

**CAPITAL REGIONAL DISTRICT
CORE AREA LIQUID WASTE MANAGEMENT PLAN
SCIENTIFIC AND TECHNICAL REVIEW PANEL**

TERMS OF REFERENCE

1. BACKGROUND

1.1 Background

The Capital Regional District (CRD) has a provincially approved Core Area Liquid Waste Management Plan (LWMP), which outlines the plans of the CRD, and its municipal partners, for the management of liquid waste from communities within the plan area for the next 25 years. Specific commitments designed to protect human health and the environment from the impacts of liquid waste generated as a result of human activity are made in the following subject areas:

- source control
- management of inflow and infiltration
- wastewater and marine assessment
- stormwater quality management
- harbours environmental action
- management of trucked liquid waste
- management of sewerage system overflows
- wastewater treatment and disposal for areas serviced by municipal collection systems
- wastewater treatment and disposal for areas not serviced by municipal collection systems

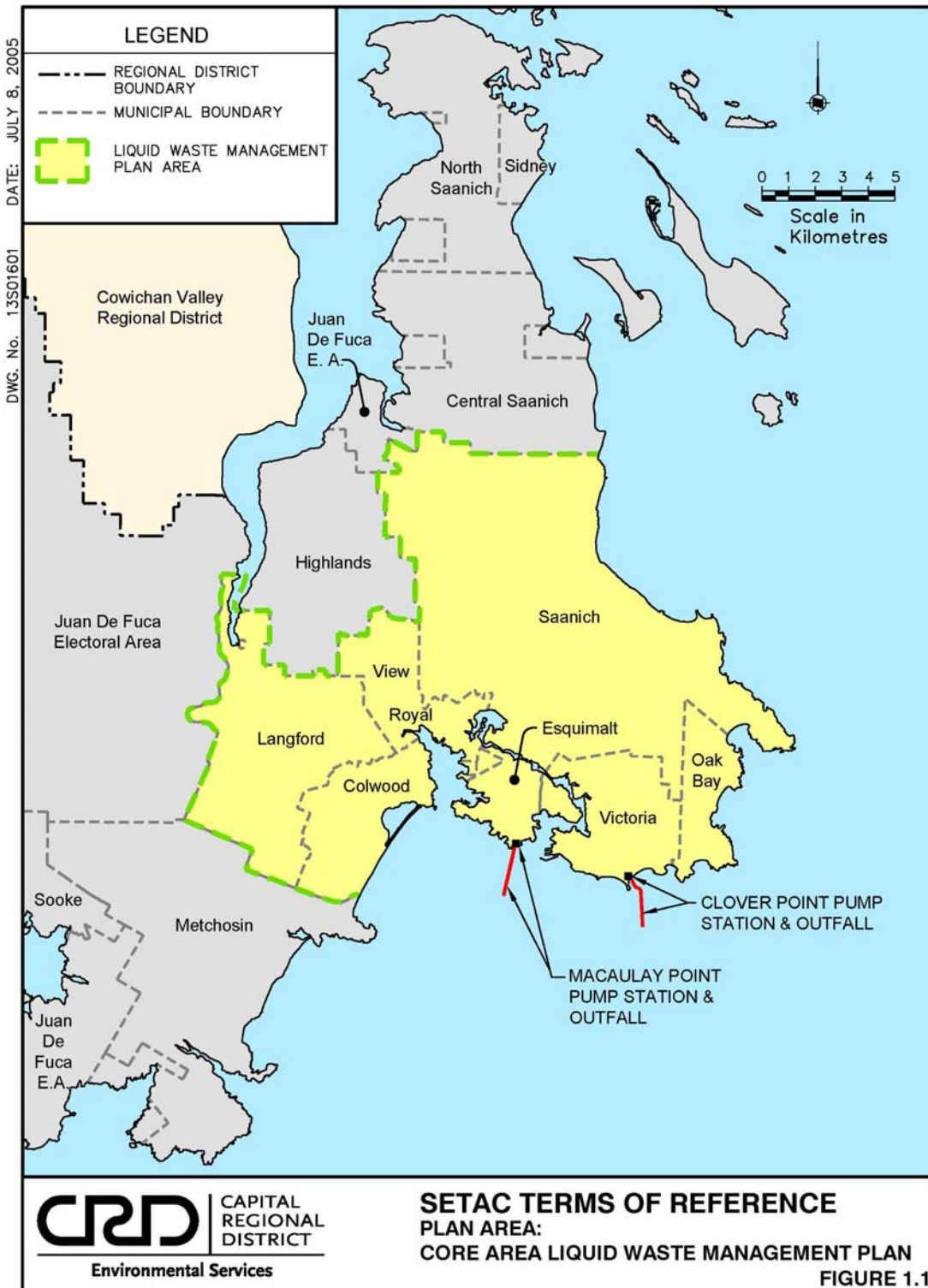
An introductory outline of the purpose and goals of the above liquid waste management programs is provided in Attachment A.

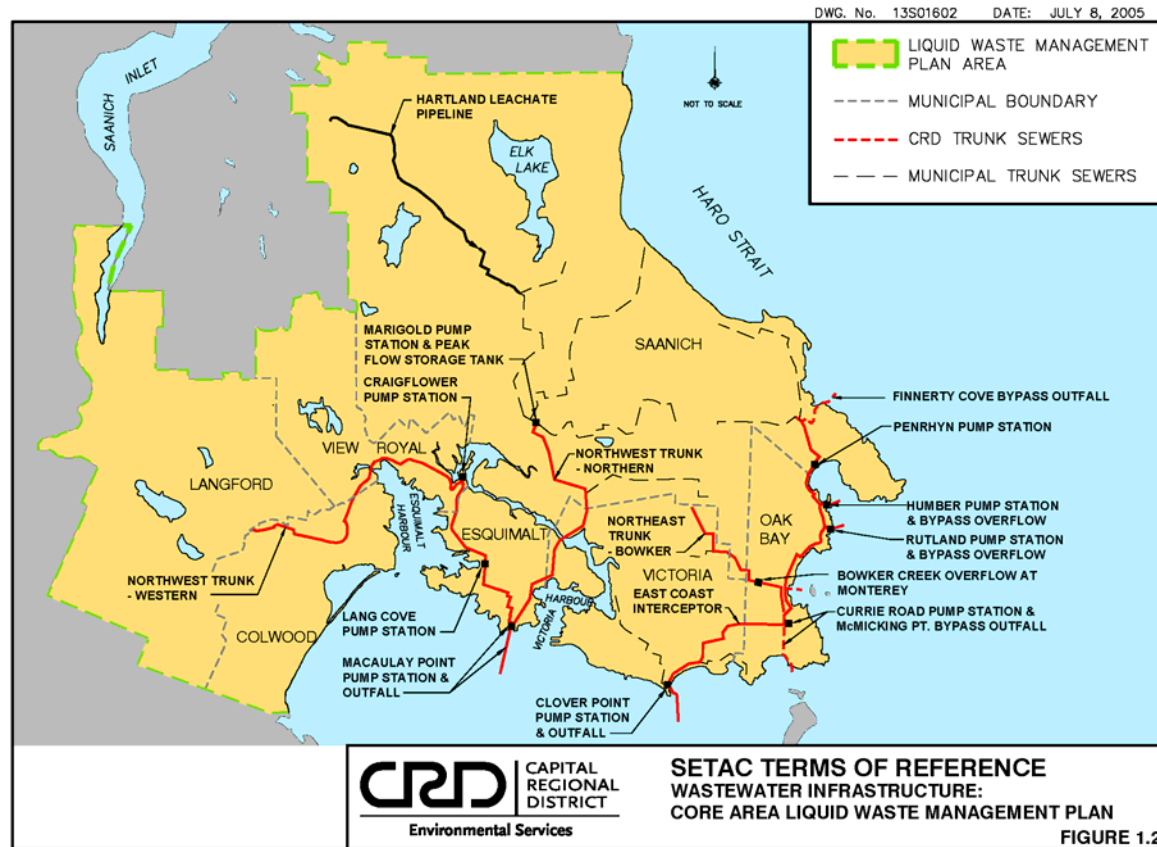
Liquid waste generated by the communities within the plan area and discharged to sanitary sewer is currently directed to one of two major pump stations and outfalls at Clover Point and Macaulay Point, shown in Figure 1.1. Figure 1.2 shows the location of the CRD's main trunk lines and outfalls within the plan area. At Clover and Macaulay points, objects larger than 6 mm are removed by screens. The effluent is then pumped out the outfalls to Juan de Fuca Strait.

Under the LWMP, and as further outlined in Attachment A, the CRD has implemented a Wastewater and Marine Assessment program to ensure that the wastewater discharges do not cause adverse effects to the receiving environment. This program includes a seafloor trigger process that determines when the development of primary or secondary treatment facilities, or additional source control measures, are necessary to protect the receiving environment.

The CRD's Core Area LWMP received approval by the provincial government in March 2003. The approval was subject to the CRD conducting additional work, including development of a Sludge Management Plan and pilot testing treatment technologies. In November 2004, a standing committee of the CRD Board agreed that a review of the entire LWMP was timely and instructed staff to establish a panel of technical experts to work with appropriate consultants to review and comment on the CRD's LWMP.

On May 4, 2004, the Core Area Liquid Waste Management committee authorized CRD staff to commence negotiations with the Society of Environmental Toxicology and Chemistry in North America (SETAC) to coordinate the independent review as outlined above.





1.2 Purpose, Values and Principles

Purpose

The purpose of the scientific and technical review is:

- to ensure the protection and quality of the environment and public health in the area of liquid waste management
- to engage a world-class, professional organization to review the Core Area LWMP and its assumptions
- to assess the adequacy of the approved LWMP to meet the needs of the region

Values

The scientific and technical review will be undertaken according to the following values:

- protection of public health
- protection of the environment
- sound scientific reasoning
- cost effectiveness

Principles

The scientific and technical review will be guided by the following principles:

1. The CRD is committed to maintaining and enhancing the quality of the environment.
2. The CRD is committed to integrated coastal management whereby all sources of contaminant discharges to the coastal environment are evaluated and priority is given to solutions that produce the greatest benefits.
3. If any significant negative environmental effects are detected as a result of a CRD business practice, the organization will move immediately to correct the problem.

2. SCOPE OF WORK

2.1 Technical Review of the CRD's Core Area Liquid Waste Management Plan

The Scientific and Technical Review Panel, selected by SETAC and with the assistance of appropriate consultants, will conduct a broad review of the CRD's Core Area LWMP in the four following areas:

- A. the components of the CRD's Core Area LWMP (including leachate)
- B. future risks related to population growth, intensification of human uses of the environment and emerging concerns related to specific chemicals
- C. alternative and new liquid waste management systems
- D. the CRD's overall approach and assumptions regarding the liquid waste management

The technical review shall include a comprehensive response and recommendations for each of the following subject areas. Rationale and background information is provided following each task.

The Panel may pose additional tasks it deems necessary in order to present a comprehensive final report that meets the intention of the terms of reference as outlined under the four subject areas listed above.

A. The components of the CRD's Core Area LWMP

A1. Assess the current environmental and human health impacts of the Clover and Macaulay points wastewater discharges. Discuss the significance of these impacts.

Since the late 1980s, the CRD has conducted comprehensive monitoring of the environmental and human health impacts of the Clover and Macaulay points wastewater discharges. The CRD's Wastewater and Marine Assessment program conducts monthly monitoring of over 200 compounds, including conventional parameters and priority pollutants in the wastewater, conducts surface water monitoring and analysis for public health effects using fecal coliforms as indicators and evaluates the seafloor for chemical and biological parameters on a yearly basis.

Based on the results of the above noted monitoring programs, how can the impacts of discharging screened sewage to the receiving environment be characterized? Are all relevant potential contaminants included in the monitoring program? Are there any significant environmental or human health impacts that the CRD is not evaluating through the established monitoring programs, such as long-term impacts related to the movement of materials discharged from the outfalls?

A2. The CRD has a series of liquid waste management programs laid out in the Core Area LWMP. Evaluate the effectiveness of these programs to manage risks associated with the CRD's wastewater practices and provide recommendations on those programs that may need to be reprioritized or restructured.

As referred to in the background section, a description of the CRD's liquid waste management programs is provided in Attachment A. The Review Panel will conduct an examination of these programs in the context of our current wastewater management practices. Further information on each program is provided in the Core Area LWMP, annual reports, correspondence from both provincial and federal governments and other documents that will be made available from the CRD.

A3. Review and assess the effectiveness of the early indication process and seafloor trigger process to signal when advanced sewage treatment is required.

A summary of the early indication process and seafloor trigger is presented in Attachment A. This evaluation will include an assessment of the validity and integrity of the selected reference stations identified as part of the program.

A4. Review the need for treating leachate to protect human health and the environment before the leachate is discharged to the sewer from Hartland landfill. Document the risks associated with the current practices. If treatment is necessary, recommend treatment options.

The Hartland landfill, located approximately 15 km north of downtown Victoria and owned and operated by the CRD, is a municipal solid waste landfill servicing the Greater Victoria area. Leachate generated at the landfill is collected in one of two storage lagoons onsite

and discharged by gravity through a leachate pipeline to the municipal sewer system and on to Macaulay Point outfall.

Under the CRD's Source Control program, a discharge permit has been established for Hartland landfill leachate and, as such, the leachate is sampled monthly. The landfill leachate has not been out of compliance under this discharge permit and, for the most part, meets the discharge criteria outlined in the CRD Sewer Use Bylaw. On occasion, an exceedence of sulphide is detected.

The leachate pipeline runs through or near residential properties that depend on well water for drinking. A number of leaks have been detected in the leachate pipeline over the past several years, which resulted in a need for increased monitoring and precautionary supply of bottled water to neighbours.

The nature of municipal solid waste disposal is changing. To save landfill space, more and more organics are being removed from the waste stream and diverted to recycling and composting programs. The CRD is contemplating the removal of food waste and other organics from the waste stream at Hartland. Over time, how will this waste management approach influence the nature of the landfill leachate and our requirement to treat it? Will the leachate become more concentrated with those chemicals that pose an environmental or human health risk in the receiving environment?

B. Future risks related to growth, intensification of human uses and emerging concerns related to specific chemicals

B1. Identify and evaluate the future risks of the CRD's wastewater management practices under reasonably plausible scenarios. Discuss the significance of these risks.

The residential population of the plan area is currently 265,000 and is anticipated to be approximately 355,000 by 2025, in addition to equivalent populations attributable to institutional and business operations. There are also significant population increases during certain times of the year due to tourism. How does the future anticipated growth within the plan area affect the environmental and human health impacts associated with the CRD's wastewater management practices?

B2. Considering the CRD's current liquid waste management practices, analyze the significance of the risks associated with emerging chemical contaminants of concern and persistent organic chemicals on the receiving environment and public health, both now and in the future.

There is growing interest in emerging chemicals of concern and persistent organic chemicals found throughout our environment, including liquid waste. Examples of such chemicals are:

- *pharmaceuticals and personal care products (e.g., synthetic hormones, chloronitrobenzenes)*
- *flame retardant chemicals (PBDEs)*
- *solvents*
- *antibacterial agents*
- *pesticides*
- *PCBs and chlorinated phenols*

C. Alternative and new liquid waste management systems

C1. Identify and rank the alternative and new liquid waste management systems that may be applicable to the CRD.

This assessment should consider the physical constraints regarding land availability at both Clover and Macaulay points. This discussion should also include a review of how the alternative and new liquid waste management systems address the chemicals of concern outlined in Question B2. Based on these constraints, examine the merits of local sewage treatment systems and the merits of smaller local sewage treatment systems from a triple bottom line perspective.

D. The CRD's overall approach to liquid waste management

D1. Review the effectiveness of the CRD's approach to liquid waste management compared to other coastal communities.

This assessment should focus on jurisdictions with similar receiving environments to the CRD and should comment on other jurisdictions utilizing a trigger process.

D2. Gauge how the impacts of the CRD's wastewater management practices and the risks associated with emerging chemicals of concern change with the implementation of sewage treatment.

Many contaminants of concern are not treated through traditional sewage treatment processes. Some contaminants make their way into the biosolids while some are discharged with the liquid effluent. If sewage treatment is implemented, assess to what extent these chemicals of concern could be treated or mitigated and how the risks associated with these chemicals can be addressed.

D3. Determine if the CRD should implement sewage treatment to manage the discharge of wastewater at Clover and Macaulay points. If so, identify what level of sewage treatment is required and why.

This discussion will provide concrete recommendations regarding the need to implement sewage treatment, what level of sewage treatment is necessary and comments on the most appropriate treatment technology(ies). This discussion should also include an assessment of resource recovery options.

When addressing this item, the Panel will identify and document the risks, costs and benefits of implementing sewage treatment including environmental costs related to energy requirements, production of greenhouse gases and other environmental costs.

The CRD has conducted preliminary conceptual design cost estimates for primary and secondary wastewater treatment. These costs are based on providing remote biosolids processing.

*Primary treatment at Clover and Macaulay
(using fine filtration technology) \$237 million*

*Secondary treatment at Clover and Macaulay
(using biological aerated filter technology) \$447 million*

2.2 Liquid Waste Management Plan – Five-year Performance Audit

In the minister's approval letter of the CRD's Core Area LWMP, she stipulated that "the CRD must, by March 31, 2006 and every five years, prepare a report that provides the results of an independent audit on the commitments contained in the Plan. Furthermore, within two months of the publication of the audit report, the CRD shall notify the public of the existence of the report and receive comments and submissions from the public."

As part of the scope of the work for the scientific and technical review, the first independent audit of the LWMP will be conducted. Terms of reference for this work will be prepared by the CRD and forwarded to SETAC by August 31, 2005.

The purpose of the performance audit is to determine and report on the extent to which the CRD and the participating member municipalities have complied with the commitments described in the LWMP and with the requirements of the minister's approval letter.

A final draft of the performance audit must be submitted to the CRD by February 1, 2006. This advanced deadline is required in order to meet the CRD's internal reporting and Board approval process to meet a March 31, 2006, deadline for submission of the document to the province.

It is suggested that SETAC retain a local consultant to conduct this work as it will be necessary to meet with CRD staff regarding the various LWMP programs and with staff from the seven member municipalities.

2.3 Receipt of Public Submissions

As part of the scientific and technical review, an opportunity will be provided to the public to make submissions to the Panel.

SETAC will coordinate a process whereby the public will be invited to make technical submissions for the Review Panel's consideration in relation to the Review Panel's scope of work. SETAC will work with a public policy consultant to determine which submissions are relevant to the technical scope of work. Those submissions that are relevant will be compiled and forwarded to the Review Panel for its consideration and inclusion in the final report. Those submissions that are not directly relevant will be reviewed and compiled by the public policy consultant, with the assistance of SETAC, and the findings incorporated into the Review Panel's final report.

It is suggested that a local public policy consultant be retained to assist SETAC with this component of the work.

2.4 Administrative Coordination and Project Management

SETAC will carry out the following tasks as part of the overall administration of the scientific and technical review:

- selecting a qualified Panel chair
- selecting qualified panelists
- overall project management
- ensuring the Review Panel addresses the entire scope of work and makes clear recommendations
- liaising with CRD staff on behalf of the Review Panel
- inviting and coordinating public submissions

- retaining consultants on behalf of the Review Panel and setting its terms of reference
- producing a final report

Further details regarding the role of SETAC are provided in the following section.

3. ROLES AND RESPONSIBILITIES

3.1 Role of SETAC

SETAC will provide general project management services in relation to the scope of work and will act as the intermediary between the CRD and the Review Panel. SETAC will formally designate a project manager for the project.

SETAC is responsible to present the findings of the Review Panel on time and within budget and is accountable to ensure that funds are spent in an appropriate manner, in accordance with the contract and the intent of the terms of reference. SETAC is responsible to ensure that the findings and recommendations of the Review Panel are clear, comprehensive and meet the TOR.

SETAC is responsible for establishing a process to select the Panel Chair and the panelists (the Review Panel). This process will be conducted by the SETAC project management team with or without the assistance of an advisory committee. Regardless of how SETAC selects the Review Panel, SETAC will be responsible to ensure that every panelist has the appropriate credentials and qualifications and does not have a conflict of interest associated with the scope of work.

SETAC will remain an impartial participant in the review process and will **not** be responsible for, or represent the views and findings of, the Review Panel.

SETAC is responsible for producing a final written report, compiling all aspects of the Review Panel's scope of work. This report must be written at a comprehension level that is understandable to the general public; inclusion of detailed technical and scientific information produced by the Review Panel is to be appended to, or referenced in, the report.

SETAC will coordinate and be responsible for all communications related to the project, including the following:

- panel requests for information, including reports, data, infrastructure specifications
- coordination and facilitation of Panel site tour(s)
- media inquiries during the time the Review Panel is considering its terms of reference
- invitation and compilation of public submissions received during the time the Review Panel is considering its terms of reference
- negotiation with the CRD regarding scope, schedule and/or budget
- submission of expense claims and invoicing

SETAC will provide assistance to the Panel Chair on an as required basis, including the following:

- coordinating meetings and preparing minutes
- selecting which components of the technical scope of work will be conducted by the Review Panel and which components will be conducted by consultants
- drafting terms of reference and administering consulting contracts
- editing and preparation of a final report

Prior to the final report being released, SETAC and the Panel Chair may respond to media inquiries regarding the makeup of the Review Panel, its timelines and process for work; however, neither SETAC nor the Panel Chair will discuss any of the Review Panel's interim findings or deliberations. SETAC will determine which media inquiries can be forwarded to the Panel Chair for comment.

SETAC will work with a public policy consultant to solicit, screen and compile public submissions. All public submissions will be reviewed. Clear submission criteria will be established by SETAC and the consultant for submission of technical submissions. Technical submissions will be compiled and considered by the Review Panel. Non-technical submissions, or those submissions not relevant to the scope of work, will be reviewed by the Panel, compiled and incorporated into the final report with the assistance of the public policy consultant.

A representative of the SETAC project management team will attend a meeting of the CRD Board, with the Panel Chair, at which time the Review Panel's findings will be presented.

3.2 Role of the Panel Chair

The Panel Chair will facilitate and coordinate the work of the Review Panel, including chairing meetings, identifying the process and means to be used to conduct the scope of work, creating and assigning action items and task lists and working with SETAC to establish terms of reference for consultants. The Panel Chair will inform SETAC as early as possible if any aspect of the terms of reference cannot be fulfilled, if the schedule cannot be met or if the budget is inadequate.

The Panel Chair is responsible for seeking consensus of the Review Panel. Consensus means that the Review Panel will work towards agreement and that all opinions, including dissenting opinions, are fairly represented. If consensus of the Review Panel cannot be achieved, the Panel Chair is responsible for identifying an appropriate course of action to fairly represent the findings of the Review Panel.

The Panel Chair will sign off on the final report produced by the Review Panel and is responsible for the technical content of the report.

The Panel Chair will make a presentation to the CRD Board on the Review Panel's findings. This presentation will be a comprehensive PowerPoint presentation that outlines the scope of work, the methods and process by which the work was conducted and the outcomes and recommendations of the Review Panel's findings. The Panel Chair may ask members of the Review Panel to present various aspects of the findings as required.

The Panel Chair will be the spokesperson for the Panel. When the Review Panel's findings are submitted and reported to the CRD Board, the Panel Chair will be available to communicate with the media and other interested parties.

3.3 Role of the Review Panel

The Review Panel will address the technical terms of reference in a professional, cooperative and timely manner. Each member of the Review Panel will sign off on the final report.

Review Panel members will make a commitment to attend all meetings of the Review Panel and carry out their tasks as directed by the Panel Chair. Each Review Panel member will attend an onsite field visit to Victoria as outlined in Section 7.

The Review Panel will consider relevant technical documentation and data, which will be made available by the CRD.

Members of the Review Panel will not communicate the findings of the Review Panel to anyone, including SETAC, the media, the CRD or to the public, unless requested to do so by the Panel Chair.

The Review Panel will have the authority to request submissions from anyone (including other professionals, consultants, CRD staff, etc.) it feels would add insight and valuable input to its deliberations.

3.4 Role of the Capital Regional District

The CRD will administer the contract between the CRD and SETAC.

The CRD will appoint a designated CRD staff contact (the contract manager) who will work directly with the SETAC project manager. The contract manager will respond in a timely manner, through the SETAC project manager, to all information requests of the Review Panel.

The CRD will provide an information package to SETAC by August 31, 2005, which includes relevant background technical documentation and data, including annual reports, monitoring data, and all relevant correspondence from provincial and federal governments.

The CRD will coordinate with SETAC an itinerary for the Review Panel's site visit to Victoria.

The CRD will draft terms of reference for the independent audit of the LWMP.

The CRD will receive, review and pay all invoices for all work satisfactorily completed.

4. SELECTION OF PANELISTS

4.1 Selection of Panel Chair

The Panel Chair will have a PhD and at least 20-years experience in a related field of expertise, such as marine pollution biology or environmental toxicology. The Panel Chair will be a well-respected, recognized individual in his/her field of study. The Panel Chair may represent academia, business and/or the government sector.

The Panel Chair will be a results-oriented individual, with excellent facilitation and consensus-building skills. The Panel Chair must bring an unbiased approach to the project. The Panel Chair will have direct experience with a technical review process of the nature posed in these terms of reference.

The Panel Chair will also have exceptional communication and presentation skills. The Panel Chair must feel comfortable speaking with the media and be able to translate the technical findings into layman's terms.

4.2 Selection of Panelists

Each member of the Review Panel will have a PhD and at least 15-years experience in a related field of expertise. Panel members may represent academia, business and/or government sectors.

It is suggested that four panelists (in addition to the Panel Chair) be selected from both Canada and the United States. The following areas of expertise must be represented in combination by the Review Panel:

- public health (with emphasis on microbiology)
- marine pollution biology
- oceanography
- marine risk assessment
- terrestrial risk assessment
- municipal wastewater treatment (engineering)
- landfill leachate treatment
- cost/benefit analysis, including triple bottom line

Other related areas of expertise not listed above, but deemed appropriate by SETAC, may be considered.

Members of the Review Panel must be team-oriented and results-driven individuals who bring an unbiased, professional attitude to the project.

The Review Panel **must** have an appropriate level of experience and expertise to participate in the review to make definitive determinations regarding the tasks set out in the scope of work.

Names and biographies for all the panelists will be made available to the public.

5. COMMUNICATION WITH THE CAPITAL REGIONAL DISTRICT

SETAC will mediate all communication between the Panel members and the CRD, including requests for background information, reports, data, consultants' contacts, infrastructure inquiries, etc. The SETAC project manager will communicate these requests directly to the CRD contract manager.

If the Panel Chair requires further clarification regarding the scope of work or negotiation of schedule or budget, communication will be conducted through SETAC to the CRD.

SETAC will direct all communications to CRD staff and CRD elected officials through the CRD contract manager.

The Marine Monitoring Advisory group (MMAG) (see Attachment A) is available to discuss issues of interest with the Panel Chair. These communications will be coordinated through SETAC and may be conducted directly with the MMAG Chair. All personal communications of this nature will be documented in the final report.

6. CONSULTING CONTRACTS

SETAC is encouraged to retain consultants for various components of the technical scope of work as deemed suitable by SETAC and the Panel Chair. It is suggested that West Coast consultants familiar with the local receiving environment and marine conditions be retained as much as possible, although this is not a requirement. SETAC will retain consultants and pay all invoices for consulting fees directly and include copies of these invoices when invoicing the CRD.

Each consulting contract will result in a formal report. Each report will be appended to the Review Panel's final technical report.

7. SITE VISIT

The Review Panel and a representative of the SETAC project management team will conduct a mandatory site visit to Victoria, BC prior to finalizing the final report. The purpose of the site visit will be to conduct a tour and visual inspection of the CRD's core area liquid waste facilities, the local receiving environment and various aspects of the CRD Core Area LWMP, such as source control inspections and stormwater sampling. The Panel Chair is encouraged to identify those facilities and areas that are of most interest to the Review Panel.

CRD staff will be available to meet with the Review Panel during the site visit to answer questions and facilitate tours of CRD wastewater facilities and monitoring locations.

8. DELIVERABLES

SETAC will deliver five copies (one unbound) of a final report detailing the technical scope of work and findings of the Scientific and Technical Review Panel. The final report will include the following:

- an executive summary outlining the key findings of the Panel
- a comprehensive response to each technical task in Section 2.1
- a copy of each consultant's report submitted as part of the scope of work (may be bound as a separate annex)
- LWMP performance audit report
- a summary of the public submissions considered by the Review Panel (may be bound as a separate annex)
- a field report for the site visit to Victoria, BC, including photographs and videos
- a list of clear recommendations derived from the Review Panel's findings
- a list of references and personal communications

The report shall be written in a manner which allows the general public to read and understand the report.

9. SCHEDULE

| | |
|--------------------------------------------|--------------------|
| SETAC selects the Panel Chair | August 31, 2005 |
| Review Panel members selected and underway | September 30, 2005 |
| Submission of LWMP performance audit | February 1, 2006 |
| Submission of Review Panel's final report | March 31, 2006 |

SETAC will inform the CRD immediately if it becomes apparent that the schedule cannot be met and present a revised schedule at that time. No extensions will be provided unless authorized in writing by the CRD.

10. BUDGET

A budget of \$495,000 Canadian is proposed for the project.

SETAC will submit a monthly invoice to the CRD. Each invoice will state the current invoice, the total amount invoiced to date and the amount remaining in the project budget. No payment will be made in excess of the agreed upon maximum budget unless prior written consent has been provided by the CRD. SETAC will submit a copy of all original invoices from independent consultants.

An hourly rate for project management will be provided by SETAC, as well as a maximum upset lump sum not to be exceeded without prior written authorization from the CRD.

CORE AREA LIQUID WASTE MANAGEMENT PLAN BACKGROUND

The following summarizes the programs within the CRD's Core Area Liquid Waste Management Plan (LWMP).

1. Source Control Program

The CRD's Regional Source Control program (RSCP) is a pollution prevention initiative aimed at reducing the amount of contaminants that industry, businesses, institutions and households discharge into the district's sanitary sewer systems. As its name implies, the program is focused on reduction or elimination of contaminants before they enter the sewer system rather than treating them after they have been mixed with other wastes.

The RSCP has been active region-wide since the adoption of the CRD's Sewer Use Bylaw in August 1994. This bylaw serves as the main regulatory instrument for source control in sanitary sewer systems and applies to any discharge of waste into a sewer that is connected to a sewage facility operated by the CRD. The bylaw specifies the types of wastes that are either prohibited or restricted for discharge to sewer and the various conditions under which facilities must operate if they discharge waste into a sanitary sewer. The program is designed to ensure that the bylaw and its associated policies and procedures are applied consistently, creating a level playing field for businesses and institutions throughout the Capital Region.

The main objectives of the RSCP are to:

- protect the marine receiving environment adjacent to the CRD's sewage outfalls
- protect regional and municipal sewerage facilities against corrosion, blockage and other harmful effects related to the presence of contaminants in wastewater
- ensure that the health and safety of sewage workers and the general public is not put at risk due to the presence of contaminants in wastewater
- protect the quality of sewage sludge (biosolids) to allow the full range of options for its beneficial use
- protect treatment plants against upset due to inhibition of treatment processes by high contaminant loadings
- ensure fair and balanced use of the CRD's sewerage facilities through education, regulation, enforcement and the application of the user-pay principle
- promote responsible pollution prevention practices, including reduction, reuse, recycling, recovery and residuals management

The program's main areas of activity include liquid waste regulation, permits, codes of practice, authorizations, monitoring, enforcement, education and administration. More information on the CRD's RSCP may be found at:

www.crd.bc.ca/es/environmental_programs/source_control/index.htm

2. Stormwater Quality Management

The objective of the Stormwater Quality Management program is to maintain a working partnership with the municipalities, the electoral areas and the community to prevent stormwater run-off from causing harm to the environment, public health and well-being, and to restore and protect freshwater and nearshore marine ecosystems. The program achieves these objectives through the following:

- *Stormwater discharge monitoring and reporting identifies the levels of biological and chemical contaminants found in stormwater discharges. Each flow is then rated for public health and environmental concern. The rating of discharges allows the jurisdictions involved to better prioritize repairs and undertake remedial measures where necessary.*
- *Water quality assessments are carried out on major watercourses and help to determine the health of watercourses and whether water quality is getting better or worse over time.*
- *Upstream investigations, using biological and chemical contaminant sampling, are carried out to identify and eliminate contaminants at their source.*
- *Nearshore marine investigations are carried out in the winter and summer to provide a general indication of nearshore ocean water quality by measuring fecal coliform levels and tracking changes over time.*
- *Watershed management involves the development of watershed assessments and management plans in consultation with municipalities, landowners, senior government and the community.*
- *Special projects are actions targeted at improving stormwater quality in the region.*

Monitoring pollution in stormwater flows is important because stormwater contamination can cause significant harm: human and animal waste contamination can contain harmful pathogens, and chemical contamination can do all sorts of damage to people and the environment. When contamination is found, investigations are often undertaken to determine the source. Eliminating the cause of the contamination usually involves working with the local municipality and other stakeholders, such as business and the community.

3. Wastewater and Marine Assessment Program

The goals of the CRD Wastewater and Marine Assessment program for the Clover and Macaulay points outfalls are to:

- (a) ensure that the wastewater discharges do not cause adverse effects to the receiving environment, either now or in the future, by providing an early warning of the potential for adverse environmental effects, which will allow the timely development and implementation of appropriate source control and/or treatment alternatives
- (b) assess the effects of the wastewater discharges on the marine environment and human health risk
- (c) determine waste loads
- (d) provide information to the CRD Source Control program
- (e) provide scientific guidance to wastewater managers regarding the use of the marine environment for the disposal of municipal wastewater

These goals will be met by the implementation of the trigger process and a monitoring program.

The CRD currently holds provincial waste management permits for the Clover and Macaulay points outfalls. These permits stipulate the effluent and receiving environment monitoring that the CRD must carry out for the two outfalls. Since 1990, the CRD has supplemented this permit monitoring by increasing the number of monitoring stations and expanding the monitored parameters. In addition, special investigations have been undertaken to define more clearly the effects of the outfalls on the receiving environment.

The CRD has implemented a Wastewater and Marine Assessment program for the Clover and Macaulay points outfalls. This program consists of:

- the trigger process (which includes seafloor monitoring)
- effluent monitoring and analysis
- surface water monitoring and analysis for human health risk
- water column investigations
- additional investigations

In the March 31, 1998, letter from the minister of environment, lands and parks responding to the CRD's Core Area LWMP Stage 2 report, the minister advised the CRD that "Ministry staff will work with your staff to establish a monitoring program and trigger points that both the CRD and the Ministry can support." Ministry and CRD staff have cooperatively developed a trigger process. This process is summarized below.

Seafloor Trigger

In 1998, staff from the CRD and what is now the Ministry of Environment (MOE) started working together to come up with a process to provide an early warning of environmental impacts. The product of this work is known as the seafloor trigger. It determines when wastewater needs to be treated to protect the environment. If the seafloor trigger is tripped, treatment will be put in place within three years. In addition to the trigger, an early indication process is used to assess environmental changes in the marine seafloor. Essentially, the early indication process allows for the implementation of measures to stop pollution at the source in order to protect the marine environment.

The seafloor trigger includes three benthic community indicators at Macaulay Point and the mussel community at Clover Point. At Macaulay Point, taxa richness, polychaete abundance and number of phyla are evaluated and compared to reference station data. At Clover Point, mussels are evaluated for shell length and tissue weight compared to reference station data.

To date, the results from the early indication process do not indicate that the seafloor trigger levels will be exceeded in the near future. At both outfalls, the seafloor trigger levels were not approached for any parameters.

The CRD is currently developing a seawater trigger with the MOE.

Seawater Trigger

The CRD is currently working with provincial staff to establish a seawater trigger process that would be incorporated into the LWMP when mutually agreed with the province and approved by the CRD Board.

Annual Monitoring

Annual monitoring is conducted to assess the health of the receiving environment and accommodates the trigger process. Additional investigations to fill in information gaps will also be carried out. These investigations will be identified and prioritized in consultation with the Marine Monitoring Advisory group (MMAG).

Marine Monitoring Advisory Group

In 1987, the CRD formed the MMAG to advise on, and provide an independent assessment of, the CRD's marine programs, specifically:

- program design
- interpretation of monitoring results and conclusions
- when requested, consultant's proposals and reports
- when requested, appropriate levels of expenditures
- quality assurance/quality control
- one-time investigations

Other roles of the MMAG include the following:

- to review the state of the receiving environments near CRD wastewater outfalls
- to review CRD environmental quality (water and sediment) guidelines
- to consider information particularly relevant to the marine monitoring program
- when requested, to provide independent advice to the CRD on other marine or liquid waste issues
- to prepare an annual letter report that will include the MMAG's comments on the conclusions presented in the Macaulay and Clover points outfalls Wastewater and Marine Assessment Program report

The membership of the MMAG consists of scientists with expertise appropriate to the group's terms of reference. Current members include representatives from Simon Fraser University, the University of Victoria, Camosun College, Environment Canada, Fisheries and Oceans Canada, the provincial MOE and the Vancouver Island Health Authority.

4. Harbours Environmental Action

The Harbours Environmental Action program commits to coordinate harbours environmental protection and improvement efforts. The harbours are the most polluted marine environments in the CRD. The implementation of this commitment is carried out under the Victoria and Esquimalt Harbours Environmental Action program, an intergovernmental initiative working to protect and improve the environmental quality in Portage Inlet, Gorge Waterway, Victoria Harbour, Esquimalt Harbour and Esquimalt Lagoon.

5. Management of Trucked Liquid Wastes

Incorporated into the Core Area LWMP, this is a program for the coordination of trucked liquid waste disposal in the core area of the Capital Region. It is recognized that, historically, there has been a lack of coordination regarding the disposal of these wastes.

High strength liquid wastes that require treatment prior to disposal, or special disposal sites, have a potential for illegal discharge due to high disposal costs or a lack of understanding by the generators on proper disposal. The program goal is to ensure that trucked liquid waste

generated in the core area of the Capital Region is handled and disposed of in an appropriate manner to protect public health and the environment. Program staff conduct education and liaison with stakeholders, collection and promotion of pollution prevention materials and review regulations.

6. Management of Inflow and Infiltration

The Core Area LWMP contains several commitments to implement plans "for staged reduction of inflow and infiltration (I&I)" and to "avoid future costs to treat and convey inflow and infiltration." Consequently, in 2001, the CRD embarked on a four-year (which was subsequently extended to a five-year) program to accelerate the identification of priority areas and projects, including expanded flow monitoring.

Since 2001, a significant amount of flow monitoring data has been collected and partially analyzed, with the primary focus on other concurrent CRD projects, such as the northeast trunk/east coast interceptor (NET/ECI) upgrade study and the Craigflower pump station upgrade study.

The CRD has established an I&I subcommittee, made up of representatives of the core area municipalities, to work together to identify various methods of reducing and controlling I&I.

7. Management of Wastewater Overflows

The Core Area LWMP contains the following municipal commitments regarding wastewater overflows:

"Each participating municipality commits:

- to develop an action plan for its bypasses and spills based on the principles outlined herein
- to submit the action plan to the Ministry of Water, Land and Air Protection within two years after the date of acceptance of this plan by the ministry."

In order to prepare these municipal action plans, the CRD is working with its core area municipal partners towards the following:

- document the locations of planned bypasses and spills
- document the frequency and quantity of discharges
- prioritize overflow points for corrective action
- develop an action plan incorporating short-term and long-term corrective actions
- prepare and submit a report on the above to the MOE (formerly the Ministry of Water, Land and Air Protection)

8. Wastewater Treatment and Disposal in Areas Not Serviced by Municipal Collection Systems

The goal of this program is to develop and implement a management program for onsite sewage systems to prevent the environmental degradation and public health risks associated with poorly maintained systems.

With the LWMP plan area, the municipalities of Colwood, Langford, Saanich and View Royal contain areas that are not serviced by municipal sewerage systems and that rely on small treatment and disposal systems serving individual residences, or several residences collectively, for wastewater treatment and disposal. Residents in these areas generally employ onsite

systems consisting of septic tanks or small treatment plants with in-ground tile fields for effluent disposal.

For more than two decades, the CRD has provided facilities for the disposal of septage and treatment plant sludge from residential and commercial onsite systems. This service continues to be provided by the private sector under the authority of the CRD.

Failing onsite systems are known to cause several problems, including contamination of surface water and groundwater supplies and shellfish beds, health concerns and nuisance to neighbours, and nutrient enrichment of sensitive water bodies. These problems are well known but the ability of public health personnel to address them is limited.

A new *Sewerage System Regulation* under the *Health Act* was issued by the provincial government in July 2004 (which took effect on 31 May 2005). This act outlines a process by which onsite systems must be designed and maintained and which also applies to existing systems that require substantial repair. The CRD is designing a program to ensure that existing systems are properly maintained as well.

9. Wastewater Treatment and Disposal in Areas Serviced by Municipal Collection Systems

Treatment Locations, Technologies and Land Requirements

When the need for primary treatment at either Clover Point or Macaulay Point is indicated by the trigger process, facilities will be provided on property immediately adjacent to the existing pump station at the indicated location. The land at Clover Point is owned by the City of Victoria. The land at Macaulay is owned by the Department of National Defence. Subject to availability of the land, treatment facilities will be constructed below ground at these locations. Conceptual plans for provision of screening facilities to achieve primary treatment indicate that an additional area of 0.4 hectares will be required at each location. The CRD is taking steps to acquire land for the addition of treatment at these locations once the plan has been approved by the minister of environment.

When the Core Area LWMP was approved in March 2003, the minister required that the CRD "immediately commence the pilot testing of treatment technology that will provide primary or equivalent treatment for the removal of suspended solids consistent with the *Municipal Sewage Regulation*." The minister further required that the CRD provide the results of the pilot testing by 31 March 2005. Pilot testing of filtration technologies to achieve the equivalent of primary treatment, defined as an effluent suspended solids level not exceeding 130 mg/L, was carried out at Macaulay Point pump station from June 2004 to January 2005.

Two of three technologies tested proved capable of achieving average effluent suspended solids levels that were substantially below the criterion; however, one of the two, the Salsnes filter, was considerably more consistent at achieving an effluent quality that was below the maximum level. With proper sizing of equipment and flow controls, it appears that either of the technologies could be selected. The pilot testing showed that effluent filtration technology is capable of achieving the appropriate level of solids removal.

The consultant is preparing a second report on the area required and cost to construct a compact primary treatment plant based on the Salsnes filter technology. That report will be made available to the Review Panel when available, following review by the CRD Board.

Sludge Management Plan

The area requirements indicated above are not sufficient for processing of the treatment plant sludge to produce a biosolids product for beneficial use. Other than dewatering, processing of sludge from both treatment facilities will be carried out at a third site at a location to be determined.

As requested in the approval letter for the CRD's Core Area LWMP, a Sludge Management Plan (SMP) has been drafted and submitted to the province. This SMP outlines the plans of the CRD in the event that sewage treatment is necessary in the future. Raw sludge will be hauled from both Macaulay and Clover points to a third location for stabilization prior to beneficial use. A site selection process for the biosolids facility was conducted in 2003/2004. Two CRD-owned properties have been shortlisted; however, further public consultation on site selection has been postponed pending the results of the scientific and technical review.

Thermophilic anaerobic digestion process has been recommended to produce Class A biosolids. These biosolids would be applied to both forest land and agricultural land. If additional markets are required, the viability of composting the Class A biosolids and marketing the final compost product will be investigated.

Cost of Treatment Facilities

The estimated cost, in year 2005 dollars, for primary treatment facilities located at Clover Point and Macaulay Point, with structures sized to serve the needs of the LWMP area to year 2045, is \$237 million. The cost of the sludge processing facility is included in the estimate. Operating costs are estimated at \$5.8 million annually.

The estimated cost, in year 2005 dollars, for secondary treatment facilities located at Clover Point and Macaulay Point, with structures sized to serve the needs of the LWMP area to year 2045, is \$447 million (including the cost of sludge management at a separate site). Operating costs are estimated at \$16.7 million annually.

Timing of Additional Treatment

The need for additional treatment beyond the primary level at either Clover Point or Macaulay Point will also be determined using the trigger process.