DISCUSSION PAPER

Capital Regional District

Core Area Wastewater Management Program

Potential Program Delivery Options

REVISED UPDATE

January 29th, 2010

Introduction

This discussion paper summarizes the procurement delivery options to be analyzed by the Capital Regional District (CRD) in its business case for the Core Area and West Shore Wastewater Program (the "Program"). It also identifies the preliminary evaluation criteria to be used in the business case for procurement analysis purposes.

Importantly, this discussion paper does not evaluate the procurement options. Such evaluation work is ongoing by the CRD and will be included in the final business case submitted to the Province of British Columbia in support of funding for the Program.

The CRD is seeking Provincial funding support of approximately $306-million. In British Columbia, all projects in excess of $50-million must comply with the requirements of the Province's Capital Asset Management Framework (CAMF).[1] CAMF requires the CRD to review the use of alternative procurement methods in its business case including public-private partnerships ("PPP or P3").

The CRD's preferred configuration for the Program is referred to as "Option 1A" and has been documented in the engineering report "*CRD Core Area Wastewater Treatment Program Wastewater Treatment Plant Option 1A*" prepared by Stantec Consulting Ltd. and Brown & Caldwell, December 08, 2009. The biosolids treatment plan is documented in the report entitled "*Core Area Wastewater Program Biosolids Management Plan Option 1*".

This discussion paper identifies each of the major components of the Program from a procurement perspective. It also summarizes criteria that can be used to evaluate various delivery methods for each component.

The scope of the Program is summarized in Appendix A.

Appendix B contains a summary of the *Market Sounding & Stakeholder Consultation*, April 2008, related to (i) procurement packaging, and (ii) procurement options.

Appendix C contains a summary of potential procurement options considered by CRD.

Appendix D reviews how each procurement approach fits each major component of the Program.

Appendix E includes a summary of typical risk allocations under various procurement contracting approaches.

[1] Details on the Province's requirements are documented here: http://www.fin.gov.bc.ca/ocg/fmb/manuals/CPM/05_Capital_Asset_Mgmt.htm

The actual procurement plans for each of the major components of the Program will not be finalized and implemented until CRD has established funding commitments from the Provincial and Federal governments.

Program Delivery Planning Methodology

The CRD has significant flexibility in the types of procurement approaches it uses for the major components of the Program. Each of the major components can feasibly be delivered using a variety of procurement methodologies – from traditional design-bid-build to public-private partnership. Given the risk profile, overall scale, and specialized technical requirements of certain components of the Program, it is likely that a variety of contracting strategies will be required for successful implementation. There is no one-size-fits-all approach to delivery of wastewater infrastructure. Virtually every type of procurement methodology has been successfully used for delivery of wastewater projects across North America. This was confirmed during the market sounding and stakeholder consultation process conducted by the CRD and its advisors (April 2008).

Thus the CRD and its advisors implemented the following approach to procurement planning:

1. Identified the major components of the Program for procurement planning.

2. Identified the major procurement options to be analyzed in the business case to ensure the CRD's goals for risk transfer, value for money and social, environmental and financial goals will be achieved. A short-list of three[2] (3) major procurement methods are described below – Traditional, Hybrid and Public-Private Partnership.

3. Identified the key evaluation criteria to be used to assess each procurement option.

This discussion paper summarizes all three of the above steps. The actual evaluation of procurement options and a recommendation on the preferred procurement approach will be finalized in the business case submitted by the CRD to the Province.

[2] Appendix C summarizes the procurement approaches considered. These approaches were reviewed and matched to each major component by the CRD and its advisors based upon the stakeholder consultation and market sounding process.

Program Major Components

The table below breaks out the Program into its major components. Some of the major components have a unique risk profile, technical requirement or other characteristic allowing for stand-alone procurement (e.g. tunnel and outfalls). Other major components can be feasibly packaged together for bulk procurement at the discretion of the CRD (e.g. wastewater treatment facilities and the energy centre).

Program Major Component	Description
A. Conveyance system, pumping stations and storage facilities	The CRD currently operates the conveyance and pumping infrastructure for the main trunk lines within the region. CRD will continue to operate and maintain the new conveyance, pumping and storage facilities. New facilities will be procured in a conventional design bid build procurement. It is anticipated that pumping, conveyance and storage facilities will be procured in separate contracts because each type of work requires specialized contractors with different skill sets.
B. Wastewater treatment plants (liquids only)	The Core Area Program includes two main wastewater treatment facilities at Saanich East and McLoughlin Point, with a third pumping station and limited wet weather primary treatment facility at Clover Point. The existing Macaulay Point pumping station must be closely integrated into these wastewater treatment plants ("WWTP"). The West Shore Program includes an additional WWTP. Each of the WWTPs could be procured separately or all the WWTPs could be bundled together as a single procurement.
C. Energy Centre / Biosolids Facility	The Energy Centre could be procured separately or as part of a bundled procurement with the WWTP facilities. Based upon feedback received during the market sounding process, it would be desirable to have the main Core Area WWTP facility and biosolids facility operated by a single entity because the operation of these processes must be carefully coordinated.
D. Specialized construction work (Outfalls and Tunnel)	The outfalls and tunnel in the Program require specialized engineering and building expertise and thus the CRD has determined that they should be procured separately to "de-risk" the other major work packages and also foster competition among the small number of specialized firms that can provide these services.

E. Resource recovery which includes the following	The key factor in determining packaging and procurement options is the level of assumed integration with each WWTP and the Energy Centre. Resource recovery that can be physically separated from the WWTPs can be procured more flexibly than components that are integrated directly into the WWTP treatment process. The major resource recovery opportunities are anticipated to be as follows: • Biogas from Energy Centre digesters • Collection of fats, oils and greases (FOG) as well as other kitchen wastes and organics for inclusion in the digestion process • Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns) • Struvite recovery • Water recovery from WWTPs • Heat recovery from wastewater effluent • Energy usage in heating district • Other (e.g. energy from digested biosolids used on-site for heat generation) See the table below for details on the bundling of each resource recovery component.
F. Special agreements with BC Hydro, University of Victoria and Terasen gas etc.	The CRD will review these special opportunities on a case-by-case basis and determine if direct negotiations and arrangements should be established between the CRD and each possible partner. Business arrangements for such opportunities will be reviewed as the Program moves forward. Under such special arrangements, the CRD will require any third party wastewater/service provider seeking to partner with such organizations to do so (i) on a non-exclusive basis, (ii) to inform CRD of all discussions related to work on the Program, and (iii) to provide CRD with the right, but not the obligation, to be a joint signatory to any agreement relating to the CRD Program.
G. Long-term plans to manage inflow and infiltration	Given complexity and overlapping jurisdiction issues of I&I, the CRD anticipates that I&I will continue to be managed by each client municipality within the CRD.
H. Demand Management and Source Control Programs	The CRD manages a variety of source control and demand management programs to control contaminants entering the wastewater system and also manage water consumption during summer dry months. All such programs shall remain controlled and managed by CRD.

Resource Recovery Bundling Assumptions

Resource Recovery Component	**Bundling with Other Major Component(s)**
Biogas from Energy Centre digesters	Can be structured as stand-alone procurement arrangement with clarification of interfaces with Energy Centre operator (if different from biogas service provider). Interface issues to be managed related to access to digesters, quality and quantity of biogas generated by digesters, etc. During the market sounding process Terasen indicated an interest in providing such a stand-alone biogas arrangement. There are also likely other parties who would be interested in purchasing biogas from the Energy Centre. These could include fleet vehicle operators and new developments or industry in close proximity of the Energy Centre.
FOG and Organics Collection	Current collections in the region are provided by private sector firms and the CRD is currently reviewing potential options. It is anticipated that the Energy Centre operator (or CRD) would receive a tipping fee for accepting such organic and kitchen wastes. It is also expected that any required pre-treatment and mixing of such organics prior to blending with the digester would be provided by the Energy Centre operator.
Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	This component can be structured as a stand-alone arrangement between the Energy Centre operator (the CRD or other party) and the end-user of the biosolids (e.g. cement kiln operators). Alternative innovative applications could be considered during the procurement phase through use of an "alternative bid" process under a Design-Build or DBFO procurement approach.
Struvite recovery	Preliminary investigations suggest at least one party may be interested in providing this service on a stand-alone basis.
Water recovery from WWTP's	The membrane bioreactor (MBR) technology currently contemplated for water recovery is fully integrated into the WWTP. Thus separation of this service from general WWTP operations would be challenging. If implemented, water recovery is anticipated to be the responsibility of the WWTP operator with users being charged on a consumption basis. A separate water delivery contractual arrangement and sales program

	could be implemented by the CRD if desired to pre-sell and distribute such water to the end-user.
Heat recovery from wastewater effluent	Heat recovery may be used on-site for buildings. Such uses are clearly integrated into WWTP and Energy Centre operations. Heat recovery could be implemented as an option within a WWTP proposal as an add-on alternative bid.
Energy usage in heating district	Generation of energy for use in a heating district could be structured as an extension of the WWTPs or Energy Centre. The CRD would provide access to treated effluent for heat recovery (within the lot lines of each WWTP) to a potential third party partner. A service provider would be responsible for implementation of the heating district outside the lot lines of each WWTP – including piping ambient or hot water to users and, where necessary, retrofitting buildings or integrating into new buildings. The CRD anticipates such arrangements could be structured as stand-alone agreements, possibly as an allowed "alternative bid" during the procurement process if a Design-Build or DBFO approach to procurement is used. These opportunities would be subject to ensuring sufficient demand or market is available for this heat.

Potential Procurement Methods

Appendix C summarises the procurement methodologies considered by the CRD for the components of the Program. Appendix D matches these procurement methodologies to each major component the Program. Based upon the feedback from the *Market Sounding and Stakeholder Consultation*[3] and input from CRD's engineering and business advisors, the CRD has identified the following three major procurement methods to be analyzed in the business case.

As directed by the CRD, in all procurement options the conveyance system, pumping stations, outfalls and tunnel will be procured using a Construction Management at Risk approach or conventional design bid build approach. The CRD would be responsible for operating and maintaining the conveyance system, tunnel and outfalls.

Each of these options is summarized in the table below with procurement assumptions for each major Program component identified.

Option A: Traditional Approach

This option generally uses Construction Management at Risk ("CMAR") or design bid build ("DBB") for delivery of the major components of the Program.

The CMAR approach would involve the CRD engaging an Engineering Consultant as well as a Construction Manager at the early project stages to refine the concept design, develop the detailed design and prepare a comprehensive project budget and schedule. Through a competitive process, the owner would hire a Construction Manager on a fee basis to work with the Engineering Consultant to provide preconstruction services including constructability, innovation, schedule and cost estimating input as the design progresses. Construction can start on early work packages on a sequential tender bases and once the overall design reaches the 80 to 90% stage the construction manager would provide a Guaranteed Maximum Price ("GMP") for the project. The construction manager typically enters a guaranteed maximum price and schedule with CRD or stipulated lump sum price contract.

The construction manager would tender each package and enter multiple trade contracts with suppliers and sub-contractors and be responsible for ensuring the project is brought in at or below the GMP. The construction manager assumes responsibility for the performance of the trade contracts (subcontracts) much as a general contractor would under traditional procurement.

[3] Appendix B includes a summary of the results of the *Stakeholder Consultation and Market Sounding Process*. The full report is available online at the CRD's document archive: http://www.wastewatermadeclear.ca/media/archived-documents/

Under a design bid build approach the CRD engages an engineering consultant to prepare the design and contract documents. The consultant tenders the project, evaluates tenders and administers the construction contract. Under both the CMAR and DBB arrangement the Owner assumes risks for unknowns or design omissions.

The CRD will be responsible for operating all facilities upon completion of construction.

The CRD will also retain the risk for long-term maintenance of the facilities and overall integration of the various components.

Delivery and operations of resource recovery components of the Program would vary by type of resource as described in more detail in the table below.

Option B: Hybrid Approach

This option utilizes a variety of procurement methodologies. These options were evaluated in detail in Appendix D and matches to each major component.

The option generally uses the Design-Build approach to procurement for the wastewater treatment facilities, plus a design, build, finance, operate and maintain ("DBFO") approach for the Energy Centre and West Shore treatment plant. Construction Management at Risk or design bid build is assumed for the conveyance system, outfalls and tunnel. Depending on scheduling requirements it is also possible that some of the treatment facilities could be delivered using CMAR.

The CRD would operate the WWTP's developed as design-build or CMAR, and would also be responsible for all maintenance and repair risks beyond the warranty period (typically two years from completion of construction). The CRD would also operate and maintain the conveyance system and pumping stations. Components developed using a DBFO approach would be operated and maintained by a third-party service provider under a long-term contract. The CRD would own all facilities regardless of the procurement method.

The Design-Build approach to procurement is described in Appendix C.

Delivery and operations of resource recovery components of the Program would vary by type of resource as described in more detail in the table below.

Option C: Public-Private Partnership Approach

This option generally uses a DBFO or DBO approach to procure the WWTP's and Energy Centre. As described in Appendix D, for the purposes of this analysis a large DBFO

procurement package has been selected for McLoughlin Point WWTP, Saanich East WWTP, Clover WWTP and the Energy Centre. A stand-alone DBFO is also included for the West Shore WWTP.

Resource recovery responsibility would generally be managed by DBFO service providers as described below.

DBO Versus DBFO

For analysis purposes this discussion paper assumes a DBFO approach for certain components of the Program. The CRD wishes to consult with the Province on the utilization of the design-build-operate (DBO) approach to procurement for these components during final procurement implementation. The CRD is flexible on the selection of DBO versus DBFO for delivery. While recognizing the DBFO approach has stronger risk transfer attributes, the CRD also acknowledges the DBO approach may generate more interest from wastewater industry specialist firms. Since only the Provincial piece of funding is anticipated to be financed using a DBFO approach, the CRD will work with the Province to structure the funding arrangements to meet expectations and mutual interests of the stakeholders.

Procurement Options for Each Major Program Component

Procurement Packages	Procurement Option A "Traditional"	Procurement Option B "Hybrid"	Procurement Option C "PPP/DBFO"
A. Conveyance System - trunk conveyance - pumping stations - storage facilities - monitoring & control	Design-Bid-Build CRD operates and maintains	Design-Bid-Build CRD operates and maintains	Design-Bid-Build CRD operates and maintains
B1. West Shore WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Stand-alone DBFO[a]	Stand-alone DBFO[a]
B2. Saanich East WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Construction Management at Risk CRD operates and maintains	Bundled DBFO[a] package including: Saanich East McLoughlin Point Clover Point Energy Centre/Biosolids Facility
B3. McLoughlin Point WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Design-Build CRD operates and maintains	
B4. Clover Point WWTP	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Design-Build CRD operates and maintains	
C. Energy Ctr./Biosolids Ctr.	Design, Bid, Build or Construction Management at Risk CRD operates and maintains	Stand-alone DBFO[a]	
D1. Outfalls	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains

[a] Note all DBFO options are anticipated to generally use a maximum of up to 1/3 private sector financing for capital costs. The other 2/3 of financing for capital costs are assumed to be provided by the CRD and the Federal government. It is possible such components may be procured using a design-build-operate approach. The CRD will consult with the Province prior to making a final decision on this matter.

D2. Tunnel	Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains		Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains		Traditional Procurement (either Design-Bid-Build or Construction Management at Risk) CRD operates and maintains	
E. Resource Recovery	Biogas from Energy Centre digesters	Stand-alone DBFO for gas upgrading and sales to distribution network.	Biogas from Energy Centre digesters	Stand-alone DBFO for gas upgrading and sales to distribution network.	Biogas from Energy Centre digesters	Part of DBFO contract.
	FOG and Organics Collection	CRD outsources collection under rolling contract.	FOG and Organics Collection	CRD outsources collection under rolling contract.	FOG and Organics Collection	Responsibility for collections transferred to DBFO service provider.
	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Cement kiln sales CRD negotiates and manages	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Cement kiln sales CRD negotiates and manages	Biosolids reuse for energy generation of digested biosolids (e.g. cement kilns)	Part of DBFO contract. Assumes cement kiln, no land uses.
	Struvite recovery	Stand-alone DBFO	Struvite recovery	Stand-alone DBFO	Struvite recovery	Part of DBFO contract.
	Water recovery from WWTPs	CRD builds, manages, operates	Water recovery from WWTPs	CRD builds, manages, operates	Water recovery from WWTPs	Part of DBFO contract.
	Heat recovery from wastewater effluent	Used on-site at WWTPs to heat buildings	Heat recovery from wastewater effluent	Used on-site at WWTPs to heat buildings	Heat recovery from wastewater effluent	Part of DBFO contract. Assume used on-site at WWTPs to heat buildings
	Energy usage in heating district	CRD WWTPs function as "platform enablers" for possible separate DBFO for	Energy usage in heating district	CRD WWTPs function as "platform enablers" for possible separate DBFO for	Energy usage in heating district	Optional part of DBFO contract. No heating district assumed implemented in current analysis.

Resource Recovery ….continued		heating loop.		heating loop.		
	Other	No additional resource recovery currently included in analysis.	Other	CRD to consider limited "alternative bid" proposals for other resource recovery at Biosolids/Energy Centre as well as WWTPs built as design-build during procurement. No additional resource recovery currently included in analysis.	Other	CRD to consider limited "alternative bid" proposals for other resource recovery during procurement. No additional resource recovery currently included in analysis.
			Same as Traditional Approach except for more flexible "alternative bid" process in procurement implementation.		For analysis purposes, similar resource recovery assumptions have been used in the DBFO option, however all such applications are assumed to be rolled under the large DBFO contract. An "alternative bid" process will also be used to allow further flexibility in resource recovery under this option.	
F. Special Agreements (for example, such parties may include one or more of the following: BC Hydro, Terasen Gas, UVic, Royal Roads etc.)	CRD negotiates special off-take agreements directly with each party.		CRD negotiates special off-take agreements directly with each party.		CRD enters tri-partite negotiations with DBFO service provider and each special party.	
G. Inflow & Infiltration Management	CRD and Client Municipalities to coordinate maintenance and repairs over long-term.		CRD and Client Municipalities to coordinate maintenance and repairs over long-term.		CRD and Client Municipalities to coordinate maintenance and repairs over long-term.	

Preliminary Assessment Criteria of Delivery Options

The business case will use a multiple-criteria assessment ("MCA") approach for evaluation of procurement options. The MCA approach is flexible and takes into consideration a variety of qualitative issues when making procurement decisions. The preliminary list of assessment criteria are identified below. Criteria are selected based upon CRD's overall goals and objectives for the Program as well as input from CRD staff and advisors[4].

Environmentally-Orientated Criteria

Criteria	Issues Considered
a) Regulatory Compliance	The extent to which each delivery option complies with regulatory requirements and can adapt to meet changes in regulatory requirements in the future.
b) Sustainability and greenhouse gas emissions impacts including for Resource Recovery etc.)	The extent to which each delivery option incorporates measures for resource recovery and also reduces impacts on climate change.
c) Opportunities to adopt best practices	The extent to which each delivery option offers opportunities to adopt best practices in design, construction or operations.
d) Permitting	The extent to which each delivery option allows for timely achievement of the required Federal and Provincial permits to begin construction.

Socially-Orientated Criteria

Criteria	Issues Considered
a) Staff recruitment and retention, and impact on existing staff	The extent to which each delivery option allows for the recruitment, training and retention of qualified and competent staff. The extent to which each delivery option has an impact on relationships with existing staff, their collective agreements, and staff in other CRD areas of work.
b) Ownership of Facilities	Who will own the facilities (land, buildings and engineering equipment)?

[4] CRD also utilized evaluation from other wastewater projects including the Pima County report entitled *Regional Optimization Master Plan Alternative Delivery Methods*, August 2008.

c) Public acceptance and communications impact	Consideration of the likely public acceptance of each of the delivery options.
d) Flexibility and control to make changes during the development and operations phases	The extent to which each delivery option allows the CRD to make changes during the development phase of the project whilst not impacting adversely on schedule or cost. The extent to which each delivery option allows the CRD to make changes during the operations phase of the project whilst not impacting adversely on schedule or cost (e.g. changes for inflow and infiltration, resource recovery technologies, a more distributed collection and treatment, future changes in regulation, expansion, plus input from neighbours surrounding facilities). The ability of the CRD to protect the public interest during both the design and construction phase and during long term operations.
e) Customer Service	How each delivery option provides the required levels of service to the member municipalities in a timely manner (including changes in growth patterns and service requirements, septic tank utilization etc.) and how concerns of local residents can be addressed?
f) Regional economic impact	The ability for the delivery option to provide maximum economic benefit to the CRD and British Columbia in terms of jobs and other economic benefits.

Financial and Risk-Orientated Criteria

Criteria	Issues Considered
a) Risk Allocation Goals	Consideration of how the proposed delivery option allocates risks with the objective of transferring risks to the party best able to manage each risk. This would include consideration of the guarantees that the public sector entity would receive in respect of long-term performance of the assets and the ability of the CRD to enforce the risk allocation over the duration of the contract.
b) Procurement and Implementation Schedule	How each delivery model affects the proposed project procurement and implementation schedule? This criterion considers financial incentives for timely completion together with levels of complexity associated with each delivery option. It also considers budget and schedule risks during the procurement phase.
c) Level of competition	The extent to which each delivery option impacts on the likely market

during the procurement	interest in the project to ensure that there is competitive tension in the procurement process.
d) Cost certainty	The extent to which each delivery option provides the CRD with price certainty during the design and construction phase as well as over the long-term operational period.
e) Complexity of immediate and future procurement	Feasibility of procurement packaging plan and ability to implement with CRD's multi-year, multi-component build-out Program.
f) Lifecycle maintenance	The extent to which each delivery option manages and provides for long-term lifecycle costs and minimises deferred maintenance of the facilities.
g) Risk adjusted capital cost	The risk adjusted capital costs of each delivery option.
h) Operational efficiencies	The potential for operational efficiencies that could be achieved by each delivery option.
i) Risk adjusted whole life cost (NPC)	The risk adjusted net present cost of the project over the life of the contract.

The final business case will analyze each procurement method and assess each component of the Program against these criteria. Only after completion of the financial analysis, risk analysis and MCA analysis will a recommendation be feasible on procurement matters.

APPENDIX A

Summary Scope of Program

The Program includes the following work that is scheduled for completion by the end of 2016.

Summary of the Core Area Program

Major Core Area Components	Scope of Work in Component
Conveyance & Trunk Sewer Upgrades	• Upgrades to existing forcemain at Clover Point pump station • Upgrades to the Macaulay outfall • Conveyance works between Macaulay Point and McLoughlin Point • Conveyance works between Clover Point and McLoughlin Point.
Macaulay Point Pump Station	• Upgrade and expansion of Macaulay Point Pump station to transfer flows to the McLoughlin Point plant. • A new forcemain to transfer flows from Macaulay pump station to McLoughlin WWTP.
Wastewater Treatment Facilities	• A new 16.1 Ml/d Saanich East (liquids only) secondary treatment plant for flows up to 1.75 times average dry weather flow (**ADWF**). Flows between 1.75 ADWF and up to four times ADWF shall receive primary treatment. Biosolids are returned to the conveyance system for downstream treatment. Note effluent up to two times ADWF will satisfy secondary-level treatment requirements through the use of an innovative strategy of blending flows from membrane bioreactor in this facility. A new outfall is proposed at this facility. • A new 84.2 Ml/d McLoughlin Point secondary treatment plant serving the Macaulay sewerage catchment for flows up to two times ADWF from the northwest trunk (Macaulay catchment) and from Clover Point, and primary treatment for flows up to four times ADWF. • Some expansion work of the existing Macaulay Point pump station linking to the Macaulay Point outfall. Treated effluent from the new McLoughlin treatment facility will be conveyed to the Macaulay Point pump station for discharge through the existing and new outfall at that location.
Clover Point Pumping Station	• A pump station at Clover Point that will pump two times the ADWF at this location to McLoughlin Point for secondary treatment.

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- Wet weather flows over two times ADWF up to four times ADWF will receive primary treatment.
- Extreme wet weather flows over four times ADWF shall be screened and discharged.

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<tr><td>Biosolids Treatment Facility</td><td>

A centralized biosolids facility will be implemented for the Combined Program. The current biosolids management plan (**BMP**) contemplates a centralized biosolids facility at the Hartland Landfill site. The plan includes a sludge conveyance pipe from the McLoughlin Point WWTP to the Hartland Landfill biosolids facility. (As noted later, a biosolids processing and resource recovery facility at an upper harbour industrial site is also under consideration.)

The CRD has conducted an extensive analysis of alternatives for the BMP. The current plan for the BMP is referred to as Option 1. The CRD's biosolids facility will process the biosolids generated by primary and secondary treatment in a manner that will optimize opportunities for beneficial use by:

- using thermophilic anaerobic digestion to stabilize and reduce solids, kill pathogens and generate methane gas (biogas) for use onsite or offsite in the natural gas distribution system,
- drying some or all of the digested biosolids and selling it as a fuel for cement kilns, paper mills or other energy facilities; and / or
- Extraction of Struvite (phosphate) from dewatering centrate for use as fertilizer.

The biosolids facility will treat sludge to produce equivalent USEPA Class "A" standard. The BMP uses year 2030 as the design horizon. The table below shows the expected flows and loads for the CAWTP. The flows shown represent the dry weight per day of the estimated biosolids generation. These estimates are based on Option 1A system configuration with a population equivalent of 493,000 (342,000 population plus 151,000 population equivalent, industrial, commercial and institution). See to Appendix 3 for details.

Item	Average Day (kg/day)	Peak day (kg/day)
Primary Solids	12,700	20,200
Secondary Solids	16,800	24,500
Total Raw Solids	29,400	44,700
Total Raw Volatile Solids	24,700	37,500

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Outfalls and Tunnels	Treated wastewater from the WWTPs will be discharged to the marine environment through existing outfalls. Some upgrade work on the outfalls is necessary, including: • Twinning of the existing major marine outfall at Macaulay Point, and • Expansion and extension of the existing marine outfall at Finnerty Cove. • Tunnel works for conveyance between Clover Point and McLoughlin Point.
Resource Recovery & Sustainability Initiatives	• Each secondary treatment plant will produce reclaimed water suitable for irrigation, toilet flushing and other uses. • Generation of methane gas at the biosolids facility for use onsite or offsite in the natural gas distribution system. • Biosolids digesters shall include adequate capacity to accept clean food waste and/or fats, oils and greases (**FOG**) to enhance production of biomethane by up to 50%. • Will recover waste heat from the digesters to pre-heat sludge feed (reducing heat required by digesters). • Reuse of digested biosolids for sale as fuel for cement kilns, paper mills, or other energy facilities, Extraction of Struvite (phosphate) from biosolids for use as fertilizer. • Possible implementation of heat recovery exchangers for heating district (under review).
Operations	• CRD shall ensure ongoing operations of the facilities (including the possibility of contracting with third party providers for certain services).

Summary of West Shore Program

The CRD is working with the West Shore communities of Colwood and Langford to establish a plan for the implementation of wastewater management systems in those areas. The current plan includes the following facilities for the West Shore Program:

Major West Shore Components	Scope of Work in Component
Wastewater Treatment Facilities	• A 14 Ml/d West Shore secondary treatment plant for liquid-only flows up to two times ADWF from the northwest trunk, and primary treatment for flows up to four times ADWF.
Biosolids Facility	• The current plan assumes biosolids are returned to the conveyance system for downstream treatment at the Core Area centralized biosolids facility.
Conveyance & Trunk Sewer Upgrades	• Conveyance works between West Shore and McLoughlin Point. • Onshore conveyance from WWTP to shoreline of outfall.
Outfall	• A new outfall extending from West Shore WWTP shoreline to southern marine discharge.
Resource Recovery & Sustainability Initiatives	• Resource recovery components of West Shore Program expected to be similar in breadth to planned Core Area Program initiatives.

Appendix B

SUMMARY OF THE MARKET SOUNDING AND STAKEHOLDER CONSULTATION REPORT, April 2008

The CRD conducted an extensive industry and stakeholder consultation in 2008 to obtain market feedback on procurement packaging options. The results of the market sounding were documented in the report "*Market Sounding & Stakeholder Consultation*", April 11, 2008. This report is available on the CRD's website at www.WastewaterMadeClear.com.

The overall Core Area and West Shore system being planned by CRD can generally be grouped into four distinct physical components (the "Technical Components"):

1. Wastewater Treatment Plants ("WWTP's") generally assumed at Macaulay Point area, Clover Point area, West Shore plus Saanich East in accordance with *The Path Forward* report;
2. Biosolids Plant and Plant Management;
3. On-Shore Linear Structures (conveyance systems and associated pumping stations); and
4. Marine outfalls (generally assumed on West Shore plus Finnerty Cove).

Subject Area of Interest to CRD	Summary of Feedback
Contract Packaging	• There was broad divergence in views on recommendations for the procurement packaging strategy. Eight (8) respondents stated that they recommended the overall Project be procured as a single system or a small number of large component packages, whereas twelve (12) respondents recommended breaking it down to a number of well-defined components. Six (6) of the respondents hedged their opinions by presenting arguments for both single and multiple procurement packages. • Respondents that favored the consolidated large-scale approach typically assumed the new linear infrastructure to be constructed would most likely be operated and maintained by the CRD.
Benefits & Weaknesses of Large-Scale Packaging Procurement	• The arguments in favour of procuring the Technical Components in a large package included lower life-cycle costs through integration efficiencies, greater risk transfer, single source accountability, and reduced procurement costs. • The weaknesses of packaging the work into a single large procurement included the need for a large contract bond by the prime contractor (thereby limiting the number of firms who could bid); insufficient due diligence information available to allow firms to bid; difficulty for firms locking-in costs over a long-term contract and procurement phasing plan; and, the nature of CRD's plan requires some flexibility and phasing which is not well suited to single

	package procurement.
Benefits & Weaknesses of Multi-Component Packaging Procurement	• The arguments in favour of breaking procurement into multiple packages are that it would increase the number of firms that could bid (smaller firms); it would allow CRD more flexibility for procurement (using different procurement approaches for components); and it may diversify risk across multiple parties during implementation. • The weaknesses of using multiple procurement packages were that it would require CRD to manage interface risk among packages; it would require CRD to manage multiple procurement contracts; it may lead to scheduling challenges and delays; it may limit innovation across the overall system (but innovation within each package may be improved); and, there may be higher procurement costs.

Procurement Options	• Overall, there was no clear preferred procurement option among respondents. Respondents argued convincingly in their submissions and follow-up discussions for a variety of procurement methodologies – from traditional procurement to full public-private partnership approaches.
	• Multiple respondents supported a DBFO for one or more components of the project as long as the CRD could address key issues related to:
	  ○ supply of additional due diligence materials,
	  ○ establishment of reasonable risk transfer expectations, and
	  ○ confirmation of clear political-level support for the procurement.
	• The design-bid-build traditional procurement approach was generally acknowledged as providing CRD with the most flexibility.
	• Those respondents supporting a DBFO approach to contracting and procurement cited the following reasons:
	  ○ Risk transfer
	  ○ Lowest life-cycle cost
	  ○ Greater potential for innovation
	  ○ Greater cost certainty
	  ○ Single point of accountability
	• Respondents who suggest a mixed approach to procurement for each Technical Component cited the following reasons:

	○ CRD flexibility. ○ Control over procurement scheduling. • Respondents who preferred more traditional approaches to procurement like design-bid-build (DBB) cited the following reasons: ○ Allows more public input and discussion. ○ Complexity of CRD's system requires flexibility in procurement over multiple years for phasing of components, integration of new technologies and accommodation of water reuse and renewable technologies. ○ Allows CRD to achieve scheduling targets.
Operations	The arguments in support of <u>CRD assuming responsibility</u> for operations and maintenance of all WWTP's included: • The historically positive Canadian experience with public sector responsibility for operations and maintenance, • Allowing continuation of existing CRD responsibilities of maintaining resources and current operations and maintenance, and • Public operation allows flexibility to accommodate future advances in treatment technology, water reuse and sustainability targets (as noted "*One of the disadvantages of multi-decade [*DBFO contracts*] is that changes in technology or requirements are not easily accommodated*…"). The arguments in support of the <u>private sector assuming</u> responsibility for operations and maintenance of WWTP's included: • Ability of CRD to transfer risk to private sector, • A perception that the private sector may be able to provide better career opportunities for personnel (thus easier to hire and retain senior, qualified staff), • Perception of improved innovation, • Clear delineation of responsibilities for performance and control/regulation, and • CRD realizes greater cost certainty.

Appendix C

Description of Potential Delivery Options

The CRD conducted an extensive industry and stakeholder consultation on procurement as described in the report "*Market Sounding & Stakeholder Consultation*", April 2008. The following table summarizes the potential delivery options identified as feasible during the market sounding process.

Procurement option	Strengths	Weaknesses
Design-Bid-Build ("DBB") Under a design bid build approach the CRD engages an engineering consultant to prepare the design and contract documents. The consultant tenders the project, evaluates tenders and administers the construction contract. Under this arrangement the Owner assumes risks for unknowns or design omissions. Such arrangements require design work to be completed to a high level and thus there is limited room for innovation once design documents have been approved by CRD. Associated project and construction management services are either included in the scope of the Engineering Consultant responsible for the design or awarded as a separate contract(s). Operation and maintenance of the completed facilities is either the responsibility of the CRD or a private sector operator(s).	• Common approach used by public sector agencies. • Understood by advisors and supplier community. • CRD retains control of the bidding process for each sub-component of the Program. • Bonding flexibility. Allows CRD to break up the bidding of the Program into smaller pieces that can be delivered by smaller firms (with lower bonding capacity). • Allows more public input and discussion. • Provides flexibility in procurement over multiple years for phasing of components, integration of new technologies and accommodation of renewable technologies. • Allows CRD to achieve scheduling targets.	• Integration risks. CRD remains responsible for ensuring integration of the components of each facility plus the overall Program. • Cost and Schedule Risks. Sometimes leads to scope expansion and changes, creating both delays and higher costs. • Requires CRD to hire new operators for all new facilities. • Commissioning and transition from development phase to operations phase can be challenging (and at CRD risk). • Lifecycle risks. CRD will be responsible for all costs after expiry of warranties in 1-2 years after completion.

Construction Management at Risk (Construction Manager as Constructor, not Agent) ("CMAR") The CMAR approach would involve the CRD engaging an Engineering Consultant and Construction Manager at the early project stages to refine the concept design, develop the detailed design and prepare a comprehensive project budget and schedule. Through a competitive process the owner would hire a construction manager on a fee basis to work with the engineer to provide preconstruction services including constructability, innovation, schedule and cost estimating input as the design progresses. Construction can start on early work packages on a sequential tender bases and once the overall design reaches the 80 to 90% stage the construction manager would provide a Guaranteed Maximum Price ("GMP") for the project. The construction manager typically enters a guaranteed maximum price and schedule with CRD under a cost-plus arrangement or stipulated price contract. The construction manager would tender each package and enter multiple trade contracts with suppliers and sub-contractors and be responsible for ensuring the project is brought in at or below the GMP. The construction manager assumes responsibility for the performance of the trade contracts (subcontracts) much as a general contractor would under traditional procurement. The	• Allows fast-tracking (over-lapping permitting, design and construction). • Allows for early construction start with early price predictability. • CRD maintains control and ability to influence design. • Flexibility for change. • Allows CRD to achieve schedule targets. • Allows more public input and discussion.	• Cost certainty not known before construction commencement. • Integration risks. CRD remains responsible for ensuring integration of the components of each facility plus the overall Program. • Cost and Schedule Risks. Sometimes leads to scope expansion and changes, creating both delays and higher costs. • Requires CRD to hire new operators for all new facilities. • Commissioning and transition from development phase to operations phase can be challenging (and at CRD risk). • Lifecycle risks. CRD will be responsible for all costs after expiry of warranties in 1-2 years after completion.

Engineering Consultant typically enters a guaranteed maximum price and schedule with CRD under a cost-plus arrangement or stipulated price contract. The CRD will be responsible for operating all facilities upon completion of construction. The CRD will also retain the risk for long-term maintenance of the facilities and overall integration of the various components. Delivery and operations of resource recovery components of the Program would vary by type of resource as described in more detail in the table below.		
Alliance Partnering ("AP") Through a competitive process a private sector consortium would be selected to partner with the CRD and its stakeholders working together to develop and deliver the Project. In order to ensure adequate levels of competition exist during the process there would be a series of gateway reviews to ensure competitive tension is maintained and value for money is achieved.	• Good for projects with ambiguous scope. • Good when fast-tracking is required.	• Few precedents in Canada. • Less certainty around costs. • May lead to schedule delays.
Design-Build Design build, as contemplated by the CRD, involves developing the design to no more than 25% to 30% completion of drawings. A point where major design requirements are defined to a greater extent or level of detail rather than just providing a high level	• Allows CRD to maintain schedule flexibility for staging of procurement. • Allows CRD to specify detailed design and clear standards for equipment to reduce the risk of long term maintenance and operability issues. • Provides CRD with price certainty once	• For equipment not specified by CRD, bidders may suggest equipment which has a short maintenance lifecycle and thus long-term whole life costs to CRD will be higher. Long-term warranties (beyond 2 years) are not provided by bidders if their staff do not operate the facilities, thus CRD

performance requirements and specifications. Issues such as primary equipment selection, space planning and layouts for maintenance are defined to provide the Owner with better long term operability and performance. This does not preclude the design builder from innovation and providing alternative bids, provided that the proposal meets the Owner's basic facility requirements.	plans are finalized and fixed price contract entered with design-build firm. • Design builder is responsible for many design and construction risk (mainly equipment and designs no specified in the bid documents). • Allows more input into design phase and facility development. • Allows CRD to provide input into the quality of critical process equipment specified for inclusion in the base design and enables standardization for maintenance purposes.	is at risk to equipment failure costs after the expiry of the warranty period. • If extensive design work is specified by CRD as part of the bid documents then innovation and competition may be limited to the construction phase. This may be mitigated by allowing bidders to provide a "base case" bid conforming to such requirements plus "alternative bids" which deviate from the specified plans and include innovative new designs and solutions for consideration by Owner. • The complexity of the CRD Program may make it difficult to the CRD to define end requirements.
Design-Build-Operate-Maintain ("DBO") ▪ Using a competitive procurement process a "team" comprising an Operator, Engineering Consultant and General Construction Contractor together with specialist service providers is selected to design, build, operate and maintain the facilities over a long-term period.	• Provides integrated solution for CRD and potential for efficiencies through integrated planning of entire system over whole life. • Uses public financing which has lower cost than third party debt and equity. • Achieves some risk transfer for CRD. • Offers potential for innovation. • Offers cost certainty for CRD at bid phase. • One party is accountable for performance. • Government retains ownership and control of assets. • Service provider assumes responsibility for hiring operations staff.	• Lack of flexibility to change design once accepted by CRD. • May require a large contract bond by the prime contractor (thereby limiting the number of firms who could bid). • Requires CRD to conduct further due diligence prior to the procurement phase which could impact on the timeline. • The nature of CRD's plan requires some flexibility and phasing which is not well suited to single package procurement.

Design-Build-Finance-Operate-Maintain "("DBFO") ▪ A DBFO is an arrangement between a public sector body and a private sector party, resulting in the private sector party providing infrastructure and/or services that are traditionally delivered by the public sector. A key element of a DBFO is transfer of risk from the public partner to the private sector partner. ▪ Bidders are responsible for assembling a team of firms – from wastewater engineering/designers to operators and financiers. All would collaborate for the delivery of the performance requirements of CRD.	• Provides integrated solution for CRD and potential for efficiencies through integrated planning of entire system over whole life. • Achieves greater risk transfer at some cost for CRD. • Offers potential for innovation. • Offers cost certainty for CRD at bid phase. • One party is accountable for performance. • Government retains ownership and control of assets. • Service provider assumes responsibility for hiring operations staff. • Lenders will carry out on-going diligence and monitoring throughout the term of the project.	• Lack of flexibility to change design once accepted by CRD. • Costly and complex bidding process. • Significant time required to prepare bid documents to ensure interests of CRD are protected. • May be a lack of capacity in the marketplace to deliver the larger components. • May require a large contract bond by the prime contractor (thereby limiting the number of firms who could bid). • Requires CRD to conduct further due diligence prior to the procurement phase which could impact on the timeline. • The nature of CRD's plan requires some flexibility and phasing which is not well suited to single package procurement. • Availability of third party financing remains uncertain in post-credit crisis environment. • Cost of third party financing will be higher than CRD cost of MFA funds. • If length of operating contract exceeds five years then voter assent may be required to enter such contract, further delaying the implementation process.

Appendix D

Delivery Options for Major Components of Program

This appendix summarizes how each major component of the Program was evaluated against the delivery options considered in Appendix C.

Under all options the CRD directed that conveyance and pumping stations shall be procured using a traditional approach (with CRD operating such facilities over the long-term). This approach has been used successfully in the past by CRD and has resulted in smaller local contractors providing competitive bids.

Importantly, the CRD is exploring the opportunity of acquiring an alternative site for the Energy Centre which may allow this facility to be combined with the main McLoughlin Point WWTP. Under such an arrangement a large-scale bundled procurement would likely be considered. If this is implemented then cost information may significantly change as it may be possible to combine facilities and / or reduce the number of facilities constructed. This option would be subject to further technical and financial assessment.

The West Shore communities (Langford and Colwood) have expressed an interest in implementing a procurement plan separate from the Core Area. Thus, for the purposes of the business case the liquid-only wastewater treatment facility in the West Shore is assumed to be procured separately in all options.

The CRD wishes to consult with the Province on the funding of DBFO components of the Program and would consider using a DBO approach or a DBFO approach for implementation of the preferred option. A DBO approach would require the Province's funding contribution is advanced as a grant during construction to the Program.

The three main delivery options considered in this discussion paper are described below.

Option C: Public-Private Partnership Procurement

The CRD conducted a review of various procurement options available for each major component of the Program as well as the requirements of the Province under Capital Asset Management[5] policy 5.3. Since the CRD is seeking Provincial funding support of over $300-million for the Program, the business case submitted to the Province must consider a public-private partnership (PPP or P3) as the base case procurement option. This P3 option is described in this discussion paper as "**Option C: P3 Procurement**".

To ensure compliance with Provincial expectations, Option C assumes all major components of the Program are delivered using a using a DBFO approach (including resource recovery components). The CRD chose to analyze a large-scale bundling plan in Option C including the three Core Area WWTPs and the Energy Centre packaged together in a single bundled

[5] The Provincial capital planning policy requires a review of alternative procurement options in any business case seeking funding over $50-million from the Province of British Columbia. These requirements are documented here:
http://www.fin.gov.bc.ca/ocg/fmb/manuals/CPM/05_Capital_Asset_Mgmt.htm

procurement (implemented over several years). Such an approach has the following benefits (based upon market sounding feedback):

- anticipated lower life-cycle costs through integration efficiencies
- greater risk transfer (fewer integration challenges for the CRD)
- single source accountability, and
- reduced procurement costs.

Plus this bundled approach will be applicable if the CRD acquires an alternative site that allows consolidation of the downtown WWTP and Energy Centre.

This large-scale package has a total estimated capital cost of approximately $665-million and represents a significant procurement opportunity. The CRD notes that under current Provincial funding assumptions, only one-third of this amount would be funded using non-public sector sources (a $222-million DBFO). Despite current challenging financial markets, this scale of DBFO is believed to be feasible. The risk of this large package is that few Canadian firms could pursue it, and the competitive process would be limited to a small number of large scale global firms. Implementing such a plan as a DBO may improve the competitiveness of the procurement and attract more bidders.

Option C also assumes the West Shore is procured using a stand-alone DBFO approach.

The CRD acknowledges this option could also be procured using three separate or phased DBFO procurements: One DBFO for the liquid-only wastewater treatment facilities in the Core Area (McLoughlin Point, Clover Point and Saanich East), one for the West Shore and a separate DBFO for the Biosolids/Energy Centre.

The outfalls and tunnel were specifically carved out of this procurement package to "de-risk" the DBFO plans and facilitate a more competitive overall procurement (including the outfall on the West Shore). The number of firms able to provide specialized marine work required for the outfalls and tunnel is limited in the Pacific Northwest. Therefore CRD's advisors recommended separating these components from core wastewater treatment facilities and procuring the specialized components using a more traditional approach. This will ensure bidders to the main WWTP facilities are not limited due to the limitations on availability of service providers (sub-contractors) on the marine outfall and tunnel components. Overall competitions and value for money is anticipated to be optimized using this approach.

Option A: Traditional Procurement

The CRD Core Area Liquid Waste Management Committee ("CALWMC" or the "Committee") expressed an interest in reviewing the value for money attributes of a traditional approach to procurement. Thus, "**Option A: Traditional**" was added to the business case analysis. Option A procures all components of the Program using the traditional design-bid-build or construction management at risk. Such approaches have been used for the majority of major wastewater treatment facilities constructed in Canada.

Option A and Option C establish “bookends” for analysis purposes.

Option B: Hybrid Approach

The CRD also wanted to analyze an intermediate option that included a variety of procurement approaches. Such an approach may provide overall benefits to the project. This option is evaluated in detail below.

Multi-Criteria Assessment of Option B: Hybrid Approach Components

This table summarizes the preliminary screening and assessment of procurement options for the major components of the Program under a Hybrid delivery.

For assessment purposes, the major components are evaluated together as follows:

1. Conveyance System
2. Outfalls and Tunnel
3. Wastewater treatment facility (including West Shore, Saanich East, McLoughlin Point and Clover Point)
4. Energy Centre / Biosolids Facility.

1. Conveyance System

As noted above, the CRD has directed that the conveyance system will be procured using a traditional approach or design-bid-build ("**DBB**") and/or construction management at risk ("**CMAR**"). This analysis has not evaluated how CMAR versus DBB will be used for each major component; while the risk profile of each differs, it is noted that for the purposes of the overall business case analysis the differences between DBB and CMAR are not material. Each would be considered a traditional approach by the Province and each would leave many risks to be managed by the CRD (although CMAR would generally transfer a few more risks during construction to service providers).

2. Outfalls and Tunnel

As noted above in the discussion of *Option C: P3 Approach*, there are a limited number of firms possessing expertise in marine outfall design/construction as well as marine tunnelling. Therefore, to de-risk the treatment facility work packages it was concluded by the entire CRD advisory team that these work packages be separated from the procurement of wastewater treatment facilities and procured separately. This approach should improve competition for treatment facilities and the outfalls/tunnel.

Given the risk profile of the outfalls and tunnel, the CRD's advisors recommend using a traditional approach to procurement of these work packages. It is extremely difficult for any party to estimate the risks of building such components and hence any bidder under a design-build or DBFO approach (whereby construction risks are typically transferred to the bidder) is expected to significantly pad the procurement budget to account for worst-case scenario implementation. The CRD would effectively pay for the worst-case scenario price. Therefore, it is recommended the CRD retain the risks of these packages and manages such risks diligently during implementation.

3. Wastewater Treatment Facilities

Criteria	DBB or CMAR "Traditional"	Design-Build	DBO or DBFO "P3"
a) Regulatory Compliance	**Good** Allows more flexibility for future change.	**Good** Design will only meet current standards unless procurement specifically requests additional items in future.	**Good** Allows enforcement of penalties. Allows financial incentive for certain types of performance. Has clear responsibility for ownership of interface and single point of responsibility.
b) Sustainability and greenhouse gas emissions impacts including for Resource Recovery etc.)	**Acceptable** Resource recovery limited to what is specified in the Program plan. Easier to expand plans in future.	**Good** More innovation possible through alternative bid process today Push toward minimizing costs will limit amount of resource recovery to what is economically viable or CRD's minimum specified standards. Integration of future new technologies easier when CRD managed operations Innovation will be most important in the Energy Centre / Biosolids Facility	**Best for Energy Centre** **Good for WWTPs** More innovation possible through alternative bid process today Push toward minimizing costs will limit amount of resource recovery to what is economically viable or CRD's minimum specified standards. Innovation will be most important in the Energy Centre / Biosolids Facility. Once plan finalized, further changes during 25-year life of agreement are limited.

c) Opportunities to adopt best practices	**Good** More flexibility to adopt new best practices in future.	**Acceptable** Future changes may be at premium if long-term operator in place (eg contract negotiation).	**Acceptable** Future changes may be at premium if long-term operator in place (eg contract negotiation).
d) Permitting	**Good**	**Good**	**Acceptable** Slow start may lead to delays in some permitting. Completion by 2016 achievable in current schedule (but tight with little slack).

Socially-Orientated Criteria

Criteria	DBB or CMAR "Traditional"	Design-Build	DBO or DBFO "P3"
a) Impact on existing staff and recruitment of new staff	**Manageable** CRD would be responsible for hiring the +/-40 people required to operate the facilities. Given the tight labour market for wastewater operations specialists this may be a challenge at commissioning and start-up, however the long build-out schedule will provide CRD with adequate time to	**Same as CMAR approach**. DB contractor can be retained during early years to assist with commissioning and training of staff. Some DB suppliers will provide a short operational transition period to train CRD staff.	**Good** Contractor would be responsible for all staff hiring, training and retention. CRD would simply manage contractual arrangements with suppliers and not day-to-day operations. Large operators already have access to trained operators and plant managers, thus transition will be

	secure staff.		easier (however any operator will face challenges hiring staff or to moving people to Victoria given its high cost of housing).
b) Ownership of Facilities	**Owned by CRD**	**Owned by CRD** CRD will require land and facilities to be owned by the CRD.	**Owned by CRD** CRD will require land and facilities to be owned by the CRD.
c) Public acceptance and communications impact	**Good**	**Acceptable**	**Extremely Challenging in Some CRD Communities** Involvement of the private sector in operations is anticipated to be highly contested. West Shore communities and councils are generally more receptive than other areas.
d) Level of CRD control and flexibility to make changes to Program during design, construction and operations phase	**Best flexibility for CRD** CRD generally controls all aspects of design, construction and operations.	**Some flexibility during early design stage plus total CRD control during operations.** Construction managed by winning bidder.	**Limited flexibility for CRD after procurement bid accepted**. Limited control for CRD after selection of winning bidder. Contract agreements regulates how CRD controls Program after commencement of construction and during operations.
e) Customer Service	**Very Good**	Same as Traditional Approach	Good but must rely on operating contract to force private sector

	Will match quality of existing customer service within the CRD. Will lead to more direct contact between public and CRD. Good for **Saanich East** where significant public interest is required and responsiveness needed for public feedback.		parties to respond to difficult situations with customers. Incentives and penalties can be structured in operating contract to ensure operator responds to all customer complaints in a timely manner. Establishes clear responsibility for operations performance and aligns interests of CRD staff, political representatives and public to force performance of private sector operator.
f) Economic impact	**Best** Smaller work packages used during construction phase may allow for more local representation.	**Good** More bids likely to be received with small to mid-size packages.	**Good** Large DBO and DBFO firms expected to bid, however local sub-contractors will be used by such firms. Thus expenditures remain in community and most jobs (similar to other approaches). If non-BC firm wins then some dividends/profit and small overhead/administration fees will likely flow outside community.

Financial and Risk-Orientated Criteria

Criteria	DBB or CMAR "Traditional"	Design-Build	DBO or DBFO "P3"
a) Risk[6] Allocation Goals	**More Risks Typically Retained by CRD** (retained risks remain under CRD control to manage). No single party guarantees project overall performance. CRD retains equipment failure risk after +/-2 year warranty on most equipment (and may face paying 100% of such costs if equipment fails). CRD typically retains most risks, including performance of each treatment plant plus overall integration risks. CRD will rely on bonding and recourse to suppliers in case of problems. For components where risk are very difficult for anyone to ascertain (e.g. outfalls and tunnel), Traditional approach may fit best.	**Good risk transfer for construction.** **Limited risk transfer for operations.** Care required to ensure only risks that can be managed by service providers are transferred (otherwise CRD will pay a premium for risk transfer). CRD retains long-term construction, design and overall performance risks after expiry of warranty period (typically after 2 years). CRD is fully responsible for long-term operations and maintenance costs and problems. Parts of design liability for plant performance plus all of construction liabilities transferred to contractor for +/-2 years after completion. Care required to ensure only risks that can be managed by service providers are transferred (otherwise CRD will pay a premium for risk transfer).	**More Risk Typically Transferred to Proponent for Energy Centre and WWTPS.** CRD will pay for risk transfer during bid phase (versus retaining and managing such risks in other options). Care required to ensure only risks that can be managed by service providers are transferred (otherwise CRD will pay a premium for risk transfer). Enforced through project agreement. Under DBFO leading consortium sponsor responsible for providing financing (DBO relies upon corporate guarantee to sponsor and contractual recourse). Financing typically leads to a greater level of due diligence being directed at service providers – both during construction as well as during long-term operations. Service provider motivated to ensure performance of operations otherwise CRD can withhold some payments

[6] See Appendix E for an overview of typical risks for each type of procurement contract.

			(which in turn typically triggers lender review of activities of service provider). If bidders cannot assess risks (e.g. on outfalls and tunnel), then they may pad budgets and over-compensate for risk exposure. Revenue risks for resource recovery from Energy Centre could be transferred to service provider.
b) Procurement and Implementation Schedule	**Allows quick start** May have longer overall construction design/construction period/duration. Risk of delays and scope changes.	**Allows quick start**	**Slower start, more front-end due diligence required for procurement planning.** Current plans allow completion by 2016, however assumes shortest construction duration to achieve 2016 deadline (could add to costs to achieve schedule).
j) Level of competition during the procurement	**Good** Significant competition expected for smaller work packages during the construction phase. No competition during design phase.	**Good** Variety of work packages allows multiple bidding. Size of work packages should allow participation of local, national and international bidders. Design-build components may see greater variety of non-standard technical/innovative solutions.	**DBFO may be challenging for larger Program components in current tight post-credit-crisis environment.** DBO approach is very common in wastewater treatment industry. The CRD could expect multiple bids during an offering of one or more components of the Program (if packages are not too large). DBFO approach is becoming a common approach to procurement in

			Canada. Several Canadian firms have an understanding of the contract structure and issues and thus will be able to bid. Access to financing may be a challenge for all firms in this approach (post-credit crisis). If financing is limited to no more than $300-million (one third of Program costs) then financing in Canada should be available at competitive rates and will facilitate a competitive bid process. If then entire Program is rolled into a large DBFO procurement then significant financing challenges may limit the bidding process. Recent large-scale WWTP offerings in North America have struggled to attract multiple bidders.
k) Cost certainty	**Limited**. Exposed to more inflation and surprises during the process. Cost certainty is the slowest to achieve of all options, and significant expenditures required on planning/design to achieve such cost certainty. This does exposes the CRD to potential cost and schedule over-runs.	**Good**. Earliest price certainty for construction phase in DB contracts. Surprises possible during the process if parts of scope undefined (particularly if alternative bids allowed).	**Best**. Construction, operations and maintenance costs all defined at completion of procurement phase in +/-2 years. Surprises possible during system operation and the process if parts of scope undefined (particularly if alternative bids allowed). Some contractual risks which may

			impact long term costs.
l) Complexity of immediate and future procurement	**Least complex.**	**Medium complexity.**	**Highly complex.**
m) Lifecycle maintenance	**Risky for CRD after expiry of warranty period (+/-2 years)** CRD selects all aspects of design and thus can ensure compliance with regulations as well as ensuring input of surrounding residents is followed. CRD responsible for long-term maintenance (which may lead to deferral of major capital repairs during years of fiscal restraint). CRD typically sees a small number of design based upon guidance of leading technical advisors. Such designs have not been broadly "market tested" to ensure innovation is maximized.	**Risky for CRD after expiry of warranty period (+/-2 years)** CRD responsible for specifying minimum standards of performance and output specifications used during procurement. Risk of equipment failure and high maintenance requirements after two-year warranty period which may impact quality and maintainability. This can be mitigated through properly prepared procurement documents.	**DBFO Best** **DBO Good** Transfer of operations responsibility to service provider ensures long-term risks and maintenance and lifecycle costs are taken into consideration by bidders. Thus long-term quality maintenance risks will be monitored and managed by service provider.
n) Risk adjusted capital cost	The following efficiencies are projected in the current plan under each type of procurement approach (based upon an assessment of the CRD's technical advisors):		

Cost Items	Traditional Option	DB Delivery Option	PPP/DBFO Delivery Option
Engineering Allowance [1]	N/A (budget currently assumed allowance of 15% of Direct Costs)	Estimated 4% of Direct Costs savings (thus budget assumes **Engineering Allowance of 11% of Direct Costs**)	Estimated 3% of Direct Costs savings (thus budget assumes **Engineering Allowance of 12% of Direct Costs**)
Administration & Program Mgt Allowance[1]	N/A (budget currently assumed allowance of 6% of Direct Costs)	Estimated 1% of Direct Costs savings (thus budget assumes Administration Allowance of 5% of Direct Costs)	Estimated 1% of Direct Costs savings (thus budget assumes Administration Allowance of 5% of Direct Costs)
Savings on Process Equipment	N/A	2% of Equipment Costs	2% of Equipment Costs
Savings on Project Efficiencies and Innovation	N/A	3% of Construction Costs	4% of Construction Costs
Discount for One Large DBFO [2]	N/A	N/A	1% of Construction Costs

Notes:
1 Engineering, program management and administration costs are adjusted to reflect efficiencies in various procurement methods.
2 Efficiencies due to single contract execution.

Source: Stantec Consulting Ltd.

o) Operational efficiencies	The following operational savings are estimated based upon a review of the management of operations of each component. Note this review only identified possible savings from reduced staffing levels under the DBFO approach. Such savings depend on packaging choices.

WWTP Facility	Traditional Option		Hybrid Option		P3 Option	
	Management & Staff Level	Annual Cost (incl. benefits)	Management & Staff Level	Annual Cost (incl. benefits)	Management & Staff Level	Annual Cost (incl. benefits)
Saanich East	8	$690,000	8	$690,000	5	420,000
Clover Point	4	280,000	4	280,000	3	230,000
McLoughlin Pt.	14	1,160,000	14	1,160,000	11	910,000
West Shore	7	610,000	5	420,000	5	420,000
Energy Centre	8	650,000	5	360,000	5	360,000
	41	**$3,390,000**	**36**	**$2,910,000**	**29**	**$2,340,000**
			Estimated Savings:	*$480,000*		*$1,050,000*
			Savings as % of Total Operating Costs:	*2.7%*		*5.8%*

Source: Stantec Consulting Ltd.

The estimates for DBFO operations are believed to be the maximum savings available for labour under private sector operations.

No savings in chemicals or power consumption have been included at this stage as it is assumed that all delivery methods would have qualified operators who would be capable of optimization of processes to minimize consumption.

The staff levels have been benchmarked with similar sized facilities in Western Canada including the City of Saskatoon.

p) Risk adjusted whole life cost	An full risk-adjusted whole life analysis of each component of the Program plant under each procurement approach was not conducted. Instead, the team made the packaging decisions based upon the above more subjective information and high-level financial summaries.

	DBB or CMAR "Traditional"	Design-Build	DBO or DBFO "P3"
OVERALL ASSESSMENT	Feasible Approach, used on many other similar wastewater procurements in Canada and USA. As noted in Appendix E this approach transfers fewest risks to service providers. Best flexibility and control for CRD, particularly for integrating new resource recovery technologies. Slowest to establish cost certainty (and requires significant expenditure in plans/due diligence before such costs locked). CRD vulnerable to surprises in operating and maintenance cost changes.	Risks transferred during design and construction. CRD has exposure to long-term equipment risks and overall performance risks. CRD also exposed to risks from operations performance. CRD retains flexibility during operations. Fastest construction cost certainty (at reasonable cost), CRD vulnerable to operations and lifecycle cost risks after +/- 2 year warranty expiry. Good approach for WWTPs using standard technologies (with well-understood operations and maintenance profiles). If innovation required in technology then this approach is less better fit. Good approach for sites with construction challenges (limited site area, poor ground conditions).	As noted in Appendix E this approach generally achieves best risk transfer goals. Will be challenging to implement in some CRD communities (however West Shore communities appear less concerned than others). Best approach for Energy Centre/Biosolids facility since risks technology innovation and possible resource recovery revenues could be transferred to operators. Large projects requiring significant financing may find DBFO approach risky. DBO approach good for Energy Centre and WWTPs (competitive market place will allow multiple bidders for most major components). Good overall integration planning if multiple components rolled into same procurement package. Complexity of CRD system may make challenging to implement this approach to procurement for entire Program.

Overall Assessment for Each Major Component

	DBB or CMAR "Traditional"	Design-Build	DBO or DBFO "P3"
Energy Centre / Biosolids	**Higher Risk but Feasible** Innovation would generally be limited to current plans but more innovation can be explored in the pre design phase and through value engineering.	**Good** Allows some flexibility and innovation potential through alternative bid process. CRD retains risk for long-term operations (and risks of equipment failure +/-2 years warranty period).	**Best** **Will maximize innovation in most technology-driven component of Program.** **Will transfer risk of innovation to private operators, as well as some revenue/cost risks.** **Interfaces with WWTP must be managed (ideally same operator handles both WWTP and solids processing).** **Could be procured as stand-alone unit or combined with one or more WWTPs (e.g. McLoughlin Point).** **Ideally, biosolids treatment co-located on same site as WWTP to ease integration.**
Saanich East WWTP	**Good for public acceptance and responsiveness and enables most public consultation. Risk of change orders (and associated higher costs).** **Allows quickest start.** **Flexibility may lead to scope creep and change orders (resulting in higher costs for CRD).** **Allows flexibility for integration of future**	Good Allows some innovation through alternative bid process. Transfers some risks during design and development to private sector, however CRD remains at risk for operations and long-term maintenance. Since most liquid treatment technologies are known, a DB approach may provide	Good Good transfer of risk for construction, operations and maintenance. Slow start. Long-term contract locks in CRD to solution defined in next few years. Limited flexibility to make changes to plan after procurement. Risk that DBFO or DBO solution may not

	technologies (possible collaborations with UVic). **Construction risks on site expected to be minimal (high, dry, flat location). Preservation of trees will be a major concern. Thus CMAR or DBB may allow such control without exposing CRD to excessive construction risks.** **CRD directed selection of CMAR for this component.**	best balance of cost, risk, flexibility/control and innovation.	be responsive for community requirements (however this could be managed through establishing architectural and design standards during procurement process).
Clover Point WWTP (primary)	Feasible Risks during construction would not be transferred adequately to builder. CRD operations would ensure responsiveness to surrounding community concerns of odour and noise. CRD is currently operating pumping and screening facility at this site and understands the operational challenges at this site and public sensitivity. Unusual operating requirements of this site (peak flow events) require special attention and integration with conveyance system. This site may be best managed by the CRD (which operates conveyance). Architectural, landscape and odour control are important at this site and will require public input.	**Best** **Good risk transfer during construction stage (expected to be challenging at this site).** **Limited site flexibility and possibility of this component being deferred or dropped entirely from the Program.** **CRD operations would ensure responsiveness to surrounding community concerns of odour and noise.** **Unusual operating requirements of this site (peak flow events) require special attention and integration with conveyance system. This site may be best managed by the CRD (which operates conveyance).** **Technical team recommended selection of DB for this component.**	Limited on stand-alone basis Good risk transfer for all stages of project – construction, operations and maintenance. This plant requires minimal operating staff and treatment facilities are infrequently used (only during peak-flow events a few days per year). Thus operations should be managed and combined with other operating WWTPs. This is not a good stand-alone DBFO or DBO. Innovation for site development and operations (allowing remote management) could add value to this procurement.

McLoughlin Point WWTP	Feasible Large, complex WWTP could expose CRD to cost management risks. Construction risk is significant at this location. Traditional approach would allow good interactions for adjacent Department of National Defence (and possible collaborations). Integration of this plant with Energy Centre would be preferred.	**Good** **Risks of limited site area will require diligent approach to layout and train design. Technology choices are also driven by small site area. Room for innovation during construction to optimize treatment technology and site layout.** **CRD exposed to long-term equipment maintenance risk and operations risk.** **CRD operations would ensure responsiveness to surrounding community concerns of odour and noise.** **DB approach may allow collaborations for development of lands on adjacent properties.** **DB approach allows early start to Program and increases likelihood of achieving 2016 target completion date.**	Good Risks of limited site area will require innovative approach to layout and train design. Technology choices are also driven by small site area. If a new site location is identified that allows this plant to be combined with the Energy Centre then the CRD should reassess how such a package will be procured. Attractive DBFO or DBO opportunity. Component is large enough to attract interest from Canadian and global firms. Large DBFO or DBO at largest WWTP may be challenge for community to accept.
West Shore WWTP	Feasible Best plan for staging of facilities given the complexities of conveyance system in Langford and Colwood and siting issues. Opportunity to continue conveyance of wastewater to Mc Loughlin site until development density increases.	Good DB allows good risk transfer during contractions and some innovation through alternative bid process. CRD/West Shore would remain responsible for operations and maintenance risks of facility. CRD operations would ensure responsiveness to surrounding community concerns of odour and noise.	**Good** **Attractive stand-alone DBFO or DBO opportunity. Component is large enough to attract interest from Canadian and global firms.** **West Shore communities believed to be receptive to alternative forms of procurement.** **West Shore interested in pursuing resource recovery and partnering with**

			innovative firms to maximize revenues. **DBFO or DBO approach would allow good risk transfer, especially for innovation.** **Termination of long-term contract may be challenging (easier for DBO approach than DBFO).**
Outfalls & Tunnel	**Best** **Some risks cannot be clearly defined, therefore, transferring to other parties may be an expensive approach to management. Costs likely minimized through CRD retaining risks and managing them through construction.** **Long-term operations requirements expected to be minimal (and thus easy to manage).** **Separating these components from other procurements anticipated to facilitate more competitive bid for other major components (allowing specialist firms to focus on their area of expertise).** **Small number of specialist firms available to perform marine outfall work in Pacific Northwest. Thus, CRD could arrange a competitive bid with such firms (as well as other service providers).** **Minimal innovation anticipated for these components, and minimal ongoing operations. Attractiveness as DBFO limited.**	Acceptable Small number of specialist firms available to perform marine outfall work in Pacific Northwest. Thus, CRD could arrange a competitive bid with such firms (as well as other service providers). Minimal innovation anticipated for these components, and minimal ongoing operations.	Worst Risks are difficult to define for marine outfalls and tunnel work, thus most bidders may pad budget (and the CRD could over-pay for risk transfer). Minimal innovation anticipated for these components, and minimal ongoing operations. Attractiveness as DBFO or DBO limited. Few value-added opportunities available.

Based upon this assessment and input from the CRD's technical/engineering team, the CRD selected the following delivery methods for each major component of the Program under the Hybrid Option. This could change pending the outcome of further consolidated siting investigations.

Component	Preferred Procurement Approach to be Analyzed in the Hybrid Option
Conveyance / Pumping Stations	DBB or CMAR
Outfalls & Tunnel	DBB or CMAR
Energy Centre / Biosolids	DBFO
Saanich East WWTP	CMAR
Clover Point WWTP (primary)	Design-Build
McLoughlin Point WWTP	Design-Build
West Shore WWTP	DBFO
Resource Recovery	Depends upon component and level of integration into other physical facilities. To be reviewed on a case-by-case base. Thus, use alternative procurement approach and assess opportunities at time of bid.

APPENDIX E

Summary of Risks Intrinsic to Each Approach to Procurement

The risk profile of the Program is directly related to the procurement approach and legal contracting structured established for each major component. Generally speaking, DBFO approaches to procurement transfer more risk to the private sector party, while traditional approaches to procurement tend to retain risks which the CRD must therefore manage. The table below summarizes how risks are typically allocated based upon the contracting structure between the CRD and service providers. This summary allocation is based upon high level assumptions about how the CRD would implement each contracting relationship. The final risk allocation among parties will not known until contracts are finalized.

Regardless of contracting structure and delivery method chosen, the CRD will still face a number of risks associated with implementation of the Program. The CRD recognizes these risks and will implement a risk management plan to manage such risks as it moves forward with plans.

The CRD anticipates it must manage the following risks regardless of procurement methodology – all are anticipated to be retained by the CRD:

1. Site selection for WWTPs and Energy Centre
2. Rezoning of various sites by each municipality
3. Funding delays by senior levels of government
4. Changes in scope of Program at request of the CRD or public
5. Approval timing by CALWM Committee during procurement phase
6. Discharge Permit Liability – the CRD remains ultimately liable under the Discharge Permit, the private operator is responsible for the contractual service levels
7. Force Majeure – natural hazard events that have catastrophic impacts, which are outside the control of either contractual party
8. Operating performance requirements - establishing appropriate contractual service levels for operations and maintenance of the facilities
9. Regulation – future changes in applicable regulations

Risk Allocations Typically Intrinsic to Each Approach to Procurement

	CMAR or DBB Methodologies			Design-Build Methodology			DBFO / DBO Methodologies		
	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared
Contract Negotiations – lack of clarity in specifications / documents and overall negotiations between the CRD and service providers			✓			✓			✓
Design –flaws in final design		✓		✓*Note 1*			✓		
Construction – general risk during construction phase		✓		✓			✓		
Geotechnical Risk - associated with the plant site		✓				✓			✓
Process Technology – effectiveness of the technology chosen for treatment of wastewater		✓		✓*Note 2*			✓		

	CMAR or DBB Methodologies			Design-Build Methodology			DBFO / DBO Methodologies		
	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared	Higher Level of Transfer	Higher Level of Retention	Shared
Integration risk of conveyance system and WWTPs		✓			✓				✓*Note 3*
Integration risk of WWTPs and Energy Centre system and WWTPs		✓			✓				✓*Note 4*
Operating - general operations associated with the WWTP		✓			✓		✓		
Maintenance – long-term lifecycle maintenance risks for major equipment failure		✓			✓ *Note 5*		✓		
Resource Recovery – revenues lower than expected, or costs higher than expected		✓			✓		✓		
Resource Recovery – technology risks		✓			✓		✓		

Risk Notes:

1. The level of risk transfer under design-build will depend upon the detail specified in procurement documents. If designs are largely completed (drawings over 30-50% level) then the CRD will be exposed to design risk since much of the design are largely specified to bidders. If documents include a lower level of specification then such design risks are more effectively transferred to the bidders.

2. As with the design comment above, if the CRD includes specific technologies in its procurement documents as a specified solution then the CRD will effectively retain the risk of such technology failures. Bidders would then take responsibility for installation under the DB approach.

3. Since the CRD will build and manage the conveyance system along with associated pumping stations and storage facilities, it is anticipated that the CRD will establish an arrangement whereby it commits to providing volumes of wastewater within a defined range to each WWTP. Bidders will therefore have clarity over the assumed design capacity requirements and operating performance expectations. If volumes fall outside of such range then the CRD may incur punitive costs. This issue is particularly important for the CRD since I&I is a significant problem and leads to frequent peak-flows of highly dilute water. A biological treatment process could be "washed out" in such circumstances of the flows are extreme. The CRD would be obligated to manage flows within the agreed range to avoid such under-performance.

4. In the Hybrid option, the current operators of the WWTPs and the Energy Centre are different. While most operating performance risks could be transferred to private operators, the CRD is anticipated to remain responsible for ensuring interfaces among WWTP and Energy Centre are managed and disputes resolved. For example, in the case of the West Shore WWTP managed by a third party private operator and the Energy Centre managed by the third party operator, there remains room for disputes about sludge chemistry and volume which must be captured in the various procurement documents. Since the CRD is responsible for stitching such procurement documentation together, there is room for the CRD to retain some risks in this area.

5. Typical design-build contracts include a warranty for 1-2 years after commissioning. Thus, the CRD would be exposed to operating risks and lifecycle maintenance risks after expiry of the warranty period.

APPENDIX F

GLOSSARY

These definitions are taken from the BC Municipal Sewage Regulations as well as AE et al 2008-2009 discussion papers prepared by Associated Engineering Ltd. and CH2M Hill.

"**Average Annual Flow**" or "**AAF**" – an estimate of the total flow at a given site for an entire year, including both dry and wet weather periods.

"**Average Domestic Flow**" or "ADF" – the average flow coming purely from the "Total Population Equivalents", i.e. excludes all sources of I&I.

"Average Dry Weather Flow" or ADWF means the daily municipal sewage flow to a sewage facility that occurs after an extended period of dry weather such that the inflow and infiltration has been minimized to the greatest extent practicable and is calculated by dividing the total flow to the sewage treatment facility during the dry weather period by the number of days in that period. In CRD this typically occurs between the months of April to September.

"Biosolids" means inorganic or organic solid residuals from a sewage facility, or septic tank sludge, resulting from a municipal sewage treatment process which has been sufficiently treated to reduce vector attraction and pathogen densities, such that it can be beneficially recycled.

"**BOD**" biochemical oxygen demand.

"**cBOD5**" carbonaceous 5-day biochemical oxygen demand.

"**CEPT**" chemically-enhanced primary treatment.

"Core Area Program" composed of Victoria, Esquimalt, View Royal, Oak Bay and Saanich plus two First Nations communities.

"**DBB**" means Design Bid Build.

"**DBFO**" means Design, Build, Finance, Operate and Maintain.

"**DB"** means design-build with design drawings and planning to approximately the +/-10% level.

"**DB 30%"** means design-build with design drawings and planning to approximately the 25% to 30% level (high level of detail).

"**DBO**" means design, build, operate and maintain.

"Effluent" means the liquid resulting from the treatment of municipal sewage;

"**ICI Equivalents**" or "**ICI**" – an estimate of the contribution of flow from industrial, commercial, and institutional activities, expressed as a number of fulltime residential population equivalents.

"**Inflow & Infiltration**" or "**I&I**" means water that enters the sanitary sewer system from direct stormwater connection (inflow) or indirectly through the land (infiltration), or both. Can be expressed as a return period based value (i.e. 25-Year Return I&I).

"**Microconstituents**" include hundreds of compounds, which encompass endocrine disrupting compounds (EDC's), pharmaceutically-active compounds (PhAC's) and Personal Care Products (PCP's). These compounds are typically present in raw wastewater at ng/L to ug/L concentrations, 5 to 6 orders of magnitude less than the concentration of conventional pollutants.

"**Peak Domestic Flow**" or "PDF" – the peak flow coming purely from the "Total Population Equivalents", i.e. excludes all sources of I&I. Expressed as a short duration average, (i.e. 15-minutes), suitable for use in hydraulic design.

"**Peak Dry Weather Flow**" is the peak daily flow that usually occurs once in the morning and then again in the evening.

"**Peak Wet Weather Flow**" is the peak flow rate that occurs at the height a rainfall or snowmelt event. "**PWWF**" = PDF + I&I. Expressed as a return period based value (i.e. 25-Year Return PWWF).

"**Per-Capita Rate**" – the average flow associated with each "Total Population Equivalent", expressed as L/per/day.

"**Primary Treatment**" means any form of treatment, excluding dilution, that consistently produces an effluent quality with a BOD5 not exceeding 130 mg/L and TSS not exceeding 130 mg/L.

"**Septic Tank**" means a watertight vessel into which municipal sewage is continually conveyed such that solids within the municipal sewage settle, anaerobic digestion of organic materials occurs and an effluent is discharged;

"**Sewage**" or "**Base Sanitary Flow**" refers to water that is contaminated with waste matter of domestic, commercial, industrial, or natural origin. The average person uses almost 225 litres of water per day performing routine activities such as bathing, recreation and body waste elimination.

"**Secondary Treatment**" means any form of treatment, excluding dilution, that consistently produces an effluent quality with a BOD5 not exceeding 45 mg/L and TSS not exceeding 45 mg/L, except for lagoon systems for which the effluent quality is not to exceed a BOD5 of 45 mg/L and a TSS of 60 mg/L.

"**Total Population Equivalents**" = "Residential Population" + "ICI". Also known as "**Contributory Population Equivalent**" means the number of persons and equivalent commercial and industrial contribution connected to the municipal sewage collection system based on the most current census data.

"**Tributary Area**" or "Area" – the estimated sewered land area associated with a catchment.

"**TSS**" means total suspended solids or non-filterable residue.

"West Shore Program" composed of the communities of Colwood and Langford.

"**WWTP**" wastewater treatment plant.