British Columbia Ferry Services Inc.

Application to the
British Columbia Ferries Commissioner

Pursuant to
Section 55 (2) of the *Coastal Ferry Act*

For the

Fleet Maintenance Unit Site Redevelopment Project

August 15, 2022

Note: In this copy of the Application information of a confidential and commercially sensitive nature has been redacted.

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Executive Summary

British Columbia Ferry Services Inc. ("BC Ferries") proposes to invest $<> million in the redevelopment of its Fleet Maintenance Unit ("FMU"), which is its primary vessel maintenance and refit facility located at Deas Basin in Richmond, B.C. near the George Massey Tunnel.

The FMU Site Redevelopment Project (the "Project") will position the facility to provide increased fleet support into the future. It will replace select buildings on the FMU site with one new consolidated building, perform tenant improvements to five buildings to extend their lives and fit them to new purposes, upgrade and replace underground utility infrastructure and relocate the supply chain management ("SCM") warehouse to a leased permanent off-site location. The new building foundation will include ground improvements to meet seismic codes. The Project will also address anticipated sea level rise and align with the City of Richmond's flood protection strategy by raising the new foundation and constructing the initial phase of a dike.

BC Ferries is an essential transportation link that connects coastal communities and facilitates the movement of people, goods and services. As identified in BC Ferries' *Ship Repair Strategy 2016-2026*, access to ship repair services is strategically important for BC Ferries' operational stability and financial sustainability. As BC Ferries modernizes its fleet and introduces standardized vessels, it needs to maintain its internal ship repair capability to support fleet resiliency, flexibility and interoperability, while reducing reliance on external ship repair facilities. The Project will:

- Replace aging infrastructure and modernize the facility to meet the repair and maintenance requirements of contemporary equipment and vessels;
- Correct existing inefficient site layout, with the goal of realizing productivity efficiencies and improvements;
- Improve employee satisfaction by providing more comfortable and modern workspaces, removing frustrating inefficiencies, and providing new opportunities for further technical growth and specialization helping to recruit and retain the best candidates for the FMU; and
- Reflect BC Ferries' commitment to environmental stewardship with energy-efficient lighting, heating and cooling systems, upgraded site-wide storm water collection and discharge systems and remedial environmental compensation of the foreshore and supplement perimeter lands.

The Project will follow the successful experiences of the terminal construction department and incorporates best practices and lessons learned from previous projects. It will implement a phased approach to develop the FMU facilities in a risk adverse, cost-effective, organized and efficient manner while maintaining delivery of core refit and maintenance services at the site.

BC Ferries believes that the Project is reasonable, affordable, and prudent. The Project will allow the FMU to focus on delivering core repair and maintenance services, while reducing operating costs. The redevelopment will help to reduce upward pressure on fares across the

coastal ferry system through realized efficiencies and will help to ensure that coastal ferry service remains safe, reliable, and sustainable for many years to come.

Section 1 – Introduction

1.1 Application Purpose

The purpose of this application is to obtain the approval of the British Columbia Ferries Commissioner (the "Commissioner") for the Project in accordance with Section 55 of the *Coastal Ferry Act* (the "Act").

Specifically, Section 55(2) of the Act requires BC Ferries to obtain the Commissioner's approval before incurring a major capital expenditure. Under Section 55(5), a major capital expenditure is defined as one that:

> *"…meets the criteria (a) established by the Commissioner from time to time, and (b) most recently provided by the Commissioner to the ferry operator".*

By Order 19-03, dated January 25, 2019, the Commissioner determined that for the purposes of Section 55(5):

> *"2. Any capital expenditure for new terminals, terminal upgrades, information technology systems or other non-vessel capital expenditures ("Non-Vessel Expenditure") is a major capital expenditure if the expenditure exceeds $25 million, inclusive of non-vessel related component programs and interest during construction;"*

As a result, in accordance with Section 55(2), BC Ferries seeks approval for a major capital expenditure for the Project of up to $<> million, exclusive of interest during construction ("IDC"), and supplemental Project operating expenditures of up to $<> million, for a total Project expenditure of up to $<> million (see Section 4.2.1 for more detailed financial information).

1.2 Application Overview

What is driving the capital expenditure (e.g. replacement, expansion, upgrade, regulatory requirements, reduction in GHG emissions)?

The FMU is BC Ferries' primary vessel maintenance and refit facility, located at Deas Basin in Richmond, B.C. west of the George Massey Tunnel.

Access to ship repair services is strategically important for BC Ferries' operational stability and financial sustainability. BC Ferries has long decided that it will maintain its own internal ship repair capability to reduce its exposure to external ship repair risks, and the work performed at the FMU is a key component in reducing these risks. At present, the FMU provides approximately 40 percent of BC Ferries' vessel repair, refit, modification, and maintenance services (excluding capital upgrades), serves as the asset repair administration headquarters for vessel-related assets, and is a core strategic business unit that needs to function at peak efficiency.

However, BC Ferries believes that the existing FMU infrastructure has reached its maximum service capability given its inherent deficiencies, capacity constraints

and inefficiencies. The Project seeks to replace select buildings on the FMU site with one new, consolidated building (a multi-purpose machine shop, welding/fabricating shop, covered storage area, and site administration building), perform tenant improvements to five buildings to extend their lives and fit them to new purposes, and relocate the SCM warehouse to a leased permanent off-site location. The new construction includes implementing ground improvements under the new building to meet seismic codes, raising the new building foundation, adding the initial phase of a dike to the FMU site to address anticipated sea level rise and updating the site utilities.

The Project will address the following specific issues with the current FMU site:

- The FMU's buildings were added and adapted over time to address specific needs as they arose. As a result, the site evolved in an ad hoc manner, and today it contains approximately 15 separate buildings that provide 28 functions or services. This configuration represents an outdated, inefficient aging facility that has fallen well behind the pace of change;
- Many of the buildings on the site are at, or near, the end of their useful lives and have a wide range of structural, seismic and hazardous-material deficiencies;
- Work areas are too small and fragmented;
- Shop spaces are undersized and not capable of handling new large thrusters, requiring high-value asset thrusters to be dismantled in adverse weather conditions before moving the components into the shops for maintenance. The combination of this phased approach and exposure to adverse weather conditions creates risk to both employees and assets;
- Outdoor covered space is virtually non-existent and exposes high-value assets to damaging weather conditions;
- Functionally connected trades and workshops are physically separated;
- Functionally connected administrative and support staff are physically separated across multiple buildings;
- The site is susceptible to liquefaction during a major earthquake and does not meet current seismic codes; and,
- The site is susceptible to inundation during future sea level rise.

Many of these deficiencies are already affecting BC Ferries' ability to service its vessel fleet. For example, the FMU lacks equipment to lift Salish-class thrusters, has inadequate facilities to service and re-certify all of the fleet's life rafts, and stores valuable assets in unsuitable locations and conditions.

Accordingly, BC Ferries submits that the Project is reasonably required, and the expenditures are reasonable, affordable and prudent. The Project will modernize the FMU, allow it to achieve BC Ferries' *Ship Repair Strategy 2016–2026* objectives, increase internal repair capacity, protect valuable assets, and position the facility to provide increased fleet support into the future. It will also ensure BC Ferries' continued ability to deliver safe, reliable and cost-effective service that meets the requirements of the Coastal Ferry Services Contract.[1]

1.3 Application Organization

This application is organized as follows:

- Section 2 describes the current environment including a discussion of BC Ferries' ship repair strategy, the current FMU facility, current and forecasted usage and consequences of delaying the Project;
- Section 3 provides a Project overview, including a description of improvements to the FMU site, the proposed schedule, Project governance and oversight, engagement, and Project benefits;
- Section 4 provides a financial assessment of the two viable options that have been considered, including discussions on expenditures, contingency, net present value (NPV) analysis results and the expected impact on the price caps for the recommended option; and,
- Section 5 addresses procurement options and Project risk identification and mitigation.

The Commissioner has provided BC Ferries with guidelines for applications under Section 55(2) of the Act.[2] Appendix A to this submission itemizes the specific Section 55 questions in these guidelines, and indicates where in this submission they have been answered. The Section 55 questions are also shown in *grey italics* in the section in which they are answered.

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[1] BC Ferries notes that the legislative requirement to seek approval of the proposed capital expenditure for the Project necessitates the submission of this application before the procurement processes for the FMU construction work is complete. With the processes yet to be finalized, there is a risk that certain assumptions BC Ferries has made in this application may require subsequent amendment, with a commensurate change in the projected capital expenditures for the Project.

[2] *Guidelines for British Columbia Ferry Services Inc. for Applications under Section 55 of the Coastal Ferry Act*, December 30, 2019.

Section 2 – Current Environment

2.1 Overview

BC Ferries provides ferry services on the west coast of British Columbia in accordance with the requirements of the Coastal Ferry Services Contract. It has 39 vessels operating on 25 routes out of 47 terminals spread over 1,600 kilometres of coastline.

BC Ferries understands the importance of supporting the local marine economy, and of investments made in the province for marine services, repair and maintenance. As the largest non-military consumer of ship repair services in the province, BC Ferries has spent approximately $1 billion in the last 10 years at local shipyards on dry-dockings and refits, capital upgrades, repairs, and maintenance. This includes work at the FMU, where 150 skilled workers are employed across the trades.

In addition, BC Ferries generates jobs and economic benefits in the province by regularly engaging other local repair and maintenance services for ship repair and refit work, including Vancouver Drydock, Vancouver Shipyard, Victoria Shipyard, Esquimalt Drydock Company and Allied Shipbuilders. BC Ferries has also taken steps to develop new partnerships to enable other shipyards in British Columbia to advance their services and expertise. In 2017, for example, BC Ferries entered into a partnership with Point Hope Maritime Ltd. on the Victoria Harbour for dry-docking and ship repair for its minor vessels. Point Hope Maritime employs 200 skilled trades, staff and contractors and, through this five-year partnership, millions of dollars are flowing to support local employment and services.

BC Ferries continues to build a network of local marine suppliers to support its fleet renewal plans and is introducing local marine manufacturers to international shipyards, enhancing their international trade and the lifecycle support opportunities for BC Ferries vessels. Several of these companies now supply to ship owners outside Canada, which represents market growth that has directly resulted from BC Ferries' efforts. This is a high-value-added activity for the British Columbia economy.

2.2 BC Ferries' Ship Repair Strategy

As described in BC Ferries' *Ship Repair Strategy 2016-2026*, BC Ferries recognizes the strategic importance of maintaining access to ship repair services for its operational stability, reliability, and financial sustainability.

Of all the ship repair services BC Ferries consumes, the scarcest critical resource is dry-docking. BC Ferries does not have internal dry-docking capability but rather sources it from the external ship repair market. Partly in compensation for this, BC Ferries has a longstanding strategy of maintaining strong internal ship repair capabilities instead of relying exclusively on external services. While some vessel

maintenance and repairs are carried out at terminals, the FMU is BC Ferries' largest internal ship repair facility. Furthermore, the FMU's accumulated experience in some trade-related capabilities is unmatched by any local external shipyard. This significant internal resource ensures access to vital vessel repair services when needed, and even without a dry-dock, mitigates the risks associated with external shipyard availability. Nonetheless, external shipyards are an important part of BC Ferries' service strategy, and they handle most of the remaining repair work, including all work requiring a dry-dock.

Within this context, BC Ferries' ship repair strategy involves using long-range maintenance planning to schedule predictable ship repairs with external shipyards, fostering healthy competition among external ship repair facilities by using competitive procurement processes, and consolidating repair activities and completing them during regulatory service intervals to reduce the number of vessel service periods. With reference to the FMU, BC Ferries' strategy is to:

- Maintain the FMU as a strategic ship repair facility capable of carrying out most repairs, with the exception of those requiring a dry-dock;
- Upgrade the FMU and expand its role as a key strategic resource; and,
- Maintain internal repair capacity (the work performed on the vessels at the FMU and at the terminals) at levels that FMU personnel can handle, including taking on more repair work as the FMU's capabilities and capacities increase.

2.3 Current FMU Facility

The FMU is located on an approximately 40 acre site and has served as BC Ferries' primary vessel maintenance and refit facility for over 50 years. The facility contains approximately 15 separate buildings that provide 28 functions or services.

The primary maintenance buildings include:

- One multi-purpose machine shop building and one heavy machine shop building to inspect, repair, maintain and overhaul major and minor mechanical systems and components;
- Three buildings, including a warehouse space, for BC Ferries' fleet-wide SCM. SCM fulfills fleet-wide orders and supplies vessel projects with materials;
- A converted vehicle garage serving as a welding shop and a rescue boat shop used to maintain vessel rescue boat outboard engines, boat structures, controls and trailers;
- Two buildings to inspect, test, service and certify vessel safety systems; and,
- Five buildings related to shipwrights, sheet metal, plumbing, electrical, upholstery, joinery, rigging and painting trades.

The FMU site also includes various other administrative areas, some for non-maintenance functions, across five buildings, such as SCM, fleet project management, engineering services, environment, operational training, marketing, customer experience, travel service and employee relations.

A large tent-like dome (SCM-G) provides a covered storage area for supply chain inventory, and shipping containers distributed across the site serve as makeshift covered storage for smaller equipment or work spaces. An additional smaller tent-like structure stores retired and or expired fleet-wide assets that are sold via auction through the asset disposal department.

Many of the facility's outdoor spaces are used to store equipment without weather protection. Large, high-value thrusters are stored in uncovered areas around the facilities where they are exposed to the elements. Some maintenance and repair work must also be performed outside due to the lack of facilities that can accommodate equipment of this size. Work on the larger units can be completed indoors by breaking down the thrusters into separate pieces, but this is time-consuming and inefficient.

Figure F-1 and Table F-1 in Appendix F illustrate the FMU and describe and identify the site's major buildings and facilities.

2.4 Current and Forecasted FMU Usage

New Vessel and Terminal: What methodology has been used to determine future demand?

The optimal level of ship repair work conducted for BC Ferries at the FMU, measured as the percentage of the total ship repair volume and characterized as the FMU's 'throughput', is a function of internal efficiencies, availability of labour resources and the mix of capabilities the work requires. BC Ferries has observed that FMU throughput at too-high levels can cause excessive overtime, increasing overall maintenance costs. Conversely, throughput levels that are too low lead to underutilized FMU resources and, again, increased overall costs.

The FMU currently provides approximately 40 percent of BC Ferries' annual vessel repair, refit, modification, maintenance and administrative services; in addition, FMU trades support vessel projects and maintenance at terminals and external shipyards. Prior to 2010, the ship repair activity at the FMU was approximately 30 percent. The increased throughput has been achieved through a combination of experience, efficiencies and good management. The annual straight time utilization rate for FMU trade hours ranges from 91 to 93 percent with the remaining hours allocated to site maintenance and meetings.

BC Ferries believes that the existing FMU has reached its maximum service throughput and that given its inherent infrastructure deficiencies, capacity constraints, and inefficiencies, increasing throughput above 40 percent will require investments in modernization, including new capabilities such as large thruster repair, increased lifesaving appliance capacity and work order management

systems. The Project will address these shortcomings and modernize the facility, allowing throughput to increase to a predicted 45 to 50 percent of the total vessel repair, refit, modification, and maintenance services.

BC Ferries' methodology for determining this future level of demand for the facility came from examining historical data and applying expected approaches from the ship repair strategy. The long-range refit schedule and capital plan provided the basis for future expected use of the facility. In addition, the ongoing consolidation of the fleet into vessel classes has provided greater certainty for long-range trade resource planning.

2.5 Sources of Expertise and Experience

What sources of expertise and experience have been relied upon in deciding to proceed with this capital expenditure?

BC Ferries has drawn on internal expertise and experience in developing the decision to proceed with this capital expenditure. BC Ferries' internal resources include:

- FMU employees, who provided input to help define the facility's functional requirements;
- BC Ferries' in-house terminal engineering, FMU operations and SCM teams, who assisted in developing the conceptual and preliminary design concepts; and,
- BC Ferries' in-house capital planning department, who completed financial analyses and developed business cases for various project options.

Through competitive procurement processes, BC Ferries has also drawn on external expertise and experience in developing the decision to proceed with this capital expenditure, in particular:

SNC-Lavalin Inc.

SNC-Lavalin Inc. worked with the following entities to complete the following work over the last five years:

- BC Ferries:
  - Conducted employee consultations and historical information reviews;
  - Conducted a workflow analysis;
  - Prepared functional requirements;
  - Conducted various assessments and studies;
  - Led the design development team;

  - Progressed the various regulatory permits, applications and approvals; and,
  - Developed a flood protection strategy;
- Sub-consultants to SNC-Lavalin Inc.:
  - Boldwing Continuum Architects, who conducted building condition and visual impact assessments and provided the architectural design and design support to SNC-Lavalin Inc.;
  - Tetra Tech, who provided geotechnical expertise for the ground improvements and a dike design;
  - North West Environmental, who conducted hazardous material surveys, and completed Hazardous Material Inventory and Checklist Reports and Pre-Demolition Hazardous Material Assessments for the buildings;
  - Leading EPC, who evaluated construction and engineering methodologies;
  - McElhanney, who completed legal surveys for the rezoning and lot consolidation plan;
  - Diamond Head Consulting Ltd., who completed arborist reports;
  - Arrowstone Archaeological Research and Consulting Ltd., who completed an archaeological overview assessment;
  - M2 Landscape Architecture, who developed a landscape plan; and,
  - Recollective, who completed an energy model of the new Multi-purpose Machine Shop for BC Energy STEP Code 2 compliance and options analysis; and,

Stuart Olson

Stuart Olson, a general contractor acting in an early contractor involvement ("ECI") role (see Section 5.2.1 and Appendix E), collaborated with the design team to offer design and constructability suggestions and developed an independent Class A pre-tender construction estimate. In the fall of 2022, Stuart Olson will prepare and implement the public construction tender process with an open-book bid based on firm pricing from sub-contractors and vendors.

2.6 Facility Assessments

Is the proposed project reasonably required?

With the support of its engineering consultant and other vendors, BC Ferries conducted the following activities to establish the FMU's needs and to complete the design process. These activities are described in more detail in Appendix B.

Historical Information Review

A review of FMU's historical information to understand the current facility and the issues surrounding its redevelopment, including verification of FMU building area and usage information; consultations with the City of Richmond and Ministry of Transportation and Infrastructure; visits with external facilities to establish methodologies, benchmarks and industry comparators for ship repair and maintenance facilities and activities; and consultations with life safety appliance service providers.

Hazardous Material Survey

Hazardous material surveys determined that many of the FMU's buildings contain hazardous materials and have other issues that are common in industrial buildings that are several decades old. While the buildings meet all health and safety requirements, it becomes ever more difficult to conduct repairs and maintenance when these issues exist.

Building Condition and Code Compliance Assessments

Independent assessments of the architectural, structural/seismic, mechanical and electrical conditions of each of the FMU buildings, and code compliance issues. The building condition assessments indicate that many of the structures are at the end of their useful lives, are in poor condition and are seismically deficient. The Project plans to demolish the buildings in the poorest condition, and to extend the life of the buildings in relatively good condition.

These assessments are fundamental to the decision to revitalize the FMU, and therefore have been factored into the business case supporting the requested capital expenditure.

Workflow Analysis

An analysis to evaluate the flow of equipment, material and personnel through the FMU, and to identify constraints and deficiencies affecting FMU operations. The workflow analysis results were used to develop the Project's functional requirements.

Functional Requirements

A functional requirements document based on the results of the workflow analysis and the stakeholder engagement consultations (see above and Section 3.3.1, respectively). The functional requirements defined the facility's design criteria and user needs, and established the facility's overall configuration and infrastructure to deliver its services and increase its productivity and efficiency. The functional requirements were used to develop the Project's design requirements.

Building Deficiencies

A building deficiencies analysis that summarized the existing buildings' deficiencies based on the workflow analysis. Common or significant themes included:

- Insufficient space, physical building constraints, undersized and congested workshops, ad-hoc workspace arrangements, and workshops or buildings fragmented or located apart from each other, which:
  - Makes it increasingly difficult to handle and service new ship assets;
  - Induces multiple handling operations and frequent tool and equipment movements in and out of work areas to complete routine maintenance, thereby introducing workflow inefficiencies;
  - Causes congested inventory warehouse spaces to be used inappropriately for component servicing purposes;
  - Results in functionally connected trades and workshops being physically separated, creating inefficient flow paths between workshops and work units; and,
  - Prohibits growth and expansion into new fleet service technologies;
- Inadequate enclosed or covered storage, including using shipping containers as storage areas. In some circumstances lack of storage results in expensive equipment being exposed to the elements and deterioration;
- In some cases, equipment is old and outdated, or insufficient for required purposes;
- Overhead cranes have insufficient capacity to lift future vessel thrusters and also do not fully cover the work spaces, making it difficult to move parts between shop areas and necessitating multiple handling operations (see also the Crane Study, 2016, below); and,
- Office spaces, meeting rooms, lunch spaces and lockers are either insufficient or spread out across disparate buildings. In particular, functionally connected administrative and support staff are physically spread out across five buildings, making it difficult for them to meet collectively. Temporary site trailers are also used as offices. Furthermore, these buildings offer few meeting rooms and training spaces for larger groups, which occur frequently.

These issues are reflected in major challenges for the FMU, including:

- Inadequate vessel thruster storage and service: BC Ferries has 50 thrusters in service, including over a dozen spares, and they vary in manufacturer, design, size and complexity. Facilities are of insufficient size and capacity to service all of the thrusters, and third-party servicing is not readily available for the work that FMU cannot complete. Contrary

to manufacturer's recommendations, some thrusters are stored outside and on their sides. Also, because there is no thruster test bed, thrusters can only be tested after installation. These issues threaten to impact BC Ferries' service by delaying maintenance or degrading thruster condition, and generally increase costs due to component handling inefficiencies and third-party involvement; and,

- Insufficient facilities for servicing life safety appliances: The FMU repairs and recertifies the fleet's 78 evacuation chutes/slides and 254 life rafts. Even with three work areas, lack of internal space often forces the life safety appliances to be sent to external parties for service, and some supplies must be stored off site because warehouse space is unavailable. In addition, the facilities lack appropriate environmental controls, do not meet the manufacturer's recommendations with respect to layout and storage, and lack sufficient drains for cleaning within the buildings. Life safety appliance removal and replacement requires expensive, contracted barge and crane services, and the FMU has no facilities to test, certify and re-charge air cylinders for life raft and marine evacuation system inflation. The poor condition of the life raft centre and the lack of adequate environmental controls increase the risk that BC Ferries will lose its certification status as bestowed by the manufacturers, classification societies and Transport Canada. The alternative is expensive manufacturer service.

Crane Study

A crane study to understand the FMU's lifting needs. The FMU currently addresses most of its lifting needs through a combination of shore-mounted davit arms, truck-mounted cranes and light-capacity mobile cranes. However, in-house equipment has limited lift capacity and is increasingly unable to meet growing demand or contend with heavier loads, such as the thrusters for Salish-class and Island-class vessels. Thus, BC Ferries turns to expensive, external contractors more frequently to lift heavy components. The increased crane capacity in the proposed new machine shop, along with a more efficient layout, addresses many of the identified issues.

Flood Protection Strategy

A flood protection strategy to address municipal and provincial requirements related to anticipated sea level rise over the next 50 years at the FMU site, which corresponds to the life of the new buildings. As a condition of the FMU's development permit, the City of Richmond has stipulated that BC Ferries build new structures with foundations raised 0.55 m, build part of a dike around the west and north of the property as part of the Project, and complete the east dike in the future when the sea level rise reaches a defined elevation set out by the City of Richmond. East dike construction is not expected to occur for 50+ years, which is far greater than the expected 20-to-30-year lifespan of the SCM-A and existing

heavy shop/proposed joinery shop buildings. The replacement buildings will be relocated off the dike right-of-way to eliminate dike encroachment issues. See Figure B-10 in Appendix B.

Subsequent Studies and Plans (2022)

BC Ferries and its consultants completed further studies and plans within the last year, including:

- Additional boreholes to obtain more geotechnical information;
- Additional ground sample testing to clarify the extent and degree of ground contamination; and,
- Hazardous Material Inventory and Checklist Reports and Pre-Demolition Hazardous Material Assessments for the FMU's buildings.

Additional studies were conducted and plans were prepared in support of the ongoing development permit and rezoning application with the City of Richmond, including a site profile, environmental assessment, traffic assessment, waste management plan and flood protection plan.

2.7 Existing Infrastructure Age and Maintenance

The age and condition of the existing capital assets is a strong factor for the Project. The existing structures are 34 to 55 years old; seven are past their 40-year life expectancy, three are over 35 years old and one is over 25 years old.

BC Ferries continues to complete general maintenance to the FMU facility, but large capital investments have been deferred in anticipation of the Project. BC Ferries anticipates that if the Project is not completed, significant investment will be required for life extension work (e.g., roof replacements, mechanical system overhauls) to many of the buildings in the next few years. In addition, there would be an increasing risk that individual buildings would not be maintainable and would have to be closed or demolished when they became unsuitable for use. Closing buildings would impact the ability of the facility to perform its functions.

2.8 Marine Structures

The Project scope does not include marine structures, such as sheet pile walls, ramps, dolphins, capstans and bollards. The majority of the FMU marine structures have an estimated residual life of 10-15 years and a full marine structure replacement is proposed for 2033 under a separate capital project (~$<> million).

Proposed near-term marine structure projects at the FMU include:

- Replacing three dolphins at Berth 1 with a residual life of 0-2 years in 2023 under a separate capital project (~$<> million); and,

- Implementing a 10-year life extension for a sheet pile wall in 2023 under a separate capital project (~$<> million) to extend the life until full replacement in 2033.

2.9 Consequences of Delaying the Project

What are the consequences of a delay in the in-service or deployment date?

Why is the proposed capital expenditure required now, and what are the consequences of any delay?

What are the consequences or the alternatives if the application is rejected?

Have there been service disruptions due to inadequacy of the existing capital asset?

What is Plan B if the project is delayed?

The FMU plays an integral role in maintaining access to timely and adequate ship repair services, which are vitally necessary for BC Ferries' operational stability and financial sustainability, and which in turn ensure the provision of reliable and resilient ferry services to customers and coastal communities in accordance with the Coastal Ferry Services Contract. Without a modern, highly functional fleet maintenance facility providing adequate and timely ship repair services, BC Ferries risks sailing delays or cancellations and vessel maintenance issues.

While no regulatory drivers exist for the Project, the redevelopment of the FMU is necessary now for all of the reasons described above. The consequences of delaying the in-service date for this Project or rejecting the application include:

- Worsening building conditions and continued inefficiencies;
- Ongoing organizational reliance on third-party thruster and life safety appliance service facilities with related risks such as reliance on their availability;
- <>;
- Increasing inability to service, move and store large thrusters;
- Increasing inability to service all of the fleet's life safety appliances, and increasing risk of losing certification status as building conditions deteriorate;
- Ongoing lack of alignment with BC Ferries' *Ship Repair Strategy 2016–2026*;
- Incurring unrecoverable expenses related to emergency building maintenance or life extension; and,
- Reducing the timeline for realizing positive operational efficiencies.

While these deficiencies have not yet caused any service disruptions, maintaining the status quo could result in service disruptions due to reliance on third-party

contractors or the inability to perform timely services at the FMU, while increasing inefficiencies cause unnecessary costs and put upward pressure on fares.

Furthermore, if the Project were not to proceed (for example because of a rejection of this application), an impairment of capital pre-implementation costs to date of up to $<> million may be required (in addition to $<> million already impaired due to change in scope).

BC Ferries has examined possible off-ramps as a 'Plan B' if unexpected conditions arise that require a delay in implementation. One possible Project stop point is once all construction bids have been received at the end of 2022, but before any contractual commitment has been made. <>

2.10 Summary

The FMU faces numerous functional and operational challenges. The longer the delay in modernizing the facility, the worse these challenges will become. The facility's deficiencies reduce ship service efficiencies and limit the FMU's productivity. As BC Ferries has renewed vessel assets, requirements have evolved to the point where the FMU's ad hoc and aging physical infrastructure has fallen behind the pace of change and has limited ability to adapt without significant investment. Consequently, the risk of service disruptions for BC Ferries' fleet continues to increase as equipment and facilities cannot meet requirements. The FMU currently relies on diminishing external services with uncertain availability or turnaround times to complete critical repairs.

By modernizing the FMU and upgrading the site, the Project will position the FMU to provide increased fleet support and increased internal repair capacity, which is one of BC Ferries' strategic objectives. A more efficient FMU prudently increases BC Ferries' ability to provide efficient and resilient service, and to manage the upward pressure on fares.

Section 3 – Project Overview

3.1 Project Rationale

Does the proposed capital expenditure demonstrate good judgment, based on wisdom, experience and good sense?

The Project will address the issues and deficiencies detailed in previous sections by:

- Replacing and consolidating or extending the life of buildings on the site, which are at, or near, the end of their useful lives and have a wide range of deficiencies as described above;
- Increasing the indoor working area of the machine shop by 2,649 m^2 to a total of 7,609 m^2, and organizing and allocating the area for appropriate use and ensure that the trades and workshops are arranged for efficient personnel and component flow;
- Introducing 696 m^2 of covered outdoor storage to ensure that high-value assets are no longer exposed to damaging weather conditions;
- Eliminating a large number of shipping containers on site that are used for storage and other sundry purposes;
- Eliminating temporary site trailers by relocating services to permanent office locations or facilities;
- Consolidating administrative and support staff and introducing suitable meeting spaces;
- Introducing ground improvements by densifying the soil under new construction to meet current seismic codes to address susceptibility to liquefaction during a major earthquake; and,
- Raising the new building's foundation by 0.55 m and introducing a dike along part of the property boundary to prepare for future floods and address susceptibility to inundation during future sea level rise.

In addition, the Project will reduce reliance on external facilities and contribute to fleet resiliency, flexibility and interoperability by:

- Providing the infrastructure needed to service and store existing and future vessel thrusters;
- Providing the infrastructure needed to service and store the full range of life safety appliances;
- Increasing work and storage space to accommodate current and future vessel maintenance needs;
- Modernizing vessel maintenance infrastructure and equipment to accommodate current and future vessel maintenance needs; and,

- Increasing BC Ferries' vessel maintenance capacity from the current 40 percent to an expected 45 to 50 percent.

Finally, the Project supports BC Ferries' commitments to employee safety and environmental stewardship by:

- Bringing the FMU up to date with respect to codes and regulations;
- Mitigating the risks caused by earthquakes and floods; and,
- Reducing environmental hazards and risks.

3.2 Project Summary

BC Ferries considered a wide variety of options before settling on the final configuration for the new building and tenant improvements (see Appendix D). The proposed scope of work strikes a balance between functional efficiency and cost, and therefore represents BC Ferries' preferred option (see Section 4.2 for the full analysis). The Project is divided into the following broad categories of work:

New Multi-purpose Machine Shop Building

The Project will replace select buildings on the FMU site with one new, consolidated building that will include a multi-purpose machine shop, welding/fabricating shop, covered storage area and site administration offices.

Building Tenant Improvements

Five buildings will receive tenant improvements including life-extension renovations and will be repurposed for new users:

- The SCM-A building will house the life raft centre, ship safety department and the marketing, customer experience and travel service offices;
- The SCM-B building will house the rescue boat shop;
- The SCM-G building will house the temporary welding shop during multi-purpose machine shop construction, and will then receive a new skin and become the asset storage and disposal area;
- The existing machine shop building will be converted to the outfitting trades building; and,
- The heavy shop building will be converted to the joinery shop building.

Figure F-2 in Appendix F illustrates these work activities and their relative placement to each other.

Permanent Off-site Lease Space for SCM Warehouse

The SCM warehouse will relocate permanently to an off-site location in the Lower Mainland, dependent on securing a long-term lease warehouse.

3.2.1 Project Elements

The following subsections describe the Project scope of work and expected benefits of each of the work categories described above.

3.2.1.1 Multi-purpose Machine Shop Building

The Multi-purpose Machine Shop Building scope of work comprises a single building that consolidates all mechanical service activity into one location, including the welding shop, hydraulics shop and outdoor covered storage space. Most administrative functions will consolidate within this building, including FMU administration, fleet project management, FMU refit supervision, FMU operations management, engineering services, environmental services, supply chain management and employee relations. See Appendix C for additional design details.

Figure 3-1 illustrates the Multi-purpose Machine Shop Building and surrounding area after construction and demolition.

FIGURE 3-1: MULTI-PURPOSE MACHINE SHOP BUILDING EXTERIOR NORTH ELEVATION

The benefits of the Multi-purpose Machine Shop Building include:

- Combining multiple buildings into a single building, which reduces the physical distance between related functions while increasing available working and storage space;
- Providing the ability to service the larger and heavier Salish-class Schottel 15/15 thrusters;
- Eliminating off-site equipment transportation and storage;

- Providing a covered outdoor storage area for thruster staging and an indoor thruster storage space where the thrusters can be stored in a vertical position per manufacturer's recommendations and have their propellers rotated;
- Repatriating outsourced thruster service, which will reduce costs and improve certainty that the thrusters will be readily available for service, which in turn will improve fleet reliability by eliminating the risk of delayed thruster maintenance or degraded thruster condition;
- Completing service sequences (inspection, disassembly, repair, re-assembly, testing and storage) within the same building with short component movements;
- Allowing trucks and trailers to enter and exit the building through large roll-up doors, thereby allowing them to load and unload heavy equipment within the building;
- Providing the ability to lift up to 50 tonnes with internal overhead cranes;
- Providing an engineered site for hazardous waste containment, storage and handling;
- Locating a new welding/fabricating workshop within the machine shop;
- Functionally and strategically aligning sub-component mechanical workshops;
- Providing space to service fire suppression systems, hydraulic and liquid natural gas components, thereby reducing third-party service costs; and,
- Consolidating administrative offices and employee facilities into a single location, and introducing gender-neutral washrooms and locker rooms.

3.2.1.2 Building Tenant Improvements

SCM-A Conversion to Life-Saving Equipment and Ship Safety

The Project will relocate the SCM warehouse permanently off site and move life-saving equipment and ship safety from two converted structures into one building. This will introduce considerable savings compared to constructing a new building, while providing a comparable increase in working space. The marketing, customer experience, and travel service departments, already present in SCM-A, will have their offices renovated and linked for better visual and operational integration.

The benefits of the new Life-Saving Equipment and Ship Safety Building include:

- Combining life-saving appliance servicing and ship safety work under one roof while creating a space that meets original equipment manufacturers' requirements for servicing certification;
- Providing appropriate ceiling heights, crane system, and access and egress doors for moving larger life rafts;
- Creating space for storing spare life-saving systems in a dry, secured, controlled environment and proper storage for tools, parts and supplies;
- Repatriating life-saving system servicing, including new capacity for compressed gas bottle testing, filling and certification;
- Adding functional spaces for meetings with ships' crews and regulatory agencies; and,
- Creating a larger, central lunchroom space and male, female and gender-neutral washrooms and locker rooms on the second floor for employees to remove these functions from the working floor area.

SCM-B Conversion to Rescue Boat Services

Rescue boat service, which involves maintaining outboard engines, boat structures, controls and trailers, will be moved from an old converted garage to SCM-B. The benefits of the new Rescue Boat Services Building include:

- Locating rescue boat services and life raft centre staff in neighboring buildings to create workflow efficiencies;
- Providing more work space with four boat repair bays and more space for part, tool and equipment storage;
- Adding a washing area with appropriate drainage;
- Allowing serviced and loaner boats to be stored under cover in the renovated storage at SCM-G; and,
- Providing lunchroom space and male, female and gender-neutral washrooms and locker rooms for employees at the nearby SCM-A.

SCM-G Upgrades

SCM-G is a metal frame structure with an outer fabric skin and is currently used for SCM overflow and spare vessel driveshaft storage. During the Project, it will be cleaned out and used as the temporary welding shop. After the welding department moves into the Multi-purpose Machine Shop Building, SCM-G will receive a new outer skin and be re-assigned to asset disposal, drive shaft storage and rescue boat storage with improved organization to better use the space.

The benefits of the changes to SCM-G include:

- Providing a storage space to better protect assets currently exposed to the elements by being stored outdoors;

- Providing space for assets not intended for short-term accessible storage; and,
- Enabling staff to use space more efficiently for both short- and long-term storage.

Existing Machine Shop Conversion to Outfitting Trades

Approximately half of the outfitting trades are located away from the related trades situated near the berths. Moving the plumbing, rigging, sheet metal and upholstery departments into the existing machine shop brings them closer to the vessels and other related departments. Some supply chain shipping/receiving staff will remain on site for functions best managed at the FMU. The Schoolhouse Training Centre will move into the office area on the second floor from its current location in a temporary trailer, and the refit safety coordinators will move into first-floor offices from their current location in a temporary trailer. Interior cosmetic upgrades and life extension work on the roof, windows and some of the building envelope during the building conversion will allow the building to be used for another 20 years, after which it is anticipated it will need replacement.

The benefits of new Outfitting Trades Building include:

- Consolidating the outfitting trades closer to the vessels in a logical and functionally efficient arrangement;
- Providing additional workspace for all outfitting trades departments;
- Moving refit safety coordinators and the Schoolhouse Training Centre into permanent working office facilities; and,
- Allowing trucks and trailers to enter and exit the building through large roll-up doors, thereby allowing them to load and unload heavy equipment within the building.

Heavy Shop Conversion to Joinery Shop

The current joinery shop is located across the FMU site from other shipwright trades. Moving the joinery shop into the current heavy shop and providing the building with tenant improvements that include life extension work brings the joinery staff closer to associated groups. The benefits of a new Joinery Building include:

- Providing more shop space in a separated building, reducing dust contamination to other trades; and,
- Physically locating the joinery department closer to other trades and providing an improved shop layout.

3.2.1.3 Off-site Lease Space for SCM Warehouse

Permanently locating the SCM warehouse off site provides the opportunity to convert the current SCM buildings into a life saving appliance service facility (rescue boat, life raft and ship safety departments). The move off site requires securing a long-term lease warehouse of approximately 1,850 m^2 in the Lower Mainland. Not all inventory will be transferred to the off-site location – capital assets (thrusters, propellers, shafting, etc.) will remain at the FMU site using new covered storage.

The logistics of supply and transfer to and from the FMU site and off-site warehouse will fold into existing distribution methods using a combination of BC Ferries-owned and operated trucks and third-party couriers as required.

3.2.2 Relocating to New Spaces

As the Project involves relocating 95 percent of all FMU staff into new facilities, at least some operational disruption is inevitable. BC Ferries has completed workflow analysis and developed detailed Project phases and employee transition sequences to address operational disruption risks. Appendix G illustrates the seven steps of the employee transition sequence and details the temporary and final moves of each group to specific locations tied to construction phases.

Mitigations have included:

- Procuring an operational readiness and move management consultant to develop and execute a detailed move management plan for each phase of the Project;
- Conducting stakeholder management to develop specific approaches to reduce the impact of construction and transition; and,
- Keeping FMU and SCM employees informed of Project progress and milestones.

In addition, employees will be familiarized with the new facilities and trained on the new systems and equipment as they become available and/or as each construction phase is completed. Each employee will receive an average of two days of training, broken up into several small sessions.

3.2.3 In-service Date

Will the capital expenditure project affect BC Ferries operations? If so, what is the impact on operations?

What is the expected in-service date? How was it determined? How confident is BC Ferries of the in-service date?

The Project is not expected to significantly impact day-to-day operations at the FMU or in the fleet. BC Ferries and its consultants developed a detailed construction

schedule from regulatory approval, construction phasing and employee transition sequence timelines. The proposed schedule encompasses five phases with staggered completion dates occurring from June 2023 through September 2026 (see Table 3-1). The construction phasing will ensure that the FMU remains fully operational during construction. Broadly speaking, construction will be executed in five phases:

- Phase 1: SCM Off-site Lease Facility Tenant Improvements;
- Phase 2: SCM-A, SCM-B, and SCM-G Tenant Improvements;
- Phase 3: Select Building Demolition and New Multi-Purpose Machine Shop Construction;
- Phase 4: Outfitting Trades and Heavy Shop Tenant Improvements; and,
- Phase 5: Remaining Building Demolition and Civil Works.

BC Ferries has a high degree of confidence in the available-for-use date and has numerous mitigations planned to keep the Project on schedule, including:

- Developing and communicating a Project schedule with critical milestones to internal stakeholders; and,
- Requiring weekly look-ahead schedule reviews from the general contractor, the BC Ferries Project team, the FMU operations team and the design consultant throughout the construction period to ensure potential delays are recognized early and mitigated.

To maintain the Project schedule and ensure operations are not impacted at the FMU, BC Ferries has scheduled the construction activities to:

- Maintain FMU operations throughout construction, including vessel repair services that will continue without interruption;
- Implement a carefully planned employee transition sequence (see Appendix G);
- Complete construction activities at the appropriate time of year, particularly with respect to the FMU's busy and slack periods;
- Facilitate parallel construction where applicable; and,
- Complete construction as early as possible.

Project duration and schedule are discussed further in Section 5 – Procurement and Risk.

3.2.3.1 Key Milestone Dates

Table 3-1 presents the Project's key milestone dates. These dates are based on BC Ferries' experience and consultant input. Construction completion dates indicate that the facility is available for use.

TABLE 3-1: KEY MILESTONE DATES

Activity	Start Date	Completion Date
Section 55 application to the Commissioner and anticipated approval	July 2022	September 2022
Secure off-site lease	October 2022	December 2022
Construction tender and contract	October 2022	December 2022
Phase 1: SCM off-site lease facility tenant improvements	March 2023	June 2023
Phase 2: SCM-A, SCM-B, and SCM-G tenant improvements	July 2023	January 2024
Phase 3: Select building demolition and new Multi-purpose Machine Shop construction	February 2024	August 2025
Phase 4: Outfitting trades and heavy shop tenant improvements	September 2025	February 2026
Phase 5: Remaining building demolition and civil works	March 2026	September 2026
Project Close-out	N/A	March 2027
Warranty period	September 2026	September 2027

As noted above, BC Ferries has hired its general contractor under an ECI contract. The general contractor has validated the construction schedule, giving BC Ferries a high degree of confidence in the in-service dates.

3.2.4 Project Governance

BC Ferries has an established terminal construction program for all on-shore and marine structures. This terminal engineering department administers this program, which draws on expertise from other departments and from external experts while adhering to BC Ferries' project governance framework.

This framework provides a disciplined approach for identifying, approving, managing, reporting and delivering projects. It defines key roles and provides principles and guidelines for project governance through the phases of the project/benefits lifecycle. The framework's goal is to ensure that a capital, major operating project meets BC Ferries' functional and business needs and is identified, managed, monitored and delivered as effectively and efficiently as possible.

The Project is designated as a Class A project and is overseen by a steering committee that reviews the Project's progress through monthly meetings.

BC Ferries also creates and delivers has the following reporting internally:

- Quarterly Project update reports to the BC Ferries Board of Directors' Capital Projects Committee; and,

- Monthly internal corporate progress reports that detail the financial status of the Project.

BC Ferries will procure the Project under the terminal construction program, and the Project will comply with all of BC Ferries' supply chain and procurement policies and procedures (see Section 5 – Procurement and Risk).

3.3 Feedback and Engagement

Have there been complaints from the public, or other stakeholders about the existing capital asset?

As the FMU is not publicly accessible, there has not been any feedback from the public about the facility.

Staff at the FMU, who are stakeholders who know their environment and its positives and negatives, have long been aware of the deficiencies and associated workflow issues due to the FMU's inefficient site layout and too-small work areas. In addition, management has had to address employee safety and hazardous material storage issues due to the condition of aging buildings.

3.3.1 Stakeholder Engagement

Has the provincial government been apprised of or consulted on the proposed capital expenditure? Provide details.

Provide detail on completed and/or planned consultations with affected customers, stakeholders and communities.

Have the connections to transit and other transportation options been considered? If not why not?

Terminal: What are the impacts on local traffic patterns?

Will there be improved access for disabled/mobility challenged passengers?

Employee Engagement

BC Ferries has consulted FMU employees to better understand their needs, the shortcomings of the facilities they use, and how to improve the efficiency of their work. The process began in April 2015 with an engineering consultant conducting a week of interviews with employees, department supervisors and operations managers. The results of the workflow analysis and consultations were fed into the development of the functional requirements are described in Appendix B.

Subsequent employee engagement efforts communicated Project progress and solicited feedback on design concepts. Specific presentations included:

- Annual employee progress reviews – 2015 to 2022;
- Regular employee Project status updates through design review sessions and supervisor and operations management updates – 2021 to 2022;

- BC Ferry & Marine Workers' Union presentation – 2022; and,
- Stakeholder final design reviews – 2021 to 2022.

Employee engagement will continue and become more focused as the Project advances closer to planned construction in March 2023. With a construction contract in place, a detailed work and communication plan will be defined to ensure all employees are informed and engaged through the Project delivery.

Though passenger transit and transportation needs are not relevant to the Project, employee transportation to work is included in the site development. BC Ferries offers transit pass subsidies to employees to reduce car use and parking requirements on site, and provides secure bike locking areas for employees who use the nearby bike trails to get to work. BC Ferries employees may also take advantage of the company's WHEEL health program to purchase bikes or other healthy modes of transportation. BC Ferries does not foresee any change in traffic patterns around the FMU due to the Project.

New construction will also provide disability access that meets regulatory requirements.

External Stakeholders

BC Ferries and its engineering consultant presented the FMU development and flood protection strategy to the City of Richmond and the Ministry of Forests, Lands and Natural Resource Operations and Rural Development ("FLNRORD"). The purpose of the consultation was to align their flood protection requirements to BC Ferries' flood protection strategy. FLNRORD and the City of Richmond were generally supportive of BC Ferries' flood protection strategy and offered suggestions for the design and alignment of the dike to better match their requirements.

In addition, BC Ferries and its engineering consultant met with the Ministry of Transportation and Infrastructure to understand their plans related to the potential new tunnel construction in the area and found no conflicts.

BC Ferries' engineering consultant is also consulting with the following authorities as part of the Project's permitting process: the City of Richmond, Fisheries and Oceans Canada, Transport Canada, FLNRORD, Ministry of Transportation and Infrastructure, Ministry of the Environment and Climate Change, and CN Rail.

Ferry Advisory Committees

In December 2018, the Ferry Advisory Committee (FAC) chairs were advised that the BC Ferries' *Capital Plan* includes an upgrade for the FMU. They were told that many of the FMU's buildings, equipment and other infrastructure require updating, and they were briefed how an efficient FMU would keep long-term costs in check and help reduce upward pressure on fares. The chairs were informed that BC Ferries would be submitting this application to the Commissioner.

BC Ferries will send an email to the FAC chairs in the near future to provide a short update on the Project.

Impact on BC Ferries' Customers

BC Ferries has not directly consulted its customers about the Project. As an internal service facility, the FMU does not generate experience-based feedback from ferry users in the same way as assets directly used by the public, such as terminals or vessels.

However, this does not mean that the FMU does not have an impact on the BC Ferries' customers and the communities it serves. Overall, access to timely and quality ship repair services directly affects the FMU's ability to support fleet resiliency and reliability, fare affordability and ultimately, the customer experience.

3.3.2 First Nations Engagement

BC Ferries is committed to constructive and mutually respectful relationships with Indigenous peoples, based on reconciliation, enhanced collaboration and effective working partnerships. BC Ferries strives to involve Indigenous groups in the early stages of planning, project, and program development where their interests may be affected. Past engagement related to the Project has facilitated an open forum of information exchange, and helped BC Ferries address First Nations' concerns and interests.

The Project is located within the asserted traditional territories of the Katzie, Musqueam, Tsleil-Waututh, Squamish, Semiahmoo, and Tsawwassen First Nations and within the claim area of the Stó:lō Nation and the Hul'qumi'num Treaty Group. To gain an understanding of potential archaeological impacts, BC Ferries had a consultant perform an archaeological overview assessment in 2016 under Stó:lō, Squamish and Tsleil-Watuth investigation permits. A representative of the Semiahmoo Nation was present for the site visit (other nations were unable to attend), which determined that the site had low potential for the presence of as-yet undiscovered archaeological sites and noted that additional permitting was not required. The final report recommended actions BC Ferries and the contractor must follow if archaeological remains are located in the course of work, which BC Ferries will incorporate into the Project's site work requirements.

3.4 Project Benefits

3.4.1 Customer and Community Centred

How does the capital expenditure affect customers?

What are the impacts of the proposed capital expenditure on the local community and other stakeholders?

Customers

As discussed in Section 3.3, the FMU is an internal maintenance facility; however, customers and communities depend on BC Ferries to provide reliable and resilient service, and to connect them to people and places important in their lives. The Project supports this objective by:

- Improving fleet reliability through faster, more reliable service and spares availability;
- Improving the FMU's resiliency to future earthquake and extreme weather events so it can continue to provide uninterrupted service;
- Reducing dependency on third-party contractor services;
- Updating and constructing buildings to current building codes;
- Updating and constructing buildings to current International Life-Saving Appliances (LSA) Codes to ensure required abilities and expertise remain on site for the testing, maintenance and record keeping of life-saving appliance external certification requirements (See Appendix B, Section B.5.2); and,
- Better managing vessel maintenance and other costs in support of keeping fares low (see Section 3.4.3).

Employees

BC Ferries cares for its employees and looks for ways to recruit and retain the best candidates for the FMU. New and upgraded buildings will improve employee satisfaction by providing more comfortable and modern workspaces, removing frustrating inefficiencies, and providing new opportunities for further technical growth and specialization. In addition, the new facilities will follow accessibility codes and include gender neutral washrooms, providing an inclusive and engaging workplace. Dedicated, separated work and relaxation areas and upgraded facilities will also contribute to employee wellness and comfort by providing better options for resting and recharging during breaks and a more welcome space to work.

See Section 3.4.2 for further discussion of employee safety benefits provided by the Project.

Local Community

BC Ferries does not anticipate any direct impacts on the community surrounding the FMU.

3.4.2 Safety

The Project reflects BC Ferries' continued focus on ensuring the safety of its employees and customers by:

- Removing buildings with hazardous material issues and seismic deficiencies and moving employees to new or upgraded facilities;
- Reducing reliance on the use of portable cranes, thereby reducing the number of high-risk critical lifts;
- Providing modern, upgraded facilities that incorporate ergonomic and task-focused layouts to improve trade operations; and,
- Removing non-work functions, such as lunch rooms and locker rooms, from the work floor.

3.4.3 Efficiency

BC Ferries operates efficiently and invests prudently in assets and infrastructure. The Project will enhance efficiency and affordability, reducing pressure on fares, by:

- Creating operational, material and labour efficiencies with better-aligned trades and material flows;
- Adding on-site storage to extend asset life and reducing equipment movement;
- Creating space for future growth and expansion while using existing space more efficiently;
- Developing new areas of in-house technical growth and expansion and increasing potential capacity; and,
- Reducing dependency on contracted services and reducing costs of retained contracted services through better use of space.

3.4.4 Prepared for the Future

Does the proposed capital expenditure show due consideration for the future?

Will the project help to reduce GHG emissions? How?

Will the project result in a more efficient and/or reduction in overall energy usage?

Clean Futures Plan

In Canada and internationally, the marine sector is focused on low carbon-intensive energy and reducing greenhouse gas (GHG) emissions. BC Ferries' *Clean Futures Plan* defines its overarching GHG emissions targets. In 2019, BC Ferries publicly committed to a 24 percent reduction in GHG emissions by fiscal 2030 compared to fiscal 2008 levels.[3] In 2022, BC Ferries further committed to align with the transportation sector target of achieving at least a 27 percent reduction in GHG emissions by fiscal 2030 compared to fiscal 2008 levels.

While the FMU is not a significant contributor to BC Ferries' overall GHG emissions, the construction of a new building built to current energy use guidelines supports the GHG emissions reduction objective. The new Multi-purpose Machine Shop Building is expected to have an energy use intensity of 0.36 GJ/m^2 as compared to the FMU's estimated overall energy use intensity of 1.77 GJ/m^2 in 2020. Demolition of existing inefficient buildings and upgrades to existing buildings will lower the FMU energy use intensity by reducing heating requirements through upgrades to building envelopes and installation of new energy-efficient equipment and lighting. Sufficient information is not available to calculate exact GHG emission reductions due to the aging complexity of the site, though an overall baseline has been determined for the site and this will be compared with the new baseline determined after the Project completion.

Provincial and Federal Targets

Many current and future government policies, programs, and initiatives are centred on climate change mitigation and adaptation. At the federal level, the Government of Canada is proposing that Canada reach net zero emission by 2050, which is an extremely ambitious goal requiring close coordination between industry and regulators. Transition from fossil fuels to low-carbon energy sources is a fundamental component of reaching net zero emissions.

The Province published its *CleanBC* plan in 2018 detailing its long-term strategy to reduce GHG emissions and to stimulate economic growth and diversification in the energy sector. Marine transportation is one of the main components of the Province's "zero-emission vehicles strategy" with a focus on electrification, energy storage systems and renewable energy. The *CleanBC* plan has set a 40 percent

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[3] Fiscal years at BC Ferries are from April 1 to March 31.

overall target by 2030 (compared to 2007) and increasingly stringent targets for 2040 and 2050. The plan has recently established sector-specific targets to further tighten emissions reduction criteria, setting a 27 to 32 percent reduction target (by 2030) for the transportation sector. While the Province is expected to release further guidance on sectoral targets, the new building and upgrades to existing buildings will likely result in reducing GHG emissions at the FMU (compared to fiscal 2008) as noted above.

Green Marine Certification

The new FMU infrastructure supports increasing the site's Green Marine Program certification with respect to spill prevention, and increasing stormwater management compliance from Level 3 to Level 4. A Level 4 standing requires upgrading the storm wastewater system as shown in our design, combined with the development of a *Stormwater Management Plan* and a documented preventive inspection and maintenance program for assets that might release harmful discharges into the environment (fuel, lubricants, etc.).

For the 2023 certification year, the Green Marine Program will release a new and unique set of performance indicators and requirements specifically developed for the shipyard category. This will be a significant change from the current program where shipyards and terminals share the same performance indicators and requirements. The Project will help to position BC Ferries for this shift.

Preparedness

BC Ferries is preparing the FMU for potential extreme weather events and the effects of climate change with investments in the storm wastewater system, the sewage system and dikes around the property. In addition, planned ground improvements and increased site elevation will reduce the risk of catastrophic failure to buildings, grounds and marine structures as a result of earthquakes and extreme weather events.

3.4.5 Significant Contributor to the BC and Canadian Economies

The Project will help stimulate British Columbia's and Canada's economies by:

- Creating meaningful and highly skilled jobs in building construction, material supply, equipment manufacturing and upgrade work;
- Fostering partnership opportunities with local industry and suppliers; and,
- Supporting continued reliable and resilient ferry service in support of businesses in coastal communities.

BC Ferries is committed to ensuring the highest possible percentage of Canadian content goes into the Project throughout its entire lifecycle. The overall strategy for ensuring Canadian content in the Project is:

- Using local contractors experienced in terminal construction; and,
- Procuring supplies from local companies where possible.

The FMU upgrades will all be completed in Canada by Canadian companies, bringing high-value technical construction work to local industries.

A further discussion of the economic impact and benefits of BC Ferries' vessel maintenance and repair activities can be found at section 2.1.

3.4.6 Innovation and Standardization

Does the proposed project include significant features that are innovative or untried?

Were new technologies or innovations contemplated? If so, why are they considered necessary?

Do the terminal improvements align with the concept of asset standardization?

While the Project is intended to modernize FMU by consolidating workflows and improving efficiencies, it does not include untried features or technologies that would increase Project risk.

The Project supports BC Ferries' asset standardization strategy by creating more in-house space for servicing large hardware. For example, it will amalgamate all expertise for the nine types of thrusters into one location and focus on maintaining newer vessels as older vessels that use shaft propulsion are retired. The facility layout will result in fewer equipment moves and more steady work for employees, resulting in safer, more efficient servicing of ferry assets.

3.4.7 Financial

The main financial benefits accrued by BC Ferries from the Project come from operating cost savings due to efficiencies from consolidating departments and increasing capabilities. Repatriating services previously performed by third-party contractors will both increase reliability and decrease related costs – see Section 4.2.3 for additional details.

3.5 Connecting Coastal Communities

Is the proposed capital expenditure consistent with the requirements of the Coastal Ferry Services Contract?

How does the proposed capital expenditure support the provincial government's approved long-term vision for the future of coastal ferry services?

The Project will help ensure the long-term reliance and resilience of the fleet, thereby maintaining ferry service in accordance with the Coastal Ferry Services Contract.

While the Province does not have an approved long-term vision for the future of coastal ferry services, in September 2020, it released a summary of feedback on its proposed *Coastal Ferry Vision*. Survey respondents supported all four themes

that emerged during the first phase of engagement, indicating that coastal ferry services should:

- Support efficient end-to-end travel of people and goods;
- Be equitable and accessible;
- Mitigate and be responsive to climate change; and,
- Reflect the values of coastal communities.

The Project will help the Province achieve its GHG emission targets and will not impact BC Ferries' ability to continue to meet or exceed core service levels. This aligns with the public interest as laid out in Section 38(1)(a.1) of the Act, and as described in Section 3.4.4.

Section 4 – Financial Analysis

4.1 Options

Does the proposed capital expenditure indicate a wise use of resources?

BC Ferries considered several different options during business case development. Five of the options were eliminated as they were not considered feasible (refer to Appendix D for further details). The status quo option (do nothing) was not considered viable because most of the FMU's buildings are near or at the end of their service life, and doing nothing fails to address any of the facility's issues as described above. The eliminated options and status quo are not discussed further in this section.

As a result, BC Ferries considered the following two viable options:

Option 1 – Major Redevelopment

Option 1 involved replacing most of the buildings scattered around the FMU site with three new consolidated buildings, and adding a tower crane and access trestle between Berths 2 and 3. This option was removed from consideration due to the desire to further reduce capital costs while maximizing the potential Project benefits.

Option 2 – Minor Redevelopment and Life Extension (Recommended Option)

Option 2 is the subject of this application. To summarize, it involves replacing select buildings at the FMU site with one new, consolidated building (a multi-purpose machine shop, welding/fabricating shop, covered storage area and site administration building), performing tenant improvements to five buildings to extend their lives and fitting them to new purposes, relocating the SCM warehouse to a leased permanent off-site location and eliminating off-site third-party storage.

4.2 Options Analysis

4.2.1 Project Capital and Operating Expenditures

What are the total estimated capital expenditures by year by option?

Does BC Ferries intend to capitalize any of its own internal costs with respect to the capital expenditure?

What is the estimated IDC?

Are financing costs included in the cost estimate between first payment to the supplier and the in-service date?

Table 4-1 details the total Project budget (upfront capital and operating expenditures) and 40-year NPV for each option:

TABLE 4-1: PROJECT EXPENDITURE AND NPV COMPARISON

	Option 1: Major Redevelopment	Option 2: Minor Redevelopment and Life Extension
Project capital expenditures	$<> million	$<> million
Project operating expenditures	$<> million	$<> million
Total managed Project budget (not including (IDC))*	**$<> million**	**$<> million**
40-year NPV	-$<> million	-$<> million
*Note: IDC costs are not included in the managed budget but will form part of the final capitalized cost of the Project per International Financial Reporting Standards (IFRS). They are estimated at $<> million for the recommended option (#2) and reflect approximate financing costs on outstanding cumulative cash flows until respective assets are recognized as available for use per IFRS. BC Ferries does not anticipate a need for specific borrowing for this Project.		

The total Project budget request for Option 2 is $<> million with a 40-year NPV of approximately -$<> million. The $<> million difference between the two options' total budgets is due to the savings from Option 2's narrower scope that does not include the cost of the new life saving shop, trades building and tower crane, but which is partly offset by the tenant improvement costs. This difference in upfront cost is also a key driver in the NPV comparison – see Section 4.2.4 for further discussion of the NPV analysis.

Capital expenditures for both options primarily consist of contracted costs for consultation, design, new construction and tenant improvements. Internal costs including labour for project management and travel are also capitalized, in accordance with internal financial policies and IFRS.

Operating expenditures for both options include execution costs that cannot be capitalized such as office moves and end-user training. Option 2 also includes $<> million of Project impairment for design work relating to scope that was subsequently reduced.

A detailed budget breakdown for Option 2 is presented in Appendix I.

4.2.1.1 Project Cost Estimate Methodology

How were the capital, operating and maintenance cost estimates derived? Entirely with BC Ferries' staff or was there an external review?

With respect to the capital cost estimates for Option 2:

- A third-party contractor completed a competitive non-binding quotation in March 2022 using a completed tender drawing package to develop a Class A (generally within 5 to 10 percent of actual award price) pre-tender estimate. <>
- BC Ferries hired a third-party consultant to develop the design and construction phase services estimates and permitting cost requirements.
- BC Ferries staff completed the project management, site supervision and employee move management budgets using current labour rates and schedule requirements.

The Project contingency amount is <> percent of the base cost (see Section 4.2.2 for contingency amount calculations).

The Option 1 budget estimate is based on detailed design engineering and costing received in 2018, updated to reflect the proportionate escalated cost increases in line with the Class A pre-tender estimates identified in Option 2.

4.2.2 Contingency Amount

Project contingency was calculated using company guidelines and the Pearson-Tukey calculation method for project estimate uncertainty. For further details, see Appendix J.

4.2.3 Ongoing Operating Implications

What are the estimated operating costs for each option?

Vessels and Terminals: Does the vessel/terminal design have any impact on labour costs? If so, how?

What are the estimated maintenance costs for each option? Where there are large differences, please explain.

How were the capital, operating and maintenance cost estimates derived? Entirely with BC Ferries' staff or was there an external review?

What is the revenue impact?

The Project will address deficiencies and improve the site functionality and operational efficiency, which will result in favourable financial impacts as more repair work is brought in-house and trade productivity is improved with the new configuration. BC Ferries and the third-party consultant designed the Option 2 site plan to retain the benefits of Option 1's full-site development, excluding savings realized by reducing contracted services associated with the tower crane.

Some incremental costs are expected to partially offset savings, such as the SCM off-site lease cost incurred in Option 2. Additionally, property taxes will likely increase under both options due to the site improvements.

BC Ferries has developed internal financial impact estimates of these benefits where possible, prepared in fiscal 2023 dollars for comparison. The estimates were based on a fleet mix as of fiscal 2023, but adjustments for future fleet changes are not reflected due to uncertainty in quantifying those adjustments. The Project scope takes into account the future fleet retirements and renewal impacts to ensure needs are met based on current long-range fleet plans. Due to the moderate uncertainty in the estimates, the ongoing operating costs and savings were sensitivity tested.

The estimate for Option 1 provided incremental annual savings of $<> million attributable to labour and other operational efficiencies and a reduced reliance on contracting services including the tower crane, offset by $<> million in incremental costs due to property tax increases for a net saving of $<> million. The estimate for Option 2 provided incremental savings of $<> million, assumed to be consistent with Option 1 except for contracted services savings associated with the tower crane. Option 2 savings are offset by $<> million in incremental costs due to the SCM lease and property tax increases for a net saving of $<> million. BC Ferries expects reduced labour costs, included in these estimates, through overtime reduction by way of workflow and site efficiencies. See Appendix H for more detailed operating and labour costs and information.

BC Ferries has not quantified the overall site operating and maintenance cost changes and expects the maintenance costs of new buildings to be less than the existing aged buildings. However, maintenance savings are expected to be minor compared to the operating cost savings for the redeveloped facility.

The Project will improve fleet resilience and reliability, which ensures revenue; however, BC Ferries does not expect the Project directly to impact revenue.

4.2.4 Lifecycle Costing

Is the net present value analysis done on a lifecycle basis for relevant comparison of options?

Is there an allowance in the estimate for inflation from the date of acceptance of a proposal to the completion date (escalation clause)?

What is the rationale for the discount rate used?

BC Ferries performed a lifecycle NPV analysis that compared both options based on upfront Project costs and incremental operating costs and savings discussed in the previous sections. See Table 4-1 for the 40-year NPV analysis results for both options.

The NPV also took into account required lifecycle asset renewal investment. Under Option 2, the Outfitting Trades Building will require replacement in 20 years when its service life can no longer be extended, and the other four buildings receiving tenant improvements as part of the Project will receive additional life extension work in 20 years.

To complete the NPV, BC Ferries included the following assumptions:

- A 7 percent discount rate that is based on current borrowing costs plus a risk premium;
- A <> percent pricing risk escalation estimate on upfront Project costs, as described in Section 4.2.1.1. Other ongoing operating and capital expenditures have a <> percent annual inflation rate applied;
- A gradual introduction of incremental operating savings and costs over two years from the estimated in-service date of the relevant scope; and,
- Residual value reflected in Option 2 to capture the timing difference of the new Outfitting Trades Building.

4.2.5 Sensitivity Analysis

Has a sensitivity analysis been done on key assumptions, such as costs, revenues, discount rate, timing and inflation?

BC Ferries carried out sensitivity tests on the NPV discount rate, inflation rate and net incremental operating savings due to the relative uncertainty in estimates. Table 4-2 summarizes the results and indicates the changes to the tested inputs impact both options relatively consistently (± $<> million).

TABLE 4-2: NPV SENSITIVITY TEST RESULTS

	Option 1: Major Redevelopment	Option 2: Minor Redevelopment and Life Extension
40-year NPV	**-$<> million**	**-$<> million**
Sensitivity scenario (net change in NPV)		
5 percent discount rate	-$<> million	-$<> million
5 percent annual inflation applied to lifecycle capital investment	-$<> million	-$<> million
25 percent reduction in net savings (see Section 4.2.3)	-$<> million	-$<> million

The $<> million difference between the 40-year NPV analyses of the two options is largely driven by Option 2's upfront cost savings and deferral compared to Option 1.

4.2.6 Scenarios for Reducing Capital Expenditures

What would have to be sacrificed to reduce total costs by 10%, and by 20%?

Has it been demonstrated that the proposed capital expenditure would not reasonably be considered excessive?

Option 2 is the result of a large-scale descoping exercise carried out by BC Ferries in 2020 and represents approximately <> percent total cost reduction from the original Option 1 budget while retaining the majority of the benefits. BC Ferries and the third-party consultant and contractor have worked together to maximize design and construction efficiencies (a prime benefit of the ECI approach) and carefully planned the building life extensions to maintain lower costs while avoiding expensive upgrades. BC Ferries will continue to work with the third party contractor and the consultant to find efficiencies through the tender and construction, but any additional set scope reductions would reduce BC Ferries' ability to carry out the Project in a manner that would achieve the intended benefits of the preferred option. Given these efforts BC Ferries believes that the proposed capital expenditure would not reasonably be considered excessive.

4.2.7 Capital Planning

How has this capital expenditure project been prioritized relative to other capital expenditure projects within the long-term capital plan?

Is the proposed capital expenditure provided for in a board approved capital plan?

Is the total cost different in any respect from what was approved in the capital plan?

Does the scope of the proposed capital expenditure differ in any respect from what was approved in the latest capital plan approved by the Board?

BC Ferries management and the Board of Directors have prioritized the Project as a strategic initiative within the overall capital portfolio based on the FMU's condition and its importance for ship repair activities. The de-scoping efforts undertaken in 2020 encompassed an extensive and critical review to address critical site deficiencies and maximize benefits at the lowest upfront cost.

The most recent 12 year *Capital Plan* approved by the Board of Directors in February 2022 included a $<> million capital placeholder for the Project as conceived in Option 2. Subsequently, the Board approved a Project business case with proposed capital budget of $<> million, subject to the Commissioner's approval. Though there was no change to the scope of work detailed in the approved *Capital Plan*, capital cash flow timing was adjusted to align with a 14 month schedule extension <>, resulting in a spending shift from Performance Term Five ("PT5") to Performance Term Six ("PT6") compared to the approved *Capital Plan*.[4]

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[4] Performance Term Five is from April 1, 2020 to March 31, 2024, and Performance Term Six is from April 1, 2024 to March 31, 2028.

These increased capital cost and cash flow changes have been offset by other capital portfolio changes and management will continue to balance the *Capital Plan* in line with strategic priorities.

4.2.8 Price Cap Implications of Preferred Option

Is the total cost different in any respect from what was indicated in the BC Ferries' last submission to the Commissioner for price cap setting purposes?

What is the estimated impact of the proposed capital expenditure on future price caps assuming no change in non-passenger related revenues?

Does the proposed capital expenditure provide good value, at a moderate and fair price? Is it affordable?

BC Ferries' submission to the Commissioner for price-cap-setting purposes for PT5 was submitted in September 2018. The PT5 12-year *Capital Plan* included a $<> million placeholder for the Project with cash flows occurring in PT5, which reflected a scope consistent with the major redevelopment detailed in Option 1. Subsequent to the PT5 submission, BC Ferries de-scoped the Project in 2020, and the timing of spending has shifted more heavily into PT6.

In September 2022, BC Ferries will file a PT6 submission including a *Capital Plan* that aligns with Option 2.

Upon Project completion, with all other things held constant, BC Ferries' analysis indicates an increase of 0.017 percent per annum to required average annual regulated tariff revenue over the 42 years from fiscal 2025 through fiscal 2066. Starting in PT6 through fiscal 2032 (the end of Performance Term 7),[5] an annual price cap increase of approximately 0.135 percent will be required. Following fiscal 2032, and for the remaining life of the FMU assets through fiscal 2066, an annual price cap increase of approximately 0.013 percent will be required.

BC Ferries submits that Option 2's modest price cap impacts reflect that the Project is affordable and that it will provide good value and a moderate and fair price.

[5] Performance Term Seven is from April 1, 2028 to March 31, 2032.

Section 5 – Procurement and Risk

5.1 Introduction

BC Ferries has an established terminal construction program for all on-shore and marine structures. The Project has appropriate governance in place (see Section 3.2.4), which is administered by the terminal engineering department and draws on expertise from other departments as well as external experts. Recent successful major vessel conversion and terminal upgrade projects provide best practices and lessons learned. This experience will serve to mitigate Project risk as BC Ferries implements and follows processes that have been tested and proven successful in the recent past.

The following sub-sections provide an overview of the procurement process and key Project risks.

5.2 Procurement Options and Process

5.2.1 Procurement Process

What are the procurement options and process?

Design Phase

BC Ferries previously awarded several design development and site investigation contracts to advance the Project's design and improve the accuracy of the Project's construction cost estimate. These contracts followed BC Ferries' established procurement policies, which at the time required at least three invited bids for scopes of work between $25,000 and $75,000, and competitive public bids for scopes of work greater than $75,000.[6]

Construction Phase

BC Ferries considered the design-bid-build, design-build, and early contractor involvement (ECI) contracting methods for the Project's construction. These options are discussed in detail in Appendix E.

Selected Procurement Strategy

BC Ferries selected the ECI procurement strategy for the Project and has engaged a general contractor to pursue this strategy. Consistent with this procurement strategy, the general contractor collaborated with the design team to offer design and constructability suggestions and prepared an open-book bid based on competitive non-binding quotations from sub-contractors and vendors. The

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[6] BC Ferries' procurement policies now require three quotes for expenditures between $75,001 and $149,999, and competitive bids for work over $150,000.

Commissioner's approval of this application is required to advance the process and seek a fixed-price tender process and implement a contract.

5.2.2 Project Timelines

The timelines for the Project are described in detail in Section 3.2.3. Since BC Ferries has chosen ECI as a procurement strategy and has already adjusted the Project schedule based on contractor advice, further changes are not expected to the proposed schedule unless significant supply chain issues persist, or become worse.

5.3 Risk Identification and Mitigation

Describe any major risks that could affect the project's success.

What are the major risks? Have they been taken into account in the NPV analysis?

Describe mitigation strategies for major risks that have been identified.

BC Ferries has rigorous processes in place to identify, monitor and address the Project risks. The following provides an overview of the key risks, together with planned mitigation strategies. The risk mitigation strategies for the latter Project phases will receive enhanced focus as the Project proceeds. BC Ferries took key risks into consideration when preparing the NPV analysis.

Affordability

- **Risk**: Higher than expected construction costs realized in December 2022 could adversely affect BC Ferries' financial ability to undertake the Project.
- **Mitigation**: BC Ferries will review the affordability of the increased costs through an evaluation of the approved *Capital Plan*. BC Ferries does not anticipate a need for specific borrowing for this Project and will finance it in line with all capital projects with cash flow from operations by drawing on credit facilities and/or by issuing bonds in the capital markets. Credit facilities include term bank debt, revolving bank lines of credit, publicly issued and privately placed debt securities, commercial paper, medium-term notes, interest rate and currency swaps and other hedging instruments.

<Risk Removed>

- **Risk**: < >
- **Mitigation**: < >

Off-Site Warehouse Lease Availability for SCM

- **Risk**: Global supply chain stress has limited the availability of 1,850 m^2 warehouse space in the Lower Mainland. The off-site lease requirement

is the first key phase of the Project freeing up building space to allow all other sequences of the Project to take place.

- **Mitigation**: BC Ferries had utilized a third-party property broker to search for a suitable warehouse space based on SCM's requirements, but without Project funding and certainty of the Project acquiring a lease was not possible. BC Ferries will re-engage the property broker to select an appropriate facility in anticipation of the Commissioners Project approval, at which point a long-term lease will be secured.

Regulatory Requirements

- **Risk**: Regulatory approvals are required from all three levels of government (municipal, provincial and federal) and other stakeholders including CN Rail. The regulatory process and permits may result in Project and schedule delays.
- **Mitigation**: BC Ferries has already identified the required permits and approvals and has begun the process of obtaining them. Each application is suitably advanced and not expected to impede construction, and dedicated Project team individuals act as key points of contact with regulators and other organizations. The statuses are as follows:
    - City of Richmond Development Permit – BC Ferries expects the development permit in early 2023;
    - City of Richmond Rezoning Application – BC Ferries expects rezoning approval in early 2023;
    - City of Richmond Building Permit Applications – BC Ferries expects building approval in early 2023;
    - City of Richmond Flood Protection Strategy – BC Ferries expects the dike and flood protection strategy approval by the end of December 2022;
    - Fisheries and Oceans Canada Project Review – BC Ferries expects a letter acknowledging the acceptability of its fish habitat protection approach by the end of December 2022;
    - CN Rail Crossing Permit – BC Ferries expects a utility rail crossing permit by December 2022;
    - FLNRORD Project Review – BC Ferries expects a letter in a few months acknowledging the acceptability of its Project approach;
    - BC Ministry of Transportation and Infrastructure Project Review – BC Ferries has received a setback permit with respect to the Ministry of Transportation and Infrastructure's access road adjacent to the east side of the site, access permit with respect to sharing the access road and the rezoning and subdivision approval;

- Environment and Climate Change Canada Species-at-Risk Application – Fisheries and Oceans Canada has confirmed that no species at risk are present in the Project area, and that an Environment and Climate Change Canada Species-at-Risk Application is not required; and,
- BC Ministry of the Environment, Conservation and Parks *Dike Maintenance Act* Approval – BC Ferries expects a letter acknowledging the Project's dike approach once it has finalized its dike plans with the City of Richmond.

The construction sub-contractors will need to obtain some minor permits and approvals related to excavations, water use, waste disposal, etc. These are easy to obtain and represent very low Project risks.

Project Complexity

- **Risk**: This Project requires relocation of 95 percent of the staff onsite into new working facilities through the five sequences of construction with potential risk to employee well being and awareness.

- **Mitigation**: BC Ferries will manage this by:
  - Developing a detailed sequencing plan to inform each phase of the construction and to inform each phase of the employee transition moves (temporary & permanent locations);
  - Developing a Detailed Construction Execution Plan by the third party contractor that will work in symmetry with the BC Ferries Project plan;
  - Procuring an Operational Readiness & Move Management consultant as part of the Project team to inventory the furniture assets of each department and develop a detailed move management plan;
  - Developing training plans between the contractor and the operational readiness team to ensure all employees are familiar and prepared to move into their new space; and,
  - Developing communication and training plans leveraged by the Project team, which will result in the staff being aware of the changes well in advance.

Project Duration / Schedule

- **Risk**: The Project construction schedule is 40 months and has been developed from regulatory approval timelines and construction and employee transition sequencing timelines. Unknown factors such as unidentified site conditions, supply chain issues and change orders could cause delays and disrupt the schedule.

- **Mitigation**: A detailed Project schedule with critical milestones has been developed and communicated to internal stakeholders and the contractor will update the detailed construction execution plan at the time of contract award. Weekly look-ahead schedule reviews will be completed by the general contractor, BC Ferries' Project team, FMU operations and the design consultant during construction to ensure potential delays are mitigated.

Schedule Risks due to Supply Chain Delivery Delays

- **Risk**: Supply chain delivery delays are anticipated during the Project due to causes such as a busy construction market in the Lower Mainland, the global pandemic and the conflict in Europe.
- **Mitigation**: BC Ferries, design engineers and the third-party contractor will continue to analyze and compile a list of critical long-lead material for the Project. The third-party contractor will order critical materials directly after contract award to lock in the cost, manufacturer queues and expected delivery dates to allow more time to mitigate any delivery delays; however, some Project schedule risk will remain because of current global supply chain issues and other possible delivery delays.

Project Management

- **Risk**: The Project is complex and has many construction elements including new construction and renovations to aging structures that must be managed. Challenges include maintaining continuous operation, relocating 95 percent of the staff on site into new working facilities and working with third-party agencies, contractors and stakeholders to complete.
- **Mitigation**: BC Ferries will manage the Project by:
  - Assigning an experienced project manager to lead the Project;
  - Following the detailed sequencing plan for each construction phase and temporary and permanent employee transition sequence;
  - Aligning BC Ferries' Project Management Plan with the Detailed Construction Execution Plan developed by the general contractor;
  - Procuring an operational readiness and move management consultant to create an inventory of furniture in each department and develop a detailed approach to the move;
  - Developing and implementing training for FMU employees to ensure familiarity with and preparedness for the move; and,
  - Keeping the FMU's employees informed of Project progress and milestones.

Labour Availability

- **Risk**: A busy construction market in the Lower Mainland could result in a low availability of construction labour for the Project.
- **Mitigation**: The Project team has been monitoring market labour and the general contractor has begun the process to secure project teams for the Project. The contractor also noted that the market outlook suggests an easing of labour shortages in 2023.

Operational Impacts

- **Risk**: Construction activities could disrupt normal operations at the FMU.
- **Mitigation**: BC Ferries developed a workflow analysis and a detailed sequencing plan to inform each phase of the construction to address operational risks. Mitigations required for smooth transitions include stakeholder management, a coordinated Project plan involving all affected groups and a detailed construction execution plan by the third party contractor that will work in symmetry with the BC Ferries Project plan.

The Project team will coordinate timelines with the fleet project management office and FMU management to determine strategies that minimize operational impacts in advance of construction activities.

Unanticipated Geotechnical Conditions

- **Risk**: Unexpected adverse geotechnical conditions could require design changes, increase construction costs and delay Project completion.
- **Mitigation**: BC Ferries hired geotechnical specialists to conduct initial site investigations during the Project's preliminary design, and to conduct more detailed borehole drilling program, during detailed design. The results of these investigations, combined with geotechnical data obtained during previous projects at the FMU, minimize the risk of encountering unexpected adverse geotechnical conditions.

Archaeological Finds

- **Risk:** Unexpected archeological finds could require excavations and investigations that would delay Project completion.
- **Mitigation:** BC Ferries hired Arrowstone Archaeological Research and Consulting Ltd. to conduct an archaeological overview assessment. The assessment concluded that there is little chance of finding unrecorded, protected archeological artifacts because the Project area represents a highly disturbed site.

Using the findings obtained from the Arrowstone assessment, SNC-Lavalin prepared an archaeological chance find procedure to satisfy provincial

regulatory agencies that proper protocols are in place if archaeological remains are discovered. This procedure replaces the upfront requirement to obtain a *Heritage Conservation Act*, Section 14 inspection permit unless, during construction, archaeological artifacts are discovered, in which case construction delays may result due to the requirement to fully assess the area again. The fact that the assessment did not reveal any findings indicates a low probability that archaeological findings will occur during construction.

Section 6 – Conclusion

Is the proposed capital expenditure considered to be in the public interest?

BC Ferries respectfully requests the Commissioner's approval for a major capital expenditure for the Project of up to $<> million, exclusive of IDC, and supplemental Project operating expenditures of up to $<> million, for a total Project expenditure of up to $<> million.

The Project is consistent with BC Ferries' 12-year *Capital Plan* and its *Ship Repair Strategy 2016–2026*. It is essential to BC Ferries' ability to service and refit its vessel fleet, and will enable BC Ferries to maintain resilient and reliable ferry service in accordance with the Coastal Ferry Services Contract, while at the same time reducing upward pressure on fares.

The Project has been comprehensively researched and prudently planned, and has appropriate governance and project management in place. Of the viable options described in this report, the proposed Project, arrived at after thousands of hours of consultation, discussion and engagement, has the least negative NPV for the benefits identified. Once completed, the Project will position the facility to support the fleet into the future by enhancing productivity, reducing costs, protecting valuable assets and adding new capabilities with respect to large thruster repair and life safety appliance service. The internal repair capacity of the modernized FMU is expected to increase to between 45 and 50 percent of total vessel repair, refit, modification, and maintenance services.

Accordingly, BC Ferries submits that this expenditure is in the public interest. It is prudent, represents a wise use of resources, is reasonably required and is affordable.

Appendix A Schedule 55 Question Cross-Reference

The following table itemizes the Schedule 55 questions, and indicates where in this document they have been answered.

Question	Answer Location
Commissioner's Determinations	
a) Is the proposed project reasonably required?	Section 2.6
b) Does the proposed capital expenditure demonstrate good judgment, based on wisdom, experience and good sense?	Section 3.1
c) Does the proposed capital expenditure indicate a wise use of resources?	Section 4.1
d) Does the proposed capital expenditure show due consideration for the future?	Section 3.4.4
e) Has it been demonstrated that the proposed capital expenditure would not reasonably be considered excessive?	Section 4.2.6
f) Does the proposed capital expenditure provide good value, at a moderate and fair price? Is it affordable?	Section 4.2.8
g) Is the proposed capital expenditure provided for in a board approved capital plan?	Section 4.2.7
i. Is the total cost different in any respect from what was approved in the capital plan?	Section 4.2.7
ii. Is the total cost different in any respect from what was indicated in the BC Ferries' last submission to the Commissioner for price cap setting purposes?	Section 4.2.8
iii. Does the scope of the proposed capital expenditure differ in any respect from what was approved in the latest capital plan approved by the Board?	Section 4.2.7
h) Is the proposed capital expenditure consistent with the requirements of the Coastal Ferry Services Contract?	Section 3.5
i) How does the proposed capital expenditure support the government's approved long-term vision for the future of coastal ferry services?	Section 3.5
Reasons for the Proposed Capital Expenditure	
a) What is driving the capital expenditure (e.g. replacement, expansion, upgrade, regulatory requirements, reduction in GHG emissions)?	Section 1.2
b) Is the proposed capital expenditure provided for in a board approved capital plan?	Section 4.2.7
c) How has this capital expenditure project been prioritized relative to other capital expenditure projects within the long-term capital plan?	Section 4.2.7
d) Have there been service disruptions due to inadequacy of the existing capital asset?	Section 2.9
e) Have there been complaints from the public, or other stakeholders, about the existing capital asset?	Section 3.3

Question	Answer Location
f) What sources of expertise and experience have been relied upon in deciding to proceed with this capital expenditure?	Section 2.5
g) Why is the proposed capital expenditure required now, and what are the consequences of delay or if the application is rejected?	Section 2.9
h) Is the proposed capital expenditure consistent with the Coastal Ferry Services Contract?	Section 3.5
i) How does the proposed capital expenditure support the provincial government's approved long-term vision for coastal ferry services?	Section 3.5
j) Is the proposed capital expenditure considered to be in the public interest?	Section 6
Options	
a) Have future changes to mix of traffic serviced by the terminal been contemplated?	N/A
b) Have changes to the type and size of vessels operating out of the terminal been contemplated?	N/A
c) Have smaller vessels been considered to reduce terminal capital?	N/A
d) Do the terminal improvements align with the concept of asset standardization?	Section 3.4.6
e) Were new technologies or innovations contemplated? If so, why are they considered necessary?	Section 3.4.6
Option Analysis – Financial	
a) What are the total estimated capital expenditures by year by option?	Section 4.2.1
b) What is the estimated IDC?	Section 4.2.1
c) What are the estimated operating costs for each option?	Section 4.2.3
d) What are the estimated maintenance costs for each option? Where there are large differences, please explain.	Section 4.2.3
e) How were the capital, operating and maintenance cost estimates derived? Entirely with BC Ferries' staff or was there an external review?	Section 4.2.1.1 and Section 4.2.3
f) Does BC Ferries intend to capitalize any of its own internal costs with respect to the capital expenditure?	Section 4.2.1
g) *Vessels and Terminals*: Does the vessel/terminal design have any impact on labour costs? If so, how?	Section 4.2.3
h) What is the revenue impact?	Section 4.2.3
i) Are financing costs included in the cost estimate between first payment to the supplier and the in-service date?	Section 4.2.1
j) Is there an allowance in the estimate for inflation from the date of acceptance of a proposal to the completion date (escalation clause)?	Section 4.2.4
k) Is the net present value analysis done on a lifecycle basis for relevant comparison of options?	Section 4.2.4
l) What is the rationale for the discount rate used?	Section 4.2.4

Question	Answer Location
m) Has a sensitivity analysis been done on key assumptions, such as costs, revenues, discount rate, timing and inflation?	Section 4.2.5
n) *Vessels and Terminals*: Have "ancillary services", including catering and retail concessions, been considered? If so, provide estimates of the incremental operating costs to provide the ancillary services and the incremental revenue expected to be generated from those services.	N/A
o) *Terminals*: Will BC Ferries be sub-contracting or entering into partnerships with other entities to provide services and infrastructure at the terminal (e.g. parking, catering, retail)?	N/A
p) What are the major risks? Have they been taken into account in the NPV analysis?	Section 5.3
Option Analysis – Customer Service and Operations	
a) How does the capital expenditure affect customers?	Section 3.4.1
b) How are the needs of commercial traffic being considered and accommodated?	N/A
c) How are the needs of cyclists and foot passengers being considered and accommodated?	N/A
d) *Terminal*: Is the terminal capacity sufficient for future demand and mix of traffic?	N/A
e) *New Vessel and Terminal*: What methodology has been used to determine future demand?	Section 2.4
f) *New Vessel and Terminal*: What passenger amenities will be provided, and why are they considered appropriate?	N/A
g) *Terminal*: Have the connections to transit and other transportation options been considered? If not why not?	Section 3.3.1
h) *New Vessel and Terminal*: Will there be improved access for disabled/mobility challenged passengers?	Section 3.3.1
i) *Terminal*: Will the facility accommodate passenger-only ferries, water taxis and/or barge operations?	N/A
j) *Terminal*: Will there be any improvements to ferry marshalling?	N/A
k) *Vessel and Terminal*: Will there be any improvements to loading, unloading and turnarounds?	N/A
l) Will the capital expenditure project affect BC Ferries operations? If so what is the impact on operations?	Section 3.2.3
Option Analysis – Environment	
a) Will the project result in a more efficient and/or reduction in overall energy usage?	Section 3.4.4
b) Will alternative energy sources be used?	N/A
c) Will the project help to reduce GHG emissions? How?	Section 3.4.4

Question	Answer Location
Option Analysis – Social/Community Impacts	
a) What are the impacts of the proposed capital expenditure on the local community and other stakeholders?	Section 3.4.1
b) *Terminal*: What are the impacts on local traffic patterns?	Section 3.3.1
c) Provide detail on completed and/or planned consultations with affected customers, stakeholders and communities.	Section 3.3.1
d) Has the provincial government been apprised of or consulted on the proposed capital expenditure? Provide details.	Section 3.3.1
Preferred Option Procurement and Risks	
a) What is the expected in-service date? How was it determined? How confident is BC Ferries of the in-service date?	Section 3.2.3
b) What are the consequences of a delay in the in-service or deployment date?	Section 2.9
c) What is Plan B if the project is delayed?	Section 2.9
d) Is the total cost different in any respect from what was approved in the capital plan?	Section 4.2.7
e) Is the total cost different in any respect from what was indicated in the BC Ferries' last submission to the Commissioner for price cap setting purposes?	Section 4.2.8
f) What is the estimated impact of the proposed capital expenditure on future price caps assuming no change in non-passenger related revenues?	Section 4.2.8
g) What would have to be sacrificed to reduce total costs by 10%, and by 20%?	Section 4.2.6
h) Does the proposed project include significant features that are innovative or untried?	Section 3.4.6
i) Describe any major risks that could affect the project's success.	Section 5.3
j) Describe mitigation strategies for major risks that have been identified.	Section 5.3
k) What are the procurement options and process?	Section 5.2.1
l) What are the procurement risks and how will they be mitigated?	Section 5.3

Appendix B Facility Assessments

B.1 Historical Information Review

SNC-Lavalin and BC Ferries reviewed the FMU's historical information in 2015 and 2022 to understand the current facility and the issues surrounding its redevelopment. Specifically:

- SNC-Lavalin verified as-built building area and usage information, reviewed environmental issues, and evaluated geotechnical constraints;
- SNC-Lavalin and BC Ferries consulted with the City of Richmond and the Ministry of Transportation and Infrastructure to understand their requirements related to sea level rise and potential new bridge construction in the area;
- SNC-Lavalin and BC Ferries visited Seaspan in North Vancouver, the Fleet Maintenance Facility in Esquimalt, Point Hope Maritime in Victoria, Rolls-Royce in Coquitlam and Allied Shipbuilders in North Vancouver to establish methodologies, benchmarks and industry comparators for ship repair and maintenance facilities and activities; and,
- BC Ferries consulted with manufacturer-certified life safety appliance service providers with respect to service facility requirements and recommendations.

B.2 Hazardous Material Survey

Environmental consultant North West Environmental conducted hazardous material surveys in 2014 and 2022 and found that many of the FMU's buildings contain hazardous materials such as polychlorinated biphenyls (PCBs), asbestos, lead, silica, mercury, mould and rodent droppings. They also found that many of the buildings suffer from inadequate ventilation to clear dust and volatile organic compounds. These issues are common in industrial buildings that are several decades old. While the buildings meet all health and safety requirements, conducting repairs and maintenance on them becomes more difficult and expensive when these issues exist.

B.3 Building Condition Assessments

SNC-Lavalin and Boldwing Continuum Architects assessed the condition of all of the FMU buildings in 2015 and completed subsequent reviews in 2021. They evaluated the architectural, structural/seismic, mechanical and electrical condition of each building, and documented any code-compliance issues. The building condition assessments indicate that the structures are 34 to 55 years old, are mostly at the end of their useful lives, are in poor condition and are seismically and structurally deficient. Of the 11 buildings evaluated, seven are past their 40-year life expectancy, three are over 35 years old and one is over 25 years old. All of the

buildings need immediate or imminent repairs. Table B-1 summarizes the overall building conditions. Figure B-1 compiles various building condition photos.

FIGURE B-1: COMPILATION OF BUILDING CONDITION PHOTOS

TABLE B-1: BUILDING CONDITION ASSESSMENTS

Building	Year	Exterior	Windows	Doors	Roof	Sealants	Interior	Code Conformance
Electrical, paint, ship safety and shipwright's shop	1973	Good to Poor	Fair/Poor	Fair	Fair to Poor	Poor	Fair/Poor	50%
Sign shop	1982	Good to Poor	Fair/Poor	Good to Poor	Good	Poor	Fair	75%
Administration offices, machine shop and fuel injection shop	1962 – 2011	Fair/Poor	Poor	Fair/Poor	Fair to Poor	Poor	Fair to Poor	48%
Heavy shop	1982 – 1992	Fair/Poor	Fair to Poor	Fair to Poor	Poor	Poor	Poor	40%
Life raft centre	1962	Poor	Poor	Fair to Poor	Fair/Poor	Poor	Fair to Poor	50%
SCM-A, SCM-B	1982, 1992	Fair/Poor	Fair to Poor	Fair/Poor	Good to Poor	Poor	Good to Poor	43%

Building	Year	Exterior	Windows	Doors	Roof	Sealants	Interior	Code Conformance
Upholstery, joinery and sheet metal shop	1976	Poor	Fair to Poor	Poor	Fair to Poor	Poor	Fair/Poor	43%
Plumbing shop	1962?	Poor	Fair/Poor	Fair to Poor	Fair/Poor	Poor	Good/Fair	20%
Engineering services offices and rigging shop	1964 – 1993	Fair/Poor	Poor	Poor	Fair to Poor	Poor	Poor	33%
Coating inspection offices, rescue boat shop, and welding and fabrication shop	1973 – 1978	Fair/Poor	Poor	Poor	Poor	Poor	Poor	33%
Self-Contained Breathing Apparatus (SCBA) building	1991	Good/Fair	Fair/Poor	Poor	Good to Fair	Poor	Good/Fair	0%

Good Condition: No deficiencies/damage noted; no expected capital expenditure within the next 10 years.

Good / Fair Condition: Minor deficiencies/damage noted; expected capital expenditure within 8 to 10 years.

Fair Condition: Minor deterioration/damage noted; expected capital expenditure within 5 to 8 years.

Fair / Poor Condition: Extensive deterioration/damage noted; recommended capital expenditure within 2 to 5 years.

Poor Condition: Critical deterioration/damage noted; recommended capital expenditure within 0 to 2 years.

B.4 Workflow Analysis

SNC-Lavalin conducted a workflow analysis in 2015 to evaluate equipment, material and personnel flow through the FMU, and to identify constraints and deficiencies affecting FMU operations.

The workflow analysis involved:

- Meeting all FMU trades and communicating the objectives of the development planning process to them;
- Identifying the range and type of work processes the trades perform;
- Observing the work processes; and,
- Identifying the issues and constraints that impact operations.

The workflow analysis specifically evaluated:

- The percentage of time that each trade spends on the vessels;
- Building and workshop locations in relation to their work interactions, material and equipment flows, and vessels;
- Adjacencies between trade functions for efficient material, parts and personnel transfers;
- The size, suitability and layout of shop buildings and storage areas compared to their needs;
- The suitability of storage areas with respect to environmental protection, material security and inventory control;
- Site access and circulation routes to accommodate part, equipment, material and personnel movements throughout the site;
- The size, number and suitability of building access doors to facilitate component and material flow, and the suitability of interior flow paths to move parts and materials and for delivery truck access;
- Suitability and capability of methods and equipment to lift, manipulate and move components and materials;
- Utility corridors; and,
- Site constraints, such as neighbouring activities and municipal and provincial planning regulations.

SNC-Lavalin summarized their findings in their *FMU Workflow Analysis Report – January 07, 2016*. The report presented a high-level schematic representation of the material, equipment and labour flows between the various trades, shops and vessels as shown in Figure B-2, and itemized the various building deficiencies as described in Section B.5. The workflow analysis results were used to develop the functional requirements.

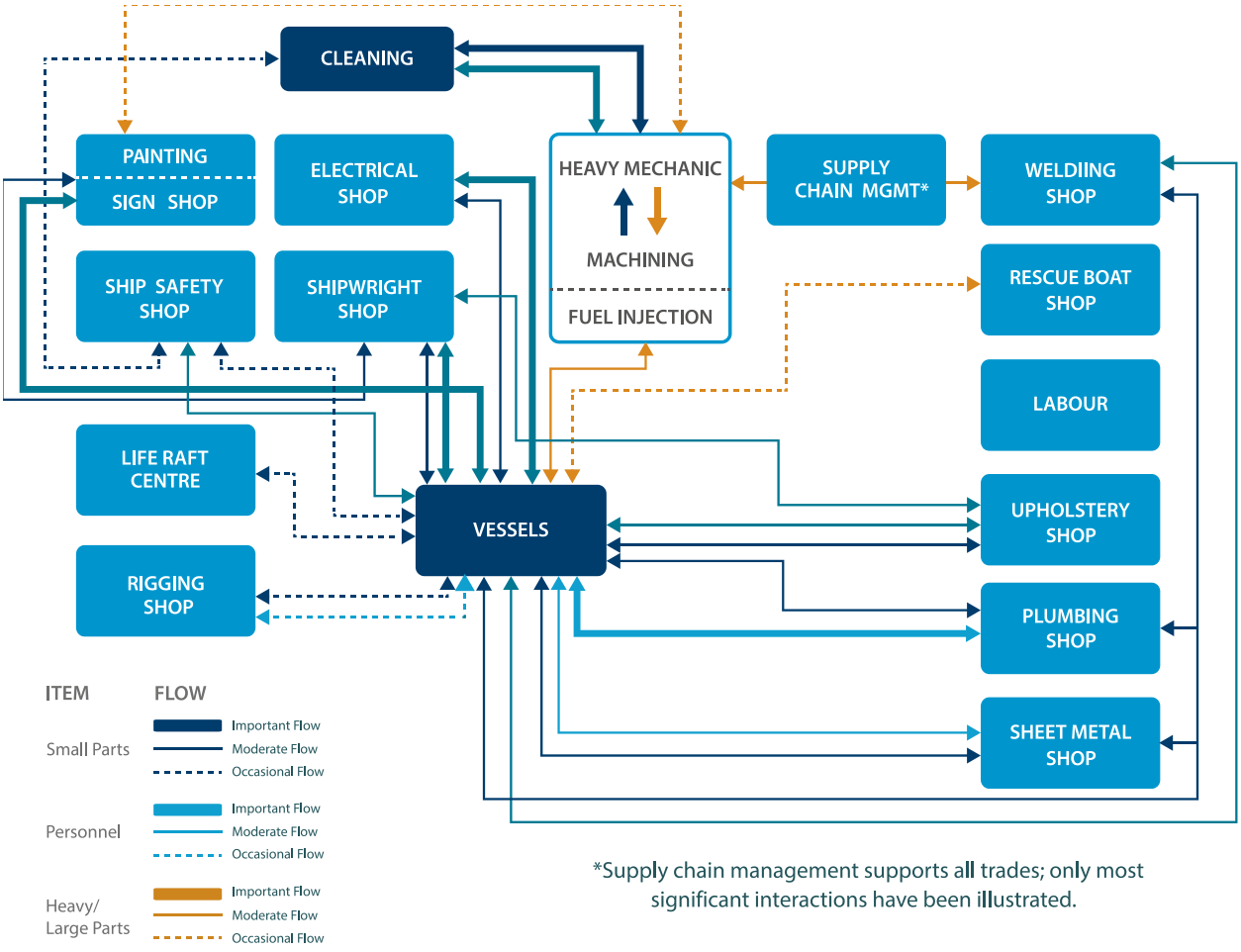

FIGURE B-2: WORKFLOW ANALYSIS FUNCTIONAL INTERDEPENDENCIES

B.5 Building Deficiencies

SNC-Lavalin's workflow analysis, described in Section B.4, summarized the existing buildings' deficiencies. The following sub-sections describe these deficiencies, as derived from SNC-Lavalin' *FMU Workflow Analysis Report – January 07, 2016*.

B.5.1 Machine Shop, Heavy Shop and Administration Offices

The machine shop and heavy shop inspects, repairs, maintains and overhauls major and minor mechanical systems and components. The shops are housed within two buildings that are near each other. Workshop areas are segmented into specialized spaces related to servicing small engines, heat exchangers and coolers, turbochargers, fuel injection equipment, cylinder heads, pumps and heavy propulsion (thruster) components. Multiple material and equipment workflows, functional dependencies and interrelationships exist between the component shops.

FIGURE B-3: MACHINE SHOP (LEFT) AND HEAVY SHOP (RIGHT)

The FMU's administration offices are on the second floor of the machine shop building. Non-FMU administrative spaces are situated in various locations around the site: in the engineering services, employee relations, SCM-A and fleet project management office buildings.

The key issue facing the heavy shop is thruster service. BC Ferries has 50 thrusters in service, including approximately 17 spares at the FMU. These thrusters are manufactured by Rolls-Royce, Niigatta, ZF, Mariner and Schottel, and they vary in in design, size and complexity. Each thruster must follow a fixed regulatory service schedule, and receives emergency service when needed.

The number of in-service thrusters has increased as the vessel fleet has evolved. Recent Salish-Class vessels, which use Schottel 15/15 thrusters, replaced the *Queen of Nanaimo* and the *Queen of Burnaby*, which used shaft propulsion. The ongoing introduction of new vessels will result in additional thrusters.

The heavy shop has insufficient size and capacity to service all of the thrusters. As a result, BC Ferries sends some thrusters to third parties for service, but this has the following problems:

- The manufacturer that serviced Rolls Royce US175 thrusters for the *Queen of Capilano* closed their local service facility and consolidated their operations in Washington State. Their manufacturer-certified shop technicians were converted to field technicians, and have subsequently been laid off. BC Ferries now has no local service options for this vessel, and the closest certified facility is in the southern US. The size of the thrusters makes them difficult and expensive to ship, and the distance to the service facility would significantly prolong servicing times;
- The company that serviced the TC73 thrusters for the *Queen of Cumberland* has taken on more work for other customers and is becoming less inclined to work on the TC73 thrusters; and,

- The Schottel 15/15 thrusters and other Schottel products have no local service support. Schottel supports certifying BC Ferries to service their products at the FMU, but the large size of their units poses significant logistical concerns.

The FMU also has insufficient indoor space to store the thrusters according to manufacturer's recommendations, which includes upright storage within a controlled environment. Instead, BC Ferries stores thrusters on their sides, and distributes them to at least four on and off-site locations. Some thrusters are stored upright but outside and uncovered for extended periods of time, resulting in potential premature corrosion.

FIGURE B-4: THRUSTER OUTDOOR STORAGE AND MOVEMENT ON ITS SIDE

Together, these thruster issues increase the risk to vessel reliability by delaying maintenance or degrading thruster condition, and generally increase costs due to component handling inefficiencies and third-party involvement.

The machine shop has the following deficiencies:

- The shop is undersized for its current and future needs;
- Component receiving, dismantling, staging and reassembly areas are too small and become extremely congested when one or more vessels are being refurbished. Components are frequently staged outside or in corridors, which creates material/part traceability issues, logistical problems and safety hazards;
- Existing workshops are fragmented and lack efficient flow paths between them, necessitating multiple handling operations;
- Overhead cranes do not fully cover the work spaces, making it difficult to move parts between shop areas and necessitating multiple handling operations;

- Outside shops lack covered storage areas, thereby exposing expensive equipment to the elements;
- Equipment is old and outdated;
- Office spaces are insufficient for supervisors and lead hands;
- Shelves to store parts and dismantled components are inadequate;
- There is no contained, ventilated space to dismantle and clean parts; and,
- The facility is inflexible and unable to meet emerging service needs.

The heavy shop has the following deficiencies:

- Overhead cranes do not fully cover the work spaces, making it difficult to move heavy parts between shop areas and necessitating multiple handling operations;
- Overhead cranes have insufficient capacity to lift future vessel thrusters;
- Exterior door openings are too small, necessitating multiple component handling operations;
- Internal circulation routes have substandard turning radii for delivery vehicles;
- Indoor storage and workspace areas are too small. Among other things, this forces thrusters to be painted and stored outside in non-sheltered conditions, which can affect quality during rainy or winter months;
- There are no outside covered staging and cleaning areas. Components are often staged and stored outside under tarps;
- There is no thruster test bed, and thrusters can only be tested after installation;
- On-site cranes have insufficient capacity to lift and move thrusters from the heavy shop to and from warehouse storage. Expensive, third-party crane trucks must be contracted for this purpose;
- On-site thruster storage space is insufficient. Thrusters commonly are not stored in the optimal, upright position according to manufacturer's recommendations, or are stored off-site at third-party warehouses at high cost; and,
- Thruster maintenance and repair capacity is insufficient, forcing some of these services to be outsourced.

The administration office has the following deficiencies:

- Administrative and support staff are physically spread out across five buildings, making it difficult for individuals to meet collectively and creating labour inefficiencies; and,
- Meeting rooms and training spaces are too small for larger groups.

B.5.2 Life Safety Appliance Buildings

The life safety appliance buildings repair and recertify the fleet's 78 chutes/slides and 254 life rafts. These activities occupy three buildings: the life raft centre (which is the main service building), the 650 m^2 SCM warehouse located in SCM-B (which is an overflow area for the life raft centre), and the rescue boat shop (described in Section B.5.3). Even with these three work areas, life safety appliances are often sent to external parties for servicing due to lack of internal space.

FIGURE B-5: LIFE RAFT CENTRE

SCM-B has been used for life raft service for nine years, although it was established as a temporary arrangement pending construction of the new Life Safety Building. Use of SCM-B is particularly problematic because:

- The warehouse space is congested and not designed for life raft service purposes;
- The warehouse space and inventory are virtually inaccessible during life raft servicing periods (September through May);
- The warehouse is a controlled inventory location, and providing non-supply chain personnel with access to the area creates an asset control risk; and,
- Some supplies must be stored off site because the warehouse space is unavailable.

FIGURE B-6: LIFE RAFT SERVICE WITHIN LIFE RAFT CENTRE

The life safety appliance buildings have the following deficiencies:

- Undersized and cramped work spaces;
- Service tasks are spread across multiple buildings because no single building has sufficient workspace. This creates labour inefficiencies and related to moving and storing equipment. For example, technicians often must spend approximately half a day to pack and move equipment being serviced so that supply chain personnel can access their inventory;
- Indoor storage is insufficient for spare canisters and heavy life rafts;
- The life raft recertification area does not have a temperature-controlled environment as recommended by the manufacturers;
- The life raft servicing area does not meet the manufacturer's recommendations with respect to layout and storage;
- Overhead cranes do not fully cover the work spaces, making it difficult to move appliances and necessitating multiple handling operations;
- The shop floor does not include internal drains, which inhibits efficient cleaning within the building;
- No ability to dry wet equipment after deployment;
- Exterior door openings are too small to pass large forklifts and life rafts;
- Life safety appliance removal and replacement requires expensive, contracted barge and crane services;

- There are no facilities to test, certify and recharge air cylinders for life raft and marine evacuation system inflation; and,
- Lunch room and lockers are located in the workshops due to space constraints.

The poor condition of the life raft centre and the lack of environmental controls in both the life raft centre and SCM-B increase the risk that BC Ferries will lose its certification status from the manufacturers, classification societies (Lloyd's Register and American Bureau of Shipping) and Transport Canada. The alternative is expensive servicing by the manufacturer.

B.5.3 Rescue Boat Shop

Rescue boat service involves maintaining outboard engines, boat structures, controls and trailers. The rescue boat shop falls under the supervisory support structure of the life raft centre, with whom they share common resources, materials, and equipment. The rescue boat shop is located in a converted vehicle garage separate from the life raft centre.

FIGURE B-7: RESCUE BOAT SHOP

The rescue boat shop has the following deficiencies:

- Undersized and cramped work spaces;
- The building is in poor condition and contains hazardous materials;
- Physical separation and distance from the life raft centre creates labour inefficiencies and workflow issues;

- Only a single, fixed jib crane to remove engines, weigh trailers and change trailers, which makes the work awkward and difficult;
- Washing facilities are inadequate and have insufficient drainage;
- Storage space is insufficient for the required parts;
- No inside boat storage space. Serviced boats are stored outside and are subject to deterioration; and,
- Lunch room and lockers are located in the workshops due to space constraints.

B.5.4 Ship Safety Buildings

Ship safety activities involve inspecting, testing, servicing and certifying vessel safety systems, such as fire extinguishers, fire dampers, scuppers, fire hoses, fire suits, compressed-air cylinders, self-contained breathing apparatuses and ancillary ship safety equipment. These activities occupy two buildings located at opposite ends of the site: the ship safety building (which is the main ship safety facility) and the Self-Contained Breathing Apparatus (SCBA) building (which services and fills compressed air cylinders). The ship safety department falls under the life raft centre supervisory support structure, with whom they share compressed air cylinder servicing processes.

FIGURE B-8: SHIP SAFETY BUILDING (LEFT) AND SCBA BUILDING (RIGHT)

The ship safety buildings have the following deficiencies:

- Undersized and cramped work spaces;
- Ship safety functions are spread between two buildings, which creates labour inefficiencies;
- No meeting space to collaborate with the ship's crew and regulatory agencies;
- No separation between clean and dirty components;
- Storage space for tools, parts and supplies is insufficient;
- No cleaning area;
- No facility to hydro-test air cylinders and bottles;

- No facility to fill carbon dioxide and nitrogen dioxide gas cylinders;
- No outside covered storage; and,
- Lunchroom and lockers are located in the workshops due to space constraints.

B.5.5 Outfitting Trades' Buildings

Outfitting trades involve shipwrights, sheet metal workers, plumbers, painters, electricians, upholsters, joiners, riggers and sign painters. These departments occupy five trade buildings spread across the site.

FIGURE B-9: SEVERAL OF THE OUTFITTING TRADES BUILDINGS

The outfitting trades' buildings have the following deficiencies:

- Workshops are too far from the berths, which creates labour inefficiencies;
- Workshops spread across multiple locations, which creates labour inefficiencies;
- Undersized work spaces;
- No covered storage space. Many materials are stored outside in shipping containers;
- Exterior door openings are small, making material and component movements awkward and difficult;
- No humidity and temperature control for sensitive materials;
- Work area ventilation is inadequate;
- Only a few, fixed jib cranes and forklifts to lift materials and components, which makes the work awkward and difficult; and,
- Lunch room and lockers are located in the workshops due to space constraints.

B.6 Functional Requirements

SNC-Lavalin prepared the FMU's functional requirements in 2016 based on the results of the workflow analysis (Section B.4) and the stakeholder engagement

consultations (Section 3.3.1). The functional requirements defined the facility's design criteria and user needs, and established the facility's overall configuration and infrastructure to deliver its services and increase its productivity and efficiency.

The objectives of the functional requirements were to:

- Optimize building and shop sizes and configurations;
- Optimize site layouts for efficient access and egress;
- Anticipate future vessel refit and maintenance needs;
- Quantify new capabilities and capacities; and,
- Minimize site development impacts on daily operations.

SNC-Lavalin documented the functional requirements in the *FMU Statement of Functional Requirements – January 07, 2016*. In general, the functional requirements described a site with a small number of large buildings, separated by wide roads with clearly segregated vehicle and pedestrian paths. Each building includes office, meeting, lunch, locker and change rooms on a second floor; natural lighting for indoor workspaces; and truck loading and drop-off points. The functional requirements were used to develop the Project's design requirements.

The functional requirements defined the following for each shop and trade:

- The amount of required workshop and storage space;
- The workspace layout, including the workspace type (indoor, outdoor, covered), special configuration needs (height, length, drainage, etc.), and interior layout;
- The storage space type and characteristics, such as outdoor, covered outdoor, indoor, secure or inventory-controlled;
- The site location with respect to adjacency requirements and percentage of time on the vessels;
- The number, size and placement of building accesses, and internal site circulation routes;
- Special equipment needs, such as cranes, mobile lifting gear, racks, shelves, cleaning equipment, tools and consumables;
- Special workspace needs, such as dedicated ventilation or temperature-controlled areas;
- Any processes or equipment shared by multiple trades, such as chemical cleaning stations, sandblasting equipment, air compressors, forklifts, or berth-attached equipment; and,
- Any additional needs not addressed by the above.

B.7 Flood Protection Strategy

SNC-Lavalin and BC Ferries developed a flood protection strategy to address municipal and provincial requirements related to anticipated sea level rise over the next 50 years at the FMU site, which corresponds to the life of the new buildings. The strategy involves:

- Raising the foundations of the new FMU buildings by 0.55 m;
- Raising other parts of the site, such as the shoreline, berths and other buildings, in the future when they are upgraded or redeveloped;
- In-filling between the new site buildings and infrastructure as they are constructed to raise the level of the yard, and raising utilities accordingly; and,
- Accommodating a dike around the outside of the FMU site (as described below).

As a condition of the development permit, the City of Richmond has stipulated that BC Ferries build part of a dike around the west and north of the property as part of the Project, and complete the dike in the future when the seal level rise reaches a defined elevation set out by the City of Richmond. Figure B-10 illustrates the Project and future dike segments in green and red, respectively. Buildings currently encroaching on the future east dike right-of-way will require re-building in 50+ years, when the new dike will be constructed.

Also shown, in blue, is the City of Richmond's existing dike easement within the property. They will release this easement and define a new easement that follows the new dike's right-of-way alignment.

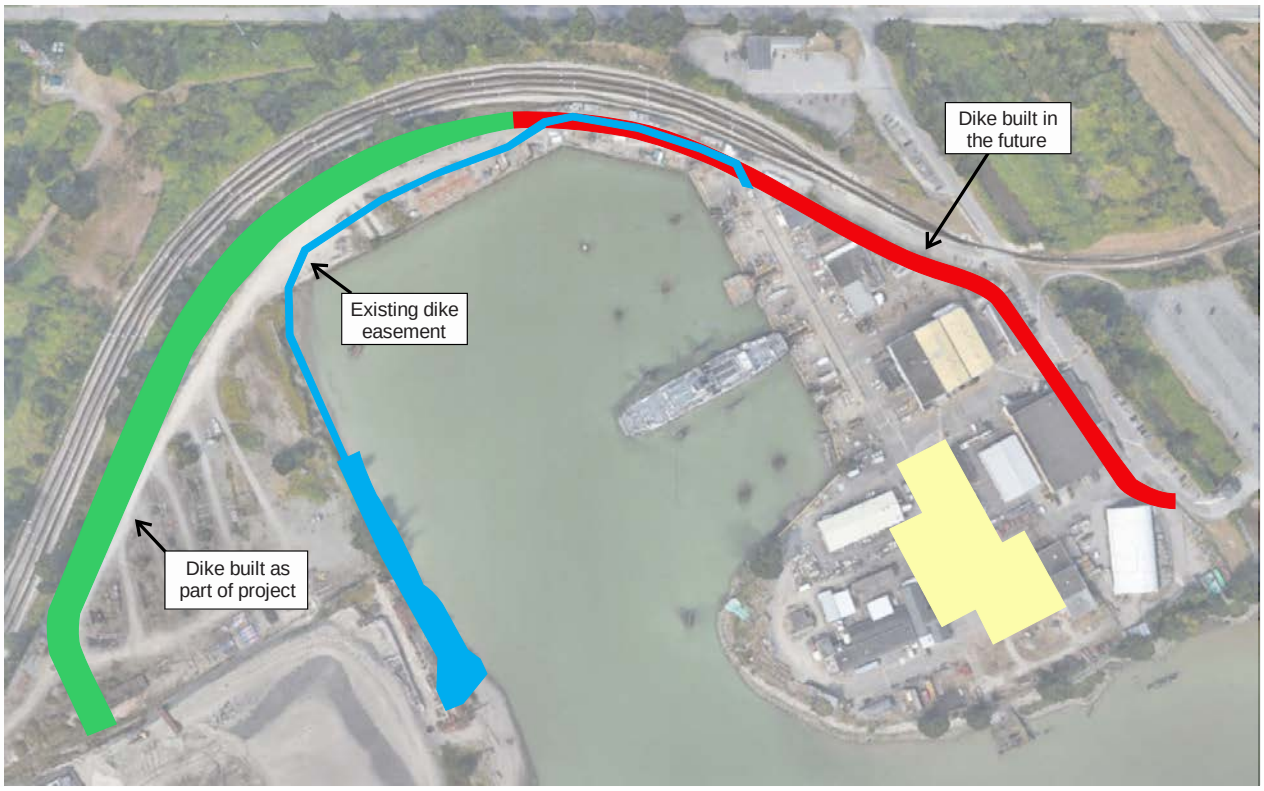

FIGURE B-10: DIKE PROVISIONS

B.8 Subsequent Studies and Plans

BC Ferries and SNC-Lavalin and its sub-consultants completed the following studies and plans from December 2017 to March 2022:

- SNC-Lavalin:
  - Site profile;
  - Environmental assessment;
  - Construction environmental management plan;
  - Traffic assessment;
  - Waste management plan;
  - Flood protection plan (with BC Ferries); and,
  - Additional ground sample testing to clarify the extent and degree of ground contamination;
- SNC-Lavalin and sub-consultants:
  - McElhanney:
    - Legal survey; and,
    - Lot consolidation plan;

- Tetra Tech – Additional boreholes to obtain more geotechnical information;
- Arrowstone Archaeological Research and Consulting Ltd. – Archaeological overview assessment;
- North West Environmental – Hazardous Material Inventory and Checklist Reports and Pre-Demolition Hazardous Material Assessments for the buildings;
- Diamond Head Consulting Ltd. – Arborist reports;
- Recollective – Energy model of the new Multi-purpose Machine Shop for BC Energy STEP Code 2 compliance and options analysis;
- M2 Landscape Architecture – Landscape plan; and,
- Boldwing Continuum Architects – Visual impact assessment.

Appendix C Multi-purpose Machine Shop Building Design Details

The Multi-purpose Machine Shop Building scope of work comprises:

- A single building that consolidates mechanical service activity and administration functions into one location;
- An adjacent welding and fabrication shop; and,
- Adjacent outdoor covered storage space.

The Multi-purpose Machine Shop Building increases the indoor mechanical and administrative working area. The shop areas consolidate the machine shop (and its various component shops), welding shop, heavy shop and fuel injection shop. The administrative areas consolidate FMU administration, fleet project management, FMU refit supervision, FMU operations management, engineering services, environmental services, supply chain management and employee relations. The employee areas include a central lunch room and male, female and gender-neutral locker and washroom facilities that also serve surrounding buildings.

The Multi-purpose Machine Shop Building design features:

- An overall building orientation that allows convenient truck access (with suitable turning radii), adjacency to the proposed Life Safety Appliance Building (currently SCM-A), covered storage area, and proximity to the Outfitting Trades Building and ship berths;
- A 50-year design life;
- Ground improvements consisting of stone columns beneath the building foundation to densify the ground and mitigate liquefaction during an earthquake;
- A raft-slab foundation, with the top of slab raised by 0.55 m above existing grade to account for future sea level rise;
- A pre-engineered steel building, with pre-coated steel cladding and a painted, steel-panel roof. Figure C-1 and Figure C-2 illustrate the exterior and interior of the Multi-purpose Machine Shop Building, respectively;
- A working area of 7,609 m^2 (5,029 m^2 of shop floor space and covered storage area, and 2,580 m^2 of administrative space), which is an increase of 2,649 m^2 over the existing facility;
- Three storeys with two mezzanine areas. Figure C-3 illustrates the first (ground), services mezzanine, mechanical mezzanine, second (middle) and third (upper) floor arrangement;
- One main bridge crane with two 60-tonne hooks (but limited to a 60-tonne maximum concurrent lift);
- Smaller cranes within specific work areas;

- Roll-up doors on the south and north ends of the building allow semi-trailers to pass through the building. Roll-up doors on the west and east sides of the building allow forklifts and equipment to pass to the adjacent shops and outdoor covered storage area;
- Electrical, water, natural gas, compressed air utilities and information technology (IT)/communication systems. High-pressure gases are stored outside, as needed;
- A new boiler for the building heating system;
- Air conditioning and air handling units as appropriate to each workspace. Some workspaces, like the welding shop, have local air exhausts;
- LED lights;
- A direct digital control energy management system; and,
- Sprinklers, fire alarm system, and emergency exits.

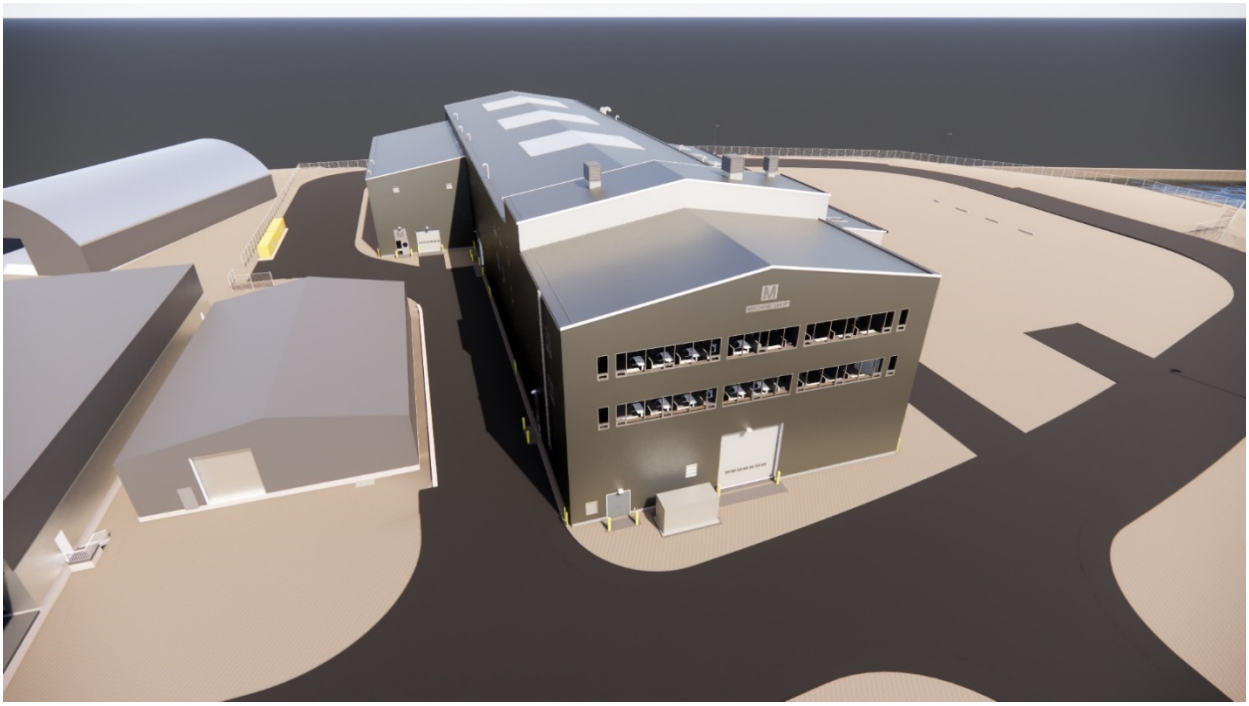

FIGURE C-1: MULTI-PURPOSE MACHINE SHOP BUILDING EXTERIOR NORTH ELEVATION

FIGURE C-2: MULTI-PURPOSE MACHINE SHOP BUILDING INTERIOR

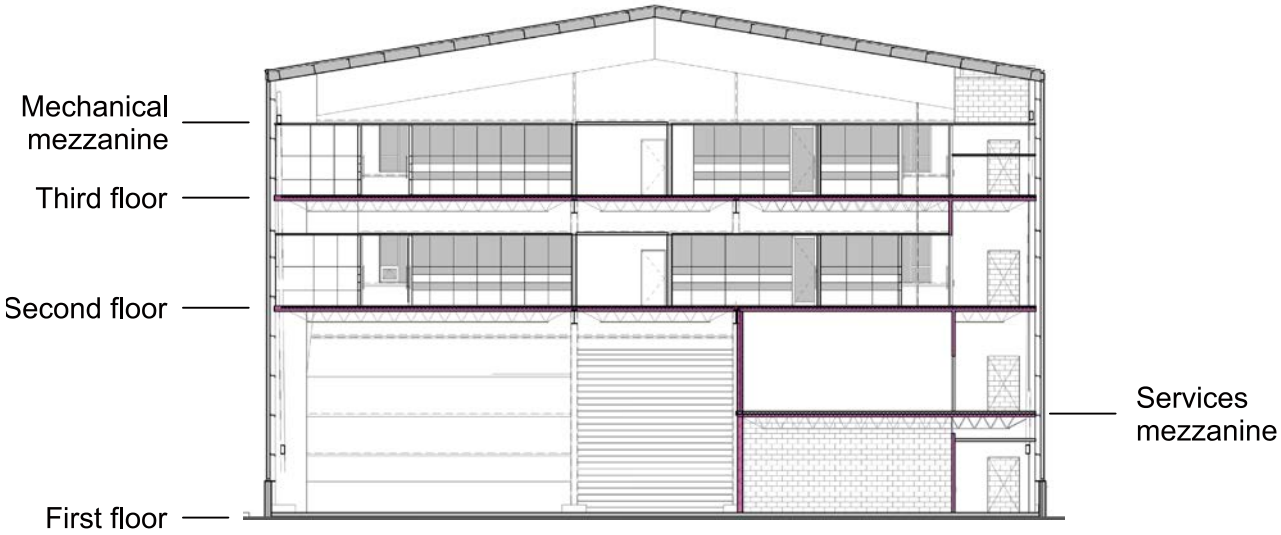

FIGURE C-3: MULTI-PURPOSE MACHINE SHOP BUILDING FLOOR ARRANGEMENT

Appendix D Facility Redevelopment Alternate Options

D.1 Options Considered

BC Ferries previously considered the following five facility redevelopment alternate options with respect to the Project, but these options were eliminated as they were not considered feasible:

1. **Develop a new greenfield site**. This option involved developing a new FMU at a new site. This option was rejected in 2017 because very few suitable locations along the southern BC coastal are available or affordable. Specifically, any new location would have to be near the major ferry terminals and industrial centres, which limits locations to areas near Nanaimo, Burrard Inlet, Victoria or the Fraser River Delta. The cost of a new location in any of these areas would be greater than the sale value of the existing FMU site, which was assessed at $<> million in 2022. For comparison, in 2022 Vancouver Shipyards' property was assessed at $<> million, and Imperial Oil's Ioco Terminal was assessed at $<> million. Since that time, market values have increased. These property costs, combined with the costs of building new marine structures and facilities (which are not otherwise part of the Project scope of work), would greatly exceed the cost of revitalizing the existing FMU. Other negative factors include a multi-year regulatory/permitting process (forcing ongoing costs to extend the life of the FMU), and the loss of employees following a relocation.

2. **Like-for-like replacement**. This option involved replacing buildings as their lifetimes expire with a similar replacement. This option was rejected as it would require a significant expense with no discernible operational, functional, capacity, or efficiency benefits. Growth in the thruster and life safety equipment sectors would not be possible and does not align with BC Ferries' *Ship Repair Strategy 2016-2026* as current facilities are already undersized for their current purposes. The only real benefits of this option would be the opportunity to perform some building code and interior crane capacity upgrades.

3. **Relocate to the Esquimalt Graving Dock**. This option involved relocating the FMU to the Public Works and Government Services' (PWGSC) Esquimalt Graving Dock in Victoria. This option was rejected because the available space only allows for three berths, limited wharf frontage and a smaller FMU than currently exists in Richmond. This reduced size would force more work to be outsourced to third-party facilities, thereby increasing ship repair costs. Furthermore, the lease terms stipulated that all structures would be classified as temporary and subject to removal, relocation or occupation by PWGSC if needed by them. Other negative factors included the loss of employees following a relocation, and total costs comparable to redeveloping the entire Richmond site but with a significant reduction in operational capacity.

4. **Redevelop the entire site**. This option involved replacing all of the Richmond site's buildings with six new buildings and replacing all marine structures. Site work would include ground improvements to meet current seismic codes, raised foundations to compensate for anticipated sea level rise, and part of a flood protection dike to meet the City of Richmond's permitting requirements. This option was rejected because it was too expensive (estimated at $<> million in 2017), and the marine structures have at least 10 years of service life left.

5. **Extend the life of all buildings and defer the project**. This option involved extending the life of all existing buildings by 10 to 12 years, at which time they would be replaced with an option similar to the proposed Project. Life extension would only address building envelope deficiencies and some hazardous material issues; buildings that could not be life-extended would be replaced with semi-permanent prefabricated structures. This option was rejected because life extension would not address any of the facility's congestion, storage space shortage, functional inefficiencies, health and safety, seismic, flood protection, lifting or thruster-servicing issues. The capital cost of life-extending the existing buildings was estimated to be $<> to $<> million, but these numbers have significant budget risk as the ability to life-extend the buildings has not been fully explored and several buildings may need to be replaced.

Appendix E Contracting Methods

E.1 Design-Bid-Build Contracts

Design-bid-build contracts involve engaging a design consultant to deliver complete design documents ready for tendering and then soliciting fixed-price bids from construction contractors to perform the work. Design consultants and construction contractors bear no contractual obligation to each other. Design-bid-build contracts are a good choice for projects that are budget sensitive and unlikely to change in scope.

The advantages of design-bid-build contracts include:

- BC Ferries maintains control over the design. The design and project requirements can therefore be revised throughout the design phase, although too many revisions will delay the overall schedule;
- The design and project requirements are completely defined before construction contracts are awarded. This reduces the risk of design or requirement changes occurring after construction is awarded;
- The design consultant is more aligned to BC Ferries' needs during construction; and,
- Construction contract bidding provides the lowest price and least amount of risk to BC Ferries.

The disadvantages of design-bid-build contracts include:

- BC Ferries maintains the risks associated with the completeness of the design documents;
- Low-bid construction contractors could underbid the project, which can lead to conflicts and poor performance during construction; and,
- The construction contractor cannot propose innovative construction methods during the design phase. These methods could benefit BC Ferries by lowering construction costs and duration.

E.2 Design-Build Contracts

Design-build contracts involve engaging a combined design and construction team to complete the detailed design and perform the construction work. Design consultants and construction contractors are contractually obliged to each other, and bear the project risk together. Design-build contracts are a good choice for projects that are time sensitive and involve intricate design and construction dependencies.

The advantages of design-build contracts include:

- The design-build team is responsible for resolving any design and construction issues without BC Ferries acting as an intermediary or assuming any design risk;
- Projects may be completed more quickly than design-bid-build contracts because the design and construction occur as a continuum, rather than separate activities that each require a contracting stage; and,
- The construction contractor can feed innovative construction methods into the design, which could lower construction costs and duration.

The disadvantages of design-build contracts include:

- BC Ferries loses control over the detailed design. Any changes that BC Ferries makes to the project requirements may result in costly change orders or project delays;
- The design and project requirements are not completely defined before the design-build contract is awarded, forcing risk on the design-build team. The design-build team mitigate this risk by adding contingency, which typically increases project costs; and,
- The design consultant and constructor are more aligned to each other than to BC Ferries during construction.

E.3 Early Contractor Involvement Contracts

ECI contracts are similar to design-bid-build contracts, but provide a mechanism for construction contractors to provide innovative, cost-saving input during the design phase. In this method, a construction contractor is selected by a competitive bidding process during the design phase. Construction contractors compete based on qualifications, profit margins, and rates for various general services, but do not commit to a fixed construction price. The successful contractor then works with BC Ferries and the design consultant to finalize the design and the construction methodologies. This early collaboration provides opportunities to adjust the design to suit construction methodologies, which can reduce construction labour and material costs and shorten the construction schedule.

When the design is complete, the construction contractor provides an open-book budget estimate for the project based on the previously agreed rates and profit margin and on fixed-price bids from sub-contractors. Typically, the construction contractor will obtain at least three bids for each sub-contractor to ensure competitiveness. When BC Ferries is satisfied with the budget, the construction contractor is awarded a fixed-price contract to complete the work, and the project proceeds the same as it would have under a design-bid-build contract.

ECI contracts are a good choice for complex projects that are prone to design or construction risk.

The advantages of ECI contracts include:

- Construction expertise provided during the design phase can identify opportunities for design or constructability improvements;
- Construction costs and duration are often reduced; and,
- The risks of surprises and conflicts during construction are reduced because the construction contractor has much more information and input compared to design-bid-build contracts.

The disadvantage of ECI contracts is that project costs might be higher than design-bid-build contracts because the construction contractor is paid a fee for their input during the design phase and no additional competitive bidding process occurs once the design is complete.