

CANADIAN CONSULTING ENGINEERING AWARDS 2021

Capital Regional District Wastewater Treatment Project

CATEGORY G – PROJECT MANAGEMENT





*Macaulay and Clover Pump Stations – Design Build,
Esquimalt, BC*

Project Summary

When the Capital Regional District embarked on an ambitious effort to plan, construct and commission a new 108 ML/d tertiary treatment facility to serve Greater Victoria, Stantec was engaged to provide technical and Owner's Engineer services. Collaborating with CRD's team to deliver nine major capital projects under the program – the largest in CRD's history –, we developed innovative solutions and used a hybrid procurement model, completing construction in just four years, on time and budget.

COVER

*McLoughlin Point Tertiary Treatment Plant – Design Build Finance,
Esquimalt, BC*

Project Highlights

Q6 COMPLEXITY

Over ten years ago, to meet new federal regulations, the Capital Regional District of Victoria initiated a \$775M Wastewater Treatment Program. Stantec came on board as the Program Manager in 2009, and for the next five years, work focused on technical planning, siting, options analysis, and funding business case applications, alongside procurement analysis and public consultation. In 2016, the project was ready to go with a strong business case, and procurement commenced.

As part of an integrated program management team with the CRD, Stantec served as the Owner's Engineer for the procurement, construction management, and commissioning of the new facilities. Our team completed the project definition report for the new wastewater treatment plant and undertook an extensive engineering and economic review of options to reduce the project's capital cost.

What made this project special? Innovation, project delivery and resource recovery.

Stantec's indicative design resulted in cost savings of \$425 million over previously developed concepts. The options evaluation process included triple bottom line evaluations, financial evaluations, extensive consultation, and numerous workshops with CRD staff. We worked with the CRD to assess options using environmental, social, financial and risk criteria. This evaluation process, along with a value for money assessment, quantitative risk allocation and risk exposure analysis, resulted in the selection of a hybrid delivery model, using several procurement and project delivery models. Each selected procurement model was chosen to address risk transfer, schedule, local market conditions and cost. The procurement models included:

- McLoughlin Point Tertiary Treatment Plant – Design Build Finance
- Hartland Residuals Treatment Facility – Public Private Partnership
- Macaulay and Clover Pump Stations – Design Build
- Arbutus Attenuation Tank – Design Bid Build
- Trent Forcemain – Design Bid Build
- Clover Forcemain – Design Bid Build
- East Coast Interceptor – Design Bid Build
- Residuals Pipeline and Pumping Stations – Design Bid Build

The McLoughlin WWTP was constructed on a small site of only 1.5 hectares, so high-rate, low footprint processes had to be utilized. The treatment process uses high-rate primary clarifiers, MBBR, biological aerated filters and tertiary disc filtration. Residuals from the wastewater treatment plant are pumped 20 km with a lift of 152 m to the Hartland Residuals Treatment Facility. The Hartland Facility treats biosolids to a class A standard, using anaerobic digesters and a fluidized bed dryer. Biogas recovered from the digestion process is used to heat the digesters and run the dryer, which produces pellets suitable for use as cement kiln fuel and other beneficial uses.



Q7 MEETING CLIENT'S NEEDS

The CRD had **three key goals** for the wastewater treatment program:

1) To comply with the Federal Regulations for secondary treatment by December 31, 2020, to protect the marine environment.

Providing tertiary treatment, the McLoughlin Point plant exceeds this requirement and was also operational ahead of the December 31, 2020 deadline. Typically, for a project of this nature, using traditional project delivery models could take around seven years to deliver. The procurement and construction of the the project was delivered in a record time of only four years.

2) To minimize capital and lifecycle costs to CRD residents and businesses, as well as enhance the day-to-day lives of local communities with an efficient wastewater system.

The facilities were delivered for \$775 million; in line with the estimated budget prepared by Stantec and \$425 million lower than previous concepts prepared by others.

3) To optimize resource recovery from the water treatment process and minimize greenhouse gas emissions.

The project produces a high quality effluent that is suitable for reuse, such as irrigation, if desired in the future by CRD. Heat recovery from effluent is practiced at the plant and the design has been developed to enable district heating in the future. The biosolids produced are class A dried products, currently used as cement kiln fuel, with flexibility for other beneficial uses.



*Hartland Residuals Treatment Facility –
Public Private Partnership,
Saanich, BC*

Q8 ENVIRONMENTAL BENEFITS

The Capital Regional District sustainability goals for the entire program have been clear. Technical options were evaluated using a triple bottom line approach with a focus on minimizing energy consumption and greenhouse gases in support of CRD's mission to safely build an environmentally and fiscally responsible program. The program entailed reviewing opportunities for resource recovery, including biogas, effluent heat recovery, and use of dried biosolids for cement kiln fuel. The many options considered during the development phase of the new resource recovery center are presented in the figure on this page.

The project protects the sensitive marine environment adjacent to Victoria, which is home to orca whales, salmon, sea lions and other diverse marine life.

The CRD went beyond the basic regulatory requirement of secondary treatment and constructed tertiary treatment facilities, demonstrating their leadership in protecting the environment.

Q9 INNOVATION

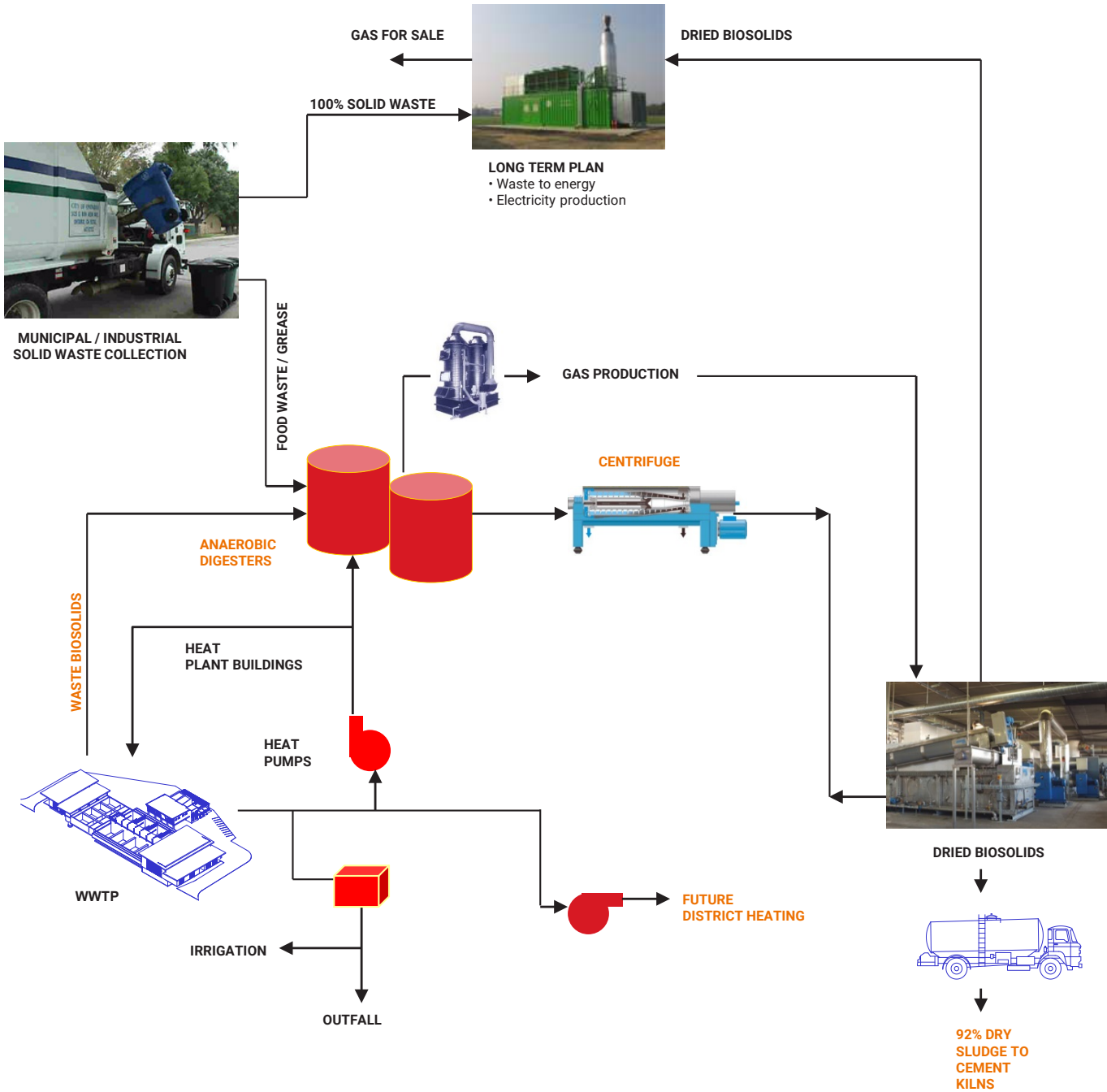
Working as an integrated team with the CRD and utilizing advanced project controls and management of multiple contracts, we were able to deliver this major project in record time and on budget.

From high-rate processes that take little space, to pumping and lifting residuals up 150 metres to the Hartland biosolids facility, to drilling horizontally under Victoria harbour, the project team devised innovative solutions that really stand out. Although complex and challenging, the project team and client were laser-focused on delivering sometimes unseen infrastructure integral to our towns and cities, as well as exceeding Federal regulatory requirements.

Given that the McLoughlin Point treatment plant is located at a prominent waterfront location at the entrance to Victoria Harbour, special attention had to be given to the aesthetics of the facility and to related design issues such as noise and odour control.

Stantec's technical and business solutions group was heavily involved in the development of the optimal program configuration. The original plan developed by others proposed five to seven local plants scattered around the city. Our creative solution, developed in partnership with CRD and based on business case evaluations, features one centralized plant that processes all flows.

RESOURCE RECOVERY OPPORTUNITIES EVALUATED





Q10 SOCIAL AND/OR ECONOMIC BENEFITS

The Greater Victoria area is one of Canada's fastest growing communities and wastewater infrastructure is key to supporting this growth. As one of Vancouver Island's largest infrastructure projects, the implementation of the wastewater program created employment opportunities for local contractors and professionals.

Capital costs, schedule, affordability, stakeholder consultation and procurement strategy were the key challenges within the overall program. As such, all major decisions were made based on value-based triple bottom line assessment in consideration of social, economic and environmental factors throughout the project. The triple bottom line was scrutinized by the public, politicians and stakeholders to arrive at an optimal project, which minimized impacts on the existing community while at the same time providing an economical wastewater solution.

Greater Victoria's wastewater rates are amongst the lowest in Canada. This project contributes to a more sustainable and environmentally friendly process and improves the quality of life of the over 300,000 residents of the area, leaving a legacy that will serve Greater Victoria for the next 100 years.

McLoughlin Point Tertiary Treatment Plant – Design Build Finance, Esquimalt, BC



