CRD Wastewater Treatment Project

Project Completion Report

Reporting Period: May 2016 to May 2021

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1 Executive Summary

1.1 Wastewater Treatment Project

The Wastewater Treatment Project (the Project) provides tertiary treatment of wastewater from the core area municipalities of Victoria, Esquimalt, Saanich, Oak Bay, View Royal, Langford and Colwood, and the Esquimalt and Songhees Nations.

The Wastewater Treatment Project was built to meet the provincial and federal regulations for treatment by December 31, 2020. The Project consists of three main components:

- McLoughlin Point Wastewater Treatment Plant: located at McLoughlin Point in Esquimalt, the treatment plant provides tertiary treatment to the core area's wastewater.
- Residuals Treatment Facility: residual solids from the wastewater treatment plant are piped to a Residuals Treatment Facility at Hartland Landfill, where they are turned into what are known as Class A biosolids. These biosolids are a high-quality byproduct treated such that it is safe for further use.
- Conveyance System: the conveyance system refers to the 'pumps and pipes' of the Wastewater Treatment Project. This system carries wastewater from across the core area to the treatment plant, and residual solids to the Residuals Treatment Facility at Hartland Landfill, and also includes an attenuation tank that temporarily stores wastewater flows during high volume storm events to reduce the number of sewer overflows.

The Capital Regional District (the CRD) planned, procured and constructed the Wastewater Treatment Project over the period from May 2016 to May 2021, with some obligations remaining to be fulfilled beyond that date, as summarised in Section 7 of this report. The federal and provincial governments assisted the Capital Regional District in funding the project.

1.2 Project Performance

1.2.1 Achievement of Project Goals

The CRD Board established the following four goals for the Wastewater Treatment Project:

- Meet or exceed federal regulations for secondary treatment by December 31, 2020.
- Minimize costs to residents and businesses (lifecycle costs) and provide value for money.
- Optimize opportunities for resource recovery and greenhouse gas reduction.
- Deliver a solution that adds value to the surrounding community and enhances the liveability of neighbourhoods.

The Wastewater Treatment Project met all four of these goals.

The McLoughlin Point Wastewater Treatment Plant met and exceeded federal regulations when it commenced treating the Core Area’s wastewater to a tertiary level before December 31, 2020. Lifecycle costs were considered at every stage of Project planning and delivery in order to minimize the costs to residents and businesses, and provide value for money. By way of example:

- Starting at the planning stage, a cost effective Project scope and configuration were selected and funding agreements were executed with senior levels of government for a significant portion (60%) of the Project's total cost;
- During the procurement stage competitive selection processes were used to ensure competitive pricing was received for the construction of the Project, and the lifecycle costs of the Project's facilities were evaluated as part of those procurements;
- Lifecycle costs were also considered during design development; and
- Proactive risk management was undertaken at every stage of Project delivery.

Environmental considerations were part of every major decision for the Project, with the result that:

- residual solids produced by the McLoughlin Point Wastewater Treatment Plant are processed into Class A biosolids at the Residuals Treatment Facility: this is the highest quality product allowing for the broadest range of beneficial uses; and
- the design of each of the new major Project facilities (being the McLoughlin Point Wastewater Treatment Plant, the Residuals Treatment Facility and the Macaulay and Craigflower Pump Stations) incorporated Leadership in Energy and Environmental Design (LEED) principles.

To enhance the livability of neighbourhoods, the Wastewater Treatment Project worked with the surrounding communities to identify amenities and/or infrastructure improvements that were either funded by the Project, or funded and delivered by the Project. In addition and in order to minimize the impact of the Project on host communities, all Project components include advanced odour treatment such that there will be no discernible odour by residents.

Section 5.1 of this report provides more detail regarding how each of the Project's goals were achieved.

1.2.2 Key Performance Indicators at Project Completion

The realization of the Project's vision and goals was monitored against the key performance indicators approved by the Project Board. The Project Director reported performance against these key performance indicators to the Project Board on a monthly basis, and their status at Project Completion has been assessed to be as shown in Table 1.

Safety was the Project's top priority: safety of the public, construction workers and CRD staff, including those responsible for delivery of the Project and for its ongoing operation and maintenance. As of May 2021, the vast majority of construction has been completed (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining) with zero fatalities and a safety-first culture maintained within the CRD and all Project Contractors.

Schedule was a critical Project driver, specifically the need to meet or exceed federal regulations for secondary treatment by December 31, 2020. As already noted, the McLoughlin Point Wastewater Treatment Plant met and exceeded federal regulations when it commenced treating the Core Area's wastewater to a tertiary level before December 31, 2020, and, through the addition of the Project components to the core area wastewater system, the system can be operated in compliance with provincial and federal wastewater regulations.

Cost was an important consideration throughout Project planning and delivery. While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur

in the last quarter of 2021, it is forecast that the total Project cost will be approximately $766.7M, which is within the approved budget of $775M. The total Project cost is therefore forecast to exceed the Project's Control Budget (of $765M) by 0.2%, but be well within the budget subsequently-approved by the CRD Board (of $775M).

Over the period of Project delivery, budget pressures included inflation in the cost of labour and materials and design changes from stakeholder input. Considering the constraints of the Project's schedule (which necessarily required an ambitious schedule in order to meet the federal regulations for treatment of wastewater by December 31, 2020) and the onset and continuation of a global health pandemic over the final year of the Project's construction schedule, delivering the Project within 0.2% of the Project's original budget is a significant achievement.

Table 1 – Status of Key Performance Indicators at Project Completion

Key Performance Indicator			Comments
Safety	Deliver the Project safely with zero fatalities and a total recordable incident frequency (TRIF) of no more than 1*.		As of May 2021, the vast majority of construction has been completed (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining), there have been zero fatalities and the TRIF was 1.5. While this exceeds the Project's ambitious target of no more than 1, it was less than half the industry average: WorkSafe BC records the TRIF for various industries, and for 2018 (the most recent year for which information has been published) the TRIF for heavy construction was 3.2.
Environment	Protect the environment by meeting all legislated environmental requirements and optimizing opportunities for resource recovery and greenhouse gas reduction.		The Project met all legislated environmental requirements and, through the design of the various components optimized opportunities for resource recovery and greenhouse gas reduction. Over the course of construction there were a relatively small number of environmental incidents: they were all diligently-managed, appropriately-reported and mitigated as required, with the result that there weren't any long-term impacts. An unexpectedly-significant environmental benefit of the Project included the remediation of McLoughlin Point.
Regulatory Requirements	Deliver the Project such that the Core Area complies with provincial and federal wastewater regulations.		Through the addition of the Project components to the core area wastewater system, the system can be operated in compliance with provincial and federal wastewater regulations.
Stakeholders	Continue to build and maintain positive relationships with First Nations, local governments, communities, and other stakeholders.		Significant efforts were made to engage with and provide accurate and timely information to stakeholders throughout the delivery of the Project. Through these efforts and the achievement of the Project's goals, positive relationships were built and maintained with First Nations, local governments, communities, and other stakeholders.
Schedule	Deliver the Project by December 31, 2020.		The Project completed the majority of construction by December 31, 2020, and achieved its schedule-related goal, which was to meet or exceed federal regulations for secondary treatment of wastewater by December 31, 2020. All aspects of the Project that were required to meet the regulatory requirements were delivered by December 31, 2020. As of May 2021, commissioning of the Residuals Treatment Facility is ongoing and is anticipated to be complete in June 2021, and the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining.
Cost	Deliver the Project within the Control Budget ($765 million).		While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur in the last quarter of 2021, it is forecast that the total Project cost will be approximately $766.7M, which is within the approved budget of $775M. The total Project cost is therefore forecast to exceed the Project's Control Budget (of $765M) by 0.2%, but be well within the budget subsequently-approved by the CRD Board (of $775M).

* A TRIF of no more than 1 means that there is 1 or fewer recordable incidents (being a work-related injury or illness that requires medical treatment beyond first aid or causes death, days away from work, restricted work or transfer to another job, or loss of consciousness) for every 200,000 person-hours of work

Status	Description
	Significant adverse effect of KPI not being met
	KPI not met but outcome managed
	KPI achieved

Section 5.2 of this report provides more detail regarding Project delivery with respect to the Project's key performance indicators.

1.3 Purpose of this Project Completion Report

The purpose of this Project Completion Report is to mark the completion of the Wastewater Treatment Project by:

- assessing the Project's performance against the goals established by the CRD Board (see section 5.1) and the key performance indicators approved by the Project Board (see section 5.2);
- identifying variances from the baseline plans prepared by the Project Board and/or Project Team, in terms of the Project's scope (see section 4), schedule (see section 5.2.5) and cost (see section 5.2.6);
- identifying Project successes and challenges (see section 6); and
- outlining the Project-related commitments and activities that extend beyond May 2021 (see section 7).

Note that another document (the Governance Transition Report) provides more details regarding the project closure activities that have been completed to-date, and the Project-related commitments that extend beyond May 2021.

2 Project Context

2.1 Project Need

The Capital Regional District (CRD) was incorporated in 1966 to provide regional decision-making on issues that transcend municipal boundaries and to enable effective service delivery to residents regionally, sub-regionally and locally. Today, the CRD is the regional government for 13 municipalities and three electoral areas on southern Vancouver Island and the Gulf Islands, serving more than 425,000 people.

The Core Area of the CRD includes seven municipalities and two First Nations within the CRD with a total land area of approximately 215 km^2. The Core Area communities are the Cities of Victoria, Langford, and Colwood, the Districts of Oak Bay and Saanich, the Township of Esquimalt, the Town of View Royal, and the Songhees and Esquimalt Nations. One of the services that the CRD provides for the Core Area is the regional sewage system, which serves a population of approximately 320,000 (as estimated in 2019) in the Core Area.

Until 2020, all wastewater from the Core Area was conveyed to preliminary treatment facilities at Clover Point in Victoria and Macaulay Point in Esquimalt, where it was screened prior to marine discharge. Preliminary treatment was provided by 6 mm fine screening to remove rocks and solids, plastic, and floatable materials. The removed materials were trucked to, and disposed of, at the Hartland Landfill. No other treatment occurred prior to the wastewater being discharged into the marine environment from one of two outfalls, located at Clover Point and Macaulay Point. The CRD was the last major coastal community in North America discharging untreated sewage into the marine environment.

Provincial Municipal Wastewater Regulations (“MWR”) under the Environmental Management Act came into effect in 2012 to, “protect public health and the environment”. The Municipal Wastewater Regulations prescribes the minimum standards of municipal wastewater quality for marine water, fresh water, or ground discharge.

Federal Wastewater System Effluent Regulations (“WSER”) under the Fisheries Act also prescribe effluent quality performance standards. WSER's objective is to decrease the level of deleterious and harmful substances discharged through wastewater effluent. Facilities discharging effluent quality not equivalent to or better than the secondary treatment performance standards are required to be upgraded. Facilities considered high risk, such as those at Macaulay Point and Clover Point were required to be upgraded by December 31, 2020, in accordance with the deadline set out in the transitional authorizations for those facilities.

Failure to comply with the WSER and the MWR could have resulted in regulatory enforcement action in the form of prosecution, fines, imprisonment, and other remedial penalties.

2.2 First Nations

The Core Area, and therefore the Project components, lie within or near the traditional territories of 16 First Nations.

The First Nations most closely associated with the Wastewater Treatment Project are the Esquimalt and Songhees. Their communities are located in the Core Area within close proximity to the McLoughlin Point Wastewater Treatment Plant and other Project components. The

Esquimalt and Songhees First Nations are participants in the Core Area Liquid Wastewater Service and the CRD is currently establishing updated service agreements with the Nations.

There are four First Nations with communities near the Core Area, but outside the Core Area wastewater system. They are the Tsawout, Tseycum, Tsartlip, and Pauquachin (the W̱SÁNEĆ Nations). The Residuals Treatment Facility and parts of the Conveyance System are located within their traditional territories.

Additionally, there are ten other First Nations with Treaty rights in the general vicinity of the Core Area, which are primarily fishing rights in the Strait of Juan de Fuca. These Nations are the Scia'new (Beecher Bay), Stz'uminus, Halalt, Penelakut Tribe, T'Sou-ke, Lyackson, MÁLEXEŁ (Malahat), Lake Cowichan, Cowichan Tribes, and Nanoose First Nation (which is included because it is represented by a tribal association, the Te'mexw Treaty Association, which was formed by some of these Nations).

3 Project Delivery

3.1 Governance

3.1.1 CRD Board

The CRD is governed by a 24-member Board of Directors, composed of one or more elected official from each of the local governments within the CRD's boundaries.

In order to meet federal and provincial wastewater regulations, on May 25, 2016 the Regional Board of the CRD (the “CRD Board”) established the Wastewater Treatment Project Board (the “Project Board”) under Bylaw 4109 (the “CRD Core Area Wastewater Treatment Board Bylaw No. 1, 2016”) for the purposes of administering the Project. The CRD Board adopted by resolution terms of reference (“Terms of Reference”) for the Project Board for the purposes of establishing principles governing the Project. The Terms of Reference are attached as Schedule “A” to the CRD Core Area Wastewater Treatment Board Bylaw No. 1, 2016. The CRD Board asked the Project Board to review the wastewater treatment issues and, by September 2016, recommend to the CRD and senior levels of government a plan to comply with the law and to preserve senior government funding.

On May 25, 2016 the CRD Board also delegated certain of its powers, duties and functions to the Project Board under Bylaw 4110 (the “CRD Core Area Wastewater Treatment Project Board Delegation Bylaw No. 1, 2016”). Notwithstanding the delegation of authority from the CRD Board to the Project Board, the delegation bylaw included the requirement that approval from the CRD Board would be required for any alteration to the scope, schedule or budget of the Project that would result in the Project not meeting provincial and federal regulations governing the Project, exceeding approved funding for the Project, or increasing costs to taxpayers from those stated in the Business Case.

The CRD Board had previously established the CRD Core Area Liquid Waste Management Committee (“CALWMC”) to oversee and make recommendations to the CRD Board regarding the Core Area Liquid Waste Management Plan, and progress on the Project was reported to the CRD Board through the CALWMC.

3.1.1.1 Project Vision and Goals

The Project Board’s Terms of Reference (as established by the CRD Board) included the following vision for the Project:

- Deliver a sewage treatment and resource recovery system that is innovative, achievable and optimizes benefits - economic, social and environmental (including climate change mitigation) - for the long term.
- Approach the Project from the perspective that waste materials should be treated as resources and managed as such, with a long term objective to create a system that supports the principles of Integrated Resource Management (“IRM”).
- Give consideration to, and reflect, public input received with an objective of being responsive to community values and concerns.

The Terms of Reference included the following goals to support achieving the vision:

- Meet or exceed federal regulations for secondary treatment by December 31, 2020.

- Minimize costs to residents and businesses (lifecycle costs) and provide value for money.
- Optimize opportunities for resource recovery and greenhouse gas reduction.
- Deliver a solution that adds value to the surrounding community and enhances the liveability of neighbourhoods.

3.1.2 Project Board

In accordance with the bylaw that established it (the "CRD Core Area Wastewater Treatment Board Bylaw No. 1, 2016"), the Project Board consisted of seven members appointed by the CRD Board, one of whom was the Chief Administrative Officer of the CRD.

The Project Board's role and function as defined in the Terms of Reference was as follows:

- Be responsible for overall planning, Project management, site acquisition, expenditures, and liquid waste management planning for the purposes of the Project.
- Select a Project Director to oversee all aspects of the Project.
- Provide direction and guidance to the Project Director on Project matters, including the development of a decision making framework, business priorities, strategies and resource approval, and appropriate Project controls and reporting procedures.
- Manage the development of a comprehensive Business Case for submission to the federal and provincial governments to confirm funding to proceed to Project implementation.
- Appoint or confirm advisors including fairness advisor and conflict of interest adjudicator.
- Oversee Project scope, schedule and budget as the Project progresses through planning, procurement and implementation phases, with particular attention to risk identification and risk management.
- Work with the Project Director to resolve material issues that may arise over the course of the Project.
- Oversee Project communications, information and consultation activities.

3.1.2.1 Final Report and Business Case

Upon establishment, the Project Board heard delegations and presentations from the public, industry professionals, and a CRD Director. The Project Board Chair and Vice Chair also met with staff from the CRD and all of the Core Area municipalities, and with Esquimalt and Songhees Nations representatives.

The Project Board reviewed the previous technical work and extensive public commentary and developed a methodology to review and evaluate all options. This methodology included evaluation of a large number of options to identify a short list that best addressed the Project goals.

The Project Board developed detailed cost estimates for the short-listed options, ranked the short list using triple bottom line (economic, social and environmental) criteria, and identified the best option. This option was the basis of the final report of the Project Board with respect to its recommendation for the Project, dated September 7, 2016 (the "Final Report").

On September 14, 2016 the CRD Board received the Final Report and approved the business case attached as Appendix 1 (the "Business Case") to the Final Report. The Business Case defined the scope of the Project and established the control budget of $765 million (the "Control Budget").

Following the CRD Board's approval of the Business Case, the CRD submitted amendment number 11 ("Amendment 11") to the Core Area Liquid Waste Management Plan ("CALWMP") to the British Columbia Ministry of Environment. The CALWMP is a 25-year plan under the Environmental Management Act which outlines the CRD's wastewater management strategies, including wastewater treatment.

On September 30, 2016, the British Columbia Ministry of Environment provided conditional approval of Amendment 11 to the CALWMP, and on November 18, 2016 provided a revised conditional approval that superseded the September 30, 2016 approval. The November 18, 2016 conditional approval clarified: that primary treatment is to be guaranteed for Clover Point catchment flows of up to three times average dry weather flows[1]; and that a definitive plan providing a solution for the beneficial use of biosolids that does not incorporate multi-year storage of biosolids within a biocell was to be submitted to the British Columbia Ministry of Environment by June 30, 2019. The November 18, 2016 conditional approval further mandated that the CRD's solution for the beneficial use of biosolids meet the requirements for beneficial use specified in the Canadian Council of Ministers of the Environment 'Canada-Wide Approach for the Management of Wastewater Biosolids' (October 11, 2012).

The CRD therefore needed to develop a definitive plan for the beneficial use of the biosolids to be produced at the Residuals Treatment Facility, that met the requirements of the British Columbia Ministry of Environment's conditional approval.

Once the Project had concluded the procurement for the Residuals Treatment Facility, the nature of the biosolids to be beneficially-used was known. At that point the CRD undertook a process (separate to the Project and based on the nature of the biosolids to be produced by the Residuals Treatment Facility) with the participation of municipalities and First Nations, to review its regional waste management policy and develop a definitive plan for the beneficial use of biosolids and integrated resource management.

3.1.3 Project Director

In accordance with the CRD Core Area Wastewater Treatment Project Board Delegation Bylaw No. 1, 2016, in December 2016 the Project Board appointed a Project Director to oversee all aspects of the Project. In accordance with the Terms of Reference, the Project Director was responsible for leading a Project team to plan, procure, and implement the Project.

The Project Board also appointed a Deputy Project Director. The Project Director and Deputy Project Director were delegated authority in accordance with Bylaw 4186 (the "CRD Delegation Bylaw No. 1, 2017"), which delegates to the CRD's officers and employees the authority to acquire and purchase goods and services on behalf of the CRD, subject to the CRD's purchasing policies and procedures, and signing authority limitations.

[1] The average dry weather flow (ADWF) is the average daily flow during the dry weather season: the average dry weather season for the core area is from June 1 to August 31.

3.2 Project Delivery Strategy

3.2.1 Project Team

In accordance with the Terms of Reference, the Project Director assembled a Project team:

- to carry out the work of the Project on behalf of the Project Board; and
- that included the relevant expertise required for the Project, including financial, technical, estimating, communication and consultation, procurement and legal expertise.

The Terms of Reference noted that membership of the team was to reflect the requirements of the work at a particular time and may change over time. The Project Director established the Project Team based on the contracting strategies outlined in Table 2 (in the following sub-section). The composition of the Project Team is outlined in the Project Management Plan, and was supported by consultants as required to provide specialist expertise and balance the changing resource needs over the course of Project delivery.

The Project Team reported directly to the Project Director and Deputy Project Director and as part of their overall Project execution and delivery responsibilities had the following duties:

- Project execution and delivery;
- Stakeholder relations, communication management and reporting;
- Project controls, including document control, cost control, schedule, risk management and reporting;
- Financial management, primarily through integration with CRD's Finance Department, including for: cash flow management, payment processing, and financial controls;
- Managing scope and monitoring engineering and construction activities;
- Overseeing the Project contractors' safety, environmental and quality performance; and
- Integrating with CRD departments throughout the delivery of the Project.

The Project Director determined that it would be useful for the Project Team to refer to guidance documents as they delivered the Project, and to this end the following documents were prepared by the Project Team and approved by the Project Board:

- Project Charter: the Project Charter included the Project's goals (as defined by the CRD Board), and established the parameters and mandate for the Project Team to execute and deliver the Wastewater Treatment Project, including key performance indicators against which delivery of the Project could be assessed. The Project Charter was first approved by the Project Board on April 4, 2017, and was subsequently updated twice to account for progress made on delivering the Project, with each update approved by the Project Board (on April 27, 2018 and September 30, 2019).

- Project Management Plan: the Project Management Plan specified the project management objectives and approaches intended to be used to achieve the key performance indicators (as established in the Project Charter); and stated the key organizational roles and responsibilities anticipated to be required to provide effective management, administration and control of the Project. The Project Management Plan was approved by the Project Board on September 26, 2018.

- Risk Management Plan: the Project's Risk Management Plan included the risk management process, roles and responsibilities, management escalation hierarchy and requirements for risk meetings and reporting cycles, in order to direct and empower the Project Team to: develop and maintain a 'risk aware' culture; provide a comprehensive risk identification and control process; and to proactively forecast and report on risks. The Project's Risk Management Plan was approved by the Project Board on March 29, 2018.
- Communications and Engagement Plan: the Project's Communications and Engagement Plan defined the Project's communications and engagement goals, described the communications and engagement activities and described the roles and responsibilities of the Project's Communications and Engagement Team, which included CRD staff, consultants and representatives from the contractors for each component of the Project. The Project's Communications and Engagement Plan was first approved by the Project Board on April 4, 2017, and was subsequently updated twice to account for progress made on delivering the Project, with each update approved by the Project Board (on July 26, 2018 and July 25, 2019).

3.2.2 Prime Contractors

Given the risk profile, overall scale and diverse scope, the Project Board determined that the Project would be delivered through a number of contracts with a variety of contracting strategies, and in the Business Case outlined the rationale for: the McLoughlin Point Wastewater Treatment Plant to be delivered through a design-build-finance contract; the Residuals Treatment Facility to be delivered through a design-build-finance-operate-maintain contract; the Macaulay and Clover Point Pump Stations to be delivered through design-build contracts, and the remainder of the conveyance system to be delivered through design-bid-build contracts. The Project Team determined the packaging for the conveyance system, with consideration of: market capacity; the design, construction and commissioning schedule for each aspect of the conveyance system; and the interfaces between each Project component. The selected contracting and packaging strategy is outlined in Table 2.

The Project Team ran competitive selection processes to select a construction contractor for each Project component. The procurements were open for any interested party to participate in, were advertised on BC Bid (a website that allows public sector organizations to advertise opportunities for contracts for a wide range of goods and services), and followed CRD's purchasing policy as applicable to the procurement. The construction contractors selected through these processes are summarised in Table 2.

In order to manage scope and interface risks the Project Team used a single owner's engineer to develop the indicative design for all critical Project components with significant interfaces. The indicative design formed the basis for defining the key interfaces between Project components. Stantec were retained as the owner's engineer for the overall Project, as they had been engaged by the CRD during an earlier stage of Project development. In addition and as shown in Table 2, the Project Team retained a design consultant for each Project component delivered through a design-bid-build contract.

Table 2 – Contracting Strategy, Design Consultant and Construction Contractor

Project Component	Contract	Contracting Strategy	Design Consultant	Construction Contractor
McLoughlin Point Wastewater Treatment Plant	McLoughlin Point Wastewater Treatment Plant	Design-build-finance	Harbour Resource Partners (Graham Infrastructure and AECOM Canada)	
Residuals Treatment Facility	Residuals Treatment Facility	Design-build-finance-operate-maintain	Hartland Resource Management Group (Synagro Capital, Maple Reinders PPP Ltd., Bird Construction Inc.)	
Conveyance System	Clover Point Pump Station	Design-build	Kenaidan Contracting Ltd.	
	Clover Forcemain	Design-bid-build	Kerr Wood Leidal	Windley Contracting Ltd.
	Macaulay Point Pump Station & Forcemain	Design-build	Kenaidan Contracting Ltd.	
	Craigflower Pump Station[2]	Design-bid-build	Associated Engineering	Jacob Bros Construction
	Residual Solids Conveyance Line	Design-bid-build	Parsons	Don Mann Excavating Ltd.
	Residual Solids Pump Stations	Design-bid-build	Parsons	Knappett Projects Inc.
	Arbutus Attenuation Tank	Design-bid-build	Kerr Wood Leidal	NAC Constructors Ltd.
	Trent Forcemain	Design-bid-build	Stantec	Jacob Bros Construction

3.2.3 CRD Integration and Support

CRD integration and support was critical to the successful delivery of the Project. The Project Board and Project Team completed the tasks delegated to them with:

- ongoing co-ordination between the Project Team and the two CRD departments that have responsibilities for commissioned Project components, being:
  - the CRD's Integrated Water Services department, who are responsible for the operation and maintenance of all Project components (upon commissioning) other than the Residuals Treatment Facility; and
  - the CRD's Parks and Environmental Services department, who are responsible for: the CRD's Core Area Liquid Waste Management Plan; the environmental monitoring and regulatory compliance reporting for the core area wastewater system; and the administration of the Residuals Treatment Facility contract post May 2021; and

[2] The Craigflower Pump Station was delivered by the CRD between 2013 and 2015, before the Project Board were established.

- the support of many CRD departments, including Corporate Communications, First Nations Relations, Human Resources, Legislative and Corporate Services, and Finance and Technology.

The CRD integration and support occurred through various avenues, including the following:

- The Chief Administrative Officer's appointment as a member of the Project Board;
- Monthly executive leadership meetings attended by the Project Director, Deputy Project Director and the CRD's Chief Administrative Officer, Chief Financial Officer, and General Managers of Parks and Environmental Services and Integrated Water Services;
- Monthly project coordination meetings attended by Project Team members and members of relevant CRD departments, including Integrated Water Services, Parks and Environmental Services, First Nations Relations, and Properties;
- The participation in design review and hazard and operability workshops of members of the Integrated Water Services and Parks and Environmental Services departments;
- The review of contract submittals (e.g. operating plans) by members of the Integrated Water Services and Parks and Environmental Services departments; and
- Interaction between designated CRD and Project Team personnel responsible for ensuring integration on specific subjects, as outlined in Appendix 3 of the Project Management Plan.

Particular support and integration was provided by the following CRD individuals and departments:

- The CRD's Chief Financial Officer - both directly and through finance staff seconded to the Project Team and through information technology support - was responsible for:
    - ensuring compliance with local government financial reporting requirements;
    - coordinating with the Project Team's Finance Manager to efficiently structure Project cash flows and financing;
    - seeking the CRD Board's approval for the means by which the Project's cash flow and financing needs were met;
    - shaping the overall financing strategy of the Project; and
    - providing information technology support to the Project.
- The CRD's Senior Manager, Human Resources and Corporate Safety was responsible for all aspects of human resources, labour relations, organizational development, and occupational health and safety leadership, direction and support for the CRD. Specific to the Project:
    - all matters regarding employment were overseen by the CRD's Human Resources and Corporate Safety division, under the direction of the CRD's Senior Manager, Human Resources and Corporate Safety and the authority of the CRD's Chief Administrative Officer; and
    - the CRD's Manager, Corporate Occupational Health & Safety was responsible for supporting the Project Team's Safety Manager in the performance of their responsibilities by periodically reviewing the status of the Project's safety activities and initiatives.
- The CRD's Senior Manager, Corporate Communications was point of contact for media, responsible for coordinating with the Project Team to manage media inquiries

related to the Project. This included local, regional, provincial, national, and at times international, media.

- The Manager of CRD's First Nations Relations was responsible for:
  - the ongoing maintenance of CRD's government-to-government relationships with First Nations; and
  - coordinating with the Project Team on Project-related First Nations engagement.
- The CRD's Corporate Services Department:
  - provided professional advice and expertise related to legislative services, information services, risk and insurance management, real estate services; and
  - was responsible for administration of the Freedom of Information and Protection of Privacy Act;
- Representatives from CRD's Integrated Water Services department were engaged in the review of design and construction submittals and provided input regarding CRD standards and operations and maintenance considerations. Specific responsibilities included participating in design review and hazard and operability workshops, and reviewing and providing comments on relevant contract submittals (e.g. design reports, drawings and operating plans).
- Representatives from CRD's Parks and Environmental Services department were engaged in the:
  - review of applications for permits and authorizations that extend beyond the Project delivery period, including the registration of the McLoughlin Point Wastewater Treatment Plant under the Municipal Wastewater Regulations; and
  - review of specific design and construction submittals for the Residuals Treatment Facility. Specific responsibilities included: participating in design review workshops, and reviewing and providing comments on contract submittals (e.g. design reports, drawings, operating plans), with a focus on the interfaces between the operations of the Hartland Landfill and the Residuals Treatment Facility.

Each service that the CRD provides has its own budget and must be accounted for and reported on separately: the CRD Financial Plan consists of more than 200 individual service budgets, which fund delivery of regional, sub-regional and local services. In accordance with this, the Project's budget included annual payments to the CRD departments that supported the Project Board and Project Team.

3.2.4 Project Reporting

The reporting requirements for the Project were defined with consideration of the Project Board Terms of Reference, the approved senior government funding agreements and the financial and accounting reporting cycle of the CRD. The Project Board's Terms of Reference required the Project Board to provide the CRD Board with monthly progress reports and a comprehensive quarterly report on the Project.

Throughout the delivery of the Project, the Project Team prepared comprehensive monthly and quarterly reports which described the status of the Project, and specifically addressed the progress with respect to scope, budget, commitments, project expenditures, schedule and risk status. The reports included a dashboard and executive summary which highlighted material

changes in any of these areas, and summarised progress on the delivery of each Project component. These reports were presented to the Project Board in open reports, and subsequently to the Core Area Liquid Waste Management Committee and CRD Board

4 Project Scope

This section summarises the scope delivered by the Project, as well as any variances in the delivered scope compared to that defined in the Business Case.

In furtherance of the Project's goal to minimize costs to residents and businesses, the Project Team undertook value engineering and reviewed the scope of each Project component in advance of commencing detailed design and initiating a competitive selection process to procure a construction contract. In some cases this value engineering led to the delivered scope exceeding that defined in the Business Case, and in some cases to the delivered scope being reduced from that defined in the Business Case.

Project Board approval was sought for variances in scope from the Business Case: CRD Board approval was not required as none of the variances resulted in any of the effects listed in CRD Core Area Wastewater Treatment Project Board Delegation Bylaw No. 1, 2016 (being: the Project not meeting provincial and federal regulations governing the Project, exceeding approved funding for the Project, or increasing costs to taxpayers from those stated in the Business Case).

4.1 McLoughlin Point Wastewater Treatment Plant

The McLoughlin Point Wastewater Treatment Plant can treat up to 108 megalitres of wastewater per day to a tertiary level, and discharge treated effluent into the ocean through a new outfall approximately 2km from shore and 60m deep.

The primary treatment process is the physical separation of solids from wastewater. Secondary treatment uses a biological process that removes dissolved and suspended organic compounds. During tertiary treatment wastewater passes through a 5 micron fabric disc filter, removing many pharmaceutical, hormones, microplastics and other contaminants from the discharged effluent.

Located at McLoughlin Point in Esquimalt, the McLoughlin Point Wastewater Treatment Plant is situated at the entrance of Victoria Harbour. Its appearance respects the setting and incorporates the highest standards of design, materials and aesthetics. It has been built to minimize visual impacts from the water and includes a multi-level green roof, mature landscaping, an observation deck, and a multi-use education space.

The McLoughlin Point Wastewater Treatment Plant's Operations and Maintenance building is designed to Leadership in Energy and Environmental Design (LEED) Gold standard and over 80% (or 1,600 m^2) of its roof is planted to increase on-site habitat and provide storm water management. A heat recovery system has also been incorporated: prior to discharge to the ocean, the effluent passes through heat exchangers which remove heat from the wastewater and use it to heat the Operations and Maintenance building at the facility.

The McLoughlin Point Wastewater Treatment Plant includes state-of-the-art odour control and a 24-hour odour control monitoring system. All treatment processing tanks are covered which result in one of the highest levels of odour capture and treatment in the industry. The odour control systems reduce odour emissions to a level not detectable by humans at the property line. The odour control system includes back-up odour control equipment and back-up power generators, reducing the possibility of odour escaping the facility if there is an equipment failure.

The McLoughlin Point Wastewater Treatment Plant has been designed for post-disaster operation in accordance with the 2012 British Columbia Building Code. The Code stipulates that post-disaster facilities must be designed to withstand the size or magnitude of earthquake that could occur once in every 2,475 year which translates approximately to a magnitude 6.5 earthquake. This means the facility will remain operational after a major earthquake, as well as other natural disasters, such as tsunamis.

The McLoughlin Point Wastewater Treatment Plant was designed and built by Harbour Resource Partners, as the design-build contractor. Harbour Resource Partners is a consortium of AECOM Canada and Graham Infrastructure.

Photographs of the McLoughlin Point Wastewater Treatment Plant are shown in Figures 1 and 2.



Figure 1 – Looking west at the McLoughlin Point Wastewater Treatment Plant



Figure 2 – Looking east over the McLoughlin Point Wastewater Treatment Plant

4.1.1 McLoughlin Point Wastewater Treatment Plant: Variance in Delivered Scope Compared to the Business Case

The McLoughlin Point Wastewater Treatment Plant delivered by the Project exceeds the scope defined in the Business Case in two key respects: the capability to increase the capacity of the plant (from 108 megalitres of wastewater per day to 124 megalitres per day), enabling it to accommodate population growth beyond 2040; and the capability to include effluent disinfection.

The Business Case required the McLoughlin Point Wastewater Treatment Plant to have the capacity to effectively accommodate the future population growth, and this was achieved: based on wastewater flow projections, the Plant has sufficient capacity to treat the core area's wastewater and accommodate regional population growth to at least 2040. In addition to that capacity, and providing a lifecycle cost benefit to the CRD, the Plant has been designed and built such that the capacity could be increased to accommodate population growth beyond 2040.

The Business Case required the McLoughlin Point Wastewater Treatment Plant to provide tertiary treatment, which it does. Disinfection of the treated effluent is not necessary to meet the regulatory requirements, and was not required by the Business Case. The Marine Environmental Impact Study undertaken for the Project by qualified professionals found that, based on extensive flow monitoring, hydraulic modelling and dispersion modelling, there would be little to no benefit to installing disinfection at this time. However, the McLoughlin Point Wastewater Treatment Plant has been designed to allow disinfection to be added at a future date if required. Specifically, after tertiary treatment, the treated effluent flows through dedicated channels which are sized to allow for the placement of ultraviolet equipment with minimal interruption to the operation of the Wastewater Treatment Plant. This configuration

allows for disinfection to be added, if desired at a later date, at a lower cost than if it had not been considered during Project delivery.

4.2 Residuals Treatment Facility

The Residuals Treatment Facility receives residual solids produced by the McLoughlin Point Wastewater Treatment Plant and processes them into Class A biosolids, the highest quality product suitable for beneficial use.

At the Residuals Treatment Facility residual solids undergo an anaerobic digestion process in which microorganisms break down biodegradable material in the absence of oxygen and produce biogas. The residual solids are then dewatered and heated to a very high temperature creating Class A biosolids.

The biogas produced during the digestion process is collected and reused within the facility as fuel for the dryer. The operations and maintenance building was designed and constructed in accordance with Leadership in Energy and Environmental Design (LEED) principles, and the process buildings incorporate sustainable design initiatives such as long-lasting building materials and water and energy efficiency.

All treatment processes are completed within closed containers and odour control systems are in place to ensure that there will be no discernible odour to residents once the commissioning phase is complete and the facility is fully-operational.

The Residuals Treatment Facility is located within the footprint of the Hartland Landfill. Key benefits of the Hartland Landfill location include:

- locating the Residuals Treatment Facility next to the existing, active landfill and within the footprint of the landfill allows for future integration between the region's solid waste and liquid waste management plans;
- the land is owned by the CRD;
- the land is not part of the Agricultural Land Reserve, park or ecological land reserve; and
- distance from residential neighbours.

The Residuals Treatment Facility has been designed for post-disaster operation in accordance with the 2012 British Columbia Building Code. The Code stipulates that post-disaster facilities must be designed to withstand the size or magnitude of earthquake that could occur once in every 2,475 year which translates approximately to a magnitude 6.5 earthquake. This means the facility will remain operational after a major earthquake.

The Residuals Treatment Facility was designed and built, and will be operated and maintained for twenty years by Hartland Resource Management Group, as the design-build-finance-operate-maintain contractor. Hartland Resource Management Group are a consortium comprising Synagro Capital, Maple Reinders PPP Ltd., and Bird Construction Inc.

Photographs of the Residuals Treatment Facility are shown in Figures 3 and 4.



Figure 3 – Looking southwest toward the Residuals Treatment Facility



Figure 4 – Looking east toward the Residuals Treatment Facility

4.2.1 Residuals Treatment Facility: Variance in Delivered Scope Compared to the Business Case

The Residuals Treatment Facility delivered by the Project exceeded the scope defined in the Business Case in a key respect (namely the ability to process and receive residual solids from other municipalities in addition to those from the Mcloughlin Point Wastewater Treatment Plant), and incorporated one of the scope elements through alternative means (being interim storage).

In furtherance of the Project's goal to provide value for money, the Project included a capital investment that exceeded the scope defined in the Business Case. The Residuals Treatment Facility was required to treat residuals solids produced by the McLoughlin Point Wastewater Treatment Plant. The Residuals Treatment Facility has been designed and constructed with the receiving facilities to enable it to also treat up to 3,100 kg/day of other municipal residual solids, while the Residuals Treatment Facility has surplus capacity (i.e. while the actual flow from the McLoughlin Point McLoughlin Point Wastewater Treatment Plant is less than the 2040 expected flow). This capital investment provides the CRD with a cost sharing and/or recovery option, and municipalities outside of the Core Area with a means to convert residual solids into a product capable of beneficial use.

Regarding interim storage, the Business Case anticipated the need to store the class A biosolids produced by the Residuals Treatment Facility at Hartland Landfill on an interim basis pending the introduction of an integrated resource management solution for all waste streams. The interim storage was to be configured with the ability to recover leachate and biogas.

To this end, after the CRD Board approved the Business Case (on September 14, 2016) the CRD submitted Amendment No. 11 to the Core Area Liquid Waste Management Plan to the Ministry of Environment (on September 16, 2016), inclusive of a biocell to store product on an interim basis to allow time for a long-term beneficial use option to be designed and implemented. On September 30, 2016 the Ministry of Environment provided conditional approval of Amendment No. 11, and on November 18, 2016 clarified the conditional approval. One condition of the clarified approval was the requirement that the CRD develop a definitive plan for the beneficial use of biosolids that did not incorporate multi-year storage of biosolids within a biocell.

The conditional approval therefore reduced the scope of the interim storage from that envisioned in the Business Case. The Project delivered the reduced scope through the following means:

i) recovery (and use) of biogas within the Residuals Treatment Facility: biogas produced during the treatment process is utilized as an energy source, making the facility thermally self-sufficient; and
ii) the inclusion of storage within the Residuals Treatment Facility, so as to allow for a period of five continuous days at 2040 maximum load conditions without offtake of any biosolids.

The Project Board approved this variance in scope from the Business Case necessitated by the Ministry's conditional approval: CRD Board approval was not sought as the alteration to the scope did not result in any of the effects listed in CRD Core Area Wastewater Treatment Project Board Delegation Bylaw No. 1, 2016 (being: the Project not meeting provincial and federal regulations governing the Project, exceeding approved funding for the Project, or increasing costs to taxpayers from those stated in the Business Case).

4.3 Conveyance System

4.3.1 Clover Point Pump Station

The Clover Point Pump Station was upgraded and expanded as part of the Wastewater Treatment Project. The original pump station was built in the 1970s and pumped wastewater directly into the ocean. The expanded pump station pumps wastewater from Victoria, Saanich, and Oak Bay to the McLoughlin Point Wastewater Treatment Plant for tertiary treatment, and provides bypass pumping to the existing outfall during storm events. Specifically, and in exceedance of the British Columbia Ministry of Environment's approval of Amendment 11 to the CALWMP (which required that primary treatment be guaranteed for Clover Point catchment flows of up to three times average dry weather flows[3]), the Clover Point Pump Station is capable of conveying four times the 2021 average dry weather flow of the Clover Point catchment to McLoughlin Point Wastewater Treatment Plant for treatment, and will convey storm flows in excess of that amount out of the Clover Point outfall.

In addition to pumping wastewater to the McLoughlin Point Wastewater Treatment Plant for treatment and providing bypass pumping during storm events, the Clover Point Pump Station functions as one of two headworks for the McLoughlin Point Wastewater Treatment Plant: all wastewater conveyed to the pump station is screened to remove stones, paper, cloth, plastics and other debris, and then passes through a grit removal system. The grit and screenings are compacted and trucked to the Hartland landfill.

The Clover Point Pump Station is underground and below the grade of the adjacent section of Dallas Road. The expanded facility has been constructed out of materials that allow it to blend with the existing facility and surrounding area. The pump station now includes upgraded odour and noise control features, such that there will be no discernible odour or noise to residents.

The Clover Point Pump Station has been designed for post-disaster operation in accordance with the 2012 British Columbia Building Code. The Code stipulates that post-disaster facilities must be designed to withstand the size or magnitude of earthquake that could occur once in every 2,475 year which translates approximately to a magnitude 6.5 earthquake. This means the facility will remain operational after a major earthquake, as well as other natural disasters, such as tsunamis.

The Clover Point Pump Station was designed and built by Kenaidan Contracting Limited, as the Design-Build Contractor.

As part of their scope of work, Kenaidan were also responsible for the construction of a number of public amenities, such as public washrooms, pedestrian and bicycle paths, bicycle facilities, a public plaza, street furniture and road intersection improvements.

Photographs of construction progress at Clover Point are shown in Figures 5 and 6.

[3] The average dry weather flow (ADWF) is the average daily flow during the dry weather season: the average dry weather season for the core area is from June 1 to August 31.



Figure 5 – Looking west towards Clover Point Pump Station (construction in progress)



Figure 6 – Entrance to the expanded Clover Point Pump Station
(construction in progress: public amenities and landscaping still to be completed)

4.3.1.1 Clover Point Pump Station: Variance in Delivered Scope Compared to the Business Case

The upgrade and expansion of the Clover Point Pump Station delivered by the Project exceeds the scope defined in the Business Case, which required an expansion to the existing pump station and the replacement of the storm pump motors in the existing station. As a result of considering lifecycle costs, the Project replaced the entire storm pumping system (rather than simply the storm pump motors) and replaced the odour control system with an improved two-stage system.

4.3.2 Clover Forcemain

The Clover Forcemain conveys wastewater from the Clover Point Pump Station to the McLoughlin Point Wastewater Treatment Plant for tertiary treatment. The Forcemain alignment is along Dallas Road from Clover Point to Ogden Point, where it connects to the Victoria cross-harbour undersea pipe. The pipe is 3.2km long and 1.2m in diameter.

The Clover Forcemain alignment was developed in collaboration with the City of Victoria and considered the protection of the Dallas Road bluffs, the location of mature trees and sensitive vegetation, and traffic impacts during construction.

The CRD constructed infrastructure improvements along the alignment of the Clover Forcemain to add value and enhance the livability of the surrounding neighbourhoods. This included a cycle path along the forcemain route, line painting, bike racks and plantings, four new crosswalks, pathway lighting, and a bike dismount area at the entrance to Clover Point.

The Clover Forcemain was constructed by Windley Contracting Ltd., as the Construction Contractor.

A photograph showing the cycle path constructed as part of the Clover Forcemain, and a map of the Clover Forcemain route, are shown in Figures 7 and 8, respectively.



Figure 7 – New cycle path amenity delivered with the construction of the Clover Forcemain

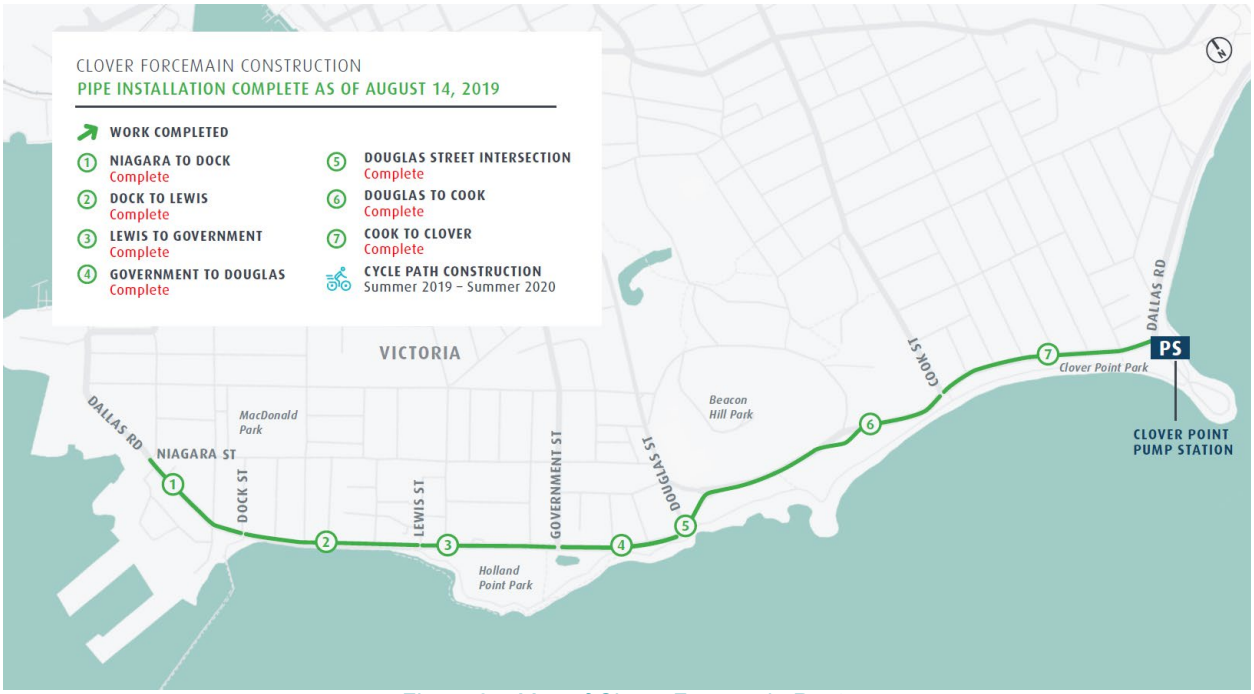


Figure 8 – Map of Clover Forcemain Route

4.3.2.1 Clover Forcemain: Variance in Delivered Scope Compared to the Business Case

The Clover Forcemain has been delivered as defined in the Business Case: there was no variance in the delivered scope compared to the Business Case.

4.3.3 Macaulay Point Pump Station and Forcemain

The new Macaulay Point Pump Station pumps wastewater from western core area municipalities and the Esquimalt and Songhees Nations to the McLoughlin Point Wastewater Treatment Plant for tertiary treatment. It was built to replace the original pump station that pumped wastewater directly into the ocean. The new Macaulay Point Pump Station will provide bypass pumping to the Macaulay Point outfall during heavy rainfall events. Specifically, the Macaulay Point Pump Station is capable of conveying six times the 2021 average dry weather flow[4] of the Macaulay Point catchment to McLoughlin Point Wastewater Treatment Plant for treatment, and will convey storm flows in excess of that amount out of the Macaulay Point outfall.

In addition to pumping wastewater to the McLoughlin Point Wastewater Treatment Plant for treatment and providing bypass pumping during storm events, the Macaulay Point Pump Station functions as one of two headworks for the McLoughlin Point Wastewater Treatment Plant: all wastewater conveyed to the pump station is screened to remove stones, paper, cloth, plastics and other debris. It is then put through a vortex grit removal system which uses centrifugal force to keep the organic material suspended while grit settles and is removed. The grit and screenings are compacted and trucked to the Hartland landfill.

The Macaulay Forcemain is a 1350mm diameter pipe that connects the Macaulay Point Pump Station to the McLoughlin Point Wastewater Treatment Plant.

The design of the pump station considers its location on the waterfront, greatly improving the visual impact of the building compared to the previous pump station, and creating a park-like amenity for the community to enjoy.

The new pump station is mostly below-grade with one storey above ground and a pitched roof that slopes towards the ocean. The design applies Leadership in Energy and Environmental Design (LEED) principles including a rain garden, native plants to reduce irrigation requirements, low-level lighting to minimize light pollution, and a green roof.

The Macaulay Point Pump Station has been designed for post-disaster operation in accordance with the 2012 British Columbia Building Code. The Code stipulates that post-disaster facilities must be designed to withstand the size or magnitude of earthquake that could occur once in every 2,475 year which translates approximately to a magnitude 6.5 earthquake. This means the facility will remain operational after a major earthquake, as well as other natural disasters, such as tsunamis.

[4] The average dry weather flow (ADWF) is the average daily flow during the dry weather season: the average dry weather season for the core area is from June 1 to August 31.

Landscaping has been used to integrate the building with the surrounding area. The design maximizes vegetation opportunities and landscape functionality: it has transformed what was an almost entirely impermeable lot into an environmentally-rich, park-like setting with public amenities.

The Macaulay Point Pump Station and Forcemain was designed and built by Kenaidan Contracting Limited, as the Design-Build Contractor.

Photographs of the Macaulay Point Pump Station are shown in Figures 9 and 10.



Figure 9 – Macaulay Point Pump Station



Figure 10 – Looking north towards the Macaulay Point Pump Station (construction in progress, landscaping still to be completed)

4.3.3.1 Macaulay Point Pump Station: Variance in Delivered Scope Compared to the Business Case

The Macaulay Point Pump Station delivered by the Project exceeds the scope defined in the Business Case, which required upgrades including improvements to the existing building and landscaping. As a result of considering lifecycle costs, rather than simply upgrade the existing pump station the Project replaced the existing Macaulay Point Pump Station.

The original Macaulay Point Pump Station was built in 1972 and would have required significant upgrades to allow it to continue to be safely operated as well as a significant expansion to allow it to pump wastewater to the McLoughlin Point Wastewater Treatment Plant.

The Project Team ran a competitive selection process for the design and build of the upgrade and expansion required to the Macaulay Point Pump Station, and selected a proposal that entailed demolition of the existing pump station and replacing it with a new pump station. This solution provides improved operating efficiency, and therefore lower operating and maintenance costs: investing in a new pump station as part of the Project, rather than paying to upgrade and maintain the existing pump station, provides better overall value to the CRD.

4.3.4 Craigflower Pump Station

The Craigflower Pump Station was delivered by the CRD between 2013 and 2015, before the Project Board were established.

The Craigflower Pump Station directs wastewater from View Royal, Colwood, Langford and Esquimalt, as well as Songhees and Esquimalt First Nations, to the Macaulay Point Pump Station. It replaced a previous pump station that was built in 1971, in order to increase the capacity of the conveyance system and prevent wastewater overflows into Portage Inlet.

The design incorporated Leadership in Energy and Environmental Design (LEED) principles including a rain garden, native plants to reduce irrigation requirements, low-level lighting to minimize light pollution, and windows designed to allow daylight in to minimize indoor lighting requirements.

The Craigflower Pump Station was built for post-disaster operation in accordance with the 2012 British Columbia Building Code. The Code stipulates that post-disaster facilities must be designed to withstand the size or magnitude of earthquake that could occur once in every 2,475 year which translates approximately to a magnitude 6.5 earthquake. This means the facility will remain operational after a major earthquake.

The Craigflower Pump Station was constructed by Jacob Bros. Construction Inc., as the Construction Contractor.

A photograph of Craigflower Pump Station is shown in Figure 11.



Figure 11 − Craigflower Pump Station

4.3.4.1 Craigflower Pump Station: Variance in Delivered Scope Compared to the Business Case

The Craigflower Pump Station was delivered by the CRD before the development of the Business Case: there was therefore no variance in the delivered scope compared to the Business Case.

4.3.5 Residual Solids Conveyance Line

The Residual Solids Conveyance Line includes two pipes and three small pump stations, to connect the McLoughlin Point Wastewater Treatment Plant to the Residuals Treatment Facility at Hartland Landfill.

The first pipe is 250mm in diameter and 19.3km long, and transports residual solids from the McLoughlin Point Wastewater Treatment Plant to the Residuals Treatment Facility for treatment. The second pipe is 300mm in diameter and 12.4km long, and returns the liquid removed from the residual solids during the treatment process at the Residuals Treatment Facility to the Marigold Pump Station. From there it is returned to the McLoughlin Point Wastewater Treatment Plant through the existing conveyance system.

The alignment was developed with the District of Saanich, Township of Esquimalt and City of Victoria based on technical, environmental, social, and economic considerations.

The three pump stations built along the route of the Residual Solids Conveyance Line pump the residual solids from the McLoughlin Point Wastewater Treatment Plant (which is at sealevel) to the higher elevation of the Residuals Treatment Facility. The pump stations are located within road rights of way. The locations of the pump stations were determined based on the grade of the route and flow rates, and accounted for community consultation.

The pump stations are designed with state-of-the-art odour control systems that contain and suppress odour so there is no discernible smell in the community. Landscaping features include a variety of trees, shrubs and ground coverings.

The Residual Solids Conveyance Line was constructed by:

- Don Mann Excavating Ltd., as the Construction Contractor for the Residual Solids Pipes; and
- Knappett Projects Inc., as the Construction Contractor for the Residual Solids Pump Stations.

A photograph of one of the Residual Solids Pump Stations (located along the Interurban Trail in Saanich) and a map of the Residual Solids Conveyance Line route are shown in Figures 12 and 13.



Figure 12 − Residual Solids Pump Station located along the Interurban Rail Trail in Saanich (Construction in progress, landscaping still to be completed)

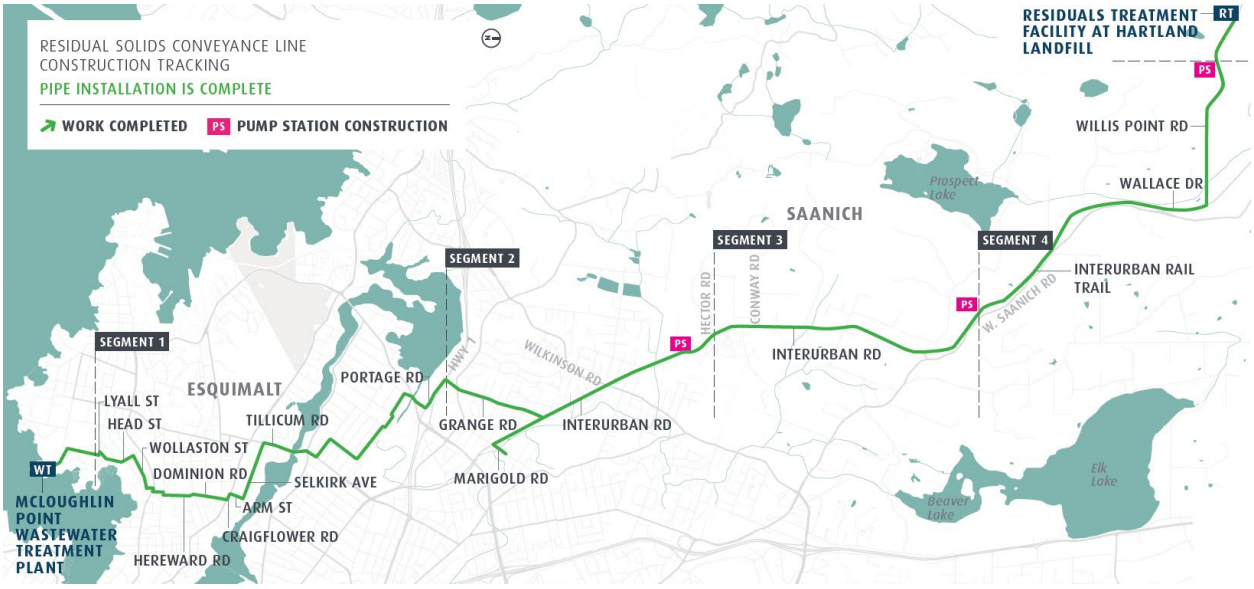


Figure 13 – Map of Residual Solids Conveyance Line Route

4.3.5.1 Residual Solids Conveyance Line: Variance in Delivered Scope Compared to the Business Case

The delivered Residual Solids Conveyance Line exceeds the scope defined in the Business Case. The Project designed and built the return Residual Solids Conveyance Line with sufficient capacity to convey leachate from Hartland Landfill - as well as centrate from the Residuals Treatment Facility – to Marigold Pump Station, from where it will be conveyed to the McLoughlin Point Wastewater Treatment Plant through the CRD's existing conveyance system.

While this increased the capital cost to the Project it provided significant value to the CRD, as the new pipe has been designed in accordance with seismic criteria, and compared to utilising the existing leachate pipe it has the following advantages: advanced monitoring, increased capacity and reliability.

4.3.6 Arbutus Attenuation Tank

The Arbutus Attenuation Tank is a 5,000m^3 underground concrete tank that temporarily stores wastewater flows during high volume storm events in order to reduce the number of sewer overflows. High volume storm events usually occur in the winter and during these events excess wet weather flows in the eastern portion of the conveyance system will be diverted into the Arbutus Attenuation Tank. The Arbutus Attenuation Tank will function in a similar manner to the Marigold attenuation tank in the western portion of the conveyance system. Once the high storm flow has passed, the tank will empty back into the existing sewer system to direct wastewater to the Clover Point Pump Station and then onto the McLoughlin Point Wastewater Treatment Plant for tertiary treatment.

Once the tank is emptied, an automatic cleaning system will be activated to clean the floors, walls and columns of the tank. CRD staff will inspect the tank after each use to ensure it is cleaned and that all wastewater has drained back into the sewer system. The temporary storage of wastewater will reduce the number of overflows and resultant impacts along the coastline. The tank will be kept under negative air pressure to draw air within the tank directly into an activated carbon absorber system that will contain and suppress potential odours.

The Arbutus Attenuation Tank is located in Haro Woods and the site will be planted with vegetation appropriate for the local woodland setting.

The Arbutus Attenuation Tank was constructed by NAC Constructors Ltd., as the Construction Contractor. As at May 2021, some minor construction and commissioning activities are required to complete this Project component, and it is expected to be operational in June, 2021.

A photograph of the Arbutus Attenuation Tank is shown in Figure 14.



Figure 14 – Arbutus Attenuation Tank (Construction in progress)

4.3.6.1 Arbutus Attenuation Tank: Variance in Delivered Scope Compared to the Business Case

The Arbutus Attenuation Tank has been delivered as defined in the Business Case: there was no variance in the delivered scope compared to the Business Case.

4.3.7 Trent Forcemain

The section of Trent Forcemain delivered by the Project is an extension of the portion of forcemain constructed by the CRD in 2007 as part of the Trent Pump Station Project. The extension allows the Trent and Currie Pump Stations to operate at full design capacity: it increases the capacity of the eastern branch of the Capital Regional District's core area conveyance system (which collects wastewater from Saanich, Oak Bay, and Victoria, directing it to the Clover Point Pump Station), thereby reducing the number of wet weather overflows.

The Trent Forcemain is 2km of pipe installed from the intersection of Chandler Ave and St Charles Street to the Clover Point Pump Station. The Trent Forcemain consists of a section of 0.9m diameter pipe and a 1.5m diameter pipe.

The Trent Forcemain was constructed by Jacob Bros. Construction Inc., as the Construction Contractor.

A map of the Trent Forcemain route is shown in Figure 15.

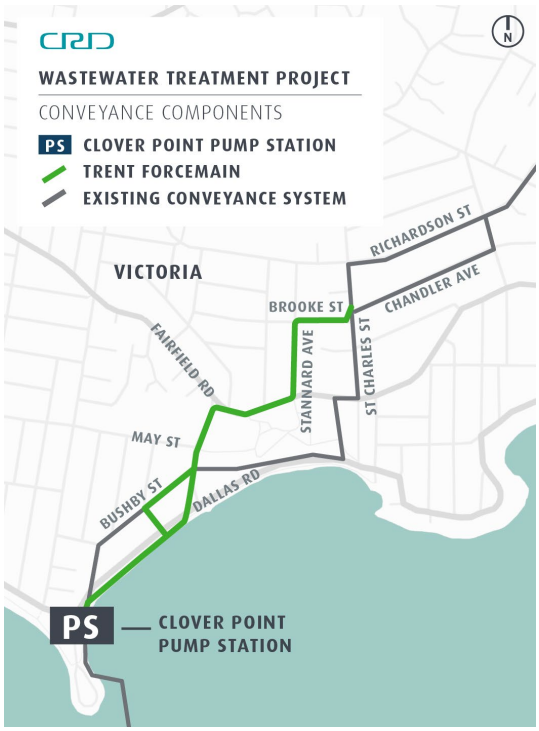


Figure 15 – Map of Trent Forcemain Route

4.3.7.1 Trent Forcemain: Variance in Delivered Scope Compared to the Business Case

The Business Case anticipated the need for upgrades to the conveyance system consistent with previous plans, which included the following four components:

- Capacity expansion of the Currie Pump Station;
- Twinning of the Currie Forcemain;
- Twinning of the East Coast Interceptor; and
- Extension of the Trent Forcemain.

These four components are shown in Figure 16. The need for these components was identified in 2004, and they were designed to convey excess wet weather flows to Clover Point, where they could be discharged out of the long outfall, rather than through a number of shorter outfalls in Oak Bay.

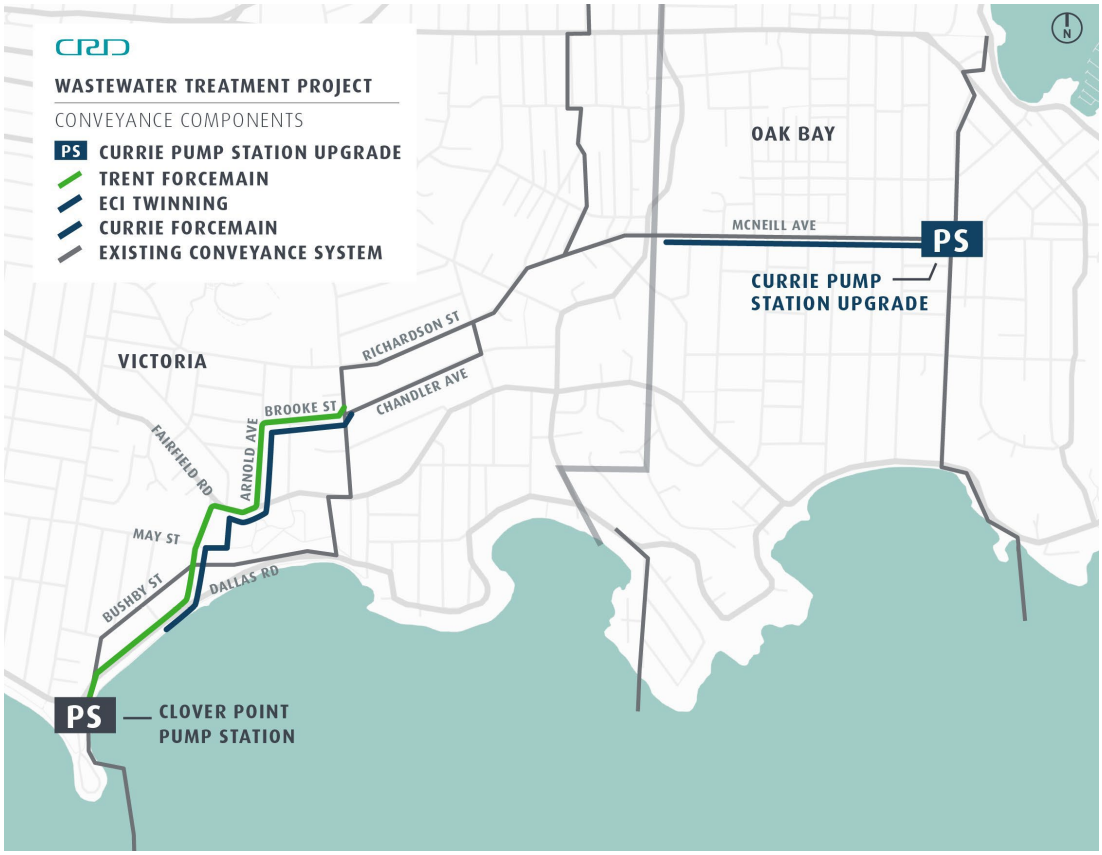


Figure 16 – Four Anticipated Components of the Conveyance Scope, as Identified in 2004

Over the last 15 years there were significant changes to factors influencing the need for these components including the availability of considerably more flow data that indicates a substantial reduction in water use per person. The Project therefore engaged the consulting engineering firm Kerr Wood Leidal to develop an updated model of the core area's wastewater system and assess the need for the components. This model will also be useful to the CRD outside of the Project as it will allow informed decisions to be made regarding capital investments required to meet future demands.

Based on extensive flow monitoring data and future wastewater flow estimates, KWL determined that only one of the remaining components (the extension of the Trent Forcemain) had any benefit and was required to meet federal and provincial regulations. Three components (capacity expansion of the Currie Pump Station, twinning of the Currie Forcemain, and twinning of the East Coast Interceptor) would not provide any benefit now, or in the future. Based on KWL's work, the Project Board approved refining the Project's scope to remove the three components that would provide no benefit to CRD residents.

The existing Currie Pump Station is still required to be operated for the core area wastewater system to function as intended, and as equipment reaches the end of its service life it will need to be rehabilitated or replaced. The CRD's Integrated Water Service Department is responsible for planning this work, and has included it in the current five-year capital plan for the core area wastewater system.

The Project Board approved this variance in scope from the Business Case: CRD Board approval was not sought as the alteration to the scope did not result in any of the effects listed

in CRD Core Area Wastewater Treatment Project Board Delegation Bylaw No. 1, 2016 (being: the Project not meeting provincial and federal regulations governing the Project, exceeding approved funding for the Project, or increasing costs to taxpayers from those stated in the Business Case).

4.4 Business Case: Scope Delivered Independently

The following items were included in the Business Case, however, either by jurisdiction or because of subsequent discussions, they were not within the scope of the Project or the Project Director's accountabilities:

- Advance studies for a wastewater treatment proposal in Colwood: provision for this was included in the Business Case but as a result of subsequent discussions between the CRD and Colwood a $2 million reserve has been established and funded by the Project's budget;
- Comprehensive planning and consultation process to develop a waste policy, including management of municipal solid and biosolid waste streams as part of an integrated resource management plan: this process is being led by the CRD outside of the Project; and
- The development of a multi-year capital plan to improve CRD sewage facilities to mitigate their impacts on host communities as part of the capital planning and project delivery progress. This process is being led by the CRD outside of the Project.

5 Project Performance Assessment

5.1 Achievement of Project Goals

As noted in Section 2.3, the Project Board's Terms of Reference included the following goals:

- Meet or exceed federal regulations for secondary treatment by December 31, 2020.
- Minimize costs to residents and businesses (lifecycle costs) and provide value for money.
- Optimize opportunities for resource recovery and greenhouse gas reduction.
- Deliver a solution that adds value to the surrounding community and enhances the liveability of neighbourhoods.

The Wastewater Treatment Project met all four of these goals, and the following sub-sections summarise the Project's performance against the goals.

5.1.1 Meet or exceed federal regulations for secondary treatment by December 31, 2020

The McLoughlin Point Wastewater Treatment Plant met and exceeded federal regulations when it commenced treating the Core Area's wastewater to a tertiary level before December 31, 2020.

Tertiary treatment is one of the highest levels of wastewater treatment available. For context:

- Two key regulated parameters for wastewater are total suspended solids (TSS) and carbonaceous 5-day biochemical oxygen demand (BOD_5);
- The Federal Wastewater Systems Effluent Regulations, which fall under the Fisheries Act, require the Core Area's wastewater to be treated such that the effluent discharged from the McLoughlin Point Wastewater Treatment Plant not exceed 25 mg/litre for those two key parameters (TSS and BOD_5); and
- The McLoughlin Point Wastewater Treatment Plant is capable of treating effluent such that those two key parameters (TSS and BOD_5) do not exceed, on average, 10 mg/litre.

Tertiary treatment was included in the Project as, during the development of the Business Case (which defined the scope of the Project), the Project Board concluded that there was a benefit to tertiary treatment for the following reason: the region places a high value on the environment and the public commentary suggested a widespread desire to do as much as is reasonably possible to treat the effluent, while recognizing cost implications.

The provision of tertiary treatment means that, in addition to treating the effluent such that it has lower TSS and BOD_5 than would be the case if the McLoughlin Point Wastewater Treatment Plant only met the federal regulatory requirements, more compounds of emerging concern, such as pharmaceuticals, hormones, microplastics and other contaminants are also removed from the effluent prior to discharge into the ocean.

5.1.2 Minimize costs to residents and businesses (lifecycle costs) and provide value for money

The Project met this goal through:

- identifying a cost effective Project scope and configuration;
- the capacity of the McLoughlin Point Wastewater Treatment Plant (which is sufficient to accommodate regional population growth) and its ability to: treat wastewater to a tertiary level, and add disinfection in the future if required;
- the execution of funding agreements for a significant portion (60%) of the Project's total cost;
- the use of competitive selection procurement processes for all construction contracts, to ensure competitive pricing was received, and the consideration of lifecycle costs in the evaluation of those procurements;
- the consideration of lifecycle costs during design development; and
- proactive risk management.

As part of the scoping of the Project, and as detailed in the Business Case, the Project Board evaluated a large number of options to identify a short list that best addressed the Project's goals. The Project Board developed detailed cost estimates for the short-listed options, ranked the short list using triple bottom line (economic, social and environmental) criteria, and identified the Project's scope and configuration as the best option to meet the Project goals and provide a sensible, cost-effective solution that was consistent with the views expressed by CRD residents.

Several design elements were included to allow the McLoughlin Point Wastewater Treatment Plant to meet the region's future capacity and treatment requirements more cost-effectively than if the Plant was to be retrofitted at a later date:

- Based on wastewater flow projections, the McLoughlin Point Wastewater Treatment Plant has been built with sufficient capacity to treat the core area's wastewater and accommodate regional population growth to at least 2040, and the Plant has been designed and built such that the capacity could be increased to accommodate population growth beyond 2040.

- The inclusion of tertiary treatment exceeds the current regulatory requirements. There are many compounds of emerging concern that are currently unregulated, but are being researched and may become regulated in the future. The provision of tertiary treatment at the McLoughlin Point Wastewater Treatment Plant means that it has the capability to meet more stringent regulations than exist today.

- The Plant has been built with the flexibility to add ultra-violet disinfection treatment to the process in the future if desired. While disinfection is not included in the Plant at this time (see section 4.1.1 for information regarding why there would be little to no benefit to installing disinfection at this time), building the Plant with the space for disinfection allows for it to be more cost-effectively added in the future if required.

After the CRD Board approved the Project's scope and configuration, funding agreements were executed with the federal and provincial governments, providing funding for 60% of the Project's budget. Table 3 summarises the total committed funding, and the funding received to-date. Note that the timing for the provision of Government of British Columbia and Government of Canada's funding differs by funding source. The Project Team have, and the CRD will continue to, submit claims to the funding partners in accordance with the relevant funding agreements. In accordance with the funding agreements, the remainder of the funding cannot be claimed until the Residuals Treatment Facility obtains service commencement.

Table 3 - Project Funding

Funding Source	Funding Received To-Date	Total Funding Committed
Government of Canada (Building Canada Fund)	$120M	$120M
Government of Canada (Green Infrastructure Fund)	$45M	$50M
Government of Canada (P3 Canada Fund)	-	$41M
Government of British Columbia	$186M	$248M
Federation of Canadian Municipalities	-	$0.3M
Total Federal and Provincial Funding	**$351M**	**$459.3M**

Competitive selection procurement processes were used for all construction contracts. These were advertised on BC Bid and open for participation by any interested party to ensure competitive pricing was received. In addition, lifecycle costs were factored into the evaluation of proposals received in response to competitive selectin processes. Some examples of factoring lifecycle costs into procurement evaluations include:

- Residuals Treatment Facility: the evaluation was based on the total cost to the CRD (inclusive of the estimated costs of transporting and beneficially-using the biosolids produced by the Residuals Treatment Facility) rather than just that portion to be funded by the Project (being the capital cost of constructing the facility).
- Replacement of the existing Macaulay Point Pump Station: the Project scope approved in the Business Case included an upgrade to the existing Macaulay Point Pump Station - to include a new building and alterations to the existing building. The original Macaulay Point Pump Station was built in 1972 and would have required significant upgrades to allow it to continue to be safely operated as well as a significant expansion to allow it to pump wastewater to the McLoughlin Point Wastewater Treatment Plant. The Project Team ran a competitive selection process for the design and build of the upgrade and expansion required to the Macaulay Point Pump Station, and selected a proposal that entailed demolition of the existing pump station and replacing it with a new pump station. This solution provides improved operating efficiency, and therefore lower operating and maintenance costs: investing in a new pump station as part of the Project, rather than paying to upgrade and maintain the existing pump station, provides better overall value to the CRD.
- Clover Point Pump Station: the evaluation accounted for the life cycle costs associated with the proponent's design solution, including the forecast cost of powering, operating, maintaining and replacing certain systems, equipment and portions of the pump station.

Throughout the design development and delivery of each Project component, lifecycle costs were factored into decisions. Some examples of lifecycle costs driving design decisions include:

- The replacement of the Macaulay inlet sewer: the original design was based on utilizing the existing inlet sewer to convey wastewater to the new pumping station. When the inlet sewer was exposed it was clear that corrosion had degraded the integrity of the pipe to the point where it could no longer be utilized. Options were

developed and evaluated on the basis of their construction cost and value to the CRD, and the replacement of the inlet sewer was selected as the option that minimized the lifecycle cost.

- Adding the capability to clean the Clover inlet channel: construction of the Clover Point Pump Station revealed substantive debris build-up in the inlet channel, from years of operations. Project funds have been committed to install infrastructure that will allow the CRD to clear debris from the inlet channel as needed.
- Capital investment at the Residuals Treatment Facility, to enable it to treat other municipal residual solids: while not part of the base scope of the Project (as defined in the Business Case), the inclusion of receiving facilities at the Residuals Treatment Facility provides value to the CRD as it allows the Residuals Treatment Facility to treat up to 3,100 kg/day of liquid and dewatered residual solids, while the Residuals Treatment Facility has surplus capacity (i.e. while the actual flow from the McLoughlin Point Wastewater Treatment Plant is less than the 2040 expected flow). This capital investment provides the CRD with a cost sharing and/or recovery option.
- Building the return Residual Solids Conveyance Line with sufficient capacity to convey leachate from Hartland Landfill - as well as centrate from the Residuals Treatment Facility – to Marigold Pump Station, from where it will be conveyed to the McLoughlin Point Wastewater Treatment Plant through the CRD's existing conveyance system: while this significantly-increased the capital cost borne by the Project it provided significant value to the CRD, as it allowed for: the existing line to be decommissioned, and provided a new line with increased capacity and lower maintenance costs.

Risk management on the Project involved the identification, analysis, oversight, management and monitoring of the Project risks. Project risks were reported monthly, and by proactively managing these risks the Project was able to address risks in a cost-effective way throughout the delivery of the Project. This was supported by the findings of Ernst and Young when they conducted an independent project execution review part-way through Project delivery (in April 2019), and reported:

- a strong risk-aware culture that was supported by well-defined processes and risk registers;
- the Project Team had put careful consideration into risk transfer when structuring contracts. Notable and leading industry practices around controlling mechanisms are in place, including incentive and penalty clauses; and
- Project reporting to be comprehensive and forward-looking, with commentary to provide the necessary context around key items.

5.1.3 Optimize opportunities for resource recovery and greenhouse gas reduction

The Project met this goal by:

- considering environmental implications when defining the Project's scope and configuration: the configuration of the Project was selected from a shortlist of options using a triple bottom line approach (economic, social and environmental). The

environmental aspect of this approach rated options based on the carbon footprint and potential for resource recovery; and

- constructing Project facilities with the following features:
  - the operations and maintenance building at the McLoughlin Point Wastewater Treatment Plant was built to the level of LEED (Leadership in Energy and Environmental Design) Gold, providing energy and water consumption reductions that exceed building code requirements. Some of the design features that contributed to the operations and maintenance building being built to the level of LEED Gold are:
    - the heat recovery system: prior to discharge to the ocean, the effluent passes through heat exchangers which remove heat from the wastewater and use it to heat water which is in turn circulated throughout the building to air handling units, and unit heaters, to heat the operations and maintenance building.
    - a green roof covering 80% of the operations and maintenance building (over 1,600 m^2) increases onsite habitat, provides stormwater management and contributes to reducing the heat island effect.
  - at the Residuals Treatment Facility:
    - the operations and maintenance building was designed and constructed in accordance with Leadership in Energy and Environmental Design (LEED) principles,
    - the process buildings incorporate sustainable design initiatives such as long-lasting building materials and water and energy efficiency
    - biogas produced during the treatment process is captured and utilized as an energy source, making the facility thermally self-sufficient.
  - the design of the Macaulay Point pump station incorporates LEED principles and sustainable design elements, such as:
    - rainwater run-off control using a rain garden and storm water management system;
    - the use of native plants to reduce irrigation requirements;
    - low-level lighting to minimize light pollution; and
    - green roof and increased open space.

5.1.4 Deliver a solution that adds value to the surrounding community and enhances the livability of neighborhoods

The Wastewater Treatment Project met this goal through working with the Township of Esquimalt, the City of Victoria, the District of Saanich, the Esquimalt and Songhees Nations, the Greater Victoria Harbour Authority and the Department of National Defence to identify amenities and/or infrastructure improvements that were either funded by the Project, or funded and delivered by the Project.

All Project components have also been designed to minimize their impacts on their host communities, including through the inclusion of advanced odour treatment such that there is no detectable odour by residents.

5.1.4.1 Township of Esquimalt

As part of the Host Community Impact 5-year Agreement the CRD has provided $17 million to the Township of Esquimalt, with:

- $7 million to be used for the improvement of waterfront parks;
- $5 million to be used for the improvement of public space within recreational facilities; and
- $5 million to be used for the construction, addition or improvement of emergency services and public safety facilities within the Township.

The delivered Project scope also considered the appearance of CRD wastewater facilities and the addition of neighbourhood amenities and public space improvements, including:

- Situated at the entrance of Victoria Harbour, the design of the McLoughlin Point Wastewater Treatment Plant respects the setting and incorporates the highest standards of design, materials and aesthetics. The design includes a multi-level green roof, mature landscaping, observation deck, and education space.
- The Macaulay Point Pump Station was designed to reflect its location on the waterfront and integrate it into the surrounding area. It transformed an almost entirely impermeable lot into an environmentally-rich, park-like setting with public amenities for the community to enjoy.

5.1.4.2 City of Victoria

Public space improvements were made by the Project as part of constructing the Clover Point Pump Station and the Clover Forcemain. Delivered improvements fully-funded by the Project included:

- At Clover Point: a public plaza, public washroom, bicycle facilities and drinking fountains; and
- Along the route of the Clover Forcemain: a multi-use path, benches, wayfinding signage, new sidewalks, and intersection improvements.

In addition to the above improvements that were fully-funded by the Project, the Project Team worked with the City of Victoria to incorporate streetscape improvements that were funded by the City and delivered by the Project's contractor more cost-effectively and with less construction impacts to residents than would otherwise have been possible.

5.1.4.3 District of Saanich

A land exchange was organized with the District of Saanich which added 2.8 hectares of land to Saanich's park inventory and secured the long-term preservation of the vast majority of Haro Woods. It also allowed the Arbutus Attenuation Tank to be installed on lands that were already partially cleared and previously disturbed. A blanket easement was also granted to the District of Saanich to allow for recreational use of the Arbutus Attenuation Tank site which will be planted with vegetation considering the local woodland setting following construction.

Funding will also be provided to the District of Saanich for infrastructure improvements including a new bike lane, sidewalk, and storm water management improvements along Arbutus road, next to the Arbutus Attenuation Tank, as well as providing traffic calming measures and pedestrian connectivity in neighbourhoods along the Residual Solids Conveyance Line.

As part of the work for the Residuals Treatment Facility, improvements were made to the level of water service to properties in the vicinity of the Hartland Landfill.

5.1.4.4 Songhees and Esquimalt Nations

Support agreements were signed with the Songhees and Esquimalt Nations, providing a number of benefits, including the provision of funding to assist in the upgrading and development of the Westbay Marine Village Marina and R.V. Park. The CRD also worked with the Songhees and Esquimalt Nations to procure Indigenous art for display outside the Macaulay Point Pump Station. Further context is provided in sections 2.2 and 5.2.4.1 of this report.

5.1.4.5 Greater Victoria Harbour Authority

After installing a portion of the Clover Forcemain within land owned by the Greater Victoria Harbour Authority (GVHA) and using a plot of GVHA's land as a temporary staging area for the Project, the Project worked with the GVHA to discuss how the land should be restored. After the GVHA reviewed and approved the restoration plan for this location the Project restored the land to a condition that met their needs, which included planting grass and installing a gravel parking lot.

5.1.4.6 Department of National Defence

Temporary laydown areas were put in place on several parcels of land owned by the Department of National Defence (DND). Restoration of this land was completed in consultation with DND staff and the Project implemented identified improvements including: the construction of a new fenced and lit storage yard; improvements to the fencing and grading at the community garden; planting of boulevard trees to provide shade to resident housing and improvements to staff parking areas near Macaulay Point.

5.2 Key Performance Indicators Dashboard

As established in the Project Charter, the realization of the Project's vision and goals was monitored against the Project's key performance indicators, and the Project Director reported performance against these key performance indicators to the Project Board on a monthly basis. The key performance indicators at Project Completion have been assessed to be as shown in Table 4, and as described in the following sub-sections of this report.

Table 4 – Status of Key Performance Indicators at Project Completion

Key Performance Indicators		Project Overall	Comments
Safety	Deliver the Project safely with zero fatalities and a total recordable incident frequency (TRIF) of no more than 1*.		As of May 2021, the vast majority of construction has been completed (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining), there have been zero fatalities and the TRIF was 1.5. While this exceeds the Project's ambitious target of no more than 1, it was less than half the industry average: WorkSafe BC records the TRIF for various industries, and for 2018 (the most recent year for which information has been published) the TRIF for heavy construction was 3.2. See section 5.2.1.
Environment	Protect the environment by meeting all legislated environmental requirements and optimizing opportunities for resource recovery and greenhouse gas reduction.		The Project met all legislated environmental requirements and, through the design of the various components optimized opportunities for resource recovery and greenhouse gas reduction. Over the course of construction there were a relatively small number of environmental incidents: they were all diligently-managed, appropriately-reported and mitigated as required, with the result that there weren't any long-term impacts. An unexpectedly-significant environmental benefit of the Project included the remediation of McLoughlin Point. See section 5.2.2 for further information.
Regulatory Requirements	Deliver the Project such that the Core Area complies with provincial and federal wastewater regulations.		Through the addition of the Project components to the core area wastewater system, the system can be operated in compliance with provincial and federal wastewater regulations. See section 5.2.3 for further information.
Stakeholders	Continue to build and maintain positive relationships with First Nations, local governments, communities, and other stakeholders.		Significant efforts were made to engage with and provide accurate and timely information to stakeholders throughout the delivery of the Project. Through these efforts and the achievement of the Project's goals, positive relationships were built and maintained with First Nations, local governments, communities, and other stakeholders. See section 5.2.4.
Schedule	Deliver the Project by December 31, 2020.		The Project completed the majority of construction by December 31, 2020, and achieved its schedule-related goal, which was to meet or exceed federal regulations for secondary treatment of wastewater by December 31, 2020. All aspects of the Project that were required to meet the regulatory requirements were delivered by December 31, 2020. As of May 2021, commissioning of the Residuals Treatment Facility is ongoing and is anticipated to be complete in June 2021, and the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining. See section 5.2.5 for further information.
Cost	Deliver the Project within the Control Budget ($765 million).		While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur in the last quarter of 2021, it is forecast that the total Project cost will be approximately $766.7M, which is within the approved budget of $775M. The total Project cost is therefore forecast to exceed the Project's Control Budget (of $765M) by 0.2%, but be well within the budget subsequently-approved by the CRD Board (of $775M). See Section 5.2.6 for further information.

* A TRIF of no more than 1 means that there is 1 or fewer recordable incidents (being a work-related injury or illness that requires medical treatment beyond first aid or causes death, days away from work, restricted work or transfer to another job, or loss of consciousness) for every 200,000 person-hours of work

Status	Description
	Significant adverse effect of KPI not being met
	KPI not met but outcome managed
	KPI achieved

5.2.1 Safety

Safety was the Project's top priority: safety of the public, construction workers and CRD staff, including those responsible for delivery of the Project and for its ongoing operation and maintenance.

The Project's safety key performance indicator was to deliver the Project safely with zero fatalities and a total recordable incident frequency (TRIF) of no more than 1. A TRIF of no more than 1 is an ambitious target that means that there is 1 or fewer recordable incidents (being a work-related injury or illness that requires medical treatment beyond first aid or causes death, days away from work, restricted work or transfer to another job, or loss of consciousness) for every 200,000 person-hours of work.

Safety information for the Project is summarised in Table 5 for the period up to May 2021, at which time the vast majority of construction was complete (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining), there have been zero fatalities and the TRIF was 1.5. While this exceeds the Project's ambitious target of no more than 1, it was less than half the industry average: WorkSafe BC records the TRIF for various industries, and for 2018 (the most recent year for which information has been published) the TRIF for heavy construction was 3.2.

Table 5: Project Safety Information

	Project Total
	Person Hours (Sept 2016 – May 2021)
Project Management Office Hours	171,264
Project Contractor Hours	2,364,950
Total Person Hours	2,536,222
	Number of Incidents (Sept 2016 – May 2021)
Near Miss Reports	49
High Potential Near Miss Reports	7
Report Only	190
First Aid	69
Medical Aid	12
Medical Aid (Modified Duty)	2
Lost Time	5
Total Recordable Incidents	19
	Project Frequency (from January 1, 2017)
First Aid Frequency	5.4
Medical Aid Frequency	1.1
Lost time Frequency	0.4
Total Recordable Incident Frequency	1.5

The responsibility for safety on each of the Project sites was delegated to a prime contractor (being the contractor for that Project site) under section 118 of the Workers Compensation Act (British Columbia). Each prime contractor was required to designate a site safety representative and submit site safety management and traffic management plans for the Project Team's review prior to commencing construction.

The Project Team validated that each contractor met their safety requirements through a robust oversight and audit program. The Project Team continued to emphasise the importance of safety to every prime contractor, including through:

- mandating and participating in hazard and operability safety reviews during design progression;
- reviewing and commenting on design submittals considering safety impacts;
- reviewing and commenting on contractors' safety and traffic management plans;
- monitoring contractors' performance for conformance to their safety and traffic management plans; and
- reviewing the prime contractors' and their subcontractors' safety performance.

In addition, while the Project Team understood that, although the responsibility for safety on each Project site was delegated to a prime contractor, safety remains everybody's responsibility at all times, and maintained a strong safety-first culture throughout the delivery of the Project.

The Project Team believe that the ambitious TRIF target, focus on safety as the Project's top priority, and commitment to continuous improvement in safety management resulted in the Project being delivered more safely than would otherwise have been the case. The effectiveness of this focus was demonstrated by the independent review of the Project's safety management system, conducted by Allman Safety part-way through Project delivery in April 2019, which found that:

- There was strong and obvious commitment from senior management to remove or minimize risk in the workplace.
- The Safety Management System meets or exceeds industry health and safety standards and regulatory requirements.
- Prime contractor safety programs have improved under the direction of the project team to be complete and compliant.
- The communication strategy for safety improvement from contractors to the project team and from the project team to the contractors is both electronic and verbal and is effective in both directions.
- There is evidence that the organization has continuing strategies to reduce unsafe conditions.
- Leading and lagging indicators are reported and reviewed to focus attention on target areas.
- There has been continuous improvement in safety response by contractors, with still more room for improvement.

5.2.2 Environment

The Project's environment key performance indicator was to protect the environment by meeting all legislated environmental requirements and optimizing opportunities for resource recovery and greenhouse gas reduction.

The Project met this key performance indicator: see Section 5.1.3 for how the Project optimized opportunities for resource recovery and greenhouse gas reduction; the Project also protected the environment by meeting all legislated environmental requirements.

The Project Team's approach to environmental and regulatory management was multi-faceted and included activities during design, procurement and construction, including:

- Preparing Environmental Impact Studies, to inform the design and configuration of the Project in order to minimise environmental impacts at the outset, and to identify mitigation measures to reduce potential environmental impacts;
- Designing the Project to ensure the scope meets: legislative requirements, approval conditions, and incorporates Leadership in Energy and Environmental Design (LEED) or equivalent principles, as applicable;
- Retaining an archaeological advisor to provide advice and assistance with respect to archaeological management for the Project as a whole;
- Including robust environmental protection, monitoring and reporting requirements in construction contracts, including the requirement for each contractor to appoint a qualified professional to monitor the contractor's compliance with environmental laws, environmental aspects of applicable permits, archaeological protection, and contaminated soil management;
- Reviewing contractors' environmental management plans, environmental protection plans and regulatory approval plans – both upon initial submission and as construction progresses to ensure that the plans remain valid and are updated as warranted by, for example, the introduction of new work methods or regulatory requirements; and
- Auditing contractors' environmental performance, including through:
    - The review of any environmental incidents to confirm the accuracy and sufficiency of reporting, to discuss "lessons learned", and to go over how corrective actions are implemented;
    - conducting site tours and monitoring contractors' construction activities to confirm contractors are following their environmental protection plans; and
    - conducting periodic meetings with contractor's site and environmental representatives to review environmental performance.

This approach was effective in protecting the environment throughout the course of construction – which occurred at over 26 active work sites - as evidenced by the fact that there were a relatively small number of environmental incidents, and they were all diligently-managed, appropriately-reported and mitigated as required, with the result that there weren't any long-term impacts.

Most environmental incidents were minor in nature and did not result in any impacts on the environment. A typical example would be a low-volume release of hydraulic fluid as a result of equipment breakage, with the release being immediately contained.

Three environmental incidents occurred that were more significant and had the potential to have adverse effects, but the rapid implementation of appropriate mitigative action and oversight by environmental professionals avoided any significant long-term impacts:

- In November 2018, Vancouver Pile Driving, a subcontractor to Harbour Resource Partner (Harbour Resource Partners, the Design-Build Contractor for the McLoughlin

Point Wastewater Treatment Plant) towed a scow loaded with material dredged as part of the construction of the McLoughlin Point Wastewater Treatment Plant outfall to Bamberton in the Saanich Inlet. The scow was towed to Bamberton as the dredged material was previously identified as contaminated (from activities unrelated to the Project) and there is a suitable disposal site near Bamberton. The scow was tied up for the night and the following morning the starboard stern corner of the scow was observed to be listing heavily. Van Pile notified Harbour Resource Partners, the Coast Guard and Provincial Emergency Management Program. The Coast Guard arrived on site that morning and deployed containment booms around the scow. Van Pile initiated activities to right the scow and by the morning of November 16, 2018 the scow was floating safely and crews offloaded the remaining dredged material. The Coast Guard returned that morning and removed the containment booms. Coast Guard and Transport Canada investigations determined that no hydrocarbons were released to the environment during the incident, and Van Pile determined that no dredged material entered the water. Harbour Resource Partners' qualified environmental professionals took water samples on November 15 and 16, 2018 to assess potential effects on water quality. They determined that inside of the containment boom the incident resulted in Provincial Water Quality standards for turbidity and total suspended solids being exceeded for a period of less than 24 hours. Outside of the containment boom there were no water quality guideline exceedances. The Province determined that the incident was not reportable, and Harbour Resource Partners' qualified environmental professionals determined that there were no adverse environmental impacts from the incident.

- In August 2019, Knappett (the Construction Contractor for Residual Solids Pump Stations), was preparing to install the Residual Solids Conveyance Line under the Colquitz Creek and experienced challenges with dewatering and isolation of the work area, leading to sediment releases that resulted in short-term increases in turbidity. The sediment releases were reported to federal and provincial authorities and instream work was temporarily-suspended while the construction plan was revised. The water quality remained within BC Water Quality Guidelines, and due to the short duration of the turbidity increases, Knappett's qualified environmental professional determined it is unlikely that there were any adverse effects on fish or fish habitat. In September once the new plan was implemented, work resumed and a different isolation methodology was employed, allowing the Residual Solids Conveyance Line to be installed successfully. Prior to placement of spawning gravel and completion of backfilling, a large rain event resulted in the isolated work area being inundated. In response, Knappett removed the isolation dams, as they were no longer required to finish the work. The inundation and dam removal also led to sediment releases that created short-term turbidity increases, but again, water quality remained within BC Water Quality Guidelines, and due to the short duration of the turbidity increases, Knappett's qualified environmental professional determined it was unlikely that there were any adverse effects on fish or fish habitat The instream work was completed without further incident, and restoration and stream enhancement work conducted. This included placement of spawning gravel, removal of invasive plant species and planting of native riparian vegetation. The stream enhancement was successful, and Coho spawners have been observed using the installed spawning gravel.

- In October 2020, there was a release of residual solids at the Residuals Treatment Facility site. A temporary pipe failed during the commissioning process. Some of the

residual solids were contained on-site (within Hartland Landfill) but some travelled through a culvert and collected in a nearby low area in the CRD's Mount Work Regional Park. The release was reported to Emergency Management BC, in accordance with the Spill Reporting Regulation. Qualified environmental professionals assessed the affected area and provided oversight over remediation activities, including on the appropriate monitoring and testing protocols. It was determined that there was no surface flow to Durrance Lake but samples were taken as a precaution: microbiological indicators in the samples were present at consistent or slightly lower levels than prior to the incident, demonstrating that the release did not impact Durrance Lake.

The fundamental purpose of constructing the Project was to treat the core area's wastewater prior to its discharge into the marine environment, thereby reducing pollution in the Strait of Juan de Fuca and contributing to the overall health of aquatic ecosystems in the area.

In addition to the fundamental environmental benefit of constructing the Project, an unexpectedly-significant environmental benefit of the Project was the remediation of McLoughlin Point. The McLoughlin Point site was contaminated as a result of its previous use as an oil tank farm. As part of the Project a significant amount of contaminated materials were removed from the site (and disposed of in regulated landfills), and the site was remediated to meet the applicable standards set by the Environmental Management Act ("EMA") and the Contaminated Sites Regulation ("Regulation") - as documented by the Certificate of Compliance issued by the Province.

5.2.3 Regulatory Requirements

The Project's regulatory requirements key performance indicator was to deliver the Project such that the Core Area complies with provincial and federal wastewater regulations.

The Project met this key performance indicator: see Section 5.1.1 for how the Project exceeded federal wastewater regulations; the delivered Project also complies with provincial wastewater regulations, as demonstrated by the registration of the Project under the Municipal Wastewater Regulation.

For further context, the provincial regulations comprise two main elements:

- Effluent quality requirements for treated wastewater discharged out of McLoughlin Point outfall, which the Project enables the CRD to meet through the provision of tertiary treatment at the McLoughlin Point Wastewater Treatment Plant; and
- The circumstances under which untreated wastewater can be discharged out of the core area's other outfalls, which the Project enables the CRD to meet through the Project components that expand the existing conveyance capacity (namely the construction of the Trent Forcemain and Arbutus Attenuation Tank). For context, in addition to the McLoughlin Point outfall (a new, 2km-long outfall built as part of the Project), the core area wastewater system includes a number of outfalls and overflow locations that are utilised in wet weather events. The provincial regulation requires that an overflow must not occur during storm or snowmelt events with a return period of less than five years, other than, as allowed by the Core Area Liquid Waste Management Plan.

The addition of the Project components to the core area wastewater system means that, based on current wastewater flow projections:

- The McLoughlin Point Wastewater Treatment Plant has sufficient capacity to treat the core area's wastewater and accommodate regional population growth to at least 2040; and
- The conveyance system has sufficient capacity to meet and exceed the following Core Area Liquid Waste Management Plan (CALWMP) commitments past 2045:
    - all wet weather flows up to four times the average dry weather flow (4 x ADWF) from the Macaulay Point catchment will be conveyed to McLoughlin Point for treatment;
    - all wet weather flows up to 3 x ADWF from the Clover Point catchment will be conveyed to McLoughlin Point for treatment;
    - no overflows will occur for a wet weather event with less than a 100-year return period at any of the high sensitivity receiving waters along the East Coast (i.e. Broom Road or Bowker Creek); and
    - no overflows will occur for a wet weather event with less than a 5-year return period at any of the receiving waters along the East Coast (i.e. Finnerty and McMicking Points), with the exception of those associated with the combined sewer system.

Note that there will continue to be overflows at Humber and Rutland. These overflows occur as portions of the collection system in Oak Bay have combined sewer systems that carry both sanitary (municipal wastewater) and storm flows. The Project was not scoped to reduce these overflows: Amendment No. 12 to the CALWMP – which entails undertakings independent of the Project - is intended to address this.

5.2.4 Stakeholders

The Project's stakeholders key performance indicator was to continue to build and maintain positive relationships with First Nations, local governments, communities, and other stakeholders. Significant efforts were made to engage with and provide accurate and timely information to stakeholders throughout the delivery of the Project. Through these efforts, which are summarised in the following subsections, and the achievement of the Project's goals, positive relationships were built and maintained with First Nations, local governments, communities, and other stakeholders.

5.2.4.1 First Nations

As outlined in section 2.2 of this report, the Core Area lies within or near the traditional territories of 16 First Nations. The CRD has been engaged in consultations with First Nations relating to wastewater treatment since 2006, and in relation to the Project since 2014.

The First Nations most closely associated with the Project are the Esquimalt and Songhees, historically known as the "*Lekwungen"*. Their communities are located in the Core Area within several kilometres of the McLoughlin Point Wastewater Treatment Plant and other important components of the Project. The Esquimalt and Songhees support the goals of the Project and are participants in the Core Area wastewater system through service agreements. The Chiefs from each Nation are members of the Core Area Liquid Waste Management Committee. The Esquimalt and Songhees have leased land in the Victoria Harbour to the Project for use during construction. In recognition of their assistance in the planning and development of the wastewater system, and in recognition of their right to be consulted about the potential impacts of the Project on their Douglas Treaty rights, the CRD entered into support agreements with each of them. These agreements provide, amongst other things, for an Esquimalt Nation liaison

position and a Songhees Nation liaison position for the four year term of the Project. The liaison representatives have been assisting the CRD in its communications with the Esquimalt and Songhees communities, in the administration of protocols involving potential impacts on ancestral remains and their traditional lands, and in the discussion and management of other important Project-related issues.

There are four First Nations with communities near the Core Area, but outside the Core Area wastewater system. They are SȾÁUTW̱ (Tsawout), W̱SIḴEM (Tseycum), W̱JOŁEŁP (Tsartlip), and BOḰEĆEN (Pauquachin). These Nations are known as the W̱SÁNEĆ Nations, and the Residuals Treatment Facility and parts of the conveyance system are located on municipal roads or CRD lands within their traditional territories. The CRD and the W̱SÁNEĆ Leadership Council engaged in discussions about the construction and operation of Wastewater Treatment Project components in W̱SÁNEĆ Territory, and in December 2019 entered into a Memorandum of Understanding to provide capacity funding to allow this productive engagement to continue. In addition to providing capacity funding, the Memorandum of Understanding commits the CRD to move toward a negotiated agreement that considers the Project's presence within W̱SÁNEĆ territory, and engage in further discussions towards an agreement involving the broader relationship between CRD and the W̱SÁNEĆ Nations that takes into consideration CRD's operations within W̱SÁNEĆ territory and the recommendations of CRD's First Nations Task Force Final Report as adopted by the Board of the CRD.

There are ten other First Nations with Treaty rights in the general vicinity of the Core Area, which are primarily fishing rights in the Strait of Juan de Fuca. These Nations are the Scia'new (Beecher Bay), Stz'uminus, Halalt, Penelakut Tribe, T'Sou-ke, Lyackson, MÁLEXEŁ (Malahat), Lake Cowichan, Cowichan Tribes, and Nanoose First Nation (which is included because it is represented by a tribal association, the Te'mexw Treaty Association, which was formed by some of these Nations). The CRD concluded that the construction and operation of the Project, including the construction of outfall pipes, will not conflict with any of the Douglas Treaty rights of these Nations but, throughout the delivery of the Project, kept them informed of Project activities, especially as they relate to beneficial outcomes in the marine environment.

5.2.4.2 Communications and Engagement Plan

The key focus of the Project's communications and engagement activities were to keep residents and stakeholders informed of project plans, progress and construction information, and to receive and respond to questions and concerns raised by the community. Working in conjunction with CRD Corporate Communications, and utilising tools and developed relationships, the engagement and communications program included:

- Communications Planning, which involved developing plans and strategies in support of the Project;
- Community Relations, which involved building and maintaining positive relationships with Frist Nations, local governments, communities and other stakeholders, and keeping them informed through ongoing, two-way communications regarding the Project, and responding to inquiries in an effective and timely manner;
- Public Engagement, which involved gathering and receiving public input on certain aspects of the Project;
- Media Relations, which involved providing the media with progress reports and updates on the Project and responding to issues raised; and

- Construction Communications, which involved developing traffic management plans and a process to keep the public and stakeholders advised in a timely manner about matters relating to construction progress, schedules and impacts.

The Project Team prepared, implemented and annually updated a Project Communications and Engagement Plan. A variety of communications tools and engagement activities were utilized to support the implementation of the plan and ensure that information was easily accessible and distributed through a variety of methods. These included stakeholder meetings, Project website updates, social media posts, media updates for key Project milestones, construction notifications, door-to-door notifications, and a public inquiry program, among other methods.

The Project facilitated ongoing two-way community and stakeholder communications to ensure the public and stakeholders were well-informed; responded to inquiries; and ensured that Project managers were mindful of community interests and concerns. The communications and engagement team communicated with stakeholders, community groups, businesses and the public regarding Project schedules, progress, developments and construction information.

A liaison committee was set up for the Township of Esquimalt to provide a forum for the discussion of issues related to the construction and operation of the Wastewater Treatment Plant, the Macaulay Point Pump Station and Forcemain, and the Residual Solids Conveyance Line. The committee includes representatives from the Township of Esquimalt, West Bay Residents Association, Lyall Street Action Committee, Macaulay Elementary School Parent Advisory Committee, Department of National Defence, CRD, McLoughlin Point Wastewater Treatment Plant contractor Harbour Resource Partners, Macaulay Point Pump Station and Forcemain contractor Kenaidan Contracting Ltd. and Residual Solids Conveyance Line contractor Don Mann Excavating. This committee met monthly during construction and will continue to meet semiannually now that the McLoughlin Point Wastewater Treatment Plant is operating.

The Project Team met as necessary with three neighbourhood groups in Victoria that were in close proximity to Project Construction: the James Bay Neighbourhood Association, the Fairfield Gonzales Community Association, and the Victoria West Community Association. Engagement with these neighbourhood and community associations was focused on construction progress and disturbance mitigation measures.

The Project Team met with the Saanich Community Association Network (SCAN) and established a relationship with the Willis Point Community Association to provide updates on construction of the Residuals Treatment Facility at Hartland Landfill and the Residual Solids Conveyance Line.

In advance of commencing construction in a new area, community information open houses were a valuable communication tool to provide information about the different components of the Project to the public. Twenty open houses in Esquimalt, Victoria and Saanich were held for this purpose, as summarized in Table 6. Over 1,200 people attended these meetings, which were publicized widely through mailed notices to residents, email, newspaper advertisements, social media, and on the Project website.

Table 6 – Community Information Open Houses

Date	Community
January 11, 2017	Victoria - Fairfield Gonzales
January 11, 2017	Victoria - James Bay
January 12, 2017	Esquimalt
January 14, 2017	Esquimalt
January 18, 2017	Department of National Defence
April 5, 2017	Victoria - James Bay
April 12, 2017	Esquimalt
November 15, 2017	Saanich
November 18, 2017	Saanich
November 22, 2017	Esquimalt
November 27, 2017	Victoria
January 10, 2018	Victoria - James Bay (50%)
January 11, 2018	Victoria - Fairfield Gonzales (50%)
February 21, 2018	Niagara Street Information Meeting
February 24, 2018	Niagara Street Information Meeting
March 13, 2018	Esquimalt - Macaulay
September 25, 2018	Victoria – James Bay, Fairfield Gonzales
September 26, 2018	Victoria – James Bay, Fairfield Gonzales
November 27, 2018	Saanich
November 28, 2018	Saanich

Project updates were produced on a regular basis and at key Project milestones to provide information about the Project. This newsletter-style document highlights construction updates across various components of the Project. The updates were posted to the website, distributed to stakeholders, including MLAs, municipal Mayors and Councillors, and hand delivered to community centres.

In addition, 19 information sheets were developed to provide more details regarding the different Project elements. These information sheets were posted online, emailed to stakeholders and had hard copies distributed as appropriate.

To share specific and targeted information about upcoming construction impacts, 143 construction notices were developed. Each construction notice was hand delivered to residents near the work site, posted online and circulated to stakeholders via email as appropriate. Approximately 9,800 construction notices were hand delivered for this Project.

The Project communications and engagement team worked with the CRD's Senior Manager of Corporate Communications to brief journalists to ensure that local, regional, provincial, national and international media were informed about key Project milestones, and to provide information for timely media responses. The Deputy Project Director was the Project's spokesperson, and regularly spoke to media to provide Project updates.

An inquiry response program was established to track, record and provide accurate and timely responses to questions or concerns from the public and stakeholders. It comprised an email address (wastewater@crd.bc.ca) and a 24/7 Project information telephone line 1-844-815-6132. Since September 2016, the Project Team responded to 2,127 inquiries, as summarised in Table 7.

Table 7 – Project Inquiries

Inquiry Source	Contacts (September 2016 - May 2021)
Information phone line inquiries	1,221
Email inquiries responded to	906
Total inquiries responded to	**2,127**

5.2.5 Schedule

The Project's schedule key performance indicator was to deliver the Project by December 31, 2020. The Project completed the majority of construction by that date, and achieved its schedule-related goal, which was to meet or exceed federal regulations for secondary treatment of wastewater by December 31, 2020.

All aspects of the Project that were required to meet the regulatory requirements were delivered by December 31, 2020: in the third quarter of 2020, the Clover Point and Macaulay Point Pump Stations diverted the Core Area's wastewater, through the Clover and Macaulay Forcemains, respectively, to the McLoughlin Point Wastewater Treatment Plant, for tertiary treatment; and from the third quarter of 2020, the Residuals Solids Conveyance Line conveyed residual solids to the Residuals Treatment Facility.

The Residuals Treatment Facility commenced production of class A biosolids later than anticipated, in January 2021, and commissioning of the facility is ongoing and is anticipated to be complete in June 2021.

On the conveyance component of the Project, the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining. The Arbutus Attenuation Tank is being built to increase the capacity of the conveyance system and is expected to be operational in June 2021, and the remaining work on the Clover Point Pump Station is expected to be complete in fall 2021: it has been delayed by the need to remove debris from the inlet channel that has built-up over decades of use.

Figure 17 shows a comparison of the achieved Project schedule against that forecast in the Project Charter – which was a high-level schedule that was developed to be optimised and refined as the Project and planning progressed.

It was noted in the Project Charter that, in order to meet the federal regulations for treatment of the Core Area's wastewater by December 31, 2020, the Project schedule was ambitious. It was further noted that while the Project schedule was achievable there was no float.

Therefore, despite the Project schedule not including an allowance for a global heath pandemic (that impacted workforce availability, workforce productivity and equipment and material deliveries), the Project met the goal of meeting or exceeding federal regulations for secondary

treatment of wastewater by December 31, 2020, and completed the majority of construction by December 31, 2020.

As of May 2021, the vast majority of construction has been completed (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining). The works remaining under each construction contract are summarised in section 7 of this report, and the Project budget includes committed funds to complete the remaining works and close-out the construction contracts.

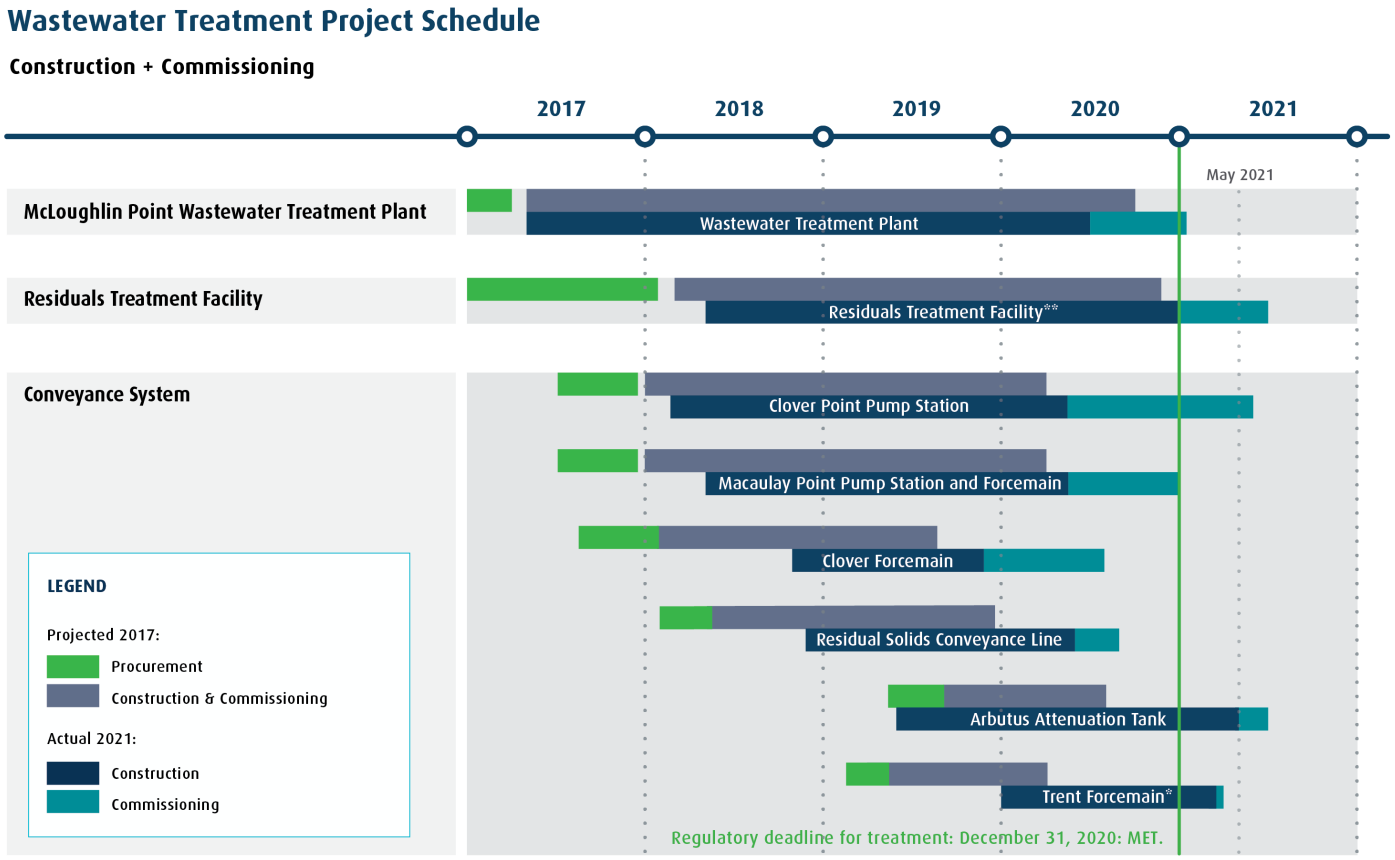


Figure 17 - Schedule comparison: March 2017 forecast to May 2021 actual

Notes to Figure 17:

** In 2019, the Wastewater Treatment Project's scope was refined to remove three components of the conveyance system (expanding the capacity of the Currie Pump Station, twinning the Currie Forcemain and twinning the East Coast Interceptor), as they would provide no benefit to the CRD's residents and businesses.*

*** The Residuals Treatment Facility commenced production of class A biosolids later than anticipated, in January 2021, and commissioning of the facility is ongoing and is anticipated to be complete in June 2021.*

**** The commissioning time period shown is the timeline for each Project contractor to complete their commissioning requirements. Upon each Project contractor completing their commissioning requirements, the responsibility for operating the component is transferred from the relevant Project contractor to the CRD's Integrated Water Services department, who are then responsible for managing the optimisation of the operation of each Project component and any resultant impacts on the operation of the other components of the core area wastewater system.*

5.2.6 Cost

The Business Case established the Control Budget of $765 million. The Project's cost key performance indicator was to deliver the Project within the Control Budget ($765 million). In May 2019 the CRD Board approved an increase in the Project's budget by $10M to $775M.

While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur in Q4 2021, it is forecast that the total Project cost will be approximately $766.7M, which is within the approved budget of $775M. The total Project cost is therefore forecast to exceed the Project's Control Budget (of $765M) by 0.2%, but be well within the budget subsequently-approved by the CRD Board (of $775M).

The total Project cost forecast of $766.7M includes:

- costs expended to-date to plan, procure, construct and commission the Project;
- the forecast cost to complete the activities remaining to close-out the construction contracts and the obligations remaining to be fulfilled in the Project's funding, First Nation and land access agreements; and
- an appropriate amount of contingency ($2.74M), based on the Project Team's assessment of the: status of each component; the risks associated with the remaining work and the outstanding obligations; and the funds and resources committed to complete these.

The total Project cost forecast includes all Project costs, being those incurred in order to plan, procure, construct and commission the Project components. The Project budget does not include the costs to operate and maintain the Project components, which are included in CRD operating budgets. Operating and maintaining costs include (but are not limited to) the costs of: optimising the operation of the Project components after handover from the relevant Project contractor to the CRD's Integrated Water Services department; the cost of the transportation and use of biosolids produced by the Residuals Treatment Facility; the amount by which the operating period payments for the Residuals Treatment Facility exceed the net present value of the capital cost; and the cost of CRD's management of any required warranty work (the Project budget covers the cost of each Project component's warranty, but not the cost of CRD's oversight of warranty work).

Several factors resulted in the Project not meeting its cost KPI. The Project Team reported budget pressures through its monthly reports to the Project Board (and CRD Board) since September 2017, primarily as a result of inflation in the Vancouver Island construction market. Other factors that contributed to budget pressures include: design development to incorporate stakeholder input; geotechnical considerations including removal and disposal of a significant quantity of contaminated material; and schedule constraints associated with the requirement to provide wastewater treatment by the regulatory deadline of December 31, 2020.

In addition, since the onset of the global health pandemic, the Project Team reported cost impacts from the COVID-19 public health emergency. Impacts included labour availability and productivity (as a result of work modifications required to comply with provincial guidelines), and delays to the delivery of equipment and supplies.

Countering these budget pressures, Project risks were diligently and proactively managed, and there were significant cost savings in the Project's forecast financing costs. As outlined in

section 6.4, these resulted from the CRD's financing strategy, combined with low interest rates and early payment of a significant proportion of the Province's funding.

Attached as Appendix B to this report is a cost report for the Project, showing a detailed breakdown of the budget at April 30, 2021, including costs expended and the forecast funds and contingency required to complete the Project-related commitments and activities that extend beyond May 2021 (see section 7 of this report for further information on those commitments and activities).

5.2.6.1 Project Cost Comparison

Table 8 shows a comparison of total forecast cost compared to the allocated Control Budget approved by the Project Board on June 6, 2017, and Table 9 provides the main reasons for the differences. The allocated Control Budget was used as the basis for the Project Team's management of the budget and reporting, including to control costs, commitments, use of contingency and manage cash flow.

One component of the allocated Control Budget is the Project Management Office (PMO) budget, which was approved by the Project Board on January 10, 2017. At that time, KPMG carried out an exercise to review and benchmark the PMO budget against industry standards. KPMG found that industry standards were that the PMO budget of a project should make up between 5 and 13% of the total project cost, exclusive of engineering costs. KPMG considered the complexity of the Wastewater Treatment Project, and noted that the Project entailed: complex procurements with a number of different contract types (DBB, DBF and DBFOM); integration and commissioning of multiple components; and a significant number of internal and external stakeholders. Based on this assessment of complexity, and the fact that the Project's PMO budget, inclusive of engineering costs, was 10% of the total project cost, KPMG determined that the PMO Budget was well within industry standards.

Table 8 – Comparison of Total Forecast Cost against the Allocated Control Budget (all in $ millions)

Project Component	Control Budget Approved June 6, 2017	Total Forecast Cost[1]	Variance
McLoughlin Point Wastewater Treatment Plant	$331.4	$336.3	($4.9)
Residuals Treatment Facility	$159.4	$140.2	$19.2
Conveyance System	$158.2	$206.5	($48.3)
Project Management Office	$75.8	$72.5	$3.3
BC Hydro	$12.9	$2.7	$10.2
Third Party Commitments	$8.1	$8.5	($0.4)
Sub-Total	**$745.9**	**$766.7[2]**	**($20.8)**
Program Reserve	$19.2	$8.3	$10.9
Total	**$765.0**	**$775.0**	**($10.0)**

Notes to Table 8:

1. *Total forecast cost is the forecast cost at completion, and comprises:*

a. *$617.2M of costs expended at April 30, 2021, which includes invoices received and processed before the cut-off for the April 2021 cost period;*

b. *$157.8M of funds to cover:*

    i. *work completed but not yet invoiced (i.e. invoices for work already completed but not yet invoiced by the cut-off for the April 2021 cost period); and*

    ii. *the work required to complete the Project-related commitments and activities that extend beyond May 2021 (see section 7 of this report for further information on those commitments and activities); and*

c. *$2.74M of contingency to manage the risks associated with completing the Project-related commitments and activities that extend beyond May 2021, comprising:*

    i. *$1M to cover the potential performance incentive payment to HRP, that is payable after the completion of the performance period (which concludes on January 12, 2023), and will be payable at an amount (of up to $1 million) to be determined based on performance against milestones over the two year performance period; and*

    ii. *$1.74M for the conveyance component, which is anticipated to be more than sufficient given the nature of the remaining commitments and activities (see section 7 of this report for further information on those commitments and activities).*

2. *While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur in Q4 2021, it is forecast that the total Project cost will be approximately $766.7 M, which is within the approved budget of $775M.*

3. *A program reserve of $19.2 million was included in the Control Budget to manage risks impacting the entirety of the Project, or the interface between any of the Project components.*

   At April 30, 2021, $8.3 million remains in program reserve; this is in addition to $2.74M of contingency that is included within the total forecast cost of $766.7M, as outlined in note 1 to manage the risks associated with completing the Project-related commitments and activities that extend beyond May 2021.

Table 9 summarises the main reasons for the differences between the total forecast cost compared to the allocated Control Budget approved by the Project Board on June 6, 2017

Table 9 – Principal Factors causing Variances between the Total Forecast Cost and the Allocated Control Budget

Project Component	Variance ($ millions)	Principal Factors Driving Variance
McLoughlin Point Wastewater Treatment Plant	($4.9)	- Significantly greater contamination at site than forecast: see section 5.2.2 for further information - Cost impacts from the COVID-19 public health emergency: impacts included labour availability and productivity (as a result of work modifications required to comply with provincial guidelines). + Lower than forecast financing costs: see section 6.4 for further information
Residuals Treatment Facility	$19.2	+ Strong market response to procurement (opportunity big enough to attract qualified contractors from across North America) + Rescoping of storage area: see section 4.2.1 for further information
Conveyance System	($48.3)	- Inflation in the Vancouver Island construction market - Design development to incorporate stakeholder input + Value engineering combined with substantial reduction in water use per person reduced required scope: see section 4.3.7.1 - Cost impacts from the COVID-19 public health emergency: impacts included labour availability and productivity (as a result of work modifications required to comply with provincial guidelines). + Lower than forecast financing costs: see section 6.4 for further information
Project Management Office	$3.3	+ Efficient delivery
BC Hydro	$10.2	+ Efficient delivery
Third Party Commitments	($0.4)	- Commitments slightly greater than estimated
Program Reserve	$10.9	A program reserve of $19.2 million was included in the Control Budget to manage risks impacting the entirety of the Project, or the interface between any of the Project components. At April 30, 2021, $7.8 million remains in program reserve.
Total	$-	

6 Project Successes and Challenges

The most significant Project challenges, and actions that contributed to the successful management of them, are summarised in the following sections.

6.1 Safety

Maintaining safety as the Project's top priority was critical given the scope, scale and complexity of construction, and its performance in an urban environment during a period of time that included a global health pandemic.

Key to meeting this challenge was:

- All of the Project's Prime Contractor's continued commitment to safety as the number one priority on the Project;
- All of the Project's Prime Contractor's implementation of additional precautions during the global health pandemic to comply with provincial guidelines and protect their workers, CRD staff and the public;
- The Project Team's maintenance of a strong safety-first culture – beginning with the evaluation of contractors' safety performance, personnel and practices as part of all construction procurements, and progressing through chartering sessions to ensure new Project contractors understood the primary importance of safety, and a robust oversight and audit program that included regular site inspections, reviewing safety incidents with prime contractors to discuss lessons learned and how corrective actions are being implemented as a result of these reviews, and the sharing of trending observations or similar incidents between Project contractors;
- Comprehensive monthly reporting of safety incidents, including descriptions of the incident, the outcome and corrective actions – for all categories of safety incidents from near misses to recordable incidents; and
- Acknowledgement that safety is everyone's responsibility.

6.2 Schedule: Project Delivery to meet the Regulatory Deadline

As noted in the Project Charter, in order to meet the federal regulations for treatment of the Core Area's wastewater by December 31, 2020, the Project schedule was ambitious. To plan, procure, construct and commission the Project within five years - from the time the Project Board was appointed to the regulatory deadline for treatment – required:

- the co-operation of multiple parties and governance bodies; and
- procuring and constructing some components through multiple contracts in order to optimise the design, procurement, construction and commissioning schedule, which necessitated the Project Team expending a greater effort on contractor and interface management.

Key to meeting this challenge was:

- The CRD Board's delegation of authority to the Project Board, as this allowed for appropriate oversight and governance by a body with expertise in major project management and construction that could focus solely on delivery of the Project in order to achieve the goals established for it;

- The inclusion of the CRD's Chief Administrative Officer on the Project Board, as this facilitated CRD integration and support, and the identification and implementation of CRD policies and procedures relevant to the Project's delivery;
- The establishment of a Project Team with the relevant expertise required to deliver the Project;
- The full support of the CRD, and the integration of CRD departments in Project delivery, as this provided institutional knowledge and expertise that was critical to allowing the immediate commencement of, and expeditious progress to be made in, Project planning and delivery;
- The input and engagement of the Project's First Nations partners;
- The collaboration and cooperation of host municipalities, funding partners and regulatory authorities;
- Schedule mitigation by the Project's contractors;
- The engagement of community and neighbourhood associations which assisted in the identification of concerns and interest allowing the Project to respond or adjust plans as appropriate;
- The willingness of transit and other service providers to coordinate with our contractors to work around impacted areas while continuing to provide service to the community; and
- The patience of the CRD's residents, commuters, businesses and stakeholders, particularly those most impacted by the Project's construction and operations.

Also of significance in meeting the challenge was the Project Team's approach to schedule management, which included the following steps:

- the establishment of the master project schedule, which was the primary planning and coordination tool for schedule management;
- the development and maintenance of a permit register to identify and monitor the status of permits, approvals, authorizations, licences and agreements that may be required for the Project.
- the inclusion of relevant milestones, schedule incentives and acceleration clauses in each construction contract;
- the maintenance of the master project schedule through the review and incorporation of contractors' baseline and monthly updated schedules; and
- monitoring progress and taking action as required to manage the interfaces between the different Project contracts and meet the Project's key performance indicators.

6.3 Delivering a Major Infrastructure Project in an Urban Setting

The delivery of a major infrastructure project in an urban setting with construction in three different municipalities presented multiple challenges, including: design and construction complexity as a result of congested utility corridors and substantial road use; how to manage stakeholder impacts and build infrastructure to meet different municipal requirements.

The Project met these challenges through the establishment of individual technical working groups with all three host municipalities: this allowed for the collaboration and cooperation of host municipalities as components were designed, procured and constructed.

Section 5.2.4 outlines the significant efforts made to build and maintain positive relationships with First Nations, local governments, communities, and other stakeholders, and these undoubtedly contributed to addressing the challenges of building such significant infrastructure in an urban environment. A particular example of how the challenges were met is provided by the management of stakeholder impacts during the staging of the cross-harbour pipe.

For six weeks, Niagara Street, a small, residential street, was used to assemble a 940-metre pipe above ground before it was pulled into a cross-harbour undersea tunnel from Ogden Point to McLoughlin Point.

Beginning the first week of March 2018, 78 pipe sections were welded together and the pipe was moved into place on rollers on Niagara Street across eight city blocks from South Turner Street to St. Lawrence Street. Over three days, cranes and sidebooms lifted the pipe in the 100 block of Niagara Street where the pipe was threaded into the tunnel at Ogden Point and pulled from the McLoughlin Point side.

Managing the significant impacts that this work had on the neighbourhood involved comprehensive planning to coordinate with the contractor, local authorities and service providers; and extensive communications and engagement with local residents. Some of the community outreach included:

- A door-to-door survey which was conducted with Niagara Street residents to provide updated information and a resident needs assessment in December 2017;
- Two community meetings with residents to answer questions which were held on February 21 and February 24, 2018;
- A Help Tent that was located in the 200 block of Niagara Street and staffed by a Project representative to provide information and answer questions about the Project;
- The 24/7 phone line and project email address were provided to residents so that they could request information or report a concern; and
- A community BBQ was held on May 1, 2018 as a thank you to the residents for their patience.

As a result of the community outreach undertaken, and the patience and understanding of the community, the Project Team and Project contractor (Harbour Resource Partners) built positive relationships within the community, many of whom expressed an interest in witnessing a remarkable engineering feat.

6.4 Cost

The Project faced significant cost pressures as a result of several factors including inflation, greater than anticipated contamination, and the global health pandemic, as outlined in Section 5.2.6 of this report.

Key to meeting this challenge was:

- The ability to manage risk: risk management on the Project involved the identification, analysis, oversight, treatment and monitoring of the Project risks. The Project Leadership Team promoted a risk-aware culture whereby any person was encouraged to raise potential risks for consideration. The success of this approach was supported by the findings of Ernst and Young when they conducted an

independent project execution review part-way through Project delivery (in April 2019), and reported:

- A strong risk-aware culture that was supported by well-defined processes and risk registers;
- The Project Team had put careful consideration into risk transfer when structuring contracts. Notable and leading industry practices around controlling mechanisms are in place, including incentive and penalty clauses; and
- Project reporting to be comprehensive and forward-looking, with commentary to provide the necessary context around key items.

- Lower than forecast financing costs: due to the Project's funding sources and related conditions, there were differences in timing between incurring and recovering Project-related costs. As a result of these differences, the CRD's Finance Department needed to develop and implement a financing strategy to manage cashflow to meet the Project's financial commitments. The financing strategy implemented, combined with low interest rates and early payment of a significant proportion of the Province's funding resulted in significant cost savings in the Project's forecast financing costs, which helped to offset the budget pressures described in section 5.2.6 of this report.

6.5 Interfaces between Project Components

Managing the physical and schedule interfaces between the different components required to deliver the overall Wastewater Treatment Project was a challenge.

Key to meeting this challenge was:

- The inclusion of elements with critical interfaces into a single contract – where the resulting risk profile, type of work and size of the package, would still allow for sufficient market interest in the package such that competitive pricing would be received - for example:
  - the Macaulay Point Pump Station and Forcemain were procured together in a single contract; and
  - three elements (the McLoughlin Point Wastewater Treatment Plant, marine outfall and harbour crossing) were included in a contract to allow a single contractor to manage the physical and schedule interfaces between these components with critical interfaces
- The use of a single owner's engineer to develop the indicative design for all critical Project components with significant interfaces;
- The use of a single systems integrator to develop standards and implement an approach for computerised controls and communication; and
- Developing of a master project schedule that allowed for a logical sequence of commissioning activities, considering that construction of the Project would be achieved through multiple contracts and that each required the delivery of waste streams to achieve completion.

6.6 Construction Challenges

Construction challenges included: geotechnical considerations (especially protecting the integrity of the Dallas Road bluffs during the construction of the Clover Forcemain component of the Project); working in proximity to water; managing contaminated soils and utility conflicts; constructing on constrained sites (especially at McLoughlin Point); and building in areas with archaeological sites and the potential for archaeological finds.

Key to meeting these challenges were:

- Hiring experienced design consultants and construction contractors;
- Developing plans and procedures, both Project-wide and component-specific that mitigated potential adverse environmental impacts;
- Technical peer review of alternative solutions to complex challenges;
- Specific to the site constraints: developing indicative designs sufficiently during procurement processes to ensure designs were selected that were technically-feasible and could be constructed within the site constraints;
- Colloborating with First Nation partners; and
- Hiring archaeological advisors to provide advice and assistance with respect to archaeological management, including by:
    - preparing Archaeological Overview Assessments and Archaeological Impact Assessments;
    - planning for archaeological mitigation and data recovery;
    - preparing archaeological protocols and specifications for inclusion in construction contracts;
    - conducting archaeological awareness training for construction crews; and
    - undertaking archaeological monitoring with the support of First Nation partners.

6.7 Integration of the Project Components into the Existing Core Area Wastewater System

The integration of new Project components into an existing operating system presented several challenges.

These challenges were managed through the:

- Engagement of representatives from CRD's Integrated Water Services department in the review of design and construction submittals;
- Commitment and support of CRD operating staff , especially through the commissioning period;
- Inclusion in the construction contracts of requirements regarding the training that contractors had to provide to CRD operating staff;
- Project funding of the following initiatives as the CRD planned to integrate the Project components into the core area system:
    - Operational Readiness Review: a performance-based examination of facilities, equipment, personnel, procedures and management control systems for ensuring the Project assets can be operated safely and securely

in compliance with the applicable legislative and regulatory frameworks and in accordance with the policies and delegated responsibilities of the CRD.

- SCADA IT Network Design – Phase 1: starting with the existing network topologies and IP addresses, this study provided a high level design that accounted for the future mapping that would be required for the most intense deployment, in order to provide input on the Project sites now that considers the future goal of the CRD IT/SCADA Network, thereby reducing the need for modifications in the future.
- Asset Management Study: a study to develop a master list of assets with associated attributes that will be stored in Asset Accounting to meet financial processes and long-term capital planning needs for all the infrastructure related to the Core Area Wastewater Treatment Project and Service.

6.8 Establishment of Project Office

The establishment of a Project Team with the relevant expertise required to deliver the Project was key to meeting all of the Project goals, but it presented a potentially-significant challenge to find individuals with appropriate Project delivery experience that were both available and interested in committing to a Project in Victoria for a relatively short-term position.

The Project managed this challenge by recruiting key Project team members, and supplementing them with consultant support as required. For financial, engineering and administrative resources, the Project was aided in meeting this challenge by the ability to second some resources from the CRD, and also the potential for Project resources to apply for and transition to employment opportunities at the CRD.

The Project Board and Director were successful in attracting and retaining the core competencies required throughout delivery of the Project, and this strategy allowed for continuity through dedicated Project team members, while also providing a means to manage the natural variation in resource needs as the Project progressed, and gain access to specialist skill sets as required.

7 Project Handover

The Project Board have fulfilled their role and function as defined in the Terms of Reference, and the term of the Project Board concludes on May 24, 2021. This report section outlines the Project-related commitments and activities that extend beyond May 2021, and is organised in three categories:

i) Activities related to closing-out the Project's construction contracts;
ii) Obligations remaining to be fulfilled in the Project's funding, First Nation and land access agreements; and
iii) Operating and maintenance obligations related to the infrastructure built by the Project.

This report section outlines Project-related commitments and activities that extend beyond May 2021 and that are transitioning from the Project to the CRD. In addition there are organizational/corporate leadership, administrative and support function responsibilities that the CRD will need to fulfill as a result of the addition of the Project components to the core area wastewater system.

7.1 Close-out of the Project's Construction Contracts

As of May 2021, the vast majority of construction has been completed (the Arbutus Attenuation Tank and Clover Point Pump Station are the only Project sites with some minor construction activities remaining). The works remaining under each construction contract are summarised in Table 10, and the Project budget includes committed funds to complete the remaining works and close-out the construction contracts.

Table 10 – Summary of Works Remaining on the Project's Construction Contracts at May 2021

Project Component	Contract Type	Summary of Works Remaining at May 2021
McLoughlin Point Wastewater Treatment Plant	DBF	Providing advice and guidance to optimize plant performance over the remainder of the two-year performance period (to January 12, 2023) and complete warm weather odour test.
Residuals Treatment Facility	DBFOM	Complete activities required to achieve Completion; minor deficiency items and record drawing submission.
Macaulay Point Pump Station and Forcemain	DB	Landscaping, minor deficiency items and record drawing submission
Clover Point Pump Station	DB	Generator ventilation rectification; inlet channel debris removal; final acceptance testing; minor deficiency items and record drawing submission
Clover Forcemain	DBB	Quarterly post-construction stability surveys over the warranty period
Residual Solids Pump Stations	DBB	Removal of low floats and upgrade programming; landscaping, minor deficiency items and record drawing submission
Trent Forcemain	DBB	Restoration, minor deficiency items and record drawing submission
Arbutus Attenuation Tank	DBB	Final commissioning activities, site grading and landscaping, minor deficiency items and record drawing submission

The Project budget also includes committed funds for the resources required to oversee the completion of the remaining works and close-out the construction contracts. Specifically, the

Project budget includes committed funds for the following resources to support close-out post May 2021:

- Project staff transitioning to the CRD, including project management, document control and finance staff resources that the Project budget will fund post May 2021;
- Project consultants: funds have been committed for design consultants (KWL and Parsons) and the Project's owner's engineer (Stantec), to support Project close-out activities; and
- The remainder of the CRD finance department allocation for 2021.

7.2 Obligations Remaining to be Fulfilled in the Project's Funding, First Nation and Land Access Agreements

In addition to the Project's nine construction contracts, approximately 20 funding, First Nation and land access agreements were entered into in order to deliver the Project (refer to Appendix C for a list of the agreements). There are a relatively small number of obligations remaining to be fulfilled in the Project's funding, First Nation and land access agreements. The Project budget includes committed funds to fulfil the outstanding obligations, and the Governance Transition Report details both the fulfilled and the outstanding commitments.

7.3 Operation and Maintenance of Infrastructure Built by the Project

7.3.1 Responsibility for Operations and Maintenance of Project Components

The CRD's Integrated Water Services department are responsible for operating and maintaining all of the Project components other than the Residuals Treatment Facility (see section 7.3.3) upon the relevant Project contractor completing their commissioning requirements. This transfer has occurred for all components other than the Arbutus Attenuation Tank, for which the transfer is forecast to occur in June 2021.

This responsibility includes:

- managing the optimisation of the operation and maintenance of each Project component upon handover, and any resultant impacts on the operation of the other components of the core area wastewater system;
- managing the contractual warranties for each of the Project components;
- administering the two-year performance period for the McLoughlin Point Wastewater Treatment Plant, as outlined below.

The McLoughlin Point Wastewater Treatment Plant contract includes a two-year performance period, from the acceptance date (January 2021). Over the performance period the CRD will operate and maintain the McLoughlin Point Wastewater Treatment Plant, and Harbour Resource Partners are responsible for:

- monitoring operations;
- consulting with and providing advice to the CRD and the CRD's plant manager with respect to the operation of the Facility;
- assisting with environmental and regulatory compliance;
- preparing and updating the operations manual and operations and maintenance plans;
- assisting with the evaluation of the performance of the Project and the implementation of plans to achieve continued compliance with the process performance guarantees;

- assisting with the development and implementation of plans that will minimize use of power, chemicals, water and labour; and
- responding to warranty claims.

There are physically interfacing works and screened, degritted wastewater is required to be delivered in order for the performance period to operate as intended. Responsibility for these interfaces is retained by the CRD: it was the Project Team's responsibility to manage the interfaces during construction and commissioning, and upon the acceptance date (January 2021), the CRD's Integrated Water Services department assumed responsibility for the operation of the McLoughlin Point Wastewater Treatment Plant and the management of the interfaces.

As noted earlier in this report, the Project met it's regulatory requirements key performance indicator (to deliver the Project such that the Core Area complies with provincial and federal wastewater regulations). Specifically, the McLoughlin Point Wastewater Treatment Plant operated in compliance with the provincial and federal wastewater regulations over the three month period from the start of November 2020 to the end of January, 2021, and since April 18, 2021. In the interim period (between the start of February and mid-April, 2021), a number of operating challenges arose, resulting in the discharged effluent exceeding the permitted quality limits. The Plant has continuously treated wastewater since being commissioned, but over the interim period, the discharged effluent was closer in quality to that which would be produced from a secondary treatment plant than a tertiary.

Operating and equipment challenges of the nature experienced at the McLoughlin Point Wastewater Treatment Plant are not uncommon in the period of time immediately after handover of an operating facility from a contractor to an operator, as a period of fine-tuning and optimising operations is to be expected. The Plant is now in compliance with the regulations, and treating wastewater to a tertiary level.

7.3.1.1 Operational Readiness Review

The Project funded the engagement of independent experts to conduct an Operational Readiness Review. This review commenced prior to the transition of Project components from the commissioning phase to the operating phase, with the objective of seeking an independent review of the transition planning conducted and ensure:

- equipment, facilities, and systems were in a state of readiness to safely and securely conduct operations in accordance with the operating plans and performance objectives;
- management control programs were in place to ensure safe and secure operations could be sustained; and
- user/operating organization personnel were trained and qualified.

7.3.2 Contract Administration of Residuals Treatment Facility Project Agreement

The Residuals Treatment Facility was procured through a design-build-finance-operate-maintain contract under which Hartland Resource Management Group have the responsibility to design, build, partially-finance, operate and maintain the facility to meet the performance specification and contract requirements over the term of the contract.

The Residuals Treatment Facility has been constructed and is close to completing commissioning, and the Hartland Resource Management Group will be responsible for operating and maintaining the facility over the next 20 years. The Project's committed budget includes the net present value of the capital cost of the Residuals Treatment Facility: the CRD's operating budget will need to fund the amount by which the operating period payments for the Residuals Treatment Facility exceed the net present value of the capital cost.

There are physically-interfacing works and residual solids required to be delivered and biosolids required to be transported in order for the contract to operate as intended. The CRD's Parks and Environmental Services Department are responsible for managing these interfaces and administering the contract over the 20 year operating and maintenance period.

7.3.3 Permits

The CRD's Parks and Environmental Services Department and/or Integrated Water Services department (as applicable) are responsible for environmental monitoring and/or mitigation activities related to the operation and maintenance of Project components, and maintaining and complying with the terms of operating permits and the limited number of construction-related permits that have obligations that extend beyond the commissioning period.

7.3.4 Responsibility for Operations and Maintenance of Project Amenities

In furtherance of the Project's goal to deliver a solution that adds value to the surrounding community and enhances the liveability of neighbourhoods, the Project either funded or funded and delivered a number of amenities and/or infrastructure improvements (as outlined in Section 5.1.4). These amenities and infrastructure improvements have been transferred to the benefitting municipality to operate and maintain.

7.4 Knowledge Transfer

Project knowledge transfer has been achieved through:

- The support and integration of the CRD throughout the planning, design, procurement and construction of the Project – including through the secondment of CRD resources, and CRD resource review of Project submittals;
- The continuity of personnel through the transfer of resources from the Project Team to CRD positions; and
- The retention of Project records.

Appendix A – Guiding and Key Supporting Documents

CRD Core Area Wastewater Treatment Project Board Bylaw No. 1, 2016

The CRD Core Area Wastewater Treatment Board Bylaw No. 1, 2016 established the Project Board for the purposes of administering the Project. Attached to the bylaw are the Project Board's Terms of Reference, which set out the role, responsibilities and function of the Project Board. The Terms of Reference also provide a framework that includes the Project vision and goals, guiding principles and values, Project Board meeting protocols, confidentiality considerations and identifies those matters that must be referred to the CRD Board for approval. The bylaw was adopted by the CRD Board on May 25, 2016.

Business Case

The Business Case defined the scope of the Project and established the control budget of $765 million (the "Control Budget"). The CRD Board approved the Business Case on September 14, 2016.

Core Area Liquid Waste Management Plan

The Core Area Liquid Waste Management Plan ("CALWMP") outlines CRD's wastewater management strategies, including wastewater treatment under the Environmental Management Act.

Amendment 11 of the Core Area Liquid Waste Management Plan defines how the CRD will treat wastewater in the Core Area. The CRD has received approval from the Ministry of Environment for Amendment 11 on the condition that a definitive plan for the beneficial use of biosolids be submitted to the Minister by June 30, 2019

The CALWMP also includes seven liquid waste management initiatives designed to protect the core area's water quality: monitoring and sampling; harbour stewardship; watershed protection; trucked liquid waste management; inflow and infiltration; onsite septic maintenance; and source control.

Project Charter

The Project Charter was developed to define the parameters and establish the mandate for the Project Team to execute and deliver the Project. The Project Charter included the Project goals from the Project Board's Terms of Reference and established key performance indicators for the Project. The Project Charter also includes a description of roles and responsibilities, and presents a high-level description of the Project budget, schedule, scope, risks, and stakeholders. The Project Charter was first approved by the Project Board on April 4, 2017, and was subsequently updated twice to account for progress made on delivering the Project, with each update approved by the Project Board (on April 27, 2018 and September 30, 2019).

Project Management Plan

The Project Management Plan specified the project management objectives and approaches intended to be used to achieve the key performance indicators (as established in the Project Charter); and stated the key organizational roles and responsibilities anticipated to be required

to provide effective management, administration and control of the Project. The Project Management Plan was approved by the Project Board on September 26, 2018.

Risk Management Plan

The Project's Risk Management Plan included the risk management process, roles and responsibilities, management escalation hierarchy and requirements for risk meetings and reporting cycles, in order to direct and empower the Project Team to: develop and maintain a 'risk aware' culture; provide a comprehensive risk identification and control process; and to proactively forecast and report on risks. The Project Risk Management Plan was approved by the Project Board on March 29, 2018.

Communications and Engagement Plan

The Project's Communications and Engagement Plan defined the Project's communications and engagement goals, described the communications and engagement activities during the construction period; and described the roles and responsibilities of the Wastewater Treatment Project's Communications and Engagement Team, which included CRD staff, consultants and representatives from the contractors for each component of the Project. The Project's Communications and Engagement Plan was first approved by the Project Board on April 4, 2017, and was subsequently updated twice to account for progress made on delivering the Project, with each update approved by the Project Board (on July 26, 2018 and July 25, 2019).

Appendix B – Project Cost Report at April 30, 2021

Appendix B: Project Cost Report at April 30, 2021

Description	BUDGET		COST EXPENDED		FORECAST	
	Control Budget	Allocated Budget	Expended to April 30, 2021	Expended to April 30, 2021 as a % of Allocated Budget	Forecast to Complete	Forecast at Completion
McLoughlin Point Wastewater Treatment Plant	**331.4**	**336.3**	**329.5**	**98%**	**6.8**	**336.3**
Construction	306.7	334.4	329.3	98%	5.1	334.4
Contingency	14.9	1.0	-	0%	1.0	1.0
Financing	9.8	0.9	0.2	26%	0.7	0.9
Residuals Treatment Facility	**159.4**	**140.2**	**12.7**	**9%**	**127.5**	**140.2**
Construction	145.4	139.8	12.7	9%	127.1	139.8
Contingency	12.3	-	-	0%	-	-
Financing	1.7	0.4	-	0%	0.4	0.4
Conveyance System	**158.0**	**206.5**	**198.9**	**96%**	**7.6**	**206.5**
Macaulay Point Pump Station	25.4	32.4	32.1	99%	0.3	32.4
Macaulay Forcemain	5.6	7.4	7.4	100%	-	7.4
Craigflower Pump Station	12.5	12.4	12.4	100%	-	12.4
Clover Point Pump Station	23.7	28.7	27.4	96%	1.3	28.7
Currie Pump Station^	2.8	0.1	0.1	100%	-	0.1
Arbutus Attenuation Tank	14.2	24.6	22.9	93%	1.7	24.6
Clover Forcemain	14.6	31.8	31.7	99%	0.2	31.8
Currie Forcemain^	3.3	0.2	0.2	100%	-	0.2
Trent Forcemain	9.5	11.0	9.5	86%	1.6	11.0
Residual Solids Conveyance Line	19.1	37.0	37.0	100%	0.0	37.0
Residual Solids Pump Stations & Bridge Crossings	4.6	18.1	17.8	98%	0.4	18.1
Residual Solids Conveyance Line – Highway Crossing	-	0.3	0.3	100%	-	0.3
Contingency	16.8	1.7	-	0%	1.7	1.7
Financing	5.8	0.6	0.1	24%	0.4	0.6
Project Management Office ("PMO")	**75.8**	**72.5**	**68.8**	**95%**	**3.6**	**72.5**
Project costs Aug 2016-Dec 2016	2.2	2.2	2.2	100%	-	2.2
Owner's Engineering	17.2	18.4	17.7	96%	0.7	18.4
Conveyance Design	5.0	11.0	9.9	90%	1.1	11.0
Advisors & Professional Support	7.0	11.6	11.4	98%	0.3	11.6
Project Board	2.0	1.1	1.1	96%	0.0	1.1
Project Board Expenses	0.3	0.1	0.1	100%	-	0.1
Project Team	29.1	21.9	20.4	93%	1.6	21.9
Project Leadership Team Expenses	0.7	0.3	0.3	100%	-	0.3
Project Support Team Expenses	0.5	0.1	0.1	100%	0.0	0.1
CRD Financial Services	1.5	1.4	1.4	100%	-	1.4
CRD Human Resources	0.3	0.3	0.3	100%	-	0.3
CRD Corporate Communications	0.2	0.2	0.2	100%	-	0.2
CRD Real Estate	0.3	0.3	0.3	100%	-	0.3
CRD Information Technology	0.4	0.3	0.3	100%	-	0.3
CRD Insurance	0.1	0.0	0.0	100%	-	0.0
CRD Operations	0.6	0.6	0.6	100%	-	0.6
CRD Legislative Services	0.1	0.1	0.1	100%	-	0.1
CRD Corporate Safety	0.2	0.2	0.2	100%	-	0.2
CRD Executive Services	-	0.1	0.1	100%	-	0.1
Office Lease	1.9	1.1	1.1	96%	0.0	1.1
Office Supplies	0.1	0.2	0.2	96%	-	0.2
Vehicles	0.2	0.2	0.2	100%	-	0.2
Connections Call Center	-	0.0	0.0	100%	-	0.0
Communication support materials	0.5	0.2	0.2	100%	-	0.2
Computer Hardware, Software & Training	1.0	0.7	0.7	99%	-	0.7
Contingency	4.8	-	-	0%	-	-
BC Hydro	**12.9**	**2.7**	**2.7**	**100%**	**-**	**2.7**
Third Party Commitments	**8.1**	**8.5**	**4.6**	**54%**	**3.9**	**8.5**
Subtotal^^	**745.7**	**766.6**	**617.2**	**81%**	**149.4**	**766.6**
Program Reserves^^^	**19.2**	**8.3**	**-**	**0%**	**8.3**	**8.3**
Core Area Wastewater Treatment Project	**765.0**	**775.0**	**617.2**	**80%**	**157.8**	**775.0**

* Values presented in $millions, results in minor rounding differences

** Costs expended to April 30, 2021 includes invoices received and processed before the cut-off for the April 2021 cost period

^ In 2019, the Wastewater Treatment Project's scope was refined to remove three components of the conveyance system (expanding the capacity of the Currie Pump Station, twinning the Currie Forcemain and twinning the East Coast Interceptor), as it was determined that they would provide no benefit to the CRD's residents and businesses: see section 4.3.7.1 for further information. The expended costs on these removed components comprise costs incurred before 2016 on planning and design.

^^ While the total Project cost will not be known until total completion of all contracts, which is anticipated to occur in Q4 2021, it is forecast that the total Project cost will be approximately $766.7 M, which is within the approved budget of $775M.

^^^ A program reserve of $19.2 million was included in the Control Budget to manage risks impacting the entirety of the Project, or the interface between any of the Project components. At April 30, 2021, $8.3 million remains in program reserve; this is in addition to $2.74M of contingency that is included within the total forecast cost of $766.7M, to manage the risks associated with completing the Project-related commitments and activities that extend beyond May 2021.

Appendix C – Funding, First Nation and Land Access Agreements

Funding Agreements:

- Infrastructure Canada:
  - Building Canada Fund;
  - Green Infrastructure Fund; and
  - PPP Canada Fund;
- Province of BC; and
- Federation of Canadian Municipalities (FCM): three funding agreements (for three grants and one loan).

First Nation Agreements:

- Songhees First Nation Support Agreement;
- Esquimalt First Nation Support Agreement; and
- WSANEC Leadership Council Memorandum of Understanding.

Land Access Agreements:

- Transport Canada Licences:
  - McLoughlin Point Harbour Crossing;
  - McLoughlin Point Outfall;
- Township of Esquimalt Amenity Agreements:
  - Host Community Impact 5-Year Agreement;
  - Community Impact Mitigation and Operating Agreement; and
  - Amenity Reserve Fund Administration Agreement.
- City of Victoria Licences of Occupation:
  - Dallas Road; and
  - Clover Point Pump Station.
- Greater Victoria Harbour Authority (GVHA) Agreements:
  - Compensation Agreement; and
  - Right to Enter Agreement.
- DND Licence Agreements:
  - Access to Federal Real Property; and
  - Relocation Expenses
- Minister of Transportation and Infrastructure RSCL Highway Crossing Agreement;
- District of Saanich RSCL Infrastructure Access Agreement; and
- Rock Bay Lease Agreement.