

## **MEMORANDUM**

**TO:** Committee of the Whole- February 16, 2015

**FROM:** Director of Engineering Services

**DATE:** February 12, 2015

**RE:** Uplands Combined Sewer Separation Project  
[ Jack Hull - Project Manager - Presentation ]

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### **BACKGROUND:**

The municipality has engaged Mr. Jack Hull as the project manager for this project. Mr. Hull will make a presentation to Committee of The Whole summarizing work done to date and the recommended path forward. Mr. Hull's report entitled Uplands Combined Sewer Separation Project (February 11, 2015) is attached to this memo as Attachment # 1.

### **DISCUSSION:**

The separation of combined sewer in the Uplands has been studied and discussed for many years. The current legislation requires that separation must proceed and that separate pipes for each of the sewer and storm flows be installed.

Mr. Hull's presentation and report outlines all facets of the issue to date and identifies a path forward, with recommendations to specifically address the scope and content of the proposed Request for Proposal (RFP) for a pre-design study.

### **OPTIONS:**

1. That it be recommended to Council that staff to be directed to:
  - Develop a Request for Proposals (RFP) for consulting services to undertake a pre-design study to examine the options for sewer separation in the Uplands. Options to be considered include:
    - gravity sanitary sewer system, the existing (combined) sewer would convey storm water;
    - a gravity system for storm sewers, the existing sewer would convey wastewater;
    - a low pressure system for wastewater;
    - a low pressure system for storm water;
    - a combination of gravity and pressure systems, and
    - any other innovative approach envisaged by the Consultant to achieve the goal of separating the combined sewers in Uplands.

- It will be necessary to undertake site specific geotechnical investigations to identify suitable conditions for ground infiltration, either for rain-gardens if rain-gardens are considered to be appropriate or on-site ground disposal of rainwater. The estimated cost of the investigation would be included in the responses to the RFP.
- Design concepts should exclude construction in easements on private property that would involve destruction of fences, hedges and mature trees, unless trenchless technologies can be employed.
- Design concepts and cost comparisons to include life cycle costs and to be developed to a level of confidence that will allow Council to apply for senior government funding and move forward to the next phase - detailed design.
- All options to be analysed and compared on a 'triple bottom line' (economic, social and environmental) basis.
- Develop a communication and public engagement program to engage and inform all Oak Bay residents about the project.

2. That Committee of the Whole provide alternate direction to staff.

#### **FINANCIAL IMPACT:**

It is estimated that the cost to generate, Issue, receive and evaluate the Request For Proposals would be in the range of \$10,000 - \$12,000. This money is included in the Sewer Fund budget and is funded by a combination of sewer user fees and property taxes.

#### **RECOMMENDATION(S):**

That it be recommended to Council that staff be directed to:

- Develop a Request for Proposals (RFP) for consulting services to undertake a pre-design study to examine the options for sewer separation in the Uplands. Options to be considered include:
  - gravity sanitary sewer system, the existing (combined) sewer would convey storm water;
  - a gravity system for storm sewers, the existing sewer would convey wastewater;
  - a low pressure system for wastewater;
  - a low pressure system for storm water;
  - a combination of gravity and pressure systems, and
  - any other innovative approach envisaged by the Consultant to achieve the goal of separating the combined sewers in Uplands.
- It will be necessary to undertake site specific geotechnical investigations to identify suitable conditions for ground infiltration, either for rain-gardens if rain-gardens are considered to be appropriate or on-site ground disposal of rainwater.

The estimated cost of the investigation would be included in the responses to the RFP.

- Design concepts should exclude construction in easements on private property that would involve destruction of fences, hedges and mature trees, unless trenchless technologies can be employed.
- Design concepts and cost comparisons to include life cycle costs and to be developed to a level of confidence that will allow Council to apply for senior government funding and move forward to the next phase - detailed design.
- All options to be analysed and compared on a 'triple bottom line' (economic, social and environmental) basis.
- Develop a communication and public engagement program to engage and inform all Oak Bay residents about the project.

Respectfully Submitted,



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D. Marshall B.Sc., A.Sc.T.  
Director of Engineering Services

Source of Funds/I concur with the recommendation of the Director of Engineering Services.



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Patricia Walker  
Municipal Treasurer

I concur with the recommendation of the Director of Engineering Services.



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Helen Koning  
Chief Administrative Officer

Attachment:

1. Report – HJA Water Management Consulting, Uplands Combined Sewer Separation Project, February 11, 2015

# **ATTACHMENT # 1**

## **THE CORPORATION OF THE DISTRICT OF OAK BAY UPLANDS COMBINED SEWER SEPARATION PROJECT**

**To Comply with the Municipal Wastewater Regulation and the Core Area Liquid  
Waste Management Plan**

**February 11, 2015**

**HJA Water Management Consulting**

**J.A. (Jack) Hull MBA, P.Eng.**

## **UPLANDS SUBDIVISION COMBINED SEWER SEPARATION**

### **INTRODUCTION**

The Uplands Subdivision of 400 homes constructed in the early 1900's and covering an area of 188 hectares is serviced by a combined sewer system in which the domestic sewage from homes and runoff from roads and impermeable surfaces on the residential lots is conveyed in a single pipe. In this regard Uplands is unique in the District of Oak Bay (Oak Bay) Elsewhere in Oak Bay separate pipes convey sanitary sewage and storm water – sewage ultimately to Currie Road Pump Station and storm water to creeks or to marine discharges. Separate sanitary and storm sewers are the norm in the other municipalities in the Capital Region.

The combined sewer system drains two separate catchment areas of the subdivision, referred to as Rutland and Humber catchments (Attachments 1 and 2). The Rutland and Humber catchments drain to the Rutland and Humber Pump Stations which pump to the East Coast Interceptor (ECI), a CRD owned and operated trunk sewer. As the pump stations are not designed to handle the high flows that occur during wet weather events, flows in excess of the pump stations' capacity bypass the stations and discharge to Cadboro Bay. Domestic sewage and storm water runoff, referred to as combined sewer overflows (CSOs) contain substances including suspended solids, pathogens, nutrients, hydrocarbons, floating inorganic material and organic fecal matter. While these materials are highly diluted in CSOs they have the potential to have a deleterious effect on aquatic habitat and inhabitants. When overflows occur the CRD typically issues a public health advisory because of the potential of fecal contamination.

New homes being built in Uplands are required by Oak Bay to install separate sanitary and storm water pipes in anticipation of the combined sewers being separated. In some cases the home owner has to install one and sometimes two sump pumps because of the elevation of the residence in relation to the available sewer, on pump to handle wastewater flows, the water from tile drains and rainwater runoff.

### **THE CRD TRUNK SEWER – THE EAST COAST INTERCEPTOR**

The ECI (Attachment 3) is part of the CRD core area trunk sewer system. Construction of the ECI was completed in 1991 along with the Currie Road Pump Station to combine discharges to the marine environment at the Clover Point deep sea outfall, which was constructed in 1980. In Oak Bay by-pass outfalls were retained at the Humber pump station, Rutland pump station and Currie Road pump station. The Currie Pump Station overflows at McMicking Point. Overflows occur during storm events when the capacity of the pump stations and trunk sewers is exceeded. Overflows at Humber and Rutland are more frequent because of the combined sewer system in Uplands.

The 1987 'East Coast Design Memorandum' – Kerr Wood Leidal and Associates (KWL) identified that the preferred plan for Humber and Rutland Pump Stations was to capture the 'first flush' of storm events as these typically contain the highest level of contaminants. Therefore it appears that the intent was to allow overflows during storm events. The ECI design memorandum also noted that without separating the Uplands sewers it was not practical to eliminate overflows for the 1-year return period event.

### **REGULATORY REQUIREMENTS – CORE AREA LIQUID WASTE MANAGEMENT PLAN**

In British Columbia wastewater management is regulated by the Municipal Wastewater Regulation (MWR) formerly known as the Municipal Sewage Regulation. In compliance with the MWR the CRD has developed the Core Area Liquid Waste Management Plan (CALWMP). Participants include Saanich, Oak Bay, Victoria, Esquimalt, View Royal, Colwood, Langford and two First Nations. When the original CALWMP was approved in March 2003 it included the following condition as it relates to Oak Bay:

*'This approval is made with the following conditions that the CRD shall: ...*

*11. On or before March 31, 2008 complete cost/benefit studies and an implementation schedule directed at the elimination of the combined sewers in Oak Bay to be consistent with the Municipal Sewage Regulation.'*

A cost benefit study was never undertaken due to the uncertainty as to the intent of the study. While the CALWMP has had subsequent amendments the requirement to separate the Uplands sewers has not changed. However, it appears from the records that initial efforts focussed on eliminating overflows for up to the 5-year storm event as an intermediate measure toward separating the combined sewers.

The current CALWMP requires all flows up to two times average dry weather flow (ADWF) will receive secondary treatment as required by the Municipal Sewage Regulation (MSR) and all systems will be in operation by the end of 2018. Wet weather flows in excess of 2 times ADWF up to 4 times ADWF from the Macaulay Point contributory area will receive primary treatment. Flows in excess of 4 times ADWF will be screened prior to discharge through the marine outfall. At Clover Point, a pump station will divert up to 3 times ADWF to McLoughlin Point. Flows in excess of 3 times ADWF will be screened prior to discharge through the Clover Point marine outfall.

In order to reduce the wet weather flows, the CALWMP includes an inflow and infiltration (I&I) program designed to limit storm flows such that all flows receive at least primary treatment. In the case of Clover Point the Ministry of Environment (MOE) has agreed that this applies to flows up to a one in five year storm event. In Section 5 of the CALWMP 'Management of Infiltration and Inflow and Control of Wastewater Overflows' the CRD and participating municipalities commit to actions to 'reduce I&I sufficiently to reduce maximum daily wet weather flows to less than four times average dry weather flow by 2030.' Table 5.5 of the CALWMP, the relevant part of which is reproduced below, presents Oak Bay's commitments to overflow reduction, including the 'Uplands Sewer Separation', with an estimated completion date of 2015.

## Section 5 – Management of Inflow and Infiltration and Control of Wastewater Overflows

Table 5.5  
Prioritized Order of Oak Bay Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost (\$2008) to Complete
1.	Uplands Sewer Separation	Complete the separation of combined sewers in Uplands.	2015	\$12,000,000 (est.)
2.	South Oak Bay I&I Rehab Project	Continue with the phased rehabilitation project in the Windsor catchment area.	2010	\$1,000,000 (est.)
3.	Hydraulic Model	Continue to complete a hydraulic model of the entire collection system.	2014	\$90,000 (est.)
4.	CCTV Inspection	Continue to video inspect sewer mains.	Annually	\$25,000

The estimated cost was for the low pressure system. Oak Bay has proceeded with Item 2 including manhole lid sealing, main line relining and flow monitoring. Items 3 and 4 are in progress.

### UPLANDS SEWER SEPARATION – BACKGROUND

Oak Bay has commissioned a number of studies over the past 28 years. This report reviews reports starting in 1995 including:

- 1995 - Investigation of Alternatives to Combined Sewer Separation in the Rutland Drainage Basin – KWL
- 2004 - Assessment of ECI Pressure Siphon Capacity and Arbutus Peak Flow Storage Tank – KWL
- April 2005 – ‘Uplands Subdivision Combined Sewerage System – Compliance with Cor Area Liquid Waste Management Plan and Municipal Sewage Regulation’ – Associated Engineering (AE).
- September 19, 2006 – ‘Technical Memorandum ‘Uplands Sewer System Modelling’ – KWL
- February 13, 2008 – Technical Memorandum – ‘Uplands Sewerage System Modelling Rutland and Humber Catchments’ – KWL
- December 12, 2008 – Technical Memorandum – ‘Uplands Sewerage System Modelling Rutland and Humber Catchments’ – KWL

- February 22, 2009 – Technical Memorandum – ‘Uplands Sewerage System Modelling Rutland and Humber Catchments’
- December 9, 2010 – ‘Uplands Combined Sewers Storm and Rain Garden Option – Phase 1’ – KWL
- September 21, 2012 – Technical Memorandum - Uplands Combined Sewers – Storm Main to Separate Sewer – Phase 1.’ - KWL

The following provides an overview of these reports to provide Council with a sense of the evolution of the Uplands sewer separation issue. Some of the information in these Technical Memoranda (TM) is either outdated or no longer applicable. Also included are Council resolutions in the same timeframe as the TM and relevant communication from the MOE.

**June 1995 – ‘Investigation of Alternatives to Combined Sewer Separation in the Rutland Drainage Basin’ Kerr Wood Leidal Associates (KWL)**

The scope of the study was to:

- Conduct a literature review.
- Develop combined sewer overflow criteria which meet draft provisional objectives for the reduction of combined sewer overflows in the Uplands area.
- Conduct a hydrologic review
- Estimate the size of storage and treatment facilities to comply with proposed criteria.
- Develop a number of combined sewer overflow treatment and storage options complete with costs.
- Select the most appropriate method and develop a phased plan.

KWL identified the following options for reducing CSOs:

- Increase downstream capacity of ECI.
- Any combination of separation, storm sewer installation, sanitary sewer installation, storage.
- Reduce storm water runoff with various source control measures.

KWL concluded that:

- The ECI has reduced CSOs.
- Increasing the size of the ECI is not considered feasible.
- The cost of separation was up to 3 times that of storage.
- The existing combined sewer is in good condition.
- The Ministry’s policy is to encourage eventual elimination of all combined sewer overflows.
- The most cost effective solution is storage, but such a project cannot be phased over several years.

KWL recommended that Oak Bay and the CRD should:

- Initiate a sampling program to gather combined sewer overflow quality to provide an initial benchmark.
- Conduct an environmental review of the receiving waters and confirm the length of replacement outfalls needed.



- Continue the combined sewer system but enhance with combined sewer overflow storage and treatment.
- Submit plans to the Ministry of Environment for review.
- Confirm that the plan conforms to the CALWMP.
- Have consultants perform a twenty year continuous flow simulation to heighten confidence.
- Implement the plan.

**April 2005 – ‘Uplands Subdivision Combined Sewerage System – Compliance with Core Area Liquid Waste Management Plan and Municipal Sewage Regulation’ – Associated Engineering (AE).**

The scope of the study was to evaluate available options to eliminate combined sewer overflows from the Uplands under a five year storm. AE identified the following options and cost estimates:

- Combined sewer separation - \$25 million plus
- In-line storage (large tanks) - \$24 million
- In-line storage (satellite tanks) \$47.2 million
- Combined sewer overflow treatment - \$8 million
- Combined sewer overflow treatment and disinfection - \$10 million

AE dismissed a low pressure system as in its opinion the operation and maintenance costs would be greater than a gravity system. AE also suggested that if a new pipe was to be installed it should be for a sanitary sewer as a smaller pipe would be required than for a storm sewer.

While the combined sewer overflow treatment was determined to be the least expensive, the option would not comply with Oak Bay's obligation under the CALWMP to eliminate the combined sewers in Uplands.

KWL next prepared a series of technical memoranda on Uplands sewer system modelling. These TMs focused on the actions necessary to reduce flows to 90 L/s (the pumping capacity at Rutland and Humber) minus the peak sanitary flow to eliminate overflows during the 5-year storm event and not compliance with the CALWMP.

**September 19, 2006 – ‘Technical Memorandum ‘Uplands Sewer System Modelling’ – KWL**

The purpose of the study was to confirm the proposed CSO reduction criteria selected by Oak Bay staff, and investigate the extent of new storm sewers and/or detention facilities to meet the target of an I&I reduction of 90 litres per second (L/s) minus the peak sanitary flow to eliminate overflows during the 5-year storm event.

The modelling determined that if the combined sewers were not separated the Rutland and Humber pump stations and the ECI downstream would have to be upgraded. In order to eliminate the overflows during the 5-year storm event KWL recommended:

- 3,200 metres of new storm drain system be installed in Rutland catchment to remove 46% of existing roadways from the existing combined sewer system.
- A 740 cubic metre detention facility be constructed at the Rutland Pump Station.
- 4,700 metres of new storm drain system be installed in the Humber catchment to remove 72% of existing roadways from the existing combined sewer system.

- A 275 cubic metre detention facility be constructed at the Humber Pump Station.
- The storm sewer system should be designed at sufficient depth and with sufficient capacity so that the new storm drain service laterals can be connected.

The cost estimate (2006\$) was \$10 million. Based on the annual budget provided by Oak Bay staff of \$100,000 per catchment, 100 metres of new storm drain per catchment would be installed, taking 32 years and 47 years respectively for the Rutland and Humber catchments to complete the recommended length of new storm drains. Full separation could have been achieved by extending the length of storm drain required to service the entire Rutland and Humber catchments to 7000 metres and 6500 metres respectively.

While this study once again focused on eliminating overflows during the 5-year storm event implementation would have separated 59% of the combined sewers.

#### **Committee of the Whole – September 6, 2005**

MOVED by Councillor Macey-Brown, Seconded by Councillor Cassidy,

That the suggested option of sewer separation of the Uplands combined sewer system to bring the Municipality into compliance with the CRD's Core Area Liquid Waste Management Plan (LWMP) and the Provincial Municipal Sewer Regulation be endorsed in principle subject to the following:

- Clarification of the provincial requirement for cost/benefit studies with respect to the elimination of combined sewers in Oak Bay; and
- Confirmation by the Capital Regional District that the proposed option would meet the requirements of the Provincial Municipal Sewer Regulation.
- Confirmation that there is no possibility of change in the Municipal Sewer directives.

CARRIED

No cost/benefit study was undertaken due the uncertainty by all parties as to its purpose. The Province has consistently maintained its position on combined sewer separation. The Municipal Wastewater Regulation remains unchanged and to our knowledge there are no plans to do so.

#### **Council – November 14, 2005**

MOVED by Councillor Herbert, Seconded by Councillor Jensen,

That the Mayor and Municipal Clerk be authorized to sign and do all things necessary to execute the Community Works Fund Agreement, regarding transfer of federal gas tax revenues under the "New Deal for Cities and Communities", as attached to the circular from the Union of British Columbia Municipalities dated October 25, 2005.

CARRIED

On January 17, 2008 the Ministry of Environment in response to an e-mail from the CRD on May 15, 2007 which asked 'Does the ministry want to eliminate combined sewer overflows or combined sewers?', stated, 'The strategy prepared by Oak Bay does not comply with the Minister's directive because, ultimately, full combined sewer separation is not being proposed.'

**February 13, 2008 – Technical Memorandum – 'Uplands Sewerage System Modelling Rutland and Humber Catchments' – KWL**

The February 2008 TM revised the September 2006 memorandum by eliminating the detention structures. As a result the length of the new storm drain increased to reduce the flows to the pump stations.

The recommendations were:

- 5,600 metres of new storm drain system be installed in the Rutland catchment to remove approximately 80% of the existing roadways from the existing combined sewer system.
- 5,150 metres of new storm drain system be installed in the Rutland catchment to remove approximately 79% of the existing roadways from the existing combined sewer system.
- The storm drain systems should be designed at sufficient depth and with sufficient capacity so that the new storm drain service laterals can be connected.
- All new building permits to include the provision that roof, area drains and foundation drains be disconnected from the (sanitary) sewer connection.

This updated memorandum eliminated the detention facilities previously recommended. Based on 2006\$ the cost of this proposal was \$10.75 million. Based on the annual budget provided by Oak Bay staff of \$100,000 per catchment, 100 metres of new storm drain per catchment would be installed, taking 54 years to complete the recommended length of new storm drains. Again without further extension of the storm sewers, this proposal did not comply with the CALWMP and MWR. Implementing this proposal would have separated 80% of the combined sewers.

#### **Committee of the Whole - February 18, 2008**

Re: Oak Bay's Inflow and Infiltration Plans for Presentation to the CRD – Uplands Separation Project and South Oak Bay Pilot Project

Moved by Councillor Cassidy, Seconded by Councillor Braithwaite,

That resolutions be prepared and brought forward to Council to endorse the plans proposed by Kerr Wood Leidal Associates in reports attached to correspondence item no. 2008-46, to satisfy the requirements of the Municipal Sewage Regulation.

CARRIED

(Note: The resolution referred to the February 13, 2008 report from KWL).

Resolutions were brought forward to the February 25, 2008 Council meeting.

#### **Council Meeting - February 25, 2008**

Capital Regional District Core Area Liquid Waste Management Plan: Sanitary Sewer Overflows, Inflow and Infiltration.

MOVED by Councillor Braithwaite, Seconded by Councillor Copley,

That Oak Bay Council endorse the plan described in the Technical Memorandum prepared by Kerr Wood Leidal Associates dated September 25, 2006, as the method of determining the most cost-effective expenditure of public funds within Oak Bay in support of the Capital Regional District's requirement to eliminate sanitary sewer overflows consistent with the Municipal Sewage Regulation, conveyed as Condition No. 10 in the 2000 letter from the Minister of Water, Land and Air Protection approving the Capital Regional District Core Area Liquid Waste Management Plan.

CARRIED

MOVED by Councillor Jensen, Seconded by Councillor Carson,

That Oak Bay Council adopt the plan for the elimination of combined sewers in the two Uplands catchment areas consistent with the Municipal Sewage Regulation, as set out in the Technical Memorandum prepared by Kerr Wood Leidal Associates dated February 13, 2008, as the District of Oak Bay's response to the directive represented by Condition No. 11 in the 2000 letter from the Minister of Water, Land and Air Protection approving the Capital Regional District Core Area Liquid Waste Management Plan.

CARRIED

MOVED by Councillor Herbert, Seconded by Councillor Braithwaite,

That implementation of the plan with regard to the separation of combined sewers in the Uplands be delayed until it is known whether or not the Capital Regional District's sewage treatment strategy will result in a reduction of flows in the East Coast Interceptor Trunk Sewer, to allow for analysis of the extent to which the reduced flows in the trunk sewer would free up capacity to accommodate peak combined sewer flows from the Uplands and thereby reduce the incidence of storm event overflows to the five year return period required by the Municipal Sewage Regulation.

CARRIED

While the Capital Regional District's sewage treatment plan ultimately included a flow attenuation tank at Haro Woods, it would not reduce the storm event overflows as these are dependent on the pumping capacity at the Rutland and Humber pump stations.

**Committee of the Whole – July 14, 2008**

Re: Capital Regional District Core Area Liquid Waste Management Plan: Uplands Combined Sewer Separation Proposal

MOVED by Councillor Braithwaite, Seconded by Councillor Copley,

That correspondence item no. 2008-176 be deferred to a future Committee of the Whole meeting with CRD engineering staff in attendance to provide further information with respect to the Provincial Municipal Sewer Regulation and the CRD Core Area Liquid Waste Management Plan as they relate to the required elimination of combined sewers in the two Uplands catchment areas.

CARRIED

(Note: The correspondence referred to a letter from KWL dated June 19, 2008 concerning the implications of a possible CRD treatment plant in the Arbutus area. It concluded that such a plant would not create additional capacity in the ECI for 5-year flows).

**Special Committee of the Whole - September 3, 2008**

Re: Capital Regional District Core Area Liquid Waste management Plan: Uplands Combined Sewer Separation Design Proposal.

MOVED by Councillor Jensen, Seconded by Councillor Braithwaite,

That staff engage Kerr Wood Leidal Associates Limited to augment its original Technical Memorandum dated February 13, 2008 with respect to the adopted plan for the elimination of combined sewers in the two Uplands catchment areas to provide a comparison between that option and a new low pressure or vacuum sanitary sewer system.

CARRIED

The low pressure system was subsequently selected as least cost option.

**December 12, 2008 – Technical Memorandum – ‘Uplands Sewerage System Modelling Rutland and Humber Catchments’ – KWL**

Since the February 2008 Technical Memorandum was submitted two issues came to light regarding the future operation of sewerage in Uplands, namely:

- Submission and statements by the CRD promoting future injection rates for the current Rutland and Humber Pump stations that are significantly lower than the current rates and,
- Indications that cost sharing for the proposed \$1.2 billion CRD treatment plants will be based on annual sewer flow rates from each municipality.

As noted by KWL the concern for Oak Bay is that on the first point, the previously proposed new storm drain system may not yield acceptable results in terms of sewage flows into the ECI. The second point alludes to savings in capital charges to CRD for a separation scheme that limits inflow and infiltration and therefore total flow. Consequently, KWL was asked to investigate three new sewer options including traditional gravity, centralized vacuum systems and a decentralized low pressure system. In other words to investigate a new sanitary sewer option in addition to the new storm sewer option. As KWL note the new sanitary sewer option would need to be constructed in a few years because the existing system would continue to be a combined system injecting into the ECI until the very last house connection is switched over to separated services.

Their analysis concluded that the low pressure system (LPS) was the most economical overall. All of the sewer options need to be fully operational before any environmental benefits are realized and this will likely require that they are built within a short time frame of a few years. The overall costs to the municipality for the LPS system is expected to be one third of what a new storm drain system would be according to KWL. As noted previously, AE dismissed the low pressure option as being too expensive when capital and operational costs were considered.

	Storm Sewer	Sanitary Sewer	Vacuum System	LPS
Capital Cost	\$14.3	\$16.4	\$9.0	\$8.4

As KWL noted these are relative costs only and not for budgeting purposes.

As explained later in this report, separating the Uplands sewers will not make a significant difference to the average household cost of the sewage treatment project because the most of the costs (capital and operating) are based on ADWF.

**February 22, 2009 – Technical Memorandum – ‘Uplands Sewerage System Modelling Rutland and Humber Catchments’**

This TM is essentially a final version of the December 2008 TM.

**Special Council Meeting – February 25, 2009**

Re: Capital Regional District Core Area Liquid Waste management Plan: Uplands Combined Sewer Separation Design Proposal.

MOVED by Councillor Herbert, Seconded by Councillor Braithwaite,

That the District's engineering consultants for the Uplands sewer separation project be asked to prepare for consideration by Council a draft application for funding under the Building Canada Fund program, based on the low pressure sanitary sewer option as described in Item No. 2009-88, with the project's capital cost to include, subject to confirmation of funding eligibility, the cost of purchasing the grinder pumps that would be required to be installed by owners of all properties in the Humber and Rutland catchment areas.

CARRIED

**SPECIAL COUNCIL MEETING – MARCH 12, 2009**

Re: Uplands Low Pressure System Grant Application

MOVED by Councillor Cassidy, Seconded by Councillor Jensen,

That staff be authorized to submit an application for a grant under the Canada BC Building Canada Fund - Communities Component for funding of two-thirds of the estimated \$7,650,000 cost to construct a low pressure sewer system in the Uplands area of the District of Oak Bay, and further, that staff be directed to include Oak Bay's share of the cost of the project in the Financial Plan to be adopted by Council following the conclusion of the 2009 Estimates Committee process.

CARRIED

An application was subsequently submitted and fund for the Uplands low pressure system approved.

**Council Meeting – July 19, 2010**

Re: Capital Regional District Core Area Liquid Waste Management Plan – Amendment No. 8

MOVED by Councillor Herbert, Seconded by Councillor Braithwaite,

That staff be directed to send a letter to the Ministry of Environment pointing out Council's concerns regarding the proposed amendment to the Core Area Liquid Waste Management Plan, and that the Minister reconsider Oak Bay's commitments under the plan regarding separation of the Uplands combined sewers.

CARRIED

**December 9, 2010 – Uplands Combined Sewer Storm and Raingarden Option – Phase 1 – KWL**

This memo developed an option that would include infiltration rain gardens where geotechnical conditions permitted thus reducing the length of new storm sewer to eliminate overflows up to the 5-year storm event. Under this option construction would be phased over a one hundred year schedule with 1% of construction activity completed each summer. The intent of the TM was to present the concept to the Province for discussion, which to date has not happened.

The District invited KWL to submit a detailed proposal for Engineering and complete project management services in connection with the uplands low pressure sewer system project. In October 2009 the District received confirmation of Federal/Provincial funding of up to \$5,100,000 under the Building Canada Fund – Communities Component (BCF-CC). Because the funding was approved under the BCF-CC Top Up the work had to be completed by March 31, 2011. However, as a result of vigorous objections, primarily from Uplands residents, construction of the low pressure system did not proceed. Consequently, the District lost the funding for the project as it was specifically for the low pressure project.

The next TM prepared by KWL addressed directly the separation of Uplands sewers.

**September 21, 2012 – Technical Memorandum - Uplands Combined Sewers – Storm Main to Separate Sewer – Phase 1.' – KWL**

In this latest iteration of the Uplands sewer separation the KWL TM presented the following concept for the proposal:

1. The combined system will be fully separated with a new storm drain which will allow the existing combined pipe to become a dedicated sanitary sewer.
2. Rear lot easements will be avoided as a location to place new storm pipes. However onsite storm water will be separated and either infiltrated to ground, or pumped to the street. The District of Oak Bay has sketched 11 different scenarios for properties to disconnect and these are attached to this report.
3. A storm drain will collect the road runoff for all of the roadways. Where possible houses may have disconnected roof leaders and/or infiltration systems. These details will be confirmed with further geotechnical investigation.
4. The storm drain will connect to the existing Rutland and Humber pump station outfall pipes and discharge to the ocean at these locations.

Innovative Raingardens and Storage will be investigated as a way to manage storms up to the 5 year event and as an added strategy to separate all of the sewers and storm. These

raingardens, if feasible, would be located at the upper reaches of catchments and reduce the amount of storm pipe required. The raingardens will overflow back to the street in events greater than the 5 year storm. Overland flow will be used to convey this water down to the storm drain. The spacing of the new storm pipe will be calculated from the capacity of the roadway to convey this storm safely. These raingardens may be built in the first stages of the project as, if feasible, may attract higher level government funding, and will also have the greatest impact on rainwater reduction in the sewer system.

KWL stated 'The plan however is to separate all of the storm water from the sewer system should therefore exceed the LWMP.' However, as the CALWMP require the separation of the sewers the KWL plan would meet rather than exceed the CALWMP requirements.

Oak Bay has committed \$1 million to the first phase of the project. KWL estimates that based on a Class D 2012 estimate of \$13.9 million, and \$200,000 per year on a three year rolling schedule it would take 65 years to complete the project. Since 2012 Oak Bay has undertaken a survey of streetscape elevations and house floor and basement elevations as well as distance to the property line. Based on the survey the District has identified the houses may currently have or that would require individual pump stations to pump sewage into the sewer.

### **Special Council Meeting - March 25, 2013**

#### **Uplands Sewer Separation**

There was discussion regarding a letter proposed to be sent under the Mayor's signature to the Capital Regional District with respect to requesting approval at the Regional and Provincial level for Oak Bay's proposed approach to the separation of the Uplands sewer as mandated by the Provincial Government. The plan, said the Municipal Administrator, would be to install a new storm drain system in the sections of the Uplands now served by a single sewer line. It was further noted that if the plan receives approval from the CRD and the Province, a survey program would be undertaken to determine the elevations of each house to facilitate the design of the proposed new storm main, along with the collection of other data on existing pump usage. Following approval of the plan at the Regional and Provincial levels, noted Mr. Nason, a preliminary design would be brought forward to Council for consideration. Following discussion, it was the consensus of Council members present to submit the letter to the Capital Regional District as described.

### **CRD COST SHARING FORMULAE FOR CALWMP BASED ON THE MCLOUGHLIN POINT WASTEWATER PROJECT.**

The following cost sharing principles were developed in consultation with municipal staff and subsequently presented to municipal councils.

#### **Capital and Operating Costs:**

1. Capital (debt servicing) costs are allocated on the basis of design capacity flows projected to 2030 using the following proportions – 70% ADWF and 30% AAF (annual average flow)
2. Operating costs are allocated on the basis of current flows using the following proportions of 80% ADWF and 20% AAF. The proportions are based on estimated capital and operating cost drivers, prepared by the consultants, for the treatment system (i.e., 70% of the plant's capital cost and 80% of its operating costs are to treat dry weather flows.)



3. Each municipality to request the capacity that it wishes to acquire at the McLoughlin treatment facility and they would be apportioned up to the full 108ML/day capacity at the plant.

Based on the cost estimate for the McLoughlin Point project (including anaerobic digestion and infrastructure work) the estimated cost per household was estimated for 2017 and 2030 using the above noted costs allocation. The estimated Oak Bay per household costs were \$391 and \$370 for 2017 and 2030 respectively. The 2030 cost estimate assumed that the Uplands sewers had been separated. In Oak Bay AAF is 1.3 times ADWF compared to the average for all of the participating municipalities of 1.17 times ADWF, based on 2009 flows. If Oak Bay reduced its AAF to the average, the AAF for all of the municipalities would be reduced by less than 1%. Separating the Uplands combined sewer does not significantly decrease Oak Bay's share of the costs because of the greater part of the costs (capital and operating) are based on ADWF.

The question arises: Would the capacity of the central plant at McLoughlin have been smaller if the Uplands sewers had already been separated and would any reduction in the treatment plant capacity result in cost savings? The simple answer is no for three reasons. First, 70% of the capital cost of the plant is to treat the organic load at 2 times ADWF, which is not influenced by Uplands combined sewer flows in the summer period used to determine ADWF. The impact of a less than the 1% reduction in the AAF would not have an insignificant effect on either the plant cost or capacity. Second, the indicative design for McLoughlin concluded the maximum capacity that could be accommodated at on the site was 107.8 mega litres per day (ML/D) with no room for future expansion. A smaller plant would not have been designed because of a 1% reduction in AAF. Third, the 2030 design capacity assumed separation of the Uplands combined sewers.

## DISCUSSION

With the approval of the CALWMP in 2003 the option of a partial replacement of the combined sewer system in Uplands ceased being an option for Oak Bay. However, it appears KWL believed that by eliminating overflows up to the 5-year storm event, Oak Bay would be in compliance because of the wording in Section 42 of the MSR), which states in part:

- (1) *A discharger must ensure that an overflow does not occur during storm or snow melt events with less than a 5-year return period, unless*
  - a) *For a municipal wastewater collection systems for which the contributory population is 10,000 or more, the person responsible for the municipal wastewater collection system develops and implements, as part of a liquid waste management plan, measures to eliminate overflows, or*
  - b) *If paragraph a) does not apply, the person responsible for the municipal wastewater collection system or combined sewer system*
    - i. *Develops a liquid waste management plan or conducts a study, and*
    - ii. *Develops and implements measures to eventually eliminate overflows.*

Consequently, subsequent work, primarily by KWL, continued to focus on eliminating overflows at Humber and Rutland pump stations for up to the 5-year storm event. The low pressure system (LPS) proposed in 2009 would have resulted in Oak Bay complying with the CALWMP. However, the proposal did not proceed primarily because of public opposition from Uplands residents who objected, perceiving a lack of public consultation, concerns over disturbance to landscaping, questioning why it was needed and the mechanical nature of the option i.e., a pumping station at each residence.

While gravity sewer systems are preferred, installation of residential low pressure sewage ejector pumps are commonly used where topographic conditions of residences' elevation relative to the sewer pipe. Individual residential sewage ejector pumps are relatively common. Sump pumps are also used to remove water from the perimeter drain. Local examples include the District of Sooke with approximately 300 homes on LPS, Langford with over 200, and an estimated 125 in North Saanich. There are already a number of homes in Uplands and other parts of Oak Bay with LPS.

The topography of the Uplands area (Attachment 5) presents a challenge for gravity servicing using the road rights of way and dedicated easements. The topography slopes from Cadboro Bay Road to the shore line with roads mostly running approximately parallel to the contours. As can be observed from Attachments 1 and 2 the existing sewers are not confined to the roads right of way. There are 40+ lots serviced from sewer lines in easements at the rear of lots or through lots. In addition to registered easements there may be unregistered 'easements'. To install a second pipe in these existing easements would be very disruptive as typically over the intervening years lots have been landscaped and trees have been planted and matured. (Attachment 6). Any attempt to reactivate the easements for pipe installation would inevitably result in strong public opposition. If the sewer is to be located on the adjacent roadway there will be the challenge of redirecting sewers exiting the rear of a residence to the front of the property. Disturbance of some landscaping etc., is inevitable.

The survey work undertaken by Polaris in 2014 has established the main floor elevations and estimated basement foundation elevations of all the residences in Uplands along with manhole rim and invert elevations for the existing combined sewer. If a low pressure system was the preferred option then individual residences would require a low pressure pump station to pump into the low pressure relatively shallow forcemain in the road right of way. The existing sewer would be used to convey storm water to the Rutland and Humber outfalls.

If a gravity sanitary sewer system is the preferred option and the sanitary sewer is installed in the road right of way then some properties will be able to connect by gravity, others will require small pump stations to connect. The challenge will be to find the optimum solution that is a balance between the depth of the sewer installation (the deeper the sewer the higher the cost) and the number of residential pumping stations.

It is expected that excavations in Uplands to install pipes will uncover First Nations archaeological artifacts and remains. In anticipation of this probability local First Nations should be contacted well in advance of any work to establish a protocol to be followed when any First Nations artifacts or remains are uncovered. Also in advance of any excavation the Ministry of Forests Lands and Natural Resource Operations should be contacted to determine what approvals or permits may be required to address archaeological artifacts.

## **CONCLUSIONS**

1. The only way that Oak Bay can comply with the CALWMP and the MWR is to separate the existing combined sanitary sewage and storm water conveyance system.
2. Separation of the combined sewer system can be achieved in as little as 3 – 5 years. However, the actual timeframe will depend on the chosen sewer separation methodology, the level of funding by Oak Bay and the availability of senior government funding.
3. Utilizing the existing easements on private property for a parallel sewer will be disruptive to existing landscaping, fences/hedges and will likely result in mature trees having to be removed.

## RECOMMENDATIONS

1. Develop a Request for Proposals (RFP) for consulting services to undertake a predesign study to examine the options for sewer separation in the Uplands. Options to be considered include:
  - a gravity sanitary sewer system, the existing (combined) sewer would convey storm water;
  - a gravity system for storm sewers, the existing sewer would convey wastewater;
  - a low pressure system for wastewater;
  - a low pressure system for storm water;
  - a combination of gravity and pressure systems, and
  - any other innovative approach envisaged by the Consultant to achieve the goal of separating the combined sewers in Uplands.
2. It will be necessary to undertake site specific geotechnical investigations to identify suitable conditions for ground infiltration, either for raingardens if raingardens are considered to be appropriate or on-site ground disposal of rainwater. The estimated cost of the investigation would be included in the responses to the RFP.
3. Design concepts should exclude construction in easements on private property that would involve destruction of fences, hedges and mature trees, unless trenchless technologies can be employed.
4. Design concepts and cost comparisons to include life cycle costs and to be developed to a level of confidence that will allow Council to apply for senior government funding and move forward to the next phase - detailed design.
5. All options to be analysed and compared on a 'triple bottom line' (economic, social and environmental) basis.
6. Develop a communication and public engagement program to engage and inform all Oak Bay residents about the project.

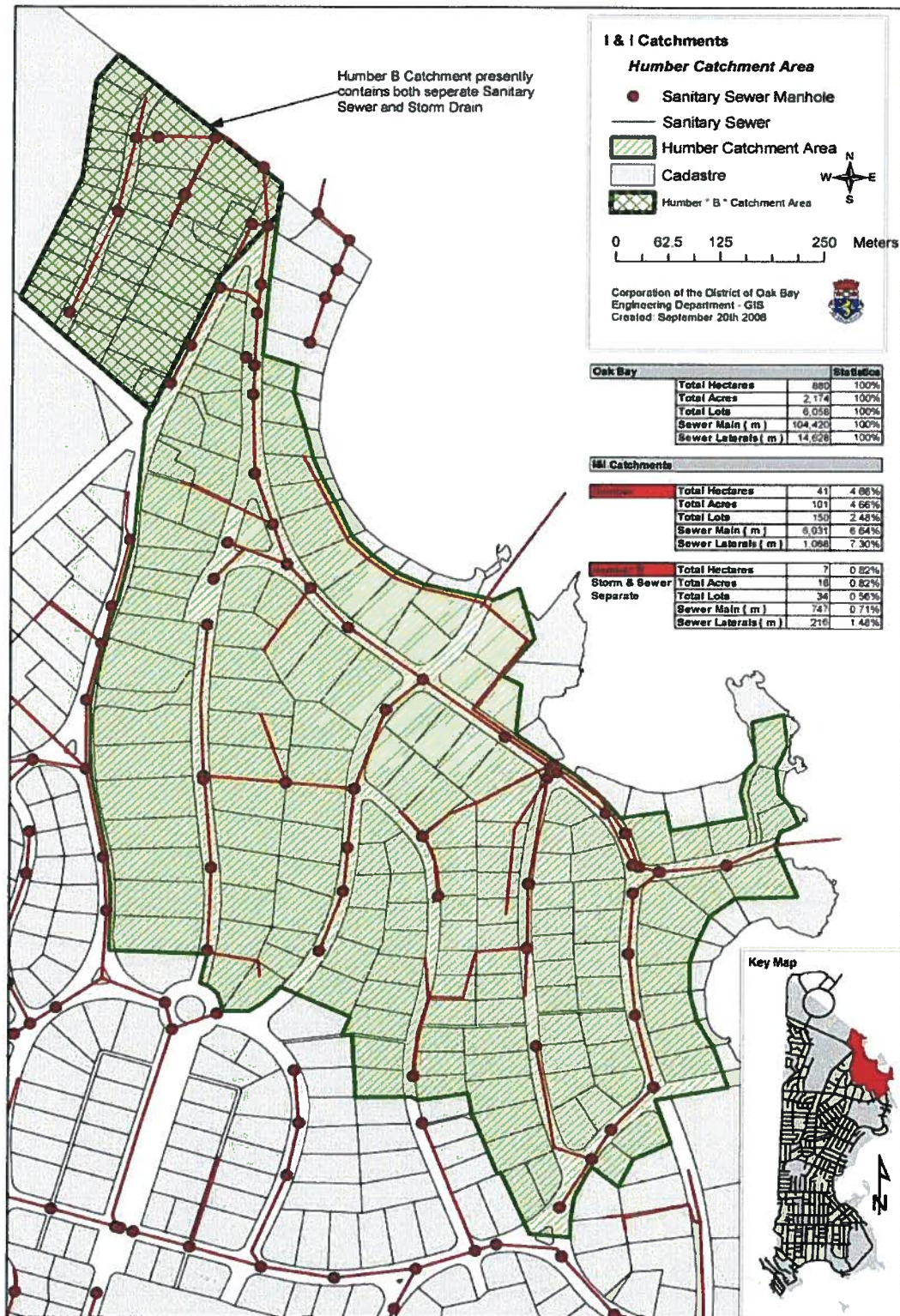
## Schedule

The following schedule is suggested to move the project forward to construction. Milestone decisions by council are shown in **bold**. Actual timelines will depend on the scope of work for the first phase of Uplands Sewer separation.

### Uplands Combined Sewer Separation Project - Schedule of Activities

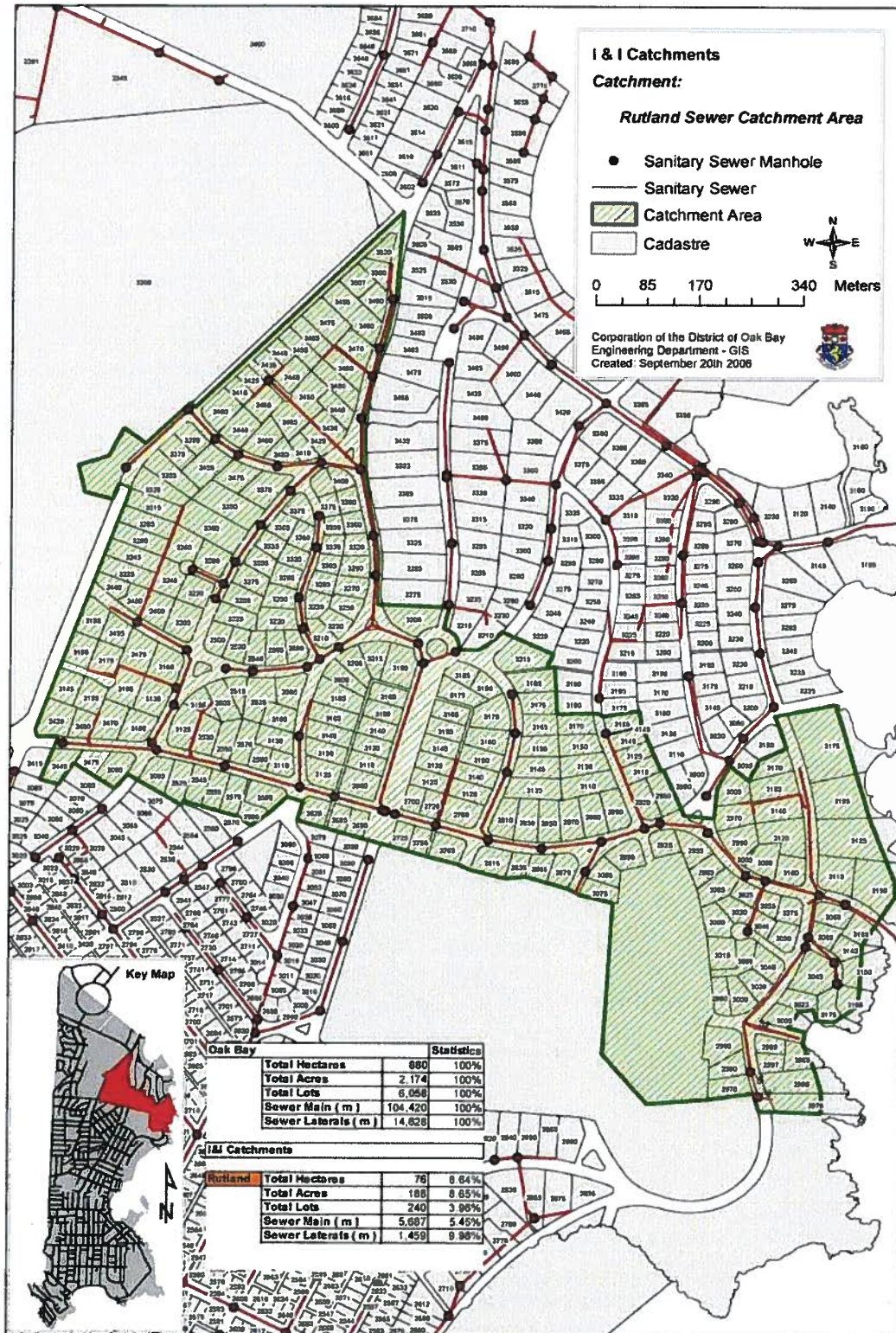
Activity	Date
<b>1. Authorization to issue RFP for predesign services</b>	<b>23 February 2015</b>
2. Issue RFP for predesign consulting services	20 March 2015
<b>3. Award consulting contract</b>	<b>27 April 2015</b>
4. Predesign Engineering - Study of Options	May – September 2015
5. Develop a public engagement/consultation plan	May – August 2015
6. Public engagement/consultation	October – November 2015
<b>7. Select Preferred Option</b>	<b>11 January 2016</b>
8. Meet with CRD & MOE re: CALWMP amendment	January 2016
9. Issue RFP for Detailed Design	24 February 2016
<b>10. Award Phase 1 Design Contract</b>	<b>25 January 2016</b>
11. Detailed Design	February – June 2016
12. Apply for Senior Government Funding	March 2016
13. Tender Phase 1 Construction	June 2016
<b>14. Award Construction Contract</b>	<b>29 August 2016</b>
15. Phase 1 Construction	September 2016 -

# Attachment 1 - Uplands Combined Sewer System - Humber Catchment



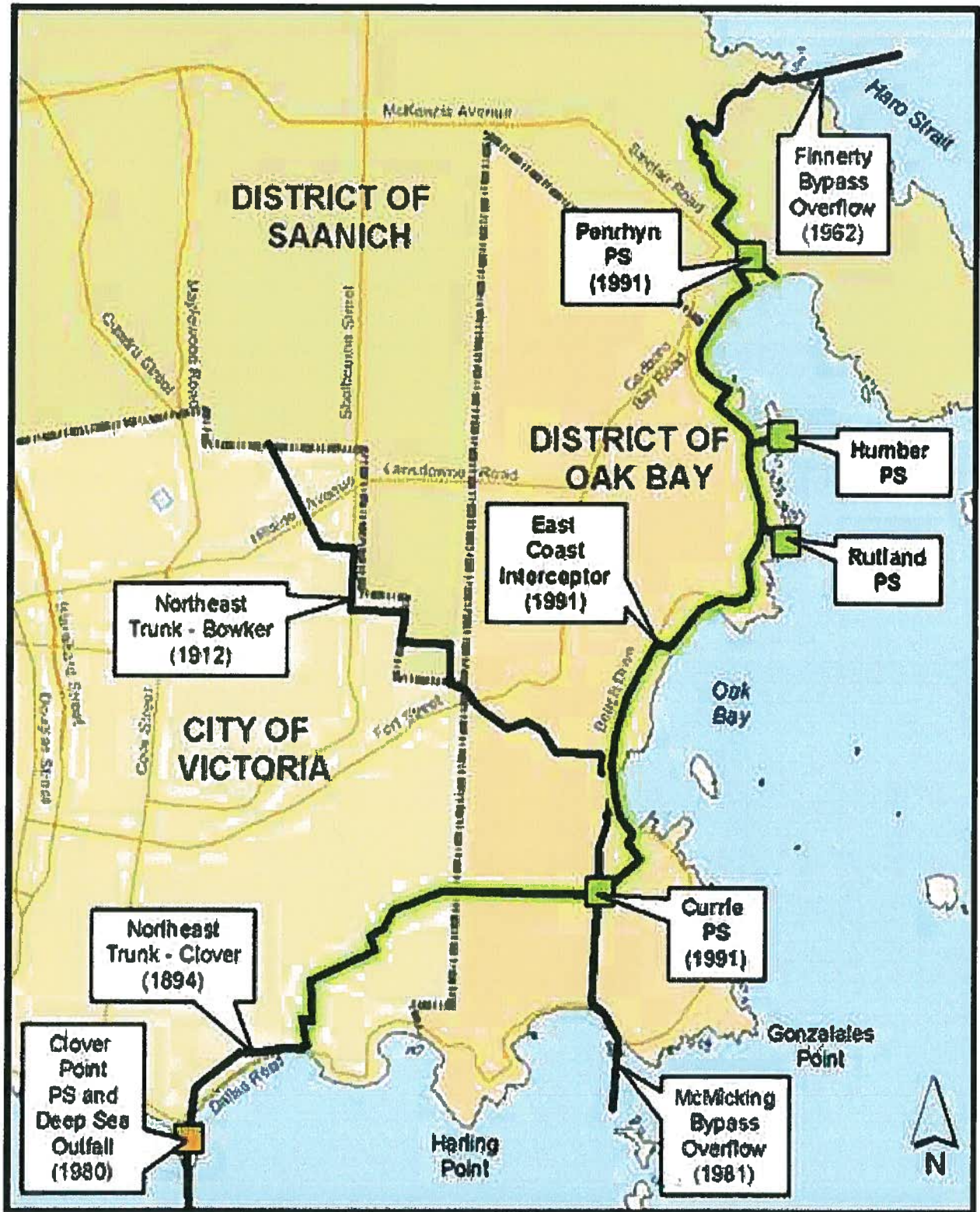


## Attachment 2 - Uplands Combined Sewer Separation – Rutland Catchment

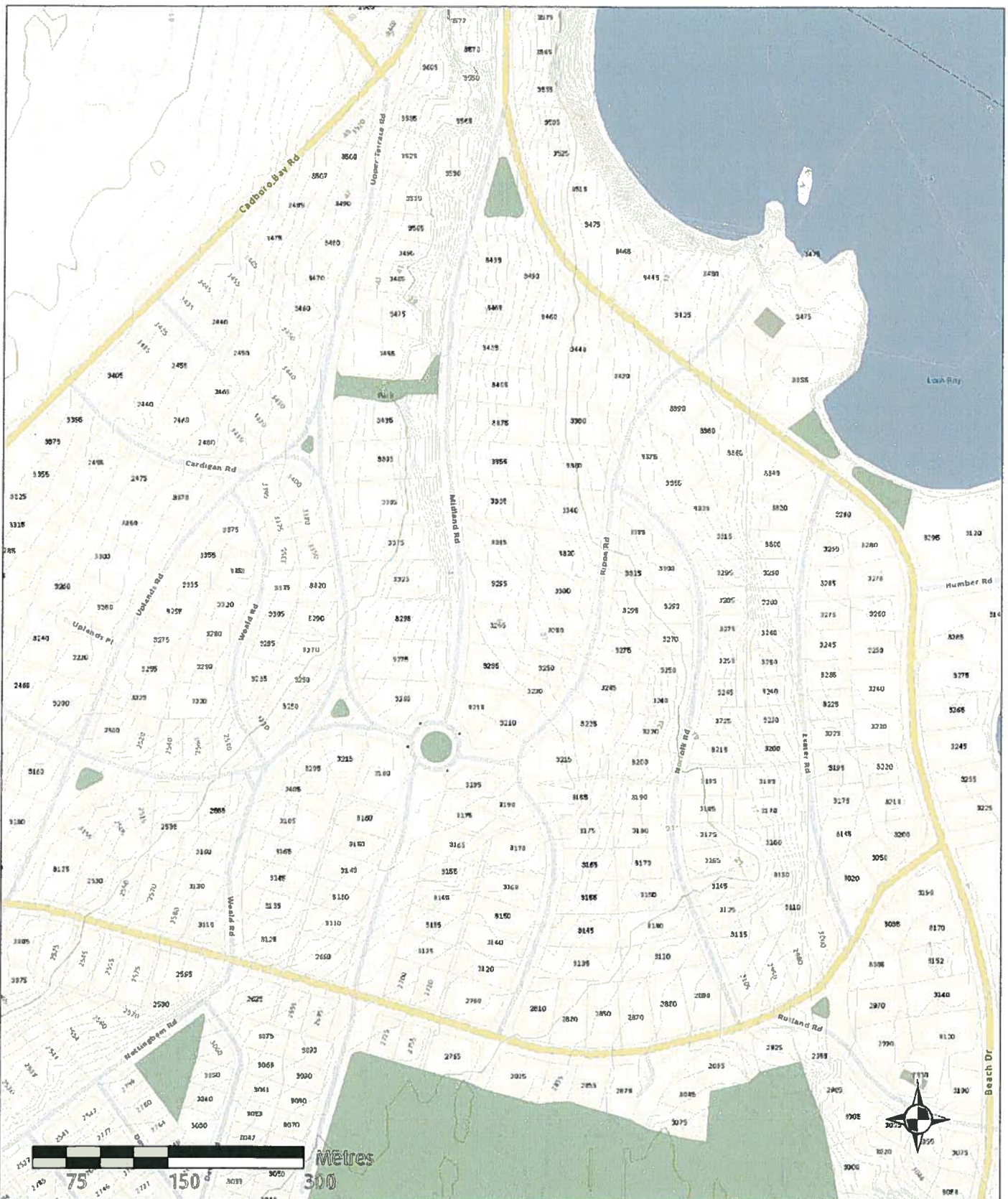




Attachment 3 - East Coast Interceptor – CRD Trunk Sewer







### Important

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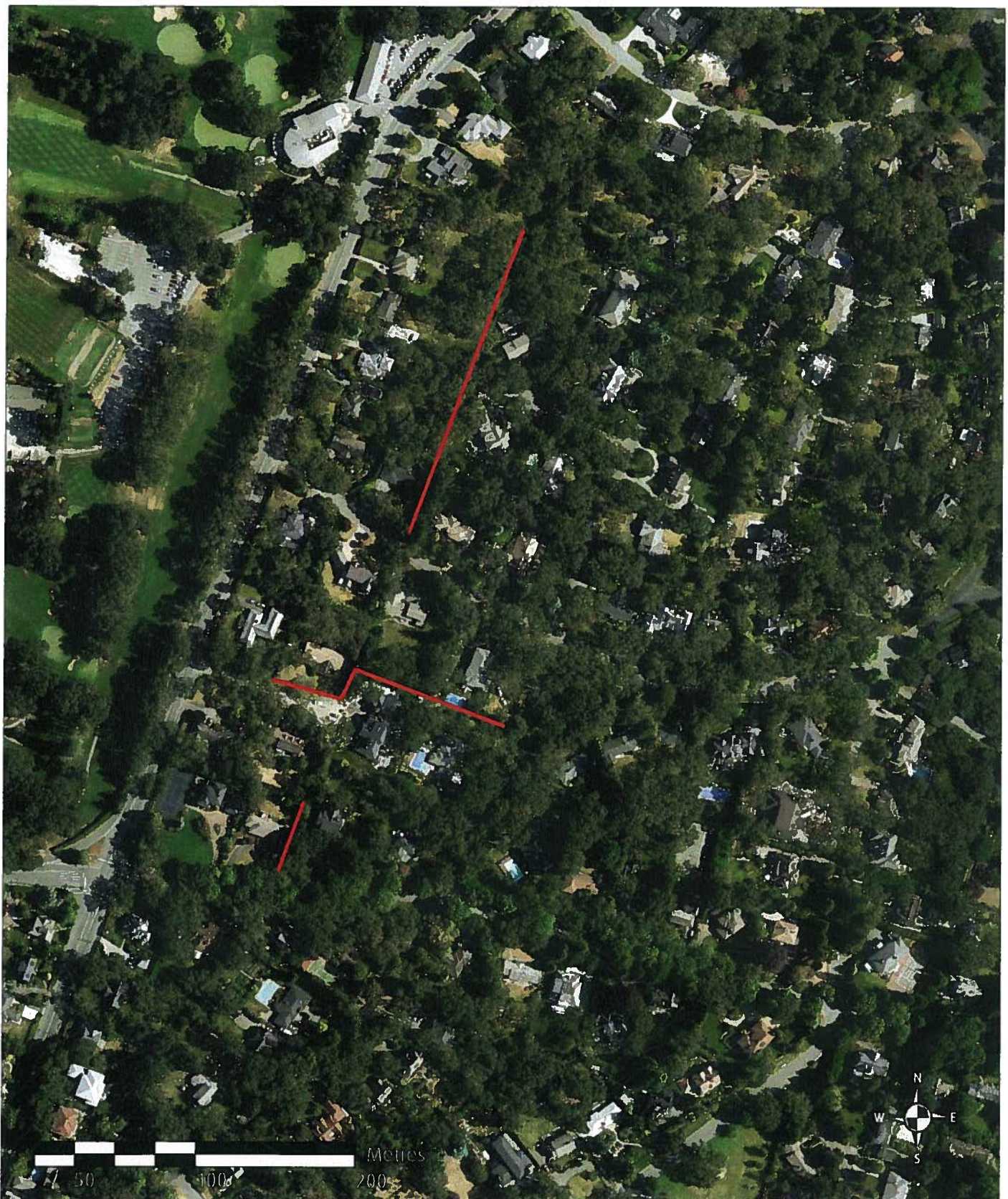
## Uplands Combined Sewer Separation

### Attachment 4 - Topography

### Regional Community Atlas

Capital Regional District  
gis@rd.bc.ca  
<http://www.crd.bc.ca>





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## Uplands Combined Sewer Separation

### ATTACHMENT 4 - Example Sewer Locations

### Regional Community Atlas

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