McElhanney

APPENDIX L

RECENT EVOLUTION OF REGULATORY FRAMEWORK

DAYTON & KNIGHT MEMORANDUM

MEMORANDUM

TO: Ian Whitehead, P.Eng.
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495 Sixth Street, Courtenay, B.C., V9N 6V4

FROM: Dayton & Knight Ltd.

DATE: October 3, 2008

RE: CVRD Sewerage Master Plan Update Study
Recent Evolution of Regulatory Framework

1.0 DISCHARGES TO SURFACE WATER

Current regulatory criteria for treated wastewater discharges to surface waters are based on existing provincial regulations, which are set out in the Municipal Sewage Regulation (MSR) of the Environmental Management Act. Impending federal regulations for wastewater discharges are expected to be enacted in the near future. In addition, the B.C. Ministry of Environment intends to review and possibly revise the MSR.

Recent (2007) amendments to the MSR mere mainly matters of clarification and editing. A wide range of potential review and amendment items has been identified for the upcoming MSR review, including harmonization of the MSR with the new federal regulations and with the recently amended Ministry of Health Sewerage System Regulation, which applies to smaller wastewater discharges to ground disposal (see Section 2.0 of this Memorandum). The MSR review will consist of a five-step process, namely scoping, publication of a Policy Intentions Paper for Consultation, consultation with stakeholders and the general public, drafting of revisions for review by the Minister and Lieutenant Governor-in-Council, and implementation. The schedule for conducting the MSR review is not known at this time.

Information regarding the existing provincial regulations and the impending federal regulations for discharges of treated wastewater to surface water is summarized below.

1.1 Provincial Regulations and Guidelines

The Municipal Sewage Regulation (MSR) administered by the Ministry of Environment (MOE) applies to all discharges to surface water and to discharges to ground in excess of 22.75 m^3/d (MOE, 1999). The effluent criteria for discharges of treated wastewater to surface waters (based on the MSR) are summarized in Table 1-1. For the discharge from existing CVRD WWTP, the criteria for open marine waters are applicable.

TABLE 1-1
EFFLUENT REQUIREMENTS FOR DISCHARGES TO SURFACE WATERS

Parameter	Effluent Criteria for Discharges to Surface Waters[1]							
	Maximum Daily Flow 50 m^3/d or greater				Maximum Daily Flow less than 50 m^3/d			
	Streams, Rivers & Estuaries		Marine		Streams, Rivers & Estuaries		Marine	
	Dilution 40:1[2]	Dilution 10:1[2]	Open Marine Waters	Embayed Marine Waters	Dilution 40:1[2]	Dilution 10:1[2]	Open Marine Waters	Embayed Marine Waters
Treatment Requirement	Secondary	High Quality Secondary	Secondary	Secondary	Secondary	High Quality Secondary	Primary	Secondary
BOD_5 (milligrams/litre)	45	10	45	45	45	10	130	45
TSS (milligrams/litre)	45	10	45	45	45	10	130	45
pH	6.0-9.0	6.9-9.0	6.0-9.0	6.0-9.0	--	--	--	--
Disinfection	see[3]	see[3]	see[3]	see[3]	see[3]	see[3]	see[3]	see[3]
Total Phosphorus (mg P/L)	1.0[4]	1.0[4]	--	--	--	--	--	--
Orthophosphate (mg P/L)	0.5[4]	0.5[4]	--	--	--	--	--	--
Ammonia	see[5]	see[5]	see[5]	see[5]	--	--	--	--

1 Effluent quality standards for all receiving water discharges are based on the use of an outfall which provides a combination of depth and distance to produce a minimum 10:1 initial dilution within the mixing zone.

2 Dilutions less than 100:1 will require an environmental impact study to determine if effluent quality needs to be better than tabulated. Where the dilution ratio is below 40:1 and the receiving stream is used for recreational or domestic water extraction within the influence of the discharge, discharge will not be permitted unless an environmental impact study shows that the discharge is acceptable and no other solutions are available.

3 For discharges to recreational use waters, fecal coliform < 200 MPN/100 mL. Where domestic water extraction occurs within 300 m of a discharge, fecal coliform < 2.2 MPN/100 mL with no sample exceeding 14 MPN/100 mL. Where chlorine is used, dechlorination will be required. Wherever possible alternate forms of disinfection to chlorine should be implemented.

4 The total and orthophosphate criteria may be waived if it can be shown from an environmental impact study that receiving waters would not be subject to an undesirable degree of increased biological activity because of the phosphorus addition. Alternatively, an environmental impact study may show that lower effluent concentrations than are tabulated are necessary, or that a mass load criteria may be needed.

5 The allowable effluent ammonia concentrations at the "end of pipe" must be determined from a back calculation from the edge of the initial dilution zone. The back calculation must consider the ambient temperature and pH characteristics of the receiving water and known water quality guidelines.

Table 1-2 shows the allowable concentrations of microbiological indicators in accordance with the Ministry of Environment Water Quality Guidelines (British Columbia Approved Water Quality Guidelines, 2006 Edition) for recreational use and for the protection of shellfish waters.

TABLE 1-2
WATER QUALITY GUIDELINES FOR MICROBIOLOGICAL INDICATORS

Indicator Organism	Number of Organisms per 100 mL			
	Aquatic life – shellfish harvesting [1]		Recreation, secondary contact, crustacean harvesting	Recreation, primary contact
	90th percentile	median	geometric mean [2]	geometric mean [2]
Escherichia coli	< 43	< 14	< 385	< 77
Enterococci	< 11	< 4	< 100	< 20
Fecal coliforms	< 43	< 14	none applicable	< 200

1 Measured outside the initial dilution zone.

2 The geometric mean is a type of mean or average, which indicates the central tendency or typical value of set of numbers. The n numbers are multiplied and then the nth root of the resulting product is taken, where n = count of numbers in the set.

The following toxicity standards are based on the MSR, Part 4 Standards for Effluent Reuse and Discharges to the Environment.

9 (1) A person must not discharge effluent, unless

(a) the discharge passes a 96 hour LC50 bioassay test as defined by Environment Canada's Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, Reference Method, EPS 1/RM/13, or

(b) if the discharge fails a bioassay test described in paragraph (a), the discharge passes a test conducted as a follow up according to requirements set out in Schedule 6 of the MSR.

(2) Subsection (1) does not apply if

i. the discharge is to ground,

ii. the discharge quality meets a maximum BOD_5 not exceeding 10 mg/L and a maximum TSS not exceeding 10 mg/L,

iii. the discharge does not exceed a maximum daily flow of 5,000 m^3/d and the discharger demonstrates to the satisfaction of a director that the discharge does not adversely affect the receiving environment,

iv. the discharge is to open marine waters,

v. the discharge is diluted such that at the outside boundary of the initial dilution zone the dilution ratio exceeds 100:1 and the discharger demonstrates to the satisfaction of a director that the discharge does not adversely affect the receiving environment,

vi. reclaimed water is being provided or used in accordance with this regulation, or

vii. the discharger demonstrates to the satisfaction of a director that the discharge does not adversely affect the receiving environment.

(3) If subsection (1) applies, a person must not discharge effluent unless the discharge is monitored for toxicity in accordance with the requirements of Schedule 6, Table 3 in the MSR.

1.2 Federal Regulations and Guidelines

The Canadian Council of Ministers of the Environment (CCME) is developing a Canada-wide Strategy for the Management of Municipal Wastewater Effluent. As discussed at the beginning of Section 1.0, the B.C. Ministry of Environment intends to review the Municipal Sewage Regulation (MSR) with a view to harmonizing the provincial MSR with the CCME strategy. The CCME strategy focuses on effluents released from wastewater treatment systems and overflows from sewer collection systems. National performance standards will be regulated under the Fisheries Act and in provincial and territorial regulatory instruments. The following discharge levels are expected to be defined in the federal regulations:

- BOD_5 — maximum effluent average discharge level 25 mg/L
- TSS — maximum effluent average discharge level 25 mg/L
- residual chlorine — maximum 0.02 mg/L
- acute toxicity — include specific requirements and timelines to identify and reduce toxicity in cases of acute toxicity test failure

- ammonia — include specific requirements if acute toxicity test failure is due to ammonia that would authorize discharge of ammonia in effluent based on receiving environment considerations.

Monitoring of the environment and timelines to achieve effluent discharge levels are based on risk while considering elements such as sensitivity of the receiving environment, size and composition of the effluent release. In the long-term, the wastewater effluent discharge levels require wastewater treatment systems equivalent in performance to secondary treatment with advanced treatment if required.

The strategy also includes source control measures to preventing the entry of pollutants into the wastewater system (see Section 5.0 of this Memorandum). An action plan for wastewater systems on how to manage overflows from the combined sewers and how to achieve the effluent discharge levels within a 30 year timeline would be required.

1.3 Combined Sewer and Sanitary Sewer Overflows

Requirements for control of combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) are set out in the MSR, Schedule 1, Parts 15 and 16, respectively. The requirements are that an SSO (or CSO) shall not be allowed to occur during storm or snow melt events with less than a 5-year return period.

1.4 Control of Inflow and Infiltration

The B.C. Municipal Sewage Regulation (MSR) specifies that, where the maximum daily flow at treatment facilities exceeds two times the average dry weather flow during storm or snowmelt events with less than a 5-year return period, inflow and infiltration (I&I) to the collection system is deemed excessive and specified actions must be taken to reduce I&I must be taken.

1.5 Pumping Stations

The B.C. Municipal Sewage Regulation (MSR) includes the following design standards for wastewater pumping stations:

- minimum of 2 pumps with each pump capable of pumping peak design flows;
- for larger stations with multiple pumps, the station must have sufficient capacity to pump peak design flows with the largest pump out of service;
- for two-pump stations, a receptacle for a portable generator must be provided;
- for multiple-pump stations, an on-site generator must be provided; and
- provision must be made so that standby power is activated prior to the hydraulic capacity of the pump station being exceeded.

1.6 Canadian Shellfish Sanitation Program

The federal, provincial and municipal governments are currently engaged in an initiative to strengthen the Canadian Shellfish Sanitation Program (CSSP), which will result in enhanced food safety for consumers of shellfish harvested from areas that may be affected by failures of wastewater treatment plants. Where operational failures of wastewater treatment plants can occur and potentially contaminate nearby harvest areas, it is critical that timely and effective response measures are in place to prevent any affected shellfish from reaching domestic and international companies.

The CSSP partners are developing an implementation protocol with the following key elements:

i) the development of area-specific "management plans," which will outline collective responsibilities and a process for timely failure detection, notification, and response; and

ii) enhanced food safety controls by shellfish processing plants.

The protocol will be implemented in a step-wise, area-by-area manner across Canada. Eight harvest areas, including three in British Columbia (around the Ladysmith, Crofton and Chemainus wastewater treatment plants), are scheduled for implementation before the end of 2008 as the first phase of the initiative.

1.7 Summary of Surface Discharge Criteria

As described in the preceding sections, minimum standards for secondary treatment are set out in provincial and (impending) federal legislation. The provincial regulation will be reviewed and possibly revised in the near future. For the purpose of this study, the provincial and federal standards for secondary treatment (whichever is the more stringent) are proposed as a minimum for discharges to surface water. Disinfection to meet the recreational and shellfish standards set out in the Provincial Municipal Sewage Regulation, the British Columbia Approved Water Quality Guidelines (criteria), and the Canadian Shellfish Sanitation Program may also be necessary, depending on the location of the outfall discharge. Advanced treatment such as effluent filtration and/or nutrient removal may also be required if discharges to sensitive receiving waters (e.g., streams, embayed marine waters) is contemplated.

2.0 DISCHARGES TO LAND

Disposal of treated wastewater effluent to land is normally accomplished by the use of a network of buried, perforated pipes (commonly referred to as drain fields, disposal fields, or tile fields) that allow the effluent to seep into the surrounding soil. This type of system is designated "onsite", since wastewater is treated and disposed of within individual lots or parcels. The level of treatment required prior to ground disposal depends on the nature of the site and on the sensitivity of the receiving environment (e.g., the potential for groundwater contamination). Treatment systems vary in complexity from simple septic tanks to small off-the-shelf treatment facilities (commonly called "package plants").

2.1 Ground Disposal Systems Regulated under the Health Act

Ground disposal systems with design flows of less than 22.75 m^3/d (i.e., single home systems and community systems servicing up to about 50 or 60 homes) are administered by local Health Authorities under the Health Act. In 2005 the Sewerage System Regulation (SSR) replaced the old Sewage Disposal Regulation. The SSR requires that "authorized" (properly qualified and certified) persons certify that certain actions have been done or will be done in accordance with "standard practice", where standard practice is defined to mean "a method of constructing and maintaining a sewerage system that will ensure that the sewerage system does not cause, or contribute to, a health hazard." This differs from the former approach under the Sewage Disposal Regulation, in that the new SSR transfers responsibly for certification of systems design and construction to industry, where the Ministry of Health was responsible for monitoring and enforcement under the old regulation.

The SSR refers to the the Sewerage System Standard Practice Manual (SPM) recently published by the Ministry of Health. The SPM contains guidelines to be followed by authorized persons for design, installation, operation and maintenance of ground disposal systems that are administered under the Health Act. The SPM, first introduced in 2005 as V1, is periodically updated and revised by the B.C. Onsite Sewage Association (BCOSSA) Technical Review Committee for the Ministry of Health. The most recent version of the SPM (V2) was published in 2007. Alternative forms of standard practice other than those set out in the SPM can be undertaken to meet the requirements of the SSR, provided that the alternative practices are certified by authorized persons.

The old Sewage Disposal Regulation set out requirements for ground disposal based on soil percolation rates and total length of drain pipe; an area for a standby (redundant) disposal field was also required. The new Sewerage System Regulation is based on an evaluation of soil characteristics and soil hydraulic conductivity as well as soil percolation rate, to determine the allowable soil hydraulic loading rate, (i.e., infiltration trench bottom area), rather than on drain pipe length; in addition, the soil linear loading rate (i.e., movement of effluent away from the discharge area) must be evaluated under the new regulation. No standby disposal field is required under the new Regulation. Treatment standards are set out in the SPM, with the level of treatment required depending on site constraints. Monitoring of system performance and system maintenance requirements are identified in the SPM, where this was absent from the old Sewage Disposal Regulation.

2.2 Ground Disposal Systems Regulated under the Environmental Management Act

The Municipal Sewage Regulation (MSR) of the Environmental Management Act applies to discharges to ground that are equal to or greater than 22.75 m^3/d. The effluent class definitions for ground disposal systems according to the MSR are shown in Table 2-1. The minimum drainage pipe length for the designated effluent classes are shown in Table 2-2. As discussed above, the requirements for ground disposal systems set out in the MSR are based on soil percolation rate and are similar to the standards that were contained in the old Sewage Disposal Regulation (now replaced by the new Sewerage System Regulation). Similar to the old Sewage Disposal Regulation, the MSR requires that two disposal fields, each capable of handling the design flow, be installed and that a standby area for a third field be set aside. The impending review of the MSR may result in revision of the ground disposal requirements that are more closely aligned with those in the new sewage system regulation.

TABLE 2-1
EFFLUENT CLASS DEFINITION[1]

		Effluent Quality Parameters (maximum values)[2]				
Effluent Class	Description	BOD_5 (mg/L)	TSS (mg/L)	Fecal Coliform (number of fecal coliform organisms/100 mL)	Turbidity (NTU)	Nitrogen (mg/L)
A	High quality secondary (drinking water well within 300 m)	10	10	median 2.2 any sample 14	average 2 any sample 5	nitrate-N 10 total N 20
B	high quality secondary	10	10	[3]	N/A	N/A
C	secondary	45	45[5]	N/A[4]	N/A[4]	N/A[4]
D	typical septic tank	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]

1 from B.C. Municipal Sewage Regulation (1999), Schedule 4.
2 continuous effluent quality monitoring required for Class A and Class B.
3 A fecal coliform limit of 400/100 mL applies to discharges designed to meet the requirements of Row 2 to Table 5-5.
4 N/A means not applicable.
5 for lagoon systems the maximum TSS level must not exceed 60 mg/L.

TABLE 2-2
MINIMUM DRAINAGE PIPE LENGTH[1]

	Number of metres of drainage pipe for each 10 m^3/d of Maximum Daily Flow for percolation rates shown						
Percolation rate; minutes/25 mm	2[2,3]	5[2]	10	15	20[4]	25[4]	30[4]
Effluent Class Prior to Application: A, B or C	50	75	100	110	120	135	150
Effluent Class prior to Application: D	120	215	280	320	360	400	430

1 from B.C. Municipal Sewage Regulation (1999), Schedule 4.
2 for discharges equal to or greater than 37 m^3/d only, if the soils are well drained and if the depth to groundwater including any groundwater mounding effect is greater than 1.0 m below the bottom of the drainage trench, a qualified professional may design the ground disposal system with deeper narrower trenches and the drainage pipe length may be reduced to a value equal to the product of Table 5-4 pipe length and a factor of $1/H^{0.5}$ or 0.8 (whichever factor is greater), where H is the drainage trench depth below pipe invert in metres.
3 percolation rates less than 2 minutes per 25 mm are too fast for adequate renovation and drainfields will not be permitted, unless hydrogeological studies show that local groundwater quality can be met at the property boundary. For discharges of less than 37 m^3/d only, use of AMERICAN SOCIETY OF TESTING MATERIALS C33 sand mounding or AMERICAN SOCIETY OF TESTING MATERIALS C33 sand-filled trenches to reduce percolation is permitted if Class B or A effluent is discharged by pressure distribution.
4 percolation rates more than 20 minutes per 25 mm require the construction to be supervised by a qualified professional to have been carried out in a manner which has not reduced the trench wall permeability unless, for discharges less than 37 m^3/d only, the native undisturbed permeable soil depth exceeds 1.35 m.

2.3 Ministry of Community Services Requirements

The Ministry of Community Services requires that local governments meet the following requirements in order to be eligible for infrastructure funding assistance for wastewater projects from the Province:

- enact a bylaw which applies to all areas within the boundaries under jurisdiction of the applicant that requires community sewer service to all new lots of less than one hectare; or

- an approved (by Minister of Environment) Liquid Waste Management Plan (LWMP) for decentralized wastewater - the LWMP must address on-site sewage in a sustainable fashion, with the understanding that on-site sewage systems will be considered as permanent infrastructure - the LWMP must be supported by appropriate bylaws (OCPs, zoning, subdivision standards, etc.), and at a minimum, the LWMP will address:

  - where the recipient is proposing development of new properties that will not receive community sewer, and the cumulative hydraulic loading from onsite sewage disposal systems can be safely and sustainably handled by the overall soils environment,
  - a community plan for the management and maintenance of onsite septic systems,
  - a biosolids management plan, and
  - a septage collection plan.

3.0 RECLAIMED WATER

Historically in British Columbia, and generally throughout North America, the emphasis in wastewater management in the past has been to provide sufficient treatment to allow disposal of effluent in order to protect public health and the environment. With the exception of some arid southern states in the U.S., the emphasis has been on disposal of effluent to water or to land. Treated wastewater is now being looked upon as a resource that should be beneficially reused where feasible. This evolving approach contrasts with wastewater disposal practices that currently prevail. An appropriate level of treatment and monitoring for various reuse applications is important for protection of public health and the receiving environment. With effective source control programs coupled with adequate and reliable treatment, effluent can be beneficially reused. Treatment plants designed for water reuse are more appropriately classified as water reclamation plants.

Standards for the use of reclaimed effluent in British Columbia were adopted in July 1999, and are administered by the Ministry of Environment (MOE) under the standards set out in the Municipal Sewage Regulation (MSR). The MSR standards for water reuse in British Columbia dictate that effluent used as reclaimed water must meet either of the two requirements described in Table 3-1, depending on the use of the reclaimed water. Environmental impact studies are required for both categories of reclaimed water. Use of reclaimed water must be authorized in writing by the local Health Authority having jurisdiction.

TABLE 3-1
RECLAIMED WATER CATEGORY AND PERMITTED USES

Unrestricted Public Access Category	Restricted Public Access Category
EFFLUENT QUALITY REQUIREMENTS $6 \geq pH \leq 9$ $BOD_5 \leq 10$ milligrams/litre Turbidity ≤ 2 NTU Fecal coliforms $\leq 2.2/100$ millilitres	EFFUENT QUALITY REQUIREMENTS $6 \geq pH \leq 9$ $BOD_5 \leq 45$ milligrams/litre TSS ≤ 45 milligrams/litre TSS Fecal coliforms $\leq 200/100$ millilitres
URBAN - Parks - Playgrounds - Cemeteries - Golf Courses - Road Rights-of-Way - School Grounds - Residential Lawns - Greenbelts - Vehicle and Driveway Washing - Landscaping around Buildings - Toilet Flushing - Outside Landscape Fountains - Outside Fire Protection - Street Cleaning	AGRICULTURAL - Commercially processed food crops - Fodder, Fibre - Pasture - Silviculture - Nurseries - Sod Farms - Spring Frost Protection - Chemical Spray - Trickle Drip Irrigation of Orchards and Vineyards
AGRICULTURAL - Aquaculture - Food Crops Eaten Raw - Orchards and Vineyard - Pasture (no lag time for animal grazing) - Frost Protection, Crop Cooling and Chemical Spraying on crops eaten raw - Seed crops	URBAN/RECREATIONAL - Landscape Impoundments - Landscape Waterfalls - Snow Making not for skiing or snowboarding - Golf Courses (providing health and environmental issues resolved to manager's satisfaction) - remote areas of parks, school grounds during vacation period (providing health and environmental issues resolved to manager's satisfaction)
RECREATIONAL - Stream Augmentation - Impoundments for Boating and Fishing - Snow Making for skiing and snowboarding	CONSTRUCTION - Soil Compaction - Dust Control - Aggregate Washing - Making Concrete - Equipment Washdown
	INDUSTRIAL - Cooling Towers - Process Water - Stack Scrubbing - Boiler Feed
	ENVIRONMENTAL - Wetlands

According to the MSR, the use of reclaimed water requires the following:

- provide in addition to seasonal storage an alternative method of disposing of the reclaimed water or satisfy the manager that no such alternative is required to assure public health protection and treatment reliability.
- in the absence of seasonal storage, the provision of at least 20 days emergency storage (the storage volume may be reduced to 2 days if multiple treatment units are used);
- the system for conveying reclaimed water must incorporate safeguards to prevent cross connection with the potable water system;
- authorization in writing by the local health authority or the establishment of a local service area under which a municipality, or a private corporation under contract to a municipality, assumes responsibility for the system;
- the provision of user information when Unrestricted Public Access Category uses are proposed;
- where frequent worker contact with reclaimed water occurs, disinfection must achieve a fecal coliform level of <14/100 millilitres;
- the reclaimed water provider must demonstrate that reclaimed water does not contain pathogens or parasites at levels which are a concern to local health authorities;
- reclaimed water must be clean, odourless, non-irritating to skin and eyes, and must contain no substances that are toxic on ingestion;
- where available, agricultural (crop) limits must govern criteria for metals;
- high nutrient levels may adversely affect some crops during certain growth stages, consequently crop limits and season must govern nutrient application; and
- the reclaimed water provider must obtain monitoring results, and confirm that water quality requirements are met, prior to distribution.

According to definitions contained in the MSR, water-carried wastes from liquid or non-liquid culinary purposes, washing, cleansing, laundering, food processing or ice production (i.e., grey water) are classified as domestic sewage, regardless of whether or not toilet wastes (black water) are included. As such, the MSR standards for use of reclaimed sewage effluent apply to treated and recycled grey water as well as to reclaimed sewage. According to the MSR, water reuse projects must be approved in consultation with the Ministry of Health (MOH). The MOH has allowed demonstration projects for grey water recycling (e.g., CK Choi Building and Quayside Village in North Vancouver). These projects required special permission from health authorities. Procedures and facilities must be in place to ensure that systems will be monitored and operated properly, so that it can be demonstrated that there is no danger to the public health. Each demonstration project is carefully considered on a case-by-case basis, before receiving approval.

4.0 SOURCE CONTROL

Regulation of waste discharges to sanitary sewers is essential for the protection of public health and the environment. These discharges may enter the system via service connections from buildings, or from pumper truck discharges at treatment facilities (e.g. septage and trucked liquid waste from private businesses). Toxic and hazardous materials that enter the sanitary system pose a risk to sewerage system workers, to the general public, to the collection and treatment works, and to the receiving environment. Toxic and hazardous materials in wastewater can upset biological treatment processes, heavy metals can accumulate in sediments and wastewater treatment plant residuals (biosolids), and waterborne contaminants can be discharged to surface waters; the result can be a negative impact on the environment from both liquid and solids discharges. Source control of trace metals is particularly important if the biosolids generated at wastewater treatment plants are to be used as a soil amendment/fertilizer now or in the future, since the use of biosolids in B.C. is restricted by the Provincial Organic Matter Recycling Regulation (OMRR) according to trace metals content and other factors.

Source controls can be implemented through either a regulatory or an educational approach, or a combination of the two. The regulatory approach is typically focused on non-domestic (i.e., commercial, industrial, and institutional) discharges through sewer use bylaws, also referred to as source control bylaws. A source control approach that includes a significant educational component is likely to be more effective than one of strict policing and enforcement. However, it must be emphasized that it is essential to prevent unauthorized discharges of industrial, toxic, and/or dangerous wastes to the wastewater collection and treatment system. Responsibilities for inspection and enforcement of source control regulations should be clearly defined.

A bylaw regulating discharges to the sanitary sewer collection system is an essential component of a source control program. The Canadian Council of Ministers of the Environment (CCME) recently developed a Model National Sewer Use Bylaw. The national study reviewed existing provincial sewer use bylaws, completed an analysis of potential contaminants and parameters to be covered in the CCME Model Bylaw, and provided recommendations for federal, provincial, and territorial governments to develop and implement effective sewer use bylaws. Forty-one substances and physical parameters were recommended for inclusion in the bylaw. Hazardous substances are typically prohibited and therefore do not require concentration limits. The Supplemental List contains substances that are of potential concern for environmental release or human health, and can be implemented in the municipal bylaw depending on existing industries in the community. The focus of the CCME for the Model Sewer Use Bylaw is on wastewater; however, prohibited substances for stormwater are to be identified and best management practices to protect stormwater quality (construction erosion, sediment control, outdoor storage of materials) are required.

Many communities require a Waste Discharge Permit for Restricted Wastes, High Volume Discharges, Stormwater or Cooling Waste. A Permit typically will apply to non-domestic discharges from the industrial, commercial and institutional (ICI) sectors. Waste Discharge Permits typically include the following:

- limits and restriction on the quantity, frequency and nature of the discharge; and
- requirements of the Permit holder (discharger) to:
  - construct the pre-treatment works if needed to meet the specified discharge limits,
  - monitor the discharge and provide reports to District, and
  - operate and maintain the pre-treatment and monitoring facilities.

APPENDIX M

SUGGESTED DEVELOPMENT COST CHARGE UPDATE SUMMARY

COMOX VALLEY REGIONAL DISTRICT 2011 SEWERAGE STUDY

SUGGESTED DEVELOPMENT COST CHARGE PROJECT LIST UPDATE - CORE AREA

15-Feb-11

Project #	Project Title	Year to Implement	Estimated Cost (2006 $)	Estimated Cost (2011 $)	Government Grant	Net Cost	Allocation		1 % Assist	Reg. Dist. Cost	Development Cost
							Existing	New			
CVWPCC											
1	Sludge Composting Expansion (5 Bays)	2010	$ 2,500,000	$ 2,894,063	$ 144,703	$ 2,749,359	$ -	$ 2,749,359	$ 27,494	$ 27,494	$ 2,721,866
2	Willimar Bluff Bypass Pump Station	2012	$ 5,130,000	$ 5,938,616	$ 296,931	$ 5,641,685	$ 2,820,843	$ 2,820,843	$ 28,208	$ 2,849,051	$ 2,792,634
3	Willimar Bluff Bypass Forcemain	2013	$ 3,630,000	$ 4,202,179	$ 210,109	$ 3,992,070	$ 1,996,035	$ 1,996,035	$ 19,960	$ 2,015,995	$ 1,976,075
4	Sludge Thickening & Dewatering (2nd DAF, 3rd Gravity Thickener, 3rd Centrifuge)	2012	$ 1,000,000	$ 1,157,625	$ 57,881	$ 1,099,744	$ -	$ 1,099,744	$ 10,997	$ 10,997	$ 1,088,746
5	Primary Clarifier (Duplicate Basins, Sludge Pumps, Scum Pumps and Screen)	2020	$ 1,666,000	$ 1,928,603	$ 96,430	$ 1,832,173	$ -	$ 1,832,173	$ 18,322	$ 18,322	$ 1,813,851
CONVEYANCE											
6	North Trunk (Greenwood Trunk)	2020	$ 2,491,000	$ 2,883,644	$ 144,182	$ 2,739,462	$ -	$ 2,739,462	$ 27,395	$ 27,395	$ 2,712,067
7	South Trunk	2020	$ 1,939,000	$ 2,244,635	$ 112,232	$ 2,132,403	$ -	$ 2,132,403	$ 21,324	$ 21,324	$ 2,111,079
8	Duplicate Gravity Main to CFB Comox Pump Station	>2025		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	Upgrade CFB Comox Pump Station	>2025		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	Duplicate CFB Comox Force Main	>2025		$ -	$ -	$ -		$ -	$ -	$ -	$ -
11	Courtenay River Pump Station Upgrade	2011		$ 2,500,000	$ 125,000	$ 2,375,000	$ 1,089,513	$ 1,285,487	$ 12,855	$ 1,102,368	$ 1,272,632
12	Jane Street Pump Station Upgrade	2011		$ 1,000,000	$ 50,000	$ 950,000	$ 596,734	$ 353,266	$ 3,533	$ 600,266	$ 349,734
13	Courtenay PS to Indian Reserve, along Dyke Rd	2011		$ 3,144,000	$ 157,200	$ 2,986,800	$ 923,550	$ 2,063,250	$ 20,633	$ 944,183	$ 2,042,618
14	Foreshore from IR to Comox Marina	2011		$ 1,577,000	$ 78,850	$ 1,498,150	$ 463,244	$ 1,034,906	$ 10,349	$ 473,593	$ 1,024,557
15	Crossing Comox Marina	2011		$ 360,000	$ 18,000	$ 342,000	$ 105,750	$ 236,250	$ 2,363	$ 108,113	$ 233,888
16	Comox Marina to Jane St. PS	2011		$ 375,250	$ 18,763	$ 356,488	$ 110,230	$ 246,258	$ 2,463	$ 112,692	$ 243,795
17	Jane St PS to Croteau Rd	2011		$ 1,045,000	$ 52,250	$ 992,750	$ 372,669	$ 620,081	$ 6,201	$ 378,870	$ 613,880
18	Croteau Rd, from foreshore to Docliddle PS	2011		$ 28,500	$ 1,425	$ 27,075	$ 10,164	$ 16,911	$ 169	$ 10,333	$ 16,742
19	Docliddle Pump Station	2011		$ 6,000,000	$ 300,000	$ 5,700,000	$ 2,139,729	$ 3,560,271	$ 35,603	$ 2,175,332	$ 3,524,668
20	Forcemain section, per CH2MHILL forcemain relocation repo	2011		$ 484,000	$ 24,200	$ 459,800	$ 172,605	$ 287,195	$ 2,872	$ 175,477	$ 284,323
21	Forcemain section, per CH2MHILL forcemain relocation repo	2011		$ 209,000	$ 10,450	$ 198,550	$ 74,534	$ 124,016	$ 1,240	$ 75,774	$ 122,776
22	Gravity section, per CH2MHILL forcemain relocation report	2011		$ 696,000	$ 34,800	$ 661,200	$ 248,209	$ 412,991	$ 4,130	$ 252,338	$ 408,862
23	Inverted Siphon, per CH2MHILL forcemain relocation report	2011		$ 846,000	$ 42,300	$ 803,700	$ 301,702	$ 501,998	$ 5,020	$ 306,722	$ 496,978
			$ 18,356,000	**$ 24,749,365**	**$ 1,187,468**	**$ 22,561,896**	**$ 5,906,391**	**$ 17,008,772**	**$ 166,555**	**$ 6,072,946**	**$ 16,488,950**

- Estimated 2011 costs based on inflation of 5% per annum
- Costs are based on Class D estimates of Option 3a Infrastructure
- Percent attributable to existing vs. new users requires immediate update following RGS completion, and regular (bi-annual) updates thereafter in order to ensure adequate funds are collected

McElhanney

COMOX VALLEY REGIONAL DISTRICT 2011 SEWERAGE STUDY

SUGGESTED DEVELOPMENT COST CHARGE PROJECT LIST UPDATE - SOUTHERN OUTLYING AREA

15-Feb-11

Project #	Project Title	Year to Implement	Estimated Cost (2006 $)	Estimated Cost (2011 $)	Government Grant	Net Cost	Allocation Existing	Allocation New	1 % Assist	Reg. Dist. Cost	Development Cost
TREATMENT											
1	Southern STP Initial Construction	2015		$ 29,300,000							
2	Southern STP Expansion 1	2045		$ 10,000,000							
CONVEYANCE											
3	Union Bay Pump Station	2015		$ 2,940,000							
4	Highway 19A, from Seymour St to Jones St	2015		$ 1,342,500							
5	Highway 19A, from Jones St to Van West Logging Rd.	2015		$ 1,140,000							
6	Highway 19A, from Van West Logging Rd. to Inverness Rd.	2015		$ 1,942,500							
7	Highway 19A, from Inverness Rd. to Herondale Rd.	2015		$ 855,000							
8	Highway 19A, from Herondale Rd to Gartley Rd.	2015		$ 1,425,000							
9	Highway 19A, from Gartley Rd. to Southern Treatment Plant (assumed to be at the intersection of Royston Rd and Hwy 19A	2015		$ 1,237,500							
10	Pump Station at Constructed Wetland Treatment Facility	2015		$ 3,000,000							
11	CWTF to Inland Island Hwy	2015		$ 605,000							
12	Royston Rd, Inland Island Hwy to BC Hydro ROW	2015		$ 1,140,000							
13	Royston Rd, BC Hydro ROW to Hwy 19A	2015		$ 1,710,000							
14	Ships Point Pump Station	>2015		$ 2,700,000							
15	Ships Point Rd, from Tozer Rd to Hwy 19A	>2015		$ 676,500							
16	Hwy 19A, from Ships Point Rd to Old Yake Rd.	>2015		$ 951,500							
17	Hwy 19A, from Old Yake Rd to the Tsable River	>2015		$ 1,056,000							
18	Hwy 19A, from the Tsable River to Buckley Bay Rd.	>2015		$ 649,000							
19	Hwy 19A, from Buckley Bay Rd to Brean Rd	>2015		$ 1,562,000							
20	Hwy 19A, from Brean Rd to Seymour St (Terminus of Route 1)	>2015		$ 1,732,500							
				$ 65,965,000							

- Costs are based on Class D estimates of Option 3a Infrastructure

McElhanney

COMOX VALLEY REGIONAL DISTRICT 2011 SEWERAGE STUDY

SUGGESTED DEVELOPMENT COST CHARGE PROJECT LIST UPDATE - NORTHERN OUTLYING AREA

15-Feb-11

Project #	Project Title	Year to Implement	Estimated Cost (2006 $)	Estimated Cost (2011 $)	Government Grant	Net Cost	Allocation Existing	Allocation New	1 % Assist	Reg. Dist. Cost	Development Cost
TREATMENT											
1	Northern STP Initial Construction	2013		$ 11,200,000							
2	Northern STP Expansion 1	2033		$ 6,900,000							
				$ 18,100,000							

- Costs are based on Class D estimates of Option 3a Infrastructure

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APPENDIX N

OPTIONS 1 THROUGH 2A
COMPONENT COST ALLOCATION
BREAKOUTS -
TIERED ALLOCATION MODEL

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

OVERALL SYSTEM CONSTRUCTION & O&M COST ALLOCATION (TIERED ALLOCATION MODEL)

OVERALL SYSTEM OPTION 1, CORE AREA ROUTE 1

MARCH,2009

McElhanney

Yearly conveyance O&M cost	$	1,900,000
Treatment capital cost	$	103,700,000
Yearly treatment O&M cost	$	5,900,000

								COURTENAY							COMOX			
		SHIPS POINT		UBID/ RID		CUMBERLAND			COURTENAY RIVER	CFB	KITTY COLEMAN		SARATOGA/MIRACLE BEACH			JANE ST.	CFB	
SYSTEM COMPONENT DESCRIPTION	Component Cost	% Attributable	5633	% Attributable	22860	% Attributable	20100	% Attributable	50154	8336	% Attributable	2814	% Attributable	14300	% Attributable	7808	12147	
New Courtenay River Pump Station	20,000,000	6%	$ 1,140,895	23%	$ 4,630,014	20%	$ 4,071,010	51%	$ 10,158,081			$ -		$ -		$ -		
Courtenay PS to Back Rd, through Section 9	1,740,000	6%	$ 99,258	23%	$ 402,811	20%	$ 354,178	51%	$ 883,753			$ -		$ -		$ -		
Plan 35008, from Back Rd to Sheraton Rd.	1,000,500	6%	$ 57,073	23%	$ 231,616	20%	$ 203,652	51%	$ 508,158			$ -		$ -		$ -		
Sheraton Rd, from Plan 35008 to McDonald Rd.	1,087,500	6%	$ 62,036	23%	$ 251,757	20%	$ 221,361	51%	$ 552,346			$ -		$ -		$ -		
McDonald Rd, from Sheraton Rd to Hector Rd	1,160,000	6%	$ 66,172	23%	$ 268,541	20%	$ 236,119	51%	$ 589,169			$ -		$ -		$ -		
Through Plan 60685 to Aspen Rd.	135,000	6%	$ 7,701	23%	$ 31,253	20%	$ 27,479	51%	$ 68,567			$ -		$ -		$ -		
Aspen Rd to Idiens Way	400,000	6%	$ 22,541	23%	$ 91,475	20%	$ 80,431	50%	$ 200,693			$ -		$ -	1%	$ 4,861		
Idiens Way to Connection Point	54,000	6%	$ 3,043	23%	$ 12,349	20%	$ 10,858	50%	$ 27,094			$ -		$ -	1%	$ 656		
South leg of the Greenwood trunk to Pritchard Rd.	2,115,000	6%	$ 119,184	23%	$ 483,674	20%	$ 425,278	50%	$ 1,061,164			$ -		$ -	1%	$ 25,701		
Knight Rd, Pritchard to CFB gravity sewer	990,000	6%	$ 55,788	23%	$ 226,401	20%	$ 199,066	50%	$ 496,715			$ -		$ -	1%	$ 12,030		
Re/Re existing CFB gravity sewer	2,025,000	5%	$ 102,862	21%	$ 417,439	18%	$ 367,040	45%	$ 915,846			$ -		$ -	11%	$ 221,812		
Upgrade CFB pump station	5,000,000	5%	$ 253,981	21%	$ 1,030,714	18%	$ 906,271	45%	$ 2,261,349			$ -		$ -	11%	$ 547,685		
Twin CFB forcemain	2,320,000	5%	$ 117,847	21%	$ 478,251	18%	$ 420,510	45%	$ 1,049,266			$ -		$ -	11%	$ 254,126		
Upgrade Jane St Pump Station	1,000,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 1,000,000		
Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	572,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 572,000		
Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	247,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 247,000		
Gravity section, per CH2MHILL forcemain relocation report	696,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 696,000		
Inverted siphon, per CH2MHILL forcemain relocation report	564,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 564,000		
Ships Point Rd, from Tozer Rd to Hwy 19A	676,500	100%	$ 676,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Ships Point Rd to Old Yake Rd.	951,500	100%	$ 951,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Old Yake Rd to the Tsable River	1,056,000	100%	$ 1,056,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from the Tsable River to Buckley Bay Rd.	649,000	100%	$ 649,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Buckley Bay Rd to Brean Rd	1,562,000	100%	$ 1,562,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Brean Rd to Seymour St (Terminus of Route 1)	1,732,500	100%	$ 1,732,500		$ -		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Seymour St to Jones St	1,342,500	20%	$ 265,409	80%	$ 1,077,091		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Jones St to Van West Logging Rd.	1,140,000	20%	$ 225,375	80%	$ 914,625		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Van West Logging Rd. to Inverness Rd.	1,942,500	20%	$ 384,028	80%	$ 1,558,472		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Inverness Rd. to Herondale Rd.	855,000	20%	$ 169,032	80%	$ 685,968		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Herondale Rd to Gartley Rd.	1,425,000	20%	$ 281,719	80%	$ 1,143,281		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Gartley Rd. to Royston Rd future Pump station	1,237,500	20%	$ 244,651	80%	$ 992,849		$ -		$ -			$ -		$ -		$ -		
New Pump Station, Hwy 19A & Royston Rd	9,000,000	12%	$ 1,043,298	47%	$ 4,233,943	41%	$ 3,722,758		$ -			$ -		$ -		$ -		
Highway 19A, from Royston Rd future Pump Station to Courtenay Pump Station	5,040,000	12%	$ 584,247	47%	$ 2,371,008	41%	$ 2,084,745		$ -			$ -		$ -		$ -		
Pump Station at Constructed Wetland Treatment Facility	3,000,000		$ -		$ -	100%	$ 3,000,000		$ -			$ -		$ -		$ -		
CWTF to Inland Island Hwy	605,000		$ -		$ -	100%	$ 605,000		$ -			$ -		$ -		$ -		
Royston Rd, Inland Island Hwy to BC Hydro ROW	1,140,000		$ -		$ -	100%	$ 1,140,000		$ -			$ -		$ -		$ -		
Royston Rd, BC Hydro ROW to Hwy 19A	1,710,000		$ -		$ -	100%	$ 1,710,000		$ -			$ -		$ -		$ -		
Saratoga Beach Pump Station	2,500,000		$ -		$ -		$ -		$ -			$ -	100%	$ 2,500,000		$ -		
Saratoga Beach to Kitty Coleman	5,197,500		$ -		$ -		$ -		$ -			$ -	100%	$ 5,197,500		$ -		
Kitty Coleman Pump Station	4,000,000		$ -		$ -		$ -		$ -		16%	$ 657,707	84%	$ 3,342,293		$ -		
Kitty Coleman to Greenwood trunk	7,496,500		$ -		$ -		$ -		$ -		16%	$ 1,232,625	84%	$ 6,263,875		$ -		
Greenwood trunk (North)	2,940,000		$ -		$ -		$ -	22%	$ 651,856		7%	$ 220,048	38%	$ 1,118,228	32%	$ 949,868		
CONVEYANCE CAPITAL COSTS			$ 11,933,641		$ 21,533,533		$ 19,785,755		$ 19,424,055			$ 2,110,381		$ 18,421,895		$ 5,095,739		$ 98,305,000
TREATMENT CAPITAL COSTS		4%	$ 4,052,265	16%	$ 16,445,016	14%	$ 14,459,529	41%	$ 42,076,510		2%	$ 2,024,334	10%	$ 10,287,127	14%	$ 14,355,219		
TOTAL CONSTRUCTION COST BY INCRIMENTAL AREA			$ 15,985,906		$ 37,978,550		$ 34,245,284		$ 61,500,564			$ 4,134,715		$ 28,709,022		$ 19,450,958		
COST PER PERSON BY INCREMENTAL AREA			$ 2,838		$ 1,661		$ 1,704		$ 1,051			$ 1,469		$ 2,008		$ 975		
TOTAL CONSTRUCTION COST PER EQUVILANT SFD BY INCRIMENTALAREA			$ 7,095		$ 4,153		$ 4,259		$ 2,629			$ 3,673		$ 5,019		$ 2,437		
ANNUAL O&M COST PER EQUIVILANT SFD BASED ON INCRIMENTAL AREA			$ 205		$ 148		$ 150		$ 118			$ 139		$ 165		$ 115		
TOTAL COSTRUCTION COST PER EQUIVELNAT SFD - COMMON RATE			$ 3,503		$ 3,503		$ 3,503		$ 3,503			$ 3,503		$ 3,503		$ 3,503		
ANNUAL O&M COST PER EQUIVILANT SFD COMMON RATE			$ 135		$ 135		$ 135		$ 135			$ 135		$ 135		$ 135		

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

OVERALL SYSTEM CONSTRUCTION & O&M COST ALLOCATION (TIERED ALLOCATION MODEL)

OVERALL SYSTEM OPTION 2A, CORE AREA ROUTE 1

MARCH,2009

Yearly conveyance O&M cost	$ 700,000

SYSTEM COMPONENT DESCRIPTION	COMPONENT COST							COURTENAY							COMOX			
		SHIPS POINT		UBID/ RID		CUMBERLAND			COURTENAY RIVER	CFB	KITTY COLEMAN		SARATOGA/MIRACLE BEACH			JANE ST.	CFB	
		% Attributable	5633	% Attributable	22860	% Attributable	20100	% Attributable	50154	8336	% Attributable	2814	% Attributable	14300	% Attributable	7808	12147	
New Courtenay River Pump Station	$ 17,000,000		$ -		$ -		$ -	100%	$ 17,000,000			$ -		$ -		$ -		
Courtenay PS to Back Rd, through Section 9	$ 1,080,000		$ -		$ -		$ -	100%	$ 1,080,000			$ -		$ -		$ -		
Plan 35008, from Back Rd to Sheraton Rd.	$ 621,000		$ -		$ -		$ -	100%	$ 621,000			$ -		$ -		$ -		
Sheraton Rd, from Plan 35008 to McDonald Rd.	$ 675,000		$ -		$ -		$ -	100%	$ 675,000			$ -		$ -		$ -		
McDonald Rd, from Sheraton Rd to Hector Rd	$ 720,000		$ -		$ -		$ -	100%	$ 720,000			$ -		$ -		$ -		
Through Plan 60685 to Aspen Rd.	$ 112,500		$ -		$ -		$ -	100%	$ 112,500			$ -		$ -		$ -		
Aspen Rd to Idiens Way	$ 300,000		$ -		$ -		$ -	100%	$ 300,000			$ -		$ -		$ -		
Idiens Way to Connection Point	$ 45,000		$ -		$ -		$ -	98%	$ 43,936			$ -		$ -	2%	$ 1,064		
South leg of the Greenwood trunk to Pritchard Rd.	$ 1,762,500		$ -		$ -		$ -	98%	$ 1,720,823			$ -		$ -	2%	$ 41,677		
Knight Rd, Pritchard to CFB gravity sewer	$ 990,000		$ -		$ -		$ -	98%	$ 966,590			$ -		$ -	2%	$ 23,410		
Re/Re existing CFB gravity sewer	$ 3,262,500		$ -		$ -		$ -	98%	$ 3,185,353			$ -		$ -	2%	$ 77,147		
Upgrade CFB pump station	$ 5,000,000		$ -		$ -		$ -	98%	$ 4,881,767			$ -		$ -	2%	$ 118,233		
Twin CFB forcemain	$ 1,760,000		$ -		$ -		$ -	98%	$ 1,718,382			$ -		$ -	2%	$ 41,618		
Upgrade Jane St Pump Station	$ 1,000,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 1,000,000		
Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	$ 484,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 484,000		
Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	$ 209,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 209,000		
Gravity section, per CH2MHILL forcemain relocation report	$ 696,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 696,000		
Inverted siphon, per CH2MHILL forcemain relocation report	$ 564,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 564,000		
Greenwood trunk (North)	$ 2,940,000		$ -		$ -		$ -	41%	$ 1,196,497			$ -		$ -	59%	$ 1,743,503		
CONVEYANCE CAPITAL COSTS			$ -		$ -		$ -		$ 34,221,846			$ -		$ -		$ 4,999,654		$ 39,221,500
TREATMENT CAPITAL COSTS			$ 14,200,000		$ 53,000,000		$ 41,900,000		$ 46,004,627			$ 6,500,000		$ 18,000,000		$ 15,695,373		$ 195,300,000
TOTAL CONSTRUCTION COST BY INCRIMENTAL AREA			$ 14,200,000		$ 53,000,000		$ 41,900,000		$ 80,226,473			$ 6,500,000		$ 18,000,000		$ 20,695,027		
COST PER PERSON BY INCRIMENTAL AREA			$ 2,521		$ 2,318		$ 2,085		$ 1,372			$ 2,310		$ 1,259		$ 1,037		
ANNUAL O&M PER INCRIMENTAL AREA			$ 1,000,000		$ 3,700,000		$ 3,200,000		$ 3,951,775			$ 300,000		$ 1,100,000		$ 1,348,225		$ 14,600,000
TOTAL CONSTRUCTION COST PER EQUVILANT SFD BY INCRIMENTALAREA			$ 6,302		$ 5,796		$ 5,211		$ 3,429			$ 5,775		$ 3,147		$ 2,593		
ANNUAL O&M COST PER EQUIVILANT SFD BASED ON INCRIMENTAL AREA			$ 444		$ 405		$ 398		$ 169			$ 267		$ 192		$ 169		
TOTAL COSTRUCTION COST PER EQUIVELNAT SFD - COMMON RATE			$ 4,067		$ 4,067		$ 4,067		$ 4,067			$ 4,067		$ 4,067		$ 4,067		
ANNUAL O&M COST PER EQUIVILANT SFD COMMON RATE			$ 265		$ 265		$ 265		$ 265			$ 265		$ 265		$ 265		

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

OVERALL SYSTEM CONSTRUCTION & O&M COST ALLOCATION (TIERED ALLOCATION MODEL)

OVERALL SYSTEM OPTION 1A, CORE AREA ROUTE 1

MARCH,2009

Yearly conveyance O&M cost	$	1,900,000
Treatment capital cost	$	103,700,000
Yearly treatment O&M cost	$	5,900,000

McElhanney

SYSTEM COMPONENT DESCRIPTION	COMPONENT COST	SHIPS POINT		UBID/ RID		CUMBERLAND		COURTENAY			KITTY COLEMAN		SARATOGA/MIRACLE BEACH		COMOX			
									COURTENAY RIVER	CFB						JANE ST.	CFB	
		% Attributable	5633	% Attributable	22860	% Attributable	20100	% Attributable	50154	8336	% Attributable	2814	% Attributable	14300	% Attributable	7808	12147	
New Courtenay River Pump Station	$ 17,000,000		$ -		$ -		$ -	100%	$ 17,000,000			$ -		$ -		$ -		
Courtenay PS to Back Rd, through Section 9	$ 1,080,000		$ -		$ -		$ -	100%	$ 1,080,000			$ -		$ -		$ -		
Plan 35008, from Back Rd to Sheraton Rd.	$ 621,000		$ -		$ -		$ -	100%	$ 621,000			$ -		$ -		$ -		
Sheraton Rd, from Plan 35008 to McDonald Rd.	$ 675,000		$ -		$ -		$ -	100%	$ 675,000			$ -		$ -		$ -		
McDonald Rd, from Sheraton Rd to Hector Rd	$ 720,000		$ -		$ -		$ -	100%	$ 720,000			$ -		$ -		$ -		
Through Plan 60685 to Aspen Rd.	$ 112,500		$ -		$ -		$ -	100%	$ 112,500			$ -		$ -		$ -		
Aspen Rd to Idiens Way	$ 300,000		$ -		$ -		$ -	100%	$ 300,000			$ -		$ -		$ -		
Idiens Way to Connection Point	$ 45,000		$ -		$ -		$ -	100%	$ 45,000			$ -		$ -		$ -		
South leg of the Greenwood trunk to Pritchard Rd.	$ 1,762,500		$ -		$ -		$ -	100%	$ 1,762,500			$ -		$ -		$ -		
Knight Rd, Pritchard to CFB gravity sewer	$ 825,000		$ -		$ -		$ -	100%	$ 825,000			$ -		$ -		$ -		
Re/Re existing CFB gravity sewer	$ 3,262,500		$ -		$ -		$ -	63%	$ 2,060,410		4%	$ 115,604	18%	$ 587,468	15%	$ 499,019		
Upgrade CFB pump station	$ 5,000,000		$ -		$ -		$ -	63%	$ 3,157,716		4%	$ 177,171	18%	$ 900,334	15%	$ 764,780		
Twin CFB forcemain	$ 2,320,000		$ -		$ -		$ -	63%	$ 1,465,180		4%	$ 82,207	18%	$ 417,755	15%	$ 354,858		
Upgrade Jane St Pump Station	$ 1,000,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 1,000,000		
Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	$ 968,000	12%	$ 112,548	47%	$ 456,747		$ -		$ -			$ -		$ -	41%	$ 398,705		
Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	$ 418,000	12%	$ 48,600	47%	$ 197,232		$ -		$ -			$ -		$ -	41%	$ 172,168		
Gravity section, per CH2MHILL forcemain relocation report	$ 1,044,000	12%	$ 121,385	47%	$ 492,607		$ -		$ -			$ -		$ -	41%	$ 430,008		
Inverted siphon, per CH2MHILL forcemain relocation report	$ 846,000	12%	$ 98,364	47%	$ 399,182		$ -		$ -			$ -		$ -	41%	$ 348,455		
Ships Point Rd, from Tozer Rd to Hwy 19A	$ 676,500	100%	$ 676,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Ships Point Rd to Old Yake Rd.	$ 951,500	100%	$ 951,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Old Yake Rd to the Tsable River	$ 1,056,000	100%	$ 1,056,000		$ -		$ -		$ -			$ -		$ -		$ -		
	$ 649,000	100%	$ 649,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Buckley Bay Rd to Brean Rd	$ 1,562,000	100%	$ 1,562,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Brean Rd to Seymour St (Terminus of Route 1)	$ 1,732,500	100%	$ 1,732,500		$ -		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Seymour St to Jones St	$ 1,342,500	20%	$ 265,409	80%	$ 1,077,091		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Jones St to Van West Logging Rd.	$ 1,140,000	20%	$ 225,375	80%	$ 914,625		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Van West Logging Rd. to Inverness Rd.	$ 1,942,500	20%	$ 384,028	80%	$ 1,558,472		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Inverness Rd. to Herondale Rd.	$ 855,000	20%	$ 169,032	80%	$ 685,968		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Herondale Rd to Gartley Rd.	$ 1,425,000	20%	$ 281,719	80%	$ 1,143,281		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Gartley Rd. to Royston Rd future Pump station	$ 1,237,500	20%	$ 244,651	80%	$ 992,849		$ -		$ -			$ -		$ -		$ -		
New Pump Station, Hwy 19A & Royston Rd	$ 9,000,000	12%	$ 1,043,298	47%	$ 4,233,943	41%	$ 3,722,758		$ -			$ -		$ -		$ -		
Submarine Crossing to Jane Street	$ 6,825,000	12%	$ 791,168	47%	$ 3,210,740	41%	$ 2,823,092		$ -			$ -		$ -		$ -		
Pump Station at Constructed Wetland Treatment Facility	$ 3,000,000		$ -		$ -	100%	$ 3,000,000		$ -			$ -		$ -		$ -		
CWTF to Inland Island Hwy	$ 605,000		$ -		$ -	100%	$ 605,000		$ -			$ -		$ -		$ -		
Royston Rd, Inland Island Hwy to BC Hydro ROW	$ 1,140,000		$ -		$ -	100%	$ 1,140,000		$ -			$ -		$ -		$ -		
Royston Rd, BC Hydro ROW to Hwy 19A	$ 1,710,000		$ -		$ -	100%	$ 1,710,000		$ -			$ -		$ -		$ -		
Saratoga Beach Pump Station	$ 2,500,000		$ -		$ -		$ -		$ -			$ -	100%	$ 2,500,000		$ -		
Saratoga Beach to Kitty Coleman	$ 5,197,500		$ -		$ -		$ -		$ -			$ -	100%	$ 5,197,500		$ -		
Kitty Coleman Pump Station	$ 4,000,000		$ -		$ -		$ -		$ -		16%	$ 657,707	84%	$ 3,342,293		$ -		
Kitty Coleman to Greenwood trunk	$ 7,496,500		$ -		$ -		$ -		$ -		16%	$ 1,232,625	84%	$ 6,263,875		$ -		
Greenwood trunk (North)	$ 2,940,000							41%	$ 1,196,497						59%	$ 1,743,503		
CONVEYANCE CAPITAL COSTS			$ 10,413,077		$ 15,362,737		$ 13,000,850		$ 31,020,802			$ 2,265,314		$ 19,209,224		$ 5,711,495		$ 96,983,500
TREATMENT CAPITAL COSTS		4%	$ 4,052,265	16%	$ 16,445,016	14%	$ 14,459,529	41%	$ 42,076,510		2%	$ 2,024,334	10%	$ 10,287,127	14%	$ 14,355,219		$ 103,700,000
TOTAL CONSTRUCTION COST BY INCRIMENTAL AREA			$ 14,465,342		$ 31,807,754		$ 27,460,379		$ 73,097,312			$ 4,289,648		$ 29,496,351		$ 20,066,714		
CONSTRUCTION COST PER PERSON BY INCRIMENTAL AREA			$ 2,568		$ 1,391		$ 1,366		$ 1,250			$ 1,524		$ 2,063		$ 1,006		
ANNUAL O&M COST PER INCRIMENTAL AREA			$ 431,813		$ 1,232,562		$ 1,073,949		$ 2,993,496			$ 158,957		$ 956,553		$ 927,128		
TOTAL CONSTRUCTION COST PER EQUVILANT SFD BY INCRIMENTAL AREA			$ 6,420		$ 3,479		$ 3,415		$ 3,124			$ 3,811		$ 5,157		$ 2,514		
ANNUAL O&M COST PER EQUIVILANT SFD BASED ON INCRIMENTAL AREA			$ 192		$ 135		$ 134		$ 128			$ 141		$ 167		$ 116		
TOTAL COSTRUCTION COST PER EQUIVELNAT SFD - COMMON RATE			$ 3,480		$ 3,480		$ 3,480		$ 3,480			$ 3,480		$ 3,480		$ 3,480		
ANNUAL O&M COST PER EQUIVILANT SFD COMMON RATE			$ 135		$ 135		$ 135		$ 135			$ 135		$ 135		$ 135		

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

OVERALL SYSTEM CONSTRUCTION & O&M COST ALLOCATION (TIERED ALLOCATION MODEL)

OVERALL SYSTEM OPTION 2, CORE AREA ROUTE 1

MARCH,2009

McElhanney

Yearly conveyance O&M cost	$	1,200,000
Treatment capital cost	$	140,400,000
Yearly treatment O&M cost	$	8,400,000

		SHIPS POINT		UBID/ RID		CUMBERLAND		COURTENAY			KITTY COLEMAN		SARATOGA/MIRACLE BEACH		COMOX			
									COURTENAY RIVER	CFB						JANE ST.	CFB	
SYSTEM COMPONENT DESCRIPTION	COMPONENT COST	% Attributable	5633	% Attributable	22860	% Attributable	20100	% Attributable	50154	8336	% Attributable	2814	% Attributable	14300	% Attributable	7808	12147	TOTAL
New Courtenay River Pump Station	$ 17,000,000		$ -		$ -		$ -	100%	$ 17,000,000			$ -		$ -		$ -		
Courtenay PS to Back Rd, through Section 9	$ 1,080,000		$ -		$ -		$ -	100%	$ 1,080,000			$ -		$ -		$ -		
Plan 35008, from Back Rd to Sheraton Rd.	$ 621,000		$ -		$ -		$ -	100%	$ 621,000			$ -		$ -		$ -		
Sheraton Rd, from Plan 35008 to McDonald Rd.	$ 675,000		$ -		$ -		$ -	100%	$ 675,000			$ -		$ -		$ -		
McDonald Rd, from Sheraton Rd to Hector Rd	$ 720,000		$ -		$ -		$ -	100%	$ 720,000			$ -		$ -		$ -		
Through Plan 60685 to Aspen Rd.	$ 112,500		$ -		$ -		$ -	100%	$ 112,500			$ -		$ -		$ -		
Aspen Rd to Idiens Way	$ 300,000		$ -		$ -		$ -	100%	$ 300,000			$ -		$ -		$ -		
Idiens Way to Connection Point	$ 45,000		$ -		$ -		$ -	98%	$ 43,936			$ -		$ -		$ -		
South leg of the Greenwood trunk to Pritchard Rd.	$ 1,762,500		$ -		$ -		$ -	98%	$ 1,720,823			$ -		$ -	2%	$ 41,677		
Knight Rd, Pritchard to CFB gravity sewer	$ 990,000		$ -		$ -		$ -	98%	$ 966,590			$ -		$ -	2%	$ 23,410		
Re/Re existing CFB gravity sewer	$ 3,262,500		$ -		$ -		$ -	83%	$ 2,701,468			$ -		$ -	17%	$ 561,032		
Upgrade CFB pump station	$ 5,000,000		$ -		$ -		$ -	83%	$ 4,140,181			$ -		$ -	17%	$ 859,819		
Twin CFB forcemain	$ 1,760,000		$ -		$ -		$ -	83%	$ 1,457,344			$ -		$ -	17%	$ 302,656		
Upgrade Jane St Pump Station	$ 1,000,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 1,000,000		
Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	$ 484,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 484,000		
Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	$ 209,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 209,000		
Gravity section, per CH2MHILL forcemain relocation report	$ 696,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 696,000		
Inverted siphon, per CH2MHILL forcemain relocation report	$ 564,000		$ -		$ -		$ -		$ -			$ -		$ -	100%	$ 564,000		
Ships Point Rd, from Tozer Rd to Hwy 19A	$ 676,500	100%	$ 676,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Ships Point Rd to Old Yake Rd.	$ 951,500	100%	$ 951,500		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Old Yake Rd to the Tsable River	$ 1,056,000	100%	$ 1,056,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from the Tsable River to Buckley Bay Rd.	$ 649,000	100%	$ 649,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Buckley Bay Rd to Brean Rd	$ 1,562,000	100%	$ 1,562,000		$ -		$ -		$ -			$ -		$ -		$ -		
Hwy 19A, from Brean Rd to Seymour St (Terminus of Route 1)	$ 1,732,500	100%	$ 1,732,500		$ -		$ -		$ -			$ -		$ -		$ -		
Highway 19A, from Seymour St to Jones St	$ 1,342,500	12%	$ 155,625	47%	$ 631,563	41%	$ 555,311		$ -			$ -		$ -		$ -		
Highway 19A, from Jones St to Van West Logging Rd.	$ 1,140,000	12%	$ 132,151	47%	$ 536,299	41%	$ 471,549		$ -			$ -		$ -		$ -		
Highway 19A, from Van West Logging Rd. to Inverness Rd.	$ 1,942,500	12%	$ 225,179	47%	$ 913,826	41%	$ 803,495		$ -			$ -		$ -		$ -		
Highway 19A, from Inverness Rd. to Herondale Rd.	$ 855,000	12%	$ 99,113	47%	$ 402,225	41%	$ 353,662		$ -			$ -		$ -		$ -		
Highway 19A, from Herondale Rd to Gartley Rd.	$ 1,425,000	12%	$ 165,189	47%	$ 670,374	41%	$ 589,437		$ -			$ -		$ -		$ -		
Highway 19A, from Gartley Rd. to Southern Treatment Plant (assumed to be at the intersection of Royston Rd and Hwy 19A	$ 1,237,500	12%	$ 143,454	47%	$ 582,167	41%	$ 511,879		$ -			$ -		$ -		$ -		
Pump Station at Constructed Wetland Treatment Facility	$ 3,000,000		$ -		$ -	100%	$ 3,000,000		$ -			$ -		$ -		$ -		
CWTF to Inland Island Hwy	$ 605,000		$ -		$ -	100%	$ 605,000		$ -			$ -		$ -		$ -		
Royston Rd, Inland Island Hwy to BC Hydro ROW	$ 1,140,000		$ -		$ -	100%	$ 1,140,000		$ -			$ -		$ -		$ -		
Royston Rd, BC Hydro ROW to Hwy 19A	$ 1,710,000		$ -		$ -	100%	$ 1,710,000		$ -			$ -		$ -		$ -		
Greenwood trunk (North)	$ 2,940,000		$ -		$ -		$ -	41%	$ 1,196,497			$ -		$ -	59%	$ 1,743,503		
CONVEYANCE CAPITAL COST			$ 7,548,211		$ 3,736,455		$ 9,740,334		$ 32,735,339			$ -		$ -		$ 6,485,097		$ 60,245,436
TREATMENT CAPITAL COST			$ 6,282,975		$ 25,497,747		$ 22,419,278		$ 46,004,627			$ 6,500,000		$ 18,000,000		$ 15,695,373		$ 140,400,000
TREATMENT ANNUAL O&M COST			$ 278,213		$ 1,129,052		$ 992,736		$ 3,429,843			$ 300,000		$ 1,100,000		$ 1,170,157		$ 8,400,000
TOTAL CONSTRUCTION COST BY INCRIMENTAL AREA			$ 13,831,186		$ 29,234,201		$ 32,159,613		$ 78,739,966			$ 6,500,000		$ 18,000,000		$ 22,180,470		
TOTAL CONSTRUCTION COST PER PERSON BY INCRIMENTAL AREA			$ 2,455		$ 1,279		$ 1,600		$ 1,346			$ 2,310		$ 1,259		$ 1,112		
TOTAL CONSTRUCTION COST PER EQUVILANT SFD BY INCRIMENTAL AREA			$ 6,138		$ 3,197		$ 4,000		$ 3,366			$ 5,775		$ 3,147		$ 2,779		
ANNUAL O&M COST PER EQUIVILANT SFD BASED ON INCRIMENTAL AREA			$ 190		$ 132		$ 148		$ 203			$ 267		$ 192		$ 416		
TOTAL COSTRUCTION COST PER EQUIVELNAT SFD - COMMON RATE			$ 3,480		$ 3,480		$ 3,480		$ 3,480			$ 3,480		$ 3,480		$ 3,480		
ANNUAL O&M COST PER EQUIVILANT SFD COMMON RATE			$ 166		$ 166		$ 166		$ 166			$ 166		$ 166		$ 166		

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

APPENDIX O

GOVERNANCE AND OPERATING STRUCTURE DISCUSSION PAPER

APPENDIX O

GOVERNANCE AND OPERATING STRUCTURE DISCUSSION PAPER

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1.0 INTRODUCTION

The current sewer master plan update study is not provincially mandated, [as compared, for example to the Regional Growth Strategy, (RGS) and Water system planning]. Rather, this study has been authorized at the discretion of the sewage commission and CVRD board. As such, we believe decisions required as to the system operating structure, cost allocation provisions and jurisdictional adjustments will need to be made at the Regional Board level.

Per the RFP, the mandate of the master sewerage plan is to establish the preferred solution for sanitation servicing, based primarily on the basis of technical feasibility and cost. Other factors, such as societal and environmental considerations, are also of importance. The inter-relationship between land use planning, [settlement patterns, densities, etc], and the planning of infrastructure required to support population growth [or changes in land use] must be considered, in the present context. In order to arrive at defensible, rational and cost effective settlement plans, this should be <u>an iterative process</u>, with input from planners and engineering professionals in tandem, given the 50 year time horizon applicable here.

It became evident during system alternative comparisons and analysis that variation in land use assumptions, on the 50 year planning horizon adopted for this study, would potentially have a significant bearing on the ranking of the identified sewerage options. We note this sanitation master plan update study is on-going in parallel with the provincially mandated Regional Growth Strategy (RGS), as well as a regionally endorsed sustainability strategy.

The selection of a preferred overall system requires that technical feasibility, social considerations and estimated costs be weighed and included in the decision process. Sustainability and regional growth strategy initiatives, now on-going will likely affect assumptions regarding settlement patterns and overall populations having been made for this report. In turn, such changes in the geographic distribution of service demand, as well adjustment in the overall total demand, may alter the outcome of overall service delivery model preference.

The general philosophy regarding rationale for extension of sewer service into areas, now either undeveloped or served by smaller onsite treatment and disposal systems, requires, in our view, review under the terms of the RGS.

Final recommendations regarding overall system configuration should be postponed until after conclusion of the RGS process, and until political decisions or direction is provided in regard to the operating and jurisdictional structure to be used in provision of service to areas outside the mandate of the existing sewerage commission.

This discussion paper is intended to illustrate these issues in some detail, discuss the sanitation system master plan implications, and to recommend an action plan in order to establish consensus and direction needed in order to complete this study.

2.0 REQUIRED CVRD INPUT

2.1 LAND USE PLANNING ISSUES (RGS)

The RGS is a provincially mandated effort which will, by definition, seek to provide land use and settlement pattern guidance. The outcome of this is necessary to allow rational and cost effective, defensible sanitation system master plan selection.

For example, if a centralized sewage treatment model were to be pursued, with outlying areas such as Saratoga and Ships Point delivering raw sewage to centralized treatment facilities, there would be a need for long conveyance pipelines through presently sparsely populated areas. If it were decided, though the RGS process, that these intervening rural areas ought not to be the site(s) of further densification or population growth, then the arguments in favour of centralized treatment might be diminished, since the incidental benefits to otherwise resulting 'in-fill' development, over time, will not exist.

Further, if the RGS were to conclude that even densification of these outlying 'hamlets' of Union Bay, Ships Point, Saratoga Beach, etc, ought not to be allowed [through subdivision or other land use changes], then the concept of centralized treatment becomes potentially even less tenable.

Typical Local Area Plan processes include servicing and infrastructure components, wherein the feasible options for servicing are typically very limited. This is contrasted with a very long range plan such as the current study, wherein the RD has the opportunity to establish servicing and infrastructure plans which, in addition to transportation and potable water distribution planning, should assist in rational land use planning.

Input is required as to how the RD envisions settlement over the next 50 years. This will impact the feasibility and cost effectiveness of sanitation system options. The need also exists to determine what factors will drive the servicing of outlying areas. I.e.: direct development pressure, land use planning, environmental issues, infrastructure planning, or all of these together in harmony?

Each of the servicing options considered are affected by the ultimate population, and spatial distribution of this population, to varying degrees. Generally, the sensitivity is magnified in the smaller outlying areas, by virtue of the large relative change in population, brought about by a modest increase in absolute population.

For instance, service being provided to the Ships Point area, under option 2a, is estimated to have a 50 year net present value of $14,400 per equivalent single family residence, based on a population of approximately 5,600. However, if development was precluded in this area, as perhaps may be dictated by the RGS, and the same servicing costs are distributed over present day populations, the 50 year NPV would vastly exceed $30,000, per SFD.

We therefore caution that further refinement of both population projections, and the relative distribution of this population, is needed.

2.1.2 IMPACTS DUE TO LARGER LAND DEVELOPER DEMANDS, ASSISTANCE

There are a number of large private development proposals, each situated within rural areas of the RD, isolated from one another and each being a significant distance from the RD's existing trunk sewer collection system.

The challenge appears in the need to prepare development agreements with these larger land owners which limit initial 'throw away' costs represented by short term, 'onsite' sewage treatment and disposal systems. Developers will want to avoid the prospect of delays in servicing these lands, due to the likelihood the RD timeline for servicing of outlying areas will lag behind the preferred schedule of land developers. There will be a strong motivation on the part of the land developers to develop designs which are 'stand alone', not requiring connection to a regional or municipal sewerage system.

One of the difficulties with this prospect, from the RD's perspective, would be in the loss of revenue such onsite systems might represent; revenue that could otherwise help defray the cost of RD system extension to outlying areas. The extent to which this is, or will become, an issue will be dependent on:

- The decision regarding overall sewerage master plan system design, this being either a centralized or de-centralized plan.
- The land use decisions forthcoming from the RGS process.
- The political decision regarding jurisdiction and governance of an expanded sewerage function.

Demand for service from larger land developers may occur out of step with what would otherwise be the most efficient sequence of service extension, [i.e.: outward from the existing core service area]. In the absence of an agreed overall system master plan, demands imposed by large land developers may precipitate RD decisions as to overall master plan system component configuration, thereby potentially limiting future system configuration options.

The specter of RD sanitation system planning driven by the needs of specific larger land development project proposals, leads to a number of questions:

- Is the RD prepared to allow these larger land developers, with sites located in rural areas of the RD, to develop individual sewage collection and treatment systems, presumably by way of individual MSR applications?
- Would this represent lost revenue toward community based, regional sewer system initiatives? Is it preferred to avoid this by way of simply assessing their

share of capital costs for the preferred community based system in full, and allowing the alternate system(s) to be constructed, short term?

- Are larger, onsite systems viable over the longer term?

- Do these developers run the risk of building large, onsite systems which the RD will not want to take ownership of [and assume operation and maintenance of]. Is it likely the developer will not fully utilize the capacity of these systems, prior to RD providing service via a mandatory regional function? Does this commit the RD to a specific procurement schedule?

- Would the RD be prepared to take over ownership of a series of larger systems, developer initiated, but with spin off benefits to surrounding development? This is, by definition, a de-centralized system approach and appears to be the model now having been established via the comprehensive development agreement (CDA) with Kensington, for example.

- Is there any desire for privately owned and operated sewage collection, or treatment and disposal systems, or both? Would this lead to potential for 'urban sprawl' in the rural areas? These systems would, we presume, be regulated under the MSR, but would be operated under a service for profit motive. [This would be compared to the development of local service areas and site specific collection, treatment and disposal systems under RD control. In this case with a revenue neutral motive presumably]. Could the potential variation in cost of service provision, based on these two private and public service models operating concurrently be decided fair and equitable?

- Generally speaking, is the RD prepared to allow land development market forces to dictate the form and function of sewage collection, treatment and disposal in the Comox Valley? Is there a place for public/private partnerships? Does the overall system require guiding principles and an over arching long term functional plan, prior to allowing large onsite systems to be constructed? If de-centralized treatment and disposal is decided the preferred option, then larger land developers could be asked to pay for these facilities only once.

- Is it prudent, or in the general public's interest, to plan for a regional sewage function in which major elements are conceived of and constructed by land developers, over time? Can this be effectively managed? E.g., Royston/UBID LWMP vs. Kensington agreement. Can this be based on a sound vision for environmentally responsible and cost effective overall system function?

- The RGS, resulting OCP updates and, perhaps more profoundly, the sanitation system selection which is constructed in response to this process, will serve to either encourage or restrict development in the long term.

2.1.3 <u>IMPACTS DUE TO LARGE SCALE LAND DEVELOPMENT</u>

The impacts due to isolated, large scale developments are dependent upon the selection of an overall system configuration. The selection of an overall master plan system configuration is in large part dependent upon the desire of the CVRD to service large developments beyond the current urbanized area. We expect the Regional Growth Strategy and subsequent OCP amendments will dictate the character and scale of any development beyond the existing developed core area. However, in an effort to provide background information in support of RGS efforts, we have outlined our understanding of status and servicing implications relative to the major prospect developments in the region.

Sage Hills [Royston]

The parcel of land that Sage Hills have expressed interest in developing is located, very generally, at the south eastern intersection of the Trent River, and the inland island hwy. The specific location can be seen on drawing S-12.

Preliminary discussions have been held between the CVRD, MCSL and Sage Hills to discuss potential development, as envisioned. Provided below is a synopsis of development, as discussed:

- Up to 3000 residential units are possible.
- A total of 750 students (university and sports academy) are expected by year 2012.
- Construction could commence as soon as 2010.
- Full build out is expected to take 15 years.

The potential impact due to Sage Hills developing is very much dependent upon the ultimate system configuration selected. Strictly speaking, there is no technical reason that sanitation service could not be provided to Sage Hills, regardless of the system configuration selected.

Kensington [Union Bay]

Kensington properties have proposed, and received 3rd reading, for approximately 2400 residential units in the Union Bay Improvement District area. Drawing S-12 indicates the location and extents of the lands owned by the Kensington group. The development is located more proximally to existing development along the waterfront corridor. Some golf courses construction effort has begun at this site.

It is assumed, based on the status of the development proposal, that this project will be completed. However, it is not yet known with certainty where sewerage treatment facilities for the development will be located. The development agreement indicates that a satellite treatment facility will be constructed in the UBID, and will ultimately provide capacity for the connection of existing UBID residents. Ownership of this facility would, upon commissioning, be handed over the CVRD.

We recommend that the CVRD consider the ultimate servicing arrangement of the southern outlying areas as a whole, when evaluating this proposal. Specifically, the inclusion of areas as far north as Cumberland, and south to Ships Point, could potentially be serviced. This arrangement, in essence, is Option 2.

Raven Ridge [Courtenay]

The proposed Raven Ridge development in Courtenay is located in Block 71, north east of the City core. Development information presented thus far to the City of Courtenay indicates that a total of 1350 single and multifamily units, as well as an 18 hole golf course and commercial center are planned. A development application was filed by the Raven Group, but has since expired. No new information is available regarding the timing of a resubmission by the developer.

The Raven Ridge development would ultimately be serviced via the Greenwood Trunk sewer. Previous studies and preliminary designs of the Greenwood trunk, prepared on behalf of the (then) Comox-Strathcona Regional District, have accounted for this development. We understand that in the short to medium term, the developer may wish to pump effluent over the height of land, into the existing City of Courtenay Collection system. This wastewater would ultimately make its way to the CVWPCC via the Courtenay River pump station. We understand that the City of Courtenay has agreed to this arrangement, with a predetermined number of units having been tentatively agreed to. Ultimately, the Greenwood system will need to be advanced and all short term flows redirected.

Trilogy [Cumberland]

The mixed commercial/residential Trilogy development on the Cumberland interchange lands, could ultimately amass a total equivalent population of nearly 5,000. This development, and to a lesser extent the proposed Coal Valley development, could provide economic stimulus to Cumberland, which would otherwise be expected to develop at a more modest rate. Based on the most probable development scenario, the 50 yr population of Cumberland could exceed 20,000.

The Village of Cumberland is actively planning for development, as envisioned by Trilogy et al. We understand proposed expansion to the constructed treatment wetland has been postponed, pending further study by the Village. We gather that the Ministry of Environment has deemed the LWMP not complete.

The Village is now considering all potential servicing options, including connection to the CVRD system. Cumberland's existing treatment facilities are presently operating at, or beyond volumetric capacity and out of permit compliance for other parameters. We would therefore assume that if Cumberland elects to connect to the CVRD system, there may need to be a phased approach, wherein interim upgrades are undertaken (in a cost effective manner), so as to allow for some development growth in the short term.

Given Cumberland's sewer system is combined, we anticipate that the introduction of effluent, would need to be phased. This is particularly true when considering centralized treatment options. Initially, the sanitary flows from <u>new</u> development areas, and rehabilitated (separated, relatively 'tight") areas could be diverted to the CVRD system. Existing, older neighbourhoods, with combined sewers, or separated sewers with disproportionally high rates of inflow and infiltration, could be connected as funding for rehabilitation allows. This scenario, in the short term, would dictate that Cumberland maintain their existing treatment facility, and contribute financially towards the capital construction costs of required CVRD system upgrades, inclusive of O&M.

2.1.4 ONSITE SYSTEM(S) ACCEPTABILITY – LONG TERM

Numerous small to medium sized developments have been allowed to occur within the rural, unincorporated areas, utilizing private onsite treatment systems. Onsite systems having design flows less than 22,750 l/day discharging to ground are regulated by the Vancouver Island Health Authority, (less than approximately 15 units); larger systems discharging to ground are regulated under the Municipal Sewage Regulation (>15 units). The desire to continue allowing these smaller developments to occur, beyond the areas serviced by community based sanitation facilities, should be reviewed. Consideration, at a minimum, should be given to:

- Do these small systems lead to urban sprawl? What conditions, if any, could be imposed to mitigate sprawl?
- In the case of VIHA approved systems – what assurance does the CVRD have that these systems will continue to operate in perpetuity? Policy should be established as to CVRD process in the event these systems fail.
- Is the Regional District losing out on revenue, or potently being short changed in the long run, if or when community sewers are advanced to the area in question? "DCCs in kind" should be considered.

The status quo approach to private treatment systems in the outlying areas is likely not a viable strategy, long term. Geotechnical overview of the CVRD provided by EBA indicates the potential for ground disposal of wastewater, particularly along the waterfront and in areas of relatively dense (existing) development, is poor to very poor. As a result, the costs per household may be higher [e.g.: for more elaborate and high tech onsite systems] than with a community based collection and treatment system, over the long term.

Recommendations and conclusions for specific properties could not be drawn from the overview assessment provided by EBA. This was expected due to the broad nature of the effort. However, the following generalizations can be inferred:

- All effluent disposal fields have a finite service life, which will vary depending on design, insitu conditions (soils, water table, topography, etc).
- The probability of failure increases with improper usage of the system.
- The probability of failure increases without proper maintenance of the system.
- Systems that are functioning at present, but located in areas with failing septic systems, have a higher probability of failure.
- The cost of replacement onsite systems may not be the constraining factor. Site conditions and regulations may preclude replacement.

2.2 GOVERNANCE ISSUES

2.2.1 COST RECOVERY MODELS/SOURCES

Capital recovery is anticipated by a combination of the following sources:

- borrowing bylaws and special levies or fixed term taxation
- higher level government grants
- large land development funding
- development cost charges [DCCs]
- service connection fees and frontage charges

Capital construction costs could be recovered on a user pay basis, with each 'service area', the boundaries of which are yet to be defined, providing funding, on a measured flow basis. In this case, the cost of local collection sewers would be recovered from discrete areas, each of which is tributary to the RD Trunk System. Alternately, a flat fee recovery model may be decided more equitable.

Operation and maintenance funding, by contrast, is to be recovered from system users overall, through a more uniform assessment of costs.

The magnitude and breakdown of required capital funding, is perhaps best illustrated via expansion upon the current DCC tabulations. Through development of both short term and longer term draft DCC bylaw update tables, expectations as to 'benefit to existing users' can be outlined, the value of which will need to be generated from other than new land development.

In order to advance services, larger land developers may request to build treatment systems to eventually be taken over by the RD. The appropriate means of allocating regional system costs in such cases needs to be decided. Commonly, DCC credits or rebates are made available to land developers who construct portions of a planned community sewerage system. It may also transpire that larger land developers wish to design and construct plant which is intended to be completely independent of RD planned systems. In these cases, the RD will need to decide if this will be allowed, and if so, is service to areas surrounding the new large development site should be included in the discrete service area to be created.

2.2.2 COST ALLOCATION

Tiered Cost Allocation vs. Flat Rate Cost Allocation

Introduction

Setting aside the inter-jurisdictional issues, it may be illustrative to consider the model typically used by a municipality in recovery of costs for sewerage system expansion. The existing system within the municipality has value. It was paid for, or is being paid for, generally, by the residents who receive (or could receive) the service. New development will give rise to existing system upgrading requirements. DCC bylaws are typically devised in order to equitably recover the direct costs of system expansion [and sometimes the costs of system extension into new areas].

These DCC bylaws also take into account the incidental “benefits to existing users”, which the replacement or upgrading of existing system components represents. In other words, there may have been reasons other than simply capacity constraints which require particular system components to be replaced, e.g.: system age and useful service life, upgrades required due to regulatory changes, etc.

In some cases, the benefit to existing users is decided to be very small or even non-existent. Thus, notwithstanding upper government grant monies (which are sometimes anticipated and carried in the calculations of cost recovery), and “developer assist” allowances, there are DCC bylaw projects for which the entirety of cost is expected to be borne by new users of the system.

The history of payment structure for sewerage service within the RD does bear on the equitability of proposed methods for (system expansion) cost recovery. At present, the costs of ongoing capital replacement and O&M costs are levied by the CVRD on the member municipalities. In turn, user fees are collected by Courtenay and Comox, based on differing recovery formats.

Residents beyond the municipal boundaries (excluding 19 Wing Comox) were not asked to pay for the initial capital cost of the existing RD system, nor have they been asked to pay, through general taxation, for the on-going operation and maintenance of the systems. This system, by definition under the RD sewerage commission, is a separate, stand alone function, with separate tracking of funding and expenditures.

Thus, we conclude, that a cost recovery system needs to be established, based on new users of the system paying for new system extensions, and for their rightful share of existing system upgrading. An equitable breakout of future RD sanitation system capital expenditures is required, assuming of course it is decided to extend services beyond the boundaries of the existing sewerage commission mandate.

Accepting the above is acknowledged and agreed upon, it is then left to be decided how to equitably recover costs for system expansion into un-serviced areas. I.e.: should this be a simple uniform cost per new connection, [or cost per unit of flow, independent of distance from the site(s) of treatment and disposal]. Conversely, should these costs be recovered based on a system with several separate service areas, with differing costs per unit assigned to each?

In either case, we would clarify, it is expected that both the new users within existing municipal boundaries and new users within the rural, outlying RD areas, must pay for the expansion and extension of services. The RD already receives DCC monies, collected by the municipalities on behalf of the RD, as a result of development occurring within the two municipalities. Thus, the mechanism for recovery of costs in these areas already exists, although the rates charged and benefiting areas covered requires updating.

We note that in some cases, it is defensible to establish varied DCC bylaw <u>areas</u> for the same infrastructure function, e.g.: sewerage system within a given municipality, where the actual costs of the service provided vary greatly, from area to area. Thus, there are opportunities, if the municipality feels it appropriate, to charge for system expansion and replacement, via differing DCC rates in different areas. This, in essence, leads to the concept of a tiered cost recovery.

It needs to be decided if the RD's DCC bylaw charges and benefiting areas should simply be expanded, to include the rural areas in full, with uniform charges for new development assessed throughout. Alternately, should costs in the rural areas be assessed based of differing charges, reflecting the unique circumstances in each such existing developed area?

Tiered Cost Model:

Under the user pay, or tiered model of cost recovery, service area boundaries need to be established. As a first iteration effort, we have considered these boundaries, on the basis of existing local governance boundaries and there under, as a sub-set, the nodes of existing development which would be serviced. Attached are drawings S-16 through S19, which outline the boundaries assumed for purposes of illustrating this concept.

Based on the multi-jurisdictional infrastructure contemplated in this study, the need to establish a series of "service points" exists. These service points would be located at the confluence of sewerage flows from the various service areas, within the CVRD system. These locations would house flow metering stations, so as to allow for the equitable allocation of system O&M costs, based on volumetric measure. Consideration may also be given to assigning premiums to mass loadings of oxygen demanding organic material, ammonia, and solids, as may be generated by food processing, dairy, or other industrial applications.

As system (service area) expansion progresses, the need will likely arise to relocate these points of measurement. For instance, it is conceivable that the Greenwood trunk sewer could require numerous metering points at all locations where Courtenay flows are intercepted (Hudson Rd, Block 71, etc.) in the short to mid term. Longer term, metering stations will be required at the points of extension to Kitty Coleman, and Saratoga Miracle Beach, assuming central treatment is provided.

Inter-jurisdictional flows are also conceivable as illustrated in the following example: flow could be conveyed from an RD area, through trunks within [and now controlled by] the City of Courtenay and then back into the RD system again further downstream. In this case, the trunk main would need to be entirely RD owned and operated. Flow measurement would be needed at all points where flows from more than one jurisdiction merge.

In order to assist in selection of the preferred overall master plan solution, the cost per service unit [dwelling unit or unit of flow] needs to be assessed, entering at each service point within the proposed RD trunk conveyance and treatment network, as is conceptually illustrated on drawings No. S-16 through S-19.

A break out of these costs per unit of flow is provided in order to illustrate large differences in costs per unit between the proposed discrete 'service areas', and thus, potentially assist greatly in the 'testing' of legitimacy of the differing overall master plan options. Provided overleaf is Table 18 which illustrates the incremental capital construction costs of the overall system configurations, based on service area. The populations used to derive per unit costs in Table 18 are based on new units serviced, i.e., it is assumed that the costs of system expansion will be borne by new users only.

It becomes evident, as one would expect, that the costs of service generally increase with distance from treatment. It can also be observed that the cost of service, generally, decreases as population and density increase.

The core area components required under each of the four overall servicing options provide benefit to existing users. This benefit is obtained through the replacement of existing infrastructure that will, in the future, need to be replaced due to service life expiry, not capacity shortfall.

Flat Fee Model

The alternative approach to capital cost recovery is a flat fee system, wherein, capital construction costs are paid at a uniform rate amongst all new CVRD users, regardless of geographic location. This method would likely allow for capital reserves to accumulate more rapidly than the tiered approach, based on the likely rate of growth in the urbanized core areas outpacing that of the outlying areas.

The primary detractor of the flat fee model is its inability to equitably assess increasing cost of service, to outlying areas. These outlying areas, Ships Point and Saratoga/ Miracle Beach are, depending on specific option selected, up to 200% more costly to service on a per door NPV basis. Table 18 suggests that the 50 year net present value on a per SFD basis for each of the servicing options explored is as follows:

Option 1 = $6,231 per SFD
Option 1A = $6,214 per SFD
Option 2 = $6,780 per SFD
Option 2A = $9,276 per SFD

In each case the costs derived for the core areas based on the flat fee approach were higher than the corresponding tiered fee. This scenario, may, by virtue of the defrayed costs of rural development, be perceived as encouraging sprawl. Thus, the need to develop high level planning and development guidelines, via the RGS, is reinforced.

Discussion

Initial capital construction and O&M costs based on the four overall system configuration options are presented in Table 17 (overleaf).

Based on Table 17, centralized treatment (Options 1 & 1a) have the lowest initial construction cost for the existing core areas. This is expected, as Option 1 maximizes the utility of infrastructure already in place, particularly treatment facilities. The variation in per unit cost between Courtenay and Comox is academic at this point. This concept is mirrored in the current development cost charge bylaw, in which benefit to both Courtenay and Comox was determined to be essentially identical. Beyond the core area, the cost of service based on centralized treatment becomes less desirable, from a purely capital construction cost perspective.

De-centralized treatment, Options 2 and 2A, appear to be least costly, in terms of initial capital cost, to service the outlying areas of Ships Point, and Saratoga/Miracle Beach. However, the 50 year NPV costs (complete with O&M), exceed the centralized estimates.

Land owners in rural unincorporated areas will have an expectation of service, if required to fund sanitation improvements and expansions. The timing of this service will likely be a point of debate amongst these residents. Consider the scenario wherein new development in the Saratoga Beach area is asked to contribute financially, in the order of $5,000 per door, for centralized treatment. An aggressive estimate of construction timing (given the need for trunk main extension as required under Option 1), obtaining higher level government grants/funding, etc, could be 10 to 15 years. In the interim, these areas would be expected to fund private treatment and disposal infrastructure, the cost of which would essentially be "throw away", beyond the 15 year horizon. We expect this would be contentious amongst some rural residents, particularly when considering that the cost of regionally provided service would far exceed that of their urban counterparts.

Sequential phasing of system expansion will likely be required, as a function of the magnitude of the costs contemplated, and the timing of service need. The ease of which the various options lend themselves to incremental construction tends to increase with the number of treatment facilities considered. For instance, under Option 2a, each of the seven service areas would be able to, as development or other demand dictated, fund, construct and commission treatment. These same areas, under a centralized treatment scheme, would be dependent upon intermediate development, in order to advance service. Take for instance the Union Bay Improvement District. It is expected that the Kensington development will require servicing within the next one to two years. In order to provide this service, system improvements, presumably sized to accommodate development from Cumberland, west Courtenay, and Ships Point would need to be financed. Thus, the immediate cost of service may be disproportionate to the number of connections, or require that intermediate areas of development, connect before otherwise desirable.

Research suggests that equitable cost recovery of multi jurisdictional sanitation service has been addressed by other regional districts, generally, on a user pay basis. For instance, Metro Vancouver utilizes a "zone" concept, wherein varying operational and development cost charges are levied, based on actual costs for four discreet zones. We gather the Regional District of Central Okanagan is also considering a user pay approach to system expansion into outlying areas, not currently serviced. Both of these jurisdictions have cited equity amongst new and existing users as the primary reason for utilizing this format. However, the Capital Region District is considering implementing a large system construction programme, based on the flat fee approach. This scenario varies from other examples in that the CRD is providing a new service to all residents within the specified area, via a de-centralized system.

<u>Existing System Value</u>

The existing system retains residual value in 2009. This valuation was recently undertaken, as part of the PSAB requirements. The intent of this exercise was firstly to assess the present day valuation of the infrastructure assets and secondly to provide a framework to ensure adequate funding is provided over time to enable eventual component replacement(s). Based on information made available by the CVRD, the 2005 capital replacement value of all sewerage infrastructure was estimated at approximately $38,000,000.

The existing system is owned and operated by the RD. As such, was the RD to decide to expand the service beyond the present sewage commission mandate, some change or adjustment in governance will be required, as discussed below. New users beyond the City and Town boundaries should be expected to pay directly for system extensions. They will also be expected to pay, through taxation, for O&M on both the new components of the system and their prorated share of O&M of the existing system components, in both cases a portion of which is to be set aside for eventual system replacement due to service life expiry.

Future system users will benefit from the existing system to some extent, at no cost to these new users, other than the cost of O&M through taxation. However, it does not appear equitable for new users of the system, beyond the City and Town, to be required to pay some share of the residual value of the existing system. New users of the RD sanitation system will utilize the additional capacity that exists today, thus upgrades will be required sooner than otherwise needed, i.e capacity constraints would drive the need to replace existing infrastructure, rather than serviceability.

We note the existing Courtenay collection system was built, over a short time period, roughly 40 years ago. The trunk mains in Courtenay have residual value. It could transpire that inter-jurisdictional flows will be conveyed, particularly in west Courtenay, via Courtenay's existing trunk network. If so, it will need to be decided if these mains should be converted to become part of the regional system, or conversely, if the cost of conveyance can be accounted for by an adjustment of billing for service on an annual volumetric basis.

Similarly, Comox is intent upon constructing parts of the CFB Comox gravity trunk extension. Comox may elect to turn this infrastructure over to the RD at some point in the future. Comox may at that time, be in a position to seek compensation for the component of residual value to be utilized by others.

In summary, simply stated, the most equitable recovery scheme involves the following:

	O&M costs*	**Capital Replacement**	**DCCs****
Existing users	Y	Y	N
New users	Y	Y	Y

* Where O&M costs are assumed to include an allowance for capital replacement funding, per on-going updates of 'PSAB' calculations.

** Where DCCs are either flat fee or differ by distinct service areas [tiered]. If regional borrowing is used to 'front end' or advance the timing of construction of new system extensions, then new users would pay some combination of DCCs and special taxation as needed to retire the debt over a reasonable time period.

2.2.3 JURISDICTIONAL FRAMEWORK

A. Background

Circa 1981, the local 'sewerage commission' was formed. This was essentially a partnership of Courtenay, Comox and the DND's interest at 19 Wing Comox. Monies were borrowed, supplemented we believe by federal/provincial grants, and the RD 'common services' as they were to become known, were commissioned and constructed. The debt repayment for this initial capital outlay was only very recently completed.

The sewage commission, through the CVRD, recovers costs for on-going operation and maintenance of the system, pro-rated on the basis of measured components of flow, from the three above noted parties. The RD is now contemplating expanding this regional sewerage function, to include areas outside those specifically indicated under the existing sewage commission mandate. Thus, political direction and decisions are required. The preferred technical solution to the overall sewerage servicing in the study area [i.e.: centralized vs. de-centralized treatment, etc.] may very likely be influenced or altered as a result of jurisdiction decisions.

B. Discussion

Although beyond the scope of this report, in an effort to facilitate discussion, below is a list of jurisdictional and operational structures which might be suitable to facilitate an expanded, regionally based sanitation system:

- Creation of several rural local service areas, still within the CVRD jurisdiction, using population projections per RGS and with differing sewer system extension cost recovery per capita (sewage commission to remain intact). Each local service area could be assigned a fee per equivalent dwelling unit, or per capita, for construction of new infrastructure. Separate cost recovery for ongoing O&M, assessed and measured on a per cubic metre basis (tiered cost allocation model).

- Creation of an overall district municipality, complete with rate structures as the new overall municipality deems fair and appropriate.

  New, small municipal incorporations, UBID for example, which each pay to the RD, expanding the sewage commission mandate. Or, Improvement Districts as separate entities, akin to municipalities, responsible for local collection networks. In this case, the regional system would begin at the point where inter-jurisdictional conveyance occurs.

- Maintain the status quo, but with a modified sewage commission mandate, perhaps the 'C.V. Sewerage Commission', wherein members paying for the service would include both municipalities and all other rural land owners as one additional service area (flat fee model)..

Some initial observations relative to this list are as follows:

1. Of these four governance models, some would tend to favour centralized treatment while others would lead toward de-centralized systems.

2. It would appear that the distinct service area concept was the jurisdictional approach assumed, if not explicitly outlined, in the various LWMPs having been initiated within the former RDCS in recent years, these being, Saratoga, Royston/UBID, West Courtenay, the Meadowbrook/Huband area, etc.

   It may be that impacts and implications relative to sewerage commission functionality, and jurisdictional adjustments that would have been required were not fully explored in these LWMPs, as most were preliminary in their focus and dependent on higher government funding which did not materialize. The intention of these past LWMPs appears to have been to recover costs in full from the new additional population who would then be receiving service.

3. The timing of need for provision of service in the outlying areas may dictate which jurisdictional model is adopted. It may be that large land development project demands will precipitate decisions in this regard.

4. It is conceivable, under the concept of a series of new, small municipalities, that each would be responsible for its own treatment and disposal, although this would appear an unlikely outcome.

3.0 INTERIM ACTION PLAN

3.1 GENERAL

Over the short term, there are a number of factors which will affect the RD's need [and ability] to make rational system configuration and funding decisions. These include the following:

- RGS outcome, expected in draft form by the end of 2009.

- Larger land development proposals. Proposed land use public process schedules, construction schedules, phasing proposals, etc. Development agreements, either pending or potential. Sanitation system plans and need for coordinated effort whereby systems are planned to maximize utility and overall public benefit, minimize total long term costs and environmental impacts, etc.

- The Courtenay pumping station and specific components at the Brent Road treatment plant have limited capacity. It is very likely these two facilities will remain in service for the foreseeable future. However the ultimate capacity required for each is by no means certain at this stage in the master plan process. Population growth within the service areas tributary to these two facilities is dependent on the local development economy.

  Appropriate funding needs to be accumulated to cover the probable costs to upgrade these facilities, on the timelines tentatively outlined at the end of Memo 1 of this study update report. This will require a DCC bylaw update. Commissioning of design and construction of these upgrades should only occur in the context of overall regional system upgrade needs, and maintenance of system configuration flexibility, but without unnecessary capacity redundancy that might occur if a de-centralized option is ultimately decided upon.

3.2 RGS ASSISTANCE – INTEGRATION

The following issues require discussion and feedback as part of the RGS process:

- Comment on the validity and applicability of settlement patterns, population densities and total population projections, as listed thus far in this sanitation master plan update study.

- Comment on means by which the recommended overall system approach to be selected can be woven into the RGS and subsequent OCP updates. Is it expected that future OCP updates will allow for the larger land development projects as are contemplated within the CVRD currently? If so, sanitation system configuration can be more firmly established and cost estimates better confirmed. Contributions expected from these developments can also be apportioned.

- Comment on acceptability of standalone treatment and disposal systems, conceived of, designed, constructed and commissioned by larger land developers. Fundamental principles and objectives to be adhered to in such cases must be defined.

- Comment regarding issues pertaining to larger land development projects, as outlined in Section 5.2.1 above.

- RGS discussion regarding densification of the two most remote nodes of existing development, these being Ships Point to the south and the Saratoga Beach area to the north.

- MCSL should provide commentary to the RGS team regarding sanitation system servicing implications and cost implications resulting from the RGS settlement recommendations.

3.3 POLITICAL DISCUSSION/DIRECTION

The following topics require political deliberation:

- Assessment of system cost allocation and operational governance which is equitable to all system users, both existing and future. The model to be adopted needs to acknowledge and respect the structure and history of the current sewage commission function.

- Direction is required in regard to preference for tiered vs. fixed rate cost allocation methods.

- Discussion regarding need for a public education programme regarding maintenance of smaller onsite private sewage treatment/disposal systems. Is there support for some modest financial incentives akin to the BC Hydro Power Smart programme, deferring larger community based capital spending? Consideration should be given to implementing universal requirements for onsite septic system maintenance, including septic tank pumping frequencies, package treatment system maintenance, etc. enforced by bylaw.

- Discussion and direction is required in regard to the preferred jurisdictional structure, as outlined in report Section 5.3.3 above.

3.4 RD STAFF ACTION ITEMS

We ask that RD staff review the following issues and provide direction to the consultant team:

- Review this Memo No. 3 and provide feedback to MCSL.

- Discuss formal integration of this sanitation system study with the RGS, in terms of settlement and population assumptions, cost effective infrastructure planning, etc.

- Consider how best to integrate public consultation into the sanitation system master planning process and prepare a draft outline for same.

- Consider the RD's willingness to accept onsite systems as a sanitation system in perpetuity. Develop policy regarding smaller onsite privately owned sanitation facilities. This policy may differ between new and existing systems.

- Is the 'do nothing' sanitation system solution acceptable in the long term, from a purely land use planning perspective?

- Engage the provincial government in regard to opportunities for funding of the system upgrading and expansion. What are we to expect in terms of ministry response to the systems as proposed and should the province's goals and focus affect what is presented in the final report.

- Provide commentary in response to LWMPs prepared by the RD in the past. These were stand alone documents without a clear overriding regional planning context. Is there a need for a formal, RD wide, LWMP?

- O&M cost estimate assistance. Consider PSAB asset replacement valuation as compared to overall RD annual O&M budget for this sewerage function on an annual percentage basis.

- Feedback and advice from RD and municipal accounting/finance staff, as to questions posed in Section 7.3 above. Input is required to preferred mechanism for borrowing and cost allocation covering multiple borrowing bylaws. Multiple service areas and 50 year planning horizon complicate the cost recovery model.

- Interim DCC bylaw update recommendations should be acted upon. Update the RD's 5 year capital plan to include projects listed in the recommended interim DCC tabulation.

- Solicit feedback from the Village of Cumberland in regard to preferred or anticipated timing of requirement for sewage treatment connection. What is the timing Cumberland anticipates for significant sewage treatment upgrading capital outlay, if connection to an RD system were not possible? What is Cumberland's expected scheduling for phased programme of I&I reductions and separation of sanitary sewer and storm drains within the Village?

- Consider if alterations of the sewerage commission mandate will be necessary whilst the RGS process is on-going, so as for example to accommodate larger land development agreements and expand RD capital plant, eg: Cumberland and Greenwood Trunk, inter-jurisdictional flows.

- Comment on DCC structure discussion, per report Section 6.2.2 above.

- Discussion and direction regarding the willingness to embrace IRM concepts, noting the cost/benefit implications.

3.5 COMPLETION OF ACTIVITIES 4/5

Subsequent to receipt of feedback outlined above, MCSL will undertake the following tasks, thus completing the RD sanitation system master plan update report:

- Assimilate input per above.
- Refine O&M cost estimates based on comparative analysis.
- Complete system options analysis, matrix evaluations, etc.
- Determine optimal overall RD system configuration.
- Compile and present final report draft.

APPENDIX P

DAYTON & KNIGHT LETTER REGARDING SEWAGE TREATMENT PLAN COST ESTIMATES

Dayton & Knight Ltd.
CONSULTING ENGINEERS

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May 26, 2009

VIA E-MAIL AND MAIL

Mr. Ian Whitehead, P.Eng.
Manager Engineering
McElhanney Consulting Services Ltd.
495 Sixth Street
Courtenay. B.C.
V9N 6V4

Dear Mr. Whitehead:

RE: CVRD Sanitary Sewerage Master Plan Update

This letter is provided in response to the issues regarding cost estimates for wastewater treatment facilities raised by Mr. Andrew Gower P.Eng. of Wedler Engineering LLP in his letter of April 27, 2009.

Mr. Gower noted that the costs allowed for the smaller treatment facilities in Master Plan Memo No.2 were considerably higher than similar sized package plants that Wedler have recently obtained cost estimates for.

As an example, the letter compared a cost recently received for a package treatment plant (ECOfluid system) for Saratoga Beach to the price given for Kitty Colman in Memo No.2. Both plants have similar design populations and average day design flows (Saratoga Beach: 2,995 people and 1,100 m^3/d, Kitty Coleman: 2,800 people and 1,300 m^3/d). The package system price was $2.4 million, while the Master Plan estimate was $6.5 million.

Very little information is given on what the price from ECOfluid includes. The following costs, included in the Master Plan estimate, are not listed as included in the ECOfluid price:

- Outfall: The master plan cost allows a construction cost of $1.6 million for an outfall to the Georgia Straight. The ECOfluid price included no outfall cost.

- Process reliability to meet the requirements of the MSR: No mention is made of compliance with the reliability requirements of the MSR.

- Preliminary Treatment: The Master Plan cost includes screening and grit removal. The ECOfluid estimate appears to include screening but not grit removal.

- Mechanical sludge dewatering: The ECOfluid price does not appear to include mechanical sludge dewatering.

- Site piping and utilities.

- Engineering: The ECOfluid price does not include engineering advice that the District would need to seek, separate from the design engineering that would be carried out by ECOfluid. Additionally no costs appear to have been included for registration under the MSR and an Environmental Impact Study.

- Earthquake engineering.

- Site preparation and restoration, landscaping, fencing etc.

- Operations building.

- Contingency: The Master Plan price includes contingency of 30% which we believe is appropriate for this level of planning.

If both the contingency and outfall costs are removed from the Master Plan estimate, the estimate would be $2.97 million, which is not significantly different from the ECOfluid price, given that the Master plan estimate includes additional items as noted above.

As explained in Memo No.2 the basis for the cost estimates (excluding outfalls) were cost curves. We would like to clarify that the majority of treatment plants which have been used in formulating the cost curves are BC plants, and all have been constructed. The curves are not based on estimates for other facilities.

While some cost economies may be achieved by use of package plants, we believe the cost estimates given in Memo No.2 are realistic, and are adequate for the purpose of comparing options.

Please let us know if you have any questions or concerns regarding the above.

Yours truly,

Dayton & Knight Ltd.

Al Gibb, Ph.D., P.Eng.

AG/lp
327.3

cc Andew Gower, Wedler Engineering

APPENDIX Q

MCSL TABLES 13A THROUGH 13G

Table 13a - Town of Comox Population Projections

Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	12,113	Population Growth at 1.48% per Annum	2008	12,113	Population Growth at 2.2% per Annum	2008	12,113	Population Growth at 2.88% per Annum
2009	12,292		2009	12,361		2009	12,462	
2010	12,474		2010	12,615		2010	12,821	
2011	12,659		2011	12,873		2011	13,190	
2012	12,846		2012	13,137		2012	13,570	
2013	13,036		2013	13,407		2013	13,961	
2014	13,229		2014	13,681		2014	14,363	
2015	13,425		2015	13,962		2015	14,776	
2016	13,624		2016	14,248		2016	15,202	
2017	13,825		2017	14,540		2017	15,640	
2018	14,030		2018	14,838		2018	16,090	
2019	14,238		2019	15,142		2019	16,554	
2020	14,448		2020	15,453		2020	17,030	
2021	14,662		2021	15,770		2021	17,521	
2022	14,879		2022	16,093		2022	18,025	
2023	15,099		2023	16,423		2023	18,545	
2024	15,323		2024	16,759		2024	19,079	
2025	15,550		2025	17,103		2025	19,628	
2026	15,780		2026	17,454		2026	20,193	
2027	16,013		2027	17,811		2027	20,775	
2028	16,250		2028	18,177		2028	21,373	
2029	16,491		2029	18,549		2029	21,989	
2030	16,735		2030	18,929		2030	22,622	
2031	16,983		2031	19,318		2031	23,274	
2032	17,234		2032	19,714		2032	23,944	
2033	17,489		2033	20,118		2033	24,633	
2034	17,748		2034	20,530		2034	25,343	
2035	18,010		2035	20,951		2035	26,073	
2036	18,277		2036	21,380		2036	26,824	
2037	18,547		2037	21,819		2037	27,596	
2038	18,822		2038	22,266		2038	28,391	
2039	19,101		2039	22,722		2039	29,209	
2040	19,383		2040	23,188		2040	30,050	
2041	19,670		2041	23,664		2041	30,915	
2042	19,961		2042	24,149		2042	31,806	
2043	20,257		2043	24,644		2043	32,722	
2044	20,556		2044	25,149		2044	33,664	
2045	20,861		2045	25,665		2045	34,634	
2046	21,169		2046	26,191		2046	35,631	
2047	21,483		2047	26,728		2047	36,657	
2048	21,801		2048	27,275		2048	37,713	
2049	22,123		2049	27,835		2049	38,799	
2050	22,451		2050	28,405		2050	39,916	
2051	22,783		2051	28,988		2051	41,066	
2052	23,120		2052	29,582		2052	42,249	
2053	23,462		2053	30,188		2053	43,466	
2054	23,810		2054	30,807		2054	44,717	
2055	24,162		2055	31,439		2055	46,005	
2056	24,520		2056	32,083		2056	47,330	
2057	24,883		2057	32,741		2057	48,693	
2058	25,251		2058	33,268		2058	50,096	

Notes:

= Expected year of build out per MOU

McElhanney

Table 13b - City of Courtenay Population Projections

Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	23,500		2008	23,500		2008	23,500	
2009	23,848	Population Growth at 1.48% per Annum	2009	24,613	Population Growth Per MOU	2009	24,558	Population Growth at 4.5% per Annum
2010	24,201		2010	25,726		2010	25,663	
2011	24,559		2011	26,839		2011	26,817	
2012	24,922		2012	27,952		2012	28,024	
2013	25,291		2013	29,065		2013	29,285	
2014	25,666		2014	30,178		2014	30,603	
2015	26,045		2015	31,291		2015	31,980	
2016	26,431		2016	32,404		2016	33,419	
2017	26,822		2017	33,516		2017	34,923	
2018	27,219		2018	34,629		2018	36,495	
2019	27,622		2019	35,742		2019	38,137	
2020	28,031		2020	36,855		2020	39,853	
2021	28,446		2021	37,968		2021	41,647	
2022	28,867		2022	39,081		2022	43,521	
2023	29,294		2023	40,194		2023	45,479	
2024	29,727		2024	41,307	End MOU Growth	2024	47,526	
2025	30,167		2025	42,133	Most Probable Population Growth at 2.0% per Annum	2025	48,894	Population Growth at 2.88% per Annum
2026	30,614		2026	42,976		2026	50,303	
2027	31,067		2027	43,835		2027	51,751	
2028	31,527		2028	44,712		2028	53,242	
2029	31,993		2029	45,606		2029	54,775	
2030	32,467		2030	46,518		2030	56,353	
2031	32,947		2031	47,449		2031	57,976	
2032	33,435		2032	48,398		2032	59,645	
2033	33,930		2033	49,366		2033	61,363	
2034	34,432		2034	50,353		2034	63,130	
2035	34,941		2035	51,360		2035	64,948	
2036	35,459		2036	52,387		2036	66,819	
2037	35,983		2037	53,435		2037	68,743	
2038	36,516		2038	54,504		2038	70,723	
2039	37,056		2039	55,594		2039	72,760	
2040	37,605		2040	56,706		2040	74,856	
2041	38,161		2041	57,840		2041	77,011	
2042	38,726		2042	58,997		2042	79,229	
2043	39,299		2043	60,176		2043	81,511	
2044	39,881		2044	61,380		2044	83,859	
2045	40,471		2045	62,608		2045	86,274	
2046	41,070		2046	63,860		2046	88,758	
2047	41,678		2047	65,137		2047	91,315	
2048	42,295		2048	66,440		2048	93,945	
2049	42,921		2049	67,769		2049	96,650	
2050	43,556		2050	69,124		2050	99,434	
2051	44,201		2051	70,506		2051	102,297	
2052	44,855		2052	71,916		2052	105,243	
2053	45,519		2053	73,355		2053	108,275	
2054	46,192		2054	74,822		2054	111,393	
2055	46,876		2055	76,318		2055	114,601	
2056	47,570		2056	77,845		2056	117,901	
2057	48,274		2057	79,402		2057	121,297	
2058	48,988		2058	80,990		2058	124,790	

Notes:

Table 13c - RID/UBID LWMP Study Area Population Projections

Lower Bound Population Estimate			Most Probable Population Estimate				Upper Bound Population Estimate			
Year	Population	Comments	Year	Population	Comments		Year	Population	Comments	
2008	3,236		2008	3,236			2008	3,236		
2009	3,361	Development of South Courtenay Annexation Area	2009	3,361	Development of South Courtenay Annexation Area & Aggressive Infill of Waterfront Areas	Kensington Development	2009	3,261	Development of South Courtenay Annexation Area & Aggressive Infill of Waterfront Areas	
2010	3,486		2010	3,486			2010	3,311		
2011	3,611		2011	3,861			2011	3,886		Kensington Development
2012	3,736		2012	4,236			2012	4,511		
2013	3,861		2013	4,611			2013	5,136		
2014	3,986		2014	4,986			2014	5,786		
2015	4,111		2015	5,361			2015	6,461		
2016	4,236		2016	5,736			2016	7,161		
2017	4,361		2017	6,111			2017	7,886		
2018	4,486		2018	6,486			2018	8,636		
2019	4,553	Lower Bound Population Growth at 1.48% per Annum	2019	6,736			2019	9,161		
2020	4,620		2020	7,053			2020	9,686		
2021	4,688		2021	7,370			2021	10,211		
2022	4,758		2022	7,688			2022	10,597		
2023	4,828		2023	8,008			2023	10,968		Upper Bound Population Growth at 2.88% per Annum
2024	4,900		2024	8,328			2024	11,352		
2025	4,972		2025	8,400			2025	11,749		
2026	5,046		2026	8,972			2026	12,161		
2027	5,120		2027	9,296			2027	12,586		
2028	5,196		2028	9,620			2028	13,027		
2029	5,273		2029	9,946			2029	13,483		
2030	5,351		2030	10,323			2030	13,954		
2031	5,430		2031	10,620		Most Probable Population Growth at 2.88% per Annum	2031	14,443		
2032	5,511		2032	10,926			2032	14,948		
2033	5,592		2033	11,241			2033	15,472		
2034	5,675		2034	11,565			2034	16,013		
2035	5,759		2035	11,898			2035	16,574		
2036	5,844		2036	12,240			2036	17,154		
2037	5,931		2037	12,593			2037	17,754		
2038	6,018		2038	12,956			2038	18,375		
2039	6,108		2039	13,329			2039	19,018		
2040	6,198		2040	13,713			2040	19,684		
2041	6,290		2041	14,107			2041	20,373		
2042	6,383		2042	14,514			2042	21,086		
2043	6,477		2043	14,932			2043	21,824		
2044	6,573		2044	15,362			2044	22,588		
2045	6,670		2045	15,804			2045	23,379		
2046	6,769		2046	16,259			2046	24,197		
2047	6,869		2047	16,728			2047	25,044		
2048	6,971		2048	17,209			2048	25,920		
2049	7,074		2049	17,705			2049	26,827		
2050	7,179		2050	18,215			2050	27,766		
2051	7,285		2051	18,739			2051	28,738		
2052	7,393		2052	19,279			2052	29,744		
2053	7,502		2053	19,834			2053	30,785		
2054	7,613		2054	20,406			2054	31,863		
2055	7,726		2055	20,993			2055	32,978		
2056	7,840		2056	21,598			2056	34,132		
2057	7,956		2057	22,220			2057	35,327		
2058	8,074		2058	22,860			2058	36,563		

Notes:
- Assure SC Annexation area full build out = 500 units
- Kensington development assumed 2200 units

Table 13d - Cumberland Population Projections

Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	2,650	Coal Valley Estates 1000 Units Total, Approximately 4.0% Growth per Annum	2008	2,650	Coal Valley Estates 1000 Units Total, Approximately 8.0% Growth per Annum	2008	2,650	Coal Valley Estates 1000 Units Total, Approximately 6.0% Growth per Annum
2009	2,756		2009	2,862		2009	2,809	
2010	2,866		2010	3,091		2010	2,978	
2011	2,981		2011	3,338		2011	3,156	
2012	3,100		2012	3,605		2012	3,346	
2013	3,224		2013	3,894		2013	3,546	
2014	3,353		2014	4,205		2014	3,759	
2015	3,487		2015	4,542		2015	3,985	
2016	3,627		2016	4,905		2016	4,224	
2017	3,772		2017	5,297		2017	4,477	
2018	3,923		2018	5,721		2018	4,746	
2019	4,080		2019	6,179		2019	5,030	
2020	4,243		2020	6,673		2020	5,332	
2021	4,412		2021	7,207		2021	5,652	
2022	4,589		2022	7,394	Trilogy Land Corporation Development Approximately 2.6% Annual Growth, Post Coal Valley Estates	2022	5,991	
2023	4,773		2023	7,587		2023	6,351	
2024	4,843	Lower Bound Population Growth at 1.48% per Annum	2024	7,784		2024	6,637	Trilogy Land Corporation Development Approximately 4.5% Annual Growth, Post Coal Valley Estates
2025	4,915		2025	7,986		2025	6,935	
2026	4,988		2026	8,194		2026	7,247	
2027	5,061		2027	8,407		2027	7,574	
2028	5,136		2028	8,626		2028	7,914	
2029	5,212		2029	8,850		2029	8,270	
2030	5,289		2030	9,080		2030	8,643	
2031	5,368		2031	9,341	Most Probable Population Growth at 2.88% per Annum	2031	9,032	
2032	5,447		2032	9,610		2032	9,438	
2033	5,528		2033	9,887		2033	9,863	
2034	5,610		2034	10,172		2034	10,307	
2035	5,693		2035	10,465		2035	10,719	Bell Group Development Approximately 4.0% Annual Growth, Post Trilogy
2036	5,777		2036	10,766		2036	11,148	
2037	5,862		2037	11,076		2037	11,593	
2038	5,949		2038	11,395		2038	11,927	Most Probable Population Growth at 2.88% per Annum
2039	6,037		2039	11,724		2039	12,271	
2040	6,127		2040	12,061		2040	12,624	
2041	6,217		2041	12,409		2041	12,988	
2042	6,309		2042	12,766		2042	13,362	
2043	6,403		2043	13,134		2043	13,747	
2044	6,497		2044	13,512		2044	14,143	
2045	6,594		2045	13,901		2045	14,550	
2046	6,691		2046	14,301		2046	14,969	
2047	6,790		2047	14,713		2047	15,400	
2048	6,891		2048	15,137		2048	15,844	
2049	6,993		2049	15,573		2049	16,300	
2050	7,096		2050	16,021		2050	16,769	
2051	7,201		2051	16,483		2051	17,252	
2052	7,308		2052	16,958		2052	17,749	
2053	7,416		2053	17,446		2053	18,260	
2054	7,526		2054	17,948		2054	18,786	
2055	7,637		2055	18,465		2055	19,327	
2056	7,750		2056	18,997		2056	19,884	
2057	7,865		2057	19,544		2057	20,457	
2058	7,981		2058	20,107		2058	21,046	

Notes
- Coal Valley Estates total unit yield assumed to be 1000 units
- Trilogy equivalent population data per zoning servicing studies provided to the Village of Cumberland 2006 to 2008, = +/- 5500 people
- Bell Group total unit yield assumed to be 1700

Table 13e - Area A Exclusive of RID/UBID LWMP Area - Population Projections								
Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	2,702	Lower Bound Population Growth at 0.5% per Annum	2008	2,702	Most Probable Population Growth at 1.48% Growth per Annum	2008	2,702	Growth at 1.48% per Annum
2009	2,716		2009	2,742		2009	2,742	
2010	2,729		2010	2,783		2010	2,783	
2011	2,743		2011	2,824		2011	2,824	
2012	2,756		2012	2,866		2012	2,866	
2013	2,770		2013	2,908		2013	2,908	
2014	2,784		2014	2,951		2014	2,951	
2015	2,798		2015	2,995		2015	2,995	
2016	2,812		2016	3,039		2016	3,039	
2017	2,826		2017	3,084		2017	3,084	
2018	2,840		2018	3,130		2018	3,130	
2019	2,854		2019	3,176		2019	3,176	
2020	2,869		2020	3,223		2020	3,223	
2021	2,883		2021	3,271		2021	3,271	
2022	2,897		2022	3,319		2022	3,319	
2023	2,912		2023	3,368		2023	3,368	
2024	2,926		2024	3,418		2024	3,574	Sage Hills Development, Population = 8600
2025	2,941		2025	3,469		2025	3,792	
2026	2,956		2026	3,520		2026	4,023	
2027	2,971		2027	3,572		2027	4,268	
2028	2,985		2028	3,625		2028	4,529	
2029	3,000		2029	3,679		2029	4,805	
2030	3,015		2030	3,733		2030	5,098	
2031	3,030		2031	3,788		2031	5,409	
2032	3,046		2032	3,844		2032	5,739	
2033	3,061		2033	3,901		2033	6,089	
2034	3,076		2034	3,959		2034	6,460	
2035	3,091		2035	4,018		2035	6,855	
2036	3,107		2036	4,077		2036	7,273	
2037	3,122		2037	4,137		2037	7,716	
2038	3,138		2038	4,199		2038	8,187	
2039	3,154		2039	4,261		2039	8,686	
2040	3,170		2040	4,324		2040	9,216	
2041	3,185		2041	4,388		2041	9,778	
2042	3,201		2042	4,453		2042	10,375	
2043	3,217		2043	4,519		2043	11,008	
2044	3,233		2044	4,585		2044	11,679	
2045	3,250		2045	4,653		2045	11,738	Growth at 0.5% per Annum
2046	3,266		2046	4,722		2046	11,796	
2047	3,282		2047	4,792		2047	11,855	
2048	3,299		2048	4,863		2048	11,915	
2049	3,315		2049	4,935		2049	11,974	
2050	3,332		2050	5,008		2050	12,034	
2051	3,348		2051	5,082		2051	12,094	
2052	3,365		2052	5,157		2052	12,155	
2053	3,382		2053	5,234		2053	12,215	
2054	3,399		2054	5,311		2054	12,277	
2055	3,416		2055	5,390		2055	12,338	
2056	3,433		2056	5,469		2056	12,400	
2057	3,450		2057	5,550		2057	12,462	
2058	3,467		2058	5,633		2058	12,524	

Notes
- Calculation includes existing Ships Point, RID areas outside of LWMP area, Sage Hills, and surrounding area A
- Sage Hills Estimated population of 8600 provided by CVRD staff

Table 13f - Saratoga/Miracle Beach Nodal Population Projections								
Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	3,460	Population Growth at 1.48% per Annum	2008	3,460	Most Probable Population Growth at 2.88% per Annum	2008	3,460	Population Growth at 3.5% per Annum
2009	3,511		2009	3,560		2009	3,581	
2010	3,563		2010	3,662		2010	3,706	
2011	3,616		2011	3,768		2011	3,836	
2012	3,669		2012	3,876		2012	3,970	
2013	3,724		2013	3,988		2013	4,109	
2014	3,779		2014	4,103		2014	4,253	
2015	3,835		2015	4,221		2015	4,402	
2016	3,892		2016	4,342		2016	4,556	
2017	3,949		2017	4,467		2017	4,716	
2018	4,008		2018	4,596		2018	4,881	
2019	4,067		2019	4,728		2019	5,051	
2020	4,127		2020	4,865		2020	5,228	
2021	4,188		2021	5,005		2021	5,411	
2022	4,250		2022	5,149		2022	5,601	
2023	4,313		2023	5,297		2023	5,797	
2024	4,377		2024	5,450		2024	6,000	
2025	4,442		2025	5,607		2025	6,210	
2026	4,507		2026	5,768		2026	6,427	
2027	4,574		2027	5,934		2027	6,652	
2028	4,642		2028	6,105		2028	6,885	
2029	4,710		2029	6,281		2029	7,126	
2030	4,780		2030	6,462		2030	7,375	
2031	4,851		2031	6,648		2031	7,633	
2032	4,923		2032	6,839		2032	7,900	
2033	4,996		2033	7,036		2033	8,177	
2034	5,070		2034	7,239		2034	8,463	
2035	5,145		2035	7,448		2035	8,759	
2036	5,221		2036	7,662		2036	9,066	
2037	5,298		2037	7,883		2037	9,383	
2038	5,376		2038	8,110		2038	9,712	
2039	5,456		2039	8,343		2039	10,051	
2040	5,537		2040	8,584		2040	10,403	
2041	5,619		2041	8,831		2041	10,767	
2042	5,702		2042	9,085		2042	11,144	
2043	5,786		2043	9,347		2043	11,534	
2044	5,872		2044	9,616		2044	11,938	
2045	5,959		2045	9,893		2045	12,356	
2046	6,047		2046	10,178		2046	12,788	
2047	6,136		2047	10,471		2047	13,236	
2048	6,227		2048	10,772		2048	13,699	
2049	6,319		2049	11,083		2049	14,179	
2050	6,413		2050	11,402		2050	14,675	
2051	6,508		2051	11,730		2051	15,188	
2052	6,604		2052	12,068		2052	15,720	
2053	6,702		2053	12,416		2053	16,270	
2054	6,801		2054	12,773		2054	16,840	
2055	6,902		2055	13,141		2055	17,429	
2056	7,004		2056	13,520		2056	18,039	
2057	7,108		2057	13,909		2057	18,670	
2058	7,213		2058	14,309		2058	19,324	

Notes:
- Year 2020 population under most probable growth scenario is slightly more aggressive than that noted in the Saratoga/Miracle Beach LWMP

Table 13g - Kitty Coleman/Bates Beach Nodal Population Projections

Lower Bound Population Estimate			Most Probable Population Estimate			Upper Bound Population Estimate		
Year	Population	Comments	Year	Population	Comments	Year	Population	Comments
2008	1,350	Population Growth at 1.0% per Annum	2008	1,350	Most Probable Population Growth at 1.48% per Annum	2008	1,350	Population Growth at 2.0% per Annum
2009	1,364		2009	1,370		2009	1,377	
2010	1,377		2010	1,390		2010	1,405	
2011	1,391		2011	1,411		2011	1,433	
2012	1,405		2012	1,432		2012	1,461	
2013	1,419		2013	1,453		2013	1,491	
2014	1,433		2014	1,474		2014	1,520	
2015	1,447		2015	1,496		2015	1,551	
2016	1,462		2016	1,518		2016	1,582	
2017	1,476		2017	1,541		2017	1,613	
2018	1,491		2018	1,564		2018	1,646	
2019	1,506		2019	1,587		2019	1,679	
2020	1,521		2020	1,610		2020	1,712	
2021	1,536		2021	1,634		2021	1,746	
2022	1,552		2022	1,658		2022	1,781	
2023	1,567		2023	1,683		2023	1,817	
2024	1,583		2024	1,708		2024	1,853	
2025	1,599		2025	1,733		2025	1,890	
2026	1,615		2026	1,759		2026	1,928	
2027	1,631		2027	1,785		2027	1,967	
2028	1,647		2028	1,811		2028	2,006	
2029	1,664		2029	1,838		2029	2,046	
2030	1,680		2030	1,865		2030	2,087	
2031	1,697		2031	1,893		2031	2,129	
2032	1,714		2032	1,921		2032	2,171	
2033	1,731		2033	1,949		2033	2,215	
2034	1,749		2034	1,978		2034	2,259	
2035	1,766		2035	2,007		2035	2,304	
2036	1,784		2036	2,037		2036	2,350	
2037	1,802		2037	2,067		2037	2,397	
2038	1,820		2038	2,098		2038	2,445	
2039	1,838		2039	2,129		2039	2,494	
2040	1,856		2040	2,160		2040	2,544	
2041	1,875		2041	2,192		2041	2,595	
2042	1,893		2042	2,225		2042	2,647	
2043	1,912		2043	2,258		2043	2,700	
2044	1,932		2044	2,291		2044	2,754	
2045	1,951		2045	2,325		2045	2,809	
2046	1,970		2046	2,359		2046	2,865	
2047	1,990		2047	2,394		2047	2,922	
2048	2,010		2048	2,430		2048	2,981	
2049	2,030		2049	2,466		2049	3,040	
2050	2,050		2050	2,502		2050	3,101	
2051	2,071		2051	2,539		2051	3,163	
2052	2,092		2052	2,577		2052	3,227	
2053	2,112		2053	2,615		2053	3,291	
2054	2,134		2054	2,654		2054	3,357	
2055	2,155		2055	2,693		2055	3,424	
2056	2,177		2056	2,733		2056	3,493	
2057	2,198		2057	2,773		2057	3,562	
2058	2,220		2058	2,814		2058	3,634	

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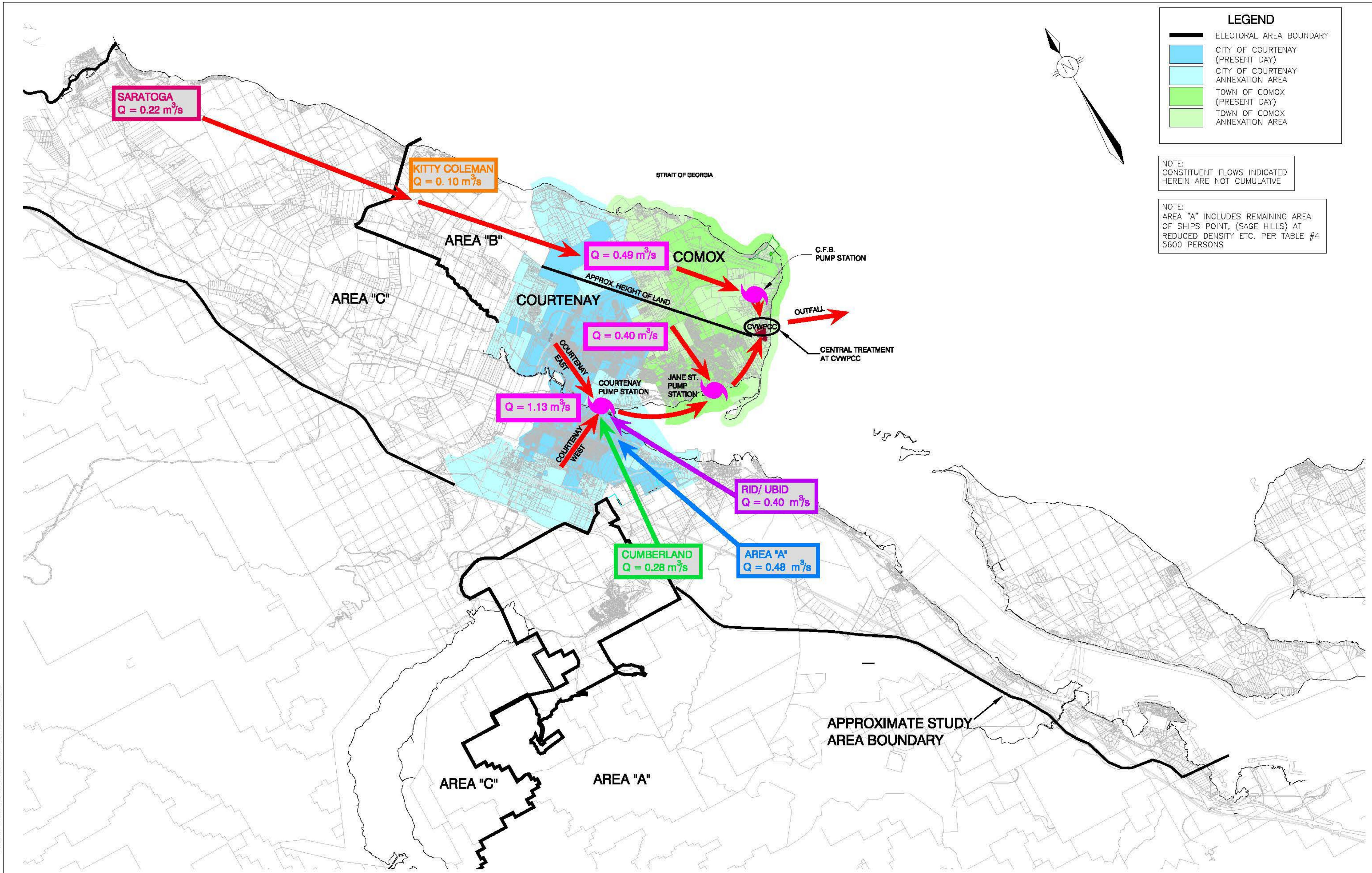
APPENDIX R

MISCELLANEOUS MCSL DRAWINGS S11, S11A THROUGH S11F, S12 & S13, O-1 THROUGH 04



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COMOX VALLEY REGIONAL DISTRICT

OVERALL SYSTEM COMPONENT SCHEMATIC
CENTRALIZED TREATMENT OPTION 1
CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No.
MCSL Project No. 2211-46970-0
Drawing No. O-1
Sheet 1 of 4
Revision 2
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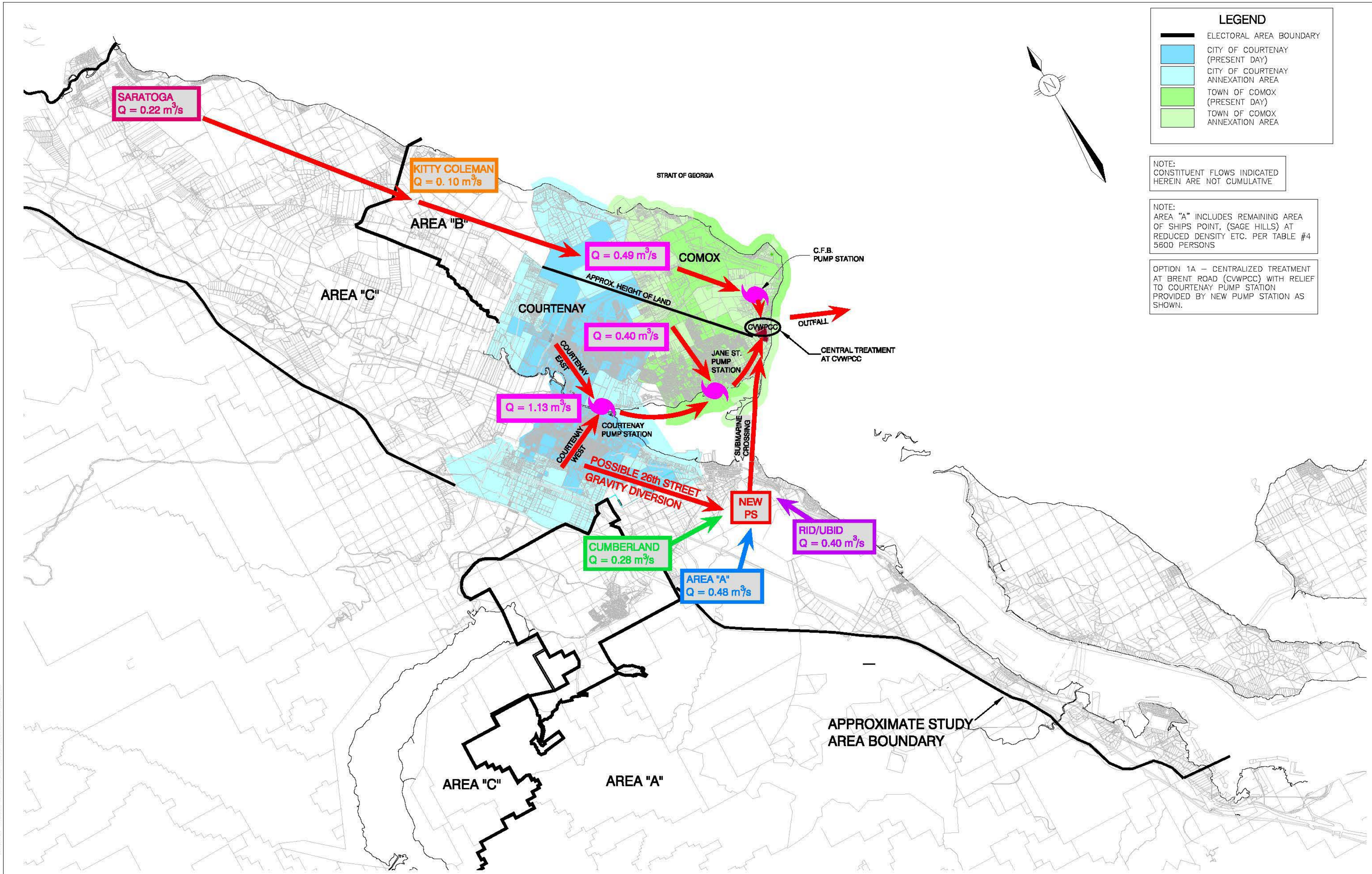

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OVERALL SYSTEM COMPONENT SCHEMATIC CENTRALIZED TREATMENT OPTION 1A

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

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Drawing No. O-2
Sheet 2 of 4 Revision 2

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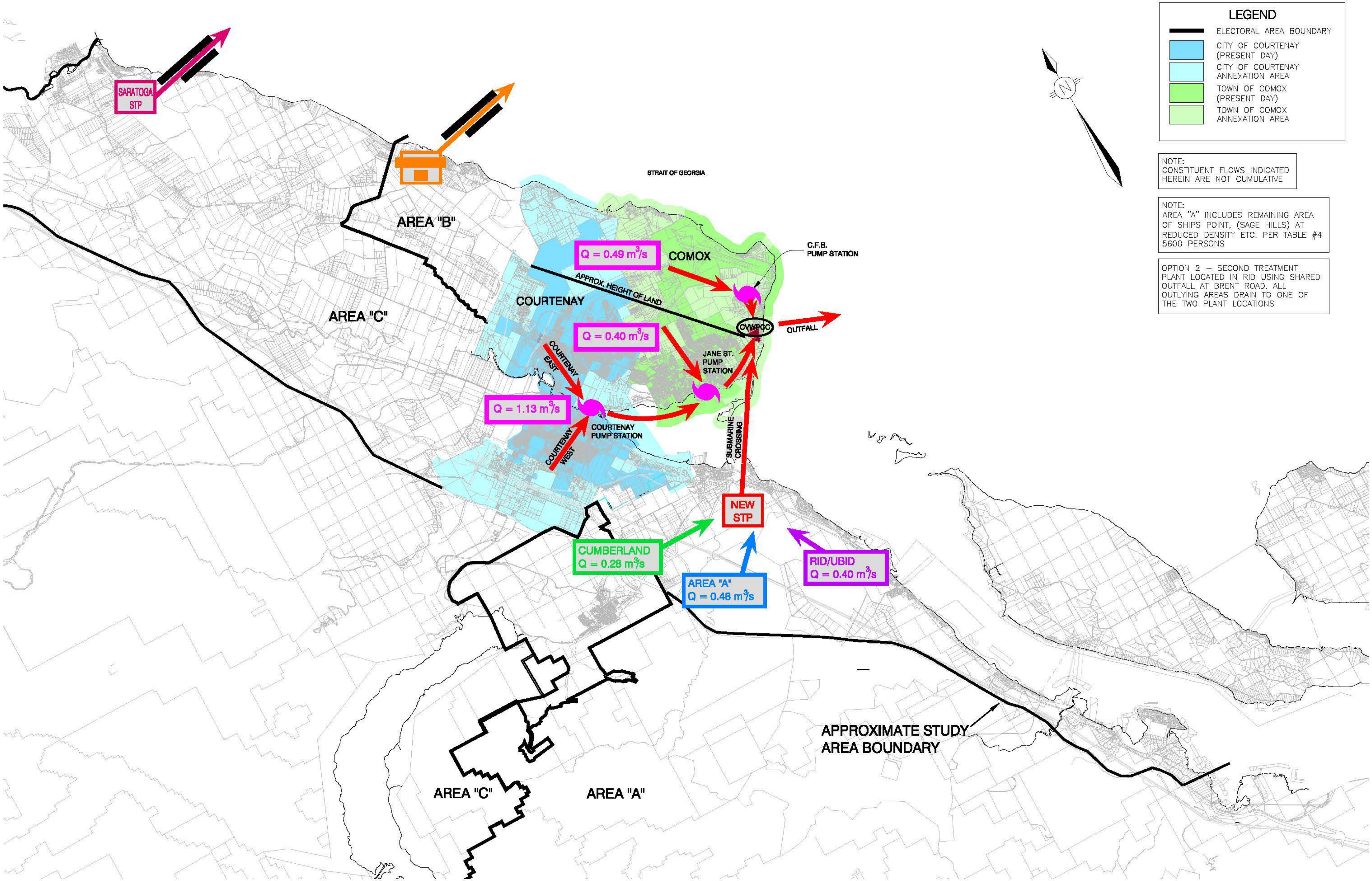

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OVERALL SYSTEM COMPONENT SCHEMATIC DECENTRALIZED TREATMENT OPTION 2

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
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Drawing No. O-3
Sheet 3 of 4
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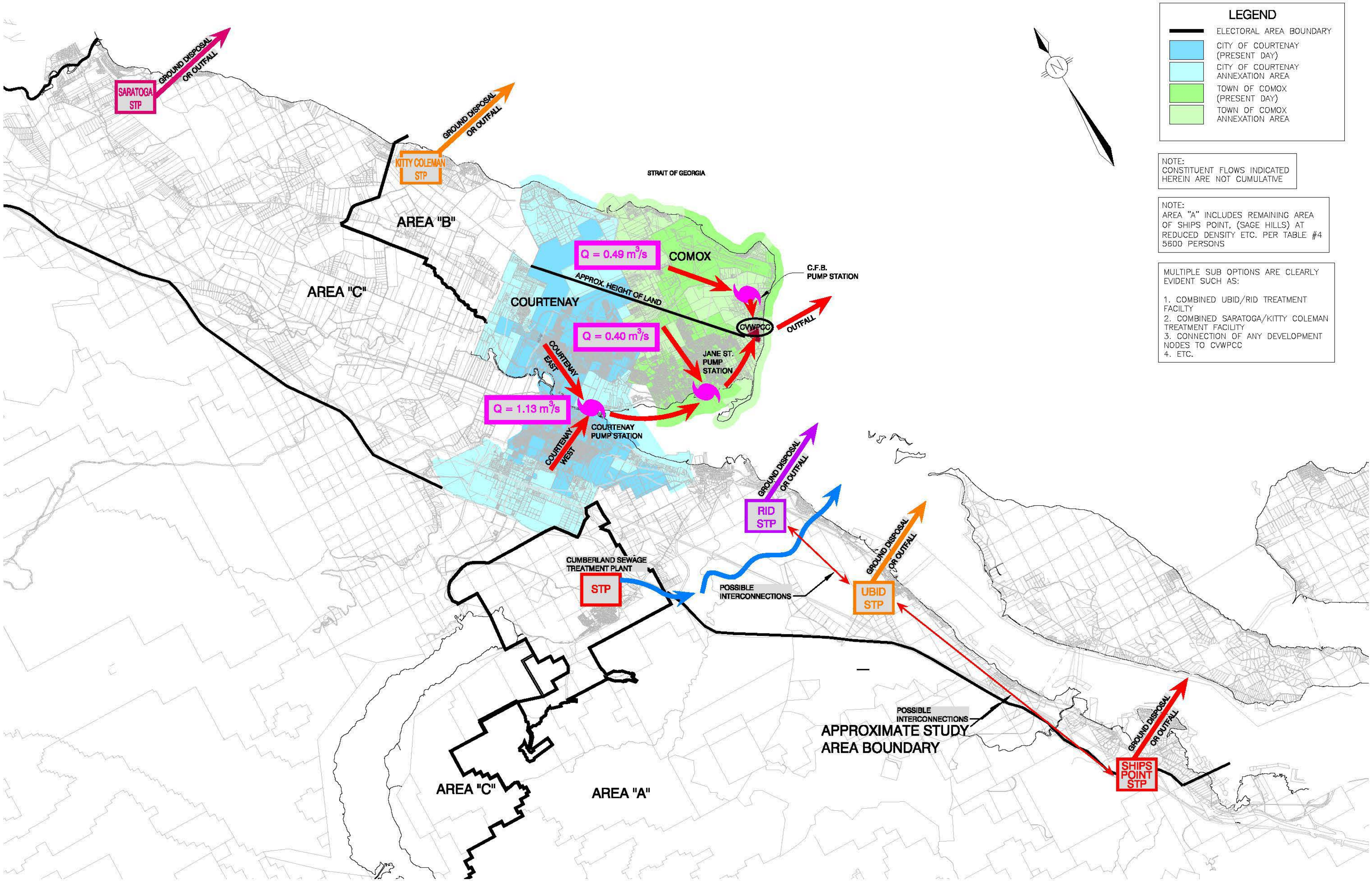

NOTE:
CONSTITUENT FLOWS INDICATED HEREIN ARE NOT CUMULATIVE

NOTE:
AREA "A" INCLUDES REMAINING AREA OF SHIPS POINT, (SAGE HILLS) AT REDUCED DENSITY ETC. PER TABLE #4 5600 PERSONS

MULTIPLE SUB OPTIONS ARE CLEARLY EVIDENT SUCH AS:

1. COMBINED UBID/RID TREATMENT FACILTY
2. COMBINED SARATOGA/KITTY COLEMAN TREATMENT FACILITY
3. CONNECTION OF ANY DEVELOPMENT NODES TO CVWPCC
4. ETC.

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COMOX VALLEY REGIONAL DISTRICT

OVERALL SYSTEM COMPONENT SCHEMATIC DECENTRALIZED TREATMENT OPTION 2A

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

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Drawing No. O-4
Sheet 4 of 4
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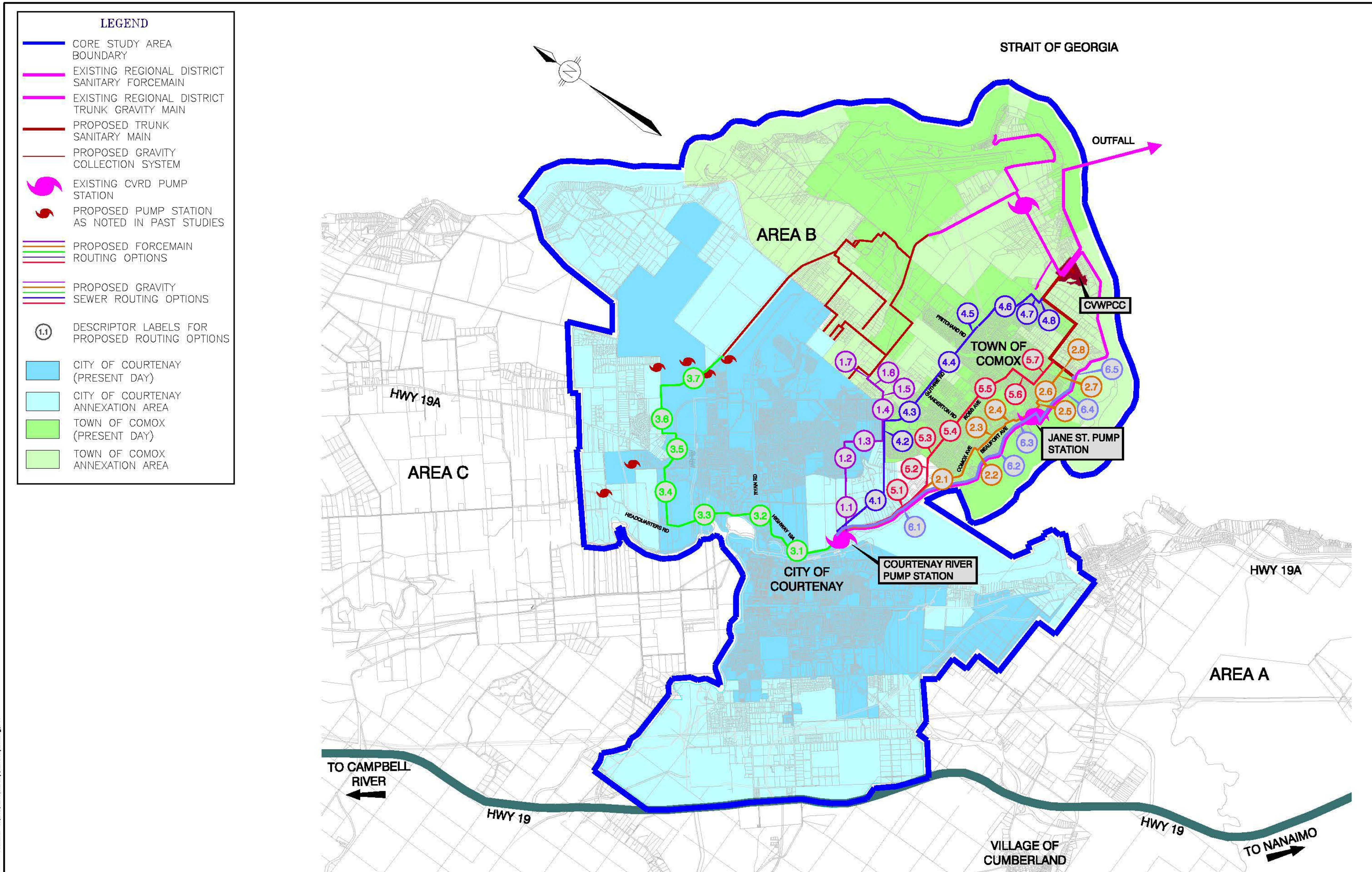

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COMOX VALLEY REGIONAL DISTRICT

PROPOSED ROUTING OPTIONS - CORE AREA

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
MCSL Project No. 2211-46970-0
Drawing No. S-11
Sheet 14 of 23
Revision 2
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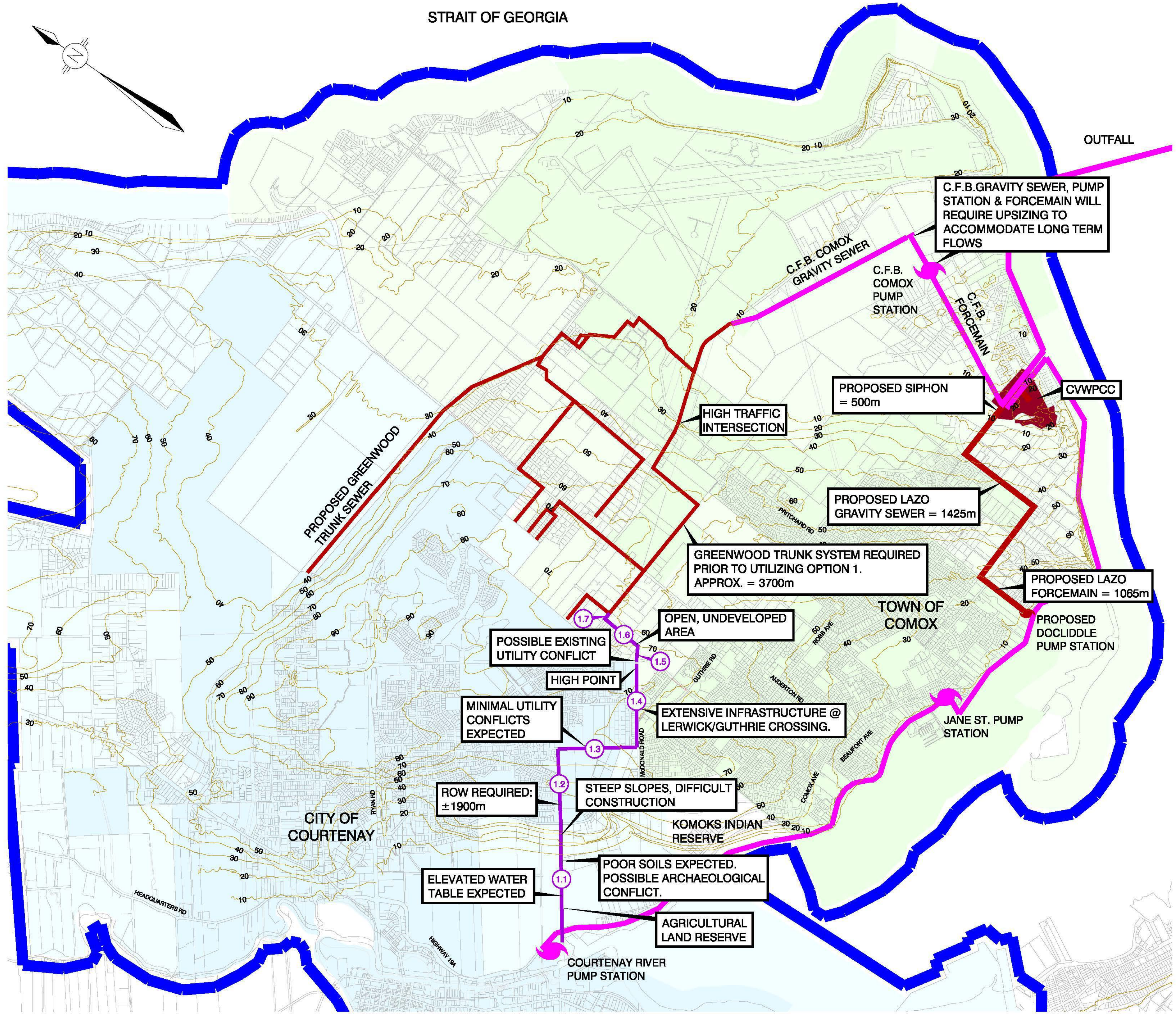
LEGEND

- CORE STUDY AREA BOUNDARY
- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
- PROPOSED TRUNK SANITARY MAIN
- PROPOSED GRAVITY COLLECTION SYSTEM
- EXISTING CVRD PUMP STATION
- PROPOSED PUMP STATION AS NOTED IN PAST STUDIES
- PROPOSED FORCEMAIN ROUTING OPTIONS
- PROPOSED GRAVITY SEWER ROUTING OPTIONS
- (1.1) DESCRIPTOR LABELS FOR PROPOSED ROUTING OPTIONS
- CITY OF COURTENAY (PRESENT DAY)
- CITY OF COURTENAY ANNEXATION AREA
- TOWN OF COMOX (PRESENT DAY)
- TOWN OF COMOX ANNEXATION AREA

Route Option Number	Pipe Section Reference Number	Description	Length (m)	Pressure or Gravity
Core Area Servicing Route 1 - McDonald/Idiens	1.1	Courtenay PS to Back Rd, through Section 9	1200	Pressure
	1.2	Plan 35008, from Back Rd to Sheraton Rd.	690	Pressure
	1.3	Sheraton Rd, from Plan 35008 to McDonald Rd.	750	Pressure
	1.4	Mcdonald Rd, from Sheraton Rd to Hector Rd	800	Pressure
	1.5	Through Plan 60685 to Aspen Rd.	150	Gravity
	1.6	Aspen Rd to Idiens Way	400	Gravity
	1.7	Idiens Way to Greenwood trunk Connection Point	60	Gravity
		Sub-Total	4050	



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COMOX VALLEY REGIONAL DISTRICT

PROPOSED CORE AREA ROUTING OPTION 1

CVRD MASTER SEWERAGE STUDY

COMOX VALLEY, BC

Client Drawing No
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Drawing No. S-11A
Sheet 15 of 23
Revision 2

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LEGEND

- CORE STUDY AREA BOUNDARY
- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
- PROPOSED TRUNK SANITARY MAIN
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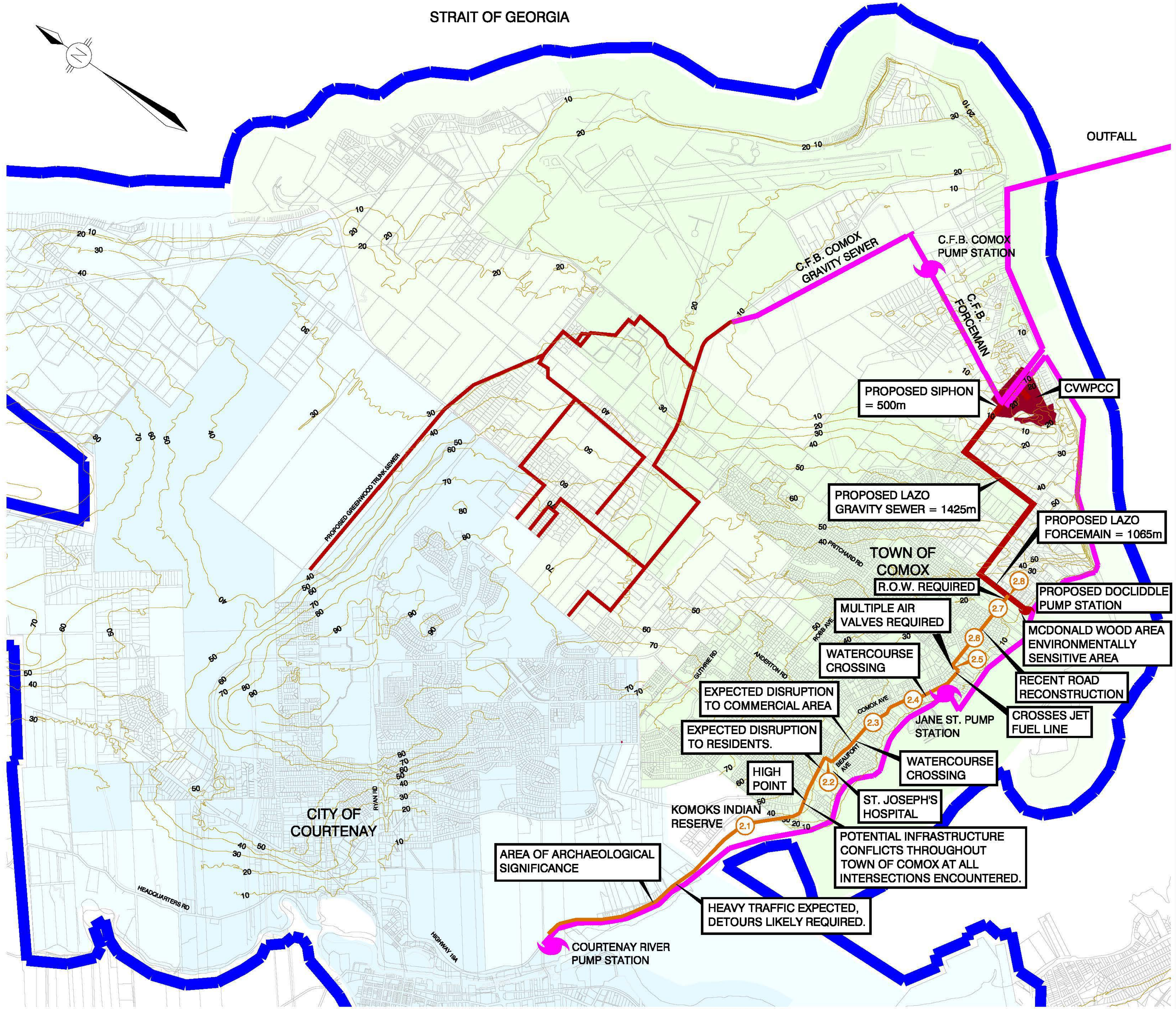

Route Option Number	Pipe Section Reference Number	Description	Length (m)	Pressure or Gravity
Core Area Servicing Route 2 - Beafort Ave	2.1	Dyke Rd. from Courtenay PS to Comox Ave at Rodello St.	3330	Pressure
	2.2	Rodello St, from Comox Ave to Beaufort Ave	80	Pressure
	2.3	Beaufort Ave, from Rodello St to Ellis St.	725	Pressure
	2.4	Beaufort Ave, from Ellis St to Stewart St.	790	Pressure
	2.5	Stewart St., from Beaufort St. to Comox Ave.	80	Pressure
	2.6	Comox Ave, from Stewart St. To end of Comox Ave.	610	Pressure
	2.7	End of Comox Ave to Croteau Rd.	220	Pressure
	2.8	New Pump Station at Croteau Rd. & Docliddle St.		
		Sub-Total	**5835**	

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COMOX VALLEY REGIONAL DISTRICT
PROPOSED CORE AREA ROUTING OPTION 2
CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
MCSL Project No. 2211-46970-0
Drawing No. S-11B
Sheet 16 of 23
Revision 2
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- CORE STUDY AREA BOUNDARY
- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
- PROPOSED TRUNK SANITARY MAIN
- PROPOSED GRAVITY COLLECTION SYSTEM
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- CITY OF COURTENAY ANNEXATION AREA
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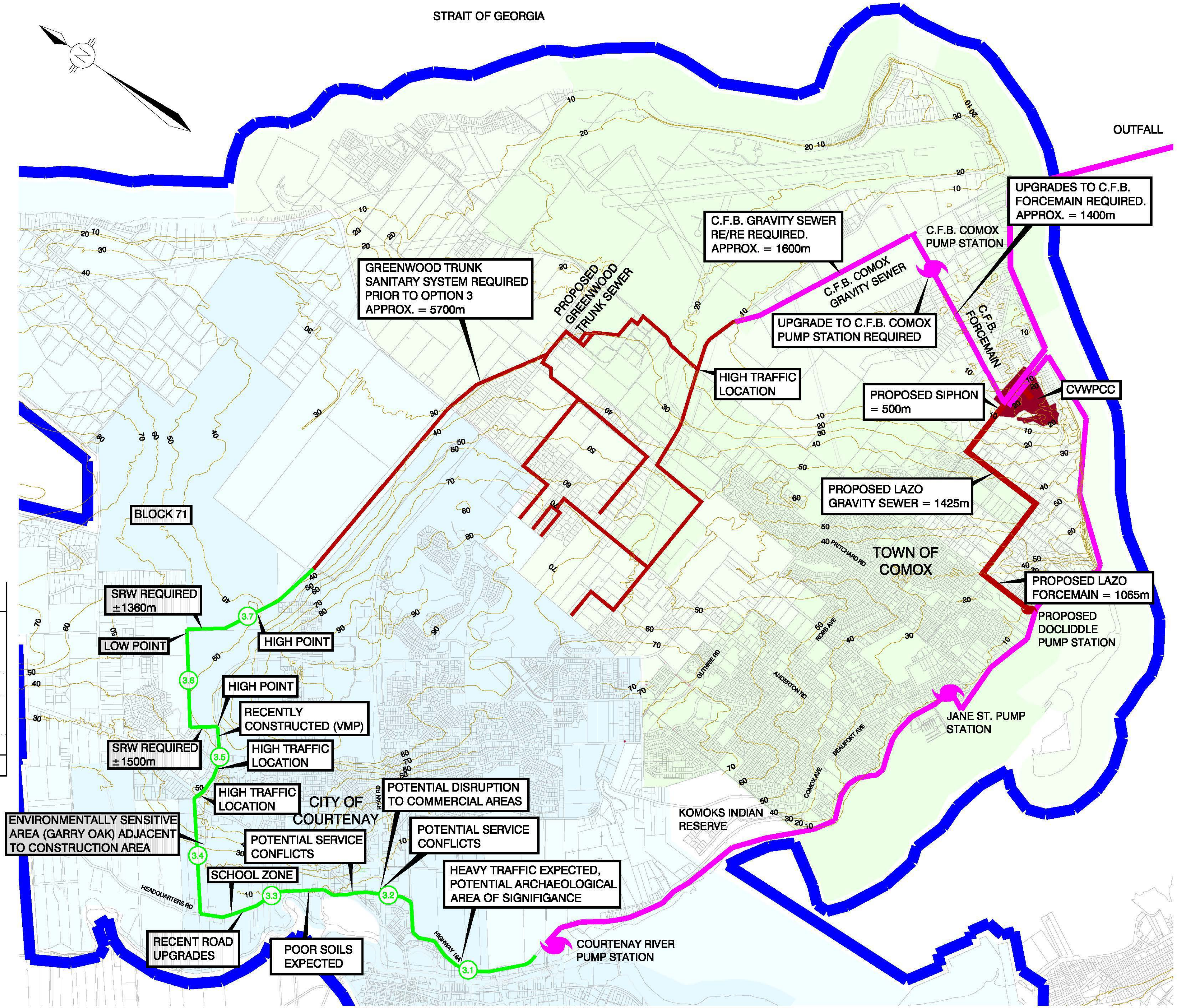
- TOWN OF COMOX ANNEXATION AREA

Route Option Number	Pipe Section Reference Number	Description	Length (m)	Pressure or Gravity
Core Area Servicing Route 3 - Block 71	3.1	Comox Rd, from Courtenay PS to HWY 19A	1500	Pressure
	3.2	HWY 19A, from Comox Rd. to Headquarters Rd.	850	Pressure
	3.3	Headquarters Rd, from HWY 19A to Vanier Dr.	1480	Pressure
	3.4	Vanier Dr., from Headquarters Rd. to HWY 19A	1160	Pressure
	3.5	Veteran's Memorial Parkway, from HWY 19A to DD 12676-N (Block 71)	670	Pressure
	3.6	Through DD 12676-N to Block 71	1170	Pressure
	3.7	Through Block 71 to Greenwood trunk	1350	Pressure
		Sub-Total	8180	



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COMOX VALLEY REGIONAL DISTRICT

PROPOSED CORE AREA ROUTING OPTION 3

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
MCSL Project No. 2211-46970-0
Drawing No. S-11C
Sheet 17 of 23
Revision 2

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LEGEND

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- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
- PROPOSED TRUNK SANITARY MAIN
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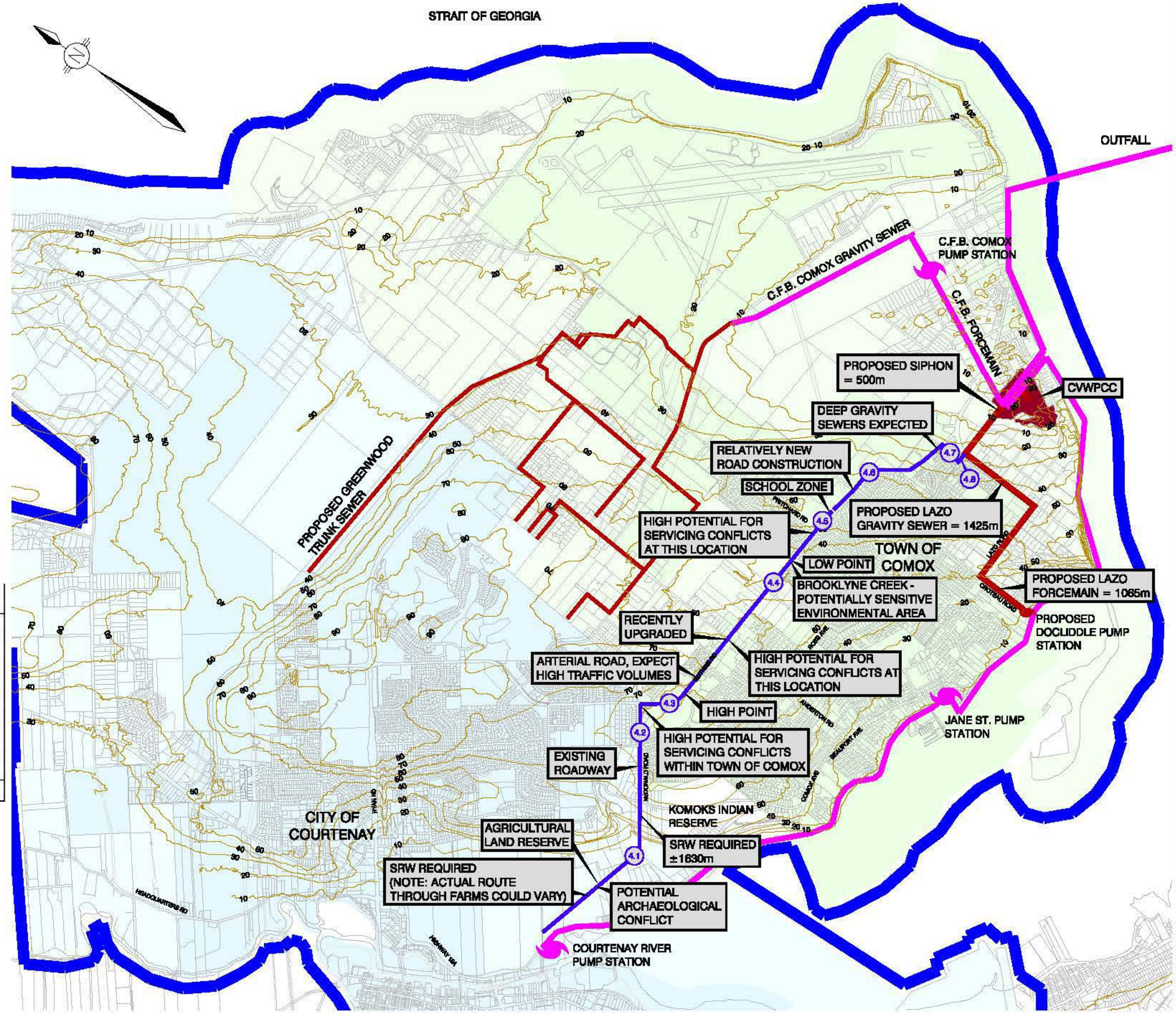
- TOWN OF COMOX ANNEXATION AREA

Route Option Number	Pipe Section Reference Number	Description	Length (m)	Pressure or Gravity
Core Area Servicing Route 4 - Guthrie Rd.	4.1	Courtenay PS to McDonald at Back Rd, through ALR	1700	Pressure
	4.2	McDonald Rd, from Back Rd to Guthrie Rd	900	Pressure
	4.3	Guthrie Rd, from McDonald Rd to Anderton Rd	1100	Pressure
	4.4	Guthrie Rd, from Anderton Rd to Pritchard Rd.	1270	Pressure
	4.5	Guthrie Rd from Pritchard Rd to Skeen Dr.	250	Pressure
	4.6	Guthrie Rd, from Skeen Dr to Beckton Dr.	1270	Gravity
	4.7	Beckton Dr, from Guthrie Rd to Gardner Way	220	Gravity
	4.8	Gardner Way, from Beckton to CH2MHILL Route	420	Gravity
		Sub-Total	7130	



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COMOX VALLEY REGIONAL DISTRICT

PROPOSED CORE AREA ROUTING OPTION 4

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

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Drawing No. S-11D
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LEGEND

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- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
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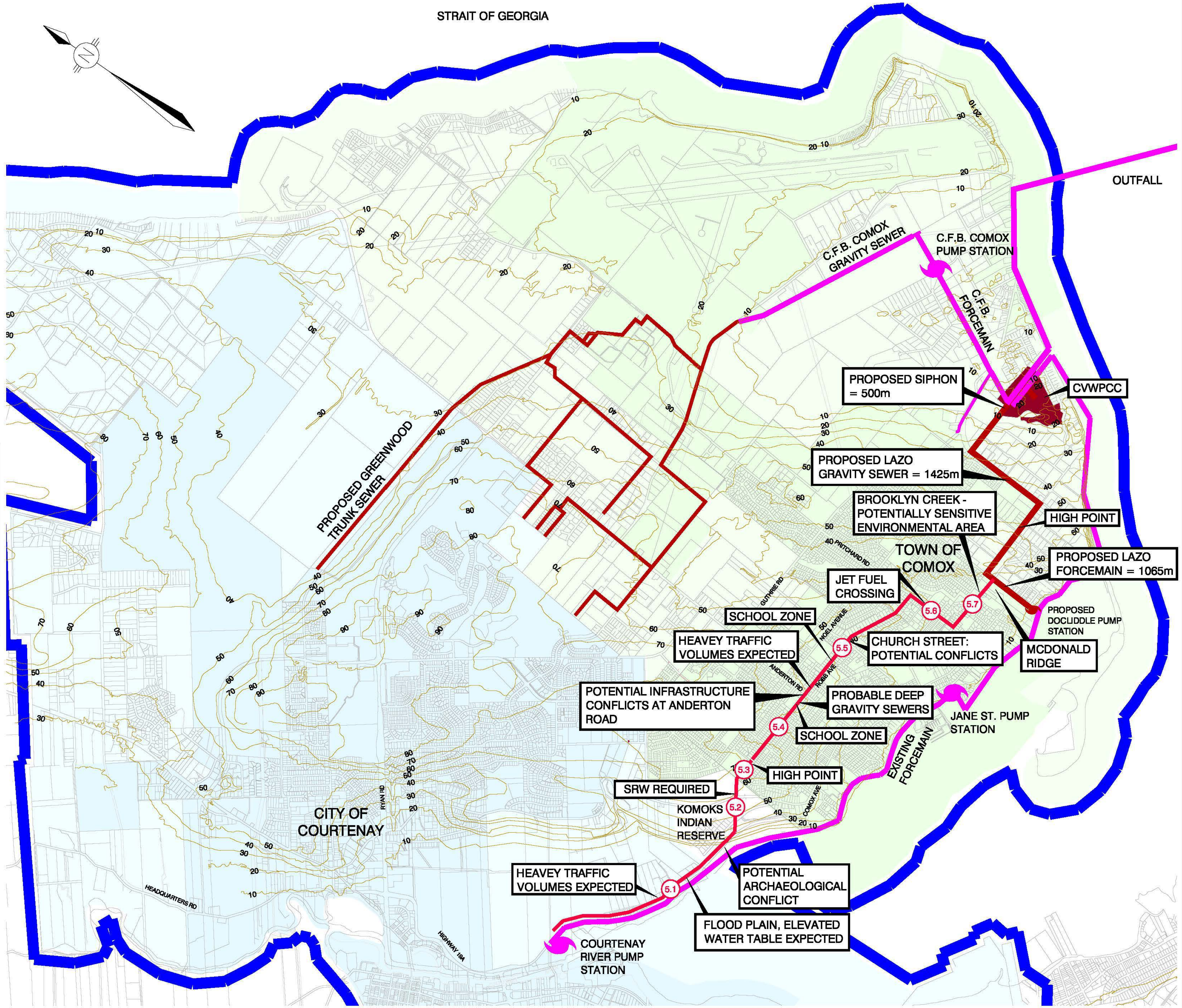
- (1.1) DESCRIPTOR LABELS FOR PROPOSED ROUTING OPTIONS
- CITY OF COURTENAY (PRESENT DAY)
- CITY OF COURTENAY ANNEXATION AREA
- TOWN OF COMOX (PRESENT DAY)
- TOWN OF COMOX ANNEXATION AREA

Route Option Number	Pipe Section Reference Number	Description	Length (m)	Pressure or Gravity
Core Area Servicing Route 5 - Robb Rd.	5.1	Courtenay PS to IR, along Dyke Rd.	2050	Pressure
	5.2	Through IR. Dyke Rd to Robb Rd.	500	Pressure
	5.3	Robb Rd, from IR to Condor St.	220	Pressure
	5.4	Robb Rd, from Condor St. to Anderton Ave.	800	Gravity
	5.5	Robb Rd, from Anderton Ave to Pritchard Rd.	1380	Gravity
	5.6	Prichard Rd, from Robb Rd to Balmoral Ave.	490	Gravity
	5.7	Balmoral Ave, from Pritchard St to Croteau, to Croteau pump station.	860	Gravity
		Sub-Total	**6300**	



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COMOX VALLEY REGIONAL DISTRICT

PROPOSED CORE AREA ROUTING OPTION 5

CVRD MASTER SEWERAGE STUDY

COMOX VALLEY, BC

Client Drawing No
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Drawing No. S-11E
Sheet 19 of 23
Revision 2

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LEGEND

- CORE STUDY AREA BOUNDARY
- EXISTING REGIONAL DISTRICT SANITARY FORCEMAIN
- EXISTING REGIONAL DISTRICT TRUNK GRAVITY MAIN
- PROPOSED TRUNK SANITARY MAIN
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- PROPOSED GRAVITY SEWER ROUTING OPTIONS
- (1.1) DESCRIPTOR LABELS FOR PROPOSED ROUTING OPTIONS
- CITY OF COURTENAY (PRESENT DAY)
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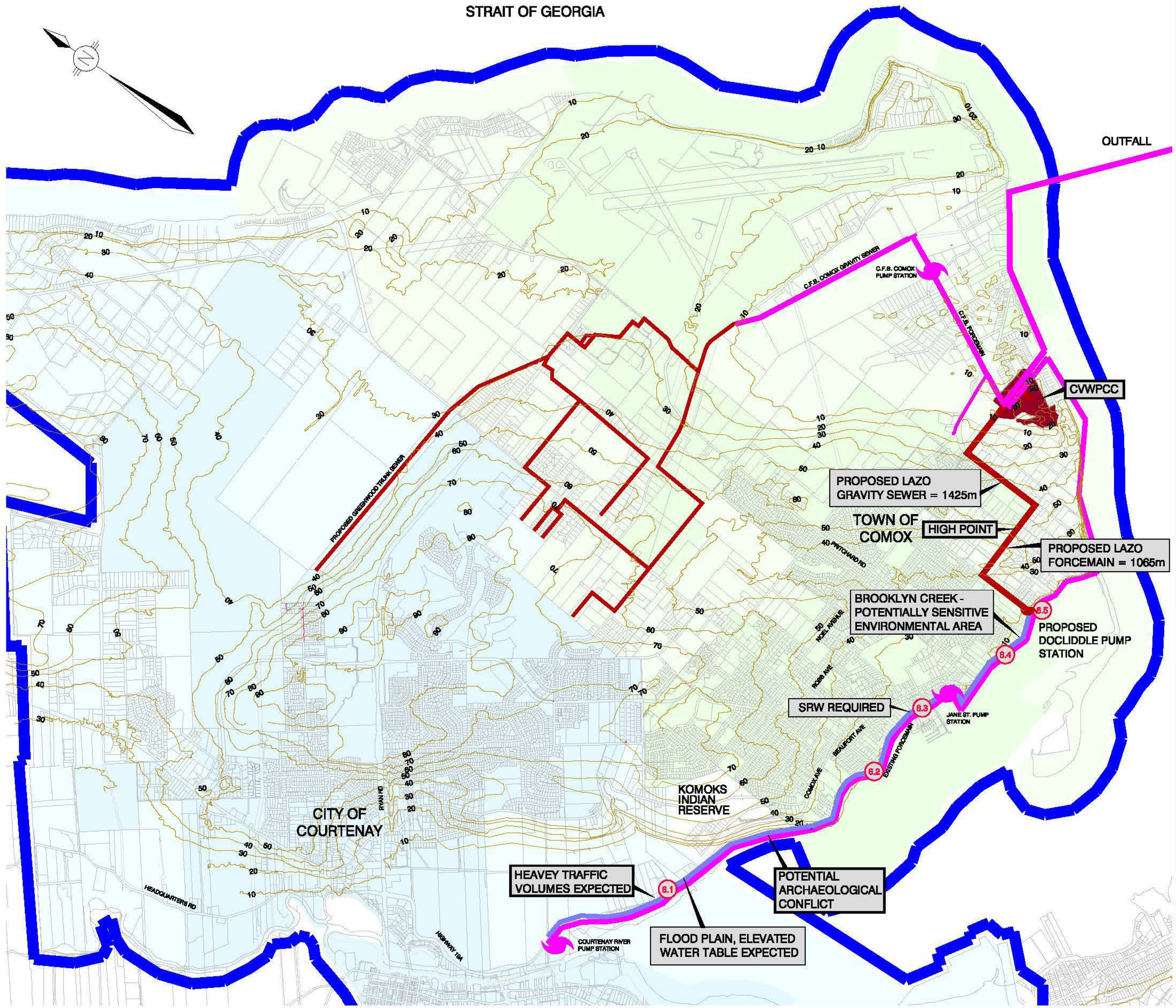
- TOWN OF COMOX (PRESENT DAY)
- TOWN OF COMOX ANNEXATION AREA



No.	Date	Revision	Dr.	Chk'd

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Designed: N/A | Checked: IW/BH | Date: 01/OCT/2008
Drawn: TM | Surveyed: N/A

SCALE N.T.S.

Approved Sealed

COMOX VALLEY REGIONAL DISTRICT

PROPOSED CORE AREA ROUTING OPTION 6

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
MCSL Project No. 2211-46970-0
Drawing No. S-11F
Sheet 19 of 23
Revision 2
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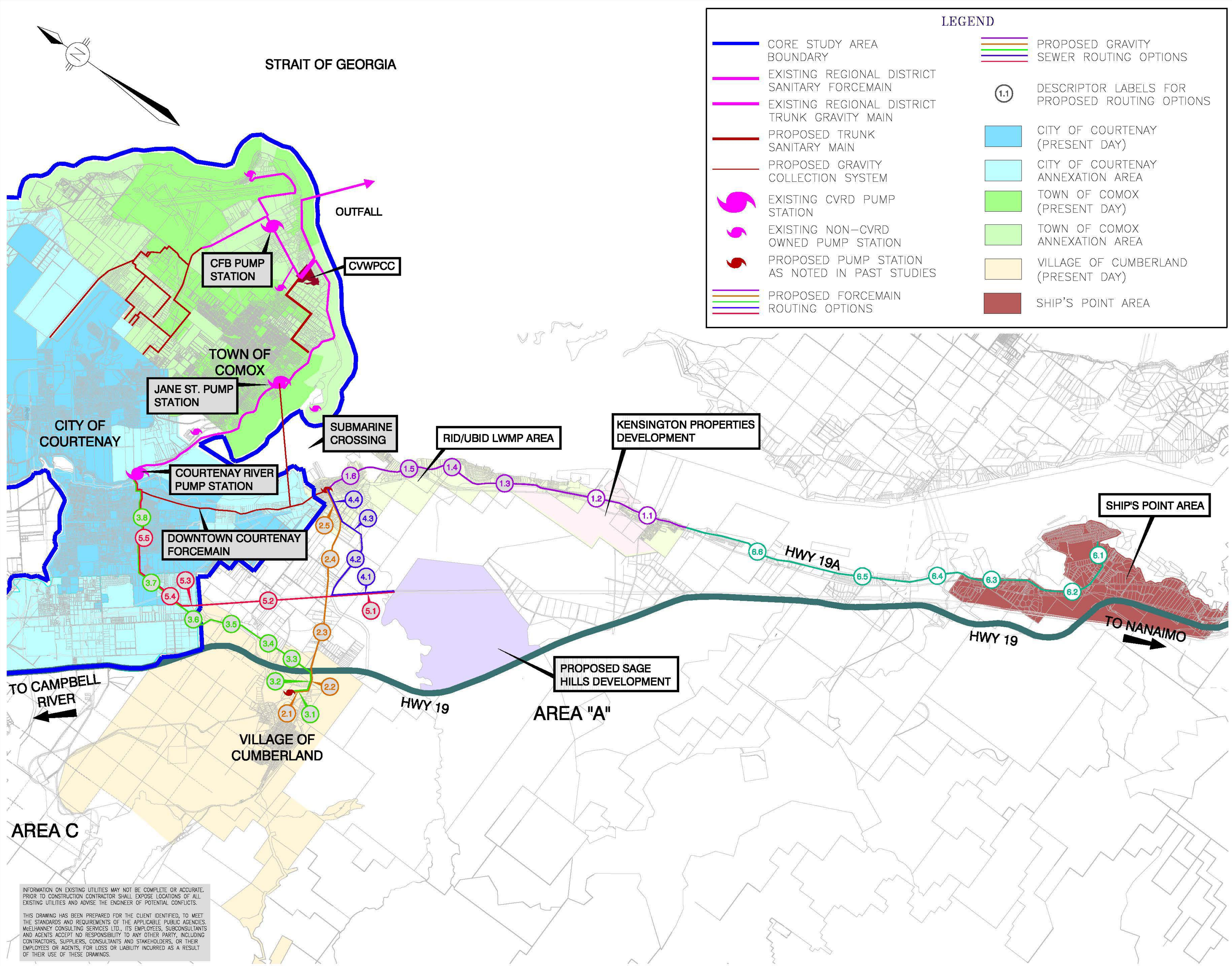

Route Option Number	Pipe Section Reference Number	Description
Route 1 - RID/UBID LWMP Area	1.1	Highway 19A, from Seymour St to Jones St
	1.2	Highway 19A, from Jones St to Van West Logging Rd.
	1.3	Highway 19A, from Van West Loggin Rd. to Inverness Rd
	1.4	Highway 19A, from Inverness Rd. to Heroncale Rd
	1.5	Highway 19A, from Herondale Rd to Gartley Rd.
	1.6	Highway 19A, from Gartley Rd. to Royston Rd future Pump station
	1.7	New Pump Station, Hwy 19A & Royston Rd
	1.8a	Highway 19A, from Royston Rd future Pump Station to Courtenay Pump Station
	1.8b	Submarine Pressure Sewer crossing from Royston Rd future PS to Jane St PS
Route 2 - Cumberland Option 1	2.1	Pump Station at Constructed Wetland Treatment Facility
	2.2	CWTF to Inland Island Hwy
	2.3	Royston Rd. Inland Island Hwy to BC Hydro ROW
	2.4	Royston Rd. BC Hydro ROW to Hwy 19A
	2.5	New Pump Station, Royston Rd & Hwy 19A
	1.7a	Highway 19A, from Royston Rd future Pump Station to Courtenay Pump Station
	1.7b	Submarine Pressure Sewer crossing from Royston Rd future PS to Jane St PS
Route 3 - Cumberland Option 2	3.1	Pump Station at Constructed Wetland Treatment Facility
	3.2	CWTF to Inland Island Hwy
	3.3	Small Rd. Royston Rd to Minto Rd
	3.4	Comox Valley Parkway. Minto to Cumberland Rd
	3.5	Cumberland Rd. Comox Valley Parkway to 20th Street
	3.6	Arden Turk Sewer Alignment to Courtenay River Pump Station
Route 4 - AREA "A" Option 1	4.1	BC Hydro ROW. from N.E. quadrant of Sage Hills development to Royston Rd. Implies private pump station at Sage Hills
	4.2	Royston Rd. BC Hydro ROW to Hwy 19A.
	4.3	New Pump Station, Royston Rd & Hwy 19A
	4.4	Per Option 1, 1.7, 1.8a and 1.8b
Route 5 - AREA "A" Option 2	5.1	development to Royston Rd. Implies private pump station at Sage Hills
	5.2	BC Hydro ROW. from Royston Rd to Cumberland Rd
	5.3	Cumberland Rd. from BC Hydro ROW to 20th Street.
	5.4	Arden Turk Sewer Alignment to Courtenay River Pump Station
Route 6 - Ships Point Service	6.1	Ships Point Rd. from Tozer Rd to Hwy 19A
	6.2	Hwy 19A from Ships Point Rd to Old Yake Rd.
	6.3	Hwy 19A from Old Yake Rd to the Tsable River
	6.4	Hwy 19A from the Tsable River to Buckley Bay Rd
	6.5	Hwy 19A from Buckley Bay Rd to Brean Rd
	6.3	Hwy 19A from Brean Rd to Seymour St (Terminus of Route 1)

INFORMATION ON EXISTING UTILITIES MAY NOT BE COMPLETE OR ACCURATE. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING UTILITIES AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.

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No.	Date	Revision	Dr.	Chk'd

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Drawn: TM | Surveyed: N/A

SCALE 1 : 30,000 (APPROX.)

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COMOX VALLEY REGIONAL DISTRICT

PROPOSED ROUTING OPTIONS - SOUTHERN OUTLYING AREAS

CVRD MASTER SEWERAGE STUDY

COMOX VALLEY, BC

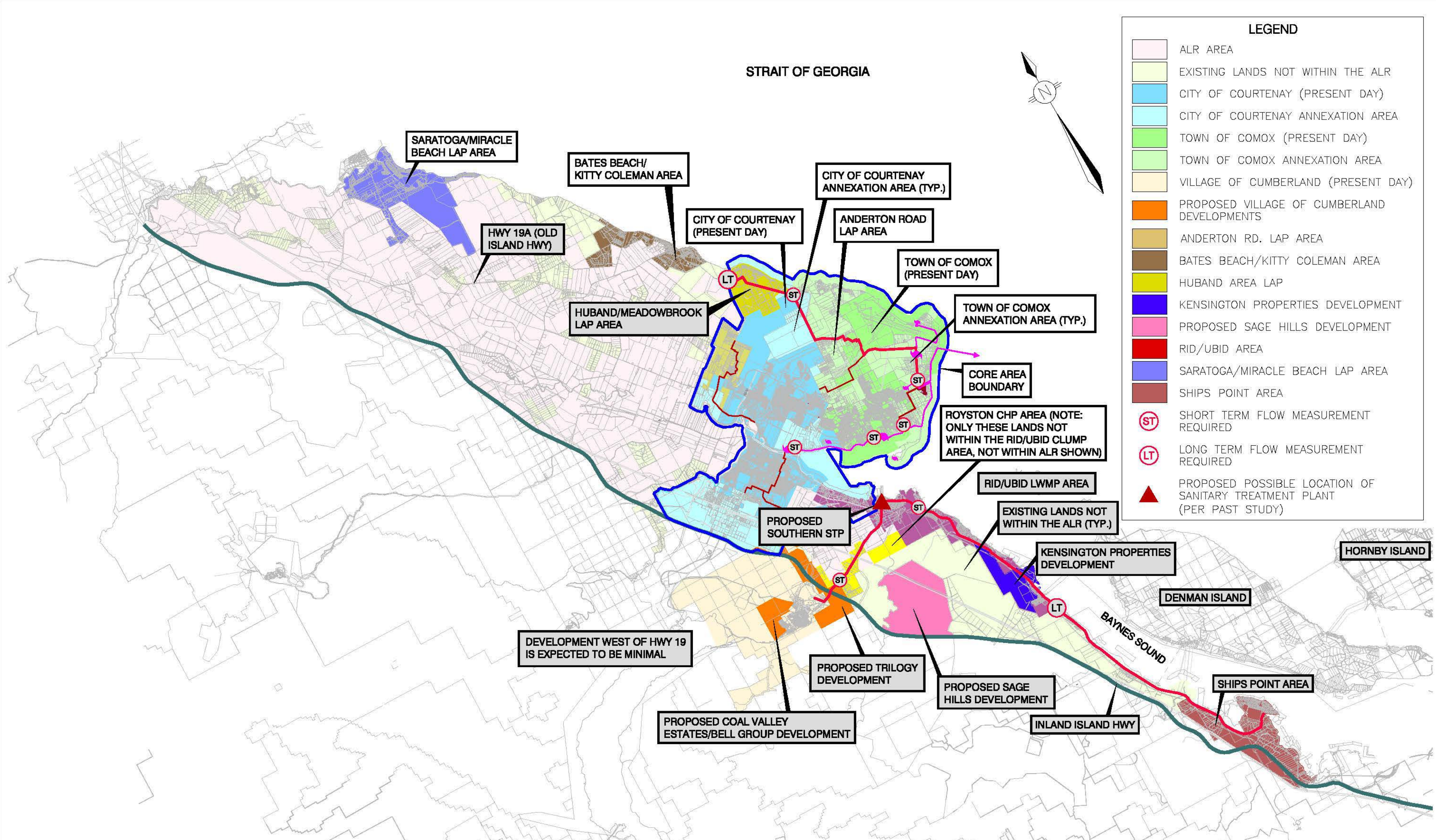
Client Drawing No

MCSL Project No. 2211-46970-0

Drawing No. S-12

Sheet 20 of 23 Revision 2

Destroy all prints bearing previous number



INFORMATION ON EXISTING UTILITIES MAY NOT BE COMPLETE OR ACCURATE. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING UTILITIES AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.

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Drawn: CDE	Surveyed: N/A	

SCALE 1 : 80,000 (APPROX.)

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COMOX VALLEY REGIONAL DISTRICT

SEWERAGE STUDY
FLOW MEASUREMENT POINTS

CVRD MASTER SEWERAGE STUDY
COMOX VALLEY, BC

Client Drawing No
MCSL Project No. 2211-46970-0
Drawing No. S-13
Sheet 24 of 27
Revision 2
Destroy all prints bearing previous number

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McElhanney

APPENDIX S

MCSL TABLES 19 & 20

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

TABLE 19 - OVERALL SYSTEM CONSTRUCTION COST

OVERALL SYSTEM OPTION 3, CORE AREA ROUTE 6

JUNE, 2009

McElhanney

Component Reference Number	SYSTEM COMPONENT DESCRIPTION	COMPONENT COST	POPULATION New Users	POPULATION Existing Users	INCREMENTAL COST New Users	INCREMENTAL COST Existing Users	Year of Expected Need	CUMULATIVE COSTS Cumulative Cost (New Users)	CUMULATIVE COSTS Cumulative Cost (Existing Users)	CUMULATIVE COSTS Total Cumulative Cost (2009 $)	Primary Driver/ Trigger
	New Pumps at Courtenay River Station	$ 2,500,000	13,355	23,500	$ 905,915	$ 1,594,085	2011	$ 905,915	$ 1,594,085		Capacity shortfall/construction of Docliddle Station
	Upgrade Jane St Pump Station	$ 1,000,000	7,808	12,500	$ 384,479	$ 615,521	2011	$ 1,290,394	$ 2,209,606		Capacity shortfall/construction of Docliddle Station
	Courtenay PS to Indian Reserve, along Dyke Rd	$ 3,144,000	57,490	23,500	$ 2,231,739	$ 912,261	2011	$ 3,522,133	$ 3,121,867		System redundancy/construction of Docliddle Station
	Foreshore from IR to Comox Marina	$ 1,577,000	57,490	23,500	$ 1,119,419	$ 457,581	2011	$ 4,641,552	$ 3,579,448		System redundancy/construction of Docliddle Station
Core Area Route 6	Crossing Comox Marina	$ 360,000	57,490	23,500	$ 255,543	$ 104,457	2011	$ 4,897,095	$ 3,683,905		System redundancy/construction of Docliddle Station
	Comox Marina to Jane St. PS	$ 375,250	57,490	23,500	$ 266,368	$ 108,882	2011	$ 5,163,463	$ 3,792,787		System redundancy/construction of Docliddle Station
	Jane St PS to Croteau Rd	$ 1,045,000	57,490	23,500	$ 741,784	$ 303,216	2011	$ 5,905,246	$ 4,096,004		System redundancy/construction of Docliddle Station
	Croteau Rd, from foreshore to Docliddle PS	$ 28,500	57,490	23,500	$ 20,230	$ 8,270	2011	$ 5,925,477	$ 4,104,273		System redundancy/construction of Docliddle Station
	Docliddle Pump Station	$ 12,000,000	78,258	36,000	$ 8,219,083	$ 3,780,917	2011	$ 14,144,560	$ 7,885,190		Willimar Bluff forcemain replacement
	Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	$ 968,000	7,808	35,613	$ 174,067	$ 793,933	2011	$ 14,318,626	$ 8,679,124		Willimar Bluff forcemain replacement
	Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	$ 418,000	7,808	35,613	$ 75,165	$ 342,835	2011	$ 14,393,791	$ 9,021,959		Willimar Bluff forcemain replacement
	Gravity section, per CH2MHILL forcemain relocation report	$ 1,044,000	7,808	35,613	$ 187,733	$ 856,267	2011	$ 14,581,524	$ 9,878,226		Willimar Bluff forcemain replacement
	Inverted Siphon	$ 846,000	7,808	35,613	$ 152,128	$ 693,872	2011	$ 14,733,653	$ 10,572,097		Willimar Bluff forcemain replacement
	CVWPCC Expansion 1	$ 32,200,000	29,000		$ 32,200,000	$ -	2011	$ 46,933,653	$ 10,572,097	**$ 57,505,750**	Capacity shortfall
	Saratoga Beach Treatment Plant Initial Construction	$ 11,200,000	7,000		$ 11,200,000	$ -	2013	$ 58,133,653	$ 10,572,097	**$ 68,705,750**	Developer initiated
	Union Bay Pump Station	$ 2,900,000	22,860		$ 2,900,000	$ -	2015	$ 61,033,653	$ 10,572,097		Developer initiated
	Highway 19A, from Seymour St to Jones St	$ 1,342,500	22,860		$ 1,342,500	$ -	2015	$ 62,376,153	$ 10,572,097		Developer initiated
	Highway 19A, from Jones St to Van West Logging Rd.	$ 1,140,000	22,860		$ 1,140,000	$ -	2015	$ 63,516,153	$ 10,572,097		Developer initiated
	Highway 19A, from Van West Logging Rd. to Inverness Rd.	$ 1,942,500	22,860		$ 1,942,500	$ -	2015	$ 65,458,653	$ 10,572,097		Developer initiated
	Highway 19A, from Inverness Rd. to Herondale Rd.	$ 855,000	22,860		$ 855,000	$ -	2015	$ 66,313,653	$ 10,572,097		Developer initiated
	Highway 19A, from Herondale Rd to Gartley Rd.	$ 1,425,000	22,860		$ 1,425,000	$ -	2015	$ 67,738,653	$ 10,572,097		Developer initiated
	Highway 19A, from Gartley Rd. to Southern Treatment Plant (assumed to be at the intersection of Royston Rd and Hwy 19A	$ 1,237,500	22,860		$ 1,237,500	$ -	2015	$ 68,976,153	$ 10,572,097		Developer initiated
	New Pump Station, Hwy 19A & Royston Rd	$ 9,000,000	42,960		$ 9,000,000	$ -	2015	$ 77,976,153	$ 10,572,097		Developer initiated
	Submarine Crossing to Jane Street	$ 6,825,000	42,960		$ 6,825,000	$ -	2015	$ 84,801,153	$ 10,572,097		Developer initiated
	Pump Station at Constructed Wetland Treatment Facility	$ 3,000,000	20,100		$ 3,000,000	$ -	2015	$ 87,801,153	$ 10,572,097		Capacity shortfall at Cumberland treatment facility
	CWTF to Inland Island Hwy	$ 605,000	20,100		$ 605,000	$ -	2015	$ 88,406,153	$ 10,572,097		Capacity shortfall at Cumberland treatment facility
	Royston Rd, Inland Island Hwy to BC Hydro ROW	$ 1,140,000	20,100		$ 1,140,000	$ -	2015	$ 89,546,153	$ 10,572,097		Capacity shortfall at Cumberland treatment facility
	Royston Rd, BC Hydro ROW to Hwy 19A	$ 1,710,000	20,100		$ 1,710,000	$ -	2015	$ 91,256,153	$ 10,572,097		Capacity shortfall at Cumberland treatment facility
						$ -					
	Greenwood trunk (North)	$ 2,940,000			2,940,000	$ -	2015	$ 94,196,153	$ 10,572,097		Developer initiated
	South leg of the Greenwood trunk to Pritchard Rd.	$ 1,057,500			1,057,500	$ -	2015	$ 95,253,653	$ 10,572,097	**$ 105,825,750**	
	Kitty Coleman Pump Station	$ 2,500,000	-		$ 2,500,000	$ -	2018	$ 97,753,653	$ 10,572,097		Public Health or Developer initiated
	Kitty Coleman to Greenwood trunk	$ 5,792,000	-		$ 5,792,000	$ -	2018	$ 103,545,653	$ 10,572,097	**$ 114,117,750**	Public Health or Developer initiated
	New Courtenay River Pump Station	$ 12,500,000	50,154		$ 12,500,000	$ -	2020	$ 116,045,653	$ 10,572,097	**$ 126,617,750**	Capacity shortfall
	Knight Rd, Pritchard to CFB gravity sewer	$ -			-	$ -			-		
	Twin existing CFB gravity sewer	$ 2,025,000			2,025,000	$ -	2029	$ 118,070,653	$ 10,572,097		Capacity shortfall
	Upgrade CFB pump station	$ 2,500,000			2,500,000	$ -	2029	$ 120,570,653	10,572,097		Capacity shortfall
	Twin CFB forcemain	$ 1,200,000			1,200,000	$ -	2029	$ 121,770,653	10,572,097	**$ 132,342,750**	Capacity shortfall
	CVWPCC Expansion 2	$ 28,300,000	52,072		$ 28,300,000	$ -	2033	$ 150,070,653	$ 10,572,097		Capacity shortfall
	Saratoga Beach Treatment Plant Expansion 1	$ 6,900,000	7,309		$ 6,900,000	$ -	2033	$ 156,970,653	$ 10,572,097	**$ 167,542,750**	Capacity shortfall
	Docliddle Pumpstation Upgrade	$ 6,000,000			$ 6,000,000		2038	$ 162,970,653	$ 10,572,097	**$ 173,542,750**	25 year design life exceeded
	Royston Pumpstation Upgrade	$ 4,500,000			$ 4,500,000		2040	$ 167,470,653	$ 10,572,097	**$ 178,042,750**	25 year design life exceeded
	CVWPCC Expansion 3	$ 30,000,000			$ 30,000,000		2041	$ 197,470,653	$ 10,572,097	**$ 208,042,750**	Capacity shortfall
	Total	**$ 208,042,750**									

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

TABLE 20 - OVERALL SYSTEM CONSTRUCTION COST

OVERALL SYSTEM OPTION 3A, CORE AREA ROUTE 6

JUNE ,2009

McElhanney

Component Reference Number	SYSTEM COMPONENT DESCRIPTION	COMPONENT COST	POPULATION		INCREMENTAL COST		Year of Expected Need	CUMULATIVE COSTS			Primary Driver/ Trigger
			New Users	Existing Users	New Users	Existing Users		Cumulative Cost (New Users)	Cumulative Cost (Existing Users)	Total Cumulative Cost (2009 $)	
	New Pumps at Courtenay River Station	$ 2,500,000	13,355	23,500	$ 905,915	$ 1,594,085	2011	$ 905,915	$ 1,594,085		Capacity shortfall/construction of Docliddle Station
	Upgrade Jane St Pump Station	$ 1,000,000	7,808	12,500	$ 384,479	$ 615,521	2011	$ 1,290,394	$ 2,209,606		Capacity shortfall/construction of Docliddle Station
Core Area Route 6	Courtenay PS to Indian Reserve, along Dyke Rd	$ 3,144,000	57,490	23,500	$ 2,231,739	$ 912,261	2011	$ 3,522,133	$ 3,121,867		System redundancy/construction of Docliddle Station
	Foreshore from IR to Comox Marina	$ 1,577,000	57,490	23,500	$ 1,119,419	$ 457,581	2011	$ 4,641,552	$ 3,579,448		System redundancy/construction of Docliddle Station
	Crossing Comox Marina	$ 360,000	57,490	23,500	$ 255,543	$ 104,457	2011	$ 4,897,095	$ 3,683,905		System redundancy/construction of Docliddle Station
	Comox Marina to Jane St. PS	$ 375,250	57,490	23,500	$ 266,368	$ 108,882	2011	$ 5,163,463	$ 3,792,787		System redundancy/construction of Docliddle Station
	Jane St PS to Croteau Rd	$ 1,045,000	57,490	23,500	$ 741,784	$ 303,216	2011	$ 5,905,246	$ 4,096,004		System redundancy/construction of Docliddle Station
	Croteau Rd, from foreshore to Docliddle PS	$ 28,500	57,490	23,500	$ 20,230	$ 8,270	2011	$ 5,925,477	$ 4,104,273		System redundancy/construction of Docliddle Station
	Docliddle Pump Station	$ 6,000,000	78,258	36,000	$ 4,109,542	$ 1,890,458	2011	$ 10,035,018	$ 5,994,732		Willimar Bluff forcemain replacement
					\						
	Forcemain section, per CH2MHILL forcemain relocation report (Croteau and Lazo)	$ 484,000	7,808	35,613	$ 87,033	$ 396,967	2011	$ 10,122,051	$ 6,391,699		Willimar Bluff forcemain replacement
	Forcemain section, per CH2MHILL forcemain relocation report (Jane st to Croteau pump station)	$ 209,000	7,808	35,613	$ 37,583	$ 171,417	2011	$ 10,159,634	$ 6,563,116		Willimar Bluff forcemain replacement
								$ 10,159,634	$ 6,563,116		
	Gravity section, per CH2MHILL forcemain relocation report	$ 696,000	7,808	35,613	$ 125,155	$ 570,845	2011	$ 10,284,789	$ 7,133,961		Willimar Bluff forcemain replacement
	Inverted Siphon, per CH2MHILL forcemain relocation report	$ 846,000	7,808	35,613	$ 152,128	$ 693,872	2011	$ 10,436,918	$ 7,827,832		Willimar Bluff forcemain replacement
	CVWPCC Expansion 1	$ 32,200,000	29,000		$ 32,200,000	$ -	2011	$ 42,636,918	$ 7,827,832	**$ 50,464,750**	Capacity shortfall
	Saratoga Beach Treatment Plant Initial Construction	$ 11,200,000	7,000		$ 11,200,000	$ -	2013	$ 53,836,918	$ 7,827,832	**$ 61,664,750**	Developer initiated
	Union Bay Pump Station	$ 2,940,000	22,860		$ 2,940,000	$ -	2015	$ 56,776,918	$ 7,827,832		Developer initiated
	Highway 19A, from Seymour St to Jones St	$ 1,342,500	22,860		$ 1,342,500	$ -	2015	$ 58,119,418	$ 7,827,832		Developer initiated
	Highway 19A, from Jones St to Van West Logging Rd.	$ 1,140,000	22,860		$ 1,140,000	$ -	2015	$ 59,259,418	$ 7,827,832		Developer initiated
	Highway 19A, from Van West Logging Rd. to Inverness Rd.	$ 1,942,500	22,860		$ 1,942,500	$ -	2015	$ 61,201,918	$ 7,827,832		Developer initiated
	Highway 19A, from Inverness Rd. to Herondale Rd.	$ 855,000	22,860		$ 855,000	$ -	2015	$ 62,056,918	$ 7,827,832		Developer initiated
	Highway 19A, from Herondale Rd to Gartley Rd.	$ 1,425,000	22,860		$ 1,425,000	$ -	2015	$ 63,481,918	$ 7,827,832		Developer initiated
	Highway 19A, from Gartley Rd. to Southern Treatment Plant (assumed to be at the intersection of Royston Rd and Hwy 19A	$ 1,237,500	22,860		$ 1,237,500	$ -	2015	$ 64,719,418	$ 7,827,832		Developer initiated
	Pump Station at Constructed Wetland Treatment Facility	$ 3,000,000	20,100		$ 3,000,000	$ -	2015	$ 67,719,418	$ 7,827,832		Capacity shortfall at Cumberland treatment facility
	CWTF to Inland Island Hwy	$ 605,000	20,100		$ 605,000	$ -	2015	$ 68,324,418	$ 7,827,832		Capacity shortfall at Cumberland treatment facility
	Royston Rd, Inland Island Hwy to BC Hydro ROW	$ 1,140,000	20,100		$ 1,140,000	$ -	2015	$ 69,464,418	$ 7,827,832		Capacity shortfall at Cumberland treatment facility
	Royston Rd, BC Hydro ROW to Hwy 19A	$ 1,710,000	20,100		$ 1,710,000	$ -	2015	$ 71,174,418	$ 7,827,832		Capacity shortfall at Cumberland treatment facility
						$ -					
	Greenwood trunk (North)	$ 2,940,000			2,940,000	$ -	2015	$ 74,114,418	$ 7,827,832		Developer initiated
	South leg of the Greenwood trunk to Pritchard Rd.	$ 1,057,500			1,057,500	$ -	2015	$ 75,171,918	$ 7,827,832		Developer initiated
						$ -					
	Southern STP Initial Construction	$ 29,300,000	15,000		$ 29,300,000	$ -	2015	$ 104,471,918	$ 7,827,832	**$ 112,299,750**	Developer initiated
	Kitty Coleman Pump Station	$ 2,500,000	2,814		$ 2,500,000	$ -	2018	$ 106,971,918	$ 7,827,832		Public Health or Developer initiated
	Kitty Coleman to Greenwood trunk	$ 5,792,000	2,814		$ 5,792,000	$ -	2018	$ 112,763,918	$ 7,827,832	**$ 120,591,750**	Public Health or Developer initiated
	New Courtenay River Pump Station	$ 12,500,000	50,154		$ 12,500,000	$ -	2020	$ 125,263,918	$ 7,827,832	**$ 133,091,750**	Capacity shortfall
	Southern STP Phase 1 Expansion	$ 11,700,000	15,000		$ 11,700,000	$ -	2022	$ 136,963,918	$ 7,827,832	**$ 144,791,750**	Capacity shortfall
	Knight Rd, Pritchard to CFB gravity sewer	$ -			-	$ -			-		
	Twin existing CFB gravity sewer	$ 2,025,000			2,025,000	$ -	2029	$ 138,988,918	7,827,832		Capacity shortfall
	Upgrade CFB pump station	$ 2,500,000			2,500,000	$ -	2029	$ 141,488,918	7,827,832		Capacity shortfall
	Twin CFB forcemain	$ 1,200,000			1,200,000	$ -	2029	$ 142,688,918	7,827,832	**$ 150,516,750**	Capacity shortfall
	CVWPCC Expansion 2	$ 33,300,000	52,072		$ 33,300,000	$ -	2033	$ 175,988,918	$ 7,827,832		Capacity shortfall
											Capacity shortfall
	Saratoga Beach Treatment Plant Expansion 1	$ 6,900,000	7,309		$ 6,900,000	$ -	2033	$ 182,888,918	$ 7,827,832	**$ 190,716,750**	
	Docliddle Pumpstation Upgrade	$ 3,500,000			$ 3,500,000		2038	$ 186,388,918	$ 7,827,832	**$ 194,216,750**	25 year design life exceeded
	Southern STP Expansion 2	$ 10,000,000	12,967		$ 10,000,000	$ -	2045	$ 196,388,918	$ 7,827,832	**$ 204,216,750**	Capacity shortfall
	Total	**$ 204,216,750**									

13	Ships Point Pump Station	$ 2,700,000	5,633		$ 2,700,000	$ -	>2015			
	Ships Point Rd, from Tozer Rd to Hwy 19A	$ 676,500	5,633		$ 676,500	$ -	>2015			
	Hwy 19A, from Ships Point Rd to Old Yake Rd.	$ 951,500	5,633		$ 951,500	$ -	>2015			
	Hwy 19A, from Old Yake Rd to the Tsable River	$ 1,056,000	5,633		$ 1,056,000	$ -	>2015			
	Hwy 19A, from the Tsable River to Buckley Bay Rd.	$ 649,000	5,633		$ 649,000	$ -	>2015			
	Hwy 19A, from Buckley Bay Rd to Brean Rd	$ 1,562,000	5,633		$ 1,562,000	$ -	>2015			
	Hwy 19A, from Brean Rd to Seymour St (Terminus of Route 1)	$ 1,732,500	5,633		$ 1,732,500	$ -	>2015			
	Total	**$ 9,327,500**								**$ 9,327,500**

Note:

New system users are defined as any development, existing or otherwise, that was not previously connected to a CVRD conveyance/treatment system.

Existing system users are defined as those persons utilizing the CVRD conveyance/treatment system as of 2009

The format utilized above is for comparative analysis of competing options only. Spatial distribution of population utilizing specific components is not considered. This information will be required prior to finalizing the master plan, however at the direction of staff, has not been considered at this time.

O&M cost have not yet been considered

NOTE: CORE AREA ROUTE "ONE" IS INCORPORATED HEREIN, TO ALLOW COMPARTIVE ANALYSIS OF THE OVERALL SYSTEM OPTIONS.

APPENDIX T

TABLE OF NPVS

COMOX VALLEY REGIONAL DISTRICT 2009 SEWERAGE STUDY

APPENDIX T - OPTION 3, 3A NET PRESENT VALUE

JUNE ,2009

McElhanney

OPTION 3 NET PRESENT VALUE

I = 0.05

NPV = $ 222,549,508

	Conveyance		Treatment						
Year	Capital Cost	Total O&M	Capital Cost	O&M	CVWPCC O&M	Saratoga STP O&M	O&M	Relative Year	NPV
2010	$ 25,305,750	$ 506,115		$ 1,880,000	$ 1,880,000		1,880,000	0	$ 27,691,865
2011		$ 506,115	$ 32,200,000	$ 1,981,000	$ 1,981,000			1	$ 33,035,348
2012		$ 506,115		$ 2,082,000	$ 2,082,000			2	$ 2,347,497
2013		$ 506,115	$ 11,200,000	$ 2,483,000	$ 2,183,000	$ 300,000	300,000	3	$ 12,257,091
2014		$ 506,115		$ 2,597,500	$ 2,284,000	$ 313,500		4	$ 2,553,352
2015	$ 37,120,000	$ 1,248,515		$ 2,712,000	$ 2,385,000	$ 327,000		5	$ 32,187,658
2016		$ 1,248,515		$ 2,826,500	$ 2,486,000	$ 340,500		6	$ 3,040,839
2017		$ 1,248,515		$ 2,941,000	$ 2,587,000	$ 354,000		7	$ 2,977,410
2018	$ 8,292,000	$ 1,414,355		$ 3,055,500	$ 2,688,000	$ 367,500		8	$ 8,637,726
2019		$ 1,414,355		$ 3,170,000	$ 2,789,000	$ 381,000		9	$ 2,955,116
2020	$ 12,500,000	$ 1,414,355		$ 3,284,500	$ 2,890,000	$ 394,500	2,890,000	10	$ 10,558,605
2021		$ 1,414,355		$ 3,362,286	$ 2,954,286	$ 408,000		11	$ 2,792,803
2022		$ 1,414,355		$ 3,440,071	$ 3,018,571	$ 421,500		12	$ 2,703,126
2023		$ 1,414,355		$ 3,517,857	$ 3,082,857	$ 435,000		13	$ 2,615,657
2024		$ 1,414,355		$ 3,595,643	$ 3,147,143	$ 448,500		14	$ 2,530,389
2025		$ 1,414,355		$ 3,673,429	$ 3,211,429	$ 462,000		15	$ 2,447,311
2026		$ 1,414,355		$ 3,751,214	$ 3,275,714	$ 475,500		16	$ 2,366,407
2027		$ 1,414,355		$ 3,829,000	$ 3,340,000	$ 489,000		17	$ 2,287,658
2028		$ 1,414,355		$ 3,906,786	$ 3,404,286	$ 502,500		18	$ 2,211,044
2029	$ 5,725,000	$ 1,414,355		$ 3,984,571	$ 3,468,571	$ 516,000		19	$ 4,402,115
2030		$ 1,414,355		$ 4,062,357	$ 3,532,857	$ 529,500		20	$ 2,064,115
2031		$ 1,414,355		$ 4,140,143	$ 3,597,143	$ 543,000		21	$ 1,993,745
2032		$ 1,414,355		$ 4,217,929	$ 3,661,429	$ 556,500		22	$ 1,925,395
2033		$ 1,414,355	$ 35,200,000	$ 4,295,714	$ 3,725,714	$ 570,000	570,000	23	$ 13,319,145
2034		$ 1,414,355		$ 4,373,000	$ 3,790,000	$ 583,000		24	$ 1,794,473
2035		$ 1,414,355		$ 4,450,286	$ 3,854,286	$ 596,000		25	$ 1,731,845
2036		$ 1,414,355		$ 4,527,571	$ 3,918,571	$ 609,000		26	$ 1,671,112
2037		$ 1,414,355		$ 4,604,857	$ 3,982,857	$ 622,000		27	$ 1,612,236
2038	$ 6,000,000	$ 1,414,355		$ 4,682,143	$ 4,047,143	$ 635,000		28	$ 3,085,740
2039		$ 1,414,355		$ 4,759,429	$ 4,111,429	$ 648,000		29	$ 1,499,898
2040	$ 4,500,000	$ 1,414,355		$ 4,836,714	$ 4,175,714	$ 661,000		30	$ 2,487,555
2041		$ 1,414,355	$ 30,000,000	$ 4,914,000	$ 4,240,000	$ 674,000	4,240,000	31	$ 8,005,297
2042		$ 1,414,355		$ 4,997,526	$ 4,310,526	$ 687,000		32	$ 1,345,637
2043		$ 1,414,355		$ 5,081,053	$ 4,381,053	$ 700,000		33	$ 1,298,254
2044		$ 1,414,355		$ 5,164,579	$ 4,451,579	$ 713,000		34	$ 1,252,332
2045		$ 1,414,355		$ 5,248,105	$ 4,522,105	$ 726,000		35	$ 1,207,839
2046		$ 1,414,355		$ 5,331,632	$ 4,592,632	$ 739,000		36	$ 1,164,745
2047		$ 1,414,355		$ 5,415,158	$ 4,663,158	$ 752,000		37	$ 1,123,015
2048		$ 1,414,355		$ 5,498,684	$ 4,733,684	$ 765,000		38	$ 1,082,619
2049		$ 1,414,355		$ 5,582,211	$ 4,804,211	$ 778,000		39	$ 1,043,524
2050		$ 1,414,355		$ 5,665,737	$ 4,874,737	$ 791,000		40	$ 1,005,696
2051		$ 1,414,355		$ 5,749,263	$ 4,945,263	$ 804,000		41	$ 969,106
2052		$ 1,414,355		$ 5,832,789	$ 5,015,789	$ 817,000		42	$ 933,719
2053		$ 1,414,355		$ 5,916,316	$ 5,086,316	$ 830,000		43	$ 899,506
2054		$ 1,414,355		$ 5,999,842	$ 5,156,842	$ 843,000		44	$ 866,433
2055		$ 1,414,355		$ 6,083,368	$ 5,227,368	$ 856,000		45	$ 834,470
2056		$ 1,414,355		$ 6,166,895	$ 5,297,895	$ 869,000		46	$ 803,587
2057		$ 1,414,355		$ 6,250,421	$ 5,368,421	$ 882,000		47	$ 773,753
2058		$ 1,414,355		$ 6,333,947	$ 5,438,947	$ 895,000		48	$ 744,938
2059		$ 1,414,355		$ 6,417,474	$ 5,509,474	$ 908,000	960,000	49	$ 717,113
2060		$ 1,414,355		$ 6,540,000	$ 5,580,000	$ 960,000	5,580,000	50	$ 693,649
	$ 99,442,750		$ 108,600,000						

OPTION 3A NET PRESENT VALUE

I = 0.05

NPV = $ 233,946,385

	Conveyance		Treatment						
Year	Capital Cost	O&M	Capital Cost	Total O&M	CVWPCC O&M	Saratoga STP O&M	Southern STP O&M	Relative Year	NPV
2010	$ 18,264,750	$ 506,115		$ 1,880,000	$ 1,880,000			0	$ 20,650,865
2011		$ 506,115	$ 32,200,000	$ 1,923,913	$ 1,923,913			1	$ 32,980,979
2012		$ 506,115		$ 1,967,826	$ 1,967,826			2	$ 2,243,937
2013		$ 506,115	$ 11,200,000	$ 2,311,739	$ 2,011,739	$ 300,000		3	$ 12,109,149
2014		$ 506,115		$ 2,369,152	$ 2,055,652	$ 313,500		4	$ 2,365,489
2015	$ 21,335,000	$ 1,248,515	$ 29,300,000	$ 3,026,565	$ 2,099,565	$ 327,000	$ 600,000	5	$ 43,023,485
2016		$ 1,248,515		$ 3,139,693	$ 2,143,478	$ 340,500	$ 655,714	6	$ 3,274,548
2017		$ 1,248,515		$ 3,252,820	$ 2,187,391	$ 354,000	$ 711,429	7	$ 3,199,015
2018	$ 8,292,000	$ 1,414,355		$ 3,365,947	$ 2,231,304	$ 367,500	$ 767,143	8	$ 8,847,849
2019		$ 1,414,355		$ 3,479,075	$ 2,275,217	$ 381,000	$ 822,857	9	$ 3,154,348
2020	$ 12,500,000	$ 1,414,355		$ 3,592,202	$ 2,319,130	$ 394,500	$ 878,571	10	$ 10,747,507
2021		$ 1,414,355		$ 3,705,329	$ 2,363,043	$ 408,000	$ 934,286	11	$ 2,993,373
2022		$ 1,414,355	$ 11,700,000	$ 3,818,457	$ 2,406,957	$ 421,500	$ 990,000	12	$ 9,428,823
2023		$ 1,414,355		$ 3,904,130	$ 2,450,870	$ 435,000	$ 1,018,261	13	$ 2,820,506
2024		$ 1,414,355		$ 3,989,804	$ 2,494,783	$ 448,500	$ 1,046,522	14	$ 2,729,468
2025		$ 1,414,355		$ 4,075,478	$ 2,538,696	$ 462,000	$ 1,074,783	15	$ 2,640,704
2026		$ 1,414,355		$ 4,161,152	$ 2,582,609	$ 475,500	$ 1,103,043	16	$ 2,554,204
2027		$ 1,414,355		$ 4,246,826	$ 2,626,522	$ 489,000	$ 1,131,304	17	$ 2,469,955
2028		$ 1,414,355		$ 4,332,500	$ 2,670,435	$ 502,500	$ 1,159,565	18	$ 2,387,937
2029	$ 5,725,000	$ 1,414,355		$ 4,418,174	$ 2,714,348	$ 516,000	$ 1,187,826	19	$ 4,573,707
2030		$ 1,414,355		$ 4,503,848	$ 2,758,261	$ 529,500	$ 1,216,087	20	$ 2,230,508
2031		$ 1,414,355		$ 4,589,522	$ 2,802,174	$ 543,000	$ 1,244,348	21	$ 2,155,046
2032		$ 1,414,355		$ 4,675,196	$ 2,846,087	$ 556,500	$ 1,272,609	22	$ 2,081,712
2033		$ 1,414,355	$ 40,200,000	$ 4,760,870	$ 2,890,000	$ 570,000	$ 1,300,870	23	$ 15,098,442
2034		$ 1,414,355		$ 4,853,859	$ 2,941,729	$ 583,000	$ 1,329,130	24	$ 1,943,572
2035		$ 1,414,355		$ 4,946,848	$ 2,993,457	$ 596,000	$ 1,357,391	25	$ 1,878,481
2036		$ 1,414,355		$ 5,039,838	$ 3,045,186	$ 609,000	$ 1,385,652	26	$ 1,815,182
2037		$ 1,414,355		$ 5,132,827	$ 3,096,914	$ 622,000	$ 1,413,913	27	$ 1,753,652
2038	$ 3,500,000	$ 1,414,355		$ 5,225,817	$ 3,148,643	$ 635,000	$ 1,442,174	28	$ 2,586,693
2039		$ 1,414,355		$ 5,318,806	$ 3,200,371	$ 648,000	$ 1,470,435	29	$ 1,635,797
2040		$ 1,414,355		$ 5,411,795	$ 3,252,100	$ 661,000	$ 1,498,696	30	$ 1,579,417
2041		$ 1,414,355		$ 5,504,785	$ 3,303,828	$ 674,000	$ 1,526,957	31	$ 1,524,698
2042		$ 1,414,355		$ 5,597,774	$ 3,355,557	$ 687,000	$ 1,555,217	32	$ 1,471,609
2043		$ 1,414,355		$ 5,690,764	$ 3,407,285	$ 700,000	$ 1,583,478	33	$ 1,420,118
2044		$ 1,414,355		$ 5,783,753	$ 3,459,014	$ 713,000	$ 1,611,739	34	$ 1,370,194
2045		$ 1,414,355	$ 10,000,000	$ 5,876,742	$ 3,510,742	$ 726,000	$ 1,640,000	35	$ 3,134,708
2046		$ 1,414,355		$ 5,974,804	$ 3,562,471	$ 739,000	$ 1,673,333	36	$ 1,275,793
2047		$ 1,414,355		$ 6,075,247	$ 3,614,199	$ 752,000	$ 1,709,048	37	$ 1,231,557
2048		$ 1,414,355		$ 6,175,690	$ 3,665,928	$ 765,000	$ 1,744,762	38	$ 1,188,642
2049		$ 1,414,355		$ 6,276,133	$ 3,717,656	$ 778,000	$ 1,780,476	39	$ 1,147,021
2050		$ 1,414,355		$ 6,376,575	$ 3,769,385	$ 791,000	$ 1,816,190	40	$ 1,106,668
2051		$ 1,414,355		$ 6,477,018	$ 3,821,113	$ 804,000	$ 1,851,905	41	$ 1,067,558
2052		$ 1,414,355		$ 6,577,461	$ 3,872,842	$ 817,000	$ 1,887,619	42	$ 1,029,663
2053		$ 1,414,355		$ 6,677,904	$ 3,924,571	$ 830,000	$ 1,923,333	43	$ 992,956
2054		$ 1,414,355		$ 6,778,347	$ 3,976,299	$ 843,000	$ 1,959,048	44	$ 957,410
2055		$ 1,414,355		$ 6,878,789	$ 4,028,028	$ 856,000	$ 1,994,762	45	$ 922,998
2056		$ 1,414,355		$ 6,979,232	$ 4,079,756	$ 869,000	$ 2,030,476	46	$ 889,692
2057		$ 1,414,355		$ 7,079,675	$ 4,131,485	$ 882,000	$ 2,066,190	47	$ 857,466
2058		$ 1,414,355		$ 7,180,118	$ 4,183,213	$ 895,000	$ 2,101,905	48	$ 826,291
2059		$ 1,414,355		$ 7,280,561	$ 4,234,942	$ 908,000	$ 2,137,619	49	$ 796,141
2060		$ 1,414,355		$ 7,540,000	$ 4,440,000	$ 960,000	$ 2,140,000	50	$ 780,853
	$ 69,616,750		$ 134,600,000						