REQUEST FOR PROPOSAL 17-30

WATERFRONT SEWER SYSTEM UPGRADES

April 19th, 2017

The City of Campbell River is requesting proposals from qualified proponents to provide all necessary engineering services required to complete the detailed design and construction of a defined portion of required upgrades to approximately 3.6km of the City's sanitary sewage conveyance system from the location of the Big Rock Boat Ramp northward along Hwy 19A to the Maritime Heritage Centre.

This RFP is available electronically by downloading from the City's website at http:\www.campbellriver.ca/city_services/purchasing/request_for_proposal.asp

This is not a tender. This is a non-binding Request For Proposals. The City reserves the absolute right to negotiate with one or more Proponents as it sees fit. Nothing in this RFP shall obligate the City to enter into a contract with any person.

This RFP is scheduled to close at:

RFP Closing Time:	**3:00 p.m. local time**
RFP Closing Date:	**Wednesday May 17th, 2017**
Delivered to:	City of Campbell River City Hall 301 St. Ann's Road 1st Floor Reception Desk Campbell River, BC V9W 4C7 **ATTN: Clinton Crook – Senior Buyer**
Enquiries:	Clinton J. Crook, SCMP, CPSM, Senior Buyer Telephone: 250.286.5766, Facsimile: 250.286.5741 clinton.crook@campbellriver.ca

REQUEST FOR PROPOSAL 17-30

WATERFRONT SEWER SYSTEM UPGRADES

RECEIPT CONFIRMATION FORM

As receipt of this document, and to directly receive any further information, addendums, etc. regarding this competition, please return this form to:

Clinton J. Crook, SCMP, CPSM,
Senior Buyer
Email: clinton.crook@campbellriver.ca
Fax: 250.286.5741

Company Name: _____

Address: _____

City: _____

Province/State: _____ Postal/Zip Code: _____

Telephone No: _____ Fax No: _____

Contact Person: _____

Title: _____

Email: _____

CITY OF CAMPBELL RIVER
REQUEST FOR PROPOSAL 17-30
WATERFRONT SEWER SYSTEM UPGRADES
INSTRUCTIONS TO PROPONENTS

1.0 Submission Requirements

1.1 Proposals may be submitted via email or in a sealed envelope and addressed to:

City of Campbell River City Hall
301 St. Ann's Road
1st Floor Reception Desk
Campbell River, BC
V9W 4C7
ATTN: Clinton Crook – Senior Buyer

Ensure that the RFP name, number, company name, and return address is labelled on the outside envelope.

1.2 Proposals submitted to City Hall should include one (1) copy preferably in a bound 8½-inch x 11-inch format along with one (1) identical copy on a virus free data storage device (i.e. CD-ROM disk, USB flash drive, etc.) in Adobe PDF format. No three-ring binders.

1.3 Proposals submitted via email are to be sent to clinton.crook@campbellriver.ca **Ensure to state the RFP name, number and "Submission" in the Subject Line.** Email submissions should be submitted as one (1) Adobe .PDF virus free file and no larger than 10 MB's.

1.4 Proposals should be received no later than **3:00 p.m., Wednesday May 17th, 2017.** Proposals will NOT be opened in public.

1.5 Proposals received and not conforming to Item 1.4 above, may at the City's discretion, be returned (unopened) to the *Proponent*(s) without consideration.

1.6 *Proponents* assume the entire risk when submitting a Proposal via email. The *City* will not be liable for any delay or rejection for any reason including, but not limited to technological delays, issues caused by any network or email program, rejected as suspected spam, virus, malware, or email not identified in the Subject Line as a submission and being missed. The *City* will not be liable for any damages associated with Proposals not being received or missed.

1.7 All submissions are to include the Appendix 1, as attached, to clearly show the complete company name, address, telephone number, e-mail address, and name of the primary contact person(s).

1.8 *Proponents* are requested to return the Receipt Confirmation Form to directly receive any further information, addendums, etc. regarding this Request For Proposal.

1.9 All prices quoted are to be in Canadian (CAD) dollars and include all taxes, including provincial sales taxes, except GST, which shall be shown separately.

1.10 *Proponents* are solely responsible for any costs or expenses related to the preparation, submission, and presentation of proposals.

1.11 Proposals, rather than tenders, have been requested in order to afford *Proponents* a more flexible opportunity to employ their expertise and innovation, and thereby satisfy the *City's* needs in a more cost-effective manner. Proposals should be based on these Instructions and any Appendices issued.

1.12 After the closing time and date, all documents received by the *City* become the property of the *City*. The successful *Proponent* will be required to assign any copyright to the *City.* The *City* will have the exclusive rights to copy, edit, and publish the material.

1.13 This proposal is subject to the terms and conditions of the Agreement for Internal Trade, Mash Annex 502.4 and the New West Partnership Trade Agreement between the provinces of B.C., Alberta and Saskatchewan.

1.14 The awarding of a contract as a result of this Request for Proposal will not permit the successful *Proponent* to advertise the relationship with the *City* without the *City's* prior authorization.

1.15 Under no circumstances may the *Work* or any part thereof be subcontracted, transferred, or assigned to another firm, person, or company without the prior written authorization of the *City*.

1.16 If any director, officer or employee agent or other representative of a *Proponent* makes any representation or solicitation to any Councillor, officer or employee of the *City* of Campbell River with respect to the Proposal, whether before or after the submission of the Proposal, the *City* shall be entitled to reject or not accept the Proposal.

2.0 Definitions

2.1 "*City" means* The *City* of Campbell River.

2.2 "*Proponent"* means the entity submitting a proposal.

2.3 *"Supplier"* means the successful *"Proponent".*

2.4 *"Work"* means and includes anything and everything required to be done for the fulfilment and completion of this agreement.

3.0 Confidentiality and Freedom of Information

3.1 Your proposal should clearly identify any information that is considered to be of a confidential or proprietary nature (the "Confidential Information"). However, the *City* is subject to the provisions of the *Freedom of Information and Protection of Privacy Act.* As a result, while Section 21 of the Act does offer some protection for third party business interests, the *City* cannot guarantee that any Confidential

Information provided to the *City* will remain confidential if a request for access in respect of your proposal is made under the *Freedom of Information and Protection of Privacy Act.*

4.0 Pricing & Payment

4.1 The items listed in the attached Terms of Reference are minimum features to be provided. *Proponents* may also provide separate pricing on additional elements they feel would benefit the *City* in meeting its goal.

4.2 All invoices paid as a result of this Request for Proposal will be paid as per the *City's* standard payment terms "current month's invoices will be paid net 30 days".

5.0 Cancellation

5.1 The *City* reserves the right to cancel this Request for Proposal at any time and for any reason, and will not be responsible for any loss, damage, cost or expense incurred or suffered by any *Proponent* as a result of that cancellation.

5.2 The *City* reserves the right to terminate the Contract, at its sole and absolute discretion, on giving 30 days written notice to the *Supplier* of such termination and the *Supplier* will have no rights or claims against the *City* with respect to such termination. Cancellation would not, in any manner whatsoever, limit the *City's* right to bring action against the *Supplier* for damages for breach of contract.

6.0 Accuracy of Information

6.1 The *City* makes no representation or warranty; either expressed or implied, with respect to the accuracy or completeness of any information contained or referred to in this RFP.

7.0 Responsibility of Proponent

7.1 Each *Proponent* is responsible for informing themselves as to the contents and requirements of this RFP. Each *Proponent* is solely responsible to ensure that they have obtained and considered all information necessary to understand the requirements of the RFP and to prepare and submit their proposal. The *City* will not be responsible for any loss, damage or expense incurred by a *Proponent* as a result of any inaccuracy or incompleteness in this RFP, or as a result of any misunderstanding or misinterpretation of the terms of this RFP on the part of any *Proponent*.

7.2 The *City* of Campbell River may at any time prior to the closing date and time issue additional information, clarifications, or modifications to the RFP by written addenda via the *City* of Campbell River website. Information provided in the addenda shall supersede all previous information provided.

7.3 The *City* of Campbell River will endeavour to notify all *Proponents* of any such addenda as may be issued but it is the *Proponent*'s sole responsibility to ensure they have reviewed the *City's* website for any addenda issued. By submitting a proposal the *Proponent* is deemed to have accepted and to abide by all addenda issued.

7.4 If a *Proponent* is in doubt as to the true meaning of any part of this Request for Proposal, or finds omissions, discrepancies or ambiguities, a request for interpretation or correction should be submitted to the Senior Buyer, in writing.

7.5 Only the written Request for Proposal and any addenda issued by the Senior Buyer should be relied upon by *Proponents* when preparing and submitting their proposals.

7.6 By submitting a proposal, the *Proponent* represents that it has the expertise, qualifications, resources, and relevant experience to perform the *Work.*

8.0 Enquiries

8.1 All questions and enquiries should be submitted in writing no later than three (3) working days prior to the closing date of the RFP.

8.2 Any questions regarding the submission of proposals should be directed to *Clinton J. Crook, SCMP, CPSM, Senior Buyer* at 250.286.5766 or clinton.crook@campbellriver.ca

9.0 References

9.1 Your proposal should identify other projects for which your company has provided similar services. Please provide references stating organization name, contact name, e-mail, phone number, and fax number to support this.

9.2 The *City* shall have the right, but not the obligation, to contact any references.

10.0 Indemnification

10.1 The successful *Supplier* hereby releases and shall indemnify and save harmless the *City*, its officers, employees, officials, agents, *Suppliers* and representatives from and against any and all claims, costs, damages, actions, causes of action, losses, demands, payments, suits and expenses, legal fees or liability arising from:

a. errors, omissions or negligent acts of the *Supplier*, its officers, agents, members, employees, *Suppliers* or subcontractors, or any other person for whom the *Supplier* is in law responsible in the performances of the Services;

b. the breach, violation or non-performance of this Agreement by the *Supplier*, its officers, agents, members, employees, *Suppliers* or subcontractors, or any other person for whom the *Supplier* is in law responsible in the performance of the Services; or

c. personal injury including death, property damage and loss arising out of, suffered or experienced by any person in connection with or during the provision of the Services under this Agreement, including without limitation WorkSafeBC claims and assessments.

10.2 The release and indemnity contained in section 10.1 shall apply except to the extent that the claims, costs, damages, actions, causes of action, losses, demands, payments, suits, expenses or legal fees or liability arise from the negligence of the *City*, its officers, employees, officials, agents, *Suppliers*, or representatives.

10.3 The *Supplier* is solely responsible for and shall promptly pay all WorkSafeBC premiums and assessments relating to the performance of the Services under this Agreement, whether by the *Supplier*, its officers, agents, members, employees, *Suppliers* or subcontractors, or any other person for whom the *Supplier* is in law responsible.

10.4 The release and indemnity contained in section 10.1 shall survive the termination of this Agreement.

11.0 Insurance

11.1 The *Supplier* must submit to the *City,* upon acceptance of its proposal, the following:

a. Comprehensive General Liability Insurance in an amount not less than $2,000,000 with a provision naming the *City* as an additional insured and a Cross Liability clause;
b. A provision requiring the Insurer to give the *City* a minimum of 30 days' notice of cancellation or lapsing or any material change in the insurance policy;
c. Professional Liability Errors and Omissions Insurance in the amount of not less than $500,000 per occurrence and a minimum of $2,000,000 aggregate for all claims;
d. A copy of your current Certificate of Clearance from WorkSafe BC;
e. A signed City of Campbell River Safety Covenant.

11.2 The *Supplier* shall provide and pay for all necessary insurances, licenses, and permits required for the performance of the *Work* and is responsible for any deductible amounts under the policies.

11.3 All insurances, licenses, and permits must remain valid for the term of the *Work.*

12.0 Declarations

12.1 In submitting a proposal the *Proponent* declares that:

- I (we) do not (or any related company) have any family, ownership, and operating relationships with the *City*, or any elected official, staff or other officials holding public office in the *City* and agree that the *City* reserves the right to reject any proposal that may be perceived to be in a conflict of interest.

- I (we) am (are) not or have not:

a. an individual who has; or
b. an individual who was a shareholder or officer of a company that has; or
c. a company that has; or
d. a company with a shareholder or officer who has; or
e. a company that is, or was a shareholder of a company that is, or was a shareholder of a company that has; or
f. a company that has a shareholder or officer who is also a shareholder or officer of another company that has;
g. had a bid bond retained, or
h. had all or part of a performance bond retained, or breached a contract with the *City*, or failed to complete its obligations under any prior contract with the *City* (or any other publicly funded jurisdiction or organization in British Columbia), or has been charged or convicted of an offence in respect of a *City* (or any other publicly funded jurisdiction or organization in British Columbia) contract.

13.0 Timing

13.1 Time is of the essence in carrying out the *Work.* The *Supplier* must commence the services in a timely manner and carry out the services in accordance with the completion dates set out in the work plan, or as mutually amended in writing by the *Supplier* and the *City* from time to time.

14.0 Regulations of Authorities Having Jurisdiction

14.1 All *Work* provided must be in accordance with all laws and regulations pertaining to the *Work*. The laws of the Province of B.C. shall govern this proposal and any subsequent contract resulting from this proposal.

15.0 Acceptance

15.1 The City will be entitled to conduct such acceptance tests as it considers necessary to verify that the product and service (the *Work*) meets the Specifications. If the product and service meets the Specifications after acceptance testing, the City will accept it in writing. If the product and service does not meet the specifications the *City* may: reject the *Work*; or accept the

Work. The *City* will not reject the product and service without first notifying the *Supplier* and giving the *Supplier* a reasonable opportunity to correct any failure of the equipment to meet the Specifications. If the product and service meets the Specifications except that some items of product and service have not yet been delivered, the *City* may accept the product and service but withhold that portion of the purchase price attributable to the product and service not yet delivered.

16.0 Resolution of Disputes

16.1 If requested in writing by either the *City* or the *Supplier*, the *City* and the *Supplier* shall attempt to resolve any dispute between them arising out of or in connection with this agreement by first entering into structured non-binding negotiations with the assistance of a mediator on a without prejudice basis. The mediator shall be appointed by agreement of the parties. If a dispute cannot be settled within a period of thirty (30) calendar days with the mediator, if mutually agreed, the dispute shall be referred to the arbitration of a single arbitrator, or to three arbitrators failing such an agreement, in which case each party shall appoint one arbitrator, and the first two named shall choose the third arbitrator. Any arbitration shall be conducted in accordance with the Commercial Arbitration Act (British Columbia). The award and determination shall be binding upon the parties hereto and their successors and assigns.

16.2 The cost of arbitration will be borne equally by the parties.

17.0 Evaluation Criteria Process

17.1 An evaluation committee made up of *City* staff and its consultants will be reviewing proposal submissions. The evaluation criteria will be applied to all submissions fairly and without bias to any *Proponent* or proposal and the same criteria and weightings will be applied to all submissions.

17.2 No assumptions should be made that information regarding the *Proponent* or its participants, their experience, expertise and performance on other projects is known, other than the documentation and responses submitted by the *Proponent*.

17.3 The City reserves the right to conduct pre-selection meetings with *Proponents*. *Proponents* may be requested, as part of the evaluation process, to provide a presentation, which may include a demonstration of their products.

17.4 The *City* reserves the right to conduct pre-selection meetings in order to correct, change or adapt the selected proposal to the wishes of the selection committee.

17.5 Award of any contract resulting from this RFP may be subject to available funding, City of Campbell River Council approval, and other budget considerations.

17.6 The *City* is entitled to accept for consideration any or none of the proposals submitted and will evaluate proposals based on the "best value" and not necessarily the lowest cost. The following are some of the key considerations that the *City* expects to take into account to determine best value:

	Description	Weight
1	**Methodology –** Approach, initiative and innovation, demonstrated understanding of project requirements, etc.	40%
2	**Qualifications & Experience –** Company experience, personnel qualifications, similar projects, references, etc.	20%
3	**Proposal –** Completeness, overall quality and level of details submitted, value added services, etc.	15%
4	**Budget**	25%

CITY OF CAMPBELL RIVER
REQUEST FOR PROPOSAL 17-30
WATERFRONT SEWER SYSTEM UPGRADES
TERMS OF REFERENCE

A. INTRODUCTION

The City of Campbell River, a coastal city of over 35,000 people, is located on the east coast of Vancouver Island at the south end of the important Inside Passage shipping route. The "Salmon Capital of the World" rises up from Discovery Passage and stretches along the coastline for approximately 14 kilometres.

As part of the delivery of its long range capital plan, the City has been upgrading various sections of the sanitary system serving the southern areas of the City, necessary to address growth and reliability issues. Included in the works done to date, the City has undertaken a number of assessments and has reviewed several conceptual designs for upgrading the sanitary sewer conveyance system on Hwy 19A connecting sanitary lift station no.7, south of Rockland Road to the location of the City's former wastewater treatment plant at the Maritime Heritage Centre (MHC). This section of the sanitary system is now being programmed for renewal and upgrade.

In addition to programming this section of sanitary system for renewal, the City has also recently received funding for the complete reconstruction the section of Highway 19A from Lift station no. 7 to the location of the Big Rock Boat Ramp. This work will be delivered under a separate project and will affect the construction of the upgrades to the sanitary system being designed under this assignment.

For the upgrade works related to the sanitary system, the City has recently finalized an options analysis and has selected the solution for completing this work and is preparing to move into the detailed design process to be followed immediately thereafter by construction services for a portion of the work being designed.

For the purposes of this Request for Proposal the City is seeking the services of a qualified engineering firm to complete the detailed design of the section of sanitary system upgrades from the Big Rock Boat Ramp property northward along Hwy 19A to the MHC. This will then be followed by construction engineering services for construction of the section of sanitary sewer conveyance system extending from 1st Avenue northward to the MHC and construction of all necessary upgrades to the affected sanitary lift stations. The balance of upgrades designed under this assignment will be delivered under the Highway 19A project.

B. OBJECTIVES

The objective of this assignment is to provide all necessary engineering services required to complete the detailed design and construction of a defined portion of required upgrades to approximately 3.6km of the City's sanitary sewage conveyance system from the location of the Big Rock Boat Ramp northward along Hwy 19A to the Maritime Heritage Centre.

The selected concept is described in the attached McElhanney Consulting Services Ltd. November 2016, Options Assessment Report which will require a new forcemain be installed within the Hwy 19A road right of way from lift station no. 7 to 1st Avenue. At this point the upgrades will either continue to the interceptor sewer at Maritime Heritage Centre (MHC) as a stand alone forcemain or convert into replacement and upgrade of

an existing gravity trunk sewer system This will result in the abandonment of the existing forcemain, connecting Hwy19A at the Hidden Harbour properties northward to the Maritime Heritage Centre, presently installed within the marine environment. It will also result in the deletion of a small gravity main serving several properties between 1st and 3rd Avenues.

Lift stations no.5 and 6 will require upgrading, a new lift station will likely be required to connect properties on the east side of Hwy 19A from 1st to 3rd Avenues currently connected to infrastructure installed within the marine environment as well as several existing lateral gravity main connections will need to be addressed.

With the recent approval of the 3rd phase of improvements to Highway 19A, the section of forcemain from sanitary lift station No.7 northward to the Big Rock Boat Ramp will be excluded from this exercise and will be designed and delivered under a separate contract.

Integral to the success of this project will be appropriate consideration of the impact to the traffic flow through this corridor which is to be minimized during the course of construction.

C. SCOPE OF WORK

To complete this project, the City of Campbell River requires the services of a qualified engineering firm to:

1. Provide all services required to complete a comprehensive detailed design process including construction cost estimating for the installation of approximately 3.6km of new sewage conveyance system to be installed from the southern limit at the Big Rock Boat Ramp site northward within the Highway 19A road right of way to the northern limit at the existing Maritime Heritage Centre. This should include, but not be limited to, the following:

    a. Complete detailed design exercise for all required upgrades to the sewage conveyance system as per the City's design development and review process defined within section D - Methodology. Design must consider future upgrades planned for the project alignment.

    b. Review existing lift stations affected by the project and identify all necessary upgrades required to accommodate revised forcemain alignment and operating pressures as well as any replacement of components that have reached the end of their service life. The lift stations must also be upgraded to include backup power and be SCADA ready (i.e. bring the stations up to current standards). This should include consideration for a new lift station required to serve affected properties between 1st and 3rd Avenues. Lift station designs should be based on similar levels of service as existing and must consider the impacts of sea level rise.

c. Review existing gravity forcemain connections and identify any potential opportunities to increase system operating efficiencies

d. Review sections of existing infrastructure to be abandoned and develop abandonment plan that considers the environment within which they are installed including section within the foreshore and potential impacts of sea level rise.

e. In coordination with the City, develop a project delivery plan that maximizes efficiencies and minimizes overall disruption through the affected corridor during the course of construction.

f. Review and fully consider all future operational requirements including necessary isolation, maintenance access and odour control

g. Identify all Property impacts and assist the City in any necessary property acquisition exercises with necessary rationale, survey and/or detailed design information including those properties from Hidden Harbour northward with gravity services affected by the abandonment of the foreshore forcemain

h. Develop preliminary construction cost estimates in accordance with City's Capital Project Management Policy and identify any potential cost saving opportunities through potential phasing of the work.

i. In consultation with appropriate authorities, acquisition of any required construction related permits and development of appropriate guidelines required including but not limited to, environmental management and traffic management necessary to ensure all permitting requirements associated with this project are adhered to

2. Provide all services required to prepare for and tender the project including:

a. Preparation of tender drawings and tender documentation including any necessary supplementary documentation in accordance with the City's standard MMCD Platinum based document set;

b. Preparation of a complete schedule of quantities based on a unit price contract;

c. Preparation of final construction cost estimate (Class A per City Council Policy);

d. Preparation of all required logistical guideline documents to be included in the tender for use by the Contractor in developing all necessary plans, i.e. traffic management, system isolation/bypass pumping environmental protection, system commissioning, etc;

e. Provision of technical assistance through entire tender period, including preparation of addendum as required;

f. Review of all tender submissions for compliance and proposed value against Class A estimate and current industry cost trends and provision of recommendation for award based on that review;

g. Preparation of all required Issued for Construction documentation.

3. Provide Contract Administration services throughout the construction phase for the section of renewal from 1st Avenue northward to MHC and for the necessary lift station upgrades and/or replacements.

    a. Act as Contract Administrator as per MMCD General Condition 1.21.1;

    b. Complete all necessary inspections and provide Quality Assurance testing required to ensure contractor's work is completed in full compliance with Contract documents;

    c. Acting as Payment Certifier, inspect and certify payment for all progress claims made by the contractor;

    d. Work collaboratively with the Owner in order to ensure the project is delivered in full conformance with the objectives and within any imposed constraints;

    e. Ensure all permitting requirements are adhered to over the course of construction and any necessary reporting is completed as per terms and conditions of any issued permits.

D. METHODOLOGY

In meeting the above, the consultant, as a minimum, should carry out the following tasks:

1. Maintain all project related correspondence and dialogue through the City's assigned Project Manager.
2. Visit the site and review all relevant plans, reports, records and pre-design studies.
3. Within 1 week of acceptance of your proposal, facilitate and chair a Project Initiation meeting with appropriate City staff to confirm the scope of work and to gather input. Compile and distribute meeting minutes within 3 days of meeting.
4. Consult with various City department and other groups as deemed necessary throughout the project (i.e.: BC Hydro, Telus, Shaw Cable, Fortis BC, adjacent land owners, etc.).
5. Obtain input from and exchange information with the City staff as required throughout the project.
6. Exchange information and coordinate thoughts, recommendations and works with consultants working on other City projects or adjacent private projects and identify opportunities for construction coordination with other utilities or agencies.
7. Complete any necessary topographic and legal survey required to complete detailed design.

8. Complete any necessary geotechnical analysis to confirm soil and ground water conditions.
9. Apply all relevant standards including but not limited to the City of Campbell River Design Standards and the MMCD Design Guidelines – identify where standards conflict or cannot be reasonably met.
10. Prepare and submit a preliminary design report (c/w a Class 'C' construction cost estimate prepared in accordance with City Policy) with requisite level of detail in order to demonstrate design intent and recommended project components at least two weeks prior to a preliminary design review meeting with City staff. This report should include all assumptions and calculations used deriving proposed solution(s). This report shall include recommended project phasing, preliminary property acquisition requirements, permitting requirements, environmental considerations, maintenance access needs (eg. pigging stations, air valves, etc), and recommended pipe alignments and locations of all pump stations. This submission should also include recommendation on scope of the section between 1st and 3rd Avenues (i.e. forcemain or integrated gravity).
11. Arrange and chair a preliminary design review meeting with City staff and agencies that may have permitting authority as well as all other relevant agencies and/or utility companies including BC Hydro, Telus, Shaw and Fortis, to confirm project objectives and components. Compile and distribute meeting minutes within three days of meeting.
12. Identify any and all areas where land purchase, Statutory Rights-of-Way (SROW), Right-to-Enter (RTE) agreements, acquisitions, etc. will be required.
13. Consult and obtain necessary approvals, sign offs and/or permits from all senior agencies including but not limited to Ministry of Environment, Ministry of Health (VIHA), Fisheries and Oceans Canada, and other agencies that may be affected.
14. Prepare 50% design drawings as per feedback received at preliminary design review meeting.
15. Submit design drawings and a Class 'B' cost estimate at approximately 50% complete design for City review at least two weeks prior to 50% design review meeting with City staff. This drawing submission to be provided in both PDF and ACAD (DWF and DWG) formats. This submission should confirm pipes alignments and provide initial pipe profiles, identify conflicts with other infrastructure, provide general layouts for all lift stations, and confirmation of limits of all property acquisition needs. Should any items from the preliminary design review not be addressed in this submission, or addressed contrary to direction, a brief report is to be provided identifying the issues and the rational for not being addressed as per direction.
16. Arrange and chair a 50% design review meeting with City staff as well as any other relevant agencies to confirm design principles and identify potential conflicts. Compile and distribute minutes within three days of meeting.
17. Prepare 90% design drawings as per feedback received at preliminary design review meeting.

18. Submit design drawings and a Class A cost estimate at approximately 90% complete design for City review and final comment. This drawing submission to be provided in both PDF and ACAD formats(DWF and DWG). Should any items from the 50% design review not be addressed in this submission, or addressed contrary to direction, a brief report is to be provided identifying the issues and the rational for not being addressed as per direction.
19. Prepare and Submit any and all required Draft Supplementary Specifications with above 90% submission in accordance with the Master Municipal Construction Documents (MMCD) Platinum Edition and the City's standard form of Contract.
20. Arrange and chair a 90% design review meeting with City and staff as well as any other relevant agencies to confirm final design. Compile and distribute minutes within three days of meeting.
21. Revise as required and submit an Issued for Tender drawing set and any and all necessary Supplementary Specifications including a detailed Schedule of Quantities and Prices. This drawing submission to be provided in both PDF and ACAD(DWF and DWG) formats.
22. Support the City in assembly and review of final tender package
23. Provide technical support and responses to all queries throughout the tender period including preparation of any required addendums.
24. Review all tender submissions for compliance with the tender documents and provide written recommendations to the City for outcome of the tender within two days of receipt of the tender submission packages.
25. Conduct a pre-construction assessment of all properties affected by the project and fully document all existing conditions fronting the work area, complete with photographs noting any existing damage, landscaping and other elements that could be impacted by construction.
26. Submit to the City a copy of the Pre-Construction Assessment Report noted above prior to the start of construction activities.
27. Act as Contract Administrator as per General Condition 1.21 and Site Inspector as per General Condition 1.64.1 in the MMCD from the point in time that Notice of Award has been issued through the construction process to the point at which the Contractor achieves Total Performance as described within the Construction Contact. This role applies to all Contracts associated with the project including the Owner's separate asphalt paving contract under which all asphalt paving is to be delivered. The role cannot be assigned to a sub-consultant without prior approval of the Owner.
28. Interpret and apply the contract in an impartial manner as per MMCD General Condition 3.6.1 in the contract documents.
29. Act as primary point of contact for all communications between the Owner and the Contractor in relation to the administration of the Construction Contract.
30. Exercise financial and administrative control of the contract on behalf of the Owner.

31. Inspect the work on a daily basis and supervise the site inspector and other resident staff to see that the work is completed in general conformance with the contract documents.
32. Reject work not conforming to requirements under the contract documents.
33. Issue and receive all formal communications to and from the contractor related to the administration of the Contract.
34. Prepare, certify and submit to the Owner, payment certificates in accordance with the contract documents.
35. Certify Substantial and Total Performance of the contract and issue the appropriate Certificates.
36. Perform the duties of Payment Certifier under the Builders Lien Act and in accordance with the contract documents for the Contractor but not any of his Sub Contractors.
37. Promote good public relations throughout the construction period and ensure that the Contractor adheres to the City of Campbell River's "Good Neighbour Policy".
38. Upon issuance of the Notice of Award, schedule and chair a pre-construction meeting with the Contractor and the Owner and prepare and distribute meeting reports within five days of the pre-construction meeting.
39. Participate in weekly progress meetings with the Owner and the Contractor to review past week's progress and outline upcoming week's activities.
40. Receive and review shop drawings and proposed alterations for conformance with the design and if necessary, seek input from designer for approval of any recommended changes.
41. Develop and implement a Quality Assurance Plan suitable for the scope of the construction contract to confirm the Contractor builds quality into his work and ensure any required quality control and quality assurance tests are performed and appropriate documentation is generated and submitted.
42. Receive contractors marked up "as-constructed" drawings and prepare Record Drawings to be submitted as a single set of sealed, hard copy full sized sheets and electronically in PDF, DWG and DWF formats
43. Complete and submit updated service record cards for all affected properties
44. Complete final inspection of all works. Following final inspection, promptly issue a list of all deficiencies and provide all administrative services required to remedy all project deficiencies and any disputes that may arise until such time that Total Performance is achieved.
45. Consult and obtain any necessary approvals, sign-offs and/or permits required from all affected agencies including any utility crossings requiring approval from third party utilities including Fortis BC, Shaw, Telus, BC Hydro or any other parties with interest in the project location.

46. Maintain photographic records of the construction progress capturing all key activities/installations and provide to the owner electronic copies of all photos taken.
47. Monitor the Contractor's construction schedule for conformance with contract documents and inform the Contractor and the Owner in a timely manner of any potential conflicts identified.
48. Prepare and maintain all project documentation from point of Notice of Award to issuance of Certificate of Total Performance.
49. Daily Inspection reports to be provided to the Owner on a weekly basis and should include photographs of each individual working day's activities. Submit daily inspection reports at end of each week for which they have been completed
50. Maintain detailed record of all Submittals, Request For Information, Site Instructions, etc. Updated logs to be provided to the Owner on a weekly basis.
51. Change approval process will require Owner involvement and will further require that the Owner approve all significant Changes to the Contract. A significant Change will be a Change value in excess of $10,000.
52. Receive and review for completeness prior to turning over to the Owner all operations and maintenance manuals to be delivered to the owner from the project engineer and the contractor.
53. Prepare and submit a Project Completion Report including the following: design criteria and assumptions, final capacities of infrastructure, triggers for any future capacity upgrades (i.e. pump upgrades), summary of property acquisition and permitting completed for project, overview of operating control logic , summary of key equipment, unique conditions encountered during construction that may impact the operation or life expectancy of the completed works (or other impacted infrastructure), etc.

The proposal should clearly outline the methodology the consultant will use in achieving the objectives of this Proposal Call.

E. TIMING

Works under this project shall be completed in conformance with Project Schedule with primary tasks and their anticipated completion timing listed as:

- RFP posted: April 20 - May 17, 2017
- RFP Review May 17 - 31
- Report to Council June 19, 2017
- Award/Contract: June 19 - 30
- Design Start-Up: July
- Preliminary Design: July – September, 2017
- Detailed Design: October – December 2017
- Tender Documents: January 2018
- Tender Period: February – March 2018
- Construction Period: April – December 2018.

F. QUALIFICATIONS

The proposal will include the names of all team members proposed to carry out the work assignment. Included should be their specific roles in the assignment and a detailed summary of qualifications and experience on similar projects. The corporate qualifications and experience in similar work should be included.

G. BUDGET

The Budget shall be presented by grouping effort and associated tasks under the following headings:

- Preliminary Design
- Detailed Design
- Tender Period
- Contract Administration

The proposals shall have a detailed budget including the following information:

Hourly rates of each team member and all sub consultants;
Number of hours anticipated for each team member;
Total upset price;
Amount of assistance expected from City staff. (Information searches, etc.)

H. INFORMATION

The following are attached for reference:

Site Plan – showing limits of the project and the necessary alignment.
McElhanney Consulting Services: Foreshore Forcemain Options Assessment – Final Report, November 2016.

APPENDIX 1

Date: _____

Name of Company: _____

Primary Contact: _____

Title: _____

Address: _____ Postal Code: _____

Telephone No.: _____ Fax No.: _____

Email: _____

Signature: _____

CITY OF CAMPBELL RIVER
REQUEST FOR PROPOSAL 17-30
WATERFRONT SEWER SYSTEM UPGRADES
DRAFT AGREEMENT

THIS AGREEMENT made this _____ day of _____, 2017

Reference No.: **RFP 17-30**

Contract: **WATERFRONT SEWER SYSTEM UPGRADES**

BETWEEN:

City of Campbell River
301 St. Ann's Road
Campbell River, B.C. V9W 4C7

(the "*City*")

AND:

TBD

(the "*Consultant*")

A. The *City* requires the professional services of the *Consultant* and desires to engage the *Consultant* to perform the services set out in this Agreement.

B. The *Consultant* has agreed to perform the Services in accordance with the terms and conditions of this Agreement.

In consideration of the terms, covenants and conditions of this Agreement, the *City* and the *Consultant* agree as follows:

1.0 CONSULTANT'S SERVICES TO THE CITY

1.1 The *Consultant* must provide and is responsible for the services outlined in the work plan submitted to the *City* by the *Consultant* in response to the Request for Proposal (the "Proposal") hereto as Schedule "A" and forming an integral part of this Agreement in the amount of $XXXXX, excluding GST.

1.2 If there is any inconsistency or conflict between the provisions of the contract documents then the contract documents shall govern and take precedence in the following order with the Agreement taking precedence over all other contract documents:

a. The Agreement between the City and Contractor;
b. The Contractor's submitted proposal and pricing;
c. The City's Request For Proposal and all addenda's;
d. All other contract documents.

1.3 The *Consultant* may engage professional sub-consultants for the performance of specific tasks forming part of the Services, as approved in writing by the *City*. The sub-*Consultant*s may not be replaced without the prior written consent of the *City*.

1.4 The *Consultant* must administer, coordinate, and manage all Services of sub-*Consultant*s, and is responsible for all work performed by the sub-consultants in relation to the Services and will pay all fees and disbursements of all sub-consultants.

1.5 The *Consultant* must perform the Services:

a) with that degree of care, skill and diligence normally applied in the performance of services of a similar nature;

b) in accordance with current professional practices; and

c) in conformance with the latest design standards and codes applicable at the time of design.

1.6 The *Consultant* must furnish all personnel required to perform the Services, and all personnel must be competent and qualified to perform the Services.

1.7 Where specific personnel have been proposed by the *Consultant* for the performance of the Services, and have been accepted by the *City*, the personnel may not be replaced without the prior written consent of the *City*.

1.8 The *Consultant* must commence the Services in a timely manner and carry out the Services in accordance with the completion dates set out in the work plan, or as mutually amended in writing by the *Consultant* and the *City* from time to time.

2.0 BASIS OF PAYMENT TO THE CONSULTANT

2.1 In consideration of the Services performed by the *Consultant* to the satisfaction of the *City*, the *City* will pay the *Consultant* the fees and reimbursable expenses as prescribed in this agreement.

2.2 Payment to the *Consultant* will be based on hours worked by the employees of the *Consultant* multiplied by their hourly rates as indicated in the proposal and shall not exceed the budget without prior written authorization from the *City*.

2.3 The limit on the fees to be paid by the *City* to the *Consultant* does not diminish the duties and obligations of the *Consultant* to provide the Services.

2.4 All other expenses not listed above are considered to be included in the *Consultant's* fees.

2.5 The *Consultant* shall submit invoices to the *City* representative or delegate on a monthly basis.

2.6 On each invoice the *Consultant* shall list the names, hours worked and pay rates of all employees of the *Consultant* or sub-consultants that have worked on the Services for the phase of the work plan. Each invoice should also record the total amount of all claims to date, the value of this claim and the remaining budget to completion.

2.7 Attached to each invoice shall be copies of invoices for all disbursements claimed; confirmation of payments made to sub-consultants and a brief report detailing work completed to date, work completed during the period covered by the invoice and work outstanding to complete the Services.

2.8 If the *City* does not approve of or wishes to further review, audit or otherwise seek clarification concerning the *Consultant's* invoices, the *City* is not liable for interest charges in respect of the invoice for the period from the date the invoice is submitted until the date that the invoice is paid.

2.9 If the *City* approves the amount of an invoice, the *City* will cause the invoice to be paid on or before the 15th day of the month following receipt and approval of the invoice.

2.10 The *Consultant* must keep proper accounts and records of all costs and expenditures forming the basis of any billing to the *City*, including but not limited to hours worked, details of all disbursements and percentage amounts of work completed.

2.11 The *City* is entitled to verify the accuracy and validity of all billing and payments made by auditing and taking extracts from the books and records of the *Consultant*.

3.0 CHANGES TO SCOPE OF SERVICES

3.1 The *City* may at any time vary the scope of work to be provided by the *Consultant*.

3.2 If the *Consultant* considers that any request or instruction from the *City* constitutes a change in the scope of the Services, the *Consultant* must advise the *City* within ten (10) days in writing.

3.3 Without written advice within the time period specified, the *City* is not obligated to make any payments for additional fees to the *Consultant*.

4.0 INDEMNIFICATION

4.1 The *Consultant* hereby releases and shall indemnify and save harmless the *City*, its officers, employees, officials, agents, contractors and representatives from and against any and all claims, costs, damages, actions, causes of action, losses, demands, payments, suits and expenses, legal fees or liability arising from:

a. errors, omissions or negligent acts of the *Consultant*, its officers, agents, members, employees, contractors or subcontractors, or any other person for whom the *Consultant* is in law responsible in the performances of the Services;

b. the breach, violation or non-performance of this Agreement by the *Consultant*, its officers, agents, members, employees, contractors or subcontractors, or any other person for whom the *Consultant* is in law responsible in the performance of the Services;

c. personal injury including death, property damage and loss arising out of, suffered or

experienced by any person in connection with or during the provision of the Services under this Agreement, including without limitation WorkSafeBC claims and assessments.

4.2 The release and indemnity contained in section 4.1 shall apply except to the extent that the claims, costs, damages, actions, causes of action, losses, demands, payments, suits, expenses or legal fees or liability arise from the negligence of the *City*, its officers, employees, officials, agents, contractors, or representatives.

4.3 The *Consultant* is solely responsible for and shall promptly pay all WorkSafeBC premiums and assessments relating to the performance of the Services under this Agreement, whether by the *Consultant*, its officers, agents, members, employees, contractors or subcontractors, or any other person for whom the *Consultant* is in law responsible.

4.4 The release and indemnity contained in section 4.1 shall survive the termination of this Agreement.

5.0 INSURANCE, LICENSES, AND PERMITS

5.1 The *Consultant* must submit to the *City*, upon acceptance of its proposal the following:

a. Comprehensive General Liability Insurance in an amount not less than $2,000,000 with a provision naming the City as an additional insured and a Cross Liability clause;
b. A provision requiring the Insurer to give the City a minimum of 30 days' notice of cancellation or lapsing or any material change in the insurance policy;
c. Professional Liability Errors and Omissions Insurance in the amount of not less than $500,000 per occurrence and a minimum $2,000,000 aggregate for all claims;
d. A copy of your current Certificate of Clearance from WorkSafe BC;
e. A signed City of Campbell River Safety Covenant.

5.2 The *Consultant* shall provide and pay for all necessary insurances, licenses, permits, and authorities having jurisdiction required for the performance of the *Work* and is responsible for any deductible amounts under the policies.

5.3 All insurances, licenses, and permits must remain valid for the term of the *Work.*

6.0 CITY APPROVALS

6.1 No reviews, approvals or inspections carried out or information supplied by the *City* or its employees derogate from the duties and obligations of the *Consultant*, with respect to the Services, and all responsibility for the Services is the *Consultant's*.

7.0 TERMINATION

7.1 At any time, in its sole judgment, the *City* may terminate the services of the *Consultant* in whole or part by giving 30 days written notice to the *Consultant*.

7.2 If termination is not for cause, the *Consultant* shall be paid at the rate prescribed for all services properly performed to the date of the delivery of the notice according to the terms of this Agreement, plus necessary and reasonable wind up costs incurred, if any, in closing out the Services or the part terminated.

7.3 At any time, in its sole judgment, the *City* may instruct the *Consultant* to terminate the services of any sub-consultant appointed a role under the Services Agreement, in whole or part by giving 30 days written notice to the *Consultant*. In this case, the *Consultant* will implement a suitable replacement, to the approval of the *City*, in the same 30 days.

8.0 CONFIDENTIALITY

8.1 The *Consultant* acknowledges that in performing the Services required under this Agreement, it will acquire information about certain matters which is confidential to the *City*, and the information is the exclusive property of the *City*.

8.2 The *Consultant* undertakes to treat as confidential all information received by reason of its position as *Consultant*, and agrees not to disclose it to any third party either during performance of the Services or after the Services have been rendered under this Agreement.

9.0 OWNERSHIP OF DOCUMENTS

9.1 All drawings, plans, models, designs, specifications, reports and other documents produced from the services shall become the sole property of the *City*, and the *City* shall have the right to utilize all of them for its benefit in any way it sees fit without limitation.

9.2 If required by the *City*, the *Consultant* will assign any copyright of the product of the *Consultant's* Services and will obtain similar assignments from the sub-contractors.

10.0 TIME

10.1 Time is of the essence in carrying out the Services. The *Consultant* must commence the Services in a timely manner and carry out the Services in accordance with the completion dates set out in the work plan, or as mutually amended in writing by the *Consultant* and the *City* from time to time.

11.0 RESOLUTION OF DISPUTES

11.1 This Agreement shall be governed by the laws of the Province of British Columbia.

11.2 If requested in writing by either the *City* or the *Consultant*, the *City* and the *Consultant* shall attempt to resolve any dispute between them arising out of or in connection with this Agreement by first entering into structured non-binding negotiations with the assistance of a mediator on a without prejudice basis. The mediator shall be appointed by agreement of the parties. If a dispute cannot be settled within a period of thirty (30) calendar days with the mediator, if mutually agreed, the dispute shall be referred to the arbitration of a single arbitrator, or to three arbitrators failing such an agreement, in

which case each party shall appoint one arbitrator, and the first two named shall choose the third arbitrator. Any arbitration shall be conducted in accordance with the Commercial Arbitration Act (British Columbia). The award and determination shall be binding upon the parties hereto and their successors and assigns.

11.3 The cost of arbitration will be borne equally by the parties.

12.0 NOTICES

12.1 Communications among the *City* and the *Consultant*, including all written notices required by the agreement, may be delivered by hand, e-mail, fax, or by pre-paid registered mail to the addresses as set out below:

The *City:* City of Campbell River
301 St. Ann's Road
Campbell River, BC
V9W 4C7
Attention:
Email:

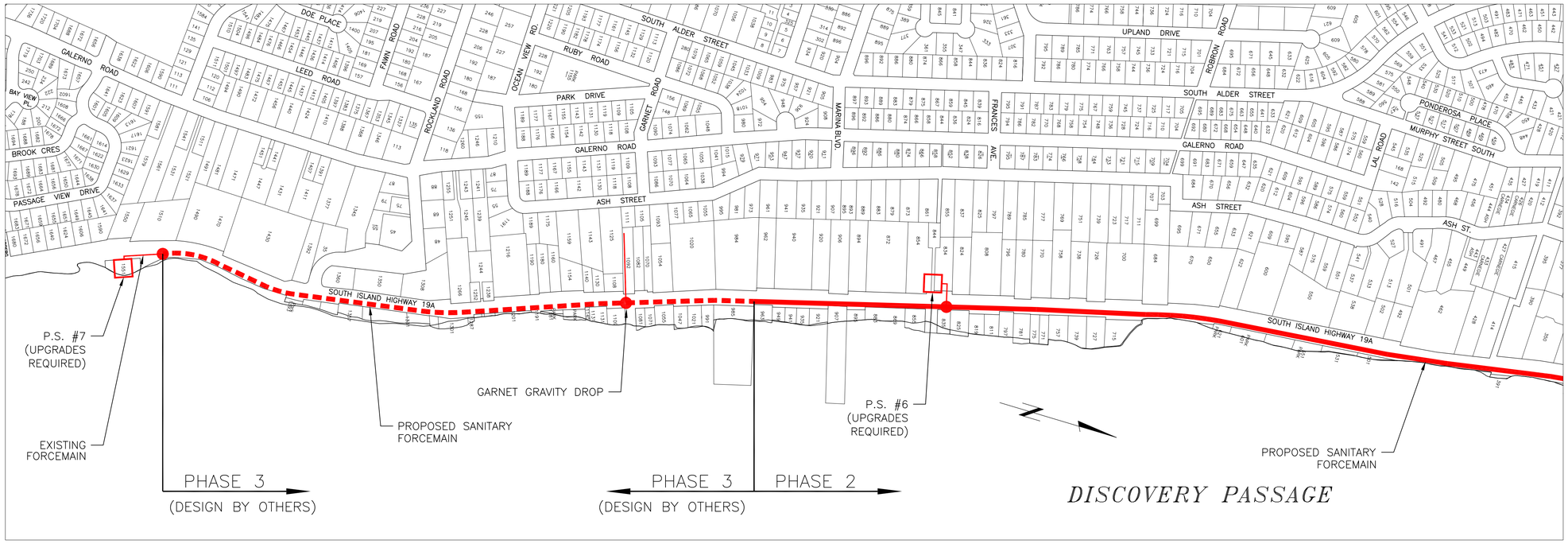
The *Consultant:* **TBD**

The City of Campbell River

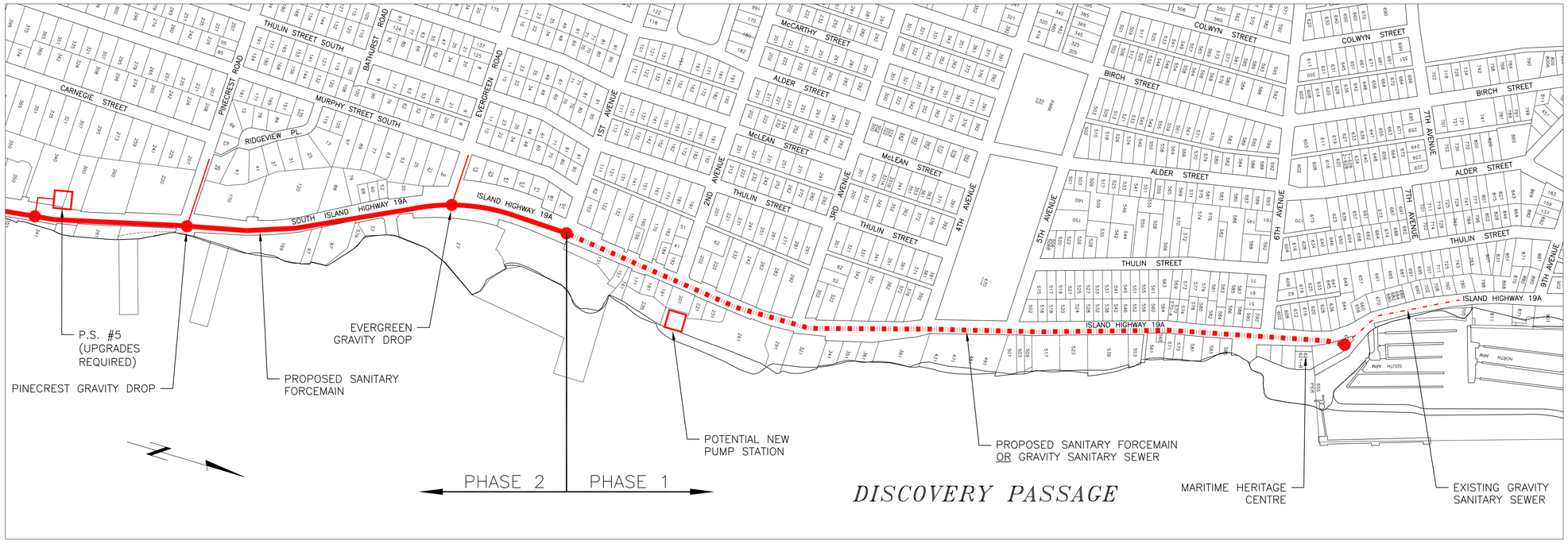
_____ _____
AUTHORIZED SIGNATORY WITNESS

TBD

_____ _____
AUTHORIZED SIGNATORY WITNESS



LOCATION PLAN
N.T.S.



KEY PLAN
SCALE: 1:50,000

INDICATES A MAJOR TIE-IN LOCATION

BC 1 CALL
1-800-474-6886

INFORMATION SHOWN ON THIS DRAWING IS COMPILED FROM NUMEROUS SOURCES AND MAY NOT BE COMPLETE OR ACCURATE. THE CITY OF CAMPBELL RIVER IS NOT RESPONSIBLE FOR ANY ERRORS OR OMISSIONS IN THIS DRAWING.

INFORMATION

NO.	REVISION	APP'D BY	DATE	CONST'D BY	DATE

EXISTING	LEGEND	DESIGN
TEL	U/G TELEPHONE	TEL
BCH	U/G HYDRO	BCH
GAS	NATURAL GAS	GAS
S	SANITARY SEWER	S
D	STORM DRAIN	D
W	WATER MAIN	W
P	PAVEMENT	P
C	CURB & GUTTER	C
	SIDEWALK	
O.D. S.M.H. D.M.H.	OPEN DITCH SANI. SEWER STORM DRAIN MANHOLE	O.D. S.M.H. D.M.H.
SIDE INLET TOP INLET	CATCH BASIN	SIDE INLET TOP INLET
HYD.	FIRE HYDRANT	HYD.
W.V.	WATER VALVE	W.V.
U.P.	UTILITY POLE	U.P.

DESIGNED:	N/A	SCALE:	1:4000
DRAWN:	TBB	DATE:	MARCH 2017
CHECKED:	N/A	DATE:	N/A
APPROVED:	JH	DATE:	MARCH 2017

City of Campbell River
Capital Works Department

TITLE:
PROPOSED WATERFRONT SEWER SYSTEM
PUMP STATION # 7 TO MARITIME HERITAGE CENTRE

DRAWING NO. N/A
PROJECT: 11-04
SHEET 1 OF 1
REV.

DESTROY PRINTS OF PREVIOUS REVISION

DRAWING PATH: G:\Capital Works\1-Projects\1-Current\11-04 Waterfront Sewer Forcemain\01-Design\B-Drawings\Project Scope.dwg
Oct Scope.dwg Tab SHEET 1 Apr 12, 2017 10:55:11am

November, 2016

City of Campbell River

FORESHORE FORCEMAIN OPTIONS ASSESSMENT – FINAL REPORT

McElhanney

McElhanney Consulting Services Ltd.
1307 Shoppers Row
Campbell River, BC
V9W 2C9

Contact: Mark DeGagne
Phone [250] 287-7799
Email: mdegagne@mcelhanney.com

OQM | Organizational Quality Management Program

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2221-48930-00

Contents

1. INTRODUCTION

The following report summarizes the latest review of options for forcemain renewal from Simms Creek Pumping Station (SCPS, formerly LS #7) to the Maritime Heritage Centre (MHC), and while the new lift station has reduced the number of recent breaks in the line, the system is nearing capacity, which is stressing the pumping system, especially that of LS #5 and LS#6, which can not currently pump against system head pressures when SCPS is pumping full speed during wet weather events.

The forcemain currently runs along the foreshore along Highway 19A from Simms Creek to a location adjacent to the Hidden Harbour Condominiums, where instead of following the highway over the hill, it veers east and runs along the beach until it discharges sewage into the collector manhole on the north side of the MHC. For this report three options were assessed for routing the forcemain, with further details provided herein:

1. A new single forcemain along Highway 19A from SCPS to 1st Avenue, transitioning to an upgraded gravity trunk sewer from 1st Avenue to the Maritime Heritage Centre (MHC).
2. A new single forcemain from SCPS along Highway 19A all the way to the Maritime Heritage Centre.
3. A new forcemain from the SCPS along Highway 19A to Hidden Harbour, transitioning to a new twin forcemain along the foreshore to the MHC. (This option was supported by Council in 2006)

In order to assess these scenarios, a number of adjustments and updates were made to the existing sanitary sewer model which McElhanney had developed in 2007 and 2008. This hydraulic assessment is followed by a review of current costs estimates and a comparison of options, before presenting conclusion and recommendations. Before this assessment can be truly evaluated, historical context is warranted to understand why this assessment is required yet again.

1.1. Historic Context of the Forcemain Project

Since the millennium, the City of Campbell River has been planning and upgrading the sewage systems in the south part of the City to provide more capacity and reliability in the collection of sanitary sewage. The planning started when a new OCP (in 1997) identified South Campbell River as a significant development growth area, and the City engaged Associated Engineering (AE, South Campbell River Sewer Study, May 25, 2001) to complete a capacity review of the collection system, and make recommendations with respect to a critical forcemain that conveyed sewage from Lift Station #7 along the foreshore to the old sewage treatment plant, which is now converted to the Maritime Heritage Centre (MHC). At that time the forcemain which was installed in the early 1970s was subject to “rupturing on an almost monthly frequency”. A synopsis of the recommendations of that study along with subsequent planning recommendations in regard to the forcemain replacement is provided below for historical context.

AE, South CR Sewer Study, 2001 – Five options were reviewed in terms of upgrading the major components of the pumping system, as follows:

1. Option 1: Upgrade lift stations LS#7, LS #6 and LS #5, and re-route the forcemain away from its present alignment along the beach between the Hidden Harbour Development to the MHC, up over the hill along the highway from Evergreen Rd to the MHC ($1.93M).
2. Option 2: Upgrade LS #7 and the forcemain and follow a similar route along the beach between Hidden Harbour and MHC ($2.01M). This option was not supported citing environmental considerations for the foreshore alignment through sensitive eco-systems and increased difficulty of access for the route considered
3. Option 3: Considered a similar scope to Option 2, with the exception that the installation of the existing forcemain would be accomplished by the "Pipe Bursting" method ($3.38M)
4. Option 4: Replace and Relocate LS #5, so that it acts as an intermediate Lift Station intercepting discharges from LS #7 and then pumping the sewage up over the hill along the highway ($2.37M). LS #7 would receive moderate upgrades of new pumps (no allowance for controls).
5. Option 5: The recommended alternative was Option 5, which included the construction of a new lift station – LS 5A near the Pinecrest right-of-way on the highway. This new lift station would receive sewage from the existing LS#7, and then pump all of South Campbell River sewage up over the hill along the highway to the receiving chamber adjacent to the MHC. With this option the existing forcemain from LS #7 would not need to be upsized, but a new 600mm forcemain would need to be constructed from LS #5A to the MHC. The estimated cost of this option in 2001 dollars was $1.433 million dollars with no contingency and 10% allowance for design engineering. This recommendation only included a small allowance to the existing LS#7, but did not fully address the operational breakage problem in the existing forcemain. In addition, this option was only identified as an 'interim fix' with total replacement of LS#7 and the forcemain projected in 10 years at 2001 assumed growth rates.

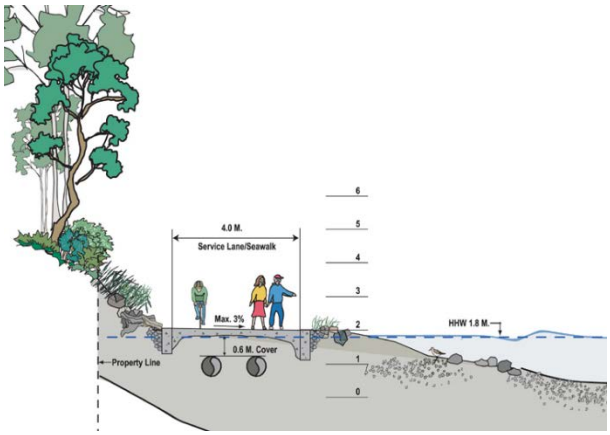
MCSL-OMNI, South Campbell River Sewer Project: *Review of Design Options (July 20, 2002).* After completion of the AE study, McElhanney and OMNI Engineering were awarded the contract for detailed design of Option 5 described above. After initial review of the AE report, McElhanney, OMNI and District staff identified additional options that were worthy of consideration. The scope of work for the detailed design assignment was then expanded to include a review of these additional options and preparation of current cost estimates so that all options could be compared by the same measure.

The pipe bursting option was not considered in this report, and although two additional options were assessed, the conclusions and recommendations came down to a preference between Option 2 and Option 5. That is an option of pumping over the hill along the highway or the beach route. In this study the beach route option was revised to consider the issues of beach erosion and continuous access by proposing construction of an embankment fill along the high tide line that is supported by a riprap revetment. The top of this fill would be placed at elevation 3.5m above mean sea level (MSL) which would allow the pipe to be installed with an invert elevation of 1.9 metres, which was the higher high water large tide elevation for Discovery Passage. The proposed width

of the top of the embankment was 4 metres. The idea was introduced to the public as an opportunity to extend the "Seawalk" from Hidden Harbour to the MHC, but required the cooperation and permission of private land owners along the way.

It is also noted that at this time the idea of including sewage from the Regional Districts, Electoral Area 'D' (Area D) was also considered in the assessment, which increased pumping and forcemain sizing and thus costs for all options. In the end, it was concluded that Option 2 (waterfront route) was indeed the best option for the long term at an estimated cost of $3.8M in 2002 dollars. This included replacement of LS #7 but **no** upgrades to LS #5 and LS #6. It also includes a 25% factor for contingency and engineering costs.

The City vigorously pursued the 2002 recommendation engaging the residents and businesses along the foreshore and the public at large. These efforts resulted in some mutations of the original concept. To address residents concerns with the walkway, it was decided to lower the walkway to about 2.0m, and twin the forcemain for redundancy as shown to the right. The last council resolution supported this idea, and this option was costed in 2006 at an estimated $5.7M, which included 20%, plus 20% for engineering and administration, plus 15% for inflation in accordance with a new City Capital Cost Estimating policy. This cost was for the forcemain renewal from LS #7 to MHC with the twin forcemain option along the beach.



Revised Beach Option

McElhanney: South Campbell River Sewer Study (SCRSS, 2008) – McElhanney completed an updated review of the South Campbell River Sewer Study, which considered new development areas in the catchment such as expanded Airport Development, as well as continuing with the concept of adding Area D to the sewershed. This report made a number of recommendations including upgrades to Lift Station #7 (now called Simms Creek Pumping Station, or SCPS) and upgrades to the forcemain from SCPS to the Maritime Heritage Centre (MHC) via the highway/beach. While the lift station was renewed and commissioned in 2011 as per these recommendations, the forcemain remains as it was constructed in the early 1970s.

Finally, the twin forcemain beach option was last re-evaluated in 2011 as part of an application for Federal and Provincial funding support. At that time, the twin beach forcemain option was re-estimated to cost $7.94 million dollars including an allowable contingency of 25%. A contingency consistent with the rules of the Federal/Provincial application process.

Since it has been 10 years since the last review and adoption by council, a review is deemed necessary. Given the historical background, and the evolution of the decision making process and the importance of this particular community asset a review is required for the reasons listed below.

- Both routing options to pump effluent to the MHC (beach route or over the hill) were based on certain assumptions that require review to confirm or refute their validity. These include a review of required volumes of effluent from changes in the community planning strategy, as well as the deletion of Area 'D' sewage from the planning process
- New environmental concerns and regulations require a new look at the routing options, especially along the beach from Hidden Harbour to MHC. This includes the requirements for approvals and possible compensation for alteration of the foreshore habitat according to the revised Fisheries Act and the new Provincial Water Sustainability Act (Feb 2016). This also includes the requirements from the City's own Sustainable OCP, which requires a full review of waterfront development through an environmental development permit process. The guidelines, of which, discourage hard armouring of the foreshore and encourage a more "Green Shores" approach.
- In 2006, Sea Level Rise was just beginning to be discussed at a regulatory level, and while there are no firm regulations in place, there are several Provincial and industry related guidelines for development within near shore environments. These guidelines provide a median prediction of a 1 metre rise in Sea Levels by the year 2100, and as much as 0.5m by the year 2075, which is just beyond a 50 year planning life span for new critical infrastructure such as this foreshore forcemain.
- There are also operational concerns with the existing system, as well as the proposed options for re-routing, and these need to be discussed in the context of each option that is currently being considered for the forcemain renewal project. In particular, LS #5 and #6 on the highway are now more than ten years older than previous assessments, which deemed them at the end of their life span, and these stations are no longer capable of pumping into the forcemain during peak wet weather events when the SCPS is pumping significant volumes of effluent through the forcemain creating excessive system pressures that these two lift stations can't overcome because the pumps are too small and now closer to the end of their practical life span more than ever.
- The locations of lift stations #5 and #6 also conflict with the proposed upgrades to Highway 19A

On the basis of the above arguments, the following report provides a review of the current sewer system model predictions and estimated system flows for future planning purposes (Section 2.0). This is followed by a more detailed description of each of the three options being considered and an assessment of the capital and life cycle costs in Sections 3 and 4. Section 5 provides a discussion on the benefits and concerns with the options that need to be considered in conjunction with the cost analysis, and the last section provides summary conclusions and recommendations.

2. SEWER SYSTEM MODEL UPDATE

In order to assess the proposed scenarios for the foreshore forcemain (from SCPS to the MHC), McElhanney used the USEPA (United States Environmental Protection Agency) SWMM (Storm Water Management Model) software to simulate performance of the sanitary sewage system. This model was created by coupling two existing sanitary sewer models together, which McElhanney had completed for previous studies:

- The South Campbell River Area model, completed for the 2008 SCRSS project; and
- The Hospital Sewershed Area model, completed December 2013 for the Vancouver Island Health Authority (VIHA)

As detailed in the following sections, these models were updated in order to ensure they reflected current conditions for 2015, as well as the most up-to-date predictions for future growth within these sewershed areas.

2.1. Sewershed Area Update

Sewershed areas were revised in accordance with City requests to remove contributions from Area 'D' of the Strathcona Regional District following a recent referendum in which northern Area 'D' residents rejected the City's proposal to expand the municipal boundary and allow connection to the City's sewage system. The following "build-out" scenario was requested by the City for this assessment:

- All future build-out of Campbell River within the Urban Containment Boundary, plus those lands zoned for light industrial/commercial development around the airport.
- An allowance for densification of areas within the Urban Containment Boundary, especially within the South Island Highway corridor.
- Those lands currently discharging to the City's sewer system from the Xwemalhkwu (Homalco) First Nation, plus future housing potential on their reserve lands.
- Up to 750 hectares and 3500 population equivalents of a future sewershed catchment area South of Jubilee Parkway, as a contingency for future connection of some Area D properties, and/or lands south of the current urban containment boundary, and/or increased industrial activity near the airport & Jubilee Parkway.

The study area and sewersheds relevant to the assessment are shown on the attached **Figure 1: Sewersheds Map**. For purposes of this study, the Study Area is referred to as the South Campbell River Sewershed and includes all sewage collected and discharged to the interceptor chamber at the Maritime Heritage Centre (MHC).

2.2. Collection System Update

Updates to the SCRSS model were necessary to both reflect new upgrades as well as to simulate future upgrades required as the City grows through development toward the "build-out" scenario using current design flow parameters. The following elements were revised in the model to simulate present conditions and future upgrades:

- The new Simms Creek Pumping Station wet well and pump curves;
- The new Interceptor Trunk along Highway 19A from Hilchey Rd to the SCPS;
- The proposed upgrades for the Highway 19A trunk from Jubilee Parkway to the Willow Creek Pumping Station (WCPS);
- The proposed Erickson/Larwood/Harrogate trunk upgrades; and
- The proposed Simms Creek trunk upgrades.

2.2.1 Simms Creek Pumping Station

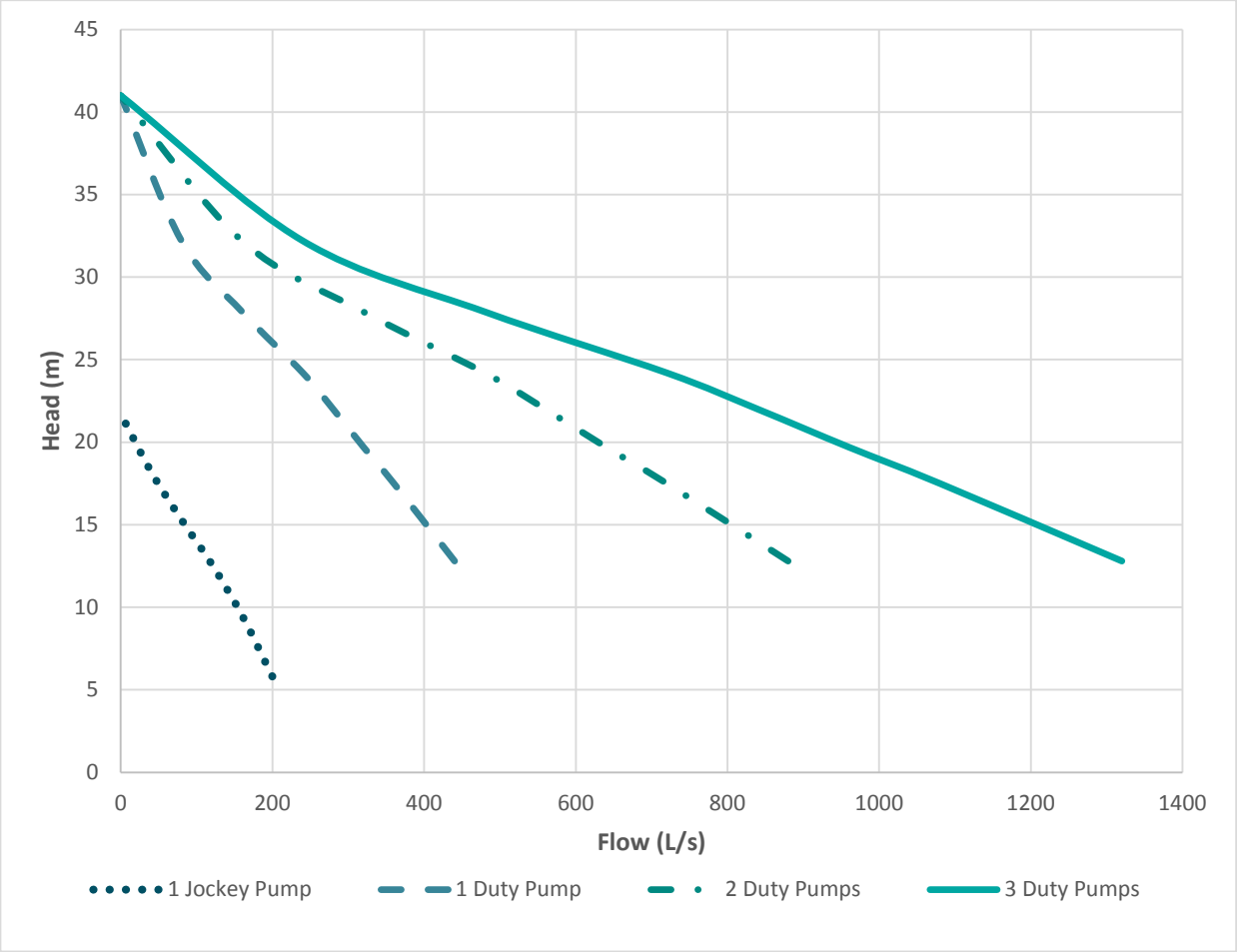
While all lift stations contributing flow within the SWMM model were reviewed to ensure they were accurately modelled, the only station requiring updating for the current modelling exercise was the Simms Creek Pumping Station (SCPS, formerly Lift Station #7). The new pumping station operates with 1 jockey pump as well as 3 duty pumps, as listed below:

- 1 x FLYGT NP 3202.180 MT 3~ 643 (35 Hp); and
- 3 x FLYGT NP 3300 MT 3~ 675 (110 Hp)

The pump curves for the SCPS are shown on **Figure 2**. When any number of the duty pumps are in operation, the jockey pump does not have enough capacity to effectively overcome the increased pressure head and therefore does not add any significant flow to the system.

All other pumping station operating curves were reviewed, and found to be accurately modelled. The pump performance curves for all pumps included in the SWMM model are attached in Appendix B.

Figure 2: Pump Curves for the Simms Creek Pumping Station



2.3. Sewer System Design Flows

Design flows for the system were re-evaluated based on updated instructions from the City of Campbell River as provided in **Table 1** below.

Table 1: Key Design Parameters

Parameter	Standard Value
Residential Occupancy (person per/household)	2.5
Residential Design Flow (L/cap/d)	360
Inflow & Infiltration Rate (I&I) (L/s/ha)	0.11
Peaking Factor Formula	Harmon Formula

The above criteria are consistent with the current City of Campbell River design standards, except for the specified infiltration rate, which is higher than the current standard of 0.06 l/s/ha but is consistent with recommendations stemming from the SCRSS. Commercial, Institutional and Industrial design flows followed the CCR Standards and/or MMCD standards where applicable and were input into the model as a residential population equivalent.

2.3.1. Present Day Sewer Discharges

The existing sewer system discharges were calculated based on the above criteria and current population estimates. Dry weather (sewage demand component) and Wet Weather (Inflow and Infiltration (I&I) component) flows were input into the model at appropriate model nodes and routed through the SWMM model to estimate discharges throughout the collection system. The maximum computed discharge from each sewershed depicted on **Figure 1** is listed in **Table 2**. The largest contributing sewersheds to the Simms Creek Pumping Station are the Larwood Road, Simms Creek Trunk and the Westgate Areas. The Hospital Area sewer discharges directly to the interceptor chamber at the MHC via a gravity main along Highway 19A from 1st Avenue, and the peak discharge from this sewershed is calculated to be 47 l/s. This will need to be considered when assessing options for routing the forcemain along Highway 19A.

Modelled peak discharges for the present day population equivalents into lift stations within the South Campbell River Sewershed area are presented on **Table 3**. Based on the above noted design criteria, our model shows present day sewage flows into the SCPS peak at 275 litres per second. This flow is known to be conservatively high when compared to actual inflows. To determine the difference between this theoretical peak discharge and actual peak wet weather discharge, an in depth look at flows into the SCPS is required. The City's current SCADA system does not allow for easy logging of the historical information from the lift stations recordings. The last physical measurements of inflow to the pumping station were completed in November of 2007. At that time, peak wet weather discharges were measured at about 150 l/s, and growth in the area has not warranted a more than doubling of peak discharges to the pumping station, as would be indicated by the current model parameters.

Table 2: Modelled Maximum Sewershed Discharges – Present Day (2015)

Sewershed	Peak Discharge (l/s)
Adams Rd	2
Airport and Homalco	8
Dahl Rd	7
Erickson Rd	7
Garnet - Pinecrest - Evergreen	33
Hilchey Rd	23
Hospital Area	47
Larwood Rd	36
Maryland Rd	8
Rockland Rd	28
Simms Creek Trunk	95
Simms Rd	5
South Island Highway	20
South Jubilee Parkway Area	0
Twillingate Rd	3
Washington Dr	11
Westgate Rd	48

Table 3: Modelled Peak Discharges into Pumping Stations – Present Day (2015)

Pumping Station	Peak Discharge (l/s)
Lift Station #5	11
Lift Station #6	13
Lift Station #8	7
Lift Station #9	0.6
Willow Creek Pumping Station	39
Simms Creek Pumping Station	275

2.3.2. Build-Out Scenario Sewer Discharges

As described previously, the "build-out" scenario includes development of lands outside the present Urban Containment Boundary, including lands around the Airport and south of Jubilee Parkway. The City requested that a contingency of discharges equivalent to 750 hectares and 3500 population equivalents of future connections of land south of Jubilee Parkway and/or additional industrial activity near the Airport or Jubilee Parkway areas be included in the assessment. This contingency is in addition to build out conditions at the Airport, Homalco and the planned development areas around the South Dogwood – Jubilee Parkway intersection. The build-out also includes development of remaining lands within the urban containment boundary, as well as an allowance for densification, especially within the South Island Highway corridor.

Computed peak discharges from the study area sewersheds for the build-out scenario are provided on **Table 4**. Although there was an allowance for growth and densification within some of the established neighbourhoods, this did not directly correlate to increases in peak discharges, because of the mitigating effects of the Harmon Peaking Factors and system attenuation due to routing effects. Only those areas with substantial growth show a direct increase in sewage discharges.

Table 4: Modelled Maximum Sewershed Discharges – "Build-out" Condition

Sewershed	Peak Discharge (l/s)
Adams Rd	2
Airport and Homalco	129
Dahl Rd	7
Erickson Rd	7
Garnet - Pinecrest - Evergreen	33
Hilchey Rd	31
Hospital Area	47
Larwood Rd	37
Maryland Rd	12
Rockland Rd	28
Simms Creek Trunk	100
Simms Rd	5
South Island Highway	23
South Jubilee Parkway Area	112
Twillingate Rd	3
Washington Dr	28
Westgate Rd	52

The corresponding peak discharges to the collection system pumping stations are listed on **Table 5** below, with significant increases calculated for the Willow Creek and Simms Creek pumping stations.

Table 5: Modelled Peak Discharges into Pumping Stations – "Build-out" Condition

Pumping Station	Peak Discharge (l/s)
Lift Station #5	13
Lift Station #6	13
Lift Station #8	7
Lift Station #9	0.6
Willow Creek Pumping Station	175
Simms Creek Pumping Station	575

Results from the previous study for the South Campbell River Area computed peak wet weather discharges to the Simms Creek Pumping Station of 454 l/s at build-out. This number included 9400 residents from Area 'D' of the SRD. By increasing the per capita design discharge for this analysis from 300 to 360 l/cap/day, and increasing the infiltration rate from 0.06 to 0.11 l/s/ha, a significant cumulative increase in design discharges over past studies is calculated at the SCPS even with a projection of only 3500 new population equivalents south of Campbell River contributing to the system in the future.

Previous population equivalents at "build-out" for the study area (for the 2008 SCRSS project) were modeled at 46,830 with 9420 Area 'D' residents included. For comparison the new model assumes about 44,590 people at build-out, which includes 3500 new person equivalents south of Jubilee Parkway, as well as the Hospital Catchment Area (an additional 3660 person equivalents).

Current design flows result in sewage discharges to the SCPS that are 25% higher than previous estimates, but this level of conservatism is considered appropriate for planning the size of larger, more critical assets such as forcemains, which are meant to be sized for a long-term planning horizon of 50 years or more. Recent flow monitoring would suggest that actual system flows are lower than what design flows are estimated to be, and these lower flows may be used to determine the timing of less critical elements of the sewer system infrastructure, deferring upgrades into the future as long as the assets are in good operating condition.

In the case of the foreshore forcemain, it is recommended to consider the upgrade in the near future as past assessments have indicated it is at the end of its practical life span and is very near its capacity to effectively convey the inflows it receives from the various sources. A larger forcemain will significantly reduce system losses and operating pressures, especially during peak wet weather events when LS #5

and #6 are inoperable because they can't push against the internal forcemain pressure. During these peak wet weather events sewer operating crews are forced to shutdown LS #5 and #6 and use the City's vacuum truck to draw sewage from each wet well, and deliver it directly to the Norm Wood Environmental Centre, which is a significant demand on operator resources and ties up a critical piece of equipment that is in high demand for other emergency tasks during storm/flooding events.

3. FORCEMAIN ALIGNMENT OPTIONS

Three alternatives were examined for the required capacity upgrade of the forcemain that conveys sewage from the SCPS to the MHC. Both capital and life cycle costs were estimated for comparison of the alternatives, in conjunction with other considerations such as environmental concerns. Option 1 examines the alternative of a forcemain along Highway 19A from SCPS to 1st Avenue, where flows would combine with those from the Hospital Area sewershed and flow via gravity to the Maritime Heritage Center (MHC). The second option examines the alternative of a forcemain that would follow the highway all the way from the SCPS to the MHC. Similar to Option 1, Option 2 would pump to the top of the hill crest at 1st Avenue, and then essentially flow by gravity from there, parallel to the existing gravity main. The 3rd option is a replacement of the existing foreshore forcemain with twin (one for redundancy) 750 mm forcemains that run along the beach from Hidden Harbour to the MHC. Each option was simulated with both present day and build-out flow scenarios.

3.1. Option 1 – Forcemain to 1st Avenue, Gravity to MHC

Option 1 for the forcemain upgrade routes the pipe from SCPS along Highway 19A to 1st Avenue, where flows would combine with those from the Hospital Area sewershed and flow via gravity to the Maritime Heritage Center (MHC) (see attached **Figure 3**). Highway 19A rises above Hidden Harbour to a crest elevation of about 24m. The integrated gravity main from 1st Avenue to the MHC would replace the aging sanitary sewer main currently servicing the Hospital Area sewershed. The existing sewer in the area was constructed in the 1950s. At nearly 70 years old the gravity main is showing signs of wear and is nearing its practical life span.

The proposed integrated sewer would have to closely follow the grade of the existing sewer in order to connect to the existing lateral mains. A 750mm diameter gravity main was calculated to be the required size for the portion between 1st and the MHC, with minor grade adjustments required of the profile to achieve the 70% full pipe at design flow standard set by the City. The sizes of the forcemain/gravity main sections are listed below:

- 600mm diameter forcemain from the SCPS to LS #6;
- 700mm diameter forcemain from LS #6 to LS #5;
- 750mm diameter forcemain from LS #5 to 1st Avenue; and
- 750mm diameter concrete gravity trunk sewer c/w manholes from 1st Avenue to the MHC.

The above configuration will require an upgrade to the pumps at the SCPS sometime in the future when the existing pumps can no longer pump the incoming flows from the upstream sewersheds. The conservative nature of the estimated design flows leads to the recommendation to carefully consider the timing of pump upgrades at SCPS. The pumps are required for increased pressure heads above station discharges of 480 l/s, while the modelling calculates a peak outflow of 560 l/s is required. On this basis, if actual inflows remain below 480 l/s then the existing pumps will provide adequate capacity to convey the effluent from the SCPS to the MHC. Currently, peak flows at the SCPS are being modeled at about 275 l/s.

The sanitary sewer model shows that as a result of the realignment of the forcemain up the hill at Hidden Harbour, the Garnet Road and Pinecrest Road gravity trunks that currently drain directly into the forcemain will flood. The increased pressure head in the forcemain would cause the hydraulic grade line (HGL) to reach the surface, therefore potentially causing sewage flows to flood to the surface at manhole locations, and likely cause significant sewage back up to homes with basements or crawl spaces below grade. On this basis, it is proposed to connect the Pinecrest trunk to the gravity line that flows into LS #5 and the Garnet trunk would be directed to either of the gravity lines that directly flow to LS #6 or the SCPS. Both trunks (Pinecrest and Garnet) have small peak flows (with maximums at 2 L/s and 3 L/s respectively), which can be easily absorbed by any of these lines. The direct to forcemain gravity trunk along Evergreen Road does not flood in this scenario, and therefore could simply be reconnected to the new forcemain. Moving north, the properties below the Highway from 121 to 321 South Island Highway currently flow by gravity to the existing forcemain along the beach. This local gravity sewer will need to be terminated at a new lift station and pumped to the proposed gravity trunk sewer along Highway 19A or to Lift Station #10, or alternatively, each individual service could be pumped to the trunk sewer or the gravity sewer at lot 351 on the highway, which conveys sewage to Lift Station #10. Allowances for the redirection of the above direct connections has been accounted for in the cost assessments.

In addition to these connection changes, pump upgrades would also be required at both LS #5 and LS #6. Both stations do not have enough capacity to overcome the increased pressure head in the forcemain due to the rise in elevation caused by the hill above Hidden Harbour. These stations however are in very poor condition and at the end of their service life and require renewal. For purposes of this analysis, the pumping configurations at these two lift stations were set to ideal pumping stations to prevent flooding. An “ideal” pumping station pumps outflows at the same rate as inflows enter the station, and therefore does not include the “buffering” effects allowed by a wet well. A detailed analysis would be required to properly size these new pumps if forcemain routing Options 1 or 2 is selected.

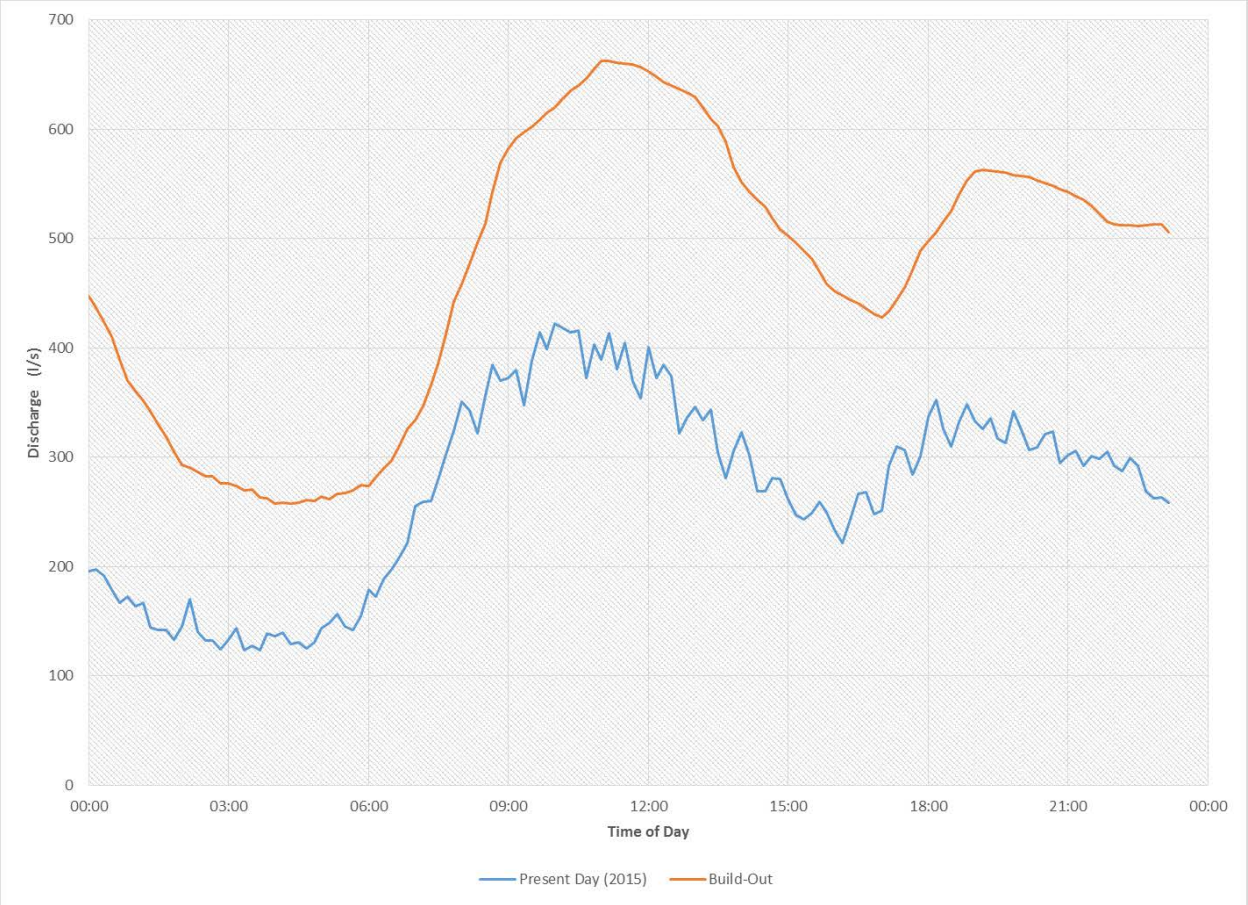
Key system parameters simulated in the SWMM model are listed on **Table 6**. For the “build-out” scenario, a portion of the forcemain is sized up to 750mm diameter to handle the increased system discharges into the SCPS. The current configuration of the SCPS will eventually need to be upgraded with higher head pumps to handle future discharges. This should be reassessed when the existing pumps are scheduled for replacement or prior to construction to any forcemain that follows the Highway 19A alignment. The total inflow hydrograph for the MHC is illustrated in **Figure 4.**

Table 6: Option 1 – Maximum Pumping Head and Peak System Discharges*

	Present Day (2015)	Build-Out
Max Pumping Head @ SCPS (m)	29.6	31.9
Max Outflow @ SCPS (L/s)	322	566
Max Inflow @ Start of Gravity Main (L/s)	380	617
Max Inflow @ MHC (L/s)	431	662

*Estimates are based on design discharges presented on Table 1

Figure 4: Option 1 – Modelled Inflow Hydrograph to MHC*



*Estimates are based on design discharges presented on Table 1

3.2. Option 2 – Forcemain to MHC along Highway

The second option is similar to the first, as depicted on **Figure 5**, except differing where the forcemain along Highway 19A would be constructed independently from, and parallel to, the existing gravity trunk from the Hospital Area sewershed. A 750 mm diameter pipe for the entire distance beyond the high point was calculated to be the required size to handle all flows up to the build-out scenario.

As in the previous scenario, the gravity trunk connections at Garnet and Pinecrest would have to be re-routed to adjacent gravity trunks along the highway, and both LS #5 and LS#6 would have to be upgraded with higher head pumps to overcome the increased system pressures. As is also similar to Option 1, the properties below the Highway from 121 to 321 South Island Highway would need to be serviced with a small lift station(s) to redirect their sewage into the new forcemain along the highway above.

The cost estimates include the future replacement of the adjacent highway gravity sewer between 1st Avenue and the MHC, which is in need of renewal. There is opportunity for cost savings to partner the two projects together as opening the road to install the forcemain will reduce re-surfacing costs if both project are completed at the same time. Alternatively, the existing gravity sewer could be upgraded by trenchless methods such as lining the existing pipe, which could be deferred or separated from the timing of the new forcemain. This alternative has not been analyzed within this scope of work, and should be looked at further once a forcemain alignment and alternative is chosen.

Systems flows are similar to scenario one and are listed on **Table 7**.

Table 7: Option 2 – Peak Flow and Maximum Pumping Head Required*

	Present Day (2015)	Build-Out
Max Pumping Head @ SCPS (m)	29.6	33.9
Max Outflow @ SCPS (L/s)	322	566
Max Inflow @ MHC (L/s)	431	663

*Estimates are based on design discharges presented on Table 1

3.3. Option 3 – Forcemain to MHC along Beach

Option 3 (**Figure 6**) is consistent with past designs where a new forcemain will be constructed along Highway 19A from the SCPS to Hidden Harbour where it is then planned to construct a twin forcemain along the foreshore to the MHC. The twinning of the forcemain is to allow for redundancy on the system, mitigating system shutdown time and environmental spills during a break in the line. This option has been studied in the past and provides the lowest possible total dynamic head (TDH). The design forcemain for Option 3 consists of:

- 600mm diameter forcemain from the SCPS to the Garnet Rd Lateral Connection Point
- 700mm diameter forcemain from the Garnet Rd Lateral Connection Point to LS #6
- 750mm diameter forcemain from LS #6 to the MHC, with the beach section twinned.

Results of the system simulations provide the following key system parameters listed on **Table 8**.

Table 8: Option 3 – Peak Flow and Maximum Pumping Head Required*

	Present Day (2015)	Build-Out
Max Pumping Head @ SCPS (m)	12.3	20.5
Max Outflow @ SCPS (L/s)	314	564
Max Inflow @ MHC (L/s)	422	663

*Estimates are based on design discharges presented on Table 1

As with the first two options, LS #5 and LS #6 require replacement due to their condition and operational inadequacies, and eventual increases in system pressures due to increased flows. In addition, the location of these two lift stations conflict with the future upgrades of the South Island Highway.

There is no requirement to alter the connection of the Garnet and Pinecrest gravity trunks from the forcemain, but this may be a consideration during detailed design to facilitate easier construction of the new forcemain, especially if the forcemain is built in phases before a decision is made regarding the route after Hidden Harbour.

With this option, properties along the highway (#121 – 321 S. Island Highway) can be re-connected to the new beach forcemain as they are now, which will ultimately reduce the costs for this alternative and is viewed as a benefit of this route. The construction of the forcemain along the beach also affords the opportunity to renew the existing gravity main along the beach that services 341 to 583 S. Island Highway, which was assessed in 2002, and deemed in need of renewal. The cost for this gravity main renewal is included in the cost assessments.

The dual forcemain concept for this option placed below a seasonal walkway at an elevation of 2.0m above mean sea level is not without its foreseeable problems, namely:

- With sea level rise predictions, the walkway would be inundated and unusable for greater parts of the year, until it will likely be predominantly submerged on a daily basis even during the low tide season. This will render the walkway unusable at anytime, and will also make any required repairs very difficult as well.
- The dual forcemain concept has significant operational challenges, as buried valves, which are required to isolate or put the second pipe into service, require regular maintenance. The redundant (twin) pipe, which is not normally in service, would require significant flushing to mitigate going septic after each use, preventing unruly odours in the system upon re-use, as well as preventing undue stress on the treatment plant should concentrated septic sewage be conveyed there upon re-use. Operationally, the flushing of one of the forcemain pipes would be challenging at best.
- Future renewal, when necessary, would double the cost accounting for the two pipes.

To adapt this option to address Sea Level Rise and operational concerns would require the construction of a significant embankment to a minimum geodetic elevation of about 5.0 metres, allowing year round access to

the forcemain pipes. Furthermore, this foreshore construction is inconsistent with the Sustainable Official Community Plan (SOCP), Foreshore Development Permit Guidelines, Marine Foreshore Habitat Assessment and Restoration Plan (NHC 2011) and the Draft Amendment to the Provincial Flood Management Guidelines. The larger impact to the environment would also increase the permitting challenges and requirements. Based on these challenges, it is concluded that adapting the beach concept to account for Sea Level Rise is not practical.

Since Option 3 pumps against lower overall system head, the discharge from the SCPS is higher with the existing pump configurations. With increased inflows at build-out, all 3 duty pumps would be required to pump through the forcemain for peak discharges, and this results in the peak outflow to a station maximum of 620 l/s.

4. COST ANALYSIS

Class 'C' cost estimates have been calculated for each option based on City policy, which requires a 25% General Contingency, a 25% Allowance for Engineering and Administrative Costs, plus a 20% Inflation contingency. The costs for construction are based on recent City tender costs, plus knowledge of pricing from similar work in other jurisdictions.

4.1. Capital Costs

The most significant factor in the capital cost is the decision of alignment along the section between Hidden Harbour and the MHC. Options 1 and 2 provided the easiest possible route for construction and allowed for the design of a single pipe forcemain from Hidden Harbour to the MHC due to the decreased risk. Option 3's capital cost estimate has been evaluated in the past and the City has decided that due to the higher risk for this alignment (with a twin forcemain or single forcemain constructed at a higher elevation with year round access), a twin forcemain (one for redundancy) with a seasonal walkway would be the preferred selection[1]. Construction along the beach would be costlier per meter than along the highway due to the increased difficulty for access of equipment and materials, as well as the increased amount of dewatering that would be needed. More effort to protect the marine environment during the construction period would also be required. The capital costs of construction for each option is listed in **Table 9**, and detailed cost estimates are appended herewith as Appendix B.

Table 9: Summary of Costs – Class 'C'

	Estimated Construction Costs	Contingencies and Allowances	Total Estimated Capital Cost
Option 1	$ 6,708,000	$ 4,696,000	$ 11,404,000
Option 2	$ 6,913,000	$ 4,839,000	$ 11,752,000
Option 3	$ 8,409,000	$ 5,886,000	$ 14,295,000

For all options, it has been assumed that both lift station #5 and #6 would be renewed as part of the project due to their present condition and future conflict with highway improvements. The scope of work would include a new lift station in an adjacent location, complete with a new wet well, pumps, piping and underground valve chamber. The electrical equipment which includes an emergency backup generator would be housed in an above ground building that may also have public washroom facilities.

[1] South Campbell River Sewer Project: Updated Cost Estimates for Beach Area Forcemain (November 20, 2006) and City of Campbell River: Waterfront Sewer Replacement Class C Construction Cost Estimate (January 26, 2011)

Options 1 and 2 include an allowance for a new small lift station to service lots 121 to 321 Island Highway. The lift station would likely be located in the easement area at the northeast corner of 235 Island Highway. The allowance also includes individual pump connections for 291 and 321 Island Highway as may be required, and are to be fully determined during the detailed design phase.

The premium to install the twin section along the beach is approximately $1,701,000 before considering contingencies and other additional sums. Even when considering going with just a single pipe along the beach, Option 3 is still the most expensive alternative, in addition to all the other concerns associated with it that are discussed in Section 5.0.

At a Class C level of cost estimating, many aspects of each alternative are not fully known or realized until further scrutiny can be made. Thus, significant contingencies are carried within each estimate. Table 8 shows that Options 1 and 2 are within a few hundred thousand dollars of each other, and as mentioned previously, there are other options for renewing the gravity sewer within Option 2. On this basis, it is recommended to look at each of these options further once the preferred route is chosen, and from the assessment of costs and all other factors, the recommended route is along the Highway and up over the hill.

4.2. Sensitivity of Costs to Pipe Sizing

All design configurations consider similar forcemain sizing starting at 600mm diameter at the SCPS and increasing to 750mm diameter as the route moves north either along the beach or over the hill along Highway 19A. The configurations are based on assumed design flows, which have been shown to be relatively conservative in comparison to actual measured values in the system. That is, the per capita dry weather flow (DWF) design value for input into the system is 360 litres per person per day (360 l/cap/day). It has been discussed that future upgrades might consider using actual per capita rates plus an allowance for further growth and/or densification. On this basis, the hydraulic model was revised to test the sensitivity of the pipe sizing with respect to possible reductions in the DWF inputs, namely:

- 300 L/Cap/Day (MMCD)
- 250 L/Cap/Day (Actual monitored flows + contingency)

It was found that the system is sensitive to the variations in flow and pipe size, especially as it relates to the lateral connections, which are gravity feeds into the forcemain. Pipe size reductions lead to higher system pressures for the same flow scenario, so the DWF flow reductions only allow for certain reductions in pipe size. It was found that the reduction of the DWF to the MMCD standard 300 l/cap/day did not have a significant effect on pipe size or hydraulic variation in the system. This is because the inflow & infiltration allowance is a significant component of the overall contributions to the flows in the system. Only when considering a reduction to 250 l/cap/day would allow for the reduction of forcemain size to 600mm diameter over the entire length of the route.

Furthermore, it has been calculated that the comparative cost saving is maximized at only about 2.5% or $250,000 over the total capital cost. Based on the limited hydraulic benefits and relatively minor cost saving, it would be prudent to maintain the design configuration for the forcemain, which will allow the growth of Campbell River to build-out and would provide a sufficient level of conservatism to allow for other inputs, such as additional flows from the south end of the City or higher levels of densification in the south area catchment. Full details of the sensitivity assessment are provided in Appendix C.

4.3. Life Cycle Costs

Life cycle costs were analyzed on a net present value (NPV) basis. This allowed for a more accurate comparison of the costs over a 50 year life cycle. The 3 options were analyzed based on the follow criteria:

- Capital cost of construction of the forcemain;
- Energy costs from operation of the pumps;
- Pump replacement costs; and
- Overall system operation and maintenance cost (O & M).

For purposes of this assessment, energy costs were assumed to be $ 0.10 per kW-hr. It is likely that by 2025 the SCPS will be due for a pump replacement and the cost of this replacement is affected by the size of forcemain selected. For this assessment, it was assumed that the SCPS would be renewed with larger size pumps at the scheduled time for replacements, which would be based on the forcemains selected at this stage of the study. Once a preferred option is selected, the pump/forcemain sizing can be optimized for the chosen life cycle, or longer depending on the time horizon for build-out. A summary of the estimated life cycle costs for each option is given on **Table 10**, with more detailed tables provided in Appendix D.

Life cycle cost for Options 1 and 2 vary significantly from Option 3 due to the major realignment at Hidden Harbour up to 1st Avenue. The maximum invert elevation in Options 1 & 2 is 22.8 m above sea level, which is approximately 20 m higher than the current foreshore route and results in higher operating costs due to increased energy consumption. Options 1 & 2 utilized the maximum invert along the adjacent gravity line in order to determine the high point in this design. This point does have the potential to be lowered for Option 2 during a detailed design phase, in order to optimize the total running costs with the capital costs.

Table 10: Life Cycle Costs

Present Value	Option 1	Option 2	Option 3
Capital Costs	$ 11,404,000	$ 11,752,000	$ 14,295,000
Operation and Maintenance	$ 1,664,000	$ 1,487,000	$ 1,734,000
Energy Costs	$ 1,953,000	$ 1,913,000	$ 797,000
Total Life Cycle Costs	**$ 15,021,000**	**$ 15,152,000**	**$ 16,826,000**

5. Benefits, Concerns and Unknowns

Each alternative has a number of benefits and other concerns related to project implementation and the end use of the constructed facility. While Options 1 and 2 have a similar route each has some unique attributes that separates them from the other. Still, these options are discussed together below while Option 3, the beach option, is considered independently, as its routing has even more unique circumstances for it to be considered a truly successful project.

5.1. Options 1 and 2

The route over the hill along the highway provides greater long-term certainty for operation and maintenance of this important asset of the City's sewer collection system. Since about half the City's sewage will be conveyed through this pipe, it is important to ensure that it is accessible and maintainable should a defect or break be encountered once the pipe is in operation. This benefit was cited in the 2001 AE report, but subsequently overturned by the perceived benefits of improving the beach route by raising the forcemain and creating an access pathway to it.

Installation of the forcemain up over the hill is considerably less expensive owing to the fact that trench dewatering shouldn't be a factor, and no special treatments need be included in the scope to protect the pipe over the long-term from wave action and erosion. When considering the beach route, there will also be additional fill to import to create the lower level berm, and there is the added cost of riprap armouring.

The upper route is also less invasive to the natural environment, and would not require the approvals from regulatory agencies. In addition, the costs relating to environmental protection for Options 1 and 2 would be significantly less than the beach alignment.

With Option 1 there is the opportunity to couple the installation with an upgrade to the existing gravity sewer along the highway, which is nearing the end of its life cycle. Option 1 has an advantage over Option 2 in that it combines what would otherwise be two parallel pipes into one, thus reducing maintenance for additional infrastructure. The larger gravity main also provides better access for inspection and cleaning than a closed forcemain conduit, though this is considered a minor benefit at best. There will be some challenge with finding an alignment for the new pipe along the highway to avoid conflict with other infrastructure and connect to existing lateral mains appropriately.

With Option 2, the City would also need to consider the opportunity of upgrading the gravity section of the parallel gravity sewer at the same time as the installation of the new forcemain. A detail cost estimate would need to be completed in order to determine the cost benefit of completing this work in conjunction with the new forcemain, or consideration of another type of renewal such as lining the existing pipe. Pipe alignment for a new forcemain and a new gravity main within the street corridor will have the same conflict issues with existing infrastructure as Option1.

The main concern with the routing over the hill is operational costs and the need to upgrade the pumps at the SCPS. Typically, sanitary sewer pumps under heavy use last about 12-15 years, so when it comes time to replace the pumps that are worn out, consideration for the replacement pump(s) will need to consider the current downstream forcemain system, and if the forcemain is constructed along the highway and over the hill, it would be prudent to consider upsizing the pump(s) at that time.

Options 1 and 2 are similar enough that it is difficult to recommend one over the other without further review of the conflicts and potential benefits to the existing infrastructure. This can be assessed during detailed design.

5.2. Option 3

Since 2002, it has been maintained that the beach route was a better alternative, because it maintained the lowest operating costs for the system, and presented an opportunity for the City to extend the Rotary Seawalk, connecting it to the Downtown core. Resistance from upland land owners has delayed the implementation, and with the construction of the new Simms Creek PS, future system operation can still be optimized though more energy will be required over time to pump over the hill.

Placing the forcemain along the beach is not without its risks and uncertainties. The twinning of the forcemain adds significant cost to the overall project, but by installing valve controls at the beginning and end of each twinned section, operation of a failed line can be transferred to the adjacent line until such time as it can be repaired under favourable tide/weather conditions. This scenario is not without its drawbacks though, as once placed in service the twin pipe will need to be completely flushed and possibly drained to prevent it from becoming septic and causing considerable operational issues with odour and treatment at the Norm Wood Environmental Centre.

The installation and maintenance of the beach section is going to be more difficult than if it were installed at a higher elevation as excavation and backfill is likely to occur under much wetter soil conditions, and a significant allowance has been carried in the cost estimates for dewatering the pipe trench during construction.

There are both positive and negative impacts to upslope private properties with Option 3. Their access to the water will be altered and agreements are required, and there are concerns with privacy and unlawful activity. The costs have not allowed for fencing, but maintaining the elevation of the forcemain berm at the lowest possible grade will enhance privacy and security.

The riprap revetment does enhance shoreline protection and is viewed as a benefit to upslope residents that are currently experiencing significant erosion on the beach, but this design does contradict current development policies by the City, which encourage a more “green shores” approach to shoreline protection. This type of foreshore construction is inconsistent with the Sustainable Official Community Plan (SOCP), Foreshore Development Permit Guidelines, Marine Foreshore Habitat Assessment and Restoration Plan (NHC 2011) and the Draft Amendment to the Provincial Flood Management Guidelines

Although this option has the largest footprint of disturbance to the existing beach habitat, previous detailed environmental studies have indicated that the proposed alternative can result in “no net loss” of fish habitat values. However, these studies are now quite dated, and should consider new environmental law and processes, which could either reverse previous conclusions and, at a minimum, delay the project construction due to a lengthier approvals process. In addition, any habitat disturbance will require compensation at a 2 to 1 ratio, which will affect the overall cost for the work. Since compensation is an unknown at this time, it has not been assessed within the cost estimates provided.

Year round access to the forcemain for maintenance/repair or recreational purposes is not possible with this alternative, as the lower, twinned, portions are within the wave action zone of the foreshore. These areas will be subject to more frequent operational interruptions by wave debris and logs. The seasonal walkway surface’s primary function is protecting the forcemain pipes below. This issue is exacerbated by potential Sea Level Rise concerns which will see the 2.0m level more frequently inundated as average ocean levels are expected to rise by one metre by the year 2100.

Given the above concerns with regulatory requirements, neighbourhood concerns and the poor compatibility of the plan with respect to expected Sea Level Rise, Option 3.0 is a poor candidate for consideration moving forward.

5.3. Summary

From the perspective of benefits and concerns, it appears that Option1 or 2, which is to pump the effluent over the hill along the Highway is the best option route to take. Option 1 has the benefit of lower capital and operational costs associated with putting all the effluent into one pipe, though there is the concern for constructing the new pipe while avoiding conflicts with existing infrastructure. Since the costs for Options 1 and 2 are very similar, it is hard to recommend Option 1 over Option 2 or visa versa. Selection between Options 1 and 2 will need to be decided at the next stage of design, where more detailed assessments of possible conflicts and/or alternative methodologies for construction can be compared. Previously, Option 3 the beach routing option was considered to be the least costly and most favourable option, but recent changes in regulation and unknown risks associated with the construction and maintenance in the near shore environment increase the cost and decrease the benefits associated with this option.

6. Conclusion & Recommendations

Based on the analysis and assumptions completed on the three options for routing the forcemain from the Simms Creek Pumping Station (SCPS) to the Maritime Heritage Centre (MHC), the following conclusions and recommendations can be made:

6.1 Previous collection system modelling completed by McElhanney was updated to reflect changes in contributions south of Campbell River, and incorporate the Hospital Area Sewershed into the overall South Campbell River Sewer System Model. In addition, all completed upgrades to the system since 2007 were also incorporated into the model

6.2 Sewage demands for the South Campbell River Area were re-calculated on the basis of a design discharge of 360 l/cap/day, plus an infiltration allowance of 0.11 l/s/ha of contributing area to the sewer system.

6.3 The resulting inflows to the SCPS are estimated to peak at 275 and 575 l/s for the present day (2015) and the “Build-out” scenarios.

6.4 Current design flows result in sewage discharges to the SCPS that are 25% higher than previous estimates even with a slightly lower population. These calculated design flows are appropriate for planning larger, more critical assets such as forcemains, which are meant to be sized for ‘build-out’ scenarios over a long-term planning horizon of 50 years or more.

6.5 It is recommended to consider the peak sewer discharges to the SCPS carefully when considering upgrades to the pumps because current flows to the lift station appear to be about **half** of what has been calculated from the design factors. It is likely that the best time to upgrade pumps for future flows will be when the existing pumps require replacement due to normal wear and tear.

6.6 Three options for routing the forcemain from the SCPS to the MHC were assessed on the basis of capital and life cycle costs.

- 6.6.1. Option 1 includes a new single forcemain along Highway 19A from SCPS to 1st Avenue connecting to an upgraded gravity trunk sewer from 1st Avenue to the Maritime Heritage Centre with an estimated capital cost of $11,404,000.
- 6.6.2. Option 2 includes a new forcemain along Highway 19A from SCPS all the way to the Maritime Heritage Centre. Estimated cost $11,752,000
- 6.6.3. Option 3 is estimated to cost about $14,295,000, and consists of a new forcemain from the SCPS along Highway 19A to Hidden Harbour, which then splits into a twinned (for redundancy) forcemain along the foreshore.

6.7 When considering future operating costs over a 50-year life cycle, Option 1 is estimated to be the least costly at $15,021,000 with Option 2 a very close second at $15,152,000. This includes a required upgrade for higher head pumps at the SCPS in the future when system pressures exceed the current pumping capacity. Option 3 is estimated to have total present value cost of $16,826,000 for the same 50-year cycle.

6.8 Based on the assessment completed for routing options related to the SCPS forcemain, it is recommended to pursue Options 1 or 2, giving preference to the “over the hill” route along the Highway. In terms of cost, Option 1 and 2 are close, and each option has benefits and concerns that make either a good option. The next level of study should complete a detailed assessment of the route from 1st Avenue to the MHC to determine more closely the potential conflicts with existing infrastructure, and to look at all options to renew or upgrade the existing gravity main.

Figures

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MARITIME HERITAGE CENTRE

LIFT STATION #5

LIFT STATION #6

LIFT STATION #7

WILLOW CREEK LIFT STATION

Sewersheds

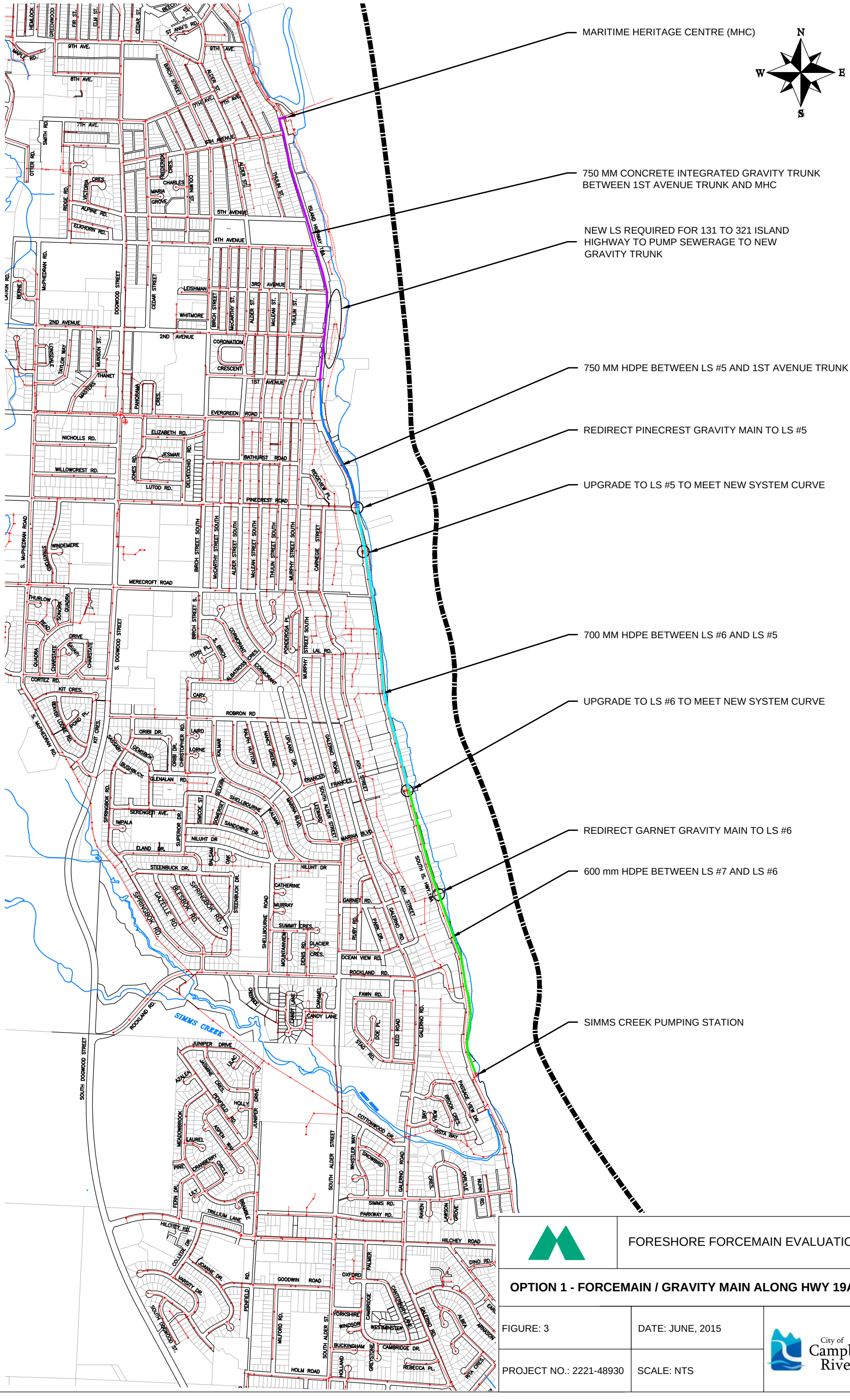
- Adams Rd
- Airport & Homathco
- Dahl Rd
- Erickson Rd
- Garnet - Pinecrest - Evergreen
- Hilchey Rd
- Hospital Area
- Larwood Rd
- Lift Station #10
- Maryland Rd
- Rockland Rd
- Simms Creek Trunk
- Simms Rd
- South Island Highway
- South Jubilee Parkway Area
- Twillingate Rd
- Washington Rd
- Westgate Rd

FORESHORE FORCEMAIN EVALUATION

SEWERSHED MAP

FIGURE: MAP-1	DATE: JUNE, 2015
PROJECT NO.: 2221-48930	SCALE: NTS

City of Campbell River


MARITIME HERITAGE CENTRE (MHC)
N
W
E
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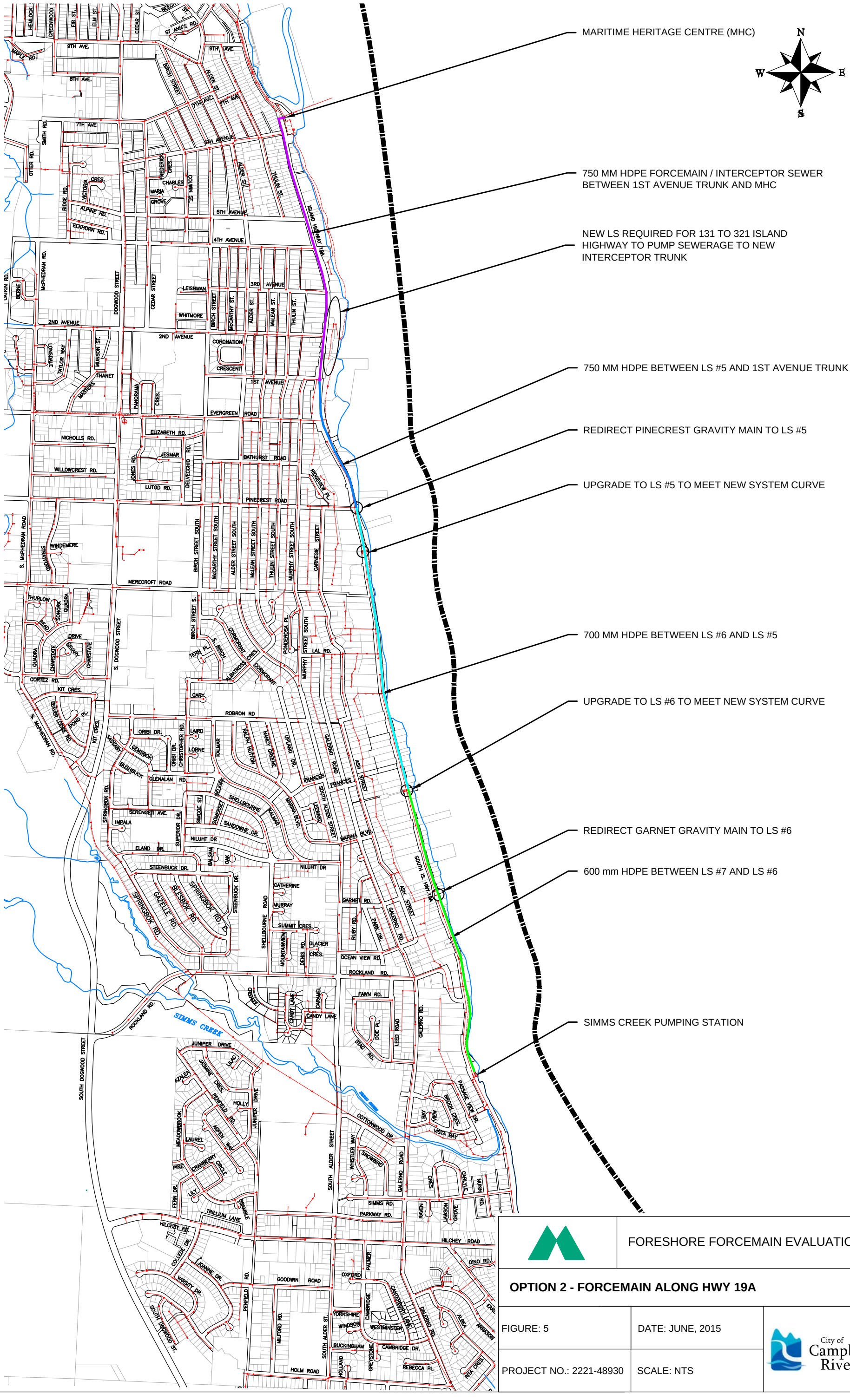
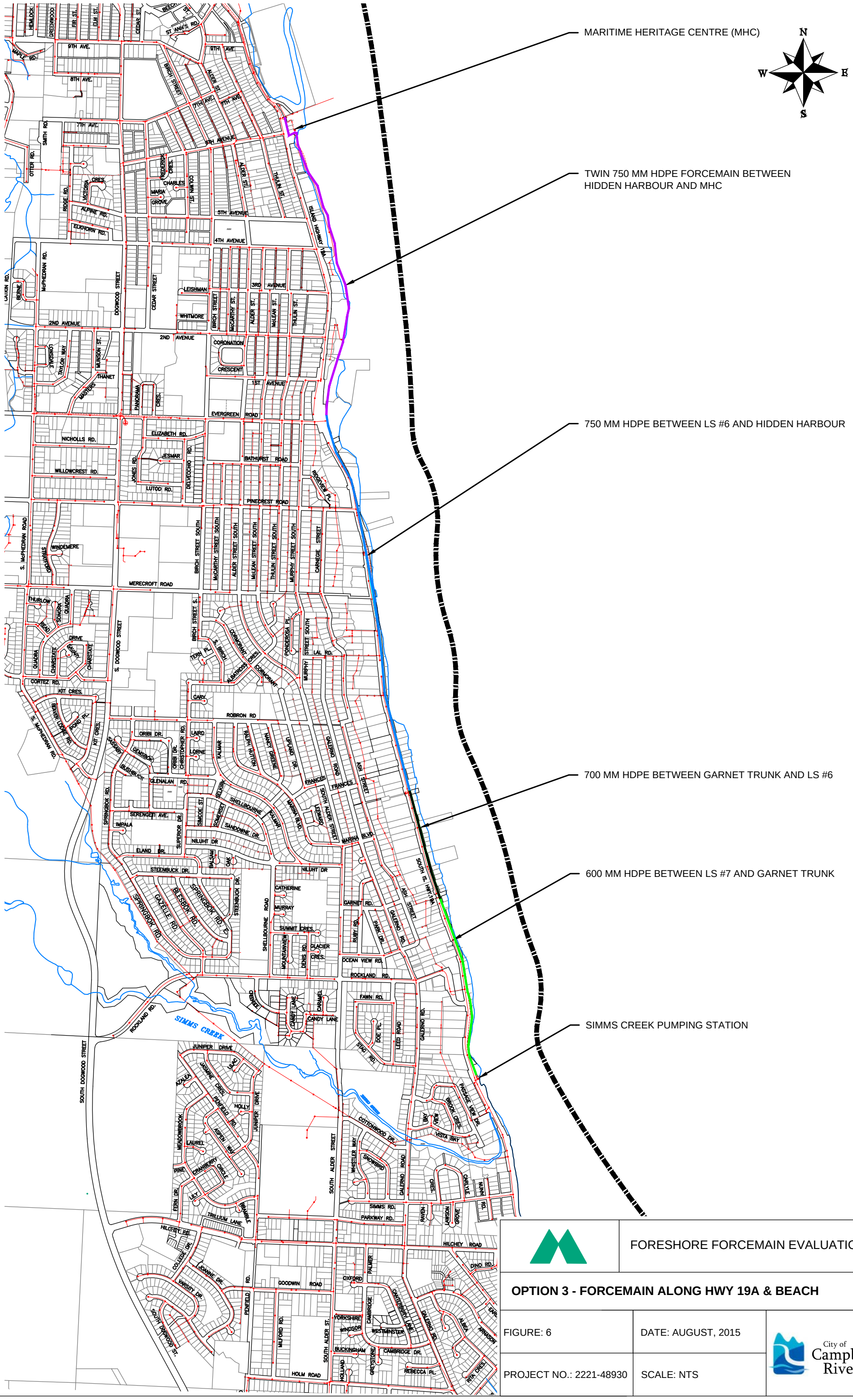
750 MM CONCRETE INTEGRATED GRAVITY TRUNK BETWEEN 1ST AVENUE TRUNK AND MHC
NEW LS REQUIRED FOR 131 TO 321 ISLAND HIGHWAY TO PUMP SEWERAGE TO NEW GRAVITY TRUNK
750 MM HDPE BETWEEN LS #5 AND 1ST AVENUE TRUNK
REDIRECT PINECREST GRAVITY MAIN TO LS #5
UPGRADE TO LS #5 TO MEET NEW SYSTEM CURVE
700 MM HDPE BETWEEN LS #6 AND LS #5
UPGRADE TO LS #6 TO MEET NEW SYSTEM CURVE
REDIRECT GARNET GRAVITY MAIN TO LS #6
600 mm HDPE BETWEEN LS #7 AND LS #6
SIMMS CREEK PUMPING STATION
ISLAND HIGHWAY 19A
SOUTH IS. HWY 19A
SIMMS CREEK
9TH AVE.
8TH AVE.
7TH AVE.
6TH AVENUE
5TH AVENUE
4TH AVENUE
3RD AVENUE
2ND AVENUE
1ST AVENUE
MERECROFT ROAD
PINECREST ROAD
BATHURST ROAD
EVERGREEN ROAD
CORONATION CRESCENT
ROBRON RD
SHELLBOURNE
MARINA BLVD.
NILUHT DR
HILCHEY ROAD
GOODWIN ROAD
HOLM ROAD
PARKWAY RD.
SIMMS RD.
COTTONWOOD DR.
CANDY LANE
ROCKLAND RD.
OCEAN VIEW RD.
GARNET RD.
FAWN RD.
SOUTH DOGWOOD STREET
SOUTH ALDER STREET
BIRCH STREET SOUTH
McCARTHY STREET SOUTH
ALDER STREET SOUTH
McLEAN STREET SOUTH
THUJIN STREET SOUTH
MURPHY STREET SOUTH
CARNEGIE STREET
ASH STREET
GALERNO ROAD
GALERNO RD.
S. McPHEDRAN ROAD
S. DOGWOOD STREET
SPRINGBOK RD.
ROGERSON PL.
PONDEROSA PL.
CORMORANT CRES.
ALBATROSS
LAL RD.
CARY
KIT CRES.
CORTEZ RD.
ORIBI DR.
GLENALAN RD.
SERENGETI AVE.
IMPALA
ELAND DR.
NILUHT DR
STEENBUCK DR.
GAZELLE RD.
BLESBOK RD.
SPRINGBOK RD. E.
SHELLBOURNE ROAD
CATHERINE
MURRAY
SUMMIT CRES.
GLACIER CRES.
MOUNTAINVIEW
DENIS RD.
RUBY RD.
PARK DR.
GALERNO RD.
ROCKLAND RD.
FAWN RD.
DOE PL.
LEED ROAD
STAG RD.
CANDY LANE
CARAMEL
JUNIPER DRIVE
AZALEA
JASMINE CRES.
PENFIELD RD.
HOLLY
ASPEN WAY
LAUREL
MEADOWBROOK
CRANBERRY CIRCLE
PINE
FERN DR.
LILY
BRAMBLE
TRILLIUM LANE
HILCHEY RD.
COLLEGE DR.
JOANNE DR.
VARSITY DR.
SOUTH DOGWOOD ST.
PENFIELD RD.
MILFORD RD.
SOUTH ALDER ST.
OXFORD
PALMER
CAMBRIDGE
CANTERBURY LANE
YORKSHIRE
WINDSOR
WESTMINSTER
BUCKINGHAM
CAMBRIDGE DR.
HOLLAND
GREYSTONE
REBECCA PL.
RITA CRES.
ALBEA
ARKINSON
EARL
DINO RD.
WHISTLER WAY
SNOWBIRD
BAY VIEW
VISTA BAY
BROOK CRES.
PASSAGE VIEW DR.
CARLYLE
MUNN
RD.
RAVEN
LAWSON GROVE
SIMMS CREEK
FORESHORE FORCEMAIN EVALUATION
OPTION 1 - FORCEMAIN / GRAVITY MAIN ALONG HWY 19A
FIGURE: 3
DATE: JUNE, 2015
PROJECT NO.: 2221-48930
SCALE: NTS
City of Campbell River



FORESHORE FORCEMAIN EVALUATION

OPTION 2 - FORCEMAIN ALONG HWY 19A

FIGURE: 5	DATE: JUNE, 2015	City of Campbell River
PROJECT NO.: 2221-48930	SCALE: NTS	


MARITIME HERITAGE CENTRE (MHC)
TWIN 750 MM HDPE FORCEMAIN BETWEEN HIDDEN HARBOUR AND MHC
750 MM HDPE BETWEEN LS #6 AND HIDDEN HARBOUR
700 MM HDPE BETWEEN GARNET TRUNK AND LS #6
600 MM HDPE BETWEEN LS #7 AND GARNET TRUNK
SIMMS CREEK PUMPING STATION
N
W
E
S
ISLAND HIGHWAY 19A
SOUTH ISLAND HWY 19A
SIMMS CREEK
9TH AVE.
8TH AVE.
7TH AVE.
5TH AVENUE
4TH AVENUE
3RD AVENUE
2ND AVENUE
1ST AVENUE
CORONATION CRESCENT
EVERGREEN ROAD
BATHURST ROAD
PINECREST ROAD
MERECROFT ROAD
ROBRON RD
GOODWIN ROAD
HILCHEY ROAD
SIMMS RD.
PARKWAY RD.
ROCKLAND RD.
GARNET RD.
NICHOLLS RD.
ELIZABETH RD.
WILLOWCREST RD.
LUTOD RD.
BIRCH STREET
ALDER ST.
THULIN ST.
MCARTHY ST.
MCLEAN ST.
BIRCH STREET SOUTH
MCARTHY STREET SOUTH
ALDER STREET SOUTH
MCLEAN STREET SOUTH
THULIN STREET SOUTH
MURPHY STREET SOUTH
CARNEGIE STREET
SOUTH DOGWOOD STREET
SOUTH ALDER STREET
S. MCPHEDRAN ROAD
SPRINGBOK RD.
GAZELLE RD.
BLESBOK RD.
STEENBUCK DR.
SHELLBOURNE ROAD
CATHERINE
MURRAY
SUMMIT CRES.
MOUNTAINVIEW
DENIS RD.
GLACIER CRES.
OCEAN VIEW RD.
ROCKLAND RD.
FAWN RD.
CANDY LANE
CARAMEL
CREEKSIDE
GALERNO RD.
LEED ROAD
STAG RD.
DOE PL.
RUBY RD.
PARK DR.
ASH STREET
SOUTH ALDER STREET
MARINA BLVD.
LEEWARD
FRANCES
UPLAND DR.
NANCY GREENE
RALPH HUTTON
KALMAR
LAIRD
LORNE
ORIBI DR.
CHRISTOPHER RD.
GEMSBOK
BUSHBUCK
GLENALAN RD.
SERENGETI AVE.
IMPALA
SUPERIOR DR.
ELAND DR.
NILUHT DR
SANDOWNE DR.
SHELLBOURNE
SELKIRK
SIMCOE ST.
SOMERSET
BALSAM
OAK
STEENBUCK DR.
SPRINGBOK RD.
KIT CRES.
BEAVER LODGE RD.
POND PL.
CORTEZ RD.
KITTY HAWK
CHARSTATE
QUADRA
SONORA
THURLOW ROAD
WINDEMERE
CRANFORD
ALBATROSS
CORMORANT
GABY
TERN PL.
S. BIRCH
CORMORANT CRES.
BIRCH STREET S.
PONDEROSA PL.
LAL RD.
MURPHY
HILGREY RD.
COLLEGE DR.
JOANNE DR.
VARSITY DR.
PENFIELD RD.
SOUTH DOGWOOD ST.
JUNIPER DRIVE
JASMINE CRES.
AZALEA
PENFIELD RD.
HOLLY
LAUREL
ASPEN WAY
MEADOWBROOK
CRANBERRY CIRCLE
PINE
JULY
FERN DR.
BRAMBLE
TRILLIUM LANE
COTTONWOOD DR.
WHISTLER WAY
SNOWBIRD
VISTA BAY
BAY VIEW
BROOK CRES.
PASSAGE VIEW DR.
CARLYLE
RAVEN
LAWSON
GROVE
HOLM ROAD
MILFORD RD.
YORKSHIRE
WINDSOR
WESTMINSTER
CAMBRIDGE
CANTERBURY LANE
CAMBRIDGE DR.
BUCKINGHAM
HOLLAND
GREYSTONE
REBECCA PL.
OXFORD
PALMER
DINO RD.
ALDEA
ARNASON
RITA CRES.
EARL
FORESHORE FORCEMAIN EVALUATION
OPTION 3 - FORCEMAIN ALONG HWY 19A & BEACH
FIGURE: 6
DATE: AUGUST, 2015
PROJECT NO.: 2221-48930
SCALE: NTS
City of Campbell River

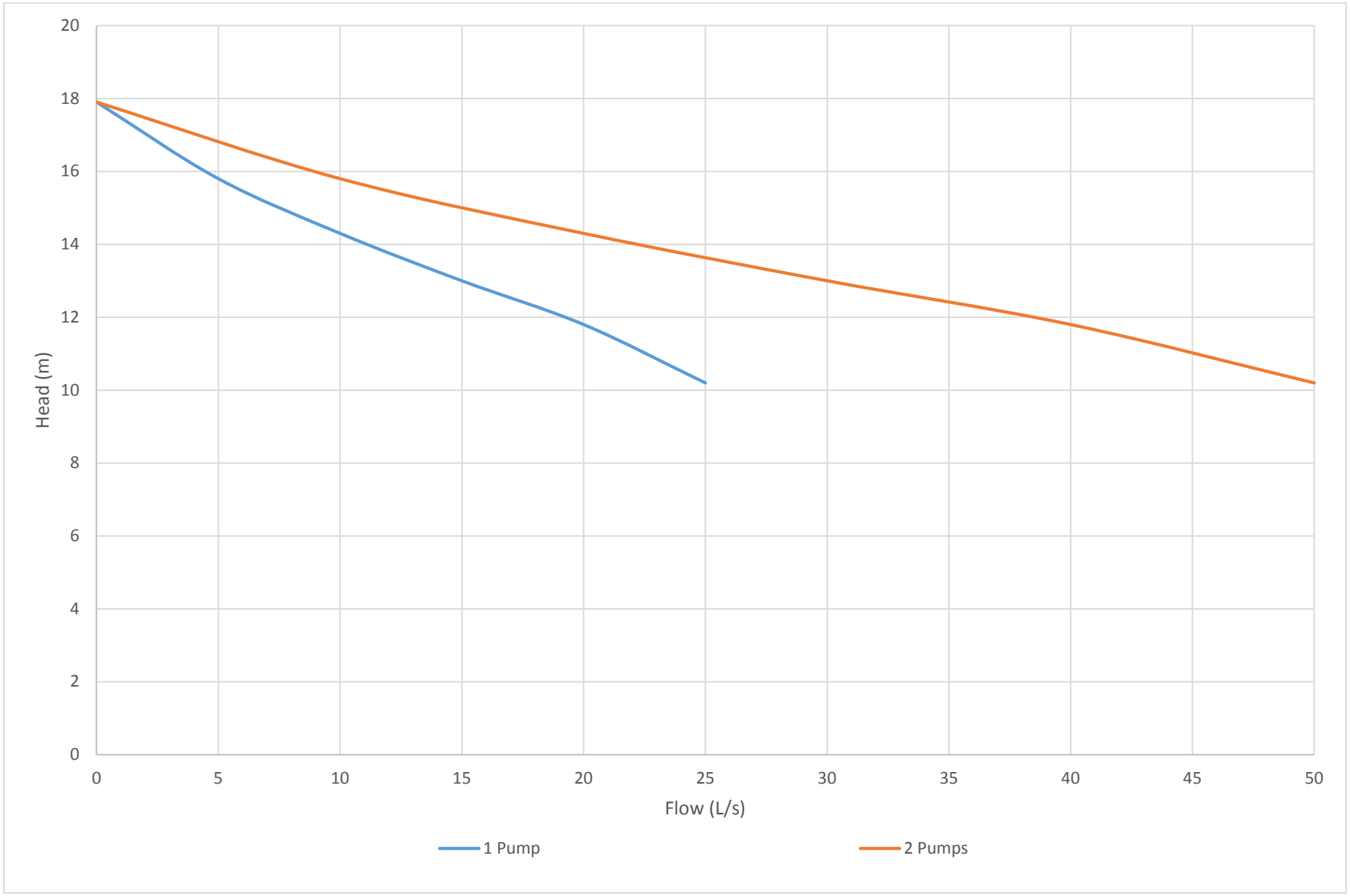
Appendix A

SOUTH CAMPBELL RIVER

LIFT STATION PERFORMANCE CURVES

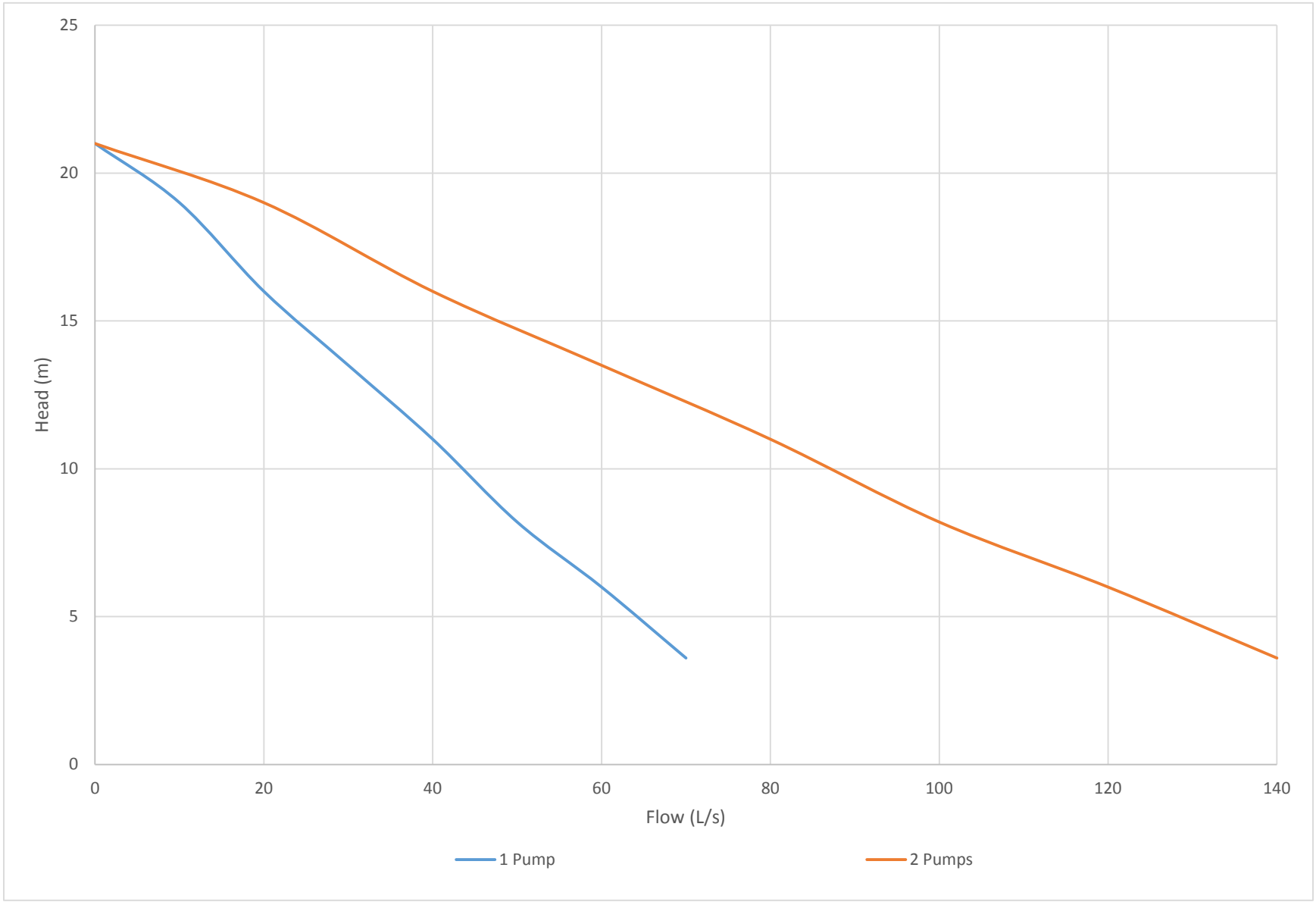
McElhanney

LIFT STATION 5 PUMP CURVES



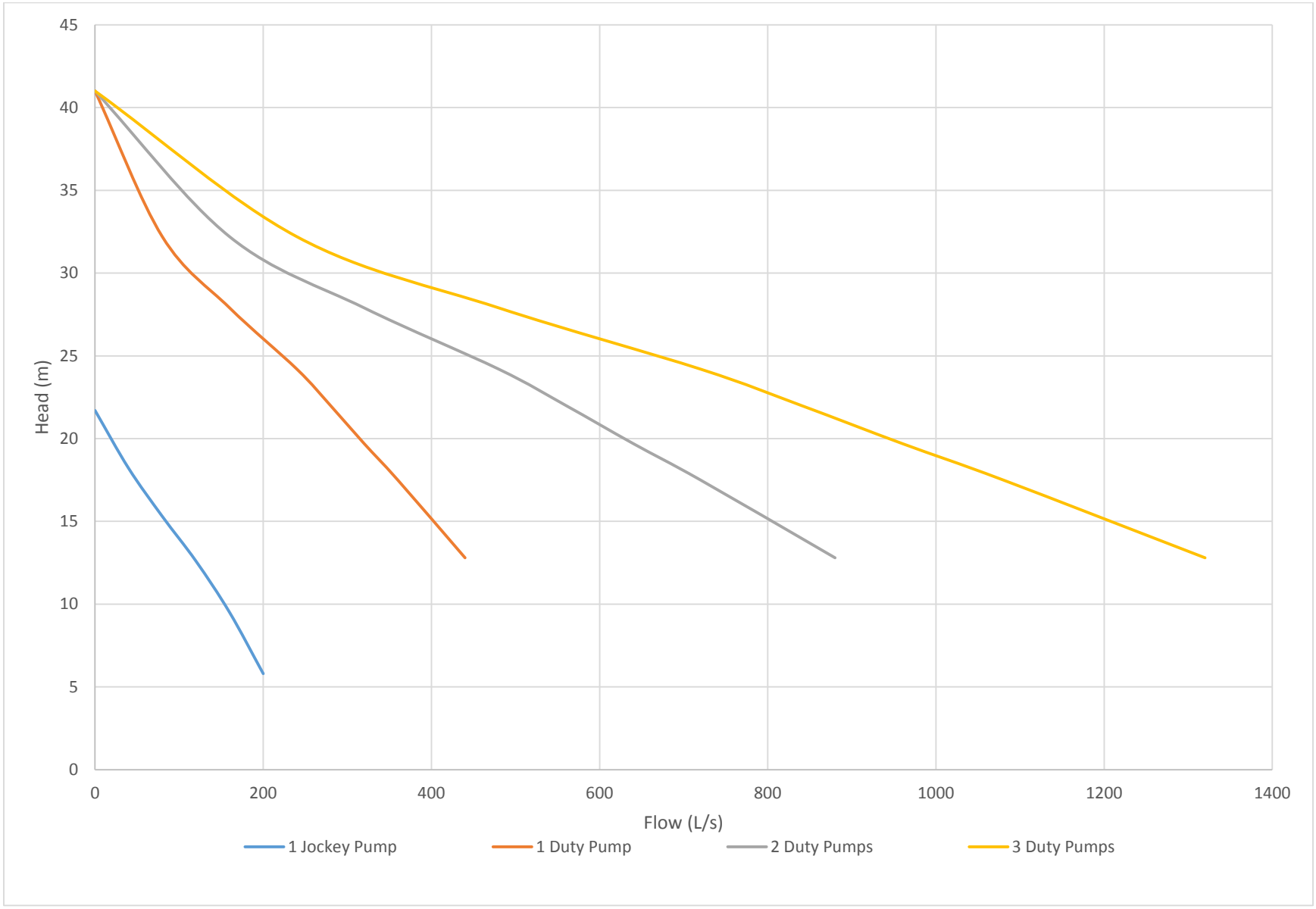
McElhanney

LIFT STATION 6 PUMP CURVES



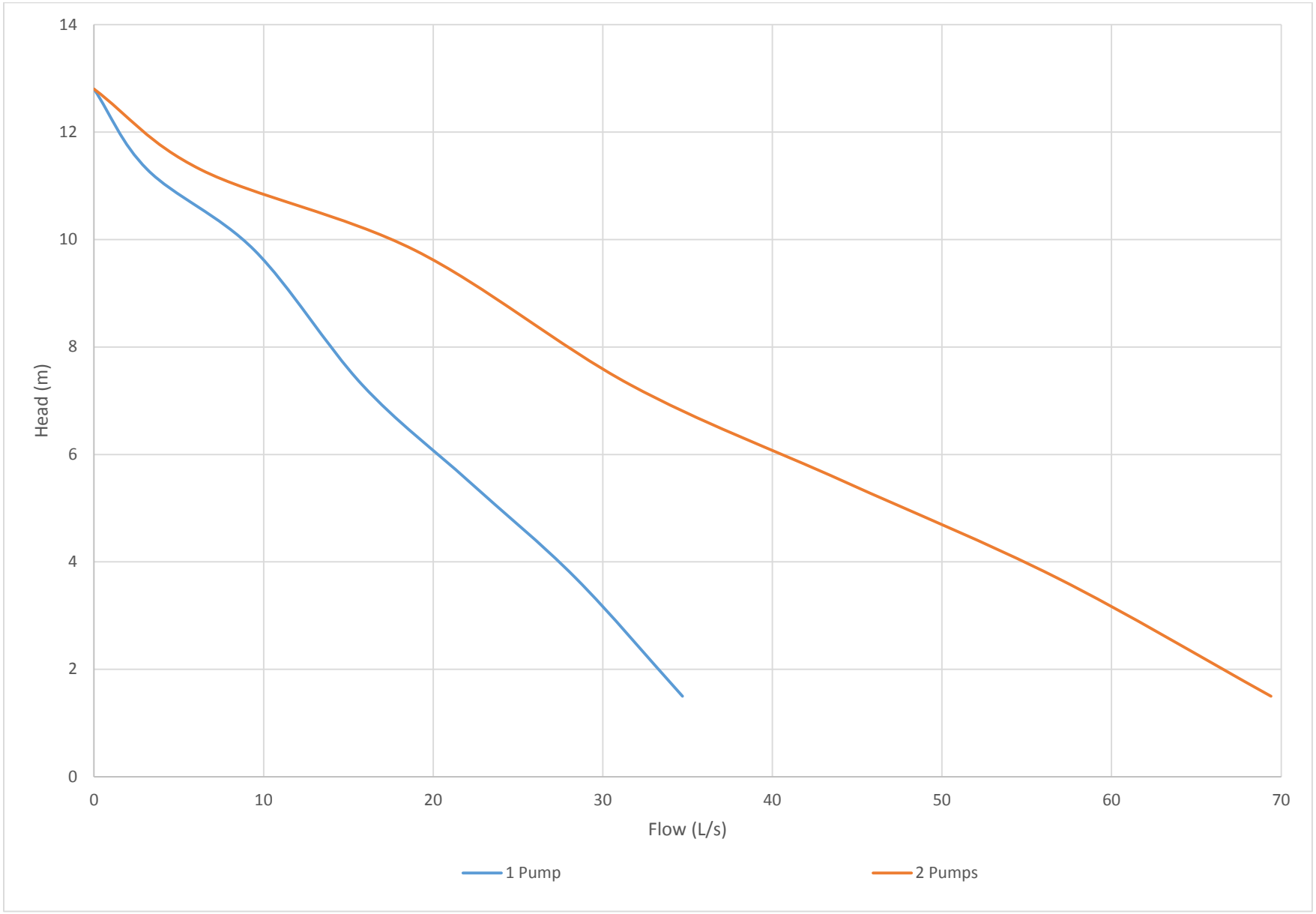
McElhanney

LIFT STATION 7 (SIMMS CREEK) PUMP CURVES



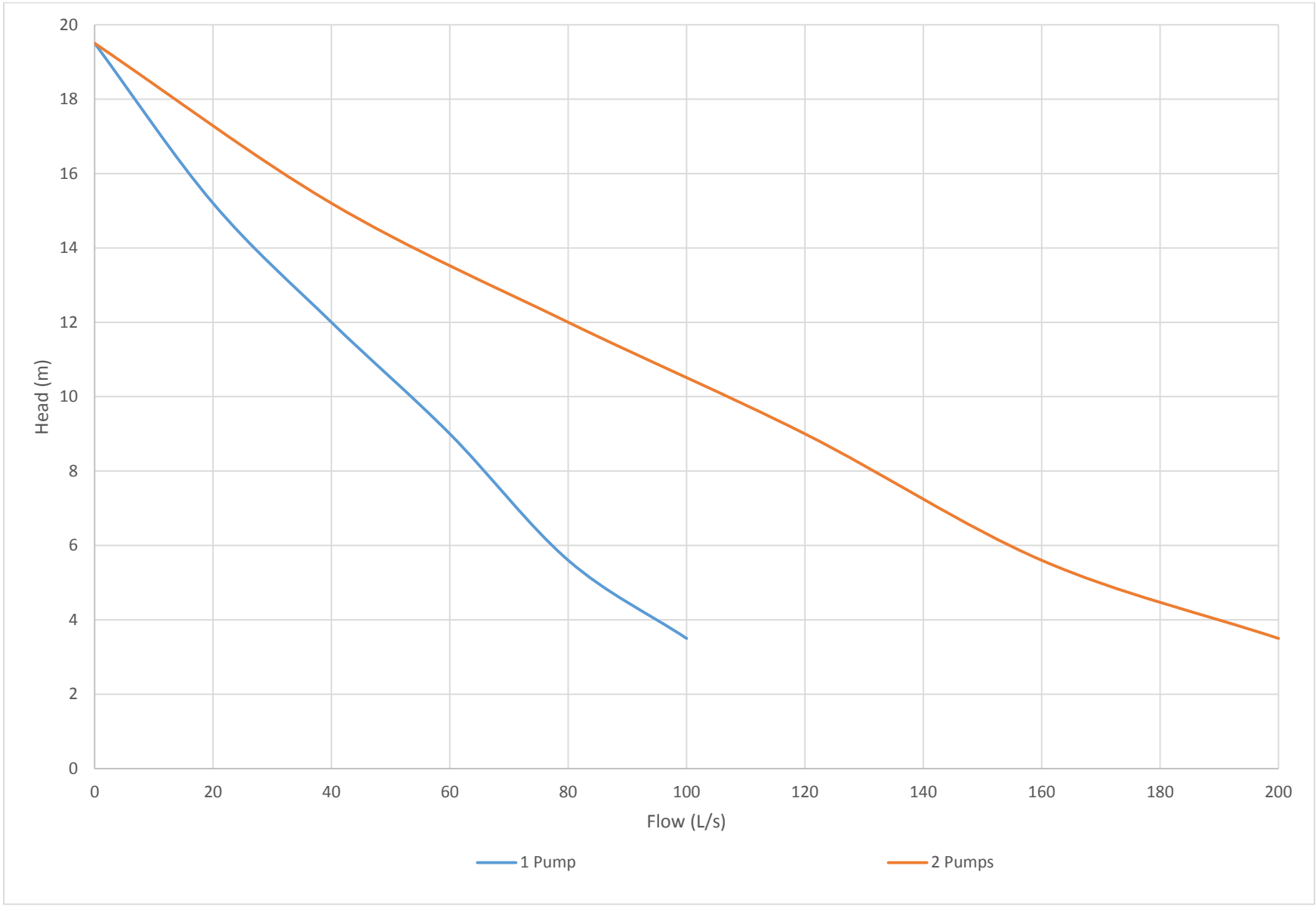
McElhanney

LIFT STATION 8 PUMP CURVES



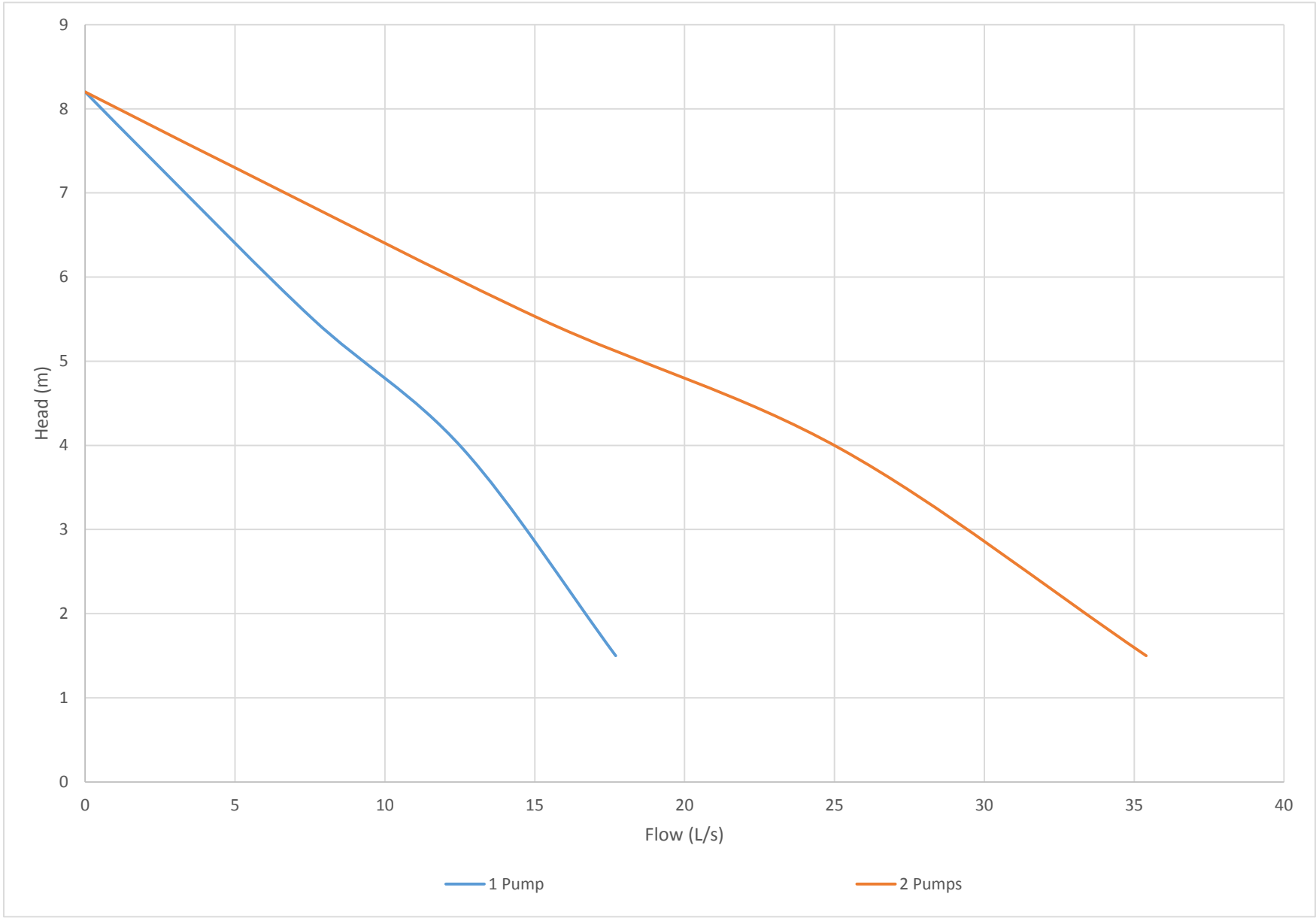
McElhanney

LIFT STATION WILLOW CREEK PUMP CURVES



McElhanney

LIFT STATION 9 PUMP CURVES



Appendix B

CAPITAL COST ESTIMATES

City of Campbell River
Waterfront Sewer Forcemain Replacement
OPTION 1 - Forcemain along Highway to 1st Av, Integrated Gravity from 1st to MHC
Class C Construction Cost Estimate

2221-48930-4.0
November, 2016

Roadworks						
Crushed Gravel Road Base (130mm thick)	2100	CM	$	80	$	168,000
Hot Mix Asphalt (100mm thick)	12500	SM	$	40	$	500,000
Over Excavation of Existing Subgrade	1	LS	$	100,000	$	100,000
				Subtotal	$	768,000
Sanitary Forcemain						
600mm HDPE (DR-21)	1377	LM	$	650	$	895,050
700mm HDPE (DR-21)	1130	LM	$	700	$	791,000
750mm HDPE (DR-21) (To 1st)	1351	LM	$	800	$	1,080,800
Dewatering Allowance	1	LS	$	50,000	$	50,000
				Subtotal	$	2,817,000
Connections to Existing Lateral Mains & Services						
Tie-in to existing forcemain at LS #7	1	LS	$	29,000	$	29,000
Convert Garnet to Gravity Main Along Hwy 19A	1	LS	$	37,000	$	37,000
LS #6	1	LS	$	32,000	$	32,000
LS #5	1	LS	$	35,000	$	35,000
Convert Pinecrest to Gravity Main Along Hwy 19A	1	LS	$	32,000	$	32,000
Evergreen	1	LS	$	55,000	$	55,000
				Subtotal	$	220,000
Fittings, Valves and Chambers						
Air Relief Valves (100mm)	2	EA	$	12,500	$	25,000
Air Relief Valves (150mm)	4	EA	$	16,500	$	66,000
Increaser (600 x 700)	1	EA	$	3,500	$	3,500
Increaser (700 x 750)	1	EA	$	3,800	$	3,800
Access Hatches	5	EA	$	16,000	$	80,000
				Subtotal	$	178,000
Lift Station Upgrades						
LS #5	1	LS	$	585,000	$	585,000
LS #6	1	LS	$	555,000	$	555,000
				Subtotal	$	1,140,000
Integrated Gravity Section (From 1st to MHC)						
750mm Concrete	850	LM	$	800	$	680,000
New Lift Station and Forcemain to service 121 to 321 Isl. Hwy	1	LS	$	175,000	$	175,000
Connect Lateral Mains from Hospital Catchment	6	EA	$	30,000	$	180,000
Services	54	EA	$	5,000	$	270,000
Manholes (1800mm)	15	EA	$	7,000	$	105,000
				Subtotal	$	1,410,000
Miscellaneous						
Mobilization & Demobilization	1	LS	$	50,000	$	50,000
Traffic Management Plan	1	LS	$	50,000	$	50,000
Remove and Replace Culverts Allowance	1	LS	$	25,000	$	25,000
Decommission Existing Forcemain	1	LS	$	50,000	$	50,000
				Subtotal	$	175,000
				Construction Cost Subtotal	$	6,708,000
Contingency						
General (25%)					$	1,677,000
Engineering, Legal, Construction, Financial and Admin (25%)					$	1,677,000
Inflation (20%)					$	1,342,000
				Total Construction Cost Estimate	**$**	**11,404,000**

City of Campbell River
Waterfront Sewer Forcemain Replacement
OPTION 2 - Forcemain on Highway to MHC (Over the Hill)
Class C Construction Cost Estimate

2221-48930-4.0
November, 2016

Roadworks						
Crushed Gravel Road Base (130mm thick)	2100	CM	$	80	$	168,000
Hot Mix Asphalt (100mm thick)	12500	SM	$	40	$	500,000
Over Excavation of Existing Subgrade	1	LS	$	100,000	$	100,000
				Subtotal	$	768,000
Sanitary Forcemain						
600mm HDPE (DR-21)	1377	LM	$	650	$	895,050
700mm HDPE (DR-21)	1130	LM	$	700	$	791,000
750mm HDPE (DR-21) (To 1st)	1351	LM	$	800	$	1,080,800
750mm HDPE (DR-21) (1st to MHC)	849	LM	$	850	$	721,650
Dewatering Allowance	1	LS	$	50,000	$	50,000
				Subtotal	$	3,539,000
Connections to Existing Lateral Mains & Services						
Tie-in to existing forcemain at LS #7	1	LS	$	29,000	$	29,000
Garnet connection to Gravity Main to LS #6	1	LS	$	37,000	$	37,000
LS #6	1	LS	$	32,000	$	32,000
LS #5	1	LS	$	35,000	$	35,000
Pinecrest connection to Gravity Main to LS #5	1	LS	$	32,000	$	32,000
Evergreen	1	LS	$	55,000	$	55,000
New Lift Station and Forcemain to service 121 to 321 Isl. Hwy	1	LS	$	175,000	$	175,000
				Subtotal	$	395,000
Fittings, Valves and Chambers						
Air Relief Valves (100mm)	2	EA	$	12,500	$	25,000
Air Relief Valves (150mm)	6	EA	$	16,500	$	99,000
Increaser (600 x 700)	1	EA	$	3,500	$	3,500
Increaser (700 x 750)	1	EA	$	3,800	$	3,800
Access Hatches	5	EA	$	16,000	$	80,000
				Subtotal	$	211,000
Lift Station Upgrades						
LS #5	1	LS	$	585,000	$	585,000
LS #6	1	LS	$	555,000	$	555,000
				Subtotal	$	1,140,000
Upgrade Gravity Main from 1st to MHC (Parallel installation)						
300mm PVC Pipe	850	LM	$	195	$	165,750
Connect Lateral Mains from Hospital Catchment	6	EA	$	20,000	$	120,000
Services	54	EA	$	5,000	$	270,000
Manholes	15	EA	$	3,500	$	52,500
Additional Paving Restoration	1700	SM	$	45	$	76,500
				Subtotal	$	684,750
Miscellaneous						
Mobilization & Demobilization	1	LS	$	50,000	$	50,000
Traffic Management Plan	1	LS	$	50,000	$	50,000
Remove and Replace Culverts Allowance	1	LS	$	25,000	$	25,000
Decommission Existing Forcemain	1	LS	$	50,000	$	50,000
				Subtotal	$	175,000
				Construction Cost Subtotal	$	6,913,000
Contingency						
General (25%)					$	1,728,000
Engineering, Legal, Construction, Financial and Admin (25%)					$	1,728,000
Inflation (20%)					$	1,383,000
				Total Construction Cost Estimate	**$**	**11,752,000**

City of Campbell River
Waterfront Sewer Forcemain Replacement
OPTION 3 - Forcemain to MHC (Highway and Beach Route)
Class C Construction Cost Estimate

2221-48930-4.0
November, 2016

Roadworks						
Crushed Gravel Road Base (130mm thick)	1500	CM	$	80	$	120,000
Hot Mix Asphalt (100mm thick)	9000	SM	$	40	$	360,000
Over Excavation of Existing Subgrade	1	LS	$	100,000	$	100,000
				Subtotal	$	580,000
Sanitary Forcemain						
600mm HDPE (DR-21)	865	LM	$	650	$	562,250
700mm HDPE (DR-21)	515	LM	$	700	$	360,500
750mm HDPE (DR-21) (To Hidden Harbour)	2020	LM	$	800	$	1,616,000
Twin 750mm (DR-21) (along beach front)	1225	LM	$	1,800	$	2,205,000
Dewatering Allowance	1	LS	$	350,000	$	350,000
				Subtotal	$	5,094,000
Connections to Existing Mains						
Tie-in to existing forcemain at LS #7	1	LS	$	29,000	$	29,000
Garnet	1	LS	$	37,000	$	37,000
LS #6	1	LS	$	32,000	$	32,000
LS #5	1	LS	$	35,000	$	35,000
Pinecrest	1	LS	$	32,000	$	32,000
Evergreen	1	LS	$	55,000	$	55,000
				Subtotal	$	220,000
Fittings, Valves and Chambers						
Air Relief Valves (100mm)	2	EA	$	12,500	$	25,000
Air Relief Valves (150mm)	7	EA	$	16,500	$	115,500
Emergency Shutoff/Isolation Valves (600mm)	4	EA	$	30,000	$	120,000
Valve Chambers	2	EA	$	75,000	$	150,000
Increaser (600 x 700)	1	EA	$	3,500	$	3,500
Increaser (700 x 750)	1	EA	$	3,800	$	3,800
Access Hatches	5	EA	$	16,000	$	80,000
				Subtotal	$	498,000
Lift Station Upgrades						
LS #5	1	LS	$	585,000	$	585,000
LS #6	1	LS	$	555,000	$	555,000
				Subtotal	$	1,140,000
Gravity Sewer Renewal Along Beach						
200mm PVC Pipe (Supply, Freight, Placement)	650	LM	$	220.00	$	143,000
200mm HDPE Pipe (Supply, Freight, Fusing)	40	LM	$	205.00	$	8,200
Manholes	17	EA	$	3,500.00	$	59,500
Tie-in Service Connections	14	EA	$	2,500.00	$	35,000
				Subtotal	$	246,000
Miscellaneous						
Mobilization & Demobilization	1	LS	$	50,000	$	50,000
Traffic Management Plan	1	LS	$	35,000	$	35,000
Habitat Restoration Allowance	1	LS	$	50,000	$	50,000
Beach Riprap Armouring	7500	CM	$	50	$	375,000
Remove and Replace Culverts Allowance	1	LS	$	25,000	$	25,000
Concrete Surround (pipe support)	90	CM	$	225	$	20,250
Replace Storm Sewer at Hidden Harbour	1	LS	$	25,000	$	25,000
Decommission Existing Forcemain	1	LS	$	50,000	$	50,000
				Subtotal	$	631,000
				Construction Cost Subtotal	$	8,409,000
Contingency						
General (25%)					$	2,102,000
Engineering, Legal, Construction, Financial and Admin (25%)					$	2,102,000
Inflation (20%)					$	1,682,000
				Total Construction Cost Estimate	**$**	**14,295,000**

Appendix C

COST SENSITIVITY ANALYSIS

SEWER SENSITIVITY ANALYSIS

A sensitivity analysis of the proposed Highway 19A sanitary sewer from Simms Creek Pumping Station (LS #7) to the existing Maritime Heritage Centre was undertaken to identify any cost savings that may be realized by utilizing a smaller diameter pipe in the expectation that actual future flows will be smaller than design flows used in the overall modelling. By varying the Dry Weather Flow (DWF) values from the current standard of 360 l/day, it is believed that smaller pumps and therefore forcemain can be used to effectively deal with the transmission of collected sewerage in the South Campbell River Area. On this basis the current standard was judged against the following DWFs:

- 300 L/Cap/Day (MMCD)
- 250 L/Cap/Day (Actual monitored flows + contingency)

The peaking factor applied to each DWF design value was 2.4, as determined by the Harmon formula. The Harmon formula determines the peaking factor based on a catchment's population and is independent of the DWF value.

The three forcemain configurations selected for the sensitivity analysis are provided in **Table 1**. The configurations were used to test the Build-Out Scenario for Option 2: The routing of the forcemain along Highway 19A for the entire length from SCPS to the Maritime Heritage Centre (MHC). The "design" forcemain was analyzed as well as two other scenarios, each with pipe diameter reductions as compared to the "design" scenario.

Table 1 – Forcemain Configurations

	LS #7 – LS #6	Garnet to LS #6	LS #6 – MHC
Design Forcemain (Alt 1)	600 mm	700 mm	750 mm
600-700 mm Forcemain (Alt 2)	600 mm	600 mm	700 mm
600 mm Forcemain (Alt 3)	600 mm	600 mm	600 mm

The result of reducing the forcemain size is an increase in system head pressures for the same flow. Thus, it takes more energy to pump the same amount of sewerage, and this may result in the need to replace the pumps at the Simms Creek Pumping Station (SCPS) with higher head pumps. The limiting factor for increasing the system pressures or Hydraulic Gradeline (HGL) in the forcemain is the connection of the Evergreen Trunk, which is a gravity connection to the forcemain at the foot of the Evergreen Road allowance. If the HGL climbs too high at this connection, the sanitary flows in the Evergreen trunk will surcharge to the surface and flood to the street. Unlike the Garnet and Pinecrest Trunks, this connection is more difficult to reroute to LS #5 and doing so would nullify any cost savings achieved by using the smaller diameter forcemain configuration. Therefore, only the viable scenarios (i.e. those that do not cause flooding via the Evergreen Trunk) are displayed in **Table 2**. Sewerage velocities in the forcemain were found to be within the acceptable range for all forcemain configurations presented herein.

Table 2 – System Hydraulic Characteristics

DWF (L/Cap/Day)	Forcemain Alternative	Pressure Head @ LS #7 (m)	Peak Flow @ LS #7 (L/s)	Peak Flows @ MHC (L/s)
360	Alt 1	32.3	580	625
	Alt 2	36.0		
300	Alt 1	30.5	520	570
	Alt 2	33.5		
250	Alt 1	27.8	435	470
	Alt 2	28.2		
	Alt 3	32.3		

From the assessment it can be seen that a reduction of the forcemain to 600mm diameter will only be feasible if the DWF is reduced to 250 l/cap/day, and the reduction of the forcemain to a 600-700mm combination, rather than the design 600-700-750mm combination has only a minor impact on system hydraulics for either the 300 or 360 l/cap/day flow scenarios. Since DWF is only part of the inflow equation, the other part being Inflow & Infiltration (I&I) allowance, the overall reduction in system flows is only a fraction of the DWF reduction.

PIPE SIZING PRICING ASSESSMENT

Tables 3, 4 & 5 provide cost estimates for the three different forcemain configurations. With the selection of a lower DWF design value, capital cost savings can be realized due to the possibility of selecting one of the reduced pipe diameter forcemain configurations.

Table 3 – Alt 1: Design Forcemain Pricing

Size (mm)	Supply HDPE DR 21	Freight	Length (m)	Cost
600	$ 139.67 /m	$ 15.50 /m	1300	$ 202 000
700	$ 190.13 /m	$ 23.58 /m	1130	$ 241 000
750	$ 218.25 /m	$ 23.78 /m	2200	$ 532 000
			Total Cost	$ 975 000

Table 4 – Alt 2: 600 mm/700 mm Forcemain Pricing

Size (mm)	Supply HDPE DR 21	Freight	Length (m)	Cost
600	$ 139.67 /m	$ 15.50 /m	2430	$ 377 000
700	$ 190.13 /m	$ 23.58 /m	2200	$ 470 000
			Total Cost	$ 847 000

Table 5 – 600 mm Forcemain Pricing

Size (mm)	Supply HDPE DR 21	Freight	Length (m)	Cost
600	$ 139.67 /m	$ 15.50 /m	4630	$ 718 000
			Total Cost	$ 718 000

Table 6 – Comparative Savings Relative to Design Forcemain

Forcemain Selection	Total Cost	Total Cost Design Forcemain	Total Savings
600 mm/700 mm	$ 847 000	$ 975 000	$ 128 000
600 mm	$ 718 000	$ 975 000	$ 257 000

The projected total capital cost for the forcemain renewal project is greater than $10,000,000, so the comparative cost savings are 2.5% or less of the overall cost.

Based on the limited hydraulic benefits and relatively minor cost saving, it would be prudent to maintain the design configuration for the forcemain, which will allow the growth of Campbell River to build-out and would provide a sufficient level of conservatism to allow for other inputs, such as additional flows from the south end of the City or higher levels of densification in the south area catchment.

Appendix D

LIFE CYCLE COST ANALYSIS

Life Cycle Costs - Option 1

FORESHORE FORCEMAIN PROJECT

DISCOUNT RATE - 3%, Expected Growth Scenario

Economic Life	50	years
Interest Rate:	5	%
O & M Escalation:	2	%
Discount Rate:	3	%
Energy Usage Escalation:	2	%

CAPITAL COSTS

	Estimated Cost	Project Year	Net Present Value
Roadworks	$ 768,000	2015	-$768,000
Sanitary Forcemain	$ 2,817,000	2015	-$2,817,000
Connections to Existing Mains	$ 220,000	2015	-$220,000
Fittings, Valves and Chambers	$ 178,000	2015	-$178,000
Lift Station Upgrades	$ 1,140,000	2015	-$1,140,000
Integrated Section (From 1st to MHC)	$ 1,410,000	2015	-$1,410,000
Miscellaneous	$ 175,000	2015	-$175,000
Contingency	$ 4,696,000	2015	-$4,696,000
Subtotal			-$11,404,000

OPERATION & MAINTENANCE COSTS

	Percent of Capital	Estimated Component Cost	Annual Cost	Year	Net Present Value
Forcemain	1.00%	$ 2,817,000	$ 28,170	N/A	-$724,807
Gravity Section	1.00%	$ 1,410,000	$ 14,100	N/A	-$362,790
Replace Pumps		$ 400,000		2027	-$280,552
Replace Pumps		$ 400,000		2042	-$180,076
Replace Pumps		$ 400,000		2057	-$115,584
Subtotal			$ 42,270		-$1,664,000

ENERGY USAGE COSTS

	Daily Usage (kW-Hr)	Rate ($ / kW-Hr)	Annual Cost	Net Present Value
Forcemain	1,703	$0.10	$ 62,165	-$1,953,455
Subtotal			$ 62,165	-$1,953,000

NET PRESENT VALUE COSTS -$15,021,000

Life Cycle Costs - Option 2

FORESHORE FORCEMAIN PROJECT

DISCOUNT RATE - 3%, Expected Growth Scenario

Economic Life	50	years
Interest Rate:	5	%
O & M Escalation:	2	%
Discount Rate:	3	%
Energy Usage Escalation:	2	%

CAPITAL COSTS

	Estimated Cost	Project Year	Net Present Value
Roadworks	$ 768,000	2015	-$768,000
Sanitary Forcemain	$ 3,539,000	2015	-$3,539,000
Connections to Existing Mains	$ 395,000	2015	-$395,000
Fittings, Valves and Chambers	$ 211,000	2015	-$211,000
Lift Station Upgrades	$ 1,140,000	2015	-$1,140,000
New Gravity Main from 1st to MHC	$ 684,750	2015	-$684,750
Miscellaneous	$ 175,000	2015	-$175,000
Contingency	$ 4,839,000	2015	-$4,839,000
Subtotal			-$11,752,000

OPERATION & MAINTENANCE COSTS

	Percent of Capital	Estimated Component Cost	Annual Cost	Year	Net Present Value
Forcemain	1.00%	$ 3,539,000	$ 35,390	N/A	-$910,576
Replace Pumps		$ 400,000		2027	-$280,552
Replace Pumps		$ 400,000		2042	-$180,076
Replace Pumps		$ 400,000		2057	-$115,584
Subtotal			$ 35,390		-$1,487,000

ENERGY USAGE COSTS

	Daily Usage (kW-Hr)	Rate ($ / kW-Hr)	Annual Cost	Net Present Value
Forcemain	1,667	$0.10	$ 60,863	-$1,912,532
Subtotal			$ 60,863	-$1,913,000

NET PRESENT VALUE COSTS -$15,152,000

Life Cycle Costs - Option 3

FORESHORE FORCEMAIN PROJECT

DISCOUNT RATE - 3%, Expected Growth Scenario

Economic Life	50	years
Interest Rate:	5	%
O & M Escalation:	2	%
Discount Rate:	3	%
Energy Usage Escalation:	2	%

CAPITAL COSTS

	Estimated Cost	Project Year	Net Present Value
Roadworks	$ 580,000	2015	-$580,000
Sanitary Forcemain	$ 5,094,000	2015	-$5,094,000
Connections to Existing Mains	$ 220,000	2015	-$220,000
Fittings, Valves and Chambers	$ 498,000	2015	-$498,000
Lift Station Upgrades	$ 1,140,000	2015	-$1,140,000
Gravity Sewer Renewal Along Beach	$ 246,000	2015	-$246,000
Miscellaneous	$ 631,000	2015	-$631,000
Contingency	$ 5,886,000	2015	-$5,886,000
Subtotal			-$14,295,000

OPERATION & MAINTENANCE COSTS

	Percent of Capital	Estimated Component Cost	Annual Cost	Year	Net Present Value
Forcemain	1.00%	$ 5,094,000	$ 50,940	N/A	-$1,310,674
Gravity Mains	1.00%	$ 246,000	$ 2,460	N/A	-$63,295
Replace Pumps		$ 250,000		2027	-$175,345
Replace Pumps		$ 250,000		2042	-$112,547
Replace Pumps		$ 250,000		2057	-$72,240
Subtotal			$ 53,400		-$1,734,000

ENERGY USAGE COSTS

	Daily Usage (kW-Hr)	Rate ($ / kW-Hr)	Annual Cost	Net Present Value
Forcemain	695	$0.10	$ 25,358	-$796,844
Subtotal			$ 25,358	-$797,000

NET PRESENT VALUE COSTS -$16,826,000