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**CORE AREA AND WEST SHORE SEWAGE TREATMENT
TECHNICAL AND COMMUNITY ADVISORY COMMITTEE MEETING**

Notice of Meeting on **Monday, November 21, 2016 at 12 pm**
Room 107, 625 Fisgard Street, Victoria, BC

L. Helps (Chair)	R. Barnhart	M. Coburn	B. Corenblum
T. Davies	G. Gillsespie	N. Grigg	E. Ishiguro
H. Machielse	M. Mahovlich	J. McIsaac	J. Miller
P. Nursey	J. Paul	D. Purewall	L. Resnick
J. Rose	J. Rosenberg	A. Teekasingh	T. Tiedje
D. White	C. Witter		

AGENDA

1. Approval of Agenda
2. Adoption of Minutes of February 16, 2016
3. Introductions
4. Chair's Remarks
5. Update – Core Area Liquid Waste Management Committee
6. Core Area Liquid Waste Management Plan - Amendment No. 12 – Oak Bay Uplands Combined Sewer Separation
7. New Business
8. Adjournment

Attachments: Staff Report: CALWMP-Amendment No. 12

Next Meeting: TBA

To ensure a quorum, please advise Margaret Reilly at 250.360.3046 or mreilly@crd.bc.ca if you cannot attend.



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DRAFT

**Minutes of a Meeting of the Core Area and West Shore Sewage Treatment Technical and Community Advisory Committee (TCAC)
Held February 16, 2016, in Room 107, 625 Fisgard St., Victoria, BC**

Present: **Committee Members:** L. Helps (Chair), R. Barnhart, M. Baxter, M. Coburn, E. Ishiguro, H. Machielse, J. Miller, G. Montgomery (for J. Mclsaac), D. Purewall, A. Teekasingh, T. Tiedje, D. White, C. Witter
Staff: L. Hutcheson, General Manager, Parks & Environmental Services; D. Telford, Project Manager, Core Area Wastewater and Resource Recovery Project; L. Taylor, Communications Coordinator, Corporate Communications; M. Reilly (recorder)
External Resources: none
Also Present: A. Gibbs, Consultant; C. Houghton, Consultant; E. Lee, Consultant
Absent: T. Davies, G. Gillespie, M. Mahovlich, J. Paul, L. Resnick, J. Rose, J. Rosenberg

The meeting was called to order at 2:01 pm.

1. Approval of Agenda

MOVED by C. Witter, **SECONDED** by R. Barnhart,
That the agenda be approved as circulated.

CARRIED

2. Adoption of Minutes

MOVED by C. Witter, **SECONDED** by R. Barnhart,
That the minutes of the January 18, 2016 meeting be adopted as circulated.

CARRIED

3. Chairs Remarks

Chair Helps commented that the phase 2 public consultation is coming to an end on Saturday, February 20 at noon. Following this, staff and consultants will work together to prepare a report for the Core Area Liquid Waste Management Committee (CALWMC) which will be a recommendation for a sewage treatment option. This staff report will be sent to TCAC members as soon as it is posted on Monday, February 22 and TCAC members are encouraged to send their comments to Chair Helps by Tuesday, February 23 at midnight. The report will be under consideration by the CALWMC on February 24. The CALWMC will meet again on February 26 at which time a decision will need to be made.

4. Core Area Siting Options Development Phase 2 Public Consultation Update

Christine Houghton (Aurora Innovations) gave a PowerPoint presentation on the Westside public engagement process and technical developments. She noted:

- Westside has developed a 3 plant option

- Westside technical staff researched the cost for a sewage treatment facility using a 2 times average dry weather flow (2xADWF) capacity model (4xADWF is the standard) which may be feasible given the low levels of inflow and infiltration in the western communities
- the high school competition in which students have an opportunity to present their vision of a sewage treatment plant is ongoing
- there has been extensive use of social media in the phase 2 consultation
- there have been 4 open houses on the Westside and one joint Eastside/Westside open house
- targeted meetings have been held with community associations, chambers of commerce and neighbourhood associations
- advertisements have been placed in all local papers and on local radio and television
- the survey was changed on February 12 to add the option “none of the above” – results of this change will be analysed

Amanda Gibbs (Public Assembly) reported that Eastside and Westside shared a common strategy for the phase 2 public consultations. She noted:

- 14 events will have been held on the Eastside by February 17
- meetings were also held with community groups, CUPE, arts groups and business groups
- open houses and workshops attracted fewer participants than anticipated although there were very specific questions and ideas from those who attended
- the online survey has been completed by approximately 1200 to date – the goal is 1500 responses

D. Purewall joined the meeting at 2:15 pm.

5. Core Area Liquid Waste Management Committee Progress Update

Ehren Lee (Urban Systems) gave a PowerPoint presentation. He noted that:

- Technical Memo 3 has been revised and expanded in response to requests and comments from the CALWMC
- Technical Memo 3 was accepted by the CALWMC last week and this final version was circulated to the TCAC members with the February 16 agenda
- Urban Systems is assisting with the open houses, particularly with answering technical questions
- the 7 options that are being presented cover all of the charter requests and present a full spectrum of choices to the public
- sites, costing, level of treatment, water reuse, heat recovery, solids technologies, infrastructure and conveyance systems, and options for solids processing at Hartland or Rock Bay have been laid out
- Technical Memo 4 will be an executive summary
- the inclusion of gasification in the options was questioned as this method is experimental and there are no successful working plants using this method for sewage sludge – the response is that gasification was included as there was a mandate to examine this option but it was noted that this method requires the

inclusion of landfill waste and the final choice will need to balance innovation, risk and cost

Mr. Lee thanked the members of the TCAC for their engagement, ideas, recommendations and helpfulness in offering “take home initiatives” throughout the process of preparing the technical memos.

6. TCAC Membership

There are several positions on the TCAC that have not been filled. Letters have been written to these organizations, both those who have previously declined and those who have yet to nominate someone, reminding them that under our Terms of Reference they are permitted to have representation on the committee and asking if they would like to nominate a representative.

7. Zoning Clarification

The zoning for McLoughlin Point was circulated to the committee with the February 16 agenda. Larisa Hutcheson reported that CRD owned lands at Macaulay Point are zoned for all of its current functions (i.e. sewage pump station, sewage outfall, sewage screening, and laboratory).

8. New Business

Thank You to Consultants

As this phase of the sewage treatment project is drawing to a close, A. Teekasingh offered thanks to Ehren Lee, Amanda Gibbs and Christine Houghton for their valuable work over the past several months.

9. Adjournment

MOVED by R. Barnhart, **SECONDED** by A. Teekasingh,
That the meeting be adjourned at 2:41 pm.

CARRIED

Next Meeting: March 29, 2016

RECORDER

CHAIR



**REPORT TO CORE AREA LIQUID WASTE MANAGEMENT COMMITTEE
MEETING OF WEDNESDAY, NOVEMBER 9, 2016**

SUBJECT **Core Area Liquid Waste Management Plan – Amendment No. 12 – Oak Bay Uplands Combined Sewer Separation**

ISSUE

To consider the District of Oak Bay's plan to separate combined sewers in the Uplands.

BACKGROUND

Since the Core Area Liquid Waste Management Plan (CALWMP) Amendment No. 8 was approved by the BC Ministry of Environment (MOE) on August 25, 2010, the District of Oak Bay has been working to develop an acceptable solution for separating its combined sewer systems serving the Humber and Rutland catchment areas in the Uplands. Oak Bay seeks the Capital Regional District's (CRD) acceptance of its September 2016 Uplands Combined Sewer Separation Plan and for an Amendment No. 12 to be submitted to the Minister of Environment for final approval.

The District of Oak Bay's plan proposes to eliminate combined sewer overflows at the Humber and Rutland pump stations in stages by separating the stormwater flows from the sanitary sewer flows into dedicated storm drain and sanitary sewer conveyance pipelines. This will be accomplished by incrementally installing a new storm drain that will progressively reduce the combined flows in the sanitary sewer as road catch basins and dwelling roof and perimeter drains are reconnected to the new storm drain conveyance pipeline.

Stage 1 of the plan will be completed by 2027 with the separation of the combined sewer flows in the Humber catchment area, at an estimated cost of \$5,425,000. Stage 2 will follow with the separation of the combined sewer flows in the Rutland Humber catchment area by 2047 at an estimated cost of \$10,075,000.

Appendix A provides the District of Oak Bay Council's letter to the CRD Board outlining its proposed Uplands Combined Sewer Separation plan and requesting Board approval of its submission as Amendment No. 12 to the CALWMP to the Minister of Environment for final approval.

As required under the CALWMP, the proposed amendment is to be referred to the Technical and Community Advisory Committee (TCAC) for consideration and its recommendations are to be brought back to the Core Area Liquid Waste Management Committee (CALWMC).

ALTERNATIVES

1. That the Core Area Liquid Waste Management Committee (CALWMC) refer the proposed Amendment No. 12 to the Technical and Community Advisory Committee (TCAC) for consideration and that its recommendations on the proposed amendment be brought back to the next CALWMC meeting.

2. That the CALWMC request changes to the proposed Amendment No. 12 to the Core Area Liquid Waste Management Plan prior to forwarding it to the TCAC for consideration.

ENVIRONMENTAL IMPLICATIONS

Implementation of the Uplands Combined Sewer Separation Plan is anticipated to substantially reduce the inflow and infiltration problems that result in sewage overflows into the marine environment at Humber and Rutland pump stations, satisfying the District of Oak Bay's commitment to separate the combined sewers in the Uplands.

ECONOMIC IMPLICATIONS

Oak Bay's Uplands Combined Sewer Separation project and amendment to the CALWMP is not expected to impact the project costs of the Core Area Wastewater Treatment Project.

INTERGOVERNMENTAL IMPLICATIONS

Staff have reviewed the proposed changes with Ministry of Environment staff. The amendments are considered minor and have been requested to be received in the form of a letter to the minister. The proposed amendments are to be forwarded to the TCAC for consideration as the next step, with TCAC recommendations being brought back to the CALWMC for consideration.

CONCLUSION

The proposed Uplands Combined Sewer Separation Plan has both community and Oak Bay Council support and should be forwarded to the TCAC for consideration and recommendations back to the CALWMC as required under the CALWMP.

RECOMMENDATION

That the Core Area Liquid Waste Management Committee refer the proposed Uplands Combined Sewer Separation Plan and Amendment No. 12 to the Technical and Community Advisory Committee for consideration and that its recommendations on the proposed amendment be brought back to the next Core Area Liquid Waste Management Committee meeting.

Submitted by:	Dan Telford, P.Eng., Senior Manager, Environmental Engineering
Concurrence:	Larisa Hutcheson, P.Eng., General Manager, Parks & Environmental Services
Concurrence	Robert Lapham, MCIP, RPP, Chief Administrative Officer

DT:mr

Attachment: Appendix A – Letter from Mayor Jensen, District of Oak Bay to CRD Board Chair Desjardins re Oak Bay Combined Sewer Separation Plan (October 24, 2016)



THE CORPORATION OF THE DISTRICT OF OAK BAY
MUNICIPAL HALL – 2167 OAK BAY AVENUE – VICTORIA, B.C. V8R 1G2
PHONE 250-598-3311 FAX 250-598-9108 WEBSITE: www.oakbay.ca

October 24, 2016

Capital Regional District
625 Fisgard Street
Victoria, BC V8W 1R7

Attn: Barbara Desjardins, Board Chair

Dear Chair Desjardins,

Re: Oak Bay Combined Sewer Separation Plan

On behalf of the District of Oak Bay, it is my pleasure to submit the District's plan for the elimination of combined sewer overflows at the Humber and Rutland pump stations. This will be achieved by separating the combined sewers in the Uplands Neighbourhood of Oak Bay and will bring the District into compliance with the provincial Municipal Wastewater Regulation and the CRD Core Area Liquid Waste Management Plan (CALWMP). The District requests an amendment to the CALWMP to incorporate the District's plan for sewer separation.

The plan proposes to eliminate combined sewer overflows in stages starting with the Humber catchment area. The District will incrementally install a new storm sewer which will progressively reduce the flows in the existing combined sewers as road catch basins and dwellings are connected to the new sewer.

The District has undertaken a technical evaluation of the options for separating the combined sewers and has also conducted a comprehensive public engagement process. Six technical options were developed and prior to approving the plan the District considered the environmental, social and economic implications of the various options. Given the topography of the Uplands and the decision not to use existing easements on private property to avoid significant environmental and property impacts, the plan will employ both gravity and pumped service connections.

In support of our request we have attached the following documentation:

Attachment 1 - summary of work undertaken to develop the plan to eliminate the combined sewers in Uplands (Project Manager's Report to September 19, 2016 Council Meeting).

Attachment 2 - resolution by Council to adopt the plan to separate the combined sewers in Uplands and Project Manager's report to the October 5, 2016 Committee of the Whole.

Attachment 3 - Pre-design Report by McElhanney Consulting Services Ltd., dated September 22, 2016).

Attachment 4 – draft updated Table 5.5 of the CALWMP “Prioritized Order of Oak Bay Overflow Reduction Plan.”

It is estimated the plan will cost the District and individual home owners in the Uplands \$15,500,000 and \$6,400,000 respectively.

We would appreciate the CRD Board’s endorsement of the plan and its submission to the Minister of Environment with a request to amend the CALWMP.

Should you have any questions about the attached documents, please have your staff contact Dan Horan, Director of Engineering Services by telephone at 250-598-3311 Ext 7421 or by email at dhoran@oakbay.ca. Thank you.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Nils Jensen', with a long horizontal flourish extending to the right.

Nils Jensen
Mayor

c – L. Hutcheson, CRD, General Manager of Parks & Environmental Services

HJA Water Management Consulting

509 Foul Bay Road, Victoria, BC., V8S 4G9 5T6 | 250-885-3711 | Jack.Hull@telus.net

To: Mayor and Council, District of Oak Bay

From: Jack Hull MBA P. Eng. - HJA Water Management Consulting

Date: September 12, 2016

Subject: Uplands Combined Sewer Separation Project Update

INTRODUCTION

The provincial government's Municipal Wastewater Regulation requires all BC municipalities to have separate stormwater and sanitary sewer systems. Compliance with the provincial regulation is mandatory for the District of Oak Bay as it is for other jurisdictions in the province where single pipe infrastructure currently exists, such as Burnaby, New Westminster and the City of Vancouver. While all other Oak Bay neighbourhoods have separated stormwater and sanitary sewers, the Uplands neighbourhood in Oak Bay still has a single pipe system to accommodate both sanitary sewer and stormwater flows.

The Uplands neighbourhood with combined sewers is divided into two drainage areas or catchments – Humber in the north with 150 properties, and Rutland in the south with 263 properties. Each catchment currently drains by gravity to a CRD pump station at Humber Road and Rutland Road respectively. Both pump stations currently pump sanitary sewage and stormwater into the East Coast Interceptor Trunk Sewer. During heavy rainfall events, the capacity of the pump stations is exceeded and a combination of stormwater and sanitary sewage is discharged into the sea through shallow outfalls.

The Capital Regional District (CRD) has authority for sanitary sewage under the Municipal Wastewater Regulation in the form of a liquid waste management plan (the Core Area Liquid Waste Management Plan (CALWMP)) which is subsequently approved by the Minister of Environment. As a condition of approval of the CALWMP, and to comply with the Municipal Wastewater Regulation, the District is required to eliminate combined sewer overflows in the Uplands neighbourhood by providing separate sanitary and stormwater sewers where combined sewer exists.

PURPOSE:

This report serves as a cumulative summary of the pre-design work and public consultation undertaken in 2015 and 2016 to help Council prepare for a decision on the selection of a single technical option that will separate the existing combined stormwater and sanitary sewer system in the Uplands neighbourhood. This is an imperative decision that will see the District of Oak Bay taking definitive steps to be in compliance with the provincial government's Municipal Wastewater Regulation mandating the separation of all existing single pipe infrastructure. The intention of this report is to provide a single reference document for Council and the public in advance of receiving the final technical report and recommendation from the Engineering consultant.

PROJECT BACKGROUND:

Since 2010, in preparation for the separation of the combined stormwater and sanitary sewer in the Uplands, District staff have directed residents in the Uplands neighbourhood to separate stormwater and sanitary sewers from their homes to the property line when undergoing new construction or a major renovation. As a consequence of the active redevelopment in this neighbourhood over recent years, approximately 91 homes in the Uplands have separate stormwater and sanitary sewers to the property line.

In the spring of 2015, the District initiated a Request for Proposal and awarded a contract for a comprehensive pre-design study (the study) to identify technical options for sewer separation in the Uplands neighbourhood to McElhanney Consulting Services Ltd. (McElhanney).

To inform McElhanney's pre-design study, a number of assumptions were made by the project team including:

1. The goal of the project is to eliminate (separate) the combined sewers in the Uplands neighbourhood of Oak Bay. This is the Minister of Environment's condition for approval of the CALWMP, and is intended to eliminate overflows in order to comply with the MWR (Section 42);
2. A second pipe would not be installed in the existing easements;
3. The lining of the existing pipe is not part of this project (from the grant funding perspective);
4. The existing pipe would continue to be utilized for either sanitary sewer or stormwater conveyance;
5. A maximum practical trench depth is considered to be five metres;
6. Trenchless technology, specifically directional drilling, is not viable for the installation of the new pipe;
7. The District would be responsible for compliance with the Heritage Conservation Act on District property;
8. Property owners would be responsible for compliance with the Heritage Conservation Act on private property;
9. Given the limitation on trench depth, sanitary and/or stormwater pumps will factor in all options;
10. Stormwater would not be treated (decontaminated) prior to discharge to the sea;
11. Based on BC Hydro statistics regarding the duration of power outages, the use of pumps on private property is viable;
12. On-site stormwater management would not be an alternative to a storm sewer connection;
13. In the absence of detailed geotechnical information, assumptions would be made on the occurrence of rock in generating cost estimates;
14. The cost estimates developed for private property are the average of the total cost to all property owners; that is, cost estimates were not developed on a site specific basis; and,
15. At this stage, pre-design, operation and maintenance costs estimates are based on a percentage of the capital costs.

SETTING THE FRAMEWORK FOR IMPLEMENTATION:

At the October 26, 2015 Council meeting, following the presentation by the project manager on the pre-design (Attachment 1), Council adopted the following resolution to set out the operational framework in preparation for the advancement of the Uplands Combined Sewer Separation Project.

That:

- 1. An amendment to Bylaw No. 3891 be brought forward: to mandate sewer separation for new homes and connection to the separated municipal sewers when available; to mandate sewer separation for homes undergoing major renovations, based on a value of \$100,000 or greater, and connection to the separated municipal sewers when available; and to update Schedule A of the bylaw with respect fees and permits to reflect current costs; and further that Schedule A of Bylaw No. 3891 then be updated annually;*
- 2. The cost of connecting properties with sewers separated prior to the municipality separating the combined sewers be included in the cost of the sewer separation construction contracts; and*
- 3. Staff obtain blanket Heritage Inspection Permits covering the municipal rights of way and adjacent property owners, as the project proceeds to construction.*

To ensure that all Oak Bay residents were given the opportunity to learn about this provincially mandated infrastructure project and to provide input directly to project engineers and District staff, Council directed that the Uplands Combined Sewer Separation Project include a comprehensive public engagement and information process.

SIX TECHNICAL OPTIONS PRESENTED TO THE PUBLIC AND TO COUNCIL

McElhaney's study identified six technical options. These are summarized below.

Option 1 – New deeper gravity sewer system and existing combined sewer system to remain for stormwater conveyance.

Option 2 – New deeper gravity storm drainage system and existing combined system to remain for sanitary conveyance.

- While the goal of Options 1 and 2 is to minimize the number of pumped connections, additional properties need pumps because the existing easements, required for gravity service, are not being used and 5 metres has been established as the maximum practical and economic depth for trench excavation.

Option 3 – New pumped low pressure system for sanitary sewers collection and existing system to remain for stormwater conveyance.

- Under this option all properties in both catchments would require sanitary sewage pumps.

Option 4 – A new shallow gravity stormwater system with localized areas requiring municipally owned stormwater pumping stations for roadway runoff and existing pipe as a sanitary sewer conveyance.

- The original proposal included a new pumped low pressure stormwater drainage system with the existing combined system to remain for sanitary sewer conveyance.
- It became clear that pumping stormwater from the whole catchment area would not be cost effective either initially or from a lifecycle perspective. Under a low pressure stormwater system, either a large number of pumping stations would be required to capture and convey road runoff, or a parallel shallow gravity network would need to be installed, with fewer, but larger municipally owned stormwater pumping stations. Consequently, this option was not considered further.
- Consultant recommendation: A hybrid option was developed in which a relatively shallow new gravity stormwater system would be constructed with smaller, localized areas requiring municipally owned stormwater pumping stations for roadway runoff.

Option 5 – A hybrid of shallow gravity sanitary sewer system, pumped where necessary, and existing pipe as a stormwater conveyance.

- This option would include a shallow depth gravity sanitary sewer system, with smaller, isolated areas of catchment serviced by municipal pressure sewers.
- The initial capital cost to the municipality for both options 4 and 5 is lower than for options 1 and 2 respectively; however, the number of properties requiring pumps is greater than options 1 and 2.

Option 6 – A hybrid shallow gravity sanitary sewer system, with localized community sanitary pumping stations where necessary and the existing system as a storm drain.

- This option is a variation of Option 5. More municipally owned pumping stations would be constructed in order to increase the number of dwelling units serviced by gravity sanitary sewer connections compared to Option 5.

It was estimated that the number of pumps required (new plus existing) in each catchment would be as follows:

Option	Humber Existing + New	Sub- total	Rutland Existing + New	Sub- total	Total
1	29 + 10	39	39 + 7	46	85
2	32 + 7	39	40 + 6	46	85
3	140 + 10	150	229 + 7	236	386
4	65 + 7	72	101 + 6	107	179
5	60 + 10	70	114 + 7	121	191
6	40 + 10	50	96 + 7	103	153

The greatest factors differentiating Options 1 and 2 from 4, 5 and 6 are the costs to the District related to pipe depth (trench excavation and backfilling) and the cost to homeowners in the Uplands for additional on-site private pumping systems in the latter, shallower gravity pipe network options.

PUBLIC ENGAGEMENT A PRIORITY

Extensive public consultation and engagement on the merits and considerations of each option took place over a two-month period at the end of 2015. Public feedback was collected at several open houses and through an online survey, and presented to Council as part of a project update at a dedicated Committee of the Whole meeting on February 2. (Attachment 3 – Uplands Sewer Separation Public Engagement Overview, and Attachment 4 – Uplands Combined Sewer Separation Project Survey).

The public challenged some of the pre-design study's assumptions and offered constructive insight into the technical options. In response to public feedback, and to help Council narrow down the six technical options, it was determined that more information was necessary to inform a decision. Council asked the project team to undertake additional analysis and gather more information over a period of six months, with updates to Council and the public at Council meetings and Committees of the Whole through June. The project team responded to the following Council inquiries:

- Condition of and risks to Uplands tree canopy;
- Environmental impact of combined sewer overflows;
- Alternative methods of stormwater management;
- Power requirements for residential pumps;
- Impact of minimizing requirement for residential pumps in Oak Bay;
- Use of attenuation tanks as an alternative to sewer separation;
- Assumptions on geotechnical conditions and cost implications;
- Use of existing easements;
- Conditions under which property owners must separate the sewers on private property;
- Archaeological implications;
- Alternative construction method, specifically trenchless technologies;
- Power outages and the implications for private pumps;
- Overflow data for the Humber and Rutland outfalls;
- Staging of project construction.

COUNCIL RESOLUTIONS AND STAFF RESPONSE SUMMARIES:

In response to comments at the Open Houses and at the February Committee of the Whole meeting staff undertook to:

- Explore the possibility of a new gravity sewer to carry either stormwater or sanitary sewage that would fully eliminate the need for pumps.
 - This additional option entailed trenching up to nine meters deep, which is beyond the reach of available excavators. Trench construction would have required benching to lower the excavator to reach nine meters. Installing pipe deeper than five meters is not considered practical or economic, therefore, this additional option was not considered further
- Explore opportunities for on-site stormwater management on municipal property.
 - Traffic islands, boulevards and the undeveloped Midland corridor were considered as potential locations for rain gardens for storage and attenuation of storm flows. In most cases, potential locations have mature trees, including

Garry Oaks, which would have to be removed to construct rain gardens. It was concluded that, from a stormwater management perspective, there would be insufficient attenuation or storage capacity to modify the design of the stormwater system under any of the options considered.

In 2016 Council provided direction to staff as follows:

- DIRECTION: Pursue MLA Dr. Weaver's offer to facilitate the presentation of the staged sewer separation implementation plan to the Minister of Environment; and advise the Capital Regional District (CRD) of the District's approach to the Minister.
 - The meeting with the Minister of Environment was held on May 19, 2016. The Mayor updated the Minister on progress to date on the sewer separation project and in particular the District's plan to separate the combined sewer in phases over the next 20 years, depending on funding. No objection was expressed to this phased approach. It was agreed that the District would work toward including the Oak Bay plan for sewer separation in the next amendment to the CRD's Core Area Liquid Waste Management Plan rather than as a separate amendment request.
 - The CRD established the Core Area Wastewater Treatment Project Board on May 25, 2016. The project board is charged with administering the project, including the preparation a project proposal and business case to the CRD board for submission to the Provincial Treasury Board by September 30, 2016. This will include submission of an accelerated submission of amendment to the Core Area Liquid Waste Management Plan (CALWMP). These accelerated deadlines mean that the District of Oak Bay will be required to submit a subsequent amendment request that captures the decisions made by Council in October.

OUTCOME: *Council adopted the following resolution: June 13, 2016*

That:

The District work towards providing a sewer separation plan with a phased approach for consideration in the next amendment to the Capital Regional District's Core Area Liquid Waste Management Plan;

- DIRECTION: Prepare a report about the effect of services installation on the mature tree canopy.
 - At the May 16, 2016 Committee of the Whole staff presented a report entitled 'Uplands – Assessing Service Installs and Tree Damage'. Out of the 91 properties where separate sanitary and stormwater sewers have been installed, only 2 properties show evidence of tree damage due to sewer pipe installation. Staff recommended that during the construction phase of the sewer separation project, laterals be located so as to minimize potential risks to mature vegetation. This may include pipe installation using non-invasive methods such as horizontal directional drilling as appropriate.

OUTCOME: *Council adopted the following resolution: June 13, 2016*

That:

At the time of construction, property owners be consulted on the location of sewer lateral connections to the new sewer, to minimize the risk to mature trees and other vegetation;

- DIRECTION: Arrange an educational session on horizontal directional drilling (HDD) to explore the utilization of easements as part of the technical solution.
 - At the May 16, 2016 Committee of the Whole meeting, Council received an educational presentation on HDD. Mr. David O'Sullivan President of PW TRENCHLESS CONSTRUCTION INC. presented an overview of the various trenchless technologies including: cured in place pipe rehabilitation; slip lining; pipe jacking; pipe bursting; and horizontal directional drilling. Mr. O'Sullivan's presentation focused on the application of HDD in relation to the Uplands Sewer Separation project. He addressed space requirements for the HDD rig and the entrance and exit slopes, and the geotechnical conditions in Uplands area. Mr. O'Sullivan's presentation indicated that while HDD may have some application on private property, HDD is neither a technically nor a financially feasible solution for the District to consider as part of the Uplands Combined Sewer Separation project on municipal land. Staff recommended that the use of HDD for the new sewer installation not be considered.

OUTCOME: *Council adopted the following resolution: June 13, 2016*

That:

No further consideration be given to the use of horizontal directional drilling for the new sewer installation on municipal property, with the exception of small diameter lateral connections from property lines as appropriate;

- DIRECTION: Prepare to conduct a survey of property owners on easements; report back to Council regarding the content of communications with easement holders.
 - Excluding the use of easements was one of the project assumptions made by McElhanney in defining the technical options for separating the combined stormwater and sanitary sewer system in the Uplands. In response to a Council resolution, staff embarked on a review of the easements in the Uplands to determine impacts and responsibilities for the District.
 - The Uplands neighbourhood has evolved over the past 100 years, and over that period of time, sequential easement documents were developed reflecting varying requirements. Upon preliminary review, the District does appear, under the existing easement agreements, to have the right to install a second pipe within the easement areas; however, this is subject to there being sufficient space available.
 - Existing easements are 5 feet and 10 feet wide - not sufficiently wide to install a second pipe without significant impact on private property. A new wider

easement would have to be negotiated with one or both property owners abutting an easement depending on the location of the existing pipe within the easement. The wider easements would have to be cleared to permit construction.

- The existing easements also contain mature tree, hedges, stone walls, driveways etc. Restoration of the new wider easements could represent a significant cost increase to the District such that construction in the easements would be more expensive than in the roadways.
- Staff recommended that no further consideration be given to the use of easements for the sewer separation project.

OUTCOME: *Council adopted the following resolution: June 13, 2016*

That:

No further consideration be given to the use of easements for the sewer separation project; and further, that a survey of property owners on easements is no longer necessary.

- DIRECTION: Undertake a geotechnical study of municipal property in the project area.
 - At the May 24 Council meeting, Council awarded a contract to WSP Canada Inc. to undertake a geotechnical study on municipal property in the Uplands neighbourhood.
 - A progress report was provided to Council on July 18, 2016 and received for information.

OUTCOME: *Council Meeting September 19, 2016*

The completed geotechnical investigation for the Uplands will be before Council at the September 19, 2016 meeting.

A summary of the reports to Council is included with the report (ATTACHMENT 2) and is also available on the District's web site at <https://www.oakbay.ca/municipal-hall/plans-reports/uplands-sewer-separation> .

CONCLUSION

Council consistently communicated their desire to include and invite the wisdom and sentiments of Oak Bay residents to help guide Council's decision making.

In order to address this desire, the following public engagement objectives were established at the outset of the community consultation:

Ensure that all Oak Bay residents:

- understand the need for the project;
- have access to clear and accurate project information in a format that is accessible and easily understood;
- have access to the consulting engineers and District staff in person, by phone and online;

- are encouraged to bring forward questions and concerns to enable meaningful discussions that test project assumptions; and,
- have an opportunity to record their opinions and that this personal feedback will be received by Council.

Ensure that the consulting engineers and District staff:

- understand how each potential option impacts all residents of Oak Bay;
- have the opportunity to meet property owners and discuss a highly technical project in plain language over a period of time;
- have the opportunity to listen to residents and to respond directly to questions and concerns;
- hear directly from residents what project considerations and impacts are most important;
- identify gaps in the information presented and respond appropriately and in a timely manner; and,
- incorporate public opinion and ideas, as appropriate, in any modifications to the options presented for Council's consideration.

In summary, the public consultation process identified the following key themes for Council to explore and consider:

- Affordability and fairness – finding the balance between cost to the District and cost to the impacted property owners while adopting a long term view;
- Most expedient positive environmental outcome;
- Protection of mature tree canopy;

Now that the project team has incorporated public feedback and addressed Council's requests for additional information, the options analysis phase of the project is almost complete. McElhanney will present their final report to the Committee of the Whole in October, highlighting the recommended decision criteria and enabling Council to choose an option for implementation that initiate the detailed design phase of the project. The anticipated decision criteria that Council will consider in order to choose an option for the next phase of the project will likely include the following:

- Most environmentally appropriate use of the existing pipe, that is, should the existing pipe carry sanitary sewage or stormwater;
- Progressively reduce the frequency and duration of overflows;
- Timeframe to completion of the project;
- Preserve the mature tree canopy;
- Minimize disruption on private property;
- Gravity service;
- Minimize the number of pumps;
- Costs to Uplands property owners;
- Costs to the District;
- Maintenance and lifecycle costs to Uplands property owners;
- Maintenance and lifecycle costs to the District.

This report summarized the pre-design and public consultation work undertaken in 2015 and 2016. The report is intended to help prepare Council to make the decisions required to positively address the provincial government's requirement for a separated stormwater and sanitary sewer system. The Uplands Sewer Separation project is complex, in terms of the influencing social factors as well as the technical challenges. The project team has progressed in a deliberate manner to address this complexity. This report, combined with McElhanney's final recommendations, will equip Council with the tools required to complete the options analysis phase and provide direction respect to the detailed design phase and construction of a solution to the sewer separation issue.

The following is a summary of the next steps in the project approval process:

1. A Special Committee of the Whole on October 5, 2016 is scheduled to address the next steps in the Uplands Sewer Separation Project. The final report from McElhanney will be presented. The aim of the Special Committee of the Whole will be to make a recommendation to Council on a sewer separation option that enables the project to proceed to detailed design and implementation.
2. Selection of a sewer separation option will enable staff to seek an amendment to the CRD's Core Area Liquid Waste Management Plan. This will provide the CRD with the District's expected implementation timelines and will signal definitively that the District intends to comply with provincial wastewater management regulations.
3. Once CRD concurrence on the District's proposed plan is obtained, staff will pursue funding opportunities for the implementation phase (design and Construction). Staff will also proceed with to develop a request for proposal to engage an engineering consultant to complete the detailed design phase and for further project implementation efforts.

ATTACHMENT 1

UPLANDS COMBINED SEWER SEPARATION – PREDESIGN

TO: Mayor and Council

FROM: J. A. (Jack) Hull, HJA Water Management Consulting

DATE: October 20, 2015

SUBJECT: Uplands Combined Sewer Separation Project – Pre-design

BACKGROUND:

The provincial government’s Municipal Wastewater Regulation (MSR) requires all BC municipalities to have separate stormwater and sanitary sewer systems. Compliance is mandatory for the District of Oak Bay (the District) as it is for other jurisdictions in the province, such as Burnaby, New Westminister, and Vancouver, where combined sewers currently exist. Separation of the combined sewers is an integral part of the CRD’s Core Area Liquid Waste Management Plan (CALWMP) in compliance with the MSR.

The Uplands neighbourhood currently has a single pipe system to convey both sanitary sewage and stormwater flows. During heavy rainfall events, the volume of stormwater exceeds the capacity of the system and a combination of stormwater and raw sewage overflows into the ocean at the Rutland and Humber pumping stations. Separate stormwater and sanitary sewer pipes will render such overflows unlikely and will achieve compliance with the MWR.

Included in this report are key considerations and recommendations for Council decisions on moving forward with the Uplands Combined Sewer Separation Project. These include:

- A review of Bylaw No. 3891;
- The compliance approach taken by other municipal jurisdictions undergoing the same mandated initiative;
- The District’s commitments under the CALWMP and
- Compliance with the Heritage Conservation Act with respect to the known and potential archaeological sites in the Uplands area and;

The District issued a Request for Proposals on March 20, 2015 for engineering services for the pre-design of the Uplands Combined Sewer Separation Project. Three submissions were received and a contract was awarded to McElhanney Consulting Services Limited (McElhanney) at the May 11, 2015 Council meeting. McElhanney divided the work into five activities. These are summarized in the following table along with the status of progress:

**Table 1
Project Status**

	Description	Progress Status
Activity 1	Project Start-up	Substantially complete
Activity 2	Options Development	Substantially complete
Activity 3	Options Assessment	In Progress
Activity 4	Phasing Plan for Construction Implementation	Not Started
Activity 5	Pre-design Options Final Report	10% complete

McElhanney has completed the development of six possible options to separate the existing combined stormwater and sanitary sewer system. A summary of the options is provided below.

DISCUSSION:

Key Considerations:

The uplands neighbourhood has considerable topographic variation, sloping from about 58 metres elevation in the north west (Cadboro Road) to just above sea level in the south east. When the Uplands subdivision was developed a century ago, the developer installed a combined sewer in 3 metre (10 foot) wide easements at the side and rear of properties in certain locations to service the area with gravity sewers and to avoid having to construct deep sewers.

To install a second pipe, an additional 2 metre (6.5 foot) wide easement would have to be obtained. The total 5 metre (16.5 foot) easement would have to be cleared to allow for equipment access and working space. Over time the easement areas have grown over substantially. As illustrated in the attached photographs (Attachments 1), clearing a 5 metre (16.5 foot) wide easement would require the removal of mature trees, hedges, fences and other mature landscaping. Consequently, McElhanney has developed options to avoid using the existing easements.

1. PRE-DESIGN OPTIONS

McElhanney has investigated six options for each of the Humber and Rutland catchment areas. Options 1 and 2 are gravity sewer systems which avoid the existing easements and for which 5 metres has been established as the maximum practical and economic depth for trench excavation. All options will require the installation of pumps for sanitary sewage and/or stormwater flows.

Option 1 – New deeper gravity sewer system and existing combined sewer system to remain for stormwater conveyance.

In the Humber catchment, out of a total of one hundred and fifty (150) properties, twenty nine (29) properties would require sanitary sewer pumps in addition to the ten (10) that already have a pump. In the Rutland catchment, out of the two hundred thirty six (236) properties, thirty nine (39) properties would require sanitary sewer pumps in addition to the seven (7) that already have a pump.

Option 2 – New deeper gravity storm drainage system and existing combined system to remain for sanitary conveyance.

In the Humber catchment, out of a total of one hundred and fifty (150) properties, thirty two (32) properties would require stormwater pumps in addition to the seven (7) that already have a pump. In the Rutland catchment, out of a total of two hundred thirty six (236) properties, forty (40) properties would require stormwater pumps in addition to the six (6) that already have a pump.

Option 3 – New pumped low pressure system for sanitary sewers collection and existing system to remain for stormwater conveyance.

Under this option all (100%) of the properties in both catchments would require sanitary sewage pumps.

Option 4 – A new shallow gravity stormwater system with localized areas requiring municipally owned stormwater pumping stations for roadway runoff.

The McElhane proposal included a new pumped low pressure stormwater drainage system with the existing combined system to remain for sanitary sewer conveyance. However, it became clear that pumping stormwater from the whole catchment area would not be cost effective either initially or from a lifecycle perspective. Under a low pressure stormwater system, either a large number of pumping stations would be required to capture and convey road runoff, or a parallel shallow gravity network would need to be installed, with fewer, but larger municipally owned stormwater pumping stations. Consequently, this option was not considered further. Instead, a hybrid option was developed in which a relatively shallow new gravity stormwater system would be constructed with smaller, localized areas requiring municipally owned stormwater pumping stations for roadway runoff.

In the Humber catchment, sixty five (65) properties would require a stormwater pump in addition to the seven (7) that already have a pump. In the Rutland catchment, one hundred and one (101) properties would require a stormwater pump in addition to the six (6) that already have a pump.

Option 5 – A hybrid of shallow gravity sanitary sewer system, pumped where necessary, and existing pipe as a stormwater conveyance.

This option would include a shallow depth gravity sanitary sewer system, with smaller, isolated areas of catchment serviced by municipal pressure sewers.

In the Humber catchment, sixty (60) properties would require a sanitary pump in addition to the ten (10) that already have a pump. In the Rutland catchment, one hundred and fourteen (114) properties would require a sanitary pump in addition to the seven (7) that already have a pump.

The initial capital cost to the municipality for both options 4 and 5 is lower than for options 2 and 1 respectively. However, the number of properties requiring pumps is greater.

Option 6 – A hybrid shallow gravity sanitary sewer system, with localized community sanitary pumping stations where necessary and the existing system as a storm drain.

In the Humber catchment, forty (40) properties would require a sanitary pump in addition to the ten (10) that already have a pump. In the Rutland catchment, ninety six (96) properties would require a sanitary pump in addition to the seven (7) that already have a pump. This option is a variation of Option 5. More municipally owned pumping stations would be constructed in order to increase the number of dwelling units serviced by gravity sanitary sewer connections compared to Option 5.

The greatest factors differentiating Options 1 and 2 from 4, 5 and 6 will likely be in the costs related to pipe depth (trench excavation and backfilling) and in the cost of additional on-site private pumping systems in the latter, shallower gravity pipe network options.

Alternative stormwater management

In addition to the six options describe above, the opportunities for on-site stormwater management on municipal property was also considered. Traffic islands, boulevards and the undeveloped Midland corridor were considered as potential locations for rain gardens for storage and attenuation of storm flows. Rain gardens provide the added benefit of filtering stormwater runoff from roads. In most cases the possible locations have mature trees, including Garry Oaks, which would have to be removed to construct rain gardens, although there is an open area on Midland Road at Lansdowne Road. (Attachment 3). It was concluded that from a stormwater management perspective, there would be insufficient attenuation or storage capacity to modify the design of the stormwater system under any of the options considered.

All of the options will be presented to the public for discussion and evaluation at the upcoming four public 'open houses' schedule for November.

2. RESPONSIBILITY FOR SEWER SEPARATION COSTS

It is standard practice in municipalities for basic infrastructure costs such as roads and sidewalks, water mains and sewers to be a common cost charged to all residents either in a utility rate or in property taxes on the basis of assessed value. For example, when a sidewalk is replaced or a sewer upgraded, the residents on the street directly benefiting from the work are not required to pay for the full cost of the work, rather it is a cost to which all property owners contribute. In the past, when combined sewers were separated in other parts of Oak Bay, the cost was shared by Oak Bay residents based on property assessment. It is assumed that this standard practice will apply to the sewer separation project in the Uplands.

Present Policy District of Oak Bay requirement for sewer separation on private property

For several years the District has required property owners in the Uplands to separate sanitary sewer and stormwater services on private property when undertaking major renovations or building a new home. This includes replacing the connection to the existing combined sewer in the municipal road right of way. To date over twenty nine (29) or (12%) of the homes in the Rutland catchment and fifty eight (58) or (39%) of the homes in the Humber catchment have separated sewers to the property boundary. All costs associated with the sanitary and storm sewer separation and the required new (single) connection to the municipal sewer have been borne by the property owner.

Bylaw No. 3891 - Mandatory connection to a newly separated sewer

Under Bylaw 3891, 'A Bylaw for the administration and regulation of public sewers,' Section 2 subsections (3) and (4) (Attachment 2) it is mandatory for property owners to separate their combined sewer system and connect to the municipal sewers in the event that the District provides a separate sanitary and storm sewer in an area with a combined sewer. Property owners are required to complete the sewer separation '*within*

one year from the date the Engineer certifies that the new sewer main is operational.' If the owner fails to do so the District may undertake the work at the expense of the property owner. Failure to pay would result in the cost being added to the property tax account.

Connection Policies of Other Jurisdictions

Our research into the practices of four other municipalities (Vancouver, Burnaby and New Westminster and the Village of Cumberland) engaged in a combined sewer separation program revealed:

- In all cases, new homes and homes undergoing major renovations must construct separate connections to the municipal sanitary and storm sewers.
- Sewer separation is not mandated for existing homes.
- In the case of New Westminster the threshold renovation for mandatory separation is a renovation value is \$100,000.
- In the case of Vancouver, not mandating existing home to separate their combined sewers is justified by the fact that on average 1% of the housing stock is replaced each year so that over the 100 year program, commenced in 1984, all of the homes will have connected to separate storm and sanitary sewers.
- Other municipalities were concerned with the high cost to property owners and the financial stress mandatory separation may cause.

Proposed Policy on Combined Sewer Separation on private property and connection to separated municipal sewers

Given the current level of funding committed by the District to the sewer separation project, of \$200,000 per year, complete separation will take several decades to complete unless significant senior government funding is obtained. During that time, many of the existing homes in the Uplands may either be replaced or undergo major renovations. The current policy of requiring new homes to have separate sewers should be continued. This would include mandatory connection to the separated municipal sewers when available.

The same policy should be applied to property owners undertaking major renovations with the suggested value of a major renovation defined as \$100,000 or more.

Responsibility for the cost of connecting homes with previously separated sewers.

As noted previously, property owners who have built new homes or undertaken major renovations have paid to separate their sewers on their property, terminating in a vault at the property line, and for a single pipe from the vault to the existing combined sewer either in the municipal roadway or easement. The practice of two of the three municipalities is to connect homes with separate sewers to the new separated sewers as a project cost during construction. It is proposed that the same policy be implemented by the District.

There are seven homes where the separated sewers have been connected to the existing combined sewer pipe in an existing easement. These properties will have to pump either their sanitary sewage or stormwater to the new separate sewer in the road right of way. The responsibility for the cost of connecting these properties to a new sewer in the road right of way still needs to be evaluated.

An incentive for existing property owners to separate their sewers.

As an incentive for existing homes to separate and connect, the connection cost could be borne by the project if the sewers on the private property are separated in advance of construction of the separate municipal sewer system so that the connections could be made during construction of the separate municipal sewer.

3. THE CORE AREA LIQUID WASTE MANAGEMENT PLAN

The question of mandatory sewer separation on private property has been discussed with the Ministry of Environment given its goal of eliminating combined sewer overflows. A letter summarizing the discussions was sent to the Ministry on September 18, followed by an e-mail on October 6. In its response the Ministry reiterated that sewer separation in the District of Oak Bay is a critical component of the CRD strategy. The Ministry also noted that any changes to the current commitments in Amendment No.8 of the CRD CALWMP must demonstrate compliance with Division 2 of the Municipal Wastewater Regulation in outlining the measures (deliverables and deadlines) that will be taken in order to reduce inflow and infiltration and control overflows as part of the amended CALWMP. In the current CALWMP the Uplands sewers were to be separated by the end of 2015. As the CRD expects to submit an amendment to the CALWMP early in 2016, the District's new proposal can be included in that amendment submission.

4. THE HERITAGE CONSERVATION ACT

McElhanney's sub-consultant, Golder Associates (Golder) prepared an archaeological overview assessment. The archaeological consultant undertook a field reconnaissance to identify areas of archaeological potential, has documented previously known sites, and prepared a background report outlining the First Nations history of settlement in the area. A version of the report that does not include specific archaeological site location information will be available to the public. Golder has also identified areas of archaeological potential within the project area and recommends an Archaeological Impact Assessment in areas with archaeological potential prior to the start of construction.

A meeting was held with the senior staff at Provincial Archaeological Branch responsible for administering the Heritage Conservation Act. Ministry staff recommended that a Section 14 Heritage Inspection "Blanket" permit is the best option for the District, as it allows for a number of proponents (Oak Bay and private property owners) to be included in the permit. Property owners would also be signatories to the blanket permit in addition to the District. A blanket permit does not absolve private property owners from full responsibility for protection of archaeological sites that may be present on their property. A Technical Memorandum from Golder entitled 'Uplands Combined Sewer Separation Project: Archaeological Guidelines' which provides details of responsibilities and procedures will be available to the public on the District's web site.

5. PUBLIC ENGAGEMENT

Four public open houses are being arranged, two in North Oak Bay and two in South Oak Bay. The dates are:

- **Saturday November 7: 2pm – 5pm,**
Location: Neighbourhood Learning Centre, Oak Bay High School
- **Tuesday November 10: 5pm – 8pm**
Location: Royal Victoria Yacht Club
- **Friday November 20: 5pm – 8pm**
Location: Uplands Campus
- **Saturday November 21: 2pm – 5pm**
Location: Uplands Campus

These meetings will inform Oak Bay residents on the project, and provide an opportunity to understand the six options being considered for each catchment area. Story Boards will address the following:

- Why is the District undertaking the Uplands Combined Sewer Separation Project?
- What are combined sewers and combined sewer overflows?
- Who pays for the separation of the municipal sewers in the Uplands area?
- What are property owner responsibilities?
- What are property owner responsibilities under the Heritage Conservation Act?
- What are the six options under consideration and what are the approximate costs?

“Story Boards” will also show homes already with separated sewers to their property boundary and homes with pumps for the Humber and Rutland catchment areas.

Information will be provided on the Heritage Conservation Act.

Oak Bay citizens will have an opportunity to provide written comments at the meetings and for the following weeks leading up to December 4, the cut-off date for public comment. All information will be available on the District website. A report will be brought to Council January 2016 summarizing public comment and recommending an option.

FINANCIAL IMPACT:

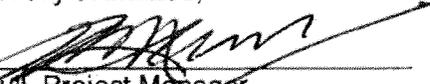
Cost estimates for each option will be presented to council in January.

RECOMMENDATIONS:

It is recommended that the District:

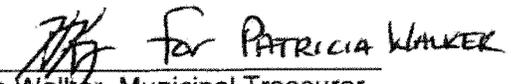
1. Amend Bylaw 3891 to mandate sewer separation for new homes and connection to the separated municipal sewers when available; to mandate sewer separation for homes undergoing major renovations, based on a value of \$100,000 or greater, and connection to the separated municipal sewers when available and to update Schedule "A" 'Fees and Permits' of the bylaw to reflect current costs and that it be updated annually.
2. Include the cost of connecting properties with sewers separated prior to the municipality separating the combined sewers, in the cost of the sewer separation construction contracts.
3. Obtain blanket Heritage Inspection Permits covering the municipal rights of way and adjacent property owners, as the project proceeds to construction.

Respectfully submitted,



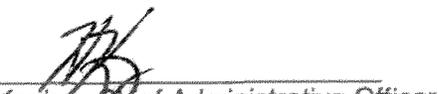
Jack Hull, Project Manager
HJA Water Management Consulting

Source of Funds/I concur with the recommendation



Patricia Walker, Municipal Treasurer

I concur with the recommendation



Helen Koning, Chief Administrative Officer

ATTACHMENT 1

Examples of existing easement locations in the Humber and Rutland catchments

Humber Catchment
Existing Easement at 3490/3460 Beach Drive



Humber Catchment
Existing Easement at 3215/3235 Midland Road



Rutland Catchment
Existing Easement at 3420/3430 Upper Terrace



Existing Easement at 2450/2470 Lansdowne



ATTACHMENT 2

Bylaw 3891, 'A Bylaw for the administration and regulation of public sewers,'
Section 2 subsections (3) and (4)

- (3) Where the Municipality has on its own initiative installed or is installing a new sewer main the purpose of which is to separate an existing combined sewer system into individual storm sewer and sanitary sewer systems an owner whose property was previously served by the said combined sewer and whose property was connected to the combined sewer by a combined lateral, shall within one year from the date the Engineer certifies that new sewer main is operational, separate the combined lateral serving the property into individual storm sewer and sanitary sewer laterals and make the necessary connections to the public sewer.

- (4) In the event of the owner failing to apply and pay all required fees for the necessary connection to the public sewer within sixty (60) days after being notified in writing by the Engineer to do so, without limiting any other recourse or remedy available to the Municipality the Engineer may cause the Municipality, by its workers or others, to have the required work completed at the expense of such owner including but not limited to the fees set out in Schedule "A", the invoice for which if unpaid on the 31st day of December next ensuing shall be added to and form part of the taxes payable in respect of the property served by the connection as taxes in arrears.

*(**Bylaw 4333, adopted Dec. 11/06)*

ATTACHMENT 3

Potential Locations for On-site Rainwater Management

Traffic Island Beach Drive/Midland Road



Midland Undeveloped Road Right of Way at Lansdowne Road



ATTACHMENT 2

Uplands Combined Sewer Separation project
 REPORTS TO COUNCIL AND COMMITTEE OF THE WHOLE

Council - Jun. 13/16	Project Manager Memo re: Supplementary Information
Council - May 24/16	Project Manager Memo re: Contract Award for Phase 1 Geotechnical Investigation
COW - May 16/16	Memo - Assessing Service Installs and Tree Damage Memo - Trenchless Technology Presentation - Trenchless 101
Council - Apr. 25/16	Acting Dir. of Engineering Services Report - Small Communities Fund
Council - Mar. 29/16	Project Manager Memo re: Phase 1 Geotechnical Investigation and RFP Chief Administrative Officer's Report
Council - Feb. 22/16	Project Manager's Report
COW - Feb. 15/16	Project Manager's Report
Sp. Committee - Feb. 2/16	CAO's Memo on Special Committee of the Whole Process Project Manager's Report Project Manager's Presentation
Council - Oct. 26/15	Summary of Six Options for Combined Sewer Separation
Council - Oct. 26/15	Powerpoint Presentation to Council by J.A. (Jack) Hull, Project Manager
Council - Jun. 22/15	Revised Grant Application - Design, Public Outreach & Construction
Council - May 11/15	RFP Evaluation and Contract Award
Council - Mar. 23/15	Grant Application - Design
Committee - Feb. 16/15	Pre-Design Study Parameters

ATTACHMENT 3 PUBLIC ENGAGEMENT OVERVIEW

Context

Separating the combined sanitary and stormwater sewers is a provincially mandated initiative for the purposes of eliminating raw sewage overflows at the Humber and Rutland pump stations in the Uplands subdivision. Overflows occur when there are heavy rains and stormwater overwhelms the capacity of the pump infrastructure.

The unique layout and topography of the Uplands subdivision presents a formidable challenge to identifying an infrastructure solution that will achieve the environmental requirements of the provincial government while balancing off the key consideration of affordability for the District (all Oak Bay homeowners), and for property owners impacted by the final decision for whom there will be additional cost implications.

McElhanney Consulting Services Ltd (Consultant) was retained by the District to undertake a pre-design study that resulted in six options to achieve sewer separation in the Uplands neighbourhood. To help guide and inform Council's decision, District staff and project consultants were asked to seek input from residents of Oak Bay. While this project will take place in the Uplands neighbourhood, it has cost implications for all taxpayers in the municipality.

Public Engagement Objectives

To ensure that all Oak Bay residents:

- ▶ understand the need for the project;
- ▶ have access to clear and accurate project information in a format that is accessible and easily understood;
- ▶ have access to the consulting engineers and District staff in person, by phone and online;
- ▶ are encouraged to bring forward questions and concerns to enable meaningful discussions that test project assumptions; and,
- ▶ have an opportunity to record their opinions and that this personal feedback will be received by Council.

To ensure that the consulting engineers and District Staff:

- ▶ understand how each option presented impacts all residents of Oak Bay;
- ▶ have the opportunity to meet property owners and discuss a highly technical project in plain language over a period of time;
- ▶ have the opportunity to listen to residents and to respond directly to questions and concerns;
- ▶ hear directly from residents what project considerations and impacts are most important;
- ▶ identify gaps in the information presented and respond appropriately and in a timely manner; and,
- ▶ incorporate public opinion and ideas, as appropriate, in any modifications to the options presented for Council's consideration.

Engagement Overview

Action Taken	Outreach	Details
Article introducing the project: Oak Bay News	November 2	Article referenced Open House schedule and call to action to become informed
Open House flyers posted throughout community	Oak Bay Recreation Centre Henderson Recreation Centre Learning Resource Centre Library Monterey Centre Windsor Park Municipal Hall	Flyer attached for reference
Open Houses (5) *see flyer/ad	Saturday Nov. 7 : • Oak Bay High School Tuesday Nov. 10 • Royal Victoria Yacht Club Friday Nov 20 and Saturday Nov 21 • Uplands Campus (Henderson Road) Monday Nov 30 • Municipal Hall	Five Open Houses were hosted by the District 247 people attended 26 presentation boards were created to share with the public 75 per cent of attendees were residents from the Uplands neighbourhood Additional Open House was added to the schedule for November 30 th to encourage more attendance
Advertisement of Open Houses in Oak Bay News	October 30 November 4, 13, 18, 20, 27	Ad is attached for reference
Open House handouts	Frequently Asked Questions, Option Summaries with cost estimates, and hard copies of the Public Opinion Survey	Handouts were available at each Open House, on line and in hard copy at the Municipal Hall
District of Oak Bay website:	Home page Spot Light link Promoting Open Houses with link off the home page to all project information and public opinion survey	All information presented at the Open Houses was made available on the District's website along with two archeology reports, and the Project Manager's reports to Council
Presentation material at Municipal Hall	A complete set of the Open House presentation boards were available at the Municipal Hall to address resident's questions and concerns.	Project Manager was available by phone and email to respond to technical inquiries

Public Opinion Survey	<p>Hosted on the District of Oak Bay's website link from the home page</p> <p>From the website, the survey could be filled in on line or downloaded/printed and returned to the Municipal Hall</p> <p>Available in hard copy at the Open Houses and at the Municipal Hall</p>	<p>Public Opinion Survey (Survey) was available between November 9 and December 11</p> <p>Online Survey linked to Open House project information</p> <p>Survey was restricted to one IP address per respondent</p> <p>Deadline was extended to encourage more participation</p> <p>117 respondents total</p>
Oak Bay News Editorial promoting the survey	November 25	
Oak Bay News advertisement: Call to action for the Public Opinion Survey	November 18 and 20	117 survey submissions were received by the deadline of December 11
Public access to Project Manager and communications staff:	The Project Manager and the communications project team member were identified as project contacts. Both responded to resident inquiries that came to the District by phone, email and formal correspondence. Ongoing	
Social media	District of Oak Bay's twitter account	Followers retweeted call to action to get engaged
Dedicated Committee of the Whole Meeting February 2	<p>Project update from the Project Manager and report out on the Public Engagement</p> <p>Opportunity for Oak Bay residents to speak directly to Council</p>	Reports posted on the District website on January 27 th

Public consultation and engagement on this important Oak Bay project focussed primarily on Open Houses, a Public Opinion Survey and the District web site which served as the "go to" source for all project information. All attendees at the Open Houses and Survey respondents gave generously of their time and their knowledge to help inform Council's decision. Their important contributions identified several themes as well as new information for consideration. While there were some very disparate opinions, there was a common desire for Council to make an informed decision that everyone can live with.

Open Houses

Five Open Houses were held throughout the month of November: two in North Oak Bay, two in South Oak Bay and one in the Uplands neighbourhood. The Open House format was chosen as it provided the public with an invitation to learn about the project from project engineers and District staff, and to have questions and concerns addressed directly in an informal format over a period of time. Residents were encouraged to provide feedback and insight as well as to identify information gaps, and test assumptions. The six options were represented along with key features and considerations for each option. Residents were asked to register and record their address. While not everyone who attended registered, the vast majority of residents who did were property owners directly impacted by the project. Some residents who attended the Open Houses were also gathering information for neighbours and a few of these mentioned specifically that their neighbour was elderly and unable to attend in person.

Twenty six presentation boards were distributed throughout the venue. In attendance to speak about the project with Oak Bay residents: McElhanney Consulting project engineer, Project Manager (engineer), District engineering and public works staff, District CAO, and the CRD's Aboriginal Liaison Officer and project communications consultants. Council members attended one or more of the Open House sessions to review the material with the project team, and to engage with residents. Hard copies of the public opinion surveys were set out on tables and people were encouraged to complete the survey at the Open House or take it home, and complete it there.

All Open House presentation materials and project related reports can be found at: <https://www.oakbay.ca/municipal-hall/plans-reports/uplands-sewer-separation/story-boards#sthash.lgO10yll.dpuf>

Project Information	Humber and Rutland Catchment Areas	Six Options: Cost Estimates
Why Are We Doing This?	Project Site Plan	Option 1: Humber
The Heritage Conservation Act	Existing: Humber – Combined	Option 1: Rutland
What is a Blanket Heritage Inspection Permit?	Sanitary Sewage and Stormwater System	Option 2: Humber
Why Easements are Excluded from the Project Solutions	Existing: Rutland – Combined	Option 2: Rutland
Sanitary Sewer Pumps	Sanitary Sewage and Stormwater System	Option 3: Humber
Stormwater Management on Municipal Property	Easements: Humber	Option 3: Rutland
Public Feedback: We Want to Hear From You! – See more at:	Easements: Rutland.	Option 4: Humber
	Possible Community Stormwater Storage Locations	Option 4: Rutland
		Option 5: Humber
		Option 5: Rutland
		Option 6: Humber
		Option 6: Rutland
		Cost Estimates
		Summary for 6 Options

Hand out materials available at the Open House sessions and on the District website included:

- ▶ Frequently Asked Questions
- ▶ Brochure from the provincial government archeology branch
- ▶ Summary document of the six options reflecting costs
- ▶ Hard copies of Public Opinion Survey (Strategic Initiatives Inc.)

The Public Opinion Survey was also online and public feedback was collected by staff during the Open Houses. In addition, Project staff were identified at Municipal Hall as well as on the District website to assist with residents' concerns, questions and requests for more information.

Public Opinion Survey (the Survey)

The District engaged Strategic Initiatives Inc. (SII), a local survey firm to assist with the gathering and analysing of public opinion among Oak Bay residents. The purpose of the Survey was to help the District gather feedback from residents of Oak Bay about the six options under consideration to separate the combined sanitary sewer and stormwater system in the Uplands neighbourhood. A total of 117 residents completed the Survey, and the vast majority of the respondents lived in one of the two project catchment areas in the Uplands neighbourhood. See Attachment 4: *The Uplands Combined Sewer Separation Project – Report on Survey Research*.

The low public response and interest in the Survey is difficult to explain given how widely advertised it was through mainstream media as well as in high traffic areas in the community. It may be that Oak Bay residents were provided with sufficient information and are prepared to accept Council's eventual decision. It may be that some of our senior residents may not be comfortable with, or able to access online data. Alternatively, it may be that the highly technical nature of this project is an explanation for the low public uptake. The public may have found it challenging to review and process the significant amount of information provided in order to complete the Survey. Without the benefit of attending an Open House to engage directly with the information and project staff, the online format may have been daunting for some. In addition, the online Survey required that the respondents complete it in one sitting, and there was no mechanism to save the survey and start again. While only five residents recorded problems with the Survey with SII or the project team, it is possible that many more tried and gave up.

Anticipating these potential challenges in advance, information was provided on the Survey directing residents to seek assistance from SII, and efforts were made to provide broader access to the Survey other than just online. A hard copy of the Survey was available as a PDF for downloading off the District's project webpage, and hard copies were available at each Open House as well as at the Municipal Hall. Advertisements and a project editorial in the Oak Bay News focused attention on the Open Houses and the Public Opinion Survey inviting residents to attend, and informing residents that hard copies of the Survey were available for downloading or could be picked up at one of the Open Houses or Municipal Hall. Of the 117 completed Surveys, 60 were submitted in hard copy.

There is a high correlation between the Survey results and the opinions expressed in conversation at the Open Houses. While all six options are technically feasible, this is a very challenging project for everyone involved and as such, each option evokes strong opinions – both for and against – depending on how the project impacts the resident respondent (directly, as a homeowner living in the project area; or indirectly, as a taxpayer living outside of the project area).

It is significant to note that the total number of Survey respondents disproportionately represents property owners living in the Humber and Rutland catchment areas of the Uplands neighbourhood – homeowners whose properties are most likely to be impacted by this project. While the Survey findings must be interpreted within this context, several conclusions, however, can be drawn from the data.

What We Heard – Survey and Open House Themes

Affordability

The most important project consideration for property owners living in Oak Bay was affordability (costs to property owners living in the Uplands AND to property owners living outside of the Uplands neighbourhood).

For property owners living in the Uplands, minimizing costs related to necessary work on their properties as well as ongoing operations and maintenance costs were the most important considerations.

For property owners living in neighbourhoods outside of the Uplands, minimizing the capital costs to the District was the most important consideration. Knowing how the District is going to finance this project and over what timeframe was linked directly to these concerns, as was ensuring that the decision reflects the best interests of all tax payers.

Almost half of the Survey respondents (44.4%) took advantage of the opportunity to respond to the open-ended question asking what other considerations that they would like to bring to Council's attention. In this section, concern was raised regarding the absence of life cycle costs for each option and the need for these numbers to be shared with the public. Several respondents asked that Council look at the lowest long term costs over the entire life-cycle of the system. Concern was also raised regarding the risk of escalating costs on a project of this magnitude. Some residents inquired if the District would be supplying the pumps to the residents if the option chosen required the property owner to have a pump (as was considered in 2010), and for the District to consider financial concessions given the overall cost implications for impacted property owners.

At the Open Houses and in the Survey, cost estimates were presented for impacted property owners in the Uplands neighbourhood specific to each option. It was pointed out by some that these estimates are not representative of the actual costs to be borne by homeowners given the complex features and amenities on each property. The actual costs were anticipated to be significantly higher for some residents.

While the Survey data indicates that impacted property owners in the Uplands neighbourhood strongly favour a deep gravity solution, given the feedback regarding the unrealistic cost estimates from some property owners, a deep gravity solution could have far greater cost implications than costs associated with installing a pump system that requires less invasive installation requirements. Bringing these divergent project considerations together may influence the opinions of some impacted property owners.

Most Environmentally Appropriate Use of Existing Pipe

Property owners throughout Oak Bay were somewhat aligned with a decision that would see the most environmentally appropriate use of the existing pipe. If the existing pipe is to remain a sanitary sewer, then consideration must be given to addressing concerns of a leaky pipe.

Some residents at the Open Houses assessed each option against achieving the goal of reducing raw sewage overflow in a timely manner. Options that reflect a new stormwater sewer would have an immediate impact on overflows as each homeowner connected. Options that reflect a new sanitary sewer would require the entire neighbourhood to hook up before any environmental impact would be achieved.

Ensuring Project Is Completed In a Timely Fashion

Property owners outside of the Uplands neighbourhood favoured a timely completion of the project more so than residents of the Uplands. Written comments however linked the timely completion of the project to affordability and a strong concern for cost overruns if the project dragged on. How the project will be financed is a primary concern.

Several respondents to the Survey explored how compliance could be achieved over a period of time. An observation was made that if the District cannot wait for the natural cycle of renovation and rebuild to modernize the drainage systems of existing older homes, then Option 4 is the only option as affected houses could continue to direct sanitary sewage to the older existing sewer, and redirect rainwater to onsite stormwater management or a new stormwater sewer as it is installed.

Negative Reaction to Pumps

The majority of respondents to the Survey, and in anecdotal information from conversations at the Open Houses, clearly indicated strong support for deep gravity Option 1 as the preferred solution. Option 3, where 100 per cent of homes in the impacted area have pumps, received little support. Concerns expressed about pumps included complications of prolonged power outages (risk of sewer back up and stormwater flooding), and costs of purchasing, installing and maintaining pumps and generators.

The importance of perceived fairness was also noted from two very different perspectives:

- ▶ Many Uplands property owners impacted by the project felt that gravity service should be maintained as the priority for the District. Others indicated that if a pump system was going to be introduced, the District should contribute to the costs. Some Uplands residents alleged a possible negative impact on property values should pumps have to be installed.
- ▶ For property owners living outside of the Uplands, concerns were raised about the capital costs of the options being borne by all Oak Bay residents. Of importance was the need to ensure that the decision reflects the best interests (affordability) of all taxpayers and not just the wishes of those directly impacted citing that the vast majority of Oak Bay taxpayers live outside of the Uplands neighbourhood.

Discussions at the Open Houses were supported by presentation materials that included a comprehensive mapping of water and sewer infrastructure, background and contextual information, as well as a map of the Uplands showing homes that have existing stormwater and or sewer pumps.

District staff noted that several homes throughout Oak Bay have pumps, and new homes under construction, particularly those that have deep basements may have pump support for sanitary and/or stormwater services. This includes homes under construction and recently constructed homes in the Uplands neighbourhood.

Preferred Options

Property owners living in the Uplands preferred Option 1 (deep gravity new sanitary sewer) and least preferred Option 3 (100 per cent pumps).

Property owners living outside of the Uplands preferred Option 3 (100 per cent) pumps and least preferred Option 1 (deep gravity new sanitary sewer).

These findings reflect the financial impact of this project on each property owner.

For both Uplands property owners and property owners living outside the Uplands, the differences in average rankings of the remaining technical options were not significant (see figure 17, Attachment 4: *Uplands Combined Sewer Separation Project – Report on Survey Research*).

The majority of respondents indicated their preference for a new sanitary sewer system while noting the existing pipe leaks and is therefore, more appropriate for stormwater. The Survey comments also noted that a new stormwater management system may be the only solution that allows for a reduction in overflows (environmental impact) in a timely fashion.

What We Heard – Open Houses and Surveys

The opportunity to discuss this project directly with Oak Bay residents at the Open Houses, and in following up on inquiries provided valuable information. Most attendees acknowledged that stopping raw sewage discharge onto local beaches is an important goal.

During the five Open Houses, residents raised concerns, provided new information, and suggested alternative considerations. Those who attended from the Uplands neighbourhood had detailed questions specific to their properties and sought detailed information beyond what is currently available due to the restricted scope of the discovery/options exercise. Having access to more specific information in order to make an informed decision from the perspective of the impacted property owners in the Uplands was identified as an underlying concern. Residents were informed that more information specific to their property will be available to the public at the next stage of detailed design.

The following concerns and comments were raised in the Survey and the Open Houses:

- ▶ **Some residents strongly advocate for taking responsibility for stormwater management on their properties arguing that the large property footprints would allow for this and that returning stormwater to the ground is the most desirable solution.**

This has been addressed in the Consultant's report.

- ▶ **The decision regarding the exclusion of the easements was challenged repeatedly and recommendations were made identifying directional drilling as a possible viable solution allowing the activation of easements.**

This has been addressed in the Consultant's report.

- ▶ **There was recognition that many older homes throughout Oak Bay still have a combined sewer connection (homeowners who have not/ may not have separated stormwater from sanitary sewer from the home to the street). Discussions included the fair and equal treatment for all Oak Bay residents (incentives and compliance).**

This has been addressed in the Consultant's report.

- ▶ **There was recognition that small areas exist in other Oak Bay neighbourhoods where separate stormwater services have not yet been installed. Discussions included the fair and equitable treatment for all Oak Bay residents (incentives and compliance).**

This has been addressed in the Consultant's report.

- ▶ **There was recognition that more information was needed with regard to the archeological implications of this project on impacted property owners in the Uplands.**

This has been addressed in the Consultant's report. The provincial government's archeology branch is the source for this information.

- ▶ **The question as to whether or not residents will be forced to install a pump, hook up appropriately or unhook appropriately was raised.**

How to proceed with compliance has been addressed in the Consultant's report.

- ▶ **Protect the mature landscape and trees on private and public property.**

This has been addressed in part within the Consultant's report under the section that discusses easements.

Other public comments captured for Council's consideration include:

- ▶ District should explore the opportunity to share capital costs of the project with other utilities such as BC Hydro, BC Tel and FORTIS BC.
- ▶ Concern whether or not the District would play a role in coordinating construction work on private property as well as public property.
- ▶ Some residents, particularly seniors, may not have adequate financial resources to comply with this initiative.
- ▶ Some homeowners living in the Uplands have already invested in separating stormwater and sanitary sewer to the property line (as directed by the District) and have paid for their connection to the combined system. Some may have to invest again to install a pump, or invest again to connect to the selected option.
- ▶ The decision making process that will arrive at a single option recommendation for Council should include local representation (Oak Bay residents including Uplands property owners).
- ▶ The final decision should reflect a long-term view (a solution that will last another 100 years).
- ▶ A new stormwater management system may be the only solution that allows for a reduction in overflows (environmental impact) in a timely fashion.
- ▶ The final decision should account for climate change which is going to have a significant impact on stormwater management.
- ▶ Concern was expressed over the negative cumulative impact of stormwater discharge to the Salish Sea. While not a requirement under the current provincial government regulation, the impact of urban discharges is a growing significant issue.

Some respondents/attendees inquired about an Option 7, and suggested other solution considerations:

▶ **Is this the opportunity to have 100 per cent gravity service in the Uplands?**

This has been addressed in the Consultant's report.

▶ **Why is the focus of this project on one single solution being applied to both catchments? Given that the topography is different in each catchment, is it possible that each catchment area has solutions that are unique to the area and perhaps more cost effective?**

The Consultant has advised that the two catchment areas have very similar characteristics. While this possibility (different solutions for each catchment) hasn't been explored at this stage, it could be considered at the detailed design stage.

▶ **Could the existing pressurized water supply be re-purposed for an appropriate use?**

The Consultant has advised that water mains could theoretically be re-usable as a pressure sewer system, in this case however, the water main diameters are too large and would result in anaerobic conditions due to long travel time through the system. In addition, a new water distribution system would be needed to replace the existing one. The cost of this approach would exceed that of Option 3, which is a pressure sewer system but with a smaller diameter pipe than that required for a new water distribution system.

▶ **Is it possible to address overflows by enlarging the two pumping stations?**

This was reviewed during an earlier study by engineering firm Kerr Wood Leidal and Associates, and was deemed to be impractical and unaffordable. It would require changes to the primary East Coast interceptor infrastructure.

Public feedback through the public engagement initiatives suggest that Council will need to reconcile the competing desires and values of taxpaying residents whose properties will be directly impacted by this project, with those desires and values of Oak Bay taxpayers living in neighbourhoods outside the project area. Finding a solution that everyone can live with is the goal.

Attachment 4: *The Uplands Combined Sewer Separation Project – Report on Survey Research*

OAKBAY NEWS

Uplands sewer separation affects all residents

posted Nov 25, 2015 at 9:00 PM

Final open house Monday, Nov. 30

The recent heavy rain storms are a stark reminder of the responsibility the District of Oak Bay and our citizens have under the provincial government's Municipal Wastewater Regulation to separate the existing combined stormwater and sanitary sewer system in the Uplands neighbourhood.

We are obliged to separate the two pipes because combined flows during heavy rains overwhelm the two pump stations at Humber Road and Rutland Road, and raw sewage overflows in the shallow ocean waters.

When the Uplands neighbourhood was designed over a century ago, a network of easements was introduced along the sides and backs of properties where the single pipe infrastructure was placed, maximizing the influence of the area's topography to allow for a gravity system. A wider easement would be required to install a second pipe and the wider easement would have to be cleared of all vegetation and fences. The six options being examined exclude the use of easements in the solutions.

This month, more than 200 Oak Bay residents attended one or more of the four open houses to review the options and test assumptions directly with project engineers and district staff. We are fortunate to have many residents with expertise, and this opportunity to convene around this project has allowed for constructive dialogue that will help strengthen a recommendation to council in the new year. Conversations to date have touched on the merits and challenges of trench construction, the capital costs to Oak Bay taxpayers, the possibility of directional drilling, the opportunity for stormwater management solutions and the desire to see a solution that takes a long-term view with maximum environmental and community benefit.

This is a complex infrastructure initiative that requires careful and thoughtful consideration of project benefits and impacts. It's not easy and we want to hear from you. Council is grateful to all those who have given their time, expertise and passion to this important project to date, and the district is hosting one more open house Monday, Nov. 30 from 5 to 8 p.m. at the municipal hall.

If you're unable to attend in person, all information presented at the open houses is on the district's website, including a public opinion survey that

can be downloaded or completed online. The online survey is also available in hard copy at the municipal hall and will be at the open house. All project surveys must be completed and handed in by Dec. 4. While this project will take place in the Uplands over several years, the capital costs on municipal property will affect everyone.

Options being examined reflect a range of total project capital costs from \$13.9 million to \$20.7 million. Options include:

- A new deeper gravity sanitary sewer system. The existing pipes would carry stormwater;
- A new deeper gravity system for storm water. The existing pipes would carry sanitary sewage;
- A low-pressure shallow sanitary sewer system. The existing pipes would carry stormwater;
- Shallow, gravity stormwater sewers pumped where necessary. The existing pipes would carry sanitary sewage;
- Shallow, gravity sanitary sewer system pumped where necessary. The existing pipes would carry stormwater;
- Shallow gravity sanitary sewer system with community sanitary pump systems where necessary. The existing pipes would carry stormwater.

Further community engagement will take place in January followed by the finalization of the technical report. A recommendation from district staff for a single option will be presented to council in the new year for consideration and decision.

The project will proceed to detailed design in 2016. It's anticipated this project will be phased in over several years based on available funding. Compliance with the provincial regulation is mandatory for the District of Oak Bay as it is for other jurisdictions in the province.

Visit the district website at oakbay.ca to view the project information and complete the survey. Council thanks you for your time and attention on this important project. We want to hear from you.

Nils Jensen,
Mayor, District of Oak Bay

OAKBAY NEWS

Oak Bay serious about Uplands sewer solutions

by Christine van Reeuwijk - Oak Bay News
posted Nov 2, 2015 at 4:00 PM

Oak Bay's provincially mandated sewer separation project in Uplands primarily needs public input to make a next move.

The Uplands neighbourhood currently has a single pipe system to convey both sanitary sewage and storm water.

During heavy rainfall, the volume of water exceeds the capacity of the system, sending overflows into the ocean at the Rutland and Humber pumping stations.

"The idea is to resolve the outflows to the beach," said Oak Bay Mayor Nils Jensen.

Separation is also required to comply with BC's Municipal Wastewater Regulation that all municipalities have separate stormwater and sanitary sewer systems.

Oak Bay plans to mandate sewer separation and connection to the separated municipal sewers when available for new homes in Uplands, to mandate sewer separation for homes undergoing renovations of \$100,000 or more and connection to the separated municipal sewers when available and to update its permit fees to reflect current costs.

"We are looking at incentives for homeowners," Jensen said. "Our goal is to create an incentive for people already separated, to hook up."

Oak Bay will consider a policy to cover the cost of connecting properties with sewers separated prior to the municipality separating the combined sewers. Those costs would be included in the sewer separation construction contracts.

Because the district has for several years required property owners in the Uplands to separate their services during major renovations or building a new home, 12 per cent of the homes in the Rutland catchment and 39 per cent of the homes in the Humber catchment have separated sewers to the property boundary.

In May, the district hired McElhanney Consulting Services, which developed six possible options to separate the sewer system. All six assume easements through private property are not in play.

Those easements would uproot significant trees and other green growth in swaths of five metres.

"By staying out of these easements more homes would have more pumps," said water management consultant Jack Hull.

However, using the existing easements would significantly add to both cost and time, including negotiating two additional metres of easement with private landowners (currently three metres, five are required) as well as devastating five metres of established trees and foliage.

Options include adding a deeper gravity system alongside the existing system; new pumped low-pressure system alongside the existing system; a new shallow-gravity storm water system with municipal pumping stations for roadway runoff; and a hybrid of shallow system pumped where necessary using the existing system.

A series of four public information sessions is planned:

- **Saturday, Nov. 7 from 2 to 5 p.m.** in the Neighbourhood Learning Centre, Oak Bay High;
- **Tuesday, Nov. 10 from 5 to 8 p.m.** at the Royal Victoria Yacht Club (3475 Ripon Rd.);
- **Friday, Nov. 20 from 5 to 8 p.m.** at Uplands Campus;
- **Saturday, Nov. 21 from 2 to 5 p.m.** at Uplands Campus (3461 Henderson Rd.)

The plan is to present information to attendees then solicit feedback, said communications consultant Kathi Springer.

Information boards will show homes already with separated sewers to their property boundary and homes with pumps for the Humber and Rutland catchment areas.

They will also outline the six options as presented to council, with the addition of associated cost estimates which council has not yet seen. "We see this process as an education process," Springer said, adding there will also be physical pumps on hand for residents to see.

Residents can also offer written comments at the meetings or to the municipality by Dec. 4.

Information is online at oakbay.ca.

"The cost will impact the whole community," Jensen said.

Council expects a report in January that incorporates the public feedback and cost estimates.

Uplands Combined Sewer Separation Project Open Houses

The provincial government's Municipal Wastewater Regulation requires all BC municipalities to have separate stormwater and sanitary sewer systems. Compliance with the provincial regulation is mandatory for the District of Oak Bay as it is for other jurisdictions in the province such as Burnaby, New Westminster and the City of Vancouver where single pipe infrastructure currently exists.

The Uplands area is the last remaining neighbourhood to have a single pipe system to accommodate both sanitary sewer and stormwater flows. During heavy rainfall, the stormwater volume exceeds the capacity of the system and a combination of stormwater and raw sewage discharges into the ocean at the Rutland and Humber pump stations.

Six options have been identified to achieve mandatory compliance. Residents of Oak Bay are invited to attend an Open House to learn more about these options. For more information, visit www.oakbay.ca

Open House Dates

Nov 7, Saturday

2 – 5 pm
Activity Rooms 3 & 4
Neighbourhood Learning Centre
Oak Bay High School
2151 Cranmore Road
Victoria, BC

Nov 10, Tuesday

5 – 8 pm
Main Lounge –
Cadboro Room
Royal Victoria Yacht Club
3475 Ripon Road
Victoria, BC

Nov 20, Friday

5 – 8 pm
Gym, Uplands Campus
3461 Henderson Road
Victoria, BC

Nov 21, Saturday

2 – 5 pm
Gym, Uplands Campus
3461 Henderson Road
Victoria, BC

Uplands Combined Sewer Separation Project Open Houses

We Want To Hear From You!

The District of Oak Bay would like to hear from residents of Oak Bay on the six options under consideration to separate the combined sewer system in the Uplands neighbourhood as mandated by the provincial government under the Municipal Wastewater Regulation.

Please join us at the Open House **November 30** or go to the District's website www.oakbay.ca to review all the Open House Presentation materials and to complete a short online survey.

This survey will help inform Council's decision-making moving forward.

The provincial government's Municipal Wastewater Regulation requires all BC municipalities to have separate stormwater and sanitary sewer systems. Compliance with the provincial regulation is mandatory for the District of Oak Bay as it is for other jurisdictions in the province such as Burnaby, New Westminster and the City of Vancouver where single pipe infrastructure currently exists. The Uplands area is the last remaining neighbourhood to have a single pipe system to accommodate both sanitary sewer and stormwater flows. Six options have been identified to achieve mandatory compliance.

Open House
November 30, Monday

5 – 8 pm
Oak Bay Municipal Hall
2167 Oak Bay Ave., Victoria, BC

Uplands Combined Sewer Separation Project

We Want To Hear From You!

Survey Deadline Extended to Midnight, Friday, December 11

www.oakbay.ca

Access the survey from the homepage.

The provincial government's Municipal Wastewater Regulation requires all BC municipalities to have separate stormwater and sanitary sewer systems. Compliance with the provincial regulation is mandatory for the District of Oak Bay as it is for other jurisdictions in the province such as Burnaby, New Westminster and the City of Vancouver where single pipe infrastructure currently exists. The Uplands area is the last remaining neighbourhood to have a single pipe system to accommodate both sanitary sewer and stormwater flows. Six options have been identified to achieve mandatory compliance.

The District of Oak Bay would like to hear from residents of Oak Bay on the six options under consideration to separate the combined sewer system in the Uplands neighbourhood as mandated by the provincial government under the Municipal Wastewater Regulation.

- Go online to **www.oakbay.ca** and follow links to complete an online survey.
- Download a hard copy of the survey **www.oakbay.ca**
- Pick up a hard copy of the survey at Municipal Hall and go online to review the project information.

Hard copies must be returned to Municipal Hall by December 11.

**Uplands Combined Sewer
Separation Project**

Council is hosting a special *Committee of the Whole* meeting dedicated to the Uplands Combined Sewer Separation Project

Tuesday February 2, 2016

**Monterey Recreation Centre
1442 Monterey Avenue – 7:00 PM**

Oak Bay residents are invited to attend this special project update to share views, ideas, concerns and support in relation to six options that are being considered to separate the existing combined sanitary and stormwater sewer in the 465 acre (190 hectare) Uplands subdivision.

A comprehensive staff report will be available on the District website on January 27 along with project materials presented at the Open Houses held in November and December.

www.oakbay.ca

The public is welcome to submit correspondence for inclusion on the agenda to Acting Director of Corporate Services

mjones@oakbay.ca

Deadline for submissions is 3:00 pm on February 2, 2016

About the Uplands Combined Sewer Separation Project:

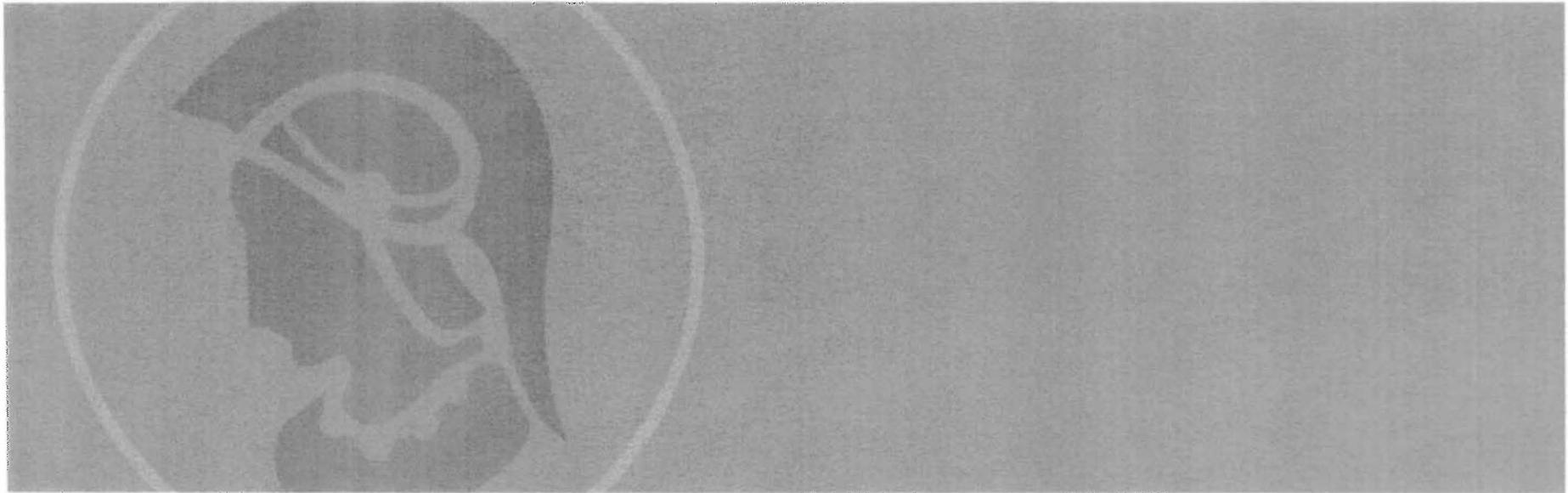
The provincial government through its Municipal Wastewater Regulation requires all B.C. communities that have single pipe infrastructure to take the appropriate action to separate stormwater flow from sanitary sewage flow. Compliance is mandatory.

ATTACHMENT 4

THE UPLANDS COMBINED SEWER SEPARATION PROJECT – REPORT ON SURVEY RESEARCH

Uplands Combined Sewer Separation Project

Report on Survey Research



PREPARED BY:

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www.StrategicInitiatives.ca

January, 2016



Executive Summary

- This document reports on the findings from a survey conducted by Strategic Initiatives (SII) on behalf of the District of Oak Bay among Oak Bay residents and/or property owners. The purpose of the survey was to help the District gather feedback and understand opinions from residents of Oak Bay about the six options under consideration to separate the combined sewer system in the Uplands neighbourhood. A total of 117 completed responses were received. Of the 117 respondents, 70% owned property in the Uplands; 95% of these in the Humber/Rutland area.
- Respondents indicated that of the various considerations about which they were asked, the most important were: minimizing operations/maintenance costs to Uplands property owners (78% rated either very important or somewhat important); most environmentally appropriate use of existing pipe (67%); and minimizing capital costs to Uplands property owners (64%). The least important considerations (based on “bottom 2 box” scores, or the percentage of respondents rating the consideration either very unimportant or somewhat unimportant) were: project is completed in a timely fashion (34%); minimize capital costs to the District (32%); and minimize length of neighbourhood disruption (25%).
- Based on respondents’ average ratings on a scale from 1 to 5, the most important considerations were: minimize operations/maintenance costs to Uplands property owners (4.2); most environmentally appropriate use of existing pipe (4.0); and minimize capital costs to Uplands property owners (3.9).
- Oak Bay homeowners whose property was not located in the Uplands (“Other OB Homeowners”) were significantly more likely than owners of property in the Uplands (“Uplands Homeowners”) to rate as important: most environmentally appropriate use of pipe (4.5 vs. 3.8); project is completed in a timely fashion (3.7 vs. 3.0); minimize capital costs to the District (4.6 vs. 2.8); and minimize operations/maintenance costs to the District (4.6 vs. 3.4). Uplands homeowners were significantly more likely than other OB homeowners to rate as important: minimize capital costs to Uplands property owners (4.4 vs. 2.6); and minimize operations/maintenance costs to Uplands property owners (4.6 vs. 2.9).
- Minimizing capital costs to Uplands property owners was rated most important by the largest percentage of all respondents to the survey (26%), followed by minimizing operations/maintenance costs to Uplands property owners (19%); and minimizing capital costs to the District (13%).
- Uplands homeowners were significantly more likely than other OB homeowners to rank as most important: minimize capital costs to Uplands property owners (37% vs. 0%); and minimize operations/maintenance costs to Uplands property owners (26% vs. 3%). Other OB homeowners were significantly more likely than Uplands homeowners to rank as most important: minimize capital costs to the District (45% vs. 2%); and minimize operations/maintenance costs to the District (28% vs. 2%).
- Almost half (44.4%) of those completing the survey took advantage of the opportunity of responding to an open-ended question asking them what other considerations they would like to make Council aware of to comment regarding cost issues – either capital or operating/maintenance. One third (32.5%) of respondents either expressed their strong preference for a gravity-based system, or indicated negative feelings about pumps and generators.
- Option 1 was the technical option preferred by the highest percentage of respondents, with 46% of all those responding to the survey ranking Option 1 first in order of preference, followed by Option 3 (10%) and Option 6 (9%).
- Based on mean ranking scores, Uplands homeowners were significantly more likely than other OB homeowners to rank Option 1 and Option 2 as their most preferred of the six technical options. Other OB homeowners were significantly more likely than Uplands homeowners to rank Option 3 as their most preferred option. The differences between Uplands homeowners and other OB homeowners in their average rankings of the remaining technical options were not significant.
- When asked for the one or two reasons why they preferred the technical option they had ranked “1”, almost half of those responding to the survey (47.9%) said their preference was related to gravity systems being “better”, or to negative feelings about pumps. More than one third of the responses (35.0%) indicated that the preference for a specific option was related to cost issues. One quarter of respondents (24.8%) related their preference for their first choice option to their concern that the current pipe be used for storm water and the new pipe be used for the sanitary system. Less than one quarter of people (17.1%) preferred their first choice option because they perceived it as less disruptive.





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Introduction and Background

This document reports on the findings, conclusions and indicated actions from a survey conducted by Strategic Initiatives (SII) on behalf of the District of Oak Bay. The survey was conducted among Oak Bay residents and/or property owners between November 9 and December 11, 2015 in order to help the District gather feedback and understand opinions from residents of Oak Bay about the six options under consideration to separate the combined sewer system in the Uplands neighbourhood, as mandated by the provincial government under the Municipal Wastewater Regulation. Responses to the survey will help inform Council's decision-making moving forward.

The survey instrument (questionnaire) was developed by Strategic Initiatives in close collaboration with the District of Oak Bay. In addition to seven closed-ended questions, the survey included two open-ended questions. Responses to the survey questions are summarized within this report. A spreadsheet including all the responses received to the open-ended questions, verbatim, is attached as appendix 1.

The online survey was hosted by Strategic Initiatives. Respondents were directed to the online survey via a clickable link on the Oak Bay website, by mentions at open houses and via social media. Paper copies of the survey were distributed at open houses and at the Oak Bay municipal offices, for those preferring to complete the survey in hard copy. A link to a downloadable hard copy version of the survey was also included on the Oak Bay website.

Of the total of 117 completed surveys, 60 were submitted in hard copy. Hard copy responses were entered into the survey software by Strategic Initiatives. Responses to open-ended questions submitted in hard copy were transcribed, verbatim, into the survey software.

Once data collection and data entry of the hard copy surveys was complete, the raw data were cleaned and tabulated. Responses to open-ended questions were coded and tabulated. Cross-tabulations were run to calculate responses to each question in the online survey according to whether respondents owned property in the Uplands. (Unfortunately, due to the small sample size, it was inappropriate to cross-tabulate responses by other variables.) Significance tests were performed at the 95% confidence level (described in the report as "significantly more likely"). Statistically significant differences between Uplands property owners and non-owners have been called out in the report. Otherwise, the reader may assume that no statistically significant differences were observed.

With a sample size of 117, survey results are accurate to within an estimated margin of error of $\pm 9.06\%$ at a 95% level of confidence (i.e. 19 times out of 20).





Respondent Demographics

The first four questions of the survey (Q1 through Q4) were used to screen and classify respondents. Individuals who were not either residents of Oak Bay or Oak Bay property owners were disqualified from completing the survey.

The base of 117 survey respondents broke down as follows:

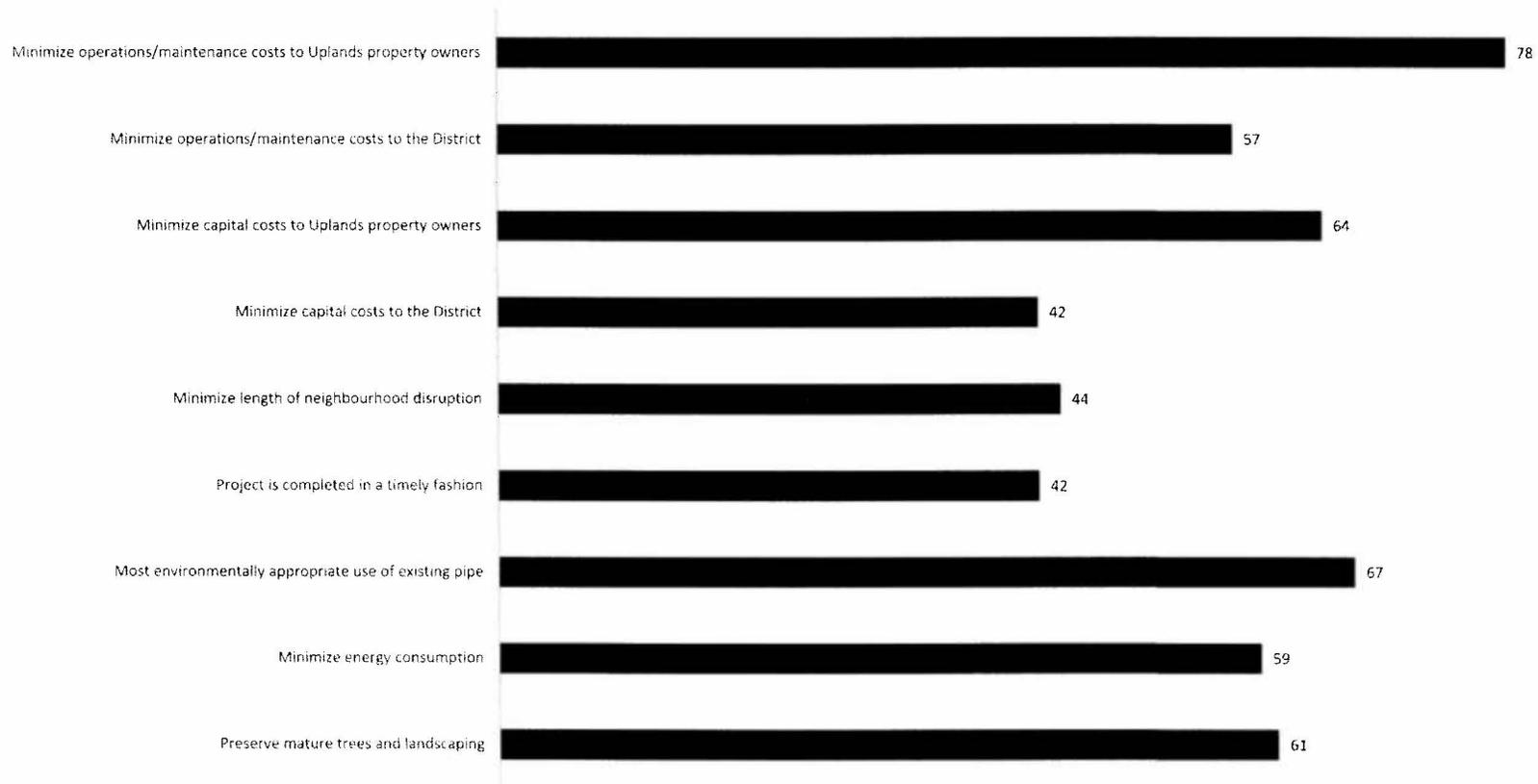
- 93% of those beginning the survey identified themselves as residents of Oak Bay;
- 93% of all respondents said they owned property in Oak Bay;
- 70% of Oak Bay property owners indicated their property was in the Uplands (82 respondents); and
- 95% of Uplands property owners said their property was located in the Humber/Rutland catchment area (78 respondents).





Overall Importance of Various Considerations

Importance of Various Considerations – Most Important
(Top 2 Box Summary – % Important)



Q5 Council will be weighing a number of considerations as it determines how best to comply with the provincial government's mandatory Municipal Wastewater Regulation. Please rate the importance of each of the following considerations.

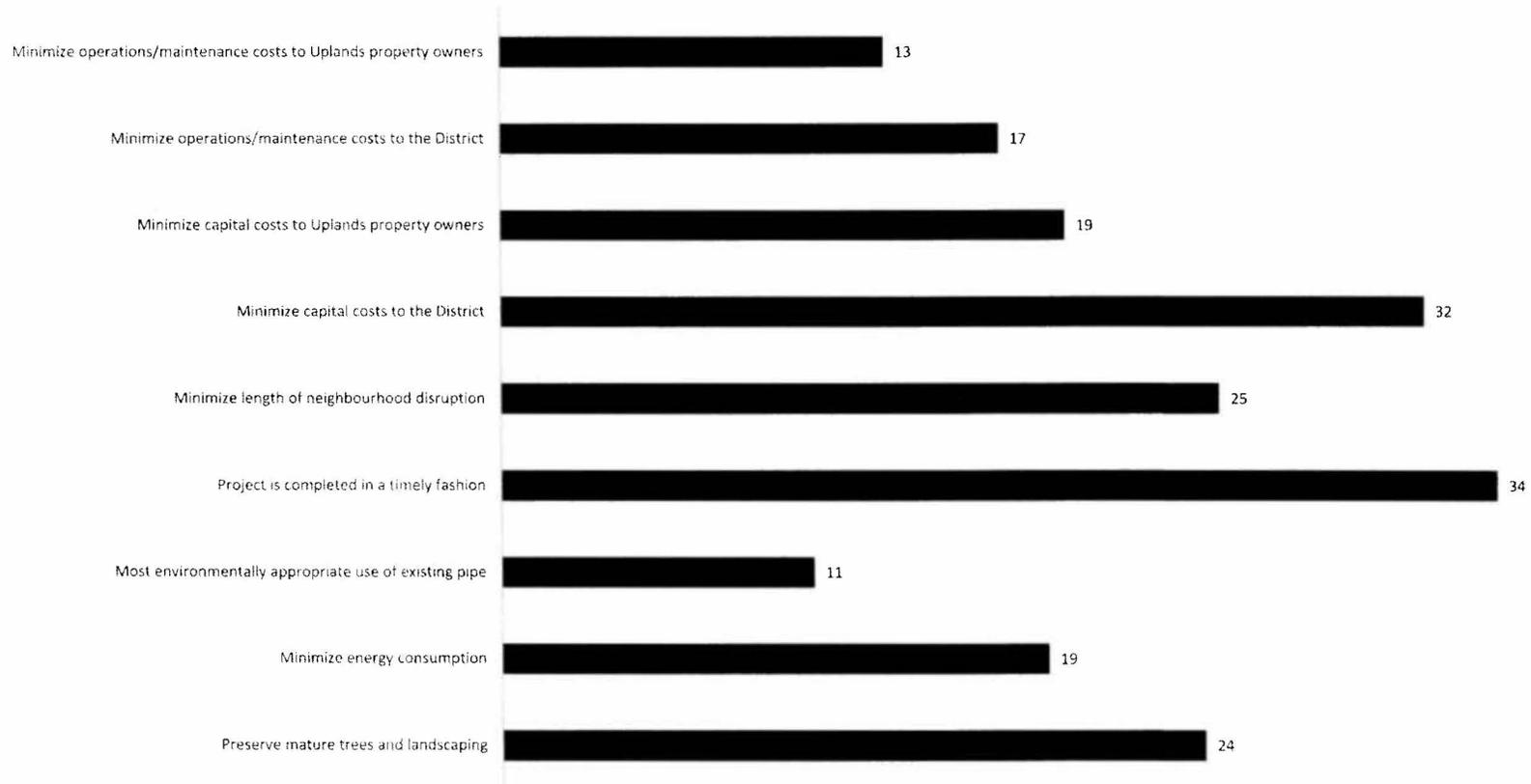
Respondents indicated that of the various considerations about which they were asked, the most important were: minimize operations/maintenance costs to Uplands property owners (78% rated either very important or somewhat important); most environmentally appropriate use of existing pipe (67%); and minimize capital costs to Uplands property owners (64%).





Overall Importance of Various Considerations

Importance of Various Considerations – Least Important
(Bottom 2 Box Summary – % Not Important)



Q5 Council will be weighing a number of considerations as it determines how best to comply with the provincial government's mandatory Municipal Wastewater Regulation. Please rate the importance of each of the following considerations.

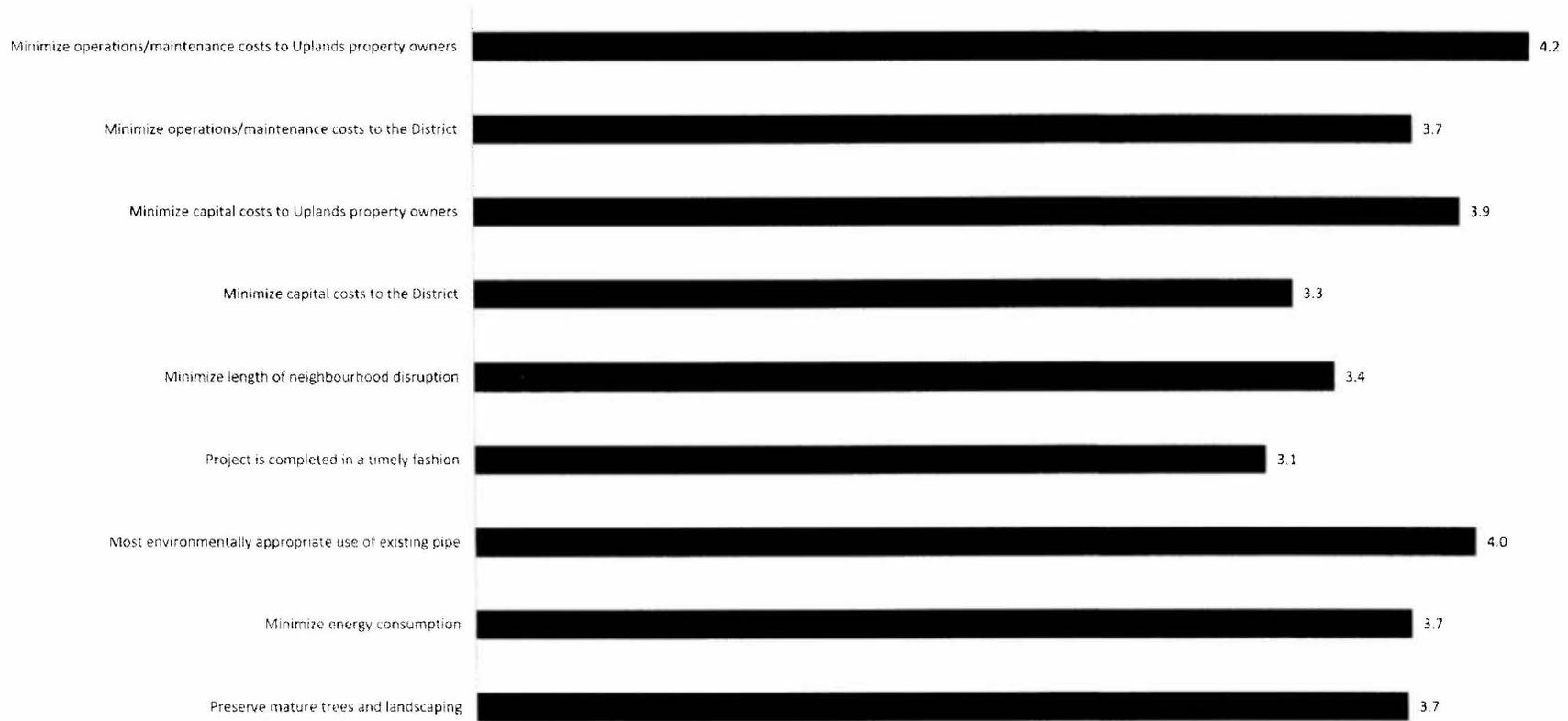
The least important considerations (based on "bottom 2 box" scores, or the percentage of respondents rating the consideration either very unimportant or somewhat unimportant) were: project is completed in a timely fashion (34%); minimize capital costs to the District (32%); and minimize length of neighbourhood disruption (25%).





Overall Importance of Various Considerations

Importance of Various Considerations
(Mean Importance)



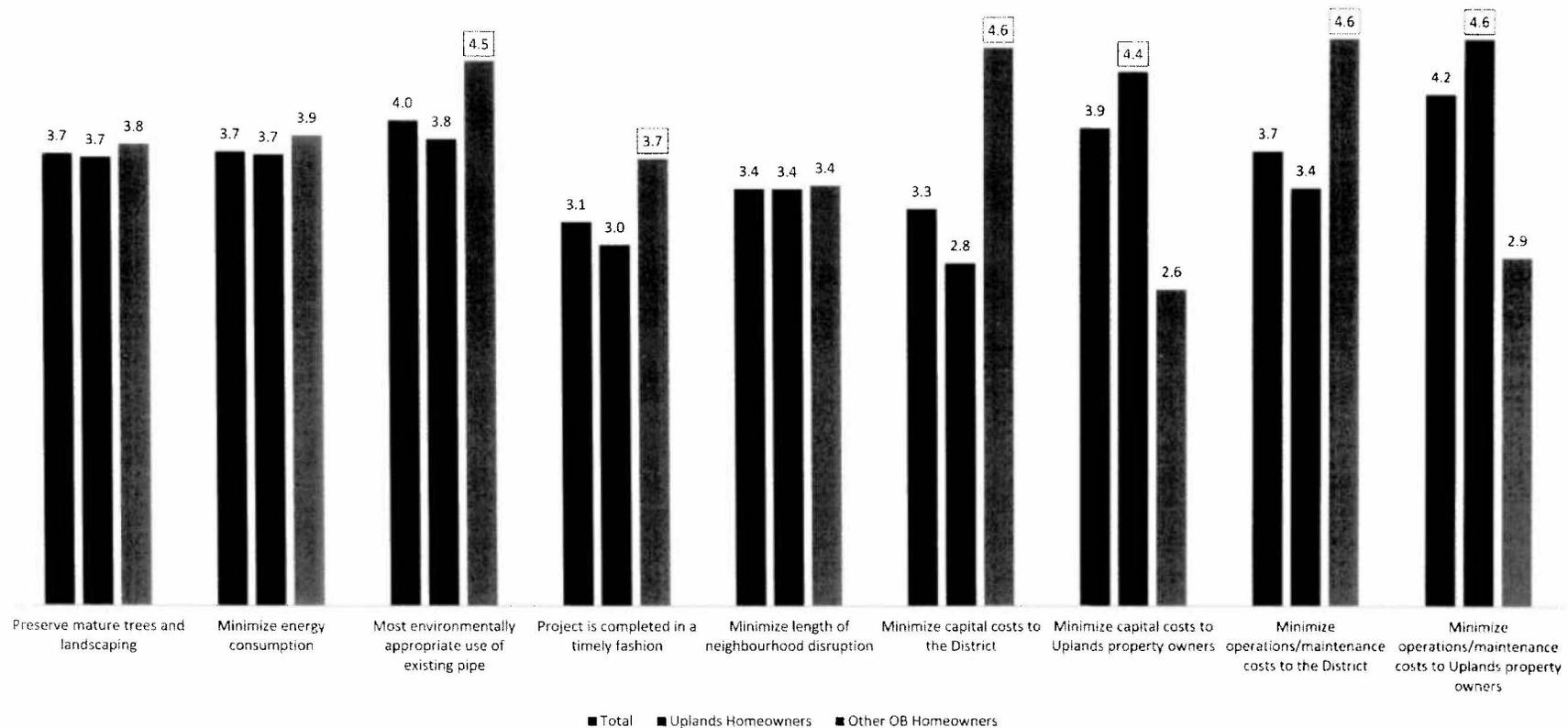
Q5 Council will be weighing a number of considerations as it determines how best to comply with the provincial government's mandatory Municipal Wastewater Regulation. Please rate the importance of each of the following considerations.

Based on respondents' average ratings on a scale from 1 to 5, the most important considerations were: minimize operations/maintenance costs to Uplands property owners (4.2); most environmentally appropriate use of existing pipe (4.0); and minimize capital costs to Uplands property owners (3.9). Considerations with the lowest average importance scores were: project is completed in a timely fashion (3.1); minimize capital costs to the District (3.3); and minimize length of neighbourhood disruption (3.4).



Overall Importance of Various Considerations

Importance of Various Considerations
(Mean Importance)



Q5 Council will be weighing a number of considerations as it determines how best to comply with the provincial government's mandatory Municipal Wastewater Regulation. Please rate the importance of each of the following considerations.

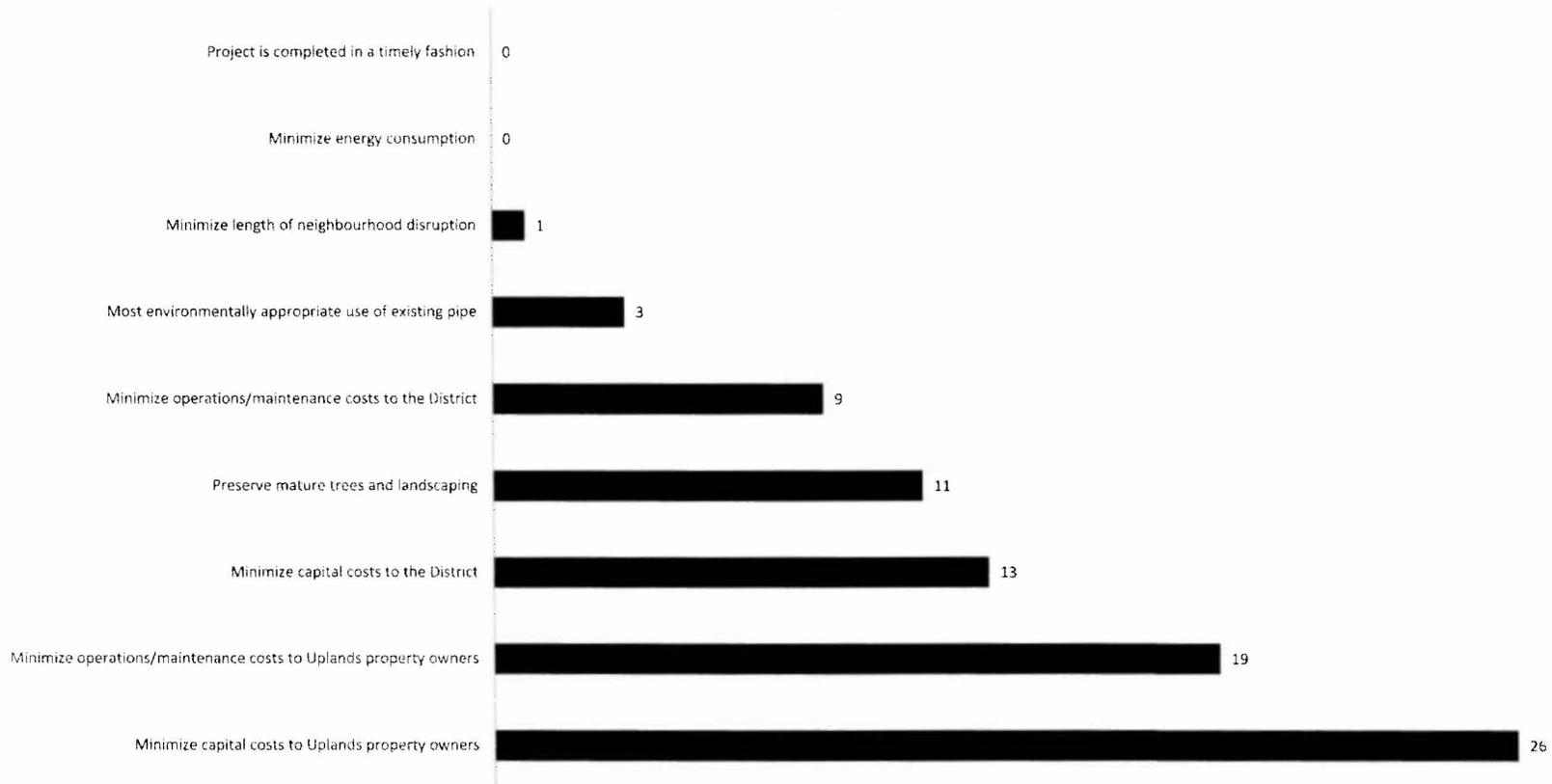
Oak Bay property owners whose property was not located in the Uplands ("Other OB Homeowners") were significantly more likely than owners of property in the Uplands ("Uplands Homeowners") to rate as important: most environmentally appropriate use of pipe (4.5 vs. 3.8); project is completed in a timely fashion (3.7 vs. 3.0); minimize capital costs to the District (4.6 vs. 2.8); and minimize operations/maintenance costs to the District (4.6 vs. 3.4). Uplands homeowners were significantly more likely to rate as important: minimize capital costs to Uplands property owners (4.4 vs. 2.6); and minimize operations/maintenance costs to Uplands property owners (4.6 vs. 2.9).





Ranked Importance of Various Considerations

Importance of Various Considerations
(% Ranked First)



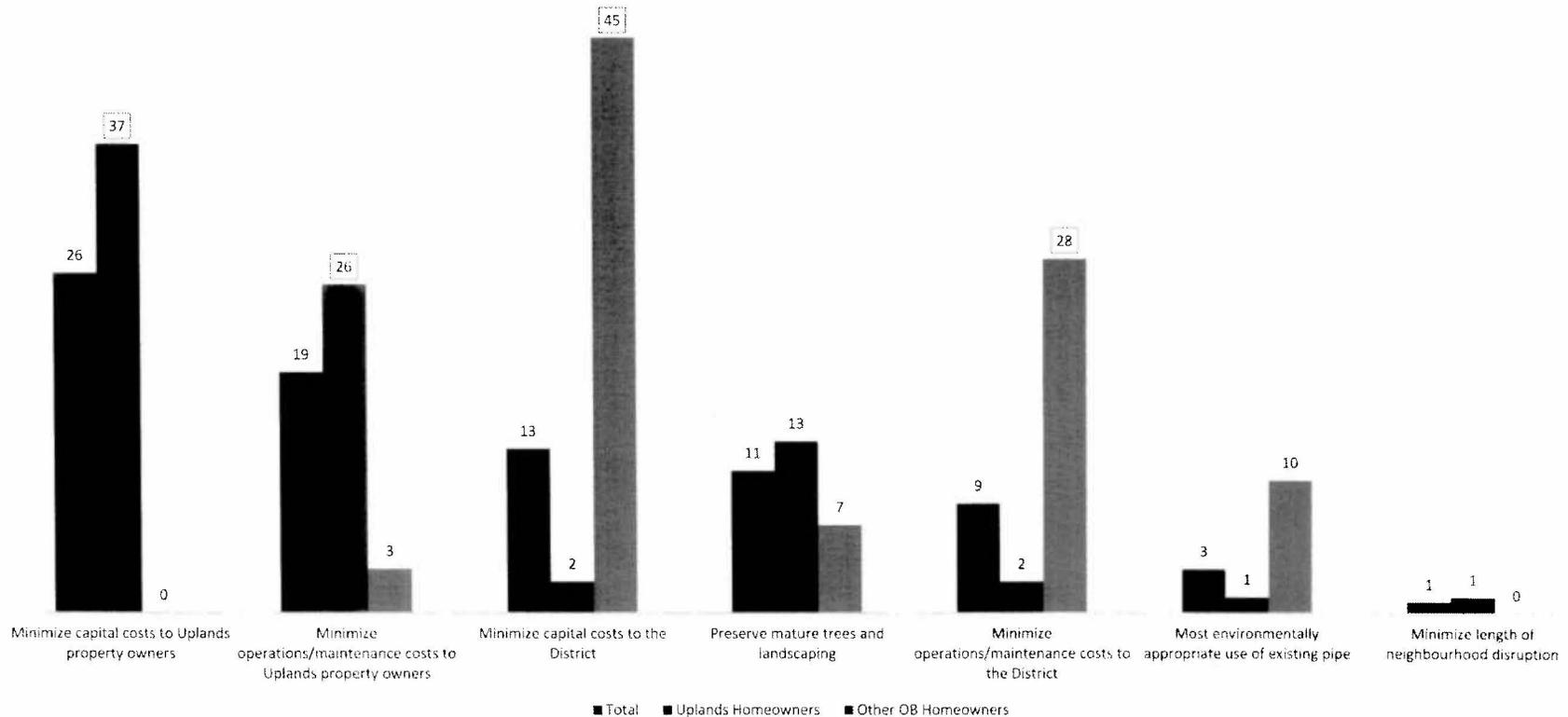
Q6 Please indicate which 3 of the following considerations are the most important to you.

Minimize capital costs to Uplands property owners was rated the most important consideration by the largest percentage of all respondents to the survey (26%), followed by minimize operations/maintenance costs to Uplands property owners (19%); and minimize capital costs to the District (13%).



Ranked Importance of Various Considerations

Importance of Various Considerations
(% Ranked First)



Q6 Please indicate which 3 of the following considerations are the most important to you.

Respondents owning property in the Uplands were significantly more likely than those whose Oak Bay property was located outside the Uplands (“Other OB Homeowners”) to rank as the most important consideration: minimize capital costs to Uplands property owners (37% vs. 0%); and minimize operations/maintenance costs to Uplands property owners (26% vs. 3%). Other OB homeowners were significantly more likely than Uplands homeowners to rank as the most important criteria: minimize capital costs to the District (45% vs. 2%); and minimize operations/maintenance costs to the District (28% vs. 2%).



Other Considerations

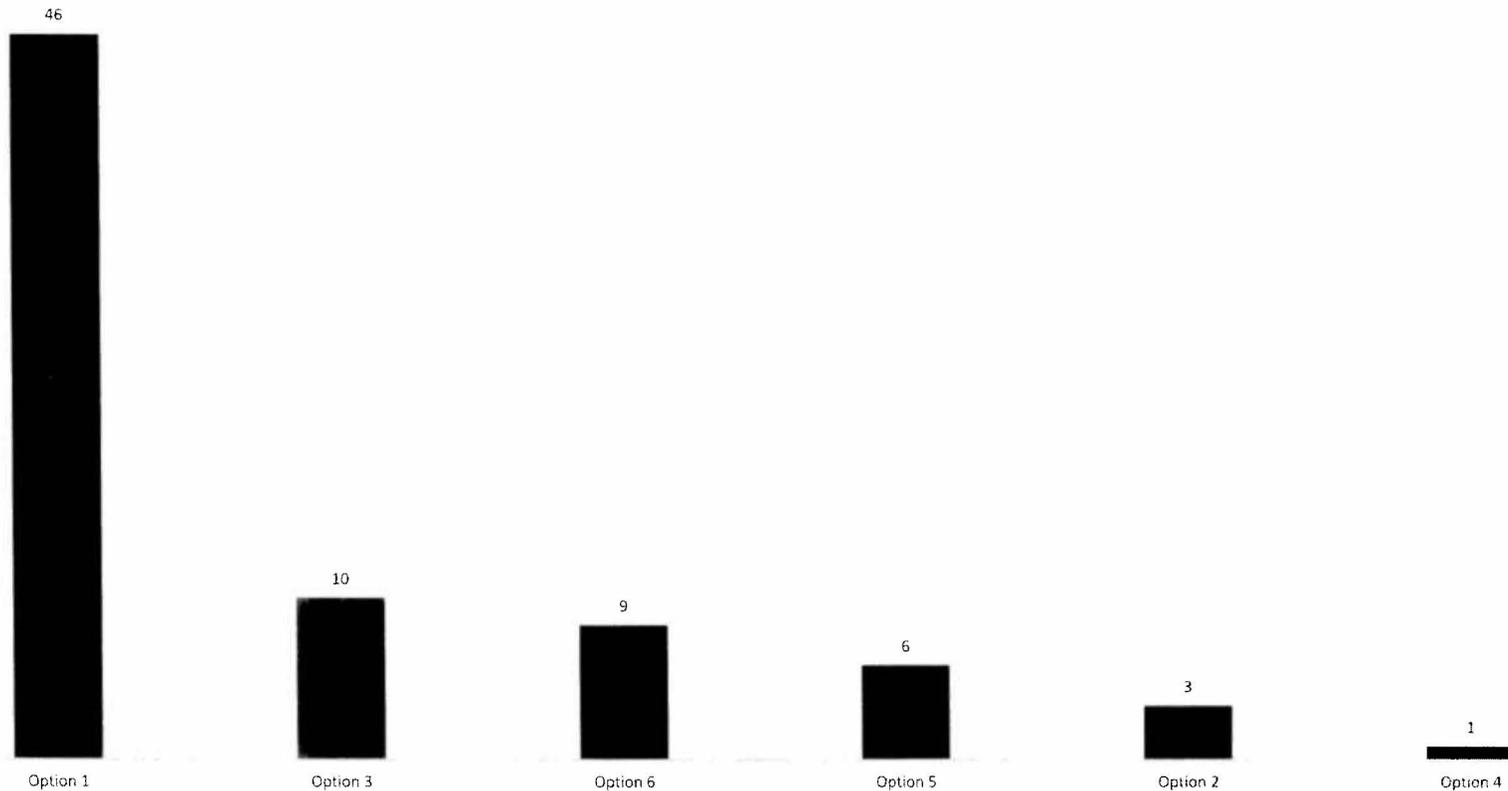
- Almost half (44.4%) of those completing the survey took advantage of the opportunity of responding to an open-ended question asking them what other considerations they would like to make Council aware of to comment regarding cost issues – either related to the capital costs of the sewer separation project or to long term costs related to operation/maintenance.
- One third (32.5%) of respondents either expressed their strong preference for a gravity-based system, or indicated negative feelings about pumps and generators. They included comments such as: pumps and generators are unfair/ridiculous/an unnecessary expense, too big a burden, unacceptable, etc.; pumps are a concern because of power outages (especially lengthy and severe in the Uplands); Oak Bay is predominantly gravity, therefore Uplands should be too; pumps are unreliable and require frequent/costly maintenance; gravity is the least costly in the long term, requires least maintenance, relies on fewer pumps, etc.; and gravity always works/is most appropriate/is a natural solution (2.6%).
- A number of those responding to the survey (9.4%) said that they felt the solution should be fair for Uplands residents who already pay high taxes, indicating that they want Uplands property owners to be treated the same as any other Oak Bay neighbourhood, that treating the Uplands differently is “discriminatory” and that the eventual decision should reflect the best interests of all taxpayers in Oak Bay.
- A smaller percentage of respondents (8.5%) suggested a number of alternative solutions, such as alternate storm water disposal methods for homeowners, solving property problems on an individual basis, separate street drains, holding tanks, etc.
- Interestingly, some respondents (6.8%) encouraged Council to ensure they focus on the best solution for the long term, and to do it correctly/once/right even if this might mean the least expensive solution was not adopted.





Preferred Technical Option

Preferred Technical Option
(% Ranked First)



Q8 Six options have been developed by engineering firm McElhanney Consulting Services Ltd. To separate the combined sewer in the Uplands. Please rank the six technical options in order of your preference.

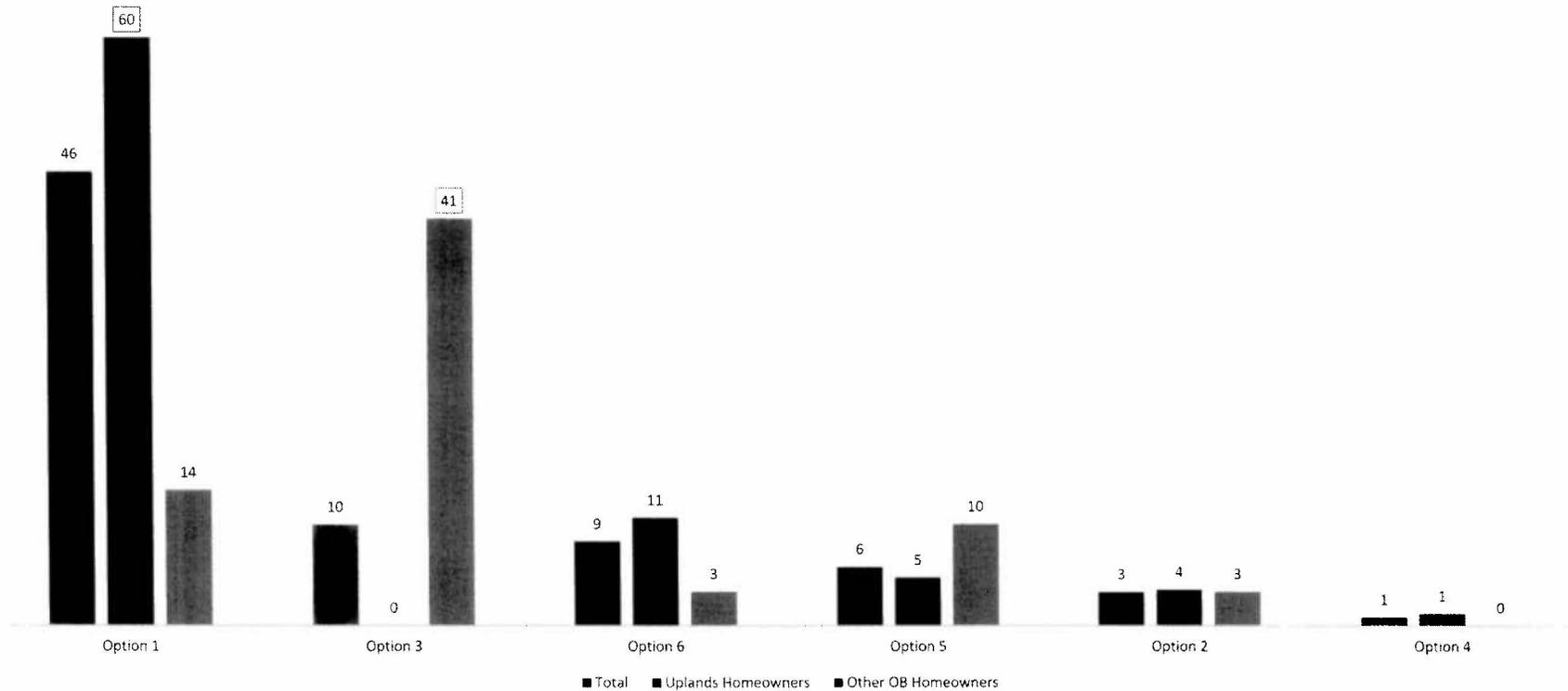
Option 1 was the technical option preferred by the highest percentage of respondents, with 46% of all those responding to the survey ranking Option 1 first in order of preference, followed by Option 3 (10%) and Option 6 (9%).





Preferred Technical Option

Preferred Technical Option
(% Ranked First)



Q8 Six options have been developed by engineering firm McElhanney Consulting Services Ltd. To separate the combined sewer in the Uplands. Please rank the six technical options in order of your preference.

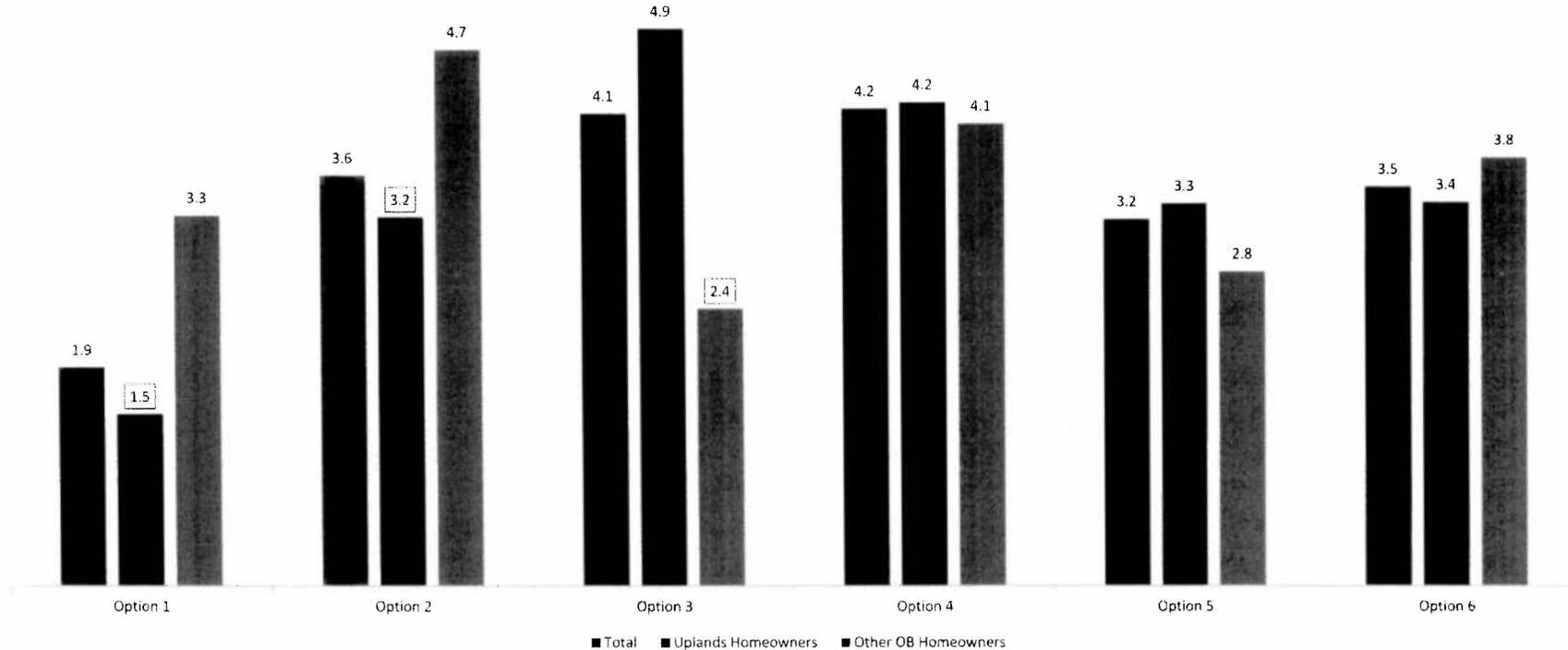
Uplands homeowners were significantly more likely than other OB homeowners to rank Option 1 as their most preferred of the six technical options (60% vs. 14%). Other OB homeowners were significantly more likely than Uplands homeowners to rank Option 3 as their most preferred option (41% vs. 0%).





Preferred Technical Option

Preferred Technical Option
(Mean Ranking)



Q8 Six options have been developed by engineering firm McElhanney Consulting Services Ltd. To separate the combined sewer in the Uplands. Please rank the six technical options in order of your preference.

N.B. Lowest mean score indicates highest ranking of preference. Option 1 was the most preferred among all survey-takers, with an average ranking of 1.9. Uplands homeowners were significantly more likely than other OB homeowners to rank Option 1 and Option 2 as their most preferred of the six options (mean ranking 1.5 vs. 3.3 and 3.2 vs 4.7 respectively). Other OB homeowners were significantly more likely than Uplands homeowners to rank Option 3 as their most preferred technical option (mean ranking 2.4 vs 4.9). The differences between Uplands homeowners and other OB homeowners in their average rankings of the remaining technical options were not significant.



Reasons for Preference

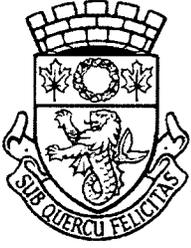
- When they were asked to indicate the one or two reasons why they preferred the technical option they had ranked “1”, almost half of those responding to the survey (47.9%) said their preference was related to gravity systems being “better”, or to negative feelings about pumps. These comments were completely consistent with (and in some cases repeated) the responses made to Q7, the earlier open-ended question.
- More than one third of the responses (35.0%) indicated that the preference for a specific option was related to cost issues, whether the lowest cost to Uplands property owners or to the District. Some of these comments included specific references to long term costs or operating/maintenance costs, but not all comments cited either capital costs or operating/maintenance costs; nor did all of the comments specifically mention which parties would bear the costs to which the comment referred (i.e. Uplands property owners or the District).
- One quarter of respondents (24.8%) related their preference for their first choice option to their concern that the current pipe be used for storm water and the new pipe be used for the sanitary system; several said specifically that if the old pipes were to leak, storm water leakage would be acceptable but leaking sewage would not be acceptable.
- The reasons given by less than one quarter of people (17.1%) for their preferred option were because they perceived the option as being less disruptive.



Conclusions and Indicated Actions

- Respondents to the survey were drawn heavily from Uplands homeowners and, within this group, were almost entirely owners of properties located in the Humber/Rutland catchment area so the survey findings must be interpreted within this context. That said, several conclusions can be drawn from the data:
 - While two of the most important considerations, as rated by respondents, clearly related to the fact that most were the owners of property in the Uplands (minimizing capital costs to Uplands property owners and minimizing operations/maintenance costs to Uplands property owners), making the most environmentally appropriate use of existing pipe was also rated highly in terms of its importance, regardless of whether the respondent was an Uplands homeowner or not.
 - In addition to making the most environmentally appropriate use of the existing pipe, ensuring the project is completed in a timely fashion and minimizing both capital and operations/maintenance costs to the District were important to other OB homeowners.
 - There are clearly a number of Oak Bay residents who will be watching the cost implications of the sewer separation project closely. Comments regarding cost issues – either related to the capital costs for installation or the long term ongoing costs of operating/maintaining the system – were made by almost half of the respondents to the survey. A number expressed concerns about the costs related to a specific technical option, while others were concerned about possible capital cost overruns, or (depending on where one’s property was located) about costs being unduly onerous for Uplands residents, or about all Oak Bay taxpayers being required to share a cost burden that Uplands homeowners should be shouldering.
 - Preference for a gravity-based system was strongly expressed by between one third and one half of respondents to the survey; this was either expressed as a positive about gravity systems (they are “better”) or as a negative about systems requiring pumps and/or generators. Comments such as “let gravity do the work” or “gravity never fails” were made in response to both of the two open-ended questions in the survey.
 - Option 1 was clearly the most preferred of the six technical options among Uplands homeowners, however, other OB homeowners were significantly more likely to prefer Option 3. The differences between Uplands homeowners and other OB homeowners in their average rankings of the remaining technical options were not significant.





THE CORPORATION OF THE DISTRICT OF OAK BAY
MUNICIPAL HALL – 2167 OAK BAY AVENUE – VICTORIA, B.C. V8R 1G2
PHONE 250-598-3311 FAX 250-598-9108 WEBSITE: www.oakbay.ca

October 24, 2016

Capital Regional District
625 Fisgard Street
Victoria, BC V8W 1R7

Attn: Barbara Desjardins, Board Chair

Dear Chair Desjardins,

Re: Oak Bay Combined Sewer Separation Plan

Please be advised that at its October 11, 2016 Regular Meeting the Council for the District Oak Bay adopted the following resolution:

That:

The District of Oak Bay approve the recommendations of the pre-design report namely:

- a. *Option 4, a shallower gravity based storm system, including two isolated areas requiring municipal storm water pumps;*
- b. *Design by catchment area and not by construction phase;*
- c. *Construction on a phased project basis, beginning with the Humber catchment, with contract packages at a minimum of \$2 million each; and*
- d. *Development of a plan for rehabilitation of the existing pipes; and*

The District of Oak Bay approve the submission to the Capital Regional District requesting an amendment to the Capital Regional District's Core Area Liquid Waste Management Plan.

Thank you for your attention.

Yours truly,

Warren Jones
Director of Corporate Services

c – L. Hutcheson, CRD, General Manager of Parks & Environmental Service



HJA Water Management Consulting

509 Foul Bay Road, Victoria, BC., V8S 4G9 5T6 | 250-885-3711 | Jack.Hull@telus.net

To: Committee of the Whole, District of Oak Bay

From: Jack Hull MBA, P.Eng. Project Manager

Date: September 28, 2016

Subject: Uplands Combined Sewer Separation Project Pre-design – Final Report

INTRODUCTION

The Uplands neighbourhood was constructed with a single pipe to convey stormwater and sanitary sewage to the CRD East Coast Interceptor trunk sewer. The Provincial Government's Municipal Wastewater Regulation requires all BC municipalities to eliminate combined sewer overflows (CSO) by having separate stormwater and sanitary sewer systems. Compliance with the provincial regulation is mandatory for the District of Oak Bay (District) as it is for other jurisdictions, for example, Burnaby, New Westminster and the City of Vancouver where combined single pipe infrastructure also exists.

For the last eighteen months a project team comprised of District staff, the Project Manager and McElhanney Consulting Services Ltd., (McElhanney) has undertaken a comprehensive pre-design study to examine the technical, environmental, financial and social aspects of this major Oak Bay infrastructure project.

A key project priority for Council has been public engagement. Open Houses, a Public Opinion Survey and regular Council meeting updates have provided residents with opportunities to learn about the project and express their views. Feedback from public engagement in late 2015 was brought back to Council in February 2016 at a Special Committee of the Whole meeting which was well attended with residents providing strong and constructive feedback. The District website continues to host all of the information presented at the Open Houses and all of the updates and reports that have come before Council. In response to feedback from the public engagement, and as the study has progressed, Council has made a number of decisions that have further defined the project scope.

The purpose of this report is to:

1. Summarize how the recommendation to implement Option 4 presented in the pre-design report was reached;
2. Present the proposed timeline for a staged approach to implementation;
3. Address the amendment to the Core Area Liquid Waste Management Plan;
4. Emphasize the importance of making a decision to implement the preferred option.

THE OPTIONS

Initially, six options were evaluated namely:

1. A deep new gravity sanitary sewer, existing pipe for stormwater conveyance;
2. A deep new gravity storm sewer, existing pipe for sanitary sewage conveyance;
3. A new pumped sanitary sewer system, existing pipe for stormwater conveyance;
4. A new shallower storm sewer, localized municipal stormwater pumping stations, existing pipe for sanitary sewage conveyance;
5. A hybrid shallower gravity sanitary sewer, pumped where necessary, existing pipe for stormwater conveyance; and
6. A variation on Option 5, with localized municipal pumping stations, existing pipe for stormwater conveyance.

As directed by the District a seventh option was considered namely, a deeper gravity sewer system to eliminate pumps. This option was found to be impractical to construct because of the required depth of some pipe trenches (greater than 8 metres).

PROJECT SUMMARY

A comprehensive project summary and update was provided to Council on September 19, 2016. This report is a summary of the key project milestones in reaching a conclusion on the recommended option.

- May 2015 – the District retained the services of McElhanney Consulting Services Ltd to undertake a pre-design study;
- May to October, 2015 - McElhanney developed technical details and cost estimates for the six options identified for sewer separation;
- October, 2015 – Council decision on criteria for mandatory sewer separation, responsibility for connection costs and Heritage Inspection Permits
- November 2015 Archaeological Overview Assessment by Golder & Associates on potential issues and areas of importance for First Nations;
- October – November, 2015 formal public engagement open houses, web site and on-line survey. In response to public feedback, the District directed staff and the project team to;
 - Explore the possibility of a deep sewer option to eliminate the need for pumps;
 - Explore the opportunities for on-site stormwater management on municipal property;
 - Report on the effect of service installation on the mature tree canopy;
 - Explore alternative construction methods and arranged a for a presentation by an industry expert on trenchless technologies including cured in place pipe rehabilitation, slip lining, pipe jacking, pipe bursting, and horizontal drilling.

As a result of these investigations the following decisions/actions were taken:

- June 2016 - Resolution from Council that no further consideration be given to the use of horizontal directional drilling for the new sewer installation on municipal property, with the exception of small diameter lateral connections from property lines as appropriate;

- June 2016 Resolution from Council to remove the use of easements from further consideration due to the significant impacts on the landscape that construction of a second pipe would cause.
- June 2016 - Retained WSP Canada Inc. to undertake a geotechnical study to better define geological conditions, in particular the occurrence of rock, to further refine the cost estimates.
- August/September 2016 - Updated project cost estimates based on the result of the geotechnical investigation.

A key consideration in the decision on which option to implement is the future use of the existing pipe. If it is to be used as a sanitary sewer, then only options 2 and 4 are applicable. Options 1, 3, 5 and 6 are applicable if the pipe is to be used as a storm sewer. The analysis in the pre-design report presents the reasons for and against the use of the existing pipe for sanitary or stormwater conveyance.

With the completion of the pre-design study, McElhanney, recommends that the District implement Option 4, namely, a new shallow gravity stormwater system with localized areas requiring municipally owned stormwater pumping stations and the existing pipe used to convey sanitary sewerage. The estimated cost of Option 4 is \$21,500,000 including contingencies and soft costs, with \$15,100,000 the responsibility of the District and \$6,400,000 the responsibility of the residents of the Uplands for private sanitary pumping systems and service connections to the new storm sewer.

Below is a summary of estimated costs for each of the options:

Option No.	Capital cost			Average Annual Operation and Maintenance Costs			Aggregate 50-year duration net present value
	Totals	To the municipality	To the private landowners	Totals	To the municipality	To the private landowners	
	\$Millions			\$1,000s			\$Millions
1	30.9	24.3	6.6	78	65	13	35.9
2	31.9	25.1	6.7	77	64	13	36.8
3	14.2	7.2	7.0	110	9	101	21.3
4							
5	21.4	15.0	6.4	89	48	41	27.2
6	23.4	16.9	6.5	90	54	36	29.2

Option No.	Total Capital Cost (per residential unit, including 50% contingencies)			
	To the Private Landowners (\$1,000s)			
	Costs to Landowners with new pumps		Costs to Landowners without new pumps	
	High	Low	High (deep and long)	Low (shallow and short)
1	20	17	38	14
2	20	17	38	14
3	20	17	n/a	n/a
4				
5	20	17	38	14
6	20	17	38	14

During the study new information on the condition of the existing sewer pipe has indicated that rehabilitation should proceed as soon as possible. Estimated costs for rehabilitation, as a separate District maintenance initiative, are in the order of \$3 million.

Option 4 provides a balance between environmental, social and financial considerations. Environmentally it provides progression towards compliance with the MWR through incremental reductions in combined sewer overflows and will result in less disruption to mature landscapes. A new sanitary sewer would require one hundred percent of residents to connect before any CSO reductions would be realized. Socially, District residents brought different perspective on the issue of affordability and fairness, depending on where they lived. Many Uplands residents impacted by the project felt that gravity service should be maintained as a priority for the District. For property owners living in neighbourhoods outside of the Uplands, minimizing capital costs to the District was the most important consideration recognizing that capital costs for this project would be borne by all Oak Bay residents. Given the Uplands residents preference for gravity service, Option 4 provides a compromise between Option 1 with an estimated 66 pumps and Option 3 with 391 pumps. Financially, Option 3, while the least cost option, does not allow for a phased approach to CSO reductions. Also a low pressure system will not function reliably if only a few homes are connected due to insufficient volume in the system. It requires one hundred percent of residents to install pumps and connect prior to their being any positive impact on CSO. Option 3 was the least favoured by Uplands residents. The shallow sewer options (Options 3, 4 and 5) are similar in cost.

The McElhanney Pre-Design report is available on the Oak bay web site (www.oakbay.ca).

SEPARATION OF COMBINED SEWERS – IMPLEMENTATION SCHEDULE

The timeframe for separating the combined sewers will depend on the available funding from the District and success in obtaining grants from Federal and Provincial governments. Recognizing the need for other infrastructure investments, it is suggested that the District plan to separate the combined sewers over the next thirty years. The Humber catchment, the smaller

of the two, could be completed within the first ten years, thereby eliminating the CSO at the Humber pump station.

The Rutland catchment could be completed in the subsequent 20 years. If government funding is received, then the sewers could be separated sooner. While the District will not mandate sewer separation on private property except under the established criteria, it is expected that the majority of homes will comply with the separation criteria over the next three decades as replacement and renovation of homes occurs.

AMENDMENT TO THE CORE AREA LIQUID WASTE MANAGEMENT PLAN

Approval of an amendment to the current CALWMP is required to implement the proposed sewer separation plan. As the Capital Regional District is responsible for the liquid waste management plan for the Core Area municipalities, a request for an amendment of the CALWMP will have to be submitted by the CRD to the Ministry of Environment. The submission to request an amendment to the LWMP will include the following:

1. Covering letter from the Mayor to the CRD Board Chair requesting an amendment to the Core Area Liquid Waste Management Plan. (Draft attached)
2. Attachments to the letter:

Attachment 1 - A summary of work undertaken to develop the plan to eliminate the combined sewers in Uplands (Project Manager's Report to Council, September 19, 2016.);

Attachment 2 - Resolution by Council to adopt the plan to separate the combined sewers in Uplands. (Project Manager's report to the Committee of the Whole, October 5, 2016 and the Pre-design Report by McElhanney Consulting Services Ltd., dated September 22, 2016).

Attachment 3 - The updated Table 5.5 of the CALWMP 'Prioritized Order of Oak Bay Overflow Reduction Plan'. (Draft attached).

Prior to a final submission it is recommended that a meeting be arranged between the staff of the District, the CRD and the Ministry of Environment to review the proposed submission to ensure that it provides all of the information required by the Ministry to support the District's request to amend the Core Area Liquid Waste Management Plan.

THE IMPORTANCE OF MAKING A DECISION

Separation of the Uplands combined sewers has been studied and discussed for several decades. This current study is the most comprehensive ever undertaken involving not only a detailed evaluation of various options but also a comprehensive public engagement process. Every effort has been made to respond to information requests from the public and council to enable Council to make a fully informed decision.

The District is in violation of the MWR. The District has been subjected to criticism from other municipalities for failing to eliminate the combined sewers and their perceived impact on sewage treatment planning. At the recent meeting with the Ministry of Environment, the Minister

expressed the expectation that Oak Bay will promptly move from the study phase to the implementation phase.

RECOMMENDATION

1. That the District of Oak Bay approve the recommendations of the pre-design report namely:
 - a. Option 4, a shallower gravity based storm system, including two isolated areas requiring municipal stormwater pumps;
 - b. Design by catchment area and not by construction phase;
 - c. Construction on a phased project basis, beginning with the Humber catchment, with contract packages at a minimum of \$2 million each; and.
 - d. Development of a plan for rehabilitation of the existing pipes.
2. That the District of Oak Bay approve the submission to the CRD requesting an amendment to the Capital Regional District's Core Area Liquid Waste Management Plan.



Prepared for the

DISTRICT OF
OAK  **BAY**

FINAL



The Uplands Combined Sewer Separation Project Final Report

RFP No. OBMH-02-2015 | September 22, 2016 | Submitted by:



McElhanney Consulting Services Ltd.

500 – 3960 Quadra Street
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Phone: 778-746-7423
Email: iwhitehead@mcelhanney.com

2243-15326-00

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Management Program



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Executive Summary

The District of Oak Bay (the District) is required to comply with Provincial and Regional District requirements for separation of municipal sanitary sewers and storm drains. The CRD's Core Area Liquid Waste Management Plan, authorized under the province's Municipal Wastewater Regulations (MWR), obligates the elimination of combined sewer overflows via the provision of separate stormwater and sanitary sewage systems. Within the Uplands neighbourhood, the original servicing construction, circa 1910, included a single pipe serving both functions. The District has been working toward compliance with the MWR for some years now.

McElhanney Consulting Services Ltd (McElhanney) was retained in May of 2015 to investigate alternatives for sewer separation within the Uplands area of Oak Bay. Six options were developed, broken down into the two CRD pumping station catchments, the Humber catchment and the Rutland catchment. The two catchments comprise a combined total of 391 existing homes. The six options were derived on the basis of design criteria established in conjunction with District technical staff. All of these options will require a number of privately owned pumping systems to service individual dwelling sites.

Refinements based on the recent geotechnical information provided by the District (the WSP Canada Inc. geotechnical investigation report August 17), indicate that fewer properties will have to pump under each option with the exception of Option 3 where all households would have to install a sanitary sewer pump. The six options are:

Option 1 – New deeper gravity sewer system and existing combined sewer system to remain for stormwater conveyance.

Option 2 – New deeper gravity storm drainage system and existing combined system to remain for sanitary conveyance.

While the goal of Options 1 and 2 is to minimize the number of pumped connections, additional properties need pumps because the existing easements, required for gravity service, are not being used and 5 metres has been established as the maximum practical and economic depth for trench excavation.

Option 3 – New pumped low pressure system for sanitary sewers collection and existing system to remain for stormwater conveyance.

Under this option all properties in both catchments would require sanitary sewage pumps.

Option 4 – A new shallow gravity stormwater system with localized areas requiring municipally owned stormwater pumping stations for roadway runoff and existing pipe as a sanitary sewer conveyance.

Option 5 – A hybrid of shallow gravity sanitary sewer system, pumped where necessary, and existing pipe as a stormwater conveyance.

This option would include a shallow depth gravity sanitary sewer system, with smaller, isolated areas of catchment serviced by municipal pressure sewers.

Option 6 – A hybrid shallow gravity sanitary sewer system, with localized community sanitary pumping stations where necessary and the existing system as a storm drain.

This option is a variation of Option 5. More municipally owned pumping stations would be constructed in order to increase the number of dwelling units serviced by gravity sanitary sewer connections compared to Option 5.

BOTH CATCHMENTS COMBINED	Services requiring a pumped connection		Gravity services possible		Total number of services	
	Was	Now	Was	Now	Was	Now
Option 1	85	66	308	325	393	391
Option 2	85	61	308	330	393	391
Option 3	393	391	0	0	393	391
Option 4	179	180	214	204	393	391
Option 5	191	170	202	221	393	391
Option 6	149	152	244	239	393	391

Attached as Appendix A are reduced copies of drawings 1a through 6b, depicting the proposed options.

As an aid in the assessment of relative merits and detractors of the options, an archaeological assessment and a 'desktop' geotechnical assessment were prepared by Golder Associates and Ryzuk Engineering, respectively. Considerable likelihood of encountering bedrock within new sewer pipe trenches was noted by Ryzuk, with two general areas identified as having higher and lower probability of rock at depth, respectively. Areas of higher archeological significance were mapped and reported upon by Golder. It was concluded that all options carry similar risks related to archeological issues.

The District has met with the Songhees Nation and the Esquimalt Nation to inform them of the District's requirement to move forward with the sewer separation project and the District committed to engaging the Nations as the project moved forward.

Technical memos 1 and 2 were prepared and delivered to the District in late 2015. Technical Memo 1 established the project design criteria and study parameters.

Tech Memo 2 covered the development of the 6 options and the modeling needed to assess required pipe sizes and depths for each option. Tech Memo 2 also provided a summary of expected differences in the number of private pumps needed under each option, as well as initial estimates of cost for each of the options. These cost estimates included a 30% contingency reflecting the preliminary nature of the analysis and a further 20% to cover soft costs such as detailed design and project management.

Subsequent to publishing of the technical memos 1 and 2, the District hosted a series of public information meetings, in order to present the material developed thus far and to seek feedback regarding public concerns and preferences. Stemming from that public process, the District requested that McElhanney undertake some additional analysis, prior to an evaluation of the options. This included:

- An assessment of a very deep gravity option that would preclude the need for most, if not all privately owned pumps. This was found to be very costly, and was not pursued further.

An assessment of the surface conditions of easements and statutory rights of way over private properties, within which the existing combined sewers are routed. Existing easements are 5 feet and 10 feet wide - not sufficiently wide to install a second pipe without significant impact on private property. A new wider easement would have to be negotiated with one or both property owners abutting an easement depending on the location of the existing pipe within the easement. The wider easements would have to be cleared to permit construction. The existing easements also contain mature tree, hedges, stone walls, driveways etc. Restoration of the new wider easements could represent a significant cost increase to the District such that construction in the easements would be more expensive than in the roadways.

Various pipe installation techniques were considered, including a number of trenchless technologies. While Horizontal Directional Drilling (HDD) may have some application on private property, HDD is neither a technically nor a financially feasible solution. The District Council resolved (June 2016) not to pursue additional pipes within the existing easements.

In addition, in response to public feedback during the public engagement process:

- Council adopted a resolution that the District work towards providing a sewer separation plan with a phased approach (June 2015)
- A geotechnical investigation was undertaken given the potential cost impact of encountering rock. This report's data increased our understanding of the probability and implications of encountering rock and its influence on cost of the options.

- In August 2016, the District directed McElhanney to incorporate these more recent initiatives and developments into an updated options assessments and revisiting of associated cost estimates. The result was a much clearer assessment of differences between the options, when comparing based on the agreed project assumptions and design criteria outlined later in this report.

Conclusions Summary and Recommendation:

- Present-day combined system operating characteristics clearly indicate that peak flows to the two CRD pumping stations are predominantly stormwater runoff, and these peak flows presently far exceed the capacity of the stations (90 l/s each) during wet weather events.
- Council adopted a resolution not to mandate immediate re-connection of private services to the new system. The public was supportive of the plan that re-construction, or major renovations within private properties, would trigger an obligation to re-connect. (October 2015).
- New storm sewer options will lead to more rapid reduction in combined sewer overflows.
- Options 2 and 4 allow the District to realize environmental benefits immediately as each property connects thereby achieving compliance with the Municipal Wastewater Regulation faster. By comparison, if a new sanitary system was constructed, no diversion of flows away from the CRD pumping stations would occur until all service connections (all homes) were confirmed connected. This could be 20 to 30 years depending on project phasing and available funding.
- Options with deeper sewers will cost considerably more than shallower options, with the degree of cost uncertainty generally increasing with increasing pipe depths. This is due to greater amount of bedrock to be removed and the larger volumes of trench spoil material needed to be trucked to offsite disposal and backfill imported.
- Options 1 and 2 (deep sewers) represent the highest capital costs and the greatest cost uncertainty for the provision of this utility. These options also represent highest risk to mature trees within the Uplands and higher probability of significant disruption within private properties.
- Option 3 is the least expensive to the District however it forces all 391 homes in the Uplands neighbourhood to install a sanitary sewage pump. In order to achieve compliance, 100% of properties must be connected to the new system before coming off the existing combined system. Phased construction of Option 3 is not practical, given the need for achievement of sufficient flushing velocities and the allowable duration of effluent within the system prior to discharge to the CRD pumping stations.

Homes with existing pumps may have to replace these units with higher head (pressure) units.

- Options 4, 5, and 6 are compromise solutions, balancing the overall capital cost and reduced upside project cost risk.
- Of these three options, only Option 4 offers the significant benefits of a new shallow, stormwater network allowing for a phased construction program with resulting gradual reductions in CSOs. Of the 391 homes in the Uplands, approximately 91 have already separated their stormwater and sanitary sewer systems to the property line allowing for immediate environmental benefit as homeowners connect.

CONSULTANT’S RECOMMENDATIONS:

It is recommended that the District:

- Implement Option 4, a shallower gravity based storm system, including two isolated areas requiring municipal stormwater pump stations.
- Undertake design by catchment area not by construction phase.
- Undertake construction on a phased project basis, beginning with the Humber catchment, with contract packages at a minimum of \$2 million each.
- The District should develop a plan for rehabilitation of the existing pipes.

Below is a summary of estimated costs for each of the options, including a 30% contingency allowance and 20% for other soft costs, as reproduced from report section 3.2:

Option No.	Capital cost			Average Annual Operation and Maintenance Costs			Aggregate 50-year duration net present value
	Totals	To the municipality	To the private landowners	Totals	To the municipality	To the private landowners	
	\$Millions			\$1,000s			\$Millions
1	30.9	24.3	6.6	78	65	13	35.9
2	31.9	25.1	6.7	77	64	13	36.8
3	14.2	7.2	7.0	110	9	101	21.3
4	21.5	15.1	6.4	91	46	45	27.4
5	21.4	15.0	6.4	89	48	41	27.2
6	23.4	16.9	6.5	90	54	36	29.2

Option No.	Total Capital Cost (per residential unit, including 50% contingencies)			
	To the Private Landowners (\$1,000s)			
	Costs to Landowners with new pumps		Costs to Landowners without new pumps	
	High	Low	High (deep and long)	Low (shallow and short)
1	20	17	38	14
2	20	17	38	14
3	20	17	n/a	n/a
4	20	17	38	14
5	20	17	38	14
6	20	17	38	14

Estimated costs for rehabilitating the existing sewer system, as a separate District maintenance initiative, are in the order of \$3 million.

1. Introduction

Under the Capital Regional District (CRD)'s Core Area Liquid Waste Management Plan (CALWMP), and the provincial Municipal Wastewater Regulation (MWR), separation of sanitary and stormwater drainage systems is required within the 'Uplands' area of Oak Bay. The District of Oak Bay (the District) must decide how best to plan for and implement a solution to this complicated and costly infrastructure servicing upgrade issue. To move forward and achieve compliance, the District prepared a request for engineering consulting proposals, in which the following over-arching project goal was indicated:

- Compliance with the CALWMP and MWR, that is, to eliminate combined sewer overflows (CSOs) by eliminating combined sewers in Oak Bay.

Reducing average annual volume—and the peak flow rate—of sewage delivered to the CRD's conveyance system, is a consequential benefit of the project.

McElhanney Consulting Services Ltd. (McElhanney) was retained in May, 2015 to:

- Review the existing combined sewer system function in the Uplands area of the municipality
- Consider and present applicable design criteria that will guide in the development of viable sewer separation options
- Consider and develop, at a preliminary design level of detail, a series of technically feasible options for sewer separation
- Develop defensible estimates of capital costs and longer-term operations and maintenance costs for these options
- Assist with presentation of this material to the public
- Identify key considerations for each of the options
- Compare the options overall, accounting for social, environmental, and project cost factors
- Report on our findings, with a preferred solution indicated

The McElhanney-led team included sub-consultant services covering a desktop geotechnical investigation (Ryzuk Engineering, Victoria) and an archeological overview assessment (Golder, Victoria). The District will engage with First Nations as part of the implementation phase of the project.

This final engineering report follows two technical memoranda submitted to the District dated 02 November, 2015 and 19 November, 2015. It reflects the inclusion of a number of subsequent supplementary documents and investigations requested by the District in response to public feedback captured during the public engagement process.

All of the options developed are technically feasible to construct and to operate. However, when considering public impacts and overall lifecycle costs, there are many constraints and factors requiring consideration. This report is intended to inform the District of pertinent issues and to provide clear direction as to the preferred servicing Option.

2. Background

Presently, sanitary sewage and stormwater runoff are conveyed within the Uplands area of Oak Bay via a combined single pipe network. The District has been investigating how best to comply with the requirements of the CRD CALWMP and provincial MWR for a number of years now. The District decided it was necessary to undertake a more comprehensive assessment of options than had been prepared previously, such that costing could be better understood and a more informed decision could be made. This pre- design options assessment study was commissioned to assist in determining the preferred servicing solution, taking into consideration social and environmental factors as well as expected project lifecycle costs.

The capital costs of the options and the resulting system functionality (MWR compliance) are important factors in selecting a preferred option but there are other factors that must be weighted and considered. These include:

- Impact during construction on the neighbourhood: property access interruption
- Disruption on private property and the cost of services installation to homeowners
- Costs to the District (taxpayers)
- The requirement to install either stormwater or sanitary sewer pump for some properties
- Environmental considerations including how best to utilize the existing sewer network and the timeline associated with addressing the overflows
- Protection of the mature tree canopy
- The long-term operating costs of the differing options to be paid by private property owners and by the District

At the outset of the project, the following key assumptions were agreed upon by the project team:

1. The goal of the project is to eliminate (separate) the combined sewers in Oak Bay (the Minister of Environment's condition for approval of the CALWMP) to eliminate overflows in compliance with the MWR (Section 42).
2. A second pipe would not be installed in existing easements.
3. The existing pipe would continue to be utilized for either sanitary sewer or stormwater conveyance.
4. A maximum practical trench depth is considered to be 5m.
5. Trenchless technology, specifically directional drilling, is not viable for the installation of the new pipe.
6. The District would be responsible for compliance with the Heritage Conservation Act on District property.
7. Property owners would be responsible for compliance with the Heritage Conservation Act on private property.
8. Given the limitation on trench depth, sanitary and / or stormwater pumps would factor in all options.
9. Stormwater would not be treated (decontaminated) prior to discharge to the sea.
10. Based on the statistics on the duration of power outages, the use of pumps on private property is viable.
11. On-site stormwater management would not be an alternative to a storm sewer connection— all properties will need a connection for stormwater.
12. In the absence of detailed geotechnical information, assumptions would be made on the occurrence of rock in generating cost estimates. *(Subsequent to the public engagement process, undertaken in late 2015, the District decided to commission a geotechnical investigation and reporting, in order to better define the impacts of bedrock on each of the options.).*
13. The cost estimates developed for private property are the average of the total cost to all property owners; that is, cost estimates were not developed on a site-specific basis.
14. At this stage, pre-design, operation, and maintenance costs estimates are based on a percentage of the capital costs.

It is assumed the reader is familiar with the District's original Terms of Reference for this assignment and our proposal dated 17 April, 2015, as well as McElhanney's technical memoranda #1 and #2, dated November 2015. The content of these documents is not repeated

here. However, a brief summary of technical memoranda #1 and #2 is provided below, to assist in contextual reference.

2.1. Tech Memo 1 – Dated 19 November, 2015

- Established technical design criteria, hydraulic operating characteristics, etc., to be used in developing and comparing options.
- Considered land use and per capita loading rates, peaking factors to be applied.
- Assessment as to expected system service life, decided upon 50 years, for Net Present Value (NPV) calculation purposes.
- Consideration as to the appropriate design storm events to be modelled.
- Consideration of acceptable infiltration and inflow rates.
- Review of video and survey materials available from the District.

2.2. Tech Memo 2 – Dated 02 November, 2015

Development of six options. Essentially there are two fundamental design solutions, with the six options being variations on these two themes:

- Re-purpose the existing system as a stand-alone storm drainage network.
- Re-purpose the existing system as a stand-alone sanitary sewage conveyance network.

The six options are:

1. Deep new gravity sanitary network
2. Deep new gravity storm drains
3. New pumped sanitary sewer system
4. New shallower storm drainage system, with more pumps
5. New shallower sanitary network, with more pumps
6. Variation on Option 5, with fewer private pumps and more municipal pumping required

For these options:

- Calculations of dwelling units that would require pumping, or not, under each option, based on agreed servicing depths and slopes of service lines and resultant hydraulic grade line
- Pipe routing feasibility assessments under the differing options
- Development of plan / profile drawings for gravity options
- Stormwater and sanitary sewer system modelling scenarios with present day and future loadings applied

- Preliminary 'desktop' geotechnical assessment
- Preliminary archeological issues and impacts assessment
- Initial identification of differing constraints between the options
- Development of unit price cost estimates for capital cost, Operation and maintenance (O&M) costs, and NPV cost estimates

3. Discussion

3.1. Further Effort Since Tech Memo 2

Late in 2015, we received additional data from the District regarding specific dwelling floor elevations. Coupled with excellent feedback via the autumn 2015 public information sessions and the WSP geotechnical report received in August 2016, we have subsequently re-worked the first iteration gravity sewer plan/profiles and associated service connection elevation assumptions for all six options.

The more detailed WSP geotechnical information was utilized by:

- First adding in all suggested rock surfaces to the original plan/profiles drawings
- Reworking of the plan/profiles—adjusting pipe depths and grades—to better optimize each of the overall pipe network options (avoiding bedrock where possible while optimizing the number of possible gravity service connections)
- Confirming the applicable probabilities of encountering rock at differing depths
 - Applying these probabilities to each of the options
 - Assessing volumes of trench rock for each option
 - These volumes were further differentiated by pipe diameter(s) and associated trench width(s)
- Assigning different costs per unit volume of rock, if encountered at differing trench depths
- Reworking the technical memorandum #2 capital cost estimates for all options
- Adding an appropriate cost allowance for encountering rock within private properties

The results of this additional analysis is provided in the form of data tables, as *Appendix B*.

Unit price cost estimates for each option were also updated, attached as *Appendix C*. These new cost estimates reflect the following:

- Updates to suit geotechnical information now in hand
 - Probabilities of more rock than had initially been accounted for
 - More limited opportunity to reuse trench material as backfill; more import fill

- Further breakout of dwelling service connection costing, both within road rights-of-way and across private properties. Increased expected costs for deeper gravity services over private properties
- Refinements in the number of pumped connections expected, whereby most options now indicate a requirement for fewer private pumps
- Allowance for re-connection of all existing roadway catch basins under Options 2 and 4.

Lastly, preliminary design drawings for the six options were also updated, reflecting these refinements. These are provided, in a reduced 11x17 format, as *Appendix A* attached.

3.1.1 Public Engagement Process Outcomes

The District engaged the public through a series of open house meetings held during November and December 2015. These meetings were well attended with the majority of the attendees representing property owners impacted directly by the project in the Uplands neighbourhood.

A number of factors were prevalent, based on public feedback:

- Pumping systems on private property are not preferred
- Costs to the individual homeowners should be minimized
- Disruption of mature trees and screening vegetation needs to be avoided
- The District needs to find the best means of utilizing the existing pipe network

It was stressed during the public engagement process that the preliminary design servicing options undertaken to date have been based on the available information. Further, that the project intent was to understand, generally, the clearly distinguishable differences between the options. It was conveyed to residents that detailed design phase analysis, complete with further survey and topographic detail, would yield refinements in the routing and depth of the District's proposed pipe network and refinement in the number of dwellings that could be serviced by gravity connections. Generally speaking, preference was indicated by residents impacted by the project in the Uplands neighbourhood for deeper gravity sewer options, whereby the need for pumping on private properties could be minimized. For a more detailed summary of the public engagement process and findings, the reader is directed to *Uplands Sewer Separation Public Engagement Overview and Project Survey* (www.okaybay.ca).

Subsequent to the public engagement process, the District instructed McElhanney to undertake supplemental investigations, intended to address specific issues raised by the public. This included the exploration of an Option 7 (a deep gravity system that would eliminate the requirement for pumps entirely) and the utilization of easements for a second pipe installation. Upon further analysis, neither was considered a viable option by the District. Further detail and discussion on these matters is provided as Appendix D.

3.1.1.1 Option Considerations for the Existing Pipe Network

Rehabilitation/lining:

While the lining of the existing century old pipe network is not specifically part of the sewer separation capital project, it is a necessary maintenance activity. District staff intend to address the rehabilitation of the existing system on a phased priority basis, independent of the option chosen for sewer separation. We estimate that pipe lining in the project area will cost in the order of \$3 million, at \$250/lineal metre.

For Options 1, 3, 5, and 6, (new sanitary network) the existing system will be re-purposed as a storm drainage network. In this case, the existing system can be 'leaky' and still function acceptably.

By contrast, for an option that involves a new storm drain network (Options 2 and 4), lining of the existing system is recommended in order to reduce the potential leakage of sanitary sewage from the pipe. In-stream flow monitoring should be undertaken such that I&I rates can be established. Results of in-stream flow monitoring and calibrated system modelling will assist in confirming the upgrading priorities.

Modeling indicates that diverting only the stormwater from roadway areas, as an interim step, per Options 2 and 4, would not be sufficient to eliminate CSOs. Diversion of stormwater from private properties, in addition to runoff from roadway areas, is required to eliminate CSOs.

3.1.1.2 Easements Over Private Properties – Opportunity to Add a Pipe Within These

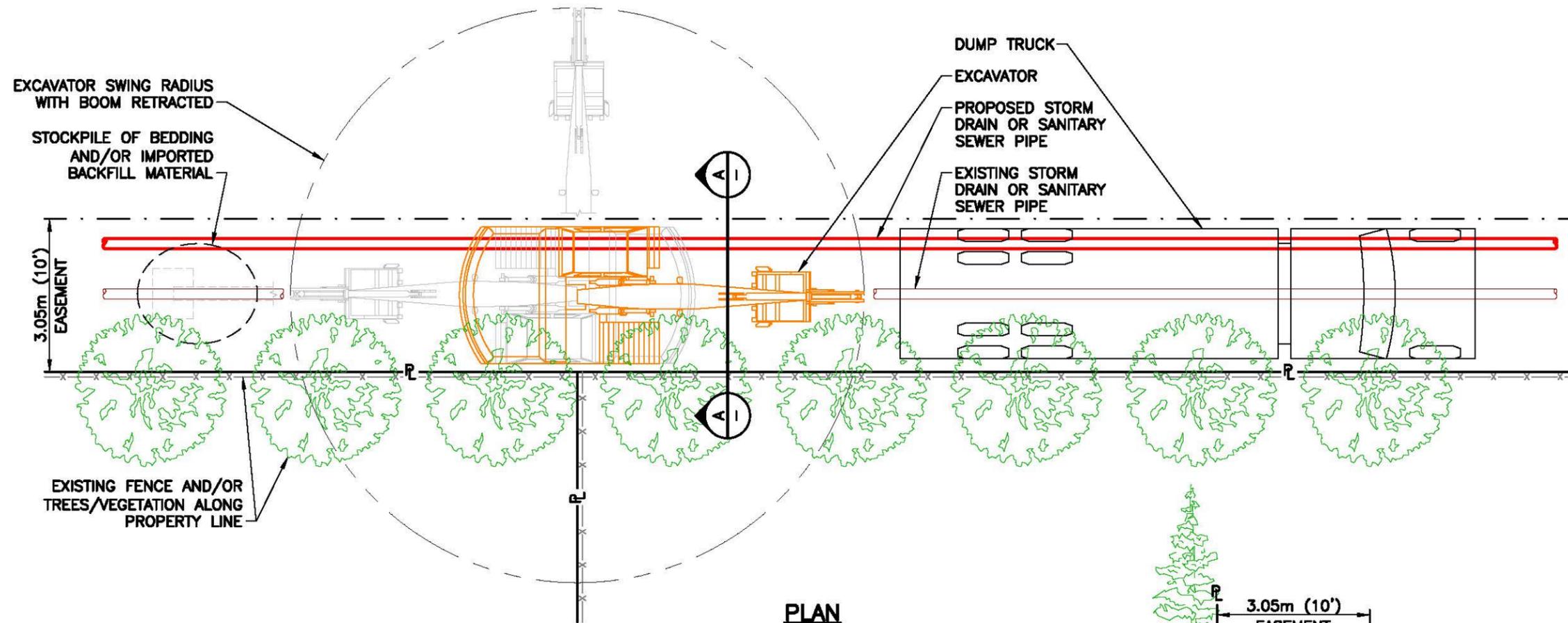
The potential for installation of a second pipe within existing easements, via alternative installation methods was evaluated.

Conventional Trench Excavation Method

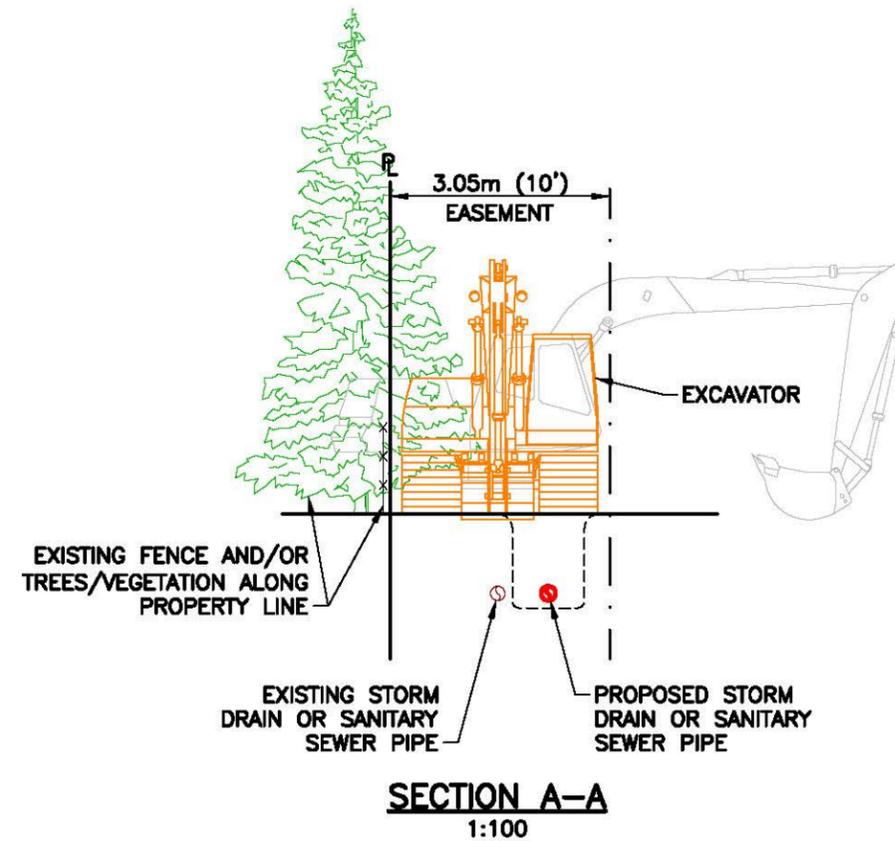
The District requested that all existing easements that presently contain a combined sewer pipe be investigated in the field. The intent was a more exhaustive initial assessment of feasibility to construct a second pipe within these easements, and determination of the resulting reduction in the number of private pumps otherwise required. It was concluded that very little realistic opportunity exists, without substantial impacts to abutting property owners.

Attached overleaf is an 8½x11 copy of Figure SK 4, dated 03 December 2015, on which easement construction access considerations are demonstrated.

The use of back lanes (being road dedication in favour of the District) for purposes of twinning sewers would be more feasible than use of the existing easements. The advantage of lanes for alignment of new sewer infrastructure should be investigated in greater detail at the time of detailed design.



PLAN
1:100



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Directional Drilling or Other Trenchless Installation Method

We discussed the options of trenchless installation with three contractors who specialize in this field.

Pipe bursting would provide for additional capacity as well as structural integrity improvement and attendance to Inflow and Infiltration (I&I) issues. However, pipe bursting will not provide a second pipe. Good line and grade control can be achieved with this technology and is therefore suitable for replacing sections of existing pipe.

Directional drilling would allow for installation of a second pipe within the 10ft easements or roadways, at least in theory. We have been advised by contractors knowledgeable in this field, however, that the likelihood of success, measured by cost-effective installation with little disruption of immediately affected residents and land owners, is low. An expert in the field of trenchless pipe installation methods, Mr. David O'Sullivan, PW Trenchless Construction Inc., presented to the District Council in May, 2016.

In summary, it was concluded that trenchless installation methods are not viable options within Uplands easement areas for installation of District owned pipes. Privately owned, pumped service connections could be installed by trenchless methods.

Lining via in situ form or equal is a method of rehabilitating existing sewers, adding structural strength and modest improvement in hydraulic characteristics. We note that the District will also need to gain access to some rear yard easement areas, in order to proceed with any such rehabilitation program, particularly where the existing pipes in easements deflect 90 degrees along the routes between adjoining streets.

3.1.1.3 Deeper Gravity Mains – As Needed to Avoid Private Pumps Altogether [OPTION 7]

The costs to install gravity sewers throughout the Uplands area, sufficiently deep so as to avoid private pumps while at the same time avoiding the need to align new sewers within existing easements over private properties, was also investigated. The resulting technical memorandum dated 05 January, 2016, is summarized as follows:

- An approximately 50% increase in the overall capital cost to the District, as compared to deeper gravity sewer Option 1, would result, in order to avoid new private pumps in their entirety, and stay clear of existing easements and rights-of-way over private properties.
 - The increased likelihood of bedrock at greater depths leads to greater financial risk.
 - Increasing pipe depths from 5m will require a benched or stepped excavation at very high cost-per-metre of trench. This is essentially impractical, given the number of other 'live' utilities within the existing roadways that would be exposed or adversely affected.

- Costs incurred by land owners, in reconnecting via a gravity service to a very deep gravity main in the roadway, may be higher than for provision of a private pumped service. This is particularly true along the low side of the road, where deep gravity sewers would result in deep gravity service connections across private properties.

Attached overleaf are reduced 8½x11 copies of Sk5 and Sk6, which illustrate the issues.

There may also be opportunity at some dwelling sites for partial gravity service and partial pumped service, rather than a very deep gravity service. This would apply to both storm and sanitary solutions. Attached double overleaf is a reduced 8½x11 copy of Sk3, illustrating this concept.

3.1.1.4 Timing of Splitting Out Servicing Connections

The operational implications—and incremental benefits—of rapidly achieving private service reconnections differ in some respects, between options involving a new sanitary network versus a new storm drainage network.

The interim benefits of Options 1, 5, and 6 (new sanitary sewer) are less pronounced, if the District does not mandate a timeline for all existing service to be separated, i.e., the existing combined pipe network leading to the CRD pumping stations will need to continue to drain there, because it carries some sanitary sewage. Thus, until all connections are separated and connected to the new sanitary sewer, the District will realize no benefit, in terms of CSO reductions, and no reduction in volumes being conveyed to the CRD system.

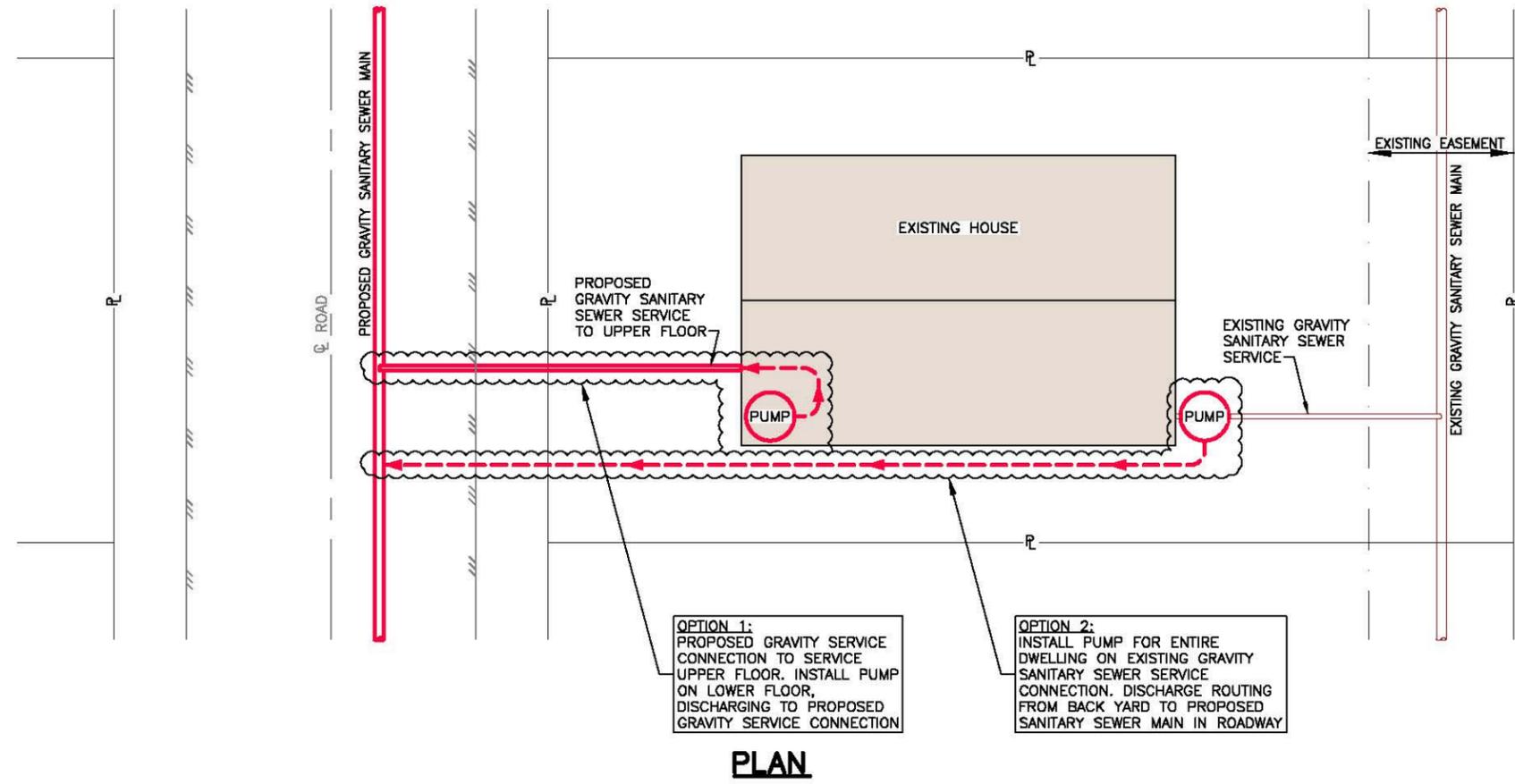
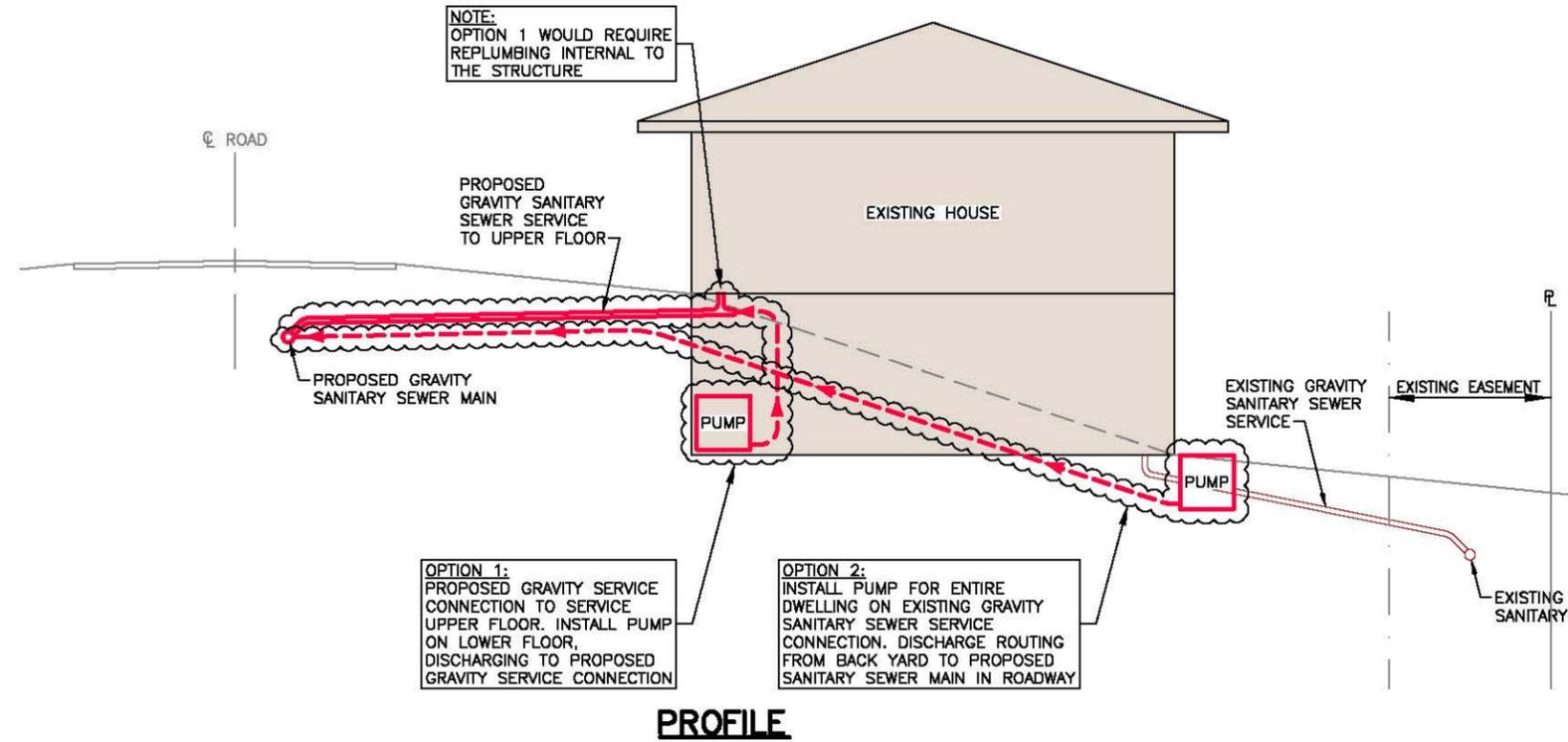
Given the District's decision on the criteria for sewer separation on private property, then the advantages of a new storm network are greater (Options 2 and 4).

Attached are reduced 8½x11 sketches Sk1 and Sk2, overleaf, depicting the hydraulic loading issues that are expected to arise during a phased construction approach, were a new stormwater network or a new sanitary network to be constructed.

3.1.2 Additional Geotechnical Investigation by WSP

Prior to completion of technical memorandum #2, the technical team met to discuss the cost estimates and determined it would be prudent to add monies to the deeper sanitary and storm sewer options to cover remaining uncertainties related to:

- Additional trucking and supply costs for import fill and disposal of trench spoil materials, compared with reuse of excavated material as trench backfill
- Bedrock location uncertainty
- Groundwater uncertainty



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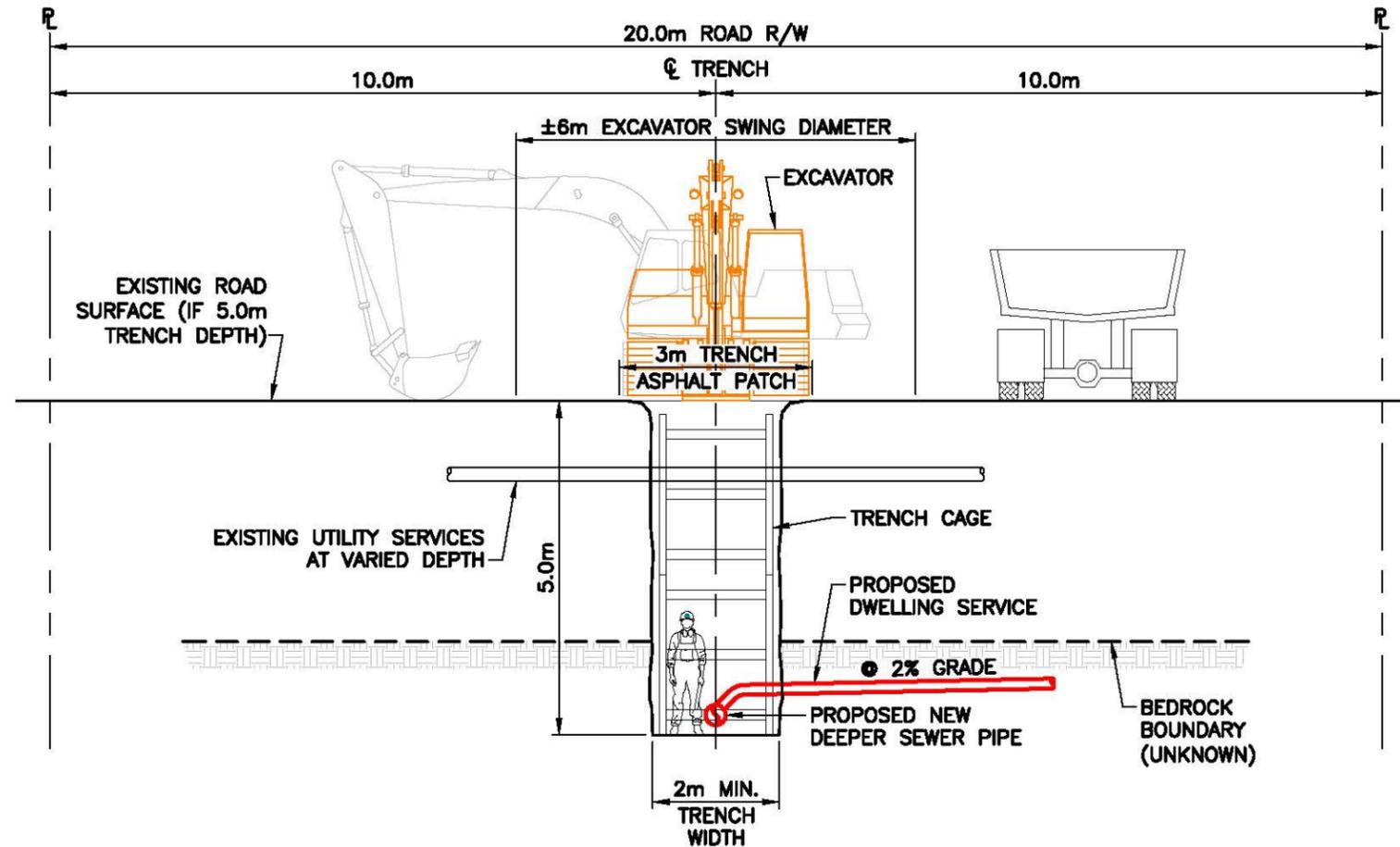
NOTE:
PUBLIC FEEDBACK INDICATES SOME RELUCTANCE OR HESITANCE TOWARD PUMPING. IMPACT DUE TO OPERATIONAL STATUS DURING POWER FAILURE(S).

P:\15-326 UPLANDS COMBINED SEWER SEPARATION PROJECT PRE-DESIGN\10 DRAWINGS\SK.3.DWG 1/6/2016 8:31 AM SK.3

McElhanney
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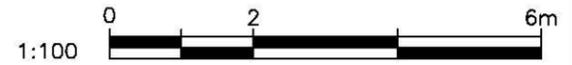
OPTION OF GRAVITY SERVICE TO UPPER FLOOR & PUMP BASEMENT AS OPPOSED TO PUMPING ENTIRE DWELLING

SCALE:	N.T.S.
DRAWN BY:	MTK
DATE:	2016-01-06
DRAWING No:	15-326-SK.3



- NOTES:**
1. TRENCH CAGE(S) ASSUMED.
 2. 5.0m MAXIMUM DEPTH BY MODERATELY SIZED EXCAVATION EQUIPMENT.
 3. UTILITY CONFLICTS WILL OCCUR. SOME RECONSTRUCTION/REPAIR OF OTHER UTILITIES WILL BE REQUIRED.
 4. ONE FULL LANE WILL BE RECONSTRUCTED/REPAIRED (1/2 OF THE ROAD).
 5. BOULEVARDS WILL REMAIN INTACT, FOR THE MOST PART.

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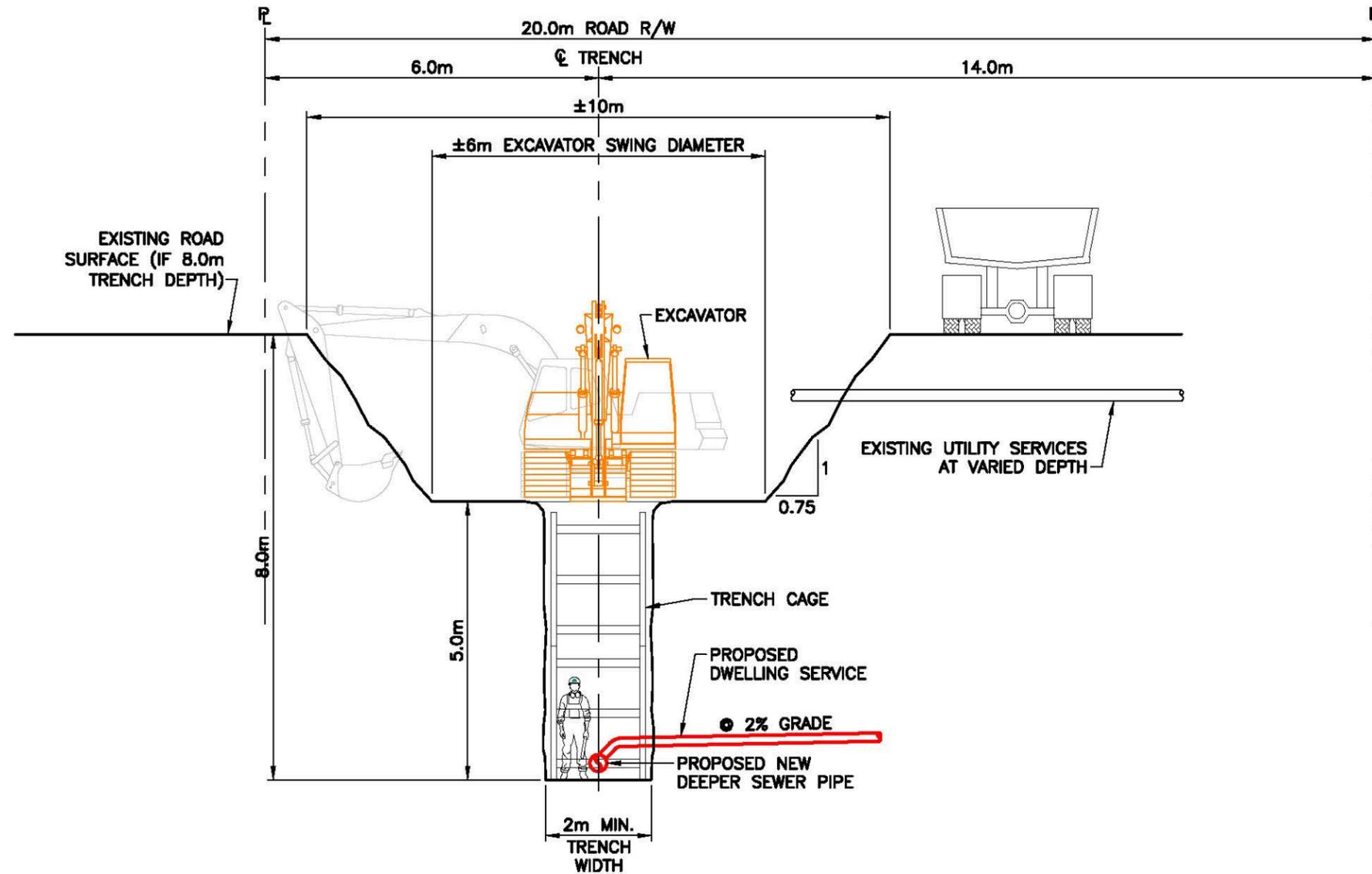


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TYPICAL 5m DEEP GRAVITY SEWER TRENCH DETAIL

SCALE:	1:100
DRAWN BY:	PL/MTK
DATE:	2016-02-01
DRAWING No:	15-326-SK.5

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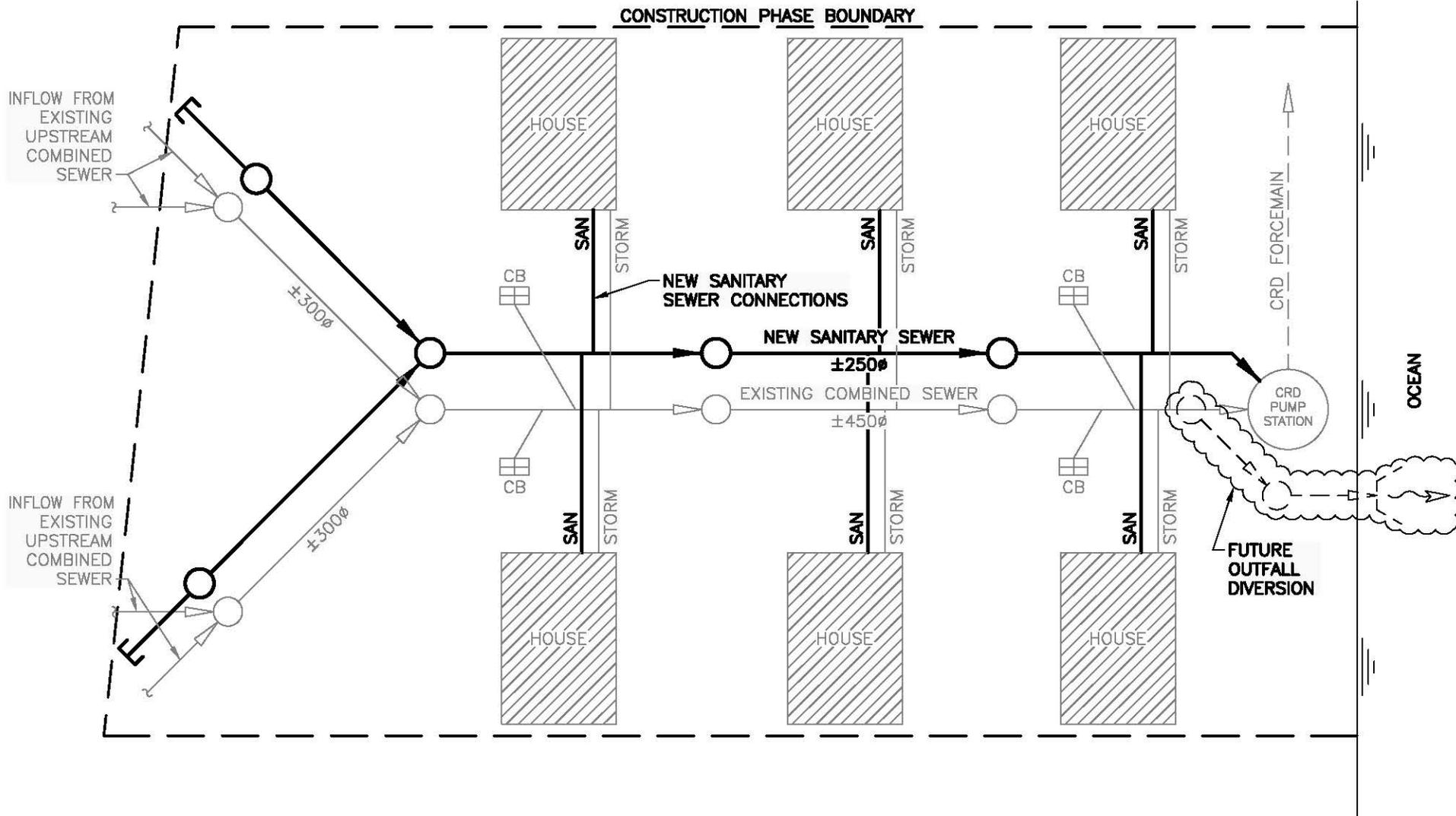


- NOTES:**
1. AT 8m DEPTH, EXCAVATOR MAY NOT BE ABLE TO REACH DUMP TRUCK FOR SPOIL DISPOSAL.
 2. PROBABILITY OF TREES & MATURE BOULEVARD VEGETATION DISRUPTION IS HIGH.
 3. ENTIRE ROAD RECONSTRUCTION IS LIKELY FOR VERY DEEP SEWERS (>5M DEPTH).
 4. WOULD NEED TO SUPPORT OR TEMPORARILY RE-ROUTE/RECONSTRUCT EXISTING UTILITIES & SERVICE CONNECTIONS.
 5. TRENCH WILL NEED TO BE OFFSET ±6m FROM ROAD CL, IN ORDER TO ALLOW ROOM FOR TRUCKS, ETC. WITHIN 20m ROAD R/W.

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OUTCOME:

1. EXISTING COMBINED 450ø TO REMAIN IN SERVICE (NEW 250ø IS TOO SMALL).
2. NO REDUCTION IN FLOW TO CRD PUMP STATION UNTIL EXISTING CAN BE DIVERTED TO OCEAN OUTFALL. AT THAT TIME = FULL STORMWATER REDUCTION FROM CRD PUMP STATION.
3. FUTURE DIVERSION OUTFALL CANNOT OCCUR UNTIL ALL SANITARY SEWER (FROM SUBSEQUENT PHASES), IN THIS SUBCATCHMENT IS EXTRACTED FROM THE EXISTING SYSTEM.
4. SHORT TERM - LESS IMPACT ON C.S.O. REDUCTION. LONG TERM - GREATER IMPACT.

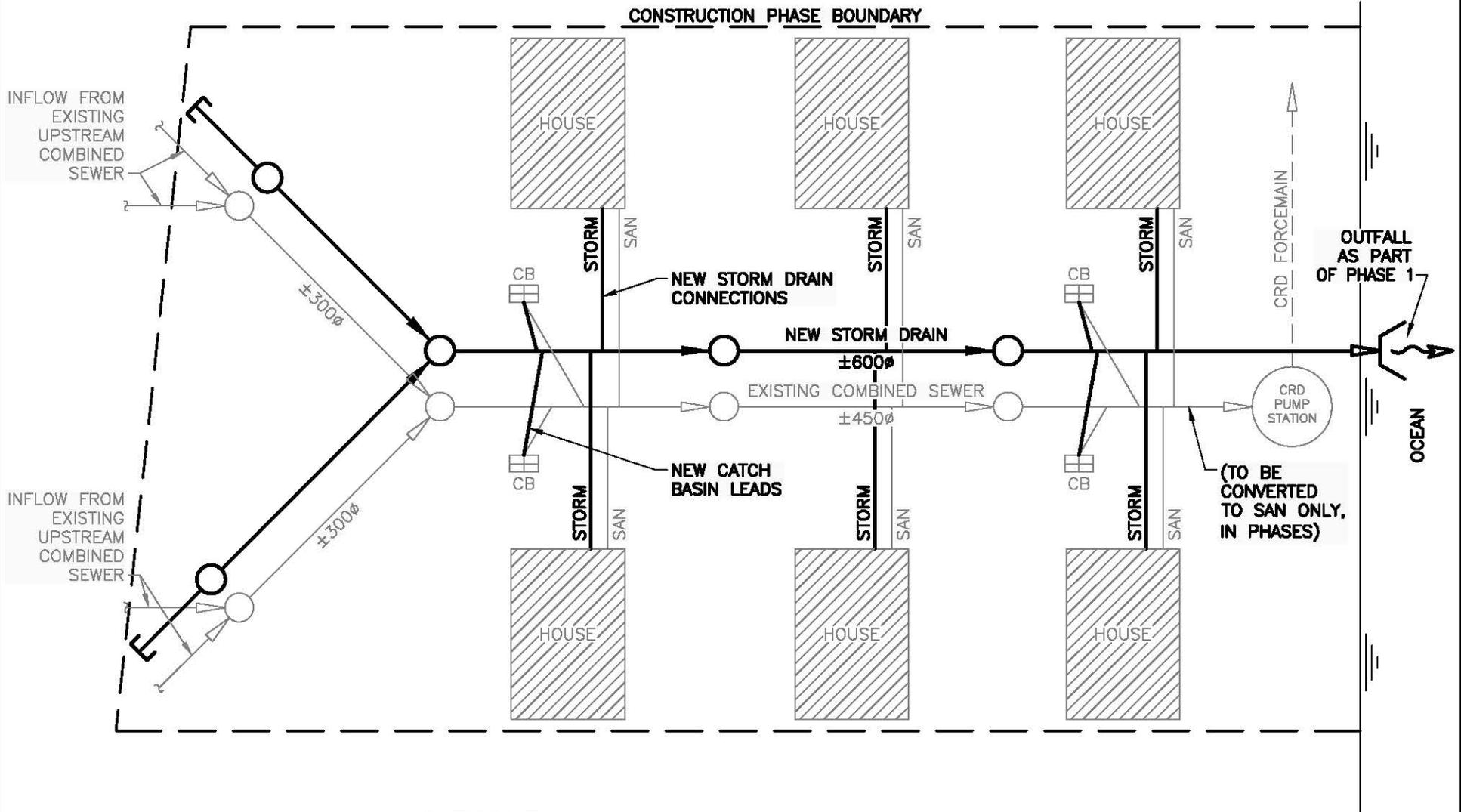
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**SCHEMATIC "PHASE #1" SCOPE
 OPTION 1 - NEW SANITARY SEWER**

SCALE:	N.T.S.
DRAWN BY:	MTK
DATE:	NOVEMBER 2015
DRAWING No:	15-326-SK.1

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OUTCOME:

1. FOR THIS SUB-CATCHMENT, THE VOLUME OF STORMWATER ENTERING THE CRD PUP STATION WILL BE REDUCED AT TIME OF PHASE 1 CONSTRUCTION.
2. GROUNDWATER FLOW FROM PHASE 1 SUBCATCHMENT WILL CONTINUE TO REACH CRD PUMP STATION UNTIL LINING/REHAB OF EXISTING PIPES IS COMPLETE.
3. SURFACE RUNOFF WILL BE DIVERTED AWAY FROM CRD PUMP STATION, FROM THIS SUBCATCHMENT.
4. SHORT TERM - GREATER IMPACT ON C.S.O. REDUCTION. LONG TERM - LESS IMPACT.

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**SCHEMATIC "PHASE #1" SCOPE
 OPTION 2 - NEW STORM DRAIN**

SCALE:	N.T.S.
DRAWN BY:	MTK
DATE:	NOVEMBER 2015
DRAWING No:	15-326-SK.2

These uncertainties led to an interim recommendation that a more detailed geotechnical investigation be undertaken, before a preferred servicing option was selected.

In particular, it was thought imperative, before a sewer separation network option was decided upon by the District, that the probability of encountering bedrock at the proposed depths of new sewers be better established. This work was undertaken during mid-2016 by WSP, a consulting geotechnical engineering firm.

Outcomes of the more detailed geotechnical investigation report, dated July 2016, have been incorporated into this final options assessment report.

The reuse of pipe trench excavated material requires careful consideration at the detailed design stage, with significant input from the District's consulting geotechnical engineers required during construction. We would envision a series of typical cross sections that will guide the installation contractor in the means of maximizing the reuse of existing trench excavation material, while achieving good long-term performance, with issues of trench settlement and groundwater migration being properly attended to.

We can foresee this might be confined to the lower sections of trenches, with import fill placed as the last upper metre of backfill, for example. We expect that scheduling of construction in better weather will greatly impact this potential for existing material reuse. Temporary staging and stockpile areas would need to be identified.

Drilling and blasting will be required where rock is encountered. This will be more extensive and disruptive with the deeper pipe options.

Certainty regarding the overall project cost remains higher for the shallower pipe network options.

3.2. Updated Cost Estimates

The following aspects of the initial estimates were re-evaluated, based on public feedback and via input from the District's technical staff through early 2016.

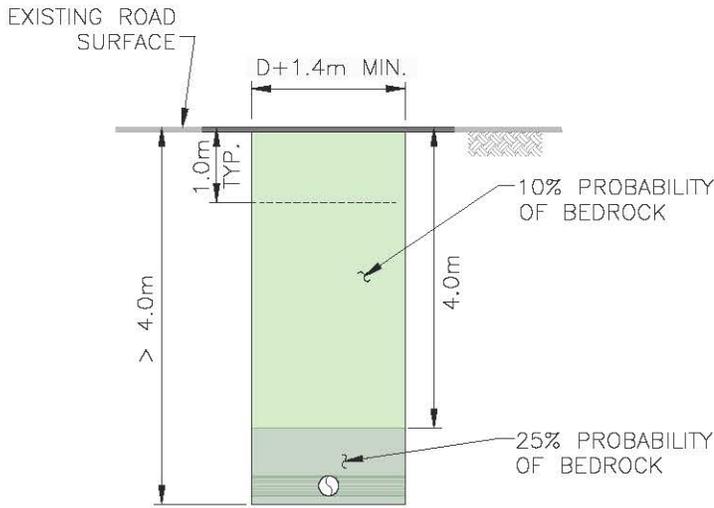
- Reworked the cost estimates based on improved geotechnical understanding:
 - Incorporated the 'green, orange, and red' zones of differing rock probability, per the WSP report. Utilized the upper bounds of rock probability at differing depths, in an effort toward conservatism at this preliminary design stage.
 - Previous estimates were based on the notion of either rock, or no rock, with an allowance added to the cost estimates.
 - Latest estimates are based on three geographic zones of differing rock probabilities, i.e., now as three differing groupings of probability of encountering rock.

- We confirmed with Western Grater, a local drilling and blasting specialty contractor, that trench rock costs in the range of \$100 to \$200 per cubic metre are realistic.
 - The geotechnical report, quite appropriately, cites relatively broad potential ranges in terms of depths and probability of encountering rock. WSP describes the expected erratic nature of sub-surface rock formations. It is expected that more test drilling will be undertaken as a function of detailed design, along some specific, critical trunk main alignments.
 - In our interpretation and cost estimating application of this geotechnical work, we have erred on the conservative side of the rock probability ranges cited by WSP.
 - Assumptions are as shown on the attached sketch overleaf, entitled Sk7.
- Reworked the costs estimates based on the total number of pumps, following technical memorandum #2 and subsequent to the public engagement sessions, including refinements undertaken in January 2016, as part of the Option 7 profiles exercise.
 - Reduced the number of pumps for most options. The following tables provide a summary of this effort.

Table 1: Updated Number of Pumps, by Option

BOTH CATCHMENTS COMBINED	Services requiring a pumped connection		Gravity services possible		Total number of services	
	Was	Now	Was	Now	Was	Now
Option 1	85	66	308	325	393	391
Option 2	85	61	308	330	393	391
Option 3	393	391	0	0	393	391
Option 4	179	180	214	204	393	391
Option 5	191	170	202	221	393	391
Option 6	149	152	244	239	393	391

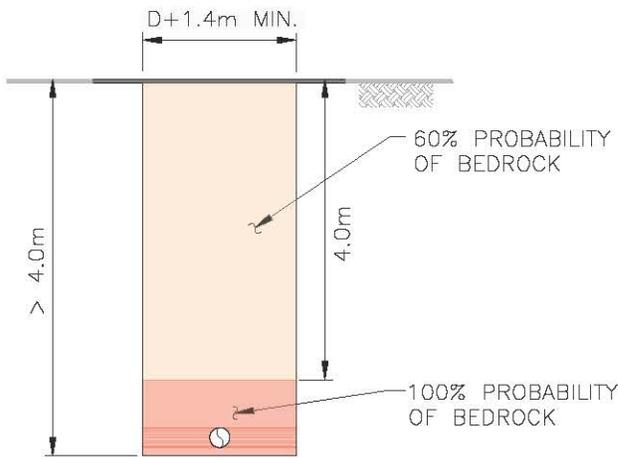
- Reworked the cost estimates for private service connections:
 - Deep versus shallow service depths—increased costs expected for services, based on public feedback and further site reconnaissance.
 - Long and short services are differentiated between now.



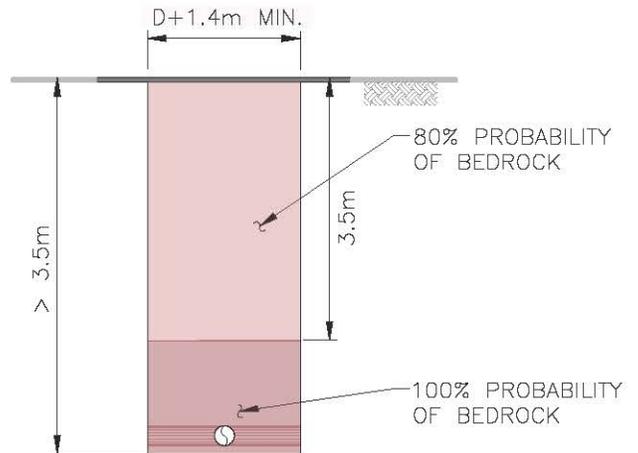
"GREEN" SECTION
1:100

NOTES:

1. MCSL PROBABILITY PERCENTAGES WERE APPLIED BASED ON HIGH SIDE OF WSP GEOTECHNICAL REPORT RANGES.
2. MINIMUM 10% PROBABILITY OF BEDROCK APPLIED DUE TO "ERRATICS" AND INVESTIGATION METHODOLOGY, IE. SPARSE TEST HOLES.
3. TRENCH WIDTH WILL VARY DEPENDANT ON NATIVE MATERIALS ENCOUNTERED.



"ORANGE" SECTION
1:100



"RED" SECTION
1:100

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- Number of low side and high side services that will be at least partially into bedrock— significant additional cost allowances were added to reflect this.
- Surface improvement damage and need for restoration within private properties is expected to cost more than previously anticipated, based on public feedback. This is amplified in the case of dwellings proposed to be serviced via deep gravity pipes, due to the size of required trenches.
- Reworked the costs as estimated for trench spoil material reuse versus need for import fill.
 - Per WSP report Section 6.3, there may be savings to be gained here at the time of detailed design. We may have erred on the side of conservatism. Further effort by the geotechnical engineers at the time of detailed design and during the construction phase could save the District considerable costs, if existing spoil material can be effectively reused.
 - We have assumed some trench rock will be reusable as trench backfill, assuming:
 - Suitable handling and design for resistance to unwanted groundwater migration through the trench
 - Fines migration within the trench that could lead to settlement
 - Appropriate weather during construction
 - Appropriate material moisture conditions, etc.

We have added between \$100 and \$150 per lineal metre to reflect the assumption that roughly half of the trench material will need to be hauled off site, in the interests of conservatism at this stage.

Table 2: Comparison of Costs Per Metre (net of rock removal allowances)

		Cost/m per Tech Memo 2 – Nov. 2015 \$	Cost/m per August 2016 report update \$
150mm to 200 mm dia	0 to 2 metres depth	450	550
	2 to 3 metres depth	575	700
	3 to 5 metres depth	950	1,100
250mm to 300 mm dia	0 to 2 metres depth	500	600
	2 to 3 metres depth	625	750
	3 to 5 metres depth	1,000	1,150
375mm to 450 mm dia	0 to 2 metres depth	600	700
	2 to 3 metres depth	750	875

		Cost/m per Tech Memo 2 – Nov. 2015 \$	Cost/m per August 2016 report update \$
	3 to 5 metres depth	1,150	1,300
525mm to 600 mm dia	0 to 2 metres depth	775	875
	2 to 3 metres depth	950	1,075
	3 to 5 metres depth	1,350	1,500

Cost estimates for rock excavation have increased substantially. For example, under Option 1, if we compare the technical memorandum #2 total costs for breakout category 1, 'gravity mains', the total increase of \$4.1 million comprises approximately \$1.3 million for installed price increases (due to increased import fill allowances, etc.) and \$2.8 million due to additional rock allowances.

Similarly, we increased the expected average costs of deeper gravity connections disproportionality, (more than the cost increase applied for shallow gravity services) to reflect the cost of rock excavation, per the attached breakout estimates.

See Appendix E for a more detailed description of the cost estimating update process and the underlying assumptions.

The following are updated overall costing tables, now reflecting the updated costs as derived above. (Detailed unit price breakout cost estimates for each of the options are provided as Appendix C.)

Table 3: Capital and Annual Operation and Maintenance Costs Including Contingencies

Option No.	Capital cost			Average Annual Operation and Maintenance Costs			Aggregate 50-year duration net present value
	Totals	To the municipality	To the private landowners	Totals	To the municipality	To the private landowners	
	\$Millions			\$1,000s			\$Millions
1	30.9	24.3	6.6	78	65	13	35.9
2	31.9	25.1	6.7	77	64	13	36.8
3	14.2	7.2	7.0	110	9	101	21.3
4	21.5	15.1	6.4	91	46	45	27.4
5	21.4	15.0	6.4	89	48	41	27.2
6	23.4	16.9	6.5	90	54	36	29.2

Costs for a higher number of deeper gravity connections in Option 2 is offset by the need for more private pumps in Option 4, leading to an overall cost to the private landowners being very similar under both options.

Table 4: Total Capital Cost Including Contingencies (Per Residential Unit)

Option No.	Total Capital Cost (per residential unit, including 50% contingencies)			
	To the Private Landowners (\$1,000s)			
	Costs to Landowners with new pumps		Costs to Landowners without new pumps	
	High	Low	High (deep and long)	Low (shallow and short)
1	20	17	38	14
2	20	17	38	14
3	20	17	n/a	n/a
4	20	17	38	14
5	20	17	38	14
6	20	17	38	14

Costs to land owners in the above table are based on professional, pre-design phase judgement. They are not based on individual private property site assessments or designs. Costs to land owners include allowance for site restoration.

3.3. Options Analysis & Comparison

3.3.1 Advantages and Disadvantages Assessment

Overleaf is a tabulated summary of the relative advantages and detractions of the differing options, *Table 5*.

In summary, the deeper gravity options (Options 1 and 2) afford the opportunity for fewer private pumps, but at much higher overall project capital cost. Risks associated with bedrock encounter are increased with these deeper options. Costs to many residents will also be high for the deeper gravity sewer options, where pumping may prove to be less costly than a deep gravity connection.

Shallower sewer system options (Options 3, 4, 5, and 6) will be much less costly to the District to construct, but will require more private pumps. Shallower pipe systems will pose less risk to existing trees, and represent less disruption of private properties due to construction of service connections.

A new sanitary system (Options 1, 3, 5, and 6) will, when finally constructed and with all private reconnections confirmed, yield lowest overall flows to the CRD pumping stations because of the most effective reduction in the I&I with a new pipe. Lining of the existing system, under Options 2 and 4, will mitigate this, to an extent. However, new sanitary systems will not allow any CSO reductions at the Humber outfall until the last residence has separated its service connections and connected to the new sanitary sewer. Similarly, for the Rutland catchment. With a new sanitary system, 100% of the properties must be connected before any CSO reductions take place.

A new storm drain system will allow for immediate reductions in CSOs, as the system is constructed in phases. Thus, a new storm drainage system is the preferred solution from an environmental perspective. A new storm drain system will also allow pipes sized to accommodate higher flows anticipated as a result of climate change. Expected capital costs to private property owners, on average, do not differ considerably between the options. Option 3 represents higher ongoing O&M costs to private property owners.

3.3.2 Decision Criteria

Relevant social, environmental and financial considerations were evaluated, in comparing the options. Individual criteria were established, based on knowledge of past projects, outcome of the public engagement process, and analysis of the advantages and disadvantages applicable to the different options.

Table 5: Advantages and Disadvantages Assessment

	Options	Relative Advantages	Relative Disadvantages
1	NEW DEEPER GRAVITY SANITARY SEWER (EXISTING SYSTEM FOR STORMWATER) - MINIMIZE PRIVATE PUMPING SYSTEMS	<p>New system will be 'tight' with very little stormwater leakage into it. New san system will be 'right sized' for lower sanitary sewer flows.</p> <p>If the system is built as <u>one construction phase</u>, then the reduction in overall stormwater volume to be pumped, over time, at the CRD stations, would be less under this option, than options involving new stormwater systems.</p> <p>Takes advantage of larger existing pipes within easements and rights of way over private properties, for conveyance of stormwater, representing much larger peak flow rates per unit area than does sanitary sewer flows.</p> <p>Less private pumps than the shallower gravity options 5 and 6.</p>	<p>Until the whole system is built [and all services are re-connected] , no flow diversion is possible from the combined system, away from the CRD pump stations.</p> <p>Assuming we are building the lower sections first, working upstream, in phases, either we would need to build oversized san sewers in the lower portions, [to convey diverted upstream portion of combined system], or allow the combined system to continue to drain to the CRD stations, as well as the new pipe.</p> <p>Depending on final phasing decisions, and funding availability, overall volumes to be pumped at the CRD stations will be higher with this option, until the system is completed in full, noting the need to continue to divert combined flows to CRD stations.</p> <p>Deep sewer options will required that the combined sewer is cut and replaced at points of service reconnection crossings - thus adding to the overall project cost. [Options 1 and 2].</p> <p>Along the low side of the roadway, gravity service reconnections to deeper mains, intended to avoid provide pumping, may be quite disruptive and costly on private properties. Pumping may ultimately be decided in some cases as preferred and the benefit of extra cost of deep mains therefore lost.</p> <p>Higher financial risk, due to bedrock and trench spoil costs. Deep sewers will encounter bedrock. The potential for excavated material from trenches, for re-use as backfill is not yet established.</p>
2	NEW DEEPER GRAVITY STORMWATER SYSTEM (EXISTING SYSTEM FOR SANITARY SEWER) - MINIMIZE PRIVATE PUMPING SYSTEMS	<p>The new storm system would divert drainage from roadway areas and some private properties, as the system is built in phases, thus reducing the overall combined flows reaching the CRD stations [& resultant reduction in periodic CSOs] more significantly than option 1, as the system is built, in phases.</p> <p>Stormwater surface runoff reductions to the CRD pumping stations would be achieved more quickly, in a phased construction program.</p> <p>New storm mains could be built to accommodate shortfalls in long term Q10 capacity, due to climate change.</p> <p>Somewhat less likely that dwelling occupants will inadvertently direct sanitary sewage to the new storm connection provided, as compared to option 1, 3, 5 and 6, where inadvertent stormwater/groundwater could be directed to the new sanitary sewer.</p>	<p>Oversized sanitary system would result, if using combined sewers for this purpose. Periodic flushing frequency and increased O&M costs will be more likely.</p> <p>Odor and solids accumulation might occur in flat grades, larger diameter, re-purposed combined sewers.</p> <p>I & I issues would need to be attended to for leaky, existing system rehab / lining.</p> <p>Requires larger new pipe system. Higher capital cost than Option 1.</p> <p>All catch basins have to be reconnected.</p> <p>Along the low side of the roadway, gravity service reconnections to deeper mains, intended to avoid provide pumping, may be quite disruptive and costly on private properties.</p> <p>Higher financial risk, due to bedrock and trench spoil disposal issues. Deep sewers will encounter bedrock. The potential for excavated material from trenches, for re-use as backfill is not yet established.</p> <p>Unless the existing system is rehabilitated, more I&I flow will be directed to the CRD pumping stations than would for Option 1, <u>upon project completion</u>.</p>
3	LOW PRESSURE MUNICIPAL SYSTEM FOR SANITARY SEWER WITH 100% PRIVATE PUMPING SYSTEMS (EXISTING SYSTEM FOR STORMWATER)	<p>Least cost to the District initially.</p> <p>Shallow trenches.</p> <p>Smaller diameter mains. Likely will be constructed more quickly than deeper gravity sewers, less public disruption due to the installation works out on the roadways.</p> <p>Least disruption of existing roads / boulevard and landscaping.</p> <p>Ease of service reconnection routing and depth, within private properties.</p>	<p>Most costly to private owners, overall, initially, and in ongoing operating costs, long term.</p> <p>All existing dwellings that do not require on-site private pumping now would need to be fitted with pumps.</p> <p>Dwellings with existing pumps may need to replace these with higher head [pressure] units.</p> <p>During power failure, dwelling occupants will need back-up owner or will need to be mindful of pumping chamber capacity limitation.</p> <p>This option does not lend it self as readily to construction in phases. It will require that a large proportion of re-connections occur early on in the process, such that flushing velocities in the mains are achieved and that duration in the system prior to discharge to the CRD pumping station is not excessive.</p> <p>Similar to other new sewer options, all combined sewage will need to be directed to CRD system until this option 3 pipe network is constructed in full <u>and</u> all residences are connected to it.</p> <p>Failure of mechanical or electrical equipment could give rise to flooding or sewage overflows on private properties.</p>

4	<p>Hybrid - SHALLOW GRAVITY STORM MAINS, WITH SOME MUNICIPALLY OWNED PUMPING STATIONS AND SOME PRIVATE PUMPING SYSTEMS AS NEEDED. MORE STORMWATER PUMPS THAN OPTION 2. (EXISTING SYSTEM FOR SANITARY SEWER)</p>	<p>The new storm system would divert drainage from roadway areas and some private properties, as the system is built in phases, thus reducing the overall combined flows reaching the CRD stations [& resultant reduction in periodic CSOs] more significantly than option 1, as the system is built, in phases.</p> <p>Stormwater surface runoff reductions to the CRD pumping stations would be achieved more quickly, in a phased construction program.</p> <p>New storm mains could be built to accommodate shortfalls in long term Q10 capacity, due to climate change.</p> <p>Somewhat less likely that dwelling occupants will inadvertently direct sanitary sewage to the new storm connection provided, as compared to option 1, 3, 5 and 6, where inadvertent stormwater/groundwater could be directed to the new sanitary sewer.</p> <p>Lower capital cost than Option 2.</p>	<p>Would need to pump road runoff drainage from catch basins from two smaller sub-catchments, via municipally owned pumping stations.</p> <p>Same detractions as Option 2, including the accelerated need for rehabilitation, lining or pipe bursting of the existing combined system, so as to reduce stormwater component of flow in the re-purposed pipe network.</p> <p>Storm water road runoff is heavily grit laden, resulting in higher pumping equipment maintenance.</p> <p>Power outages occur generally during storm events, backup power supply would add costs at two municipally owned pumping stations, else, Q100 piped route is needed in these sub-catchments.</p> <p>Pumping stormwater from dwelling sites could necessitate back-up power generators in order to avoid nuisance flooding of lower floors/habituated areas, during power outages; groundwater may enter lower occupied areas. Less opportunity for gravity overflow to the street than with deeper municipal pipes, under Option 2.</p> <p>More pumps than Option 2.</p>
5	<p>Hybrid - SHALLOW GRAVITY SANITARY AND SOME PRIVATE PUMPED SYSTEMS, WITH LOCALIZED AREA OF MUNICIPALLY OWNED PRESSURES SEWERS. MORE SEWER PUMPS THAN OPTION 1. (EXISTING SYSTEM FOR STORMWATER)</p>	<p>Many of the same benefits as Option 1, but shallower trenches and more pumps.</p> <p>Lower overall capital costs than Option 1.</p> <p>Maximizes gravity system advantages at lesser capital cost to the District.</p> <p>Lower operation and maintenance costs, energy costs, than a pure pumping option.</p> <p>During power outages, pumped sanitary flows could be less problematic than pumped stormwater flows, without backup power provision.</p> <p>Shallow depth, gravity fed, service connections will be possible for many residents.</p>	<p>Many of the same detractions as Option 1, related to separation of flows, incrementally, as the system is built in phases, with no CSO reduction possible until completion of the project.</p> <p>Requires more dwellings to pump than the deeper Option 1 and a few more than Option 6.</p> <p>Backup power requirement may exist? This is true of all options involving pumping, and thus, the issue is magnified, as more pumps are required, potentially.</p> <p>Common to all new sewer Options, 1, 3, 5, and 6, the District will need to be vigilant in ensuring that only sanitary sewage is directed from within private properties to the new system, and not a combination of sewage and some storm water.</p>
6	<p>Hybrid - COMBINATION OF LOW PRESSURE PUMPED SANITARY SYSTEM AND SHALLOW GRAVITY SANITARY SYSTEM - LARGER AREAS TRIBUTARY TO MUNICIPALLY OWNED PUMPING STATIONS AND LESS PRIVATE PUMPS THAN OPTION 5, BUT MORE THAN OPTION 1. (EXISTING SYSTEM FOR STORMWATER)</p>	<p>Less private pumped systems than for Option 5, otherwise same as Option 5.</p>	<p>Same detractions as Option 5, and:</p> <p>Higher initial capital costs and ongoing operating costs to the District than Option 5, due to additional municipally owned, pumping stations proposed here.</p> <p>Future housing redevelopment may require more pumps, if the new [future] on-site development plans call for deeper services than existing [this is true of all shallow Options, 3, 4, 5, and 6].</p> <p>More dwellings on the high side of the road receive different level of service from those situated along the low side of the roadway, typically, than the deeper gravity sewer option. This is true of all shallow gravity Options, 4, 5 and 6. [but less so with Option 6].</p>

In the following sections, the six options are evaluated from a triple bottom line perspective, namely, Environmental, Social and Financial.

ENVIRONMENTAL CRITERIA

1. Most environmentally appropriate use of the existing pipe

Assuming that the existing pipe network will be lined, over time, on a phased priority basis, utilizing the existing system as a sanitary sewer provides the highest environmental benefit, because progress towards compliance with the MWR, specifically elimination of CSO, will be achieved with gradual reductions in the frequency and extent of combined sewer overflows to the ocean.

Lining of the existing pipes will reduce infiltration and inflow within that system, thereby allowing for overall annual flow reductions toward the CRD pumping stations, over time.

The District will need to ensure, as part of the project construction phase scope, that private connections are not 'crossed' in order to maximize the environmental benefits of the project.

A new storm drainage network can be sized to suit longer term expected peak runoff rates resulting due to climate change.

Preferred Option(s): 2 and 4

2. Progressively reduce the frequency and duration of combined sewer overflows

To progressively reduce the frequency and duration of CSO new storm drainage network, is preferred. This criterion is closely tied to the preceding criterion. Compliance with the MWR will be achieved sooner. A total of 91 homes in the Uplands already have separated services

Preferred Option(s): 2 and 4

3. Construction timeframe

Least cost options are favoured, given funding availability and competition for funding from other District infrastructure capital projects. Option 3 represents least capital cost to the District. However, in order for Option 3 to function acceptably, all reconnections must occur at the time of system construction. This implies a change to the existing council resolution.

Preferred Option(s): 3

4. Preserve the mature tree canopy and mature vegetation

Shallow pipe network options are favoured as shallow trenches are less disruptive. Routing that does not destroy mature vegetation on private lands also leads to preference for shallower pipe network options.

Preferred Option(s): 3, 4, 5 and 6

5. Climate change impacts

Storm intensities are predicted to increase in future with resulting potential for shortfalls in storm drainage system capacity. Modelling indicated the potential for surcharging of the existing system in some locations using current design criteria. Repurposing the existing pipes as a storm drainage network heightens this risk. This results in a preference for a new storm pipe.

Preferred Option(s): 2 and 4

SOCIAL CRITERIA

1. Affordability and Fairness

Through the public engagement process we learned that the most important project considerations for residents living throughout Oak Bay were affordability and fairness. These were reflected during the public engagement from two very different perspectives, however.

Many Uplands residents impacted by the project felt that gravity service should be maintained as a priority for the District and that costs related to necessary work on their properties should be minimized.

For property owners living in neighbourhoods outside of the Uplands, minimizing capital costs to the District was the most important consideration recognizing that capital costs for this project would be borne by all Oak Bay residents. Reconciling these disparate desires and viewpoints is an underlying responsibility for Council. Finding a solution that everyone can live with is the goal.

2. Maximize potential for gravity service to private properties and minimize the number of pumps

Uplands residents expressed a preference for gravity service to minimize the number of pumps. Maximizing the potential for gravity service will also minimize the need for pumps, both privately owned and public/municipally owned leading to a preference for deeper gravity sewer options. Given the public concern with private pumps, deeper options are preferred.

Preferred Option(s): 1 and 2.

3. Minimize disruption on private property

The shallower options and pumped options will minimize the disruption on private property. For example, construction of a pumped connection using direction drilling will result in minimal disruption both for duration of construction and effect on the landscape.

Preferred Option(s): 3, 4, 5 and 6

4. Minimize neighbourhood disruption

The duration of disruption during each construction contract will be a factor of the depth of trenches and the presence of rock. The greater the trench depth and amount of rock the longer the construction timeframe. Shallower options are preferred.

Preferred Option(s): 3, 4, 5 and 6

5. Deep private gravity connections versus pumped connections

Uplands residents expressed a preference for gravity service to minimize the need for pumps. However, in areas where rock is present the high cost to property owners of a deep gravity connection may lead to a preference for a pumped service connection. Residents living outside the Uplands area favoured pumped connections (least cost to the District).

Preferred Option(s): 3, 4, 5 and 6

FINANCIAL CRITERIA

1. Geotechnical considerations

Geotechnical investigations indicate three groupings of areas of the Uplands in which differing probabilities of encountering rock are noted. Also note was the irregular profile of the rock surface, increasing the uncertainty surrounding encountering rock. Cost estimates now reflect an increasing cost per cubic metre of rock to be removed, incrementally with increasing depth of expected rock encounter. The quantity of reusable material will also affect project costs. The greater quantity of reusable trench material will reduce costs as less material will have to be disposed off site and less backfill material imported. Geotechnical considerations lead to a preference for shallower options.

Preferred Options 3, 4, 5 and 6

2. Operation, Maintenance and lifecycle costs to the District

These costs will be higher for options with pumping systems that are owned and operated by the District will be higher. (Options 4 and 6).

Overall O&M costs are expected to be slightly higher if the District repurposes the existing combined sewer network as a sanitary sewer system, as some of the pipes would be larger than needed. Periodic flushing may be required or additional capital upgrading may be required, possibly installing smaller pipes inside the older, larger ones.

Preferred Option(s): 3

3. Deep versus shallow pipe alignments

Deep sewers will reduce the number of private pumps, but will increase the cost of construction because of the deeper trenches and greater rock excavation as depth increases, both to be incurred by the District and the private property owners.

Potential for utility conflicts with proposed gravity mains will need to be assessed at the time of detailed design. To avoid conflicts deeper trenches may be necessary at increased costs. The risk of conflict is greater with the shallow gravity options.

Preferred Option(s): 3, 4, 5 and 6

4. Capital costs to the District

The option with the least capital cost to the District is Option 3 followed by options with shallow gravity sewers (Options 4, 5, and 6). The highest cost to the District are for the deep gravity options (Options 1 and 2). Capital costs are slightly higher for new gravity storm network than for gravity sanitary, as the new storm pipes would be larger to convey higher peak design flows.

Preferred Option(s): Option 3

5. Capital costs to Uplands property owners

The cost to property owners depends on the type of service connection, with short shallow connections the least expensive and long, deep connections the most expensive. For pumped service connections the difference between short and long connections is relatively small.

6. Maintenance and lifecycle costs to Uplands property owners

The lowest average O&M costs to property owners is expected under deep gravity sewer Options 1 and 2. The highest annual aggregate operating costs to private owners is expected under Option 3. Shallow gravity Options 4, 5, and 6 will give rise to private owner operating costs, on average, roughly double that of Options 1 and 2, but still much lower than Option 3 because of the differing number of pumps.

Both sanitary and storm pumps will require maintenance and parts replacement over time. Gravity connections and a gravity conveyance system will yield longer service life with less operation and maintenance.

Pumping systems consume hydro power. This is both a cost consideration and one of environmental sustainability.

Preferred Option(s): 1 and 2

3.3.3 Decision Matrix / Balanced Scorecard

The decision criteria described above were grouped into social, environmental and capital cost categories. Relative rankings of the different options were established for each of these decision criteria, based on a scale of zero to two points.

Zero points reflects the least favourable ranking and two points were assigned to the most favourable option(s), under each criterion. The matrix is intended to represent a 'balanced scorecard' approach to comparison of the options. However, the scoring is somewhat subjective. This scorecard aids in the decision making process, but is not the sole determinant.

The outcome of this evaluation is provided in the following table:

Table 6: Decision Matrix / Balanced Scorecard Evaluation

DECISION CRITERIA		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Notes / Data Source
Social & Environmental Criteria	Most environmentally appropriate use of the existing pipe, that is, should the existing pipe carry sanitary sewage or stormwater. *							A new sanitary sewer network would not be leaky. A new storm network will allow reductions in CSOs on a phased, incremental basis, which is an environmentally superior outcome.
	Progressively reduce the frequency and duration of overflows.							Conclusion that a new phased sanitary sewer system will not allow diversions of stormwater from the existing system until the new system is constructed in full and all private property reconnections are confirmed to be functional.
	Timeframe to completion of the project, based on a phased construction program.							Assuming the project is completed in phases and overall project capital cost will be a key determiner with respect to total project construction duration. Under Option #3, hookup would be mandatory at time of system construction.
	Preserve the mature tree canopy.							Assumes new shallower pipe systems will be more effectively maintained within alignments under existing pavement areas. Trees over private properties will be least impacted by shallow pressure sewer services. Easements will not be disrupted.
	Minimize disruption on private property.							Presumption is that pumping systems are disruptive, as is the need for very deep service connections over private properties, and that pumped services will be easier to install than will gravity services, generally speaking.
	Maximize opportunity for gravity service to residents and minimize the number of pumps.							Deeper sewers provide the opportunity to maximize gravity service and minimize the number of pumps.
Project Cost Criteria	Capital costs to Uplands property owners.							Updated Cost Estimates, September, 2016.
	Capital costs to the District.							Updated Cost Estimates, September, 2016.
	Maintenance and lifecycle costs to Uplands property owners.							Updated Cost Estimates, September, 2016.
	Maintenance and lifecycle costs to the District.							Updated Cost Estimates, September, 2016.
	Reduce project cost risks.							Most recent geotechnical report, July 2016, by WSP. Notes probability of rock. Risk of encountering rock will increase, generally speaking, with pipe depth.
Total scores, if preferred = 2 points, least preferred = 0 points, intermediate = 1 point		5	9	11	14	10	9	

*Presumes the existing pipe is to be rehabilitated within a reasonable time frame, moving forward.

Most Favoured Least favoured

Note: In Table 6, some criteria from the preceding discussion have been combined, reflecting similar themes.

3.4. Preferred Option

Given the existing pipe will be rehabilitated over time, appropriate use of the existing pipe involves re-purposing as a sanitary sewer network. This leads away from Options 1, 3, 5 and 6.

Options 1 and 2 represent very high capital costs and the greatest cost uncertainty for the provision of this utility. These options also represent highest risk to mature trees within the Uplands and higher probability of significant disruption within private properties.

Option 3 is least favored by residents impacted by the project. Construction of Option 3 in phases is not practical, given the need for achievement of sufficient flushing velocities and the allowable duration of effluent within the system prior to discharge to the CRD pumping stations. In addition, Option 3 will not afford an opportunity for CSO reductions until the entirety of the system is constructed and all private services are re-connected.

Options 4, 5, and 6 are compromise solutions, balancing the overall capital cost and reduced upside project cost risk, with the public clear preference for avoidance of pumping systems. Of these three options:

Option 4 provides a clear advantage in allowing for a phased construction program with resulting gradual reductions in CSOs.

Option 4 scores highest based on the balanced score card approach, albeit only marginally higher than Options 3 and 5.

Option 4

The most significant benefit of a new shallow, stormwater network over that of a new shallow sanitary sewer network involves the sequential, phased reduction in CSOs afforded. Present-day system operating characteristics clearly indicate that peak flows to the two CRD pumping stations are predominantly stormwater runoff, and these peak flows presently far exceed the capacity of the stations (90 l/s each) during wet weather events.

3.5. Project Phasing Discussion

The District has indicated an intention to construct the preferred alternative as quickly as budgets will allow. We believe this will be dependent, in part, upon success in acquiring grant monies from senior levels of government.

We understand there is some \$7 million in an Oak Bay account reserve for this project currently accumulated by dedicating Gas Tax revenues to the reserve. Given that the District has other infrastructure rehabilitation needs, for example, the existing combined sewer, it is suggested that a new stormwater sewer be installed in stages in the Humber catchment over the next ten years

followed by the Rutland catchment over the following twenty years resulting in separate sewers in the Uplands by 2047.

Alternately, the shortest duration project construction scenario, were funding available now, would be to tender the project under the premise that multiple crews will be engaged simultaneously. We can envision a practical limit, in terms of the level of public nuisance, noise, and access disruption that can be tolerated in a given area. We suggest that a crew installing an average of 30 lineal metres of mainline pipe per day, (c/w services and manholes, etc.) over a four-month construction window, would be able to install at most, 2,500 lineal metres of sewer. Thus, it would be possible, with two concurrent installation crews, to undertake the entirety of this project over two successive years. Pursuit of project completion this rapidly is not recommended.

Funding availability aside, a more realistic approach, weighing off the efficiencies of project and construction contract scale, traffic congestion, and public nuisance, would be to expect a single contractor to install roughly 2,500 metres of pipe per year, requiring a total four years (four construction seasons).

As suggested previously, it is recommended that installation of the new storm sewer start in the smaller, Humber catchment so that compliance with the MWR at the Humber pump station will be achieved at the earliest time possible.

4. Conclusions and Recommendations

4.1. Conclusions

- a. All options developed to date are technically feasible to design and construct.
- b. CSO reductions – compliance with the Municipal Wastewater Regulation
 - o Options 2 and 4 featuring a new stormwater sewer will yield immediate/incremental CSO reductions substantially sooner than options involving a new sanitary sewer network.
 - o Options 1, 3, 5, and 6 feature a new sanitary system and disconnection of the existing system from the CRD lift stations could only occur after all (100%) dwelling services are proven to be separated.
- c. Options 1 and 2 are deeper than the other options and will involve the removal of more bedrock. This adds considerable cost uncertainty, both to the District and to many private home owners, who will, in turn, need to decide if a deep gravity connection is cost effective or even feasible, given on-site improvements within their respective properties.
- d. Option 3 has lowest estimated capital cost to the District and highest expected annual operation and maintenance costs to impacted home owners.

- e. Options 4, 5, and 6 are comparable in total capital costs to the District and to impacted homeowners.
- f. The deeper Options 1 and 2 are expected to be roughly 30% to 45% more costly to construct (private and public costs combined) than shallow gravity options 4, 5, and 6.
- g. Operation and maintenance costs are higher for options involving pumping.
- h. Very deep sewers (Option 7), which potentially eliminates the need for private pumping systems will be impractical to construct.
- i. All options will involve at least some pumped connections.
- j. Property owners in the Uplands, impacted by the project, expressed a clear preference for options that reduce the requirement for pumping from private properties and, thus, public preference was expressed for deeper gravity sewers. Detailed design phase analysis, complete with further survey and topographic detail, will yield refinements in the routing and depth of the District's proposed pipe network and in the number of dwellings that could be serviced by gravity connections (as opposed to pumping).
- k. Routing / installation of deep gravity service connections could be very disruptive and very costly to some landowners within the Uplands.
- l. Lining, or other rehabilitation method, is needed for the existing pipes, in a phased effort.
- m. Hydro power interruptions will have differing impacts, depending on the option constructed. Pumps are a feature in all of the options. Backup power generation is recommended for stormwater pumps.

4.2. Recommendations

It is recommended that the District:

- a. Implement Option 4, a shallower gravity based storm system, including two isolated areas requiring municipal stormwater pump stations.
- b. Undertake design by catchment area not by construction phase;
- c. Undertake construction on a phased project basis, beginning with the Humber catchment, with contract packages at a minimum of \$2 million each.
- d. The District should develop a plan for rehabilitation of the existing pipes.

Attachment 4**Prioritized Order of Oak Bay Overflow Reduction Plan**

Item No.	Work name	Description	Estimated Year of Completion	Estimated Cost (\$2016) to Complete
1	Uplands Sewer Separation Humber Catchment	Construction of new storm sewer	2027	\$5,425,000
2.	Uplands Sewer Separation Rutland Catchment	Construction of a new storm sewer	2047	\$10,075,000
3	Oak Bay I&I Rehabilitation Projects	Continue with phased rehabilitation projects in various catchments	Annual	\$500,000
4	CCTV Inspection	Video inspection of sewer mains	2025	\$80,000 annually
5	Sewer system maintenance	Maintenance to keep sewers clean and free of defects	Annual	\$240,000