT

SCHEDULE "A" to BYLAW NO. R1006-4

CHARGES

1. The charge for depositing covered solid waste at the disposal ground is:
 - a. Loads 84 kg or greater \$95.00/tonne (\$8.00 minimum)
 - b. Loads under 84 kg - \$2.00 each garbage bag or can (\$8.00 maximum)
 - c. \$2.00 for each tire or \$170 per tonne, whichever is greater
 - d. \$100.00 for each wrecked auto
 - e. \$200.00 for each wrecked truck, bus or recreational vehicle
2. In the event that the scales provided are not operational, weight shall be estimated by the scale clerk at the landfill.
3. The fee to be charged for all loads of solid waste which arrives at the landfill site uncovered shall be double the normal fee for loads of covered solid waste.
4. There shall be no charge for recyclable materials, including but not limited to paper, metal, boxboard, Corrugated Cardboard, compostable materials and other materials as determined by the Regional District but excludes any material contaminated by food or oil and any material that is a Controlled Waste.
5. All charges payable under this Bylaw shall be paid prior to the deposit of the solid waste for which the charge is made unless it is necessary to weigh the vehicle depositing solid waste loaded and empty to determine the weight of solid waste, in which case the charge shall be paid immediately after weighing the vehicle empty.
6. The person paying a charge shall obtain a receipt for such payment and shall produce such receipt for inspection on request of a person employed for that purpose at a disposal site as a condition of depositing solid waste at a disposal site.
7. Notwithstanding anything to the contrary in this Bylaw, persons depositing solid waste at a disposal site on a regular basis may apply to the Regional District for credit and if credit is granted to that person, then payment of the charge imposed under Section 1 shall be made and the credit extended on condition that:
 - a. Payment in full shall be received by the Regional District within thirty days of the last day of the month for which an invoice has been submitted. The Regional District will invoice monthly for material delivered during the proceeding month. The invoice amount will be based on the total quantity of the refuse delivered during the month, and the posted disposal rates in effect at the time of delivery.
 - b. Late payments will be subject to an interest charge of 2% per month (effective annual interest of 24%)

- c. The Regional District reserves the right to cancel, upon five days' notice, the credit offered herein for late payment, non-payment or other justified cause.

8. Controlled Waste

The charges, as measured by weight on the scales, for the depositing of Controlled Waste at the disposal site are:

- a. Construction/Demolition Waste - \$120.00 per tonne; if the Demolition Waste is crushed to pieces 7 cubic centimetres or smaller the charge is \$95.00 per tonne;
- b. Stumps, land clearing debris - \$120.00 per tonne;
- c. Waste oil (commercial) - \$0.50 per litre;
- d. Material containing traces of contaminated soils:
 - i. \$10.00 per tonne provided that the Ministry of Environment has approved of disposal of the contaminated soil, without treatment, at the Alberni Valley Landfill or;
 - ii. \$70.00 per tonne plus the Regional District's estimated out-of-pocket treatment costs, provided that the Ministry of Environment has approved of the treatment and disposal of the contaminated soil at the Alberni Valley Landfill.
- e. Material containing pumpings from domestic septic tanks - \$120.00 per tonne;
- f. Material containing catch basin and manhole material - \$120.00 per tonne;
- g. Waste asbestos - \$250.00 per tonne (\$120.00 minimum);
- h. Fish, shrimp shells, animal carcasses - \$170.00 per tonne (\$95.00 minimum), provided that there will be no charge for animal carcasses removed from public roadways by a public body or their contractor;
- i. Fridges and freezers - \$20.00 each;
- j. Batteries - no charge if separated and placed in hazardous waste container;
- k. Steel Cable - \$500.00 per tonne;
- l. Biomedical waste - \$132.00 per tonne;
- m. Loads containing Gypsum - \$120.00 per tonne;
- n. Loads containing Corrugated Cardboard - \$130.00 per tonne;
- o. Loads containing fish feed totes - \$400.00 per tonne (\$120.00 minimum).

APPENDIX C

Historic Weights at AVL



APPENDIX D

Water Quality Monitoring Program to December 2013

Alberni Valley Landfill

Piteau Associates Engineering Ltd.



APPENDIX E

Waste Categorization from 1995 to 2013

&

Estimated Alberni Valley Landfill Waste Composition - 2013



Summary of AVL Weigh Scale Records - 1995 to 2013 (tonnes)

Waste Composition	Year																		
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mixed Waste (Residential & Commercial)	14,049	12,714	14,405	12,824	11,558	12,037	11,235	11,554	12,423	13,670	14,832	15,395	17,134	13,332	10,519	12,072	9,041	8,977	8,510
Residential Mixed Waste	n/a	590	5,638	6,268	6,642	6,531	6,362												
Industrial, Commercial & Institutional Mixed Waste	n/a	376	1,154	776	737	1,230	1,092												
Construction	1,718	1,218	837	927	1,486	1,385	669	880	731	832	1,278	1,518	1,861	1,624	1,154	776	737	1,230	1,092
Roofing	48	136	56	28	38	59	60	55	53	60	120	152	192	209	175	188	128	108	99
Gyproc	2,483	641	854	1,449	1,097	1,130	1,200	881	1,254	1,827	2,789	2,209	2,412	2,785	2,376	2,573	2,228	2,020	1,876
Mixed Demo	587	587	516	811	1,735	313	258	70	173	64	163	117	369	74	2,982	0	136	30	0
Contaminated Soil	5	39	11	78	13	15	13	39	34	20	16	31	51	26	23	53	29	592	214
Asbestos	763	0	15	84	32	27	27	21	4	6	0	0	0	10	11	1	1	0	2
Service Road Cleanup																			
Total =	19,653	15,335	16,694	16,201	15,959	14,966	13,462	13,500	14,672	16,479	19,198	19,422	22,019	19,026	22,878	21,931	18,942	19,488	16,155



Estimated Alberni Valley Landfill Waste Composition - 2013

Waste Type	Mass (tonnes)	Mass (%)	Waste Category (tonnes)		
			Relatively Inert	Moderately Decomposable	Decomposable
1. Residential Mixed Waste	8,510	-			
Organics	4,076	47.9	-	-	4,076
Paper	1,600	18.8	-	1,600	-
Plastics	936	11.0	936	-	-
Multi-material	808	9.5	808	-	-
Textiles & Rubber	400	4.7	400	-	-
Other	170	2.0	-	170	-
Wood	34	0.4	-	34	-
Ferrous	191	2.3	191	-	-
Glass	162	1.9	162	-	-
Renovation	51	0.6	51	-	-
Non-ferrous	72	0.8	72	-	-
Haz-waste	8	0.1	8	-	-
	Subtotal =		2,630	1,804	4,076
2. Industrial, Commercial and Institutional Mixed Waste	6,362	-			
Organics	2,022	31.8	-	-	2,022
Paper	2,497	39.3	-	2,497	-
Plastics	586	9.2	586	-	-
Wood	374	5.9	-	374	-
Multi-material	24	0.4	24	-	-
Renovation	0	0.0	0	-	-
Textiles & Rubber	73	1.1	73	-	-
Ferrous	314	4.9	314	-	-
Glass	440	6.9	440	-	-
Other	1	0.0	-	1	-
Haz-waste	10	0.1	-	10	-
Non-ferrous	23	0.4	23	-	-
	Subtotal =		1,459	2,881	2,022
3. Construction, Renovation & Demolition	3,067	-			
Roofing	1,092		1,092	-	-
Gyproc	99		99	-	-
Mixed Demolition	1,876		-	-	-
Wood	568	30.3	-	568	-
Other	551	29.3	551	-	-
Concrete	319	17.0	319	-	-
Drywall	202	10.8	202	-	-
Asphalt	150	8.0	150	-	-
Non-ferrous	49	2.6	49	-	-
Paper product	23	1.2	-	23	-
Ferrous	15	0.8	15	-	-
	Subtotal =		2,476	591	0
4. Contaminated Soil	0	-	0	-	-
5. Asbestos	214	-	214	-	-
6. Service Road Cleanup	2	-	-	-	2
Total Waste (tonnes)=	18,155		6,778	5,277	6,100
Percentage (%) =	100%		37.3%	29.1%	33.6%



APPENDIX F

Landfill Gas Generation Model Results



Status of Landfill Gas at the AVL

- A "Landfill Gas Generation Assessment Report for the Alberni Valley Landfill" was finalized in March 2011 and was completed for the 2010 assessment year (includes data up to 2009).
- This report originally predicted we may reach 1,000 tonnes of methane in 2012 (did not occur, we only reached 980 tonnes)
- The landfill gas generation tables are updated annually with the annual operations report, using the same assumptions as the original report (same composition, similar annual tonnages, minimal population growth)
- For 2013, there was an estimated 986 tonnes of methane generated
- Using 2013 data, the predicted generation rates are:

Next Five Years	Waste Tonnage (tonnes)	Methane Generation (tonnes CH ₄ /year)
2014	18,209	994
2015	18,264	1,002
2016	18,319	1,010
2017	18,374	1,017
2018	18,429	1,025

- Current prediction indicates we will exceed 1,000 tonnes of methane in the 2015 calendar year
- If this actually occurs, it will mean that
 - o The results for 2015 will be reported in 2016
 - o The Landfill Gas Facilities Design Report will be due in 2017 (1 year after results are reported)
 - o The Collection system must be operational by 2021 (4 years after design report)
- The *Landfill Gas Generation Assessment Report* must be redone/updated every five years if we do not reach 1,000 tonnes of methane annually
- Therefore, this report must be redone and submitted in early 2015
- As we are close to the 1,000 tonnes threshold value, there is always the potential for MoE to force us to do it earlier.

Year of Assessment	2014	LFG Management Regulation Reference
Annual Tonnage in Preceding Year	18,155 (tonnes/year)	4-2-a
Total waste in Place in the Preceding Yr	529,551 (tonnes/year)	4-2-c
Methane generation in the Preceding Yr	986 (tonnes CH4/year)	4-2-d

Next Five Years	Waste Tonnage (tonnes)	Methane Generation (tonnes CH4/year)	
2014	18,209	994	4-2-b & 4-2-e
2015	18,264	1,002	4-2-b & 4-2-e
2016	18,319	1,010	4-2-b & 4-2-e
2017	18,374	1,017	4-2-b & 4-2-e
2018	18,429	1,025	4-2-b & 4-2-e