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**REPORT TO ENVIRONMENTAL SUSTAINABILITY COMMITTEE
MEETING OF WEDNESDAY 27 APRIL 2011**

**SUBJECT INTEGRATION OF LIQUID AND SOLID WASTE MANAGEMENT PLANS
 – FEASIBILITY STUDY**

ISSUE

To present the results of a feasibility study on integrating the Solid Waste Management Plan (SWMP) and Liquid Waste Management Plans (LWMP).

BACKGROUND

In June 2009, the Capital Regional District (CRD) submitted an application under the *Local Government Grants Act* for an infrastructure planning grant to conduct a feasibility study on integrating solid waste and liquid waste management plans. In May 2010, the Minister of Community and Rural Development informed the CRD Board that a grant had been approved in the amount of \$10,000.

The CRD hired HB Lanarc to conduct the study. The study found that although both the SWMP and LWMPs are authorized under Section 24 of the *Environmental Management Act*, the regulatory approach to the two waste streams is very different. Liquid waste discharges are regulated by the *Municipal Sewer Regulation*, which sets numerical standards for discharges and prescribes monitoring requirements. Conversely, there is no single overarching regulation for solid waste. Instead, landfills are controlled through site-specific operational certificates, while other solid waste operations, such as composting facilities, are governed by specific regulations.

Despite the fact that the study concluded that the regulatory regime is not conducive to developing an integrated plan, it did confirm that there are operational opportunities for integrating the management of the two waste streams in areas such as co-digestion, co-composting, co-treatment and co-incineration or gasification of solid and liquid wastes. The report offered some suggestions for a potential integration process and table of contents for an integrated waste management plan, as was required in the study's terms of reference.

The study also conducted a review of other jurisdictions and found the majority have created separate solid waste and liquid waste plans. Integration between plans is usually limited to cross reference of shared waste management operations or infrastructure.

In view of the potential for operational integration, opportunities for doing so will be examined as part of the SWMP Revision 3 (Integrated Resource Management Plan), which is scheduled to be undertaken in 2011 through 2012. Staff will also explore options with BC Ministry of Environment (MOE) staff for addressing the legislative impediments to developing an integrated plan.

A copy of the report's executive summary is attached as Appendix A and the full report is available upon request. Legal counsel has also reviewed the matter and supports the consultant's findings. This report will be presented to the Core Area Liquid Waste Management Committee for information at its 11 May 2011 meeting.

CONCLUSION

The CRD received an infrastructure grant from the Minister of Community and Rural Development to conduct a feasibility study on integrating solid waste and liquid waste management plans. The study

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concluded that while the current regulatory structure is not conducive to the development of integrated waste management plans, there are opportunities for integrating the two waste streams at the operational level. These integration opportunities will be explored during preparation of the SWMP Revision 3, while the legislative impediments will be reviewed with MOE staff. Legal counsel supports the consultant's findings.

RECOMMENDATION

That the Environmental Sustainability Committee receive this report for information and request that staff forward the report to the Ministry of Environment for comment.

Tom Watkins, Acting Senior Manager
Environmental Resource Management

Dan Telford, PEng
Senior Manager, Environmental Engineering

Larisa Hutcheson, PEng
General Manager, Environmental Sustainability
Concurrence

AB:gh
Attachment: 1

HB Lanarc Draft Summary Report December 2010 Integration of Liquid and Solid Waste Management Plans

Executive Summary

The Capital Regional District (CRD) wished to investigate the feasibility of integrating its liquid waste management plans (LWMP) and solid waste management plan (SWMP). This study assessed that approach by considering the Province's interest in encouraging Integrated Resource Recovery, the regulatory requirements, and the development, content and implementation of the two types of plans.

E.1 IRR

The Ministry of Community and Rural Development is promoting the concept of Integrated Resource Recovery (IRR). This approach to waste management seeks opportunities to create energy, reduce greenhouse gas emissions, conserve water, and recover nutrients from materials that have been traditionally considered wastes. Technologies used in IRR applications may combine treatments for both liquid and solid waste streams. Regional Districts around BC are beginning to apply the IRR approach. While the operational integration of liquid and solid waste treatment is becoming more common, all regional districts currently maintain separate liquid waste management plans (LWMP) and solid waste management plans (SWMP), according to current legislative requirements.

E.2 LWMP and SWMP Enabling Legislation & Provincial Regulations

Both LWMP and SWMP are authorized under the Section 24 of the *Environmental Management Act*. However, the regulatory approach to the two waste streams is very different. Liquid waste discharges are regulated by the *Municipal Sewage Regulation (MSR)*, which sets numerical standards for discharges to the environment and for effluent reuse, and prescribes monitoring requirements. In contrast, the province does not have an overarching regulation for solid waste. Landfill operations are controlled through the issuance of Operational Certificate (OC) on a site by site basis. Solid waste management facilities (such as incinerators and facilities that recycle organic waste) are governed by specific regulations. In addition, the Landfill Gas Regulation sets standards for landfill gas capture and destruction, and the Recycling Regulation authorizes extended producer responsibility programs.

E.3 Plan Development, Content & Implementation

The development of both LWMP and SWMP involve a three stage process to document the current system, identify and evaluate a wide range of options, and to present the findings to the general public. Although the process is similar, LWMP can be developed by regional districts or municipalities and usually apply only to a specific area that is serviced by a distinct facility or infrastructure. It is therefore common for more than one LWMP to exist in a regional district. In contrast, responsibility for solid waste lies with regional districts, and as such, a SWMP must cover an entire regional district. Furthermore, local governments are not required to prepare LWMP, whereas each regional district must develop a SWMP. There are no specific requirements for LWMP to be updated, whereas SWMP are required to be reviewed for effectiveness every five years.

LWMP and SWMP have some similarities in terms of their content. Both types of plans should be guided by the “waste management hierarchy”, which promotes efforts to reduce, reuse and recycle waste ahead of recovery (of energy and materials) and residuals management. In addition, both LWMP and SWMP promote user pay or polluter pay policies to provide financial incentives to improve environmental stewardship. There are also similarities in terms of specific content in each LWMP and SWMP, such as consideration of multiple sources and types of waste; cost recovery and financing mechanisms; implementation schedules, and future service demands.

The content of a LWMP and SWMP differs in a number of key ways. SWMP are directed by guiding principles, which can be created by each regional district to address local values and priorities. In contrast, LWMP must reflect the MoE’s three strategies of pollution prevention, use of best available control technology, and the principle of polluter pay. Another difference between the content of LWMP and SWMP is the use of targets. SWMP must identify specific goals and targets related to waste reduction and diversion for the duration of the plan. This does not apply in the liquid waste context. Finally, SWMP typically have a 10-20 year horizon, whereas LWMP should forecast for 20-40 years. These different timeframes are related to the operating life of equipment and infrastructure.

Both LWMP and SWMP use Operational Certificates to control the design, operation, maintenance, performance and closure of sites or facilities used for the storage, treatment or disposal of recyclable material or waste. Both types of plans are adopted as bylaws, meaning that the local government does not need to obtain the consent of the electors in the plan area for the implementation of an approved Plan, including raising funds or allocating costs.

E.4 Conclusions and Recommendations

It appears that despite some similarities in plan development, content and implementation, the current regulatory regime is not conducive to the development of integrated waste management plans. The following major differences in requirements/management approach would need to be resolved before a regional district could write a single integrated waste management plan:

- Responsibility of different jurisdictions (municipalities vs. regional districts)
- Voluntary vs. mandatory;
- Regulation based vs. goal-oriented, and
- Timeframe of equipment/infrastructure.

Although the current regulatory regime does not appear to support the development and approval of integrated waste management plans, opportunities for integrating the treatment of the two waste streams remain viable. Municipalities and regional districts should continue to focus on integrating liquid and solid waste management at the operational level by adopting technologies and processing options that can beneficially process both waste streams. Solid and liquid waste management plans should reference each other and any operational integration opportunities.



Capital Regional District

Summary Report:

Integration of Liquid and Solid Waste Management Plans

Prepared by:

HB Lanarc Consultants Ltd.
200-420 West Hastings St.
Vancouver, BC V6B 1L1

Project Number:

10148

Date:

December 6, 2010

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The development of both LWMPs and SWMPs involves a three stage process to document the current system, identify and evaluate a wide range of options, and to present the findings to the general public. Although the process is similar, LWMPs can be developed by regional districts or municipalities and usually apply only to a specific area that is serviced by a distinct facility or infrastructure. It is therefore common for more than one LWMP to exist in a regional district. In contrast, responsibility for solid waste lies with regional districts and, as such, a SWMP must cover an entire regional district. Furthermore, local governments are not required to prepare LWMPs, whereas each regional district must develop a SWMP. There are no specific requirements for LWMPs to be updated, whereas SWMPs are required to be reviewed for effectiveness every five years.

LWMPs and SWMPs have some similarities in terms of their content. Both types of plans should be guided by the “waste management hierarchy,” which promotes efforts to reduce, reuse and recycle waste ahead of recovery (of energy and materials) and residuals management. In addition, both LWMP and SWMPs promote user pay or polluter pay policies to provide financial incentives to improve environmental stewardship. There are also similarities in terms of specific content in each LWMP and SWMP, such as consideration of multiple sources and types of waste; cost recovery and financing mechanisms; implementation schedules; and future service demands.

The content of LWMPs and SWMPs differs in a number of key ways. SWMPs are directed by guiding principles, which can be created by each regional district to address local values and priorities. In contrast, LWMPs must reflect the MOE’s three strategies of pollution prevention, use of best available control technology, and the principle of polluter pay. Another difference between the content of LWMPs and SWMPs is the use of targets. SWMPs must identify specific goals and targets related to waste reduction and diversion for the duration of the plan. This does not apply in the liquid waste context. Finally, SWMPs typically have a 10 to 20 year horizon, whereas LWMPs should forecast for 20 to 40 years. These different timeframes are related to the operating life of equipment and infrastructure.

Both LWMPs and SWMPs use Operational Certificates to control the design, operation, maintenance, performance and closure of sites or facilities used for the storage, treatment or disposal of recyclable material or waste. Both types of plans are adopted as bylaws, meaning that the local government does not need to obtain the consent of the electors in the plan area for the implementation of an approved Plan, including raising funds or allocating costs.

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Appendix A: Possible Process for Developing and Table of Contents for an Integrated Waste Management Plan

Appendix B: Examples of Integrated Liquid and Solid Waste Management Planning and Operations

1 Context

1.1 Provincial Drivers

The Ministry of Community and Rural Development is promoting the concept of Integrated Resource Recovery (IRR). The IRR approach to waste management seeks opportunities to create energy, reduce greenhouse gas emissions, conserve water, and recover nutrients from materials that were traditionally considered wastes. Technologies used in IRR applications may combine treatments for both liquid and solid waste streams. Resource recovery is prioritized by incorporating it during the design and construction of infrastructure. The IRR approach advocates a structured analysis of options, including a number of environmental aspects, such as greenhouse gas (GHG), carbon taxes and credits, and energy production. The inputs and outputs of each option are assessed to determine the net highest and best use and value of the wastes (resources).

The following principles characterize the IRR approach:

- Move upstream to prevent waste;
- Every waste is a potential resource;
- Use each resource more than once;
- Resource recovery generates revenues;
- Integration of system boundaries;
- Use each resource for its highest value, and
- Evaluate revenues first, costs second.

The province has outlined the following benefits of using an IRR approach when implementing new infrastructure:

- Reduced greenhouse gas emissions;
- Reduced water consumption;
- Reduced infrastructure requirements, and
- Reduced infrastructure costs.

Technologies that have been identified as appropriate for IRR applications:

- Reclaiming heat and cold from wastewater using heat pumps;
- Reclaiming wastewater;
- Reclaiming nutrients from wastewater;
- Anaerobic digestion of wet organic waste;
- Combustion of dry organic waste;
- Gasification of dry waste to synthesize gas; and
- Cogeneration of electricity and heat.

Common applications of IRR include district heating/cooling systems, provision of water features, production of fertilizer/soil amendment, and natural gas substitution (pipeline, co-generation or transportation).

1.2 Implementation by Regional Districts

Regional districts around BC are beginning to apply the IRR approach. While some projects are not related to solid or liquid waste (such as district heating using waste heat and heat pumps), other projects have been developed that combine treatment of organic wastes from the liquid and solid waste streams. For example, the Regional District of Central Okanagan and the Comox Valley Regional District both make a high value soil amendment from biosolids (liquid waste) and yard waste (solid waste). Other regional districts are exploring the potential for co-digestion of sewage sludge and kitchen waste, which would produce a natural gas substitute with minimal greenhouse gas emissions.

While operational integration is becoming more common, all regional districts currently maintain separate liquid waste management plans (LWMP) and solid waste management plans (SWMP), according to current legislative requirements.

1.3 Capital Regional District Context

The CRD maintains two LWMPs:

- The Core Area Liquid Waste Management Plan (CALWMP) covers the municipalities of Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria and View Royal. This plan is currently under revision, and will reflect the new wastewater treatment regime that is being developed for the Core Area.
- The CRD also maintains a LWMP for the Saanich Peninsula, covering the municipalities of Central Saanich, North Saanich and Sidney. The plan has been amended over the years and another amendment regarding stormwater management is currently going through the approval process.

A single SWMP covers the entire Capital Region. The SWMP was approved in 1995, and has been amended seven times. The most recent amendment is from 2007 (approved in 2008). The CRD also issued a Strategic Plan in 2008, which includes a strategic statement and identifies six “core strategies.” The strategic statement includes a series of guiding principles, including a reference to the integration of solid and liquid waste planning, wherever applicable.

In addition to its current separate management plans, the CRD has been evaluating opportunities for operational integration, from both the solid and liquid waste perspectives. The *Biosolids Management Plan* (Stantec and Brown & Caldwell, November 2009) identifies kitchen scraps as a desirable feedstock for anaerobic digestion (co-digestion with biosolids). The recently completed Household Organics Management report (AECOM, July 2010) also identifies co-digestion as an option that would have low GHG emissions and a low net cost over a 35 year period.

2 Legislative Authority and Associated Regulations

2.1 Enabling Legislation

Both LWMP and SWMP are authorized under the Section 24 of the *Environmental Management Act* (EMA). This sections states:¹

A municipality, alone or with one or more other municipalities, may submit for approval by the minister a waste management plan, that complies with the regulations respecting the management of municipal liquid waste.

In practice, the BC Ministry of Environment (MOE) requires regional districts to prepare a SWMP and have it approved by the MOE. LWMPs are voluntary; the MOE anticipates that administering LWMPs will be more economical and effective than the previous permit system and that municipalities and regional districts will therefore develop plans voluntarily. However, the EMA also allows the Minister to require the preparation or revision of a LWMP.

In both cases, an approved Plan authorizes a local government to act in accordance with the Plan and to raise funds as needed to implement the Plan without additional consent from the electors.

2.2 Provincial Regulations

Although the authority to implement liquid and solid waste management plans stems from the same act, the regulatory approach to the two waste streams is very different. A summary of the regulatory context is provided below.

The *Municipal Sewage Regulation* (MSR)² provides detailed requirements that elaborate on the provisions of the EMA. Compliance with the MSR provides authorization for a discharge of municipal sewage or use of reclaimed water in British Columbia. The MSR sets numerical standards for discharges to the environment and for effluent reuse, and prescribes monitoring requirements.

There are many companion documents associated with the MSR, including three guidelines (Environmental Impact Study Guideline, Compliance Guideline — Meeting the Intent and Requirements of the MSR, and Guidelines for Assurance Plans), policies, procedures, technical bulletins, fact sheets, and registration forms. All of these documents are provided to assist local governments in meeting the requirements of the MSR.

The province does not have an equivalent overarching regulation for solid waste. Landfill operations are controlled through the issuance of Operational Certificates (OC) on a site by site basis. The province does have Landfill Criteria,³ but they are not a regulation. The Landfill Criteria establish minimum siting, design, operational and closure requirements for all MSW landfills in British Columbia. These

¹ Available online at http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/03053_03#section24

² Available online at http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/30_129_99

³ Available online at <http://www.env.gov.bc.ca/epd/epdpa/mpp/lcmsw.html>

requirements form the basis of the OCs. Municipal solid waste incinerators are required to meet the Emission Criteria for Municipal Solid Waste Incinerators (1991).⁴

Other regulations related to solid waste include the *Organic Matter Recycling Regulation*⁵ (which sets standards for facilities that recycle organic waste such as yard waste, food waste or biosolids), the *Landfill Gas Regulation*⁶ (which sets standards for landfill gas capture and destruction), and the *Recycling Regulation*⁷ (which authorizes extended producer responsibility programs).

3 Plan Content Requirements

The province has issued two sets of guidelines to assist local governments with the development of LWMPs and SWMPs.⁸ The guidelines are also intended to assist the ministry's regional staff in providing direction to local governments which are developing or revising plans, and to guide the review and approval of plans. In addition to guidance on the development and content of management plans, the guidelines provide definitions, an interpretation of legislative requirements and authority, and a discussion of planning roles and jurisdiction. A comparison of the guidelines is provided below.

The provincial waste management hierarchy applies to both LWMPs and SWMPs. The hierarchy promotes efforts to reduce, reuse and recycle waste ahead of recovery (of energy and materials) and residuals management. While the processes and technologies applied to liquid and solid wastes may differ, the underlying philosophy is the same.

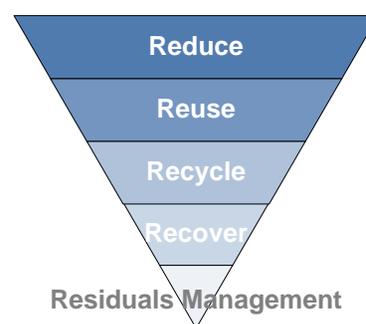


Figure 1. Waste Management Hierarchy

The guidelines for the development of LWMPs support the application of the polluter pay principle. In the context of a LWMP, this principle can be used to justify higher fees for waste discharges from facilities that do not use best available control technology (BACT). The guidelines for the preparation of SWMPs also promote the use of user-pay systems to “encourage the reduction, reuse and recycling of material which would otherwise be disposed of at a waste disposal site or facility.” User fees and the polluter pay approach both provide financial incentives to improve environmental stewardship.

Both LWMPs and SWMPs must consider multiple sources and types of waste. LWMPs are required to address the following sources of liquid waste: sewage discharges, combined sewer overflows, urban stormwater runoff, municipal sludge management, pump station overflows, subdivisions with on-site disposal, and other effluent specified by a Provincial manager. Similarly, SWMPs must consider

⁴ Available online at <http://www.env.gov.bc.ca/epd/bcairquality/reports/ecmswi.html>

⁵ Available online at http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/18_2002

⁶ Available online at http://www.env.gov.bc.ca/epd/codes/landfill_gas/pdf/lq-reg-12-08.pdf

⁷ Available online at http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/449_2004

⁸ Available online at Liquid Waste: <http://www.env.gov.bc.ca/epd/epdpa/mpp/gfdalwmp.html>
Solid Waste: <http://www.env.gov.bc.ca/epd/epdpa/mpp/gprswmp1.html>

residential (urban and rural, single family and multi-family), institutional, commercial, demolition, land clearing and construction wastes.

The content of a SWMP is directed by a set of guiding principles. These are usually based on the list of guiding principles suggested by the MOE, but each region is free to adapt or add to the list to suit local values and priorities. In contrast, LWMPs do not specify guiding principles; rather, the MOE has identified three strategies that support its long term goal of zero pollution. These are: pollution prevention, use of BACT and the principle of polluter pay. These strategies must be reflected in all LWMPs.

SWMPs are the mechanism through which the Province is seeking to achieve its goal of reducing waste disposal per capita by 50%, compared to a 1990 baseline. SWMPs must support this Provincial goal, and should identify specific goals and targets related to waste reduction and diversion for the duration of the plan. It is now expected that revised SWMPs set a more aggressive target, since the 50% reduction goal was due to be achieved by 2000, and the Province has not set a new target. The Province does not have an equivalent goal for liquid waste, beyond the philosophical goal of zero pollution (i.e., there are no specific interim numerical targets for pollution reduction) and the use of BACT.

LWMPs focus on the adoption of BACT, and LWMPs are required to include a facility upgrade schedule to facilitate the adoption of BACT. This is not the case with SWMPs, where the focus is on reducing waste disposal and on operating treatment and disposal facilities in compliance with their operational certificates. The concept of BACT is not used in SWMPs.

Both LWMPs and SWMPs must take into account future service demands and provide a long term year outlook on infrastructure needs. Typically, SWMPs have a 10 to 20 year horizon; LWMPs should forecast for 20 to 40 years. These different timeframes are related to the operating life of equipment and infrastructure.

The detailed evaluation of alternatives forms the bulk of the effort in developing both LWMPs and SWMPs. The alternatives examined in both plans generally cover all aspects of the waste management hierarchy, and the evaluation includes environmental, social and economic impacts.

LWMPs and SWMPs need to indicate cost recovery and financing mechanisms for all aspects of the Plans, including sites, facilities and educational programs. The total capital and operating costs (including closure and post-closure costs in the case of disposal sites) should be identified, along with allocations to member municipalities and electoral areas. User pay systems to encourage waste reduction (and diversion in the case of solid waste) are encouraged for both systems.

Implementation schedules must be included in both LWMPs and SWMPs. In both cases, the schedules are intended to guide more detailed planning, and are not binding.

While a well-written SWMP incorporates information from official community plans (OCP), regional growth strategies, air quality management plans and other regional planning efforts, there is no

formalized link between SWMPs and these other planning documents. Conversely, LWMPs link very directly to OCP, and facility expansions or upgrades are triggered by population increases.

4 Plan Process Requirements

4.1 Similarities

The development of both LWMPs and SWMPs follows a three stage process. While the specific requirements of each stage are slightly different, the intent of each stage is similar. In Stage 1, the current system is documented and a wide range of options are identified; in Stage 2, these options are evaluated. In Stage 3, the options are further refined and customized for the planning area, and the Plan is adopted.

The development of LWMPs and SWMPs require a significant degree of consultation. Both types of plans require consultation with technical and public advisory committees and with the general public. The purpose of this consultation is for the resulting plans to represent the values and priorities of the community. The timing of the consultation is also similar for both types of plans.

Both types of plans can be amended as needed to reflect changes. The amendment procedures are similar, and both require consultation. The SWMP process defines major and minor amendments, and the LWMP process makes a reference to major amendments, indicating a de facto differentiation between major and minor amendments. For both types of plans, a major amendment requires a full consultation process (involving a public advisory committee, technical advisory committee and the general public). For a minor amendment, consultation requirements are set by the local MOE manager.

4.2 Differences

Local governments are not required to prepare LWMPs, whereas each regional district must develop a SWMP. Local governments are being increasingly urged to create (or update) LWMPs prior to submitting applications for grant funding, and the EMA allows the Minister to direct a municipality or regional district to prepare or revise a LWMP.

LWMPs can be implemented by regional districts or municipalities and can apply to specific geographic sub-areas of a region or municipality. LWMPs usually are restricted to an area that is serviced by a distinct facility or infrastructure, and it is therefore common for more than one LWMP to exist in a regional district. LWMPs completed by different governments may reference each other due to overlap and/or integration of services (e.g., a municipality providing septage services for an electoral area, or a regional treatment facility with municipal collection). In contrast, responsibility for solid waste lies with regional districts and, as such, a SWMP must cover an entire regional district. It is possible for a SWMP to include sub-area plans, particularly if conditions in one part of the regional district differ significantly from the majority of the regional district (e.g., transportation links, population density), or if service areas are defined and funded separately. Municipalities often provide some solid waste services (such as collection), and their role must be defined in the Plan. Municipalities are usually involved in Plan development through the Technical Advisory Committee.

There are no specific requirements for LWMPs to be updated, whereas SWMPs are required to be reviewed for effectiveness every five years. The review should include an evaluation of any changes in the waste composition, a description of the waste reduction achieved, and a description of any actions in response to the review. It is fairly common for a regional district to use the five-year review as an opportunity to undertake a major plan amendment.

5 Plan Implementation

5.1 Similarities

OCs are issued under Section 28 of the EMA for the design, operation, maintenance, performance and closure of sites or facilities used for the storage, treatment or disposal of recyclable material or waste. A LWMP or SWMP authorizes the discharge of waste and storage of recyclable materials in accordance with OC, other provisions of the waste management plan, and the Minister's requirements.

Both types of plans are adopted as bylaws. This means that the local government does not need to obtain the consent of the electors in the plan area for the implementation of an approved Plan, including raising funds or allocating costs.

5.2 Differences

SWMPs play a significant role in determining programs and budgets for a regional district. Once a LWMP has been adopted, it is common next to develop one or more master plans, which provide many more details regarding design and financing. These master plans are more often consulted for guidance on implementation than the LWMP.

While both liquid and solid waste facilities are covered by OCs, OCs play a larger role in the implementation of LWMPs than SWMPs. This is in part because SWMPs tend to have significant content related to waste reduction and recycling; activities that are not covered by an OC.

The SWMP guidelines explicitly require the formation of Plan Monitoring Advisory Committee (PMAC) (or alternate body). This committee is to be established prior to submitting a plan to the Minister for approval and is tasked with evaluating the effectiveness of the SWMP. No such requirements exist for LWMPs.

6 Summary

Table 6-1 summarizes the differences and similarities between SWMPs and LWMPs.

Table 6-1. Comparison of Requirements, Content, Process and Implementation of SWMPs and LWMPs

	Solid Waste Management Plan	Liquid Waste Management Plan
Enabling Legislation		
Authorization to develop a Plan	SWMPs are authorized under Section 24 of the <i>Environmental Management Act</i> . BC Ministry of Environment (MOE) <u>requires</u> regional districts to prepare SWMPs and have them approved by the MOE	LWMPs are authorized under Section 24 of the <i>Environmental Management Act</i> . LWMPs are <u>voluntary</u> , although the EMA also allows the Minister to require the preparation or revision of a LWMP
Authority granted by Plan	An approved Plan authorizes a local government to act in accordance with the Plan and to raise funds as needed to implement the Plan without additional consent from the electors	An approved Plan authorizes a local government to act in accordance with the Plan and to raise funds as needed to implement the Plan without additional consent from the electors
Provincial Regulations	No overarching regulation. Landfill operations are controlled through the issuance of an Operational Certificate (OC) on a site by site basis. Provincial Landfill Criteria are not regulatory. Municipal solid waste incinerators are required to meet the Emission Criteria for Municipal Solid Waste Incinerators. <i>Organic Matter Recycling Regulation</i> sets standards for facilities that recycle organic waste such as yard waste, food waste or biosolids <i>Landfill Gas Regulation</i> sets standards for landfill gas capture and destruction <i>Recycling Regulation</i> authorizes extended producer responsibility programs	<i>Municipal Sewage Regulation (MSR)</i> sets detailed numerical standards for discharges to the environment and for effluent reuse, and prescribes monitoring requirements. Compliance with the MSR provides authorization for a discharge of municipal sewage or use of reclaimed water in British Columbia.
Plan Content Requirements		
Philosophy	Waste management hierarchy	Waste management hierarchy
Use of financial incentives	User pay encouraged	Polluter pays principle. Higher fees charged for discharges from facilities that do not use best available control technology
Sources of waste	Residential (urban and rural, single family and multi-family), institutional, commercial, demolition, land clearing and construction wastes	Sewage discharges, combined sewer overflows, urban stormwater runoff, municipal sludge management, pump station overflows, subdivisions with on-site disposal, and other effluent specified by a Provincial manager.

Geographic Scope	Entire regional district	Area serviced by certain infrastructure; may be municipality, regional district, or a sub-area.
Guiding Principles	Required; usually based on the list of guiding principles suggested by the MOE, but each region is free to adapt or add to the list to suit local values and priorities	Not specified; MOE has identified three strategies that support its long-term goal of zero pollution. These are: pollution prevention, use of BACT and the principle of polluter pay.
Role of WMPs in achieving Provincial goals	SWMPs are the mechanism through which the Province is seeking to achieve its goal of reducing waste disposal per capita by 50%, compared to a 1990 baseline	The Province does not have an equivalent goal for liquid waste, beyond the philosophical goal of zero pollution (i.e., there are no specific interim numerical targets for pollution reduction) and the use of BACT
Focus	Reducing waste disposal and operating treatment and disposal facilities in compliance with their operational certificates	Adoption of BACT; must include a facility upgrade schedule to facilitate the adoption of BACT
Timeframe	10-20 years	20-40 years
Evaluation of Options	Consider environmental, social and economic impacts	Consider environmental, social and economic impacts
Financial analysis	Must indicate cost-recovery and financing mechanisms for all aspects of the Plans, including sites, facilities and educational programs	Must indicate cost recovery and financing mechanisms for all aspects of the Plans, including sites, facilities and educational programs
Implementation schedule	Required	Required
Links to other planning documents	Not formalized	LWMPs link very directly to OCP, and facility expansions or upgrades are triggered by population increases
Plan Process Requirements		
Overall	3 stage process: Stage 1, the current system is documented and a wide range of options are identified; in Stage 2, these options are evaluated; in Stage 3, the options are further refined and customized for the planning area	3 stage process: Stage 1, the current system is documented and a wide range of options are identified; in Stage 2, these options are evaluated; in Stage 3, the options are further refined and customized for the planning area
Consultation	Technical and public advisory committees and with the general public	Technical and public advisory committees and with the general public
Amendment process	A major amendment requires a full consultation process (involving a public advisory committee, technical advisory committee and the general public). For a minor amendment, consultation requirements are set by the local MOE manager	A major amendment requires a full consultation process (involving a public advisory committee, technical advisory committee and the general public). For a minor amendment, consultation requirements are set by the local MOE manager
Update requirements	SWMPs must be reviewed for effectiveness every five years	No specific requirements
Plan Implementation		
Operational Certificates	SWMPs authorize the discharge of waste and storage of recyclable materials in accordance with OCs	LWMPs authorize the discharge of waste and storage of recyclable materials in accordance with OCs
Adoption	Adopted as a bylaw	Adopted as a bylaw
Application of Plans	SWMPs used directly for budgeting and work planning	After a LWMP is developed, it is common to develop one or more master plans, which provide many more details regarding design and financing
Monitoring	A Plan Monitoring Advisory Committee (or equivalent) is required. This committee is to be established prior to submitting a plan for approval and is tasked with evaluating the effectiveness of the SWMP.	No such requirements exist for LWMPs

7 Opportunities for Operational Integration

Although it appears that the current regulatory regime is not conducive to the development and approval of integrated waste management plans, opportunities for integrating the treatment of the two waste streams remain viable. Of particular interest is the treatment of organic wastes, such as biosolids from the liquid waste stream and kitchen waste from the solid waste stream. Operational integration could occur during collection (e.g., use of garburators to introduce organic solid waste to the liquid waste stream, as is practised in Banff) and/or treatment (e.g., co-digestion or co-composting).

Given the current regulatory requirements, operational integration is currently more straightforward to achieve. Regional districts and municipalities must still work hard to coordinate across organizations and departments, but some examples of this are already in place (such as the co-composting of biosolids and yard waste in the Comox Valley Regional District and the Regional District of Central Okanagan). For now, local governments can focus on operational integration, with specific facilities and practices identified in the relevant LWMP and SWMP.

In the CRD, operational integration is being explored through the mechanism of co-digestion, as described in Section 1.2.

8 Conclusions and Recommendations

The current regulatory regime is not conducive to the development of integrated waste management plans. The following major differences in requirements/management approach would need to be resolved before a regional district could write a single integrated waste management plan:

- Responsibility of different jurisdictions (municipalities vs. regional districts);
- Voluntary vs. mandatory;
- Regulation based vs. goal-oriented; and
- Timeframe of equipment/infrastructure.

In the longer term, the MOE (potentially in partnership with the Ministry of Community and Rural Development, which has been leading the IRR initiative) may develop new requirements for integrated plans or develop a new class of integrated plan. A potential framework for an integrated plan is presented in Appendix A. However, until such a framework is officially approved by the Province, municipalities and regional districts should continue to focus on integrating liquid and solid waste management at the operational level by adopting technologies and processing options that can beneficially process both waste streams. Solid and liquid waste management plans should reference each other and any operational integration opportunities.

Appendix A

Possible Process for Developing and Table of Contents for an Integrated Waste Management Plan

1 Potential for New Integrated Requirements

The development of an integrated waste management plan would require a new approach to regulating liquid waste and solid waste, as identified in body of report. If this could be achieved, the following process and sample table of contents could be used to build an integrated waste management plan.

Developing a new set of requirements and processes may be more suitable than attempting to meet the combined current requirements of SWMPs and LWMPs. The development of a new type of Plan seems to be in keeping with the Province's efforts to promote integrated resource management, a concept that formally recommends the integration of LWMP and SWMP documents.

1.1 Potential Process

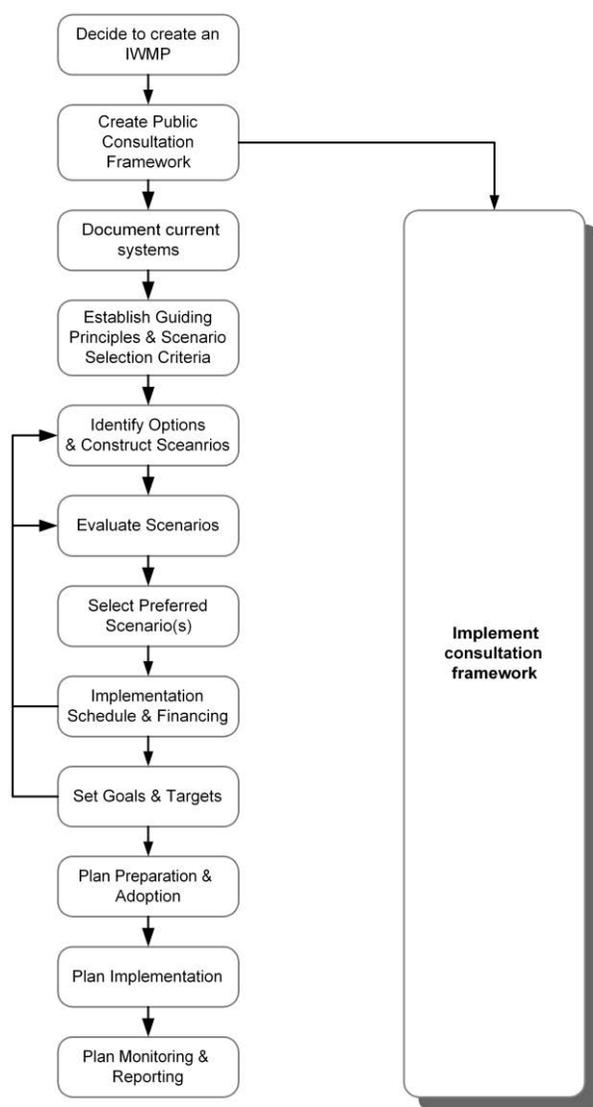


Figure A1. IWMP Process

The general three-stage process used by both LWMPs and SWMPs appears to work well in many communities. It presents a logical flow from documenting the current systems, establishing a future vision through the Guiding Principles, exploring options for achieving that vision, and then selecting a preferred option or set of options. A modified process is shown in Figure A1. Note that Figure A1 focuses on functional stages of the process and does not include all individual steps that would be required.

The documentation of the current system would assess current operations, treatment strategies, costs and performance according to measures such as effluent removal or waste diversion.

At the stage of evaluating and selecting options for inclusion in the plan, it may be useful to organize the alternatives into scenarios. It can be all too easy for a Plan to become a “laundry list” of individual program, each of which may contribute to achievement of the Guiding Principles, but that may not be well connected to other aspects of the Plan. Given the potentially greater number of components in an integrated plan, the danger of this happening may also be higher. One way of dealing with this difficulty is to bundle logical combinations of options together into scenarios, each of which is designed

to meet a specific objective. The construction of scenarios may also help to better integrate the potentially competing priorities of liquid and solid wastes. Each scenario should include all aspects of the waste management hierarchy. Scenarios may also incorporate sub-regional areas of emphasis, based on community characteristics and needs as established through other planning processes (e.g., growth and density projections in OCP). The use of scenarios may also be useful during consultation, because the level of technical detail required to choose between scenarios is much more accessible than the detail required to select between individual options.

It is recommended that the establishment of specific targets and goals be left until near the end of the process when the preferred course of action has been established. This allows the plan to develop in response to the Guiding Principles rather than being tied to quantitative measures at an early stage.

As with most planning processes, the IWMP process would likely be iterative as shown in Figure 1.

1.2 Potential Table of Contents

The following sections describe the sections that could make up an IWMP.

1.2.1 Guiding Principles

Guiding principles shape how decisions are made. They are a reflection of organizational and community priorities, as well as key concepts that the jurisdictions believe should always be considered when selecting content for the Plan. They create a common thread throughout the Plan document. Suggested guiding principles could address the following priorities that exemplify the integrated resource recovery approach:

- Recognize wastes as resources and prioritize commodity value and value creation, rather than viewing wastes as materials requiring disposal and a cost centre
- Endorse the provincial waste management hierarchy (reduce, reuse, recycle, recover, residuals management)
- Identify “whole system” opportunities and needs (e.g., how can the need to manage resources be linked to community needs for heating and cooling?)
- Apply appropriate financial and time horizons to account for longer-term investments and returns, and do not disproportionately value existing assets over future investments
- Incorporate triple bottom line evaluation approaches that consider environmental, social and economic measures of impacts.

1.2.2 Goals

Specific, measurable goals should be included. This is a departure from current LWMP practice, and may require additional work during the preparation of a region’s first IWMP. In the context of SWMPs, goals may be aspirational/philosophical (such as Zero Waste), may be based entirely on the Plan content, or may be in between (i.e., the Plan may include elements that are forecasted to result in a 60% reduction in waste disposed per capita, and the goal could be a 65% reduction). In general, goals that

are specific and measurable are more useful; if an aspirational goal is chosen for the IWMP, it is recommended that it be supported by a more specific goal with an associated timeframe. Note that the goals for an IWMP may require more than one measure. Potential goals could include:

- Reduce discharges to the environment by some percentage (this reflects both solid waste disposal and effluent quantity/concentration);
- Recover some percentage (by weight or volume) of the total waste stream as a resource;
- Generate some quantity of revenue; and
- Reduce GHG emissions from waste management by some percentage.

1.2.3 Planning Context

The IWMP will need to clearly identify links to other related planning documents. This will move beyond the documents currently referenced by LWMPs and SWMPs to include GHG emission reduction plans, Integrated Community Sustainability Plans and other such documents.

The IWMP should identify the policy framework that now encourages integrated resource approach, such as provincial GHG reduction targets and the BC Energy Plan.

The IWMP should also include a discussion on the environmental protection drivers from the legacy LWMP and SWMP documents.

1.2.4 Plan Area

This section is intended to frame the particular areas that will fall under the jurisdiction of the IWMP. In keeping with the potential guiding principle regarding a “whole system” view for planning, it is anticipated that this section would describe the entire regional district, and also explore possibilities for inter-regional synergies. This is a departure from the LWMP process, which typically applies to sub-areas of a regional district.

1.2.5 Current System Evaluation

A newly developed IWMP should provide sufficient description of existing systems, services and infrastructure so as to be logically connected to the options being proposed. As a replacement for separate SWMPs and LWMPs, this would also help to identify the synergies or integrated management tools already in place, to establish a platform from which to build further.

1.2.6 Evaluation Criteria

The evaluation criteria should support the Guiding Principles, and provide concrete tests for evaluating options and scenarios. The challenge will be to ensure that the criteria are sufficiently high-level as to apply equally to liquid and solid waste management options, but are robust enough to emphasize integrated management as a priority when choosing strategies.

1.2.7 Preferred Scenario/Options

This is the main body of the Plan, which describes programs, policies, and infrastructure requirements. It may make sense to organize this part of the IWMP according to the waste management hierarchy; this will encourage integrated thinking more than if the plan describes liquid and solid wastes separately.

1.2.8 Supporting Bylaws and Regulatory Tools

This section would describe not only the bylaws and regulatory tools needed for the IWMP to be implemented, but also the impact of the IWMP on the regulatory context in the region. As described, the IWMP would be a very powerful tool that could be used to recognize many types of public and private sector facilities and assets. An integrated system includes many components that a regional district would not necessarily want to control. Existing permit/management systems (such as provincially administered OC) would need to continue for those components. Ultimately, the IWMP should not result in the regional district taking on more regulatory responsibility than under LWMPs and SWMPs.

1.2.9 Implementation Schedule

The implementation schedule is anticipated to be fairly straightforward and will be similar to those found in LWMPs and SWMPs.

1.2.10 Financial Planning

This section of the Plan should emphasize life cycle costing and the recognition of revenues. An IWMP should also incorporate a value for carbon, both in terms of revenue potential (from non-regulated emission reductions) and as a liability (the need to have reserves to cover the cost of current and future emissions).

This section would also need to address how the programs will be funded. Questions to be answered include:

- Is region-wide utility structure needed?
- Could requisitions to municipalities continue, with municipal utilities recovering costs?
- How would neighbouring regional districts that might be part of inter-regional partnership pay their way?
- Are there any outside sources of funding, such as provincial and federal grants?

1.2.11 Plan Administration

This section will include information about jurisdictional responsibilities. This type of information is currently standard in both LWMPs and SWMPs.

1.2.12 Plan Monitoring and Measurement

The IWMP would require a system for plan monitoring and a series of measures that can be used as the basis of reporting. The performance measures could be related to service level, environmental performance, financial performance (including revenue) and market uptake for products. The measures should relate back to the goals and targets.

The system for plan monitoring should include a body similar to the current Plan Monitoring Advisory Committee that is required for SWMPs, with membership adjusted to reflect both liquid and solid waste. Annual reports should be issued.

1.2.13 Plan Review and Amendment Procedures

This section will define the process for reviewing and amending the IWMP. The IWMP should include some mandate for regular review, similar to a SWMPs. It may be advisable to have smaller, more frequent reviews, and a major review every 10 years. Since liquid waste infrastructure has a longer lifespan and is less flexible than much of the solid waste infrastructure, the frequency of review will need to be carefully considered.

The IWMP amendment procedure can replicate the existing LWMP and SWMP amendment procedures.

Table A1 Summary of Potential IWMP Table of Contents

Section	Content
Guiding Principles	<ul style="list-style-type: none"> • Reflect organizational and community priorities, and key concepts that the jurisdiction believes should always be considered when selecting content for the Plan
Goals	<ul style="list-style-type: none"> • Specific, measurable goals with associated timeframes • Will likely require more than one measure/indicator • May require additional work to establish for liquid waste
Planning Context	<ul style="list-style-type: none"> • Identify links to other related planning documents (e.g., GHG emission reduction plans, integrated community sustainability plans, air quality management plans, official community plans etc.) • Identify the policy framework that encourages IRR (e.g., provincial GHG reduction targets and the BC Energy Plan) • Discuss the environmental protection drivers from the legacy LWMP and SWMP documents
Plan Area	<ul style="list-style-type: none"> • Describe the entire regional district, and also explore possibilities for inter-regional synergies
Current System Evaluation	<ul style="list-style-type: none"> • Provide sufficient description of existing systems, services and infrastructure so as to be logically connected to the options being proposed • Identify the synergies or integrated waste management tools already in place
Evaluation Criteria	<ul style="list-style-type: none"> • Support the Guiding Principles • Provide concrete tests for evaluating options and scenarios
Preferred Scenario/Options	<ul style="list-style-type: none"> • Describe programs, policies, and infrastructure requirements • Organize this part of the IWMP according to the waste management hierarchy to encourage integrated thinking
Supporting Bylaws and Regulatory Tools	<ul style="list-style-type: none"> • Describe the bylaws and regulatory tools needed for the IWMP to be implemented • Describe the impact of the IWMP on the regulatory context in the region
Implementation Schedule	<ul style="list-style-type: none"> • Similar to those found in LWMPs and SWMPs
Financial Planning	<ul style="list-style-type: none"> • Emphasize life cycle costing and the recognition of revenues • Address how the programs will be funded • Incorporate a value for carbon, both in terms of revenue potential (from non-regulated emission reductions) and as a liability (the need to have reserves to cover the cost of current and future emissions)
Plan Administration	<ul style="list-style-type: none"> • Describe jurisdictional responsibilities
Plan Monitoring and Measurement	<ul style="list-style-type: none"> • Performance measures could be related to service level, environmental performance, financial performance (including revenue) and market uptake for products. The measures should relate back to the goals and targets • Describe the system for plan monitoring (should include a body similar to the Plan Monitoring Advisory Committee currently required by SWMPs)
Plan Review and Amendment Procedures	<ul style="list-style-type: none"> • Define the process for reviewing and amending the IWMP • Should include some mandate for regular review • Amendment procedure can replicate the existing LWMP and SWMP amendment procedures

Appendix B

Examples of Integrated Liquid and Solid Waste Management Planning and Operations

1 Examples of Integrated Plans

Most jurisdictions in North America and Europe are required to prepare and maintain plans for both liquid and solid wastes that estimate how much waste there will be, what will be done with it, the costs associated with waste management, and the responsibilities of different levels of government. Traditionally, these plans have been created separately with very little integration. Some liquid and solid waste plans may reference each other if waste management operations or infrastructure are shared (such as co-composting of solid waste and biosolids), but that is typically the extent of the integration.

1.1 British Columbia

1.1.1 Overview

A review of all solid waste management plans in BC was undertaken to determine the extent of integration between solid and liquid waste management planning. The following table summarizes the review by providing excerpts from plans that make reference to liquid waste management.

Liquid waste management plans were not reviewed, because they are not required by the Province and because they are administered by both municipalities and regional districts.

Regional District	Year of SWMP	Mention of Liquid Waste
Alberni-Clayoquot	2007	Biosolids and sewage sludge from wastewater treatment plants in the ACRD can be received at the ACRD landfills with advanced approval from the Regional District. If a composting facility or other preferable option is available in the ACRD, it is expected that biosolids will be managed through these options rather than disposed at the landfill. A local composting operation may require additional biosolids from outside the ACRD in order to be viable. Import of biosolids for composting or other treatment options will be considered by the ACRD on a case-by-case basis.
Bulkley-Nechako	1996	No
Cariboo	2001	No (The plan is currently being updated)
Central Coast		SWMP not available for review.
Central Kootenay	2010	<p><i>(The plan is currently under review. The following text is from the Draft October 2010 SWMP).</i></p> <p>Diversion of organic waste represents the 'next frontier' for waste diversion in the RDCK. The organic waste category is comprised of wood waste, yard & garden waste, food waste, municipal biosolids, and domestic septage. Keeping these materials out of Regional District landfills provides a number of environmental, social, and economic benefits.</p> <p>Wood waste accepted at RDCK landfills and transfer stations is currently stockpiled for grinding. Beneficial uses for wood waste employed at RDCK sites including blending for use as landfill daily cover material or blending with septage and biosolids for composting to produce topsoil to establish vegetation as part of landfill final cover projects.</p> <p>While management of biosolids generated from municipal wastewater treatment plants is not a mandated RDCK responsibility, the RDCK has historically accepted these materials at RDCK</p>

		<p>landfills at the request of municipalities due to a shortage of feasible and permitted management options. Where feasible, the RDCK may continue to accept municipal biosolids with the preferred management option being to blend with wood waste and compost for use in landfill final cover systems.</p> <p>The Nakusp, Central, and Ootischenia landfills have authorized facilities for receiving septage. The RDCK will continue to operate septage facilities at these sites through the Plan period. The septage facilities will receive minor upgrades to reflect best management practices.</p> <p>The RDCK also partners with the Town of Creston in the operation of a septage facility at the Town's wastewater treatment plant. During the Plan period the RDCK will continue to work with the Town on a long term solution to septage management in the Creston Valley. During the Plan period the RDCK will develop designated areas for composting septage residuals at all RDCK landfill sites.</p>
Central Okanagan	2006	No
Columbia-Shuswap	2009	By 2010, the CSRD will partner with the City of Revelstoke to establish a regional yard waste and septage composting facility at either a CSRD or City facility.
Comox-Strathcona	2003 (currently being updated)	<p>The RDC-S composts biosolids from the Comox Valley sewage treatment plant at property adjacent to the Pidgeon Lake Regional Landfill. At that facility, yard waste and other wood waste is currently used as a bulking agent. Approximately 16 tonnes of biosolids are delivered to the site daily and mixed with bulking material (yard waste, wood chips, and sawdust) that is dropped by contractors and the public in a designated area. This facility serves the sewered areas of the Comox Valley and hopes to produce bulk sales to parks departments and the public.</p> <p>While the main purpose of this facility is to manage biosolid residuals from the sewage treatment plant, it also provides substantial opportunities for composting solid waste. Some of those opportunities include:</p> <ul style="list-style-type: none"> • Including commercial food waste in the composting process • Using ground wood waste for bulking agent • Using yard waste for bulking agent <p>Arrangements will need to be worked out between the RDC-S and the sewage commission that is responsible for facility construction, but the RDC-S hopes to make use of the opportunities presented by this facility to increase the amount of solid waste composted in the District.</p> <p>The RDC-S will work with the sewage commission to investigate opportunities for incorporating appropriate solid wastes (such as grass, leaves, chipped wood, food) into the biosolids composting operation. If an agreement can be reached, the RDC-S will commission a study and implement a pilot program to investigate the feasibility of implementing a food waste composting program that targets selected ICI establishments. Cost: \$50,000 for the food waste study and pilot project. Additional funds may be needed should the RDC-S decide to implement a program.</p>
Cowichan Valley	2006	<p>Fisher Road Recycling operates an in-vessel composting facility located in Cobble Hill. This facility accepts commercial organics/food waste, biosolids, waxed cardboard, as well as clean wood waste and yard and garden material for processing into marketable compost.</p> <p>International Composting Corporation, located in the Regional District of Nanaimo, currently accepts residential and commercial organics/food waste generated within the Cowichan Region. The Town of Ladysmith blends yard and garden waste with wastewater biosolids for composting at their public works yard.</p>

East Kootenay		The plan is currently being updated and is not available for review.
Fraser Valley	1996, amended 2000	<i>(The plan is currently under review. The following text is from the previous plan).</i> The characteristics of the recyclable materials which may be managed at the composting facility are those of yard wastes; sewage sludge; and other compostable but nonputrescible materials.
Fraser-Fort George	2008	In support of food waste composting in the future, the RDFFG plans to update the source-separated organics composting feasibility study conducted in 2002 to: <ul style="list-style-type: none"> • look at recent composting facility developments and technology costs; • assess opportunities for co-composting (food waste, yard waste, wood waste, sewage sludge); • understand the implications of organics diversion on the long-term management plan of the Foothills Boulevard Regional Landfill, particularly as it relates to the production and usage of landfill gas; and • consider locations for an organic waste management facility.
Metro Vancouver	2010	Discussed in more detail below.
Kitimat-Stikine	1995	<i>(The plan is currently under review. The following text is from the previous plan).</i> There is no mention of sewage/biosolids in discussion of composting facilities. Landfills will have areas set aside for the storage of white good, wood waste and vehicle hulks. Dead animal pits and septage disposal facilities will be provided at landfills where these services are required.
Kootenay Boundary	2005	The RDKB will separate all construction/demolition/renovation wood waste for chipping and composting with sewage sludge at the McKelvey Creek and Grand Forks Landfill sites.
Mount Waddington	2010	No
Nanaimo	2004	Since 1998, the RDN has been composting biosolids that were previously buried at the Regional Landfill. At present, the composting of biosolids is done at private facilities under contract to the RDN.
North Okanagan	2007	Gap analysis in the 2007 review of the Plan identifies “co-digesting food waste and sewage sludge” as a Trend Not Addressed in the Current Plan. RM 13: According to existing practice, disposal of sewage sludge and septage will be operated outside of the solid waste management system at facilities operated by the member municipalities or the RDNO.
Northern Rockies		SWMP not available for review.
Okanagan-Similkameen		The plan is currently being updated and is not available for review.
Peace River	2008	No
Powell River	2009 (draft)	No
Skeena-Queen Charlotte		SWMP not available for review.
Squamish-Lillooet	2007	The RMOW plans to establish a centralized biosolids and organic waste processing facility at its Transfer Station property in the Callaghan Valley. If there is available capacity at this facility, the municipalities of Squamish and Whistler will individually assess the feasibility of establishing programs for collection of organic waste from their residents for processing at the centralized facility in Whistler.

		The Whistler composting facility is 50 tonne per day in-vessel facility designed to compost biosolids, food waste, yard waste and wood chips. The facility is expected to be fully operational in 2008. Its primary role is to compost biosolids from Whistler's wastewater treatment facilities. However, some capacity for source-separated food waste is anticipated. The facility will require chipped wood waste and garden debris to act as "amendment" in the composting process.
Sunshine Coast	2005 (currently being updated)	Enhance residential organics management programs <ul style="list-style-type: none"> • Expand yard waste program • Investigate food waste programs for residential food waste • Investigate biosolids management with SWM
Thompson-Nicola	2007	No

Of the 21 SWMPs available for review, 12 SWMPs made mention of current systems or future plans to co-manage organic waste from the solid waste stream with solids from the liquid waste stream. Most often this co-management is in the form of composting. Three SWMPs allow for disposal of septage in landfills. The North Okanagan SWMP (2007) is the only SWMP to explicitly avoid integration of solid and liquid waste management, by noting that "disposal of sewage sludge and septage will be operated outside of the solid waste management system at facilities operated by the member municipalities or the RDNO."

1.1.2 Metro Vancouver

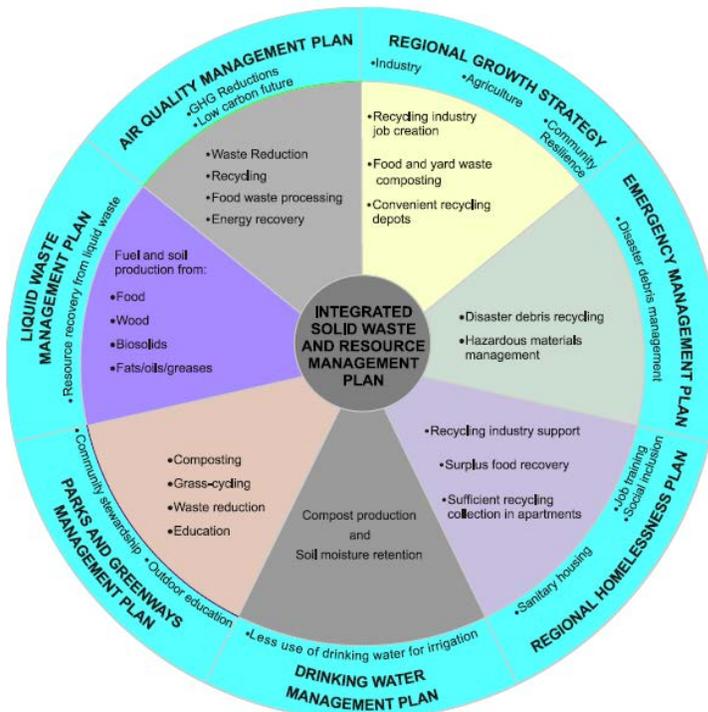
In 2010 Metro Vancouver completed updates to both its SWMP and LWMP. Both plans include the words "integrated" and "resource" in their titles. However, the integration tends to focus more on integrating operations within each realm (i.e., integration of the waste management hierarchy in the SWMP, and integration of resource recovery opportunities in the LWMP) rather than explicitly integrating the management of liquid and solid wastes. Some specific actions have been identified that will further clarify how management of liquid and solid resources can be integrated. This information is summarized below.

Integrated Solid Waste Resource Management Plan (ISWRMP)

The ISWRMP includes actions that are coordinated with the *Integrated Liquid Waste and Resource Management Plan* and that support various provincial initiatives, such as the *BC Energy Plan* and *BC Bioenergy Strategy*. Both of these initiatives encourage the production of energy from solid and liquid wastes.

The ISWRMP builds upon existing efforts involving the recovery of methane from landfills. It also promotes additional diversion of biomass, such as food residuals and treated wood, for use as renewable sources of energy.

The diagram below was included in the ISWRMP to clarify the linkages between the ISWRMP and other regional plans developed by Metro Vancouver. Note that the primary links to the LWMP are through the mechanism of fuel and soil production.



In addition to the broad statements supporting the integration of liquid and solid waste management at the beginning of the ISWRMP, the following specific actions were included:

1. Goal 2: Maximize Reuse, Recycling and Material Recovery
 - a. Strategy: Target organics for recycling and energy recovery
 - i. Action: Evaluate options for processing of organics with biosolids and other utility residuals. (2011)
 - ii. Action: Ban all compostable organics allowed in residential green bins from disposal to landfills and all forms of waste-to-energy, except anaerobic digestion. (2015)
 - b. Strategy: Integrated Utility Management Advisory Committee
 - i. Action: Establish a new overarching committee, the Integrated Utility Management Advisory Committee (IUMAC), to advise Metro Vancouver on plan implementation, particularly from the perspectives of integrated planning and resource recovery across utility systems. (2011)
2. Goal 3: Recover energy from the waste stream after material recycling
 - a. Strategy: Use waste-to-energy to provide electricity and district heating
 - i. Action: Recover energy from regional utility materials that cannot be recycled, including liquid waste and water utilities.

Integrated Liquid Waste and Resource Management Plan (ILWRMP)

The ILWRMP explicitly supports the IRR planning approach, and notes that supporting the IRR approach in turn supports the *BC Climate Action Plan*, the *BC Energy Plan*, and *Living Water Smart*. The link to the ISWRMP is defined as follows: Metro Vancouver will seek to produce biogas from co-managing liquid waste and organic solid wastes; technologies to make biodiesel from wastes, opportunities to derive marketable fertilizer products, recovered nutrients and compost will be explored.

The following specific actions to apply a resource recovery to liquid waste were identified in the ILWRMP:

1. Goal 2: Use liquid waste as a resource
 - a. Strategy: Pursue liquid waste resource recovery in an integrated resource recovery context
 - i. Action: Assess each sewerage area using an integrated resource recovery business case model that:
 1. evaluates opportunities to expand the recovery of energy, nutrients and water from the liquid waste system
 2. identifies linkages between liquid waste resource recovery opportunities and other systems (solid waste, drinking water, land use/buildings, parks, air quality, energy); and
 3. develops and evaluates business cases for integrated resource recovery/use opportunities.
2. Goal 3: Effective, affordable and collaborative management
 - a. Strategy: Use collaborative management to address evolving needs
 - i. Action: Establish a new overarching committee, the Integrated Utility Management Advisory Committee (IUMAC), to advise Metro Vancouver on plan implementation, particularly from the perspectives of integrated planning and resource recovery across utility systems. (2010)

1.1.3 North Shore (Lower Mainland)

In 2009, Fidelis Resource Group was commissioned by Metro Vancouver to undertake a study of the potential for IRR applications on the North Shore of the Lower Mainland (the District of North Vancouver, City of North Vancouver and District of West Vancouver). The North Shore was selected as the first sewerage area to be studied through an IRR lens because Metro Vancouver's ILWRMP considers advancing the timeline for upgrading/replacing the Lions Gate Wastewater Treatment Plant to secondary treatment to 2020. This will have a significant cost burden on the three municipalities, which created an incentive to study the potential for IRR. The goal of the study is to develop and define a conceptual plan for IRR, including the analysis of water, solid waste and energy considerations and a business case model.

The study was originally intended to be completed by April 2010. However, the target completion date has now been pushed to December 31, 2010, and no draft report is publicly available for review.

1.2 Other Jurisdictions

Few examples were found of jurisdictions that complete integrated solid and liquid waste management plans. While many governments claim to have “integrated waste management plans,” the integration typically refers to consideration of the complete waste management hierarchy (i.e., reduce, reuse, recycle, recover, residuals management), integration of a wide range of goals (such as resource conservation, energy generation, social equity, environmental protection, and economic feasibility) and the inclusion of a wide range of stakeholders, rather than to the integration of solid and liquid waste.

1.2.1 City of Los Angeles

The City of Los Angeles is currently developing a Solid Waste Integrated Resources Plan (SWIRP) which will describe how the City will manage “solid resources” generated in the City through 2025. The SWIRP will not discuss liquid waste management, although the process and content of the plan will draw on the lessons learned from the City’s Integrated Resources Plan (IRP) that covered the wastewater program. The IRP considered water, wastewater and runoff management, but does not explicitly link to solid waste management planning.

1.2.2 New Zealand

An example of legislation that encourages integrated study of both solid and liquid wastes is New Zealand. Under the *Waste Minimization Act 2008*⁹ (WMA), territorial authorities are required to complete a waste management plan. The WMA defines waste as “any thing disposed of or discarded” and, as such, includes both liquid waste and solid waste. An assessment of the waste management system must include:

- a) a description of the collection, recycling, recovery, treatment, and disposal services provided within the territorial authority's district (whether by the territorial authority or otherwise);
- b) a forecast of future demands for collection, recycling, recovery, treatment, and disposal services within the district;
- c) a statement of options available to meet the forecast demands of the district with an assessment of the suitability of each option;
- d) a statement of the territorial authority's intended role in meeting the forecast demands;
- e) a statement of the territorial authority's proposals for meeting the forecast demands, including proposals for new or replacement infrastructure; and
- f) a statement about the extent to which the proposals will -
 - o ensure that public health is adequately protected;
 - o promote effective and efficient waste management and minimization.

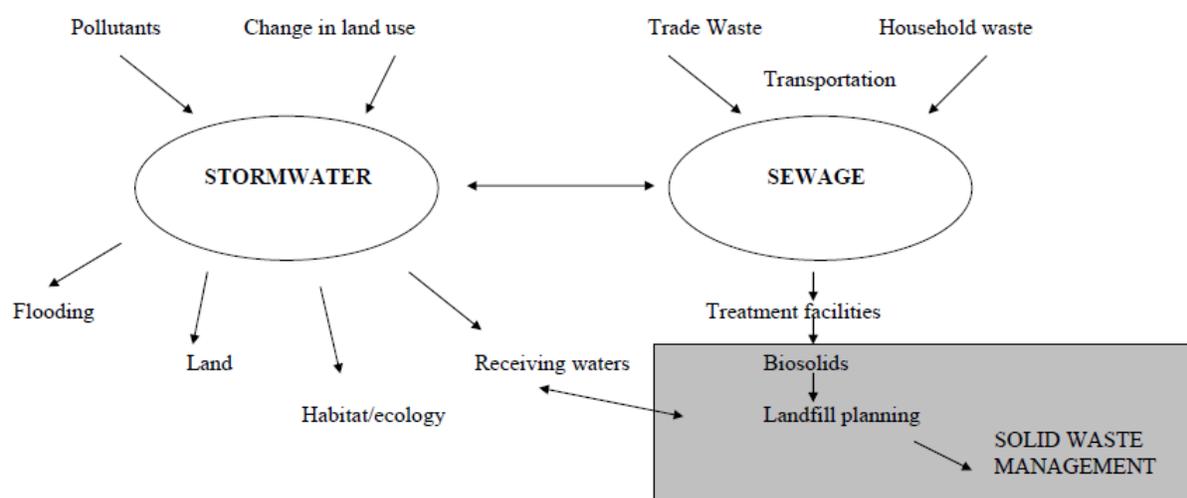
It is interesting to note the inclusion of the public health criteria, which in the BC context is largely limited to liquid waste plans.

⁹ <http://www.legislation.govt.nz/act/public/2008/0089/latest/whole.html>

In addition to the WMA, New Zealand has a Waste Strategy¹⁰. The Waste Strategy uses the same definition of waste as the 2008 WMA, and was revised in 2010 with the following two main goals:

- reducing the harmful effects of waste; and
- improving the efficiency of resource use.

Wellington, the capital of New Zealand, was selected as a case study to see how the planning requirements are fulfilled. Wellington has both solid¹¹ and liquid¹² waste management plans, which together form a complete waste management plan. The solid waste part of the plan was agreed to by Council in 2003, and the liquid waste part of the plan was adopted in 2005 (note that these plans were adopted under previous legislation, which had similar requirements to the 2008 WMA). While the solid and liquid waste plans are separate documents, they are required under the same legislation and make reference to each other. The liquid waste management plan notes the potential connections to solid waste management in terms of the organic waste stream and waste-to-energy. The following figure is used to describe the linkages between the liquid and solid waste plans.



2 Examples of Integrated Operations

While the preparation of integrated solid and liquid waste management plans is rare, it is less unusual for the actual operation of liquid and solid waste management infrastructure to be integrated. The following sections describe a number of examples of operational integration.

An inventory of integrated resource recovery projects has also been compiled by the Ministry of Community and Rural Development, and is available online

(http://www.cscd.gov.bc.ca/lgd/infra/library/Integrated_Resource_Recovery_Inventory_October_2010).

¹⁰ <http://www.mfe.govt.nz/publications/waste/waste-strategy/>

¹¹ <http://www.wellington.govt.nz/plans/policies/solidwaste/index.html>

¹² <http://www.wellington.govt.nz/plans/policies/liquidwaste/index.html>

[pdf](#)). Note that few of the listed projects integrated management of liquid and solid waste, and instead integrate industrial processes or find uses for single waste streams (such as wood waste).

2.1 Organic solid waste co-digested with biosolids

Co-digestion is the simultaneous anaerobic digestion of solid and liquid wastes. While the types of wastes can vary (such as food industry waste, slaughterhouse waste, livestock waste, municipal or industrial wastewater and municipal kitchen waste), the basic principles are the same. The intent is to utilize infrastructure to produce the maximum amount of biogas; biogas production is higher from solid organic wastes than from liquid organic wastes.

While co-digestion is gaining popularity in North America, it faces some hurdles in terms of regulatory implications and finding appropriate uses for the solid that are generated. Sweden is one jurisdiction that is leading the way towards the co-digestion of municipal organic waste and wastewater. Cities such as Uppsala and Malmö use co-digestion to generate biogas that is then used to fuel local vehicles.

In North America, one example of co-digestion is the East Bay Municipal Utility District's wastewater treatment program. The district found itself with an excess of wastewater plant capacity due to a changing industrial base in the service area. In response, the plant began to accept a variety of liquid and solid waste streams from outside the service area, such as winery wastes; fats, oils, and grease; food processing waste; and food scraps. High strength wastes are added directly to the anaerobic digesters to increase methane production at a low cost. The methane gas produced by the plant generates over 10MW of electricity.¹³

2.2 Biosolids composted along with organic solid waste

Solids from wastewater treatment can be composted together with organic solid waste. Typically, the solid waste of choice is wood or yard waste, which has a low moisture level and a high level of carbon, to balance out the high moisture and high nitrogen content of wastewater treatment solids. A few select examples of this approach are described below:

- New York State composts thousands of tons of organic waste each year. Sources include biosolids; food waste residuals from industrial food processing facilities; food waste from hospitals, colleges, office buildings, and prisons; paper sludge; yard waste, and other organic waste materials. Currently, there are 64 facilities permitted for composting in New York State, 26 of which co-compost biosolids and yard waste, and four of which compost food waste and other mixed wastes. Material resulting from the co-composting of biosolids and yard waste is used primarily as an organic soil conditioner and partial fertilizer. It is applied to agricultural lands, recreational areas such as parks and golf courses, mined lands, highway medians, cemeteries, and home lawns and gardens.
- The Town of Banff has been composting its biosolids with woodchip amendment since 2003 using an in-vessel tunnel-based composting technology. Wood waste is added to dewatered biosolids and air is injected into the tunnels for approximately 28 days in order to produce a

¹³ http://www.contracostacouncil.com/upload/ccusa/CCUSA_3_DOC_1.pdf

composted product. This product then requires an outside 'curing' period of 6-12 months. In 2007, the Town started a test project to collect food waste from centralized bins (co-located with recycling bins). The food waste is then mixed with the biosolids and wood waste and composted together. Residents are also encouraged to use their garburators as a more convenient way to have their food waste delivered to the composting facility.

- The Cities of Kelowna and Vernon jointly operate a biosolids composting facility on Predator Ridge, on the outskirts of Vernon. The facility opened at this location in 2006 at a cost of \$7.6 million, and processes biosolids from local wastewater treatment plants together with wood chips from mills or from scrap wood that is brought to the Glenmore Landfill. The two feedstocks are blended and then formed into aerated static piles. About 28,000 tonnes of biosolids were composted in 2007, together with about 15,000 to 25,000 tonnes of amendment material. The facility has had issues with odour impacting local residents.¹⁴ In 2007, about 65 odour complaints were logged, with the primary sources being from leachate, exhaust air from primary composting and pile teardown. A study concluded that the facility was operating beyond its capacity and upgrades are planned. The upgrades are estimated to cost \$6.7 million, and have been fast-tracked for completion in 2010. Once the upgrades are complete, the facility will be able to process 36,400 tonnes of biosolids per year, which should provide sufficient capacity until about 2016.
- The City of Edmonton operates the Edmonton Waste Management Centre, which processes both residential solid waste and sewage biosolids at an indoor composting facility which can process 200,000 tonnes of residential waste and 22,500 dry tonnes of sewage biosolids annually. Biosolids are dewatered and then stored in a large hopper until being injected into the mixing drums together with residential solid waste. Biosolids and wood waste are also composted in windrows under Gore Covers.

2.3 Leachate from the landfill treated by wastewater treatment plant

Another way for solid and liquid waste operations to be integrated is for the leachate from a solid waste landfill to be treated by a wastewater treatment plant. This works well if the wastewater treatment plant is located near the landfill.

- Leachate from the Faraday Township landfill in Hastings County in Ontario site is treated at the nearby Barry's Bay wastewater treatment plant with the approval of the Ministry of the Environment, the Ontario Clean Water Agency, and the Township of Madawaska Valley Council.
- In Edmonton, leachate from the former sanitary landfill (which no longer receives waste) is removed and treated at the onsite leachate treatment plant. It is then put into the sanitary sewer system. Once the leachate enters the sanitary sewer system, it is treated along with the rest of the City's wastewater.

2.4 Organic solid waste and biosolids incinerated or gasified together to produce heat/power

A fourth approach to integrating the operations of liquid and solid wastes is to co-fire sewage sludge with MSW in a waste-to-energy facility (WTEF). WTEF can use a variety of technologies, including mass burn and emerging technologies such as gasification. The advantage of using biosolids as a fuel is that the carbon dioxide emissions are completely biogenic, and therefore are not included when accounting for greenhouse gas emissions from waste management.

¹⁴ <http://www.no-ogo-grow.com/index.html>

If biosolids or sludge are dried sufficiently, they can be received together with MSW for thermal treatment. Biosolids or sludge with higher moisture content can be injected into the reaction chamber. None of the five WTEF in Canada that use MSW as the feedstock are known to use this approach.¹⁵ There are four WTEF in Canada that use sewage sludge alone as feedstock.¹⁶ These facilities use fluidized bed or multi-hearth technologies, which are generally not preferred for thermal treatment of MSW.

The following technology/vendors are representative of the types of facilities that could accept sewage sludge together with MSW. Note that not all of these examples are proven.

Vendor Name	Von Roll, Martin, Keppel Seghers, etc.	Consultech Systems	Plasco Energy Corp (Plasco)	Enerkem	WasteGen UK	Thermoselect
Technology Type	Mass Burn	Controlled Air	Gasification	Gasification and Conversion to Ethanol	Pyrolysis	Pyrolysis and gasification technology combined
Type of waste input	Residential MSW Commercial waste Bulky waste Sewage sludge					

Co-firing of MSW and sewage sludge/biosolids has been proven to be feasible in Japan and Europe (notably the Händelö combined heat and power plant in Norrköping, Sweden, which processes 200,000 tonnes of waste per year, up to 20% of which can be sewage sludge).

¹⁵ Wainwright, Alberta (2,383 tpy), Greater Vancouver, BC (275,000 tpy), Brampton, Ontario (140,000 tpy), Charlottetown, PEI (32,000 tpy), and Quebec City, PQ (280,000 tpy). http://www.ccme.ca/assets/pdf/1395_d_f_review_chandler_e.pdf

¹⁶ Montreal, QC; Longueuil, QC; Pickering, ON; and Mississauga, ON. http://www.ccme.ca/assets/pdf/1395_d_f_review_chandler_e.pdf