British Columbia Ferry Services Inc.

Application to the
British Columbia Ferries Commissioner

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

For
Spirit Class Vessels Mid-Life Upgrades

September 22, 2014

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

Contents

Executive Summary 4

Section 1 - Introduction 8

1.1 Introduction 8

1.2 Organization of the Application 9

Section 2 - Project Description 10

2.1 Project Background 10

2.2 Vessel Particulars 11

2.3 Fleet Maintenance Strategy 11

2.4 Vessel Condition 13

2.5 Vessel Reliability 14

2.6 Past and Future Vessel Deployment 14

2.7 Service Implications 16

Section 3 - Project Work Packages, Options and Analysis 18

3.1 Key Financial Assumptions 18

3.2 Work Packages 18

WP 1 – Carry Out Regulatory Requirements 19

WP 2 – Convert Propulsion to DF 21

WP 3 – Implement Other Payback Projects 29

WP 4 – Implement Condition Based Requirements 34

3.3 Financial Summary of Preferred Options 42

3.4 Total Project Costs 42

3.5 Consideration of New and Used Vessels 43

3.6 Project Financing 46

3.7 Price Cap Implications 47

3.8 Scenarios for Reducing Capital Expenditures 48

Section 4 - Procurement and Risk 50

4.1 Procurement Process 50

4.2 Top Project Risks 52

Conclusion 57

Appendices

A. Scope Listing 58

B. Schedule – Gantt Chart 69

C. Client Feedback – S Class 71

D. S Class Vessel Capacity Utilization Report 75

E. Drawings 78

F. Responses to Section 55 Guideline Questions 83

Acronyms

ABS	America Bureau of Shipping
AEQ	Automobile Equivalent, a standardized vehicle dimension
BC Ferries	British Columbia Ferry Services Inc.
BD	"Board Decision", an MTRB issued prior to 2007.
CSA	*Canada Shipping Act* (also CSA (2001))
Commissioner	British Columbia Ferries Commissioner
Company	British Columbia Ferry Services Inc.
DF	Dual Fuel, refers to marine engines capable of using either natural gas or diesel as fuel
EPC	Engineering – Procurement – Construction (contract)
FDEER	Fire Detection and Extinguishing Equipment Regulations
FMS	Fleet Maintenance Strategy
HAZID	Hazard Identification
HVAC	Heating, ventilation and air conditioning
ICF	BC Ferries' Intermediate Class Ferry project (dual fuel ferries)
IMO	International Maritime Organization
LRMP	Long Range Maintenance Plan
LNG	Liquefied Natural Gas
LR	Lloyd's Register of Shipping
LSER	Life Saving Equipment Regulations
MES	Marine evacuation system (e.g. evacuation slides)
MLU	Mid-Life Upgrade
MOI	Major Overhaul and Inspection
MSEL	Master Systems Equipment List, BC Ferries master asset numbering system
MTRB	Marine Transportation Review Board
NPV	Net Present Value
OEM	Original Equipment Manufacturer
PC	Prime Contractor
PT3	Performance Term 3 (April 1, 2012 – March 31, 2016)
PT4	Performance Term 4 (April 1, 2016 – March 31, 2020)
PT5	Performance Term 5 (April 1, 2020 – March 31, 2024)
RFEOI	Request for Expressions of Interest
RFP	Request for Proposal
RFPQ	Request for Pre-Qualification
Route 1	Ferry route connecting Tsawwassen and Swartz Bay
S Class	Spirit Class
SoBC	*Spirit of British Columbia*
SOLAS	IMO Convention for the Safety of Life at Sea
SoVI	*Spirit of Vancouver Island*
TC	Transport Canada
TCMS	Transport Canada Marine Safety
TP	Technical Publication of TCMS
UCD	Upper Car Deck
ULSD	Ultra-Low Sulphur Diesel
VCER	Vessel Construction and Equipment Regulations
VPDCR	Vessel Pollution and Dangerous Chemicals Regulations
WP	Work Package

Executive Summary

British Columbia Ferry Services Inc. ("BC Ferries" or the "Company") proposes to invest in the sustainability of the route connecting Swartz Bay with Tsawwassen ("Route 1") by performing mid-life upgrades ("MLU") of the route's primary two vessels, the *Spirit of British Columbia* and *Spirit of Vancouver Island* (the "Project").

The scale and financial performance of Route 1 make it the backbone of British Columbia's coastal ferry system. In fiscal 2014, Route 1 carried nearly 28 percent of all system passengers, 23 percent of all system vehicles and generated 38 percent of total passenger-based revenue. Positive net income generated by Route 1 supports, in part, the operation of all other routes and, in particular, the Minor[1] and Northern[2] routes. The sustainability and financial performance of Route 1 is integral to the success of the entire coastal ferry system of British Columbia.

The Spirit Class ("S Class") vessels are Canada's largest passenger ferries. At their planned MLU dates, the *Spirit of Vancouver Island* and *Spirit of British Columbia* vessels will be 22 and 24 years old, respectively. The S Class vessels have proven to be safe and highly reliable; however, they have relatively high operating costs, partially due to high fuel consumption. In fiscal 2014, BC Ferries spent $126 million on fuel. In that fiscal year, the two S Class vessels consumed approximately 15 percent of the total fuel consumed fleet-wide. These vessels are the largest consumers of fuel in the BC Ferries fleet.

BC Ferries plans to upgrade the S Class vessels to convert the propulsion systems to dual fuel ("DF") technology to enable the vessels to operate on lower-cost liquefied natural gas ("LNG"); implement modifications which are expected to reduce fuel consumption and increase ancillary revenue from catering and retail services; renew end-of-life systems; and address regulatory requirements, in the absence of which the vessels will not be able to continue to operate. Through resulting lower fuel and maintenance costs and enhanced revenue from ancillary services, this Project will reduce the pressure on fares across the coastal ferry system.

Feasibility work, preliminary engineering and non-binding procurement activity for the Project is underway. Subject to approval of the planned Project expenditures by the British Columbia Ferries Commissioner ("Commissioner"), BC Ferries will commence binding procurement activities in December 2014. BC Ferries expects to select a prime contractor in early 2015 with whom it will enter

[1] The Minor Routes consist of 18 regulated routes primarily serving the northern and southern Gulf Islands and the northern Sunshine Coast.

[2] The Northern Routes consist of two regulated routes operating on the British Columbia coast north of Port Hardy on Vancouver Island.

into an engineering-procurement-construction ("EPC") type contract in which major Project risks are consolidated with that contractor. This is similar to the "design-build" approach used in new vessel construction projects. There will be one contract covering both vessels.

The first vessel, the *Spirit of Vancouver Island*, will be removed from service in September 2016 and will re-enter service in May 2017. The *Spirit of British Columbia* will follow one year later.

The total budget for the Project (two ships) is $<> million, of which $<> million is an operating expense for feasibility analyses, crew training and other costs.

The Project is comprised of four "work packages" ("WP"):

- WP 1 – *Carry Out Regulatory Requirements*
  This is work to address mandatory regulatory requirements, without which the vessels cannot continue to operate.

- WP 2 – *Convert Propulsion to DF*
  This is an investment to convert the propulsion systems of the vessels to operate on LNG and ultra-low sulphur diesel ("ULSD"), the Company's traditional fuel, which is expected to reduce the fuel costs of the two S Class vessels by approximately 50 percent.

- WP 3 – *Implement Other Payback Projects*
  This is a set of initiatives to enhance fuel efficiency and generate incremental ancillary catering and retail revenue.

- WP 4 – *Implement Condition-Based System Renewals and Overhauls*
  This package includes age and usage related component replacements and overhauls required to ensure continued vessel reliability, and for which it is most cost-effective to perform at the MLU.

The table below provides a financial summary of the Project as proposed by BC Ferries. The portion of the Project related to conversion of the vessels to operate on LNG (WP 2) has a strong positive financial return. The positive payback of the conversion reflects the estimated price differential of more than 50 percent between LNG and ULSD. The conversion is expected to reduce fuel costs by an estimated $8.5 million in the first year both ships are in operation and an average of approximately $12 million per year, including inflation, over the remaining 27-year life of the two ships. As noted above, this represents a reduction in the cost of fuel for the S Class vessels of approximately 50 percent, and a reduction in the Company's total fuel cost for the fleet of approximately 7 percent. In addition to the LNG conversion, the vessel modifications in WP 3 to enhance fuel efficiency will

generate additional fuel cost savings of $0.65 million per year. As well, initiatives to enhance catering and retail services in WP3 will generate incremental annual ancillary net contributions of $0.64 million.

Financial Summary of Preferred Options ($M)

Preferred Options	Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (Incl. IDC)	Net Present Value	Simple Payback (years)	Discounted Payback (years)
	Capital	Operating	Capital	Operating				
WP 1 Option 1A - Carry Out Regulatory Requirements	$<>	$<>	$<>	$<>	$<>	($8.44)	N/A	N/A
WP 2 Option 2C - Convert Propulsion to DF	$<>	$<>			$<>	$42.05	8	12
WP 3.1 Option 3B - Implement Energy Efficiency Initiatives	$<>		$<>		$<>	$3.36	7	11
WP 3.2 Option 3B – Implement Ancillary Revenue Initiatives	$<>	$<>			$<>	$5.26	5	6
WP 4 Option 4B - Implement Condition Based Requirements	$<>	$<>	$<>	$<>	$<>	($69.42)	N/A	N/A
TOTAL PROJECT	**$<>**	**$<>**	**$<>**	**$<>**	**$<>**	**($27.20)**	**N/A**	**N/A**

Project risk is primarily related to schedule and technical matters. Each vessel must re-enter service in May to avoid significant disruption to peak season operations. To mitigate schedule risk, several strategies will be employed, including the early procurement of long lead time equipment, the use of an EPC contract to consolidate risk on the contractor, a DF configuration of the propulsion systems, which enables the re-entry of the vessels into service using traditional diesel fuel should the LNG systems not be ready, and conservative planning with a substantial schedule contingency.

Technical risk lies principally with the conversion to LNG. The Project will mitigate technical risk in several ways. Commercial off-the-shelf equipment of mature design will be selected. The Project will follow, to the degree practical, engineering solutions developed for BC Ferries' DF Intermediate Class

Ferries ("ICF") project, as well as other LNG-fuelled ferry projects around the world. The Company intends to employ several experienced engineering personnel with strong LNG expertise.

BC Ferries has undertaken extensive analysis in support of the Project. The Company believes the Project is reasonable, affordable, and prudent. The planned investments in the *Spirit of Vancouver Island* and *Spirit of British Columbia* will help ensure that service on Route 1 remains safe and reliable for many years to come, and will enable further advances in operational efficiency, which will moderate upward pressure on fares across the coastal ferry system.

Section 1 - Introduction

1.1 Introduction

BC Ferries submits this Application pursuant to section 55 (2) of the *Coastal Ferry Act (*"CFA") and British Columbia Ferry Commission Order 12-04, dated September 30, 2012.

The *2012 Coastal Ferry Amendment Act*, which came into effect on June 25, 2012, amended section 55 of the CFA to create a new requirement for a ferry operator to first obtain the Commissioner's approval before incurring a major capital expenditure (section 55 (2)). A major capital expenditure is defined in section 55 (5) of the CFA as one which:

> "…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 12-04, dated September 30, 2012, the Commissioner determined that for the purposes of section 55 (2) of the CFA, a major capital expenditure includes:

> "any capital expenditure which exceeds $30 million, inclusive of component programs and interest during construction, and irrespective of the level of expenditure, any new vessel or terminal, and any vessel life extension which extends the life of the vessel by more than five years."

BC Ferries proposes to perform MLUs of the *Spirit of Vancouver Island* and *Spirit of British Columbia,* the two primary vessels serving on Route 1, connecting Swartz Bay with Tsawwassen. Pursuant to Order 12-04, the Project constitutes a major capital expenditure. By this Application, BC Ferries seeks the approval of the Commissioner, in accordance with section 55 (2) of the CFA, for major capital expenditures for the Project of up to $<> million, inclusive of IDC, and supplemental Project expenditures of up to $<> million, for total Project expenditures of up to $<> million.

BC Ferries submits that the total expenditures for the Project, as described in this Application, are reasonable, affordable, prudent, and are consistent with the Company's current five-year and 12-year capital plans approved by BC Ferries' board of directors, and the current Coastal Ferry Services Contract between BC Ferries and the Province of British Columbia, as represented by the Ministry of Transportation and Infrastructure ("CFSC").

BC Ferries notes that the legislative requirement to seek pre-approval of the proposed capital expenditures for the Project necessitates the submission of this Application prior to key design elements of this vessel upgrade project being finalized.

BC Ferries' intent is to pursue an EPC contract with a prime contractor which will be selected through a formal Request for Proposal ("RFP") process. To maintain credibility with potential proponents, the RFP process can be initiated only if and when this Application is approved by the Commissioner. With key design elements yet to be determined through the procurement process, 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.

Among the key design elements yet to be finalized are those respecting conversion of the vessels to operate on LNG as the primary fuel source. BC Ferries' present intent is to employ DF engine technology in the Project, which permits the engines to be switched between LNG and diesel fuel. Further technical and financial analyses will be required, however, before a final decision is made. These analyses depend, in large part, on the responses to the RFP. BC Ferries brings this matter to the attention of the Commissioner, as a subsequent application may be required as the procurement process for this vessel upgrade project proceeds.

1.2 Organization of the Application

This Application is organized as follows:

- Section 2 describes the Project. It provides background, including details of the vessels, information on BC Ferries' Fleet Maintenance Strategy ("FMS"), vessel deployment and other matters pertinent to the Project.

- Section 3 describes the Project's four WPs. Several options are presented under each WP and the scope of work, cost, schedule, and financial analysis for each are presented. Justifications for inclusion of scope items are given. The strategy for financing the Project, price cap implications and possible opportunities for reducing the proposed capital expenditures are also discussed.

- Section 4 addresses matters related to procurement and risk.

Section 2 - Project Description

2.1 Project Background

BC Ferries is an independent company providing ferry services on the west coast of British Columbia. The Company provides frequent year-round transportation service with 35 vessels operating on 24 routes out of 47 terminals spread out over 1,000 miles of coastline. In the year ended March 31, 2014, BC Ferries carried 7.6 million vehicles and 19.7 million passengers on 183,000 sailings.

BC Ferries' operations are among the largest and most complex ferry systems in the world. The Company's Route 1 (Tsawwassen – Swartz Bay) is the largest route in its system by passenger volume, vehicle traffic and total passenger-based revenue. In fiscal 2014, Route 1 carried nearly 28 percent of all system passengers, 23 percent of all system vehicles and generated 38 percent of total passenger-based revenue. Positive net income generated by Route 1 supports, in part, the operation of all other routes and, in particular, the Minor and Northern routes. The sustainability and financial performance of Route 1 is integral to the success of the entire coastal ferry system of British Columbia.

At this time, the Company intends to invest in the sustainability of Route 1 by performing MLUs of the *Spirit of Vancouver Island* and the *Spirit of British Columbia,* the primary vessels on the route. These vessels were commissioned in 1993/1994. At their planned MLU dates, the *Spirit of Vancouver Island* and *Spirit of British Columbia* will be 22 and 24 years old, respectively.

An MLU is a major scheduled maintenance event within BC Ferries' FMS. The FMS takes a life cycle approach to asset management. The MLU marks the mid-point of the life cycle and typically occurs between 20 and 25 years after building. The MLU is the largest single maintenance event in a vessel's life and permits the Company to extract maximum economic performance from its assets.

The planned MLUs of the *Spirit of Vancouver Island* and *Spirit of British Columbia* are expected to reduce operating costs, enhance revenues and ensure continued reliability of these assets in the second half of their 40 to 50 year life cycle. The Project will standardise bridge, engine room and safety layouts to improve flexibility in crew deployment, and maintain state-of-the-industry safety. It will reduce fuel costs by converting propulsion systems to enable operation on lower-cost LNG fuel, and enhance ancillary revenue by expanding catering and retail services. The expected savings and revenue enhancements from the Project will help keep

fares affordable for customers across the ferry system. Using LNG to fuel the vessels will have the added benefit of cleaner exhaust emissions for reduced environmental impact.

2.2 Vessel Particulars

The *Spirit of Vancouver Island* and *Spirit of British Columbia* are Canada's largest passenger vessels and have been deployed solely on Route 1 since they entered service. The particulars of the vessels are set out in Table 2-1. The general arrangement drawing of the vessels is provided in Appendix E.

Table 2-1: S Class Particulars

Voyage Class	Near Coastal 2 (Home Trade III)
Vehicle Capacity	410 AEQ[3] (automobile equivalents)
Passenger /Crew Capacity	2,100
Crew	50 average actual; 48 required by A-license
Staterooms	4+1 Meeting Room
Food Service	Cafeteria; buffet restaurant; paid entry quiet lounge; snack bar; vending machines
Retail Service	Gift shop; video arcade
Class Society	American Bureau of Shipping ("ABS") – Delegated
Accessibility	Meets *Canada Transportation Act* "Code for Accessibility"

Popular with customers, the S Class established the level of passenger comfort and amenities now considered to be usual on BC Ferries' Major Routes[4]. The S Class vessels have proven to be safe and highly reliable; however, this class of vessel has high operating costs due to high fuel consumption and large crew size relative to other major vessels in BC Ferries' fleet.

2.3 Fleet Maintenance Strategy

To maintain reliability and obtain maximum economic performance from its assets, BC Ferries follows a practice of rigorous periodic maintenance and upgrades known as the FMS. This strategy sets standards of maintenance and care to be observed by each vessel. It requires each vessel to have an individualized Long Range Maintenance Plan ("LRMP") covering the scope, schedule and budget of all capital, refit and operating maintenance events in the

[3] The S Class vessels were constructed as 470 AEQ vessels, of which 60 AEQ were housed on hydraulically operated hoistable platform decks over the main car deck. Operational experience showed that these platforms were slow to use and made it impossible to keep schedule. They also reduced over-height vehicle capacity. The platforms were decommissioned in 2009 and will be permanently removed at the MLU.

[4] The Major Routes consist of three regulated routes connecting Metro Vancouver with mid and southern Vancouver Island, and one regulated route connecting Horseshoe Bay and Langdale.

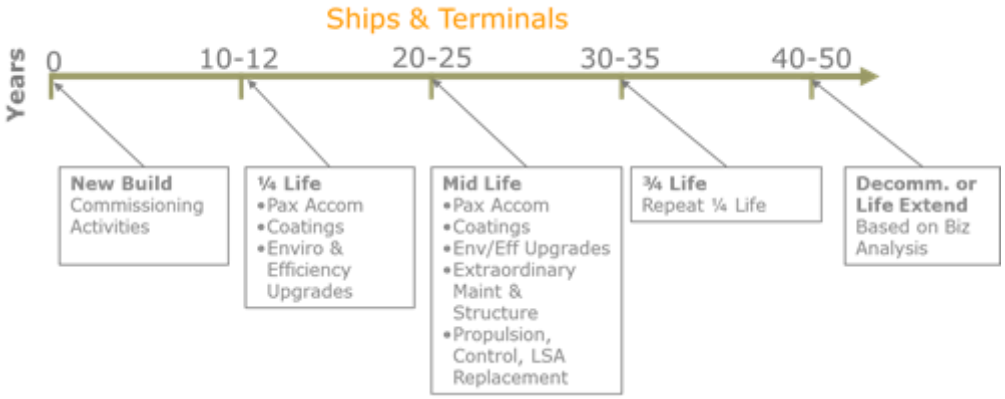
vessel's life[5] LRMPs roll up together to provide a 50-year running forecast of all maintenance events and costs in the fleet.

All LRMPs follow the same format and life cycle schedule. A vessel's life cycle is comprised of the following major maintenance events:

- Annual recertification.
- Intermediate refit and dry docking, major vessels only (on average every 2.5 years).
- Major refit and dry docking (every 5 years for major vessels, every four years for minor vessels).
- ¼ life upgrade (circa 10-12 years).
- MLU (circa 20-25 years, the single largest planned maintenance event in a life cycle).
- ¾ life upgrade (circa 30-35 years).
- Life extension (if deemed appropriate, circa 40-45 years).
- Decommission and disposal (circa 40-55 years).

Figure I presents the major events in a vessel's life cycle. Note that the scope items given in the graphic are for illustrative purposes only and do not necessarily represent work proposed in this Project. Similarly, the year in which an event occurs is flexible within limits to allow for maximum useful asset life to be attained.

Figure I: Full (40-50 Years) Life Cycle (years



[5] Sister ships in a class of vessels therefore have individual but virtually identical LRMPs.

2.4 Vessel Condition

As described above, the *Spirit of British Columbia* and *Spirit of Vancouver Island* were commissioned in 1993 and 1994. The vessels have operated safely and reliably throughout their service lives to date. In addition to following their LRMPs, there have been several capital additions or maintenance events on the class. Table 2-2 summarizes the significant capital projects that have been conducted on these vessels since their introduction into service.

Table 2-2: S Class Significant Capital Projects (Commissioning to Present)

Date Completed	Nature of Upgrade	Vessel
March 2005	¼ life upgrade; including passenger accommodation upgrades.	*Spirit of British Columbia*
March 2006	¼ life upgrade; including passenger accommodation upgrades.	*Spirit of Vancouver Island*
November 2008	Sewage treatment plant, pilot.	*Spirit of British Columbia*
March 2009	Rebuild of main engine #3, unplanned.	*Spirit of British Columbia*
February 2010	New bow thrusters, condition driven. Sewage pump ashore system, regulatory driven.	*Spirit of British Columbia*
February 2012	Sewage pump ashore system, regulatory driven.	*Spirit of Vancouver Island*

In preparation for the MLUs, the condition of the S Class vessels has been thoroughly assessed. The Company has engaged external, independent experts, such as ABS, Lloyd's Register of Shipping ("LR"), VARD Marine Canada and a variety of specialist contractors for many of these assessments.

As an overall measure of condition, a vessel condition assessment ("VCAP") survey was conducted in 2010 by LR[6] on the *Spirit of British Columbia*[7]. The survey comprised an extensive onboard survey, a review of Class (ABS) records and non-destructive testing. The survey found the structural condition was generally sound with minimal steel renewal required. Internal hull coatings were found to be sound with minimal breakdown. Both vessels have suffered fatigue failures of propeller blades (a total of five have been replaced). Cracking has been detected and repaired in the rudder stock support bearing. Overall, the structural condition of the S Class vessels is assessed as good and suitable for the remaining life of each vessel, 25 to 30 years.

6 The S Class is under continuous "class survey" by ABS. LR was used for the VCAP for an independent assessment.

7 The condition of the *Spirit of British Columbia* is indicative of condition of the *Spirit of Vancouver Island*, as shown by ABS and BC Ferries' maintenance records.

Specialist contractors were commissioned to evaluate systems such as the elevators, refrigeration, engines, power transmission, propellers, electrical, hydraulics, safety and heating, ventilation, and air conditioning (HVAC). These external parties were supplemented by BC Ferries' specialist Fleet Support Unit and Fleet Maintenance Unit technicians. As expected, many of systems have been identified as at their predicted end-of-life as defined by condition and/or by supportability.

2.5 Vessel Reliability

The S Class vessels have been highly reliable with only a small number of unexpected failures leading to service disruption. The number of mechanical issues resulting in service cancellations or disruption in the last three years is as follows:

Spirit of British Columbia

Fiscal Year	Vessel Auxiliary system	Vessel Maintenance	Vessel Propulsion control	Vessel Propulsion System	Vessel-other problems	Accumulated Mechanical delays	Total Mechanical Delays	Mechanical Sailing Cancellations
Fiscal 2012			1	2	5	9	17	13
Fiscal 2013			1	5	2	25	33	8
Fiscal 2014				1	2	3	6	2

Spirit of Vancouver Island

Fiscal Year	Vessel Auxiliary system	Vessel Maintenance	Vessel Propulsion control	Vessel Propulsion System	Vessel-other problems	Accumulated Mechanical delays	Total Mechanical Delays	Mechanical Sailing Cancellations
Fiscal 2012					3	7	10	0
Fiscal 2013				2		6	8	2
Fiscal 2014				2	2	8	12	0

2.6 Past and Future Vessel Deployment

The S Class vessels were series-produced and presently have a very high degree of physical and operational commonality. Their general configuration is dissimilar to the rest of the BC Ferries fleet as they were conceived and designed specifically for Route 1.

The S Class vessels are technically deployable to other Major Routes as they possess hull configurations that fit BC Ferries' standard major berths on Routes 1, 2 (Departure Bay to Horseshoe Bay), 3 (Horseshoe Bay to Langdale) and 30 (Duke Point to Tsawwassen). The standard major berth is, in fact, known as the "S Class standard berth". However, the size, speed and maneuvering characteristics of the S Class vessels are not well suited for routes

other than Route 1[8]. Short of an extraordinary situation, BC Ferries does not envisage deploying them anywhere other than Route 1.

The S Class vessels are integral to service provision on Route 1. The vessels meet peak and shoulder season demands when augmented with a combination of part-time or full-time supplementary vessel service, typically the *Queen of New Westminster* and a Coastal Class ship. Peak, shoulder and holiday demand requires the 410 AEQ lift-off capacity of the S Class vessels; no other ships are large enough to meet this requirement.

The S Class vessels have traditionally been the primary vessels for Route 1 service. From introduction into service in the early 1990's until 2010, they operated on an odd hourly schedule (four round trips per vessel per day) year round. The S Class vessels operated even in the lowest demand periods (typically mid-November to mid-December and early January to March), coming out of service only for planned maintenance or breakdowns. This usage of the S Class vessels has changed in recent years. Increasing operating costs, especially fuel costs, have spurred BC Ferries to exercise its fleet flexibly and match vessel capacity with demand. Since 2010, BC Ferries has deployed the slightly smaller and more fuel-efficient Coastal Class vessels in place of one or both of the S Class vessels during low demand periods. The use of the Coastal Class vessels occasionally results in overload situations.

This Project to perform MLUs on the *Spirit of Vancouver Island* and *Spirit of British Columbia* presents an opportunity to reduce the operating costs of the S Class vessels to below that of the Coastal Class vessels, primarily through the adoption of LNG as fuel. This will allow the S Class vessels to resume their traditional role as the primary year-round vessels on Route 1. By extension, more flexible and cost-effective S Class vessels allow greater availability of the Coastal Class vessels for service augmentation and continuity elsewhere.

By reducing the operating costs of the S Class vessels below that of the smaller Coastal Class vessels, the Project also supports wise use of resources. BC Ferries is making or is planning to make substantial investments in its reservation, pricing and yield management capabilities. This will allow BC Ferries to use yield management techniques to improve capacity utilization, reducing the overall number of round trips[9] to carry the same or increased level of traffic. BC Ferries' modelling indicates this approach generates greater operational savings than high frequency sailings using smaller vessels. The larger S Class vessels with operating costs below

[8] The S Class are single end vessels and are too large to turn around in Horseshoe Bay (Routes 2 & 3) while their large size means their utilization rate on Route 30 (Tsawwassen – Duke Point) would be so low as to render them uneconomic to operate.

[9] Subject to appropriate regulatory, contractual and Company approvals.

those of the smaller Coastal Class vessels improves the feasibility of this high load factor approach.

2.7 Service Implications

Project Schedule and Service Demand

The MLUs of the S Class vessels cannot be conducted in peak season as every vessel in the fleet, save one minor vessel, is required to carry traffic. The end of peak traffic in September guides the start date of the Project and the spring build-up of traffic demand in May guides the end date of the Project. The planned out-of-service dates are as follows:

- *Spirit of Vancouver Island* – out of service September 7, 2016 to May 16, 2017.
- *Spirit of British Columbia* – out of service September 6, 2017 to May 17, 2018.

A revised service delivery plan has been developed for use during the out-of-service period in which smaller vessels will operate extra sailings to compensate for the reduced lift-off capacity. The out-of-service periods of the Project extend into the shoulder seasons where the lift off capacity requirement will challenge that of the remaining ships (one S Class vessel, two Coastal Class vessels and the *Queen of New Westminster*).

Consequence of Delay in Return to Service

Any delay beyond mid-May will have a negative impact on service delivery. This will manifest as sailing overloads, customer dissatisfaction, and passengers and vehicles not carried at the end of the scheduled operating day. This may result in increased costs for overtime, fuel and contractors (e.g. traffic control) and demand for additional round trips in the late night and early morning hours. The Project recognizes this as a major risk and has several mitigation measures in place. This matter is discussed more fully in Section 4.

Crew Size

Transport Canada controls the Minimum Safe Manning process under the Marine Personnel Regulations and is the final authority for defining the minimum crew size. Transport Canada has approved two license levels for the S Class vessels:

- "A" license with a minimum crew level of 48 for use with a maximum of 2,100 total passengers and crew onboard, and
- "B" license with a minimum crew level of 40 for use with a maximum of 1,572 total passengers and crew onboard[10] .

[10] 1,580 total on the *Spirit of British Columbia.*

The determination of the minimum crew is based on four standardized scenarios: normal operation; emergency response (firefighting); abandon ship; and post-abandonment. The MLUs of the S Class vessels may offer an opportunity to reduce the minimum license crew requirement as the new evacuation system will require fewer crew to operate than the current slide system. Final determination rests with Transport Canada.

The S Class vessels usually operate above the minimum license level to provide satisfactory passenger services and to generate net ancillary (catering and retail) revenue. For example, the minimum crew for the "A" licence is 48 whereas the practice is to crew the vessel with a staff of between 48 and 52, depending on passenger traffic, where the extra crew are in the Catering department. The extra Catering crew are deployed in activities which generate significant net ancillary income, reducing pressure on fares. Put another way, reducing Catering crew would lead to a requirement to increase fares. Accordingly, the Project assumes no crew cost reductions are possible. However, the Company will seek the most efficient allowable license level to afford maximum crewing flexibility in the future.

Further discussion of crew usage in passenger services is provided in Section 3.2 – WP 3.

Section 3 - Project Work Packages, Options and Analysis

3.1 Key Financial Assumptions

The following financial assumptions are used in the analysis of the options considered.

- **Terminal Upgrades**
  It is assumed that no berth or terminal infrastructure upgrades are required beyond safety equipment required for the LNG fuel truck path through BC Ferries' terminals for the DF conversion option (Option 2C in WP 2).

- **Inflation Factor and Discount Rate**
  An annual escalation for inflation of 2 percent has been applied to future revenues and operating costs. No inflation has been applied to Project capital and operating costs.

  A discount rate of 7 percent is used for the net present value ("NPV") analysis.

- **Remaining Vessel Life**
  The remaining vessel life, post-MLU, is at least 27 years.

3.2 Work Packages

The scope of the Project has been divided into four WPs to assist presentation and analysis. Generally, the division of scope in each WP is determined by the driver for the investment. WP 1 is driven by regulatory compliance, WP 2 by the scale of its positive effect on reducing pressure on fares, WP 3 by its more modest, but still positive effect on reducing pressure on fares, and WP 4 by vessel reliability requirements.

Each WP has been approached as a stand-alone business case. Each presents options for which scope[11], schedule[12] and financial analyses are provided. The technical, financial and non-financial implications of each option are also presented.

[11] See Appendix A for a detailed listing of scope for all work packages. .
[12] See Appendix B for project schedule.

WP 1 – Carry Out Regulatory Requirements

The primary driver for WP 1 is compliance with compulsory regulations in order that the S Class vessels can continue to operate and provide ferry service to customers on Route 1 in accordance with the terms of the CFSC.

WP 1 covers modifications and survey items required to maintain statutory and regulatory compliance. This work addresses requirements of, for example, Transport Canada, WorkSafe BC, BC Safety Authority, Health Canada, Department of Fisheries and Oceans, federal and provincial Ministry and Department of Environment, ABS and local governments.

WP 1 Options

WP 1 comprises two options:

Option 1A – Do not carry out regulatory scope

Option 1B – Carry out regulatory scope

BC Ferries notes that selecting Option 1A means the vessels' operating certificates will expire. The vessels will be legally unable to operate, placing BC Ferries in breach of the CFSC. The Company does not see this as a viable option; it is presented here only to demonstrate that the Company has considered the consequences of not making this expenditure.

WP 1 Options Analysis

Option 1A – Do Not Carry Out Regulatory Scope:

Scope	None.
Schedule	None.
Capital Budget and Financial Analysis	There are no capital costs associated with this option. *See financial implications below.*
Technical Implications	The vessels will be non-compliant with regulations and unable to operate, at which point the vessels will be placed in lay-up or declared surplus and sold.
Financial Implications	The Company will avoid the capital and operating costs of Option 1B. Vessel lay-up and preservation costs of approximately $<> per year per vessel[13] will be incurred until the vessels are sold. Without the S Class vessels operating, significant revenue shortfalls will occur. Upon sale, remaining book value would be written off.

[13] Caretaking labour of $<>plus security, electricity, parts and supplies of $<>. Assumes berthing at BC Ferries' facility for no cost.

Non-Financial Implications	There will be insufficient vessel capacity in peak and holiday periods. Significant peak, shoulder and holiday service disruptions will occur throughout the Major Routes as traffic is re-directed to Routes 2 and 30. Commercial traffic capacity on the Major Routes will be significantly reduced. Significant customer dissatisfaction is expected to occur. Labour reductions in the range of 300 persons can be expected as the S Class vessels are placed in lay up or sold and crews are laid off. Insufficient capacity will be available on Route 1 to meet the Company's obligations under the CFSC. Even if not declared in breach of contract, the significant revenue shortfalls that will occur as a result of the S Class vessels not operating will place the Company's continued financial viability at significant risk.

Option 1B – Carry Out Regulatory Scope:

Scope	• Fit water mist fire suppression system in high risk areas. • Modify elevator emergency communications system. • Hull and superstructure steel and structural repairs. • Survey propeller shafts. • Modify ancillary services systems such as solid waste separation. • Dry dock and alongside berthing for vessel. • Trials and commissioning. • Project management and financial contingencies. *Note: If WP 2 is not approved, regulatory work in the amount of $<> million would be required on the existing diesel engines.*
Schedule	• Dates: Early September to mid-October • Duration: 6 weeks Implementation includes a two week dry docking and three week afloat phase, as well as three working days to complete basic safety drills, operational exercises and preparation for returning to service.
Capital Budget and Financial Analysis	*See Table 3-1 below.*
Technical Implications	The S Class vessels will be compliant with applicable regulations and remain operable.

Financial Implications	The Company will incur the capital and operating costs set out in Table 3-1. Lay-up costs will be avoided. Negative impacts on revenue through cessation of operation of the S Class vessels will be avoided.
Non-Financial Implications	The S Class vessels will be able to provide service comparable to that currently provided.

Table 3-1: Option 1B Capital Budget and Financial Analysis ($M)

Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)	Net Present Value	Discounted Payback (years)
Capital	**Operating**	**Capital**	**Operating**			
$<>	$<>	$<>	$<>	$<>	($8.44)	N/A

WP 1 Preferred Option:

Option 1B – Carry out Regulatory Requirements is preferred by BC Ferries.

WP 2 – Convert Propulsion to DF

The primary driver of WP 2 is to reduce upward pressure on fares. The preferred option under this WP significantly lowers operating costs by converting the S Class vessels to operate on a lower-cost fuel.

The Project proposes to convert the main propulsion system for the S Class vessels to use LNG as their primary fuel. LNG is approximately 50 percent of the cost of and much cleaner burning than the ULSD fuel the S Class vessels use at present.

The S Class vessels are the largest consumers of fuel in the BC Ferries fleet. In fiscal 2014, BC Ferries spent $126 million on fuel. In that fiscal year, the two S Class vessels consumed approximately 15 percent of the total fuel consumed fleet-wide. Converting to LNG will significantly reduce BC Ferries' fuel cost which will help reduce the pressure on fares. No other technology on the marine market today offers this scale of potential reduction in operating costs.

BC Ferries intends to employ mature DF engine technology in the Project. In gas mode, the engines operate on 99 percent LNG with 1 percent conventional ULSD used as a pilot fuel for

ignition in the cylinder. In diesel mode, the engines operate on 100 percent ULSD. BC Ferries intends to use gas mode full time in normal operations.

DF engine technology permits the engines to be switched between LNG and diesel fuel instantly with no loss of propulsion or power. This is important for two reasons. First, safety and reliability stem from the ability for the engine to switch to diesel should there be any malfunction with the LNG fuel system onboard. Second, business risk is mitigated; should there be any disruption to LNG supply, the vessel can continue service on conventional diesel fuel.

The alternative technology to DF, known as "single fuel" or "pure gas" engines, does not have these attributes. As the name implies, these engines use only LNG for fuel. No diesel is required; cylinder ignition is accomplished with a spark plug. There is no secondary diesel fuel system onboard for use should the fuel supply be interrupted, either onboard or in the supply chain. With DF technology, these supply and technical risks are mitigated. In addition, DF technology provides maximum flexibility should the current significant price advantage of using LNG as opposed to ULSD dissipate in the future.

In both technologies (DF and single-fuel), the natural gas is cryogenically stored (-163 degrees C) onboard as LNG to reduce storage volume.

Fuel Efficiency

The design objective of WP 2 is to maintain current vessel performance while achieving lower fuel cost. DF engines will be selected to minimize fuel costs consistent with the safe operation of the vessel in all authorized weather conditions. The range of DF engines BC Ferries is considering will likely permit a close design match to optimal technical requirements. Modern electronic engine controls will allow further engine efficiency optimization. Close design matching and control optimization ensures engines are not over-sized for the application. This has a positive impact on fuel efficiency.

Fuel efficiency is a key procurement criterion. BC Ferries intends to seek liquidated damages provisions in the DF equipment contract related to the achievement of expected fuel efficiency targets. In this context, it is important to note that while BC Ferries always considers fuel efficiency to be vital, the main benefit of DF engines comes not from reduced fuel consumption but from the lower cost of the fuel. That being said, fuel efficiency initiatives also comprise part of the proposed Project, as set out in WP 3.

Why Not Remain with Diesel Fuel?

There are no regulatory or technical issues preventing the S Class vessels remaining with conventional diesel fuel. The existing engines comply with pending NOx regulations while BC Ferries' use of ULSD fuel means the engines also comply with existing and pending SOx regulations. A condition assessment of the existing engines indicates they are capable and suitable for use to the end of each vessel's life with appropriate overhauls and maintenance.

Unless replaced by DF engines, the existing engines require modernization work for condition and reliability reasons. Many on- and off-engine components have reached end-of-life.

Since the existing engines meet operational and regulatory requirements, the driver to convert to DF is economic. The analysis shows there is strong positive payback in terms of reduced operating costs if the conversion is carried out.

Key Assumptions

The capital and operating costs associated with DF conversion are preliminary as key design elements are yet to be determined through the RFP process, under which BC Ferries intends to pursue an EPC contract with a prime contractor

The bunkering methodology established for the ICF project presently underway will be adopted for this Project. At this time, it appears most likely that the ICFs will be fuelled from LNG tanker trucks parked on the vessel car deck. This is the method the Company uses to bunker diesel fuel and, as described in Section 3.1, the financial analysis of the DF conversion option (Option 2C) assumes that no berth or terminal upgrades are required beyond safety equipment required for the LNG fuel truck path through BC Ferries' terminals. The ICF project will have established firm bunkering methodology in time to be incorporated into the S Class vessel design. The assumption about terminal upgrade costs may change if bunkering design changes.

There are a number of yet-to-be-tested pricing assumptions about the delivered cost of LNG. BC Ferries will be issuing a Request for Expressions of Interest ("RFEOI") to potential LNG suppliers shortly to address these issues. Fuel price is reflected in the NPV analysis as follows:

- The estimated future costs of LNG and diesel are based on the current futures market price, plus processing, delivery, taxes, and other applicable costs.

- Fuel prices at time of re-entry into service are assumed to be[14]:
  2017 – *Spirit of Vancouver Island*: Diesel - $1.035/litre; LNG - $0.454/DLE[15]
  2018 – *Spirit of British Columbia*: Diesel - $1.056/litre; LNG - $0.463/DLE

- An annual escalation for inflation of 2 percent has been applied to fuel price.

- In the DF conversion option, a price increase of < > per litre has been applied to future corporate diesel consumption of other vessels due to the expected reduction of volume discount.

To be conservative, the DF conversion option assumes that anticipated reductions in engine maintenance costs are offset by higher costs to maintain two fuel systems (diesel and LNG).

Payback calculations for the DF conversion option assume the S Class vessels will be utilized as the primary vessels year round on Route 1 (other than during annual recertification), thereby increasing the total number of round trips that they currently provide on an annual basis.

WP 2 Options

WP 2 comprises 3 options:

Option 2A – Do Minimum Regulatory Work; Retain Existing Diesel Engines
Option 2B – Modernize and Retain Existing Diesel Engines
Option 2C – Convert Propulsion to DF

WP 2 Options Analysis

Option 2A – Do Minimum Regulatory Work; Retain Existing Diesel Engines:

Scope	Inspect and overhaul existing engine and propulsion components only as required by classifications rules and Transport Canada regulations.
Schedule	No incremental impact to WP 1. Work can be accommodated within the duration of WP 1.
Capital Budget and Financial Analysis	*See Table 3-2 below.*

[14] ULSD average price 2014 - $1.076/litre. ULSD and LNG 2017 prices based on futures market quotes; 2018 ULSD and LNG are 2017 prices escalated 2 percent.
[15] DLE – diesel litre equivalent. LNG thermal energy content per litre differs from that of ULSD. To allow direct comparison of prices the LNG suppliers quote in DLE.

Technical Implications	Propulsion systems will be compliant and operable under regulations. Risk of age-related failures will not be mitigated. Multiple unplanned, in-service engine failures may occur. The technical and schedule risk of DF implementation will be avoided.
Financial Implications	The Company will incur capital costs as set out in Table 3-2. Reduction in operating costs from the use of lower cost LNG fuel will be foregone along with the contribution such reduction would make to lessening the pressure on fares. Unplanned, in-service engine failures will be more expensive to rectify than would be the case in a planned maintenance event. Revenue loss will occur during out-of-service periods.
Non-Financial Implications	Environmental benefits from the use of LNG will be foregone. Service disruptions due to unplanned engine failures will lower customer satisfaction. The S Class vessels will not likely resume year round service on Route 1 as the Coastal Class vessels will have lower operating costs. This may have implications for future yield management strategies.

Table 3-2: Option 2A Capital Budget and Financial Analysis ($M)

Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)	Net Present Value	Discounted Payback (years)
Capital	**Operating**	**Capital**	**Operating**			
		$<>		$<>	($1.81)	N/A

Option 2B – Modernize and Retain Existing Diesel Engines:

Scope	• Renew on-engine components such as turbochargers, coolers, internal components, pumps, etc. • Renew off-engine components such as filters, coolers, pumps, motors, etc. • Renew or overhaul gearbox components. • Renew engine starting and control systems.
Schedule	No incremental impact to WP 1. Work can be accommodated within the duration of WP 1.
Capital Budget and Financial Analysis	*See Table 3-3 below.*
Technical Implications	Engine reliability will be assured for the foreseeable future. Risk of age-related failures will be mitigated. The technical and schedule risk of DF implementation will be avoided.
Financial Implications	The capital and operating costs as set out in Table 3-3 will be incurred. Reduction in operating costs from the use of lower cost LNG fuel will be foregone along with the contribution such reduction would make to lessening the pressure on fares.
Non-Financial Implications	Environmental benefits from the use of LNG will be foregone. Service reliability will continue as before. The S Class vessels will not likely resume year round service on Route 1 as the Coastal Class vessels will have lower operating costs. This may have implications for future yield management strategies.

Table 3-3: Option 2B Capital Budget and Financial Analysis ($M)

Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)	Net Present Value	Discounted Payback (years)
Capital	**Operating**	**Capital**	**Operating**			
$<>	$<>	$<>		$<>	($20.15)	N/A

Option 2C – Convert Propulsion to DF:

Scope	• Remove existing engines and control systems. • Fit required safety systems such as fire detection & suppression, control and monitoring systems. • Carry out structural modifications to accommodate new engines, piping and fuel systems. • Procure and fit 2 x LNG storage tanks and associated piping and bunkering systems. • Procure and fit 4 x dual fuel engines, 2 x reduction gears plus required ancillary systems. • Procure and fit new ventilation systems as required by DF design. • Dry dock services and alongside berthing. • Trials and commissioning. • Procure and install safety equipment for BC Ferries' terminal LNG bunker truck path. The existing propeller shafts and propeller hubs will be retained. Condition assessment by the Original Equipment Manufacturer shows these systems are compatible and suitable to end of vessel life. Conversion to LNG as fuel will require significant training for ship and shore personnel. Training is an operating cost and is estimated to cost approximately $<>million.
Schedule	Dates: Early September – mid-May Incremental Duration of WP 2 to WP 1: 30 weeks This option is the Project schedule critical path. Scope implementation includes an incremental six weeks of dry docking time to complete the removal of the existing propulsion equipment and installation of LNG propulsion equipment, as well an incremental 20 weeks in the afloat phase to complete installation and commissioning of the DF propulsion system with redelivery to BC Ferries vessel home port. Four weeks of training is required at the BC Ferries home port for vessel familiarization and crew clearance. Significant but acceptable schedule risk will be incurred. Details of risk mitigations can be found in Section 4.

Capital Budget and Financial Analysis	*See Table 3-4 below.*
Technical Implications	The vessels will be fitted with new DF propulsion systems, requiring significant changes to major onboard systems. Significant but acceptable technical risk will be incurred. Detailed planning, engineering and commercial measures are employed to mitigate these risks; see Section 4.
Financial Implications	The Company's annual fuel costs will be reduced by an estimated $8.5 million in the first year both ships are in operation and an average of approximately $12 million per year, including inflation, over the remaining 27 years of life of the vessels. This is an average annual reduction of approximately 7 percent of the fuel cost for the total fleet. It is estimated that the fuel cost reduction will result in the daily operating cost of the S Class vessels to fall below those of the Coastal Class vessels. A conversion to DF results in a positive NPV of $42 million with a discounted payback of 12 years. If the foregone diesel overhaul costs ($<> million) are taken into account, the DF conversion NPV improves to $62 million and the discounted payback to 7 years. Lower operating costs will reduce upward pressure on fares. This WP will result in estimated write-offs of $2.2 million related to the replacement of propulsion assets, predominantly one rebuilt engine, prior to them being fully depreciated.
Non-Financial Implications	Exhaust emissions from the vessels will be substantially reduced. As their operating costs will be lower than the Coastal Class vessels, the S Class vessels will be utilized as the primary vessel year round on Route 1 (other than during annual recertification), thereby increasing the total number of round trips that they provide on an annual basis. This will support yield management strategies.

Table 3-4: Option 2C Capital Budget and Financial Analysis ($M)

Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)[16]	Net Present Value	Simple Payback (years)	Discounted Payback (years)
Capital	**Operating**	**Capital**	**Operating**				
$<>	$<>			**$<>**	**$42.05**	**8**	**12**

WP 2 Preferred Option:

Option 2C – Convert Propulsion to DF is preferred by BC Ferries.

WP 3 – Implement Other Payback Projects

The Company sees several opportunities other than the DF conversion which have positive payback potential. The returns are smaller but are nonetheless positive. Each opportunity is expected to reduce operating costs or increase revenue, ultimately benefitting taxpayers and fare payers across the ferry system through reducing the pressure on fares.

There are two categories of other payback projects:

WP 3.1 – Energy Efficiency Initiatives

WP 3.2 – Ancillary Revenue Initiatives

The initiatives in each of these categories are described below.

WP 3.1 – Energy Efficiency Initiatives

The following three initiatives in this category are proposed:

Replace Underwater Hull Coating with Low Friction Coating to Reduce Fuel Consumption

The existing conventional underwater coating will be removed, the hull blasted back to bare steel and a new low friction coating will be applied. Hull drag is expected to be reduced by 5 percent, reducing total fuel consumption by approximately 2.9 percent (based on a 5 percent reduction on fuel consumed for propulsion), resulting in annual fuel cost savings of $0.35 million. NPV and payback calculations are based on lower cost LNG fuel.

[16] The total project cost and NPV do not take into account the impact of the foregone diesel upgrade costs upon a DF conversion.

Modify Bow and Stern Configuration to Reduce Hull Resistance and Fuel Consumption

The existing hull design is based on hydrodynamic principles from the 1980's. New computer modelling and tank testing at the Institute for Ocean Technology in Newfoundland indicates measurable drag reductions are possible from relatively minor modifications to the bow and stern geometry. The bulbous bow will be modified to a new shape and a stern "flow interceptor" will be added. Both changes are based on computational flow dynamics studies performed for BC Ferries. Drag is expected to be reduced by 3 percent, lowering fuel consumption by an estimated 1.8 percent (based on 3 percent reduction in fuel consumed for propulsion), resulting in annual fuel cost savings of $0.21 million. NPV and payback calculations are based on lower cost LNG fuel.

Replace Lighting with Energy Efficient LED Fixtures

This initiative will replace a range of conventional fixtures with modern LED lighting which consumes less power and has longer service life. Fuel consumption reductions are expected to result in annual fuel savings of $.09 million. NPV and payback calculations are based on LNG fuel.

In summary, the scope of WP 3.1 is:

- Install low friction hull coating;
- Modify bulbous bow;
- Install flow interceptor at stern; and
- Install energy efficient lighting.

WP 3.2 – Ancillary Revenue Initiatives

Initiatives in this category focus on improving ancillary revenue, as measured by average passenger spend ("APS") and net margin onboard. Increased net margin helps cover operating costs and reduces upward pressure on fares. The Project proposes to enhance the onboard revenue generating amenities by expanding the gift shop into the existing snack bar location and building a new coffee bar on deck 6.

Background

The passenger amenities on the S Class vessels can be categorized into customer service and revenue generating:

- The customer service amenities include public washrooms, washrooms for persons with disabilities, children's play area, study carrels, general lounge seating, pay telephones, exterior seating, bike racks, and pet area. These amenities are consistent

with the services provided throughout the fleet on routes of similar length and are considered appropriate to meet the service needs of a diverse customer base.

- The revenue generating amenities include three food service facilities: the *Coastal Café* to capture the quick service/cafeteria market, the *Pacific Buffet* for the family/casual dining segment, and the *Coastal Café Express*, a snack bar to provide overflow capacity to the cafeteria. The ships also feature a *Passages Gift Shop*, the *Seawest Lounge,* a paid entry quiet lounge, and an assortment of vending machines.

Expanding the Gift Shop and Relocating the Coffee Bar

The gift shop produces considerable ancillary revenue[17]. Studies show expanding the size of the gift shop and carrying more and wider product selections will increase revenues and net income. An increase in the APS of $0.36 has been estimated from enhancing the size and product selection of the gift shop, resulting in an increase in gift shop revenue of approximately 30 percent. A larger gift shop would require an additional crew member during high demand periods (approximately 8 months of the year during both shifts) at an estimated cost of $<>million.

The Project also envisages a relocation of the snack bar, presently on deck 5 opposite the gift shop, to deck 6, and the conversion of it to a coffee bar to appeal to the expanding coffee culture. Moving the snack bar is required by the expansion of the gift shop. There is presently no retail or food service on deck 6 other than vending machines. BC Ferries' studies indicate there is untapped sales potential in passengers seated on deck 6. Providing a convenient and contemporary food service outlet is expected to generate higher revenues and net income than is the case on deck 5, where the snack bar is in close proximity to both the *Pacific Buffet* and the *Coastal Café*. Snack bar revenues are expected to increase by 15 percent and net contribution by 42 percent or $0.22 million annually.

Use of Crew for Passenger (Ancillary) Amenities

The onboard passenger amenities have evolved over BC Ferries' history to appeal to broad market segments and operate with limited staffing levels to maximize profitability. These amenities provide valuable customer service and make productive use of staff otherwise required onboard to meet regulatory requirements. Using staff in this manner offsets fares by providing positive income after operating expenses.

As earlier noted, Transport Canada has approved two license levels for the S Class:

- "A" license with a minimum crew level of 48 for use with a maximum of 2,100 total passengers and crew onboard and,

[17] S Class gift shop revenue for fiscal 2014 = $4.1 million.

- "B" license with a minimum crew level of 40 for use with a maximum of 1,572 total passengers and crew onboard[18].

Depending on traffic, BC Ferries may choose to sail with more than the minimum crew required by license in order to meet passenger service requirements.

- Sailing on an "A" license, the crew required to operate the *Pacific Buffet*, exceeds the license minimum by up to four (48 to 52 total crew).
- Sailing on a "B" license, the crew required to operate the *Pacific Buffet*, the *Seawest Lounge* and the *Passages Gift Shop* exceeds the license minimum by seven to 10 (47 to 50 total crew).

All of the amenities requiring crew above Transport Canada regulations produce a net positive income when charged with the full cost of the incremental crew.

In summary, the scope of WP 3.2 is:

- Expand the gift shop on deck 5 to include the space now occupied by the snack bar; and
- Fit a new coffee bar with expanded food offerings on deck 6.

Overall, BC Ferries believes an increase in average passenger spend of 7 percent, resulting in an increase in net contribution of $0.64 million per year, can be expected if WP 3.2 is implemented.

WP 3 Options

WP 3 comprises two options:

Option 3A – Do Not Implement Payback Projects

Option 3B – Implement Payback Projects

WP 3 Options Analysis

Option 3A – Do Not Implement Payback Projects:

Scope	None.
Schedule	No impact or change of schedule.
Capital Budget and Financial Analysis	None.

[18] 1,580 total on the *Spirit of British Columbia*

Technical Implications	Foregoing energy efficiency initiatives means some minor schedule and technical risk is foregone. Existing hull coatings will be repaired or replaced as required. Foregoing modifications to Decks 5 and 6 leaves the passenger spaces as they presently are. Some minor increased maintenance will occur as existing fit and finish wears out.
Financial Implications	Fuel savings associated with WP 3.1 will be foregone. The projected increase of APS in WP 3.2 will not be realized. Taken together, foregoing WP 3 will forego cost savings and revenue enhancements that would serve to reduce pressure on fares.
Non-Financial Implications	No significant non-financial implications.

Option 3B – Implement Payback Projects:

Scope	• Install low friction hull coating. • Modify bulbous bow. • Install flow interceptor at stern. • Install energy efficient lighting. • Expand gift ship. • Relocate snack bar to deck 6. • Training for new systems and equipment.
Schedule	• Dates: Early September to mid-November • Incremental Duration of WP 3 to WP 1: 3 weeks • Incremental Duration of WP 3 to WP 2: None All work in WP 3 fits within the schedule required to complete the preferred option in WP 2 (Option 2C: Convert Propulsion to DF). Three weeks would be required to complete the scope of work in WP 3 when being completed concurrently with WP 1.
Capital Budget and Financial Analysis	*See Table 3-5 below.*

Technical Implications	Implementing WP 3.1 will reduce fuel consumption. The fuel savings initiatives entail low technical risk. Coatings, steel fabrication and LED lighting are mature technologies with known performance. Some technical uncertainty exists with all hydrodynamic modelling such as that associated with the hull geometry modifications. The Company adopts a conservative fuel savings expectation to mitigate this risk.
Financial Implications	Annual fuel cost savings of $0.65 million and annual incremental ancillary contributions of $0.64 million are expected, which will reduce the pressure on fares. Implementing WP 3.2 will reduce maintenance in the passenger accommodation areas, though the Company expects the associated cost savings to be immaterial to this Application.
Non-Financial Implications	No significant non-financial implications.

Table 3-5: Option 3B Capital Budget and Financial Analysis ($M)

WP	Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)	Net Present Value	Simple Payback (years)	Discounted Payback (years)
	Capital	Operating	Capital	Operating				
WP 3.1 – Energy Efficiency	$<>		$<>		$<>	$3.36	7	11
WP 3.2 – Ancillary Revenue	$<>	$<>			$<>	$5.26	5	6

WP 3 Preferred Option

Option 3B – Implement Payback Projects is preferred by BC Ferries.

WP 4 – Implement Condition Based Requirements

The primary driver of WP 4 is to carry out essential maintenance which ensures the reliability of the S Class vessels in the most cost-effective manner. This is done by consolidating maintenance essential to vessel performance and customer satisfaction into a single carefully planned project.

This WP does not have a positive financial payback; however, it provides benefit to the fare payer in four ways: 1) by reducing, via consolidation, the overall costs of performing essential

maintenance; 2) by reducing the risk of service interruption; 3) by avoiding unplanned repairs which are more costly than if the same work had been done in a planned manner; and 4) by avoiding the need to schedule multiple out of service periods, each of which requires some degree of fleet redeployment.

Consolidating Maintenance

BC Ferries' FMS requires asset condition to be managed for maximum economic performance consistent with safety, reliability[19] and cost effectiveness. A prime tactic to contain costs is the consolidation of major maintenance into defined planned out-of-service periods, the most significant of which is the MLU.

Consolidating multiple maintenance events into a single large project is more cost- and time-effective than conducting multiple small projects. Multiple small projects require repeated mobilization/de-mobilization, engineering and fleet deployment costs. They often cause re-work as several maintenance operations may be performed in an inefficient sequence on the same asset. They also cause disruption to operations as vessels may have to be redeployed at short notice to cover unplanned vessel downtime.

Systems and components on the S Class vessels have been carefully managed to extract maximum economic performance in anticipation of replacement or overhaul at the MLU. Consequently, many assets have reached the end of their service life. Assets are considered at end-of-life when one of two conditions is reached: the present value of expected repairs and maintenance is greater than the cost of replacement, or the asset cannot be maintained at any cost due to lack of spares (it is "de-supported").

There is also significant business risk created by limited dry dock availability in British Columbia. Only two facilities in British Columbia are capable of docking the S Class vessels. These docks are heavily used. BC Ferries reserves bookings up to 10 years in advance to ensure it always has access to dry dock space to meet its planned maintenance requirements.

There is no guarantee dry dock space will be available at the time of an unplanned docking. If it is not, the Company must seek dock space in Washington State at higher cost[20] or wait until

[19] BC Ferries *Fleet Reliability Index* averages 99.97 percent, meaning 99.97 percent of all scheduled sailings actually sail. The index is adjusted for weather, crew and medical events and so is a measure of how reliably fleet assets deliver their service.

[20] There are several dry docks in Puget Sound which can accept an S Class vessel. In practice, however, it is costly and difficult to dock in the US. There are numerous US Coast Guard regulations with which Canadian vessels do not comply, requiring the Company to obtain temporary exemptions, special insurance and, in some cases, tow its vessels to and from US waters. Time and costs quickly mount to the point that waiting for a Canadian dock is usually the better course.

local space becomes available. In either case, the cost will be higher than a planned, scheduled docking of known scope and duration.

To illustrate the effects of unplanned failures, consider a rudder of an S Class vessel which is not replaced as proposed at MLU and which fails in service due to fatigue two years later:

- The vessel will require an unplanned emergency docking to make temporary repairs;
- If the failure occurs in peak season there will likely also be vessel redeployment costs;
- A replacement rudder must be procured on an expedited basis, incurring higher purchase, production and shipping costs than if it was a scheduled replacement; and
- Three to six months after the event, the vessel will require a second dry docking to fit the new rudder.

In this scenario, considered realistic by BC Ferries, the Company will have incurred the cost of the temporary repair and docking plus the premium cost of the expedited rudder. Even ignoring fleet redeployment, a conservative estimate of the incremental cost is $<>.[21]

Implementing a Design Refresh

In addition to the engineering systems work above, the Project proposes to refresh the interior design standard (the "look and feel") of the accommodation spaces on decks 5 and 6. The current interior design standard was developed in 2001 for introduction on the *Queen of Coquitlam* during her mid-life upgrade in 2003. The objectives were to introduce a consistent look and feel to the ships with a West Coast theme. The standards were developed to be durable, easily cleaned and long-lived both from a visual design and maintenance perspective.

The current standard was implemented on the S Class vessels in fiscal 2006. If left unchanged, the standard will be approximately 31 years old at the next scheduled opportunity for change, the S Class vessels' ¾ life upgrades in fiscal 2032 and 2033. Industry research indicates this is an excessively long life span for a retail service design standard without it appearing dated and negatively impacting revenue.

BC Ferries carried out a review of its interior design standard for the S Class MLU and the ICF project. It determined a completely new design is not necessary as the existing design has proved to be popular and enduring. The design, therefore, requires a refresh rather than a wholesale replacement.

The changes to the design standard as part of this refresh include more contemporary carpets, vinyl and cloth upholstery, vinyl wood effect flooring (the existing product is no longer certified

[21] Docking $<>+ rudder procurement premium $<>+ BC Ferries' internal costs $<>

for marine use) and plastic laminates for table tops. The costs of the new materials are equal to or lower than the products being replaced. The majority of these items require replacement during the MLU regardless of the design due to normal wear and tear.

To be prudent with capital costs, high cost/long life products such as the blue vinyl deck covering, plastic laminate bulkheads and washroom fixtures will not change as part of the interior design refresh. The application of logos and other brand images will be consistent with current practice throughout the interior and exterior of the vessel and will have no impact on capital cost.

Impact of a Design Refresh on Ancillary Revenue

Industry studies indicate retail spending increases in refreshed environments. They show restaurant chains, on average, prefer a renovation frequency of between approximately 7.3 and 7.6 years and the average expected percentage sales increase is approximately 5 to 8 percent. A report prepared for a major fast food restaurant franchise found that an average restaurant that has been renovated (reimaged) will generate sales 7.5 percent higher than before.

These studies refer to enterprises operating in markets in which consumers have multiple convenient alternatives from which to choose. This makes market share and revenue volatile as consumers are influenced by factors such as look and feel. Aging look and feel drives revenue down over time while a "refreshed design" is likely to attract short term rapid revenue growth.

The onboard "market" for BC Ferries' catering amenities has fewer choices than does a shore-based market. The Company believes passengers are less reluctant to avoid amenities because of aging look and feel and, conversely, are less likely to increase patronage due to a refreshed look. Onboard catering revenue is, therefore, less prone to degradation than shore-based markets, and there will be less upside revenue potential due to a refreshed design.

Considering the above, a refreshed design should prevent some degree of onboard revenue decay. To be conservative, the Project financials assume no positive effect from a design refresh. However, BC Ferries notes a foregone decline of 3.3 percent per year of cafeteria and buffet revenue will achieve a discounted payback of 7.5 years.

Key Assumptions

Foregoing WP 4 as part of the MLU means all the proposed work will have to occur while the vessel is in-service or at scheduled out-of-service period. It will have become "un-consolidated" and additional costs and disruptions will occur. The risk of unplanned

failures will be higher than if WP 4 is implemented. In the financial analysis of WP 4, the Company has estimated these impacts using the following assumptions:

- Gradual replacement of the underwater equipment in scheduled major dockings at five, 10 and 15 years after the MLU;
- Increased maintenance on equipment that has not yet been replaced;
- Each scheduled dry-docking will be one week longer until all the proposed equipment is replaced in 15 years, to allow extraordinary maintenance;
- The risk of unplanned service interruption decreases gradually as equipment is replaced. Probability of service interruption estimated at six days per year up to 5 years, four days per year up to 5 to 10 years, and two days per year up to 10 to 15 years;
- No fleet redeployment costs are included;
- Substantial increase of coating patches and repairs in each refit;
- Steel replacement greater than would otherwise occur due to failing coating system;
- Increased maintenance expected on remaining old equipment before replacement;
- Higher maintenance of the interior fixtures and food service equipment;
- Deteriorating food service revenues due to dated fixtures and finish.

WP 4 Options

WP 4 comprises two options:

Option 4A – Do Not Implement Condition Based Requirements

Option 4B – Implement Condition Based Requirements

WP 4 Options Analysis

Option 4A – Do Not Implement Condition Based Requirements:

Scope	None.
Schedule	No impact.
Capital Budget and Financial Analysis	*See Table 3-6 below.*
Technical Implications	Foregoing implementation of WP 4 will have significant impact on vessel short and long term reliability. End-of-life assets will fail in-service requiring unplanned repairs and service interruptions. Unplanned repairs are more costly due to rework, premium time costs, hurried procurements and repeated mobilizations. Standardization between vessels will decrease.

Financial Implications	Not performing WP 4 will forego the capital and operating costs associated with Option 4B. Long term capital and operating costs will be higher as unplanned breakdowns do not allow for coordinated engineering, procurement and implementation of repairs. This will increase upward pressure on fares.
Non-Financial Implications	Disruptions to fleet deployment are likely as replacement vessels cover malfunctioning S Class vessels. Customer dissatisfaction will likely occur. Damage to reputation of entire system is likely.

Table 3-6: Option 4A Capital Budget and Financial Analysis ($M)

Increased Maintenance Total Cost	Revenue Loss	Net Incremental Costs	NPV
$<>	$<>		($75.66)

Option 4B – Implement Condition Based Requirements:

Scope	The condition of many S Class assets means they now require renewal or overhaul if the vessels are to maintain an acceptable level of reliability. The following comprises the main scope of work: • Renew fire detection and control system. • Install a modern marine evacuation system. • Replace rescue boats and davits. • Renew main and upper car fire suppression (drencher) system piping. • Replace rudders; replace or overhaul steering gear. • Upgrade cathodic protection (corrosion control) system. • Repair or replace coatings on hull and superstructure, various locations. • Overhaul main embarkation doors and remove decommissioned platform decks. • Rebuild controllable pitch propeller system; fit new propeller blades. • Renew two bow thrusters (*Sprit of Vancouver Island* only). • Replace two bow thruster motors (*Spirit of British Columbia* only). • Renew, modify and upgrade ventilation systems in passenger accommodation and galley areas. • Renew uninterruptible power supply system • Replace main switchboard and electrical distribution equipment.

	• Renew or upgrade heating and air conditioning systems. • Overhaul elevator machinery. • Overhaul or renew pumps in machinery spaces as required. • Replace oily water separator. • Renew power management system. • Replace internal communications systems. • Refresh design of passenger areas. • Renovate pet area, engineer crew room and deck/catering crew areas. • Replace galley equipment at the end of its life. • Replace bridge and navigation controls with standardized equipment and layout. • Replace and upgrade IT wiring and infrastructure. • Dry dock and berthing services. • Training, trials and commissioning. Scope detail can be found in Appendix A. *Note: There is interdependency with WP 2. If WP 2 is not approved, condition based work in the amount of $<> million will be required on the existing diesel engines.*
Schedule	• Dates: Early September to mid-December • Incremental Duration of WP 4 to WP 1: 8 weeks • Incremental Duration of WP 4 to WP 2: none • Incremental Duration of WP 4 to WP 3: 5 weeks All work within WP 4 fits within the schedule required to complete the preferred option in WP 2 (Option 2C: Convert Propulsion to DF). The schedule above is the timeframe required to complete the scope of work in WP 4 if being completed concurrently with WP 1. An incremental five days will be required to complete all required testing and operational training for the vessel to return to service.
Capital Budget and Financial Analysis	*See Table 3-7 below.*
Technical Implications	Full implementation of WP 4 will maintain the current high level of vessel reliability. However, the degree of invasive work on a significant number of major ship systems carries technical risk. Careful planning, procurement and engineering mitigate this risk.

Financial Implications	Capital costs will be incurred. However, long term operating costs will be reduced as unplanned failures are avoided. This will help reduce upward pressure on fares. This WP would result in estimated write-offs of $1.5 million related to the replacement of assets prior to them being fully depreciated.
Non-Financial Implications	Continued high vessel reliability will reduce the potential for disruption to fleet deployment.

Table 3-7: Option 4B Capital Budget and Financial Analysis ($M)

Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (incl. IDC)	Net Present Value	Discounted Payback (years)
Capital	**Operating**	**Capital**	**Operating**			
$<>	$<>	$<>	$<>	$<>	($69.42)	N/A

WP 4 Financial Summary

Table 3-8 summarizes the financial analysis for the two options in WP 4. The optimal option from a financial perspective is *Option 4B - Implement Condition Based Requirements*.

Table 3-8: WP 4 Financial Summary ($M)

	Total Project Costs (incl. IDC)	Increased Maintenance Costs	Revenue Loss	Net Incremental Costs	Net Present Value
Option 4A: Do not Implement Condition Based Requirements		($<>)	($<>)		($75.66)
Option 4B: Implement Condition Based Requirements	$<>				($69.42)
Net Impact of Foregoing WP 4	$<>	($<>)	($<>)	($<>)	($6.23)

WP 4 Preferred Option

Option 4B – Implement Condition Based Requirements is preferred by BC Ferries.

3.3 Financial Summary of Preferred Options

Table 3-9 provides a financial summary of the preferred options of each WP.

Table 3-9: Financial Summary of Preferred Options ($M)

Preferred Options	Capital Project Costs		Refit Project Costs (MOI)	Other Costs	Total Project Costs (Incl. IDC)	Net Present Value	Simple Payback (years)	Discounted Payback (years)
	Capital	Operating	Capital	Operating				
WP 1 Option 1A - Carry Out Regulatory Requirements	$<>	$<>	$<>	$<>	$<>	($8.44)	N/A	N/A
WP 2 Option 2C - Convert Propulsion to DF	$<>	$<>			$<>	$42.05	8	12
WP 3.1 Option 3B - Implement Energy Efficiency Initiatives	$<>		$<>		$<>	$3.36	7	11
WP 3.2 Option 3B – Implement Ancillary Revenue Initiatives	$<>	$<>			$<>	$5.26	5	6
WP 4 Option 4B - Implement Condition Based Requirements	$<>	$<>	$<>	$<>	$<>	($69.42)	N/A	N/A
TOTAL PROJECT	**$<>**	**$<>**	**$<>**	**$<>**	**$<>**	**($27.20)**	**N/A**	**N/A**

3.4 Total Project Costs

As set out in Table 3-9, the total cost of the Project, as proposed by BC Ferries, is as follows:

Capital Costs

The total capital cost (capital plus major overhaul and inspection ("MOI")) is $<> million, of which $<> million is Project contingency.

Operating Costs

Project related operating costs will be $<> million. This is composed of approximately $<> million for training associated with the conversion to DF propulsion, $<> million for training associated with WP 1, 3 and 4, $<> million of feasibility work, $<> million of contingency and $<> million of other non-capital costs.

Each vessel will also undergo a refit concurrent with the MLU at an operating cost of $<> million per ship, which is not included in this Project.

Total Project Cost

The total Project cost is $<> million.

3.5 Consideration of New and Used Vessels

This Project involves significant capital expenditure to upgrade the S Class vessels. The Company has considered alternatives to making such expenditure, specifically the possibility of acquiring new or used vessels to replace the *Spirit of Vancouver Island* and *Spirit of British Columbia*. Based on the analysis conducted and summarized below, the Company believes that the proposed upgrade of the S Class vessels is the most prudent option at this time.

New Vessel Considerations

The most realistic vessel with which to compare a post-MLU S Class vessel is a new Coastal Class vessel fitted with DF engines. The Coastal Class has proven ability to operate on Route 1, meets customer service expectations, meets off-season traffic requirements and would be the least costly to integrate into BC Ferries operations. Working from an existing design would also reduce cost and lead time. Although a Coastal Class vessel is smaller than an S Class vessel (370 AEQ vs 410 AEQ), the size differential is small enough that extrapolating price upward based on steel weight and pro rata deck area is a valid price estimation process. Furthermore, BC Ferries has actual pricing information from the Coastal Class project which provides a firm starting point from which to adjust for the changes in the shipbuilding market in the years since they were delivered.

However, it is important to note that Route 1 service could not be satisfactorily delivered by three Coastal Class vessels and the *Queen of New Westminster*. Although this combination of ships could carry the previous year's traffic as required by the CFSC, there would be repeated overloads during peak season, likely leading to some traffic avoidance. This analysis uses smaller Coastal Class vessel size as a surrogate as it presents solid data from which to build, not because the Company believes the size is suitable for long term Route 1 sustainability.

New Vessel Price

Between 2005 and 2008, new ship prices climbed to historically high levels. Prices peaked in early 2008 following which they dropped sharply in response to the global economic crisis. Prices bottomed in March/April 2013 when, on the back of modestly recovering freight rates, financially-sound owners began to place orders to take advantage of low prices. 2013 was marked by a gradual but steady price rise as China and Korea removed uneconomic yard capacity and global trading conditions stabilized. By 2014, price levels for new ships had largely returned to 2005 levels, though not to extraordinary heights seen in 2008[22].

The actual cost of a Coastal Class vessel in 2005 was $<> million. Based on the market development since 2005, it is reasonable to expect BC Ferries could today contract for a similar vessel for the 2005 price. However, it is likely BC Ferries would specify DF propulsion. Pricing received on the ICF project indicates the premium for DF vessels compared to diesel-fuelled is 9 to 10 percent. Using the lower 9 percent to be conservative, the contract price for each new DF Coastal Class vessel would be approximately $<> million.

BC Ferries' preliminary analysis of the acquisition of two new DF Coastal Class vessels gives an NPV of negative $39.3 million. This represents the difference in the NPV of the capital costs between replacing the S Class vessels now and replacing them 27 years post-MLU. The analysis includes the impact of future upgrades of the new vessels and the existing S Class vessels, but does not include any operating impacts. It also assumes BC Ferries could recover 50 percent of the book value of the S Class vessels through resale, which is highly speculative. These are high-level estimates only.

Used Vessel Considerations

While the majority of BC Ferries' vessels have been built and acquired new, a number of used vessels have been purchased for the fleet. In some cases, the decision has proven to be a wise investment (e.g. *Kuper*), while in other cases, the investment has not been as successful (e.g. *Queen of Chilliwack*).

There are many factors to consider in assessing the viability of a used vessel. Key factors are:

Commercial Compatibility

The ability of the vessel to meet the traffic and customer needs. This includes speed, vehicle and passenger carrying capacity, passenger accommodations and other amenities.

[22] See: *2014 Annual Review – Shipping and Shipbuilding Markets*, Barry Rogliano Salles, Paris, April 2014.

Physical Compatibility

Age and physical condition of the vessel. Consistent with worldwide practice, BC Ferries requires vessels to have been built and maintained to international classification standard. Consideration also must be given to the vessel's compatibility with BC Ferries' standardized berth design and, in particular, whether the length, beam, draft, freeboard and deck configuration fit the Company's terminals and docks, and/or whether modifications would be required. Further considerations include the compatibility of the vessel's electrical system with North American requirements and the availability of spare parts.

Regulatory Compatibility

Transport Canada regulations with respect to Canadian-operated vessels are very stringent. Transport Canada applies 'New Ship' regulations to any used vessel that enters domestic service in Canada. Accordingly, foreign vessels will require modification to meet these regulations. Transport Canada regulations apply to all matters related to the safe operation of vessels, including emergency evacuation, stability, firefighting systems and crew levels. In addition, many of the used vessels currently available internationally are 'single compartment' vessels which are no longer permitted by Transport Canada.

Fleet Compatibility

Deployment of non-standard vessels on a route creates inconsistency in service, crew size and vessel capacity that generates higher operating and maintenance costs and scheduling challenges.

The ability to cost-effectively redeploy a vessel across routes (referred to as 'inter-operability') is vital to ensure consistency of service and operating costs. It is a principal objective underlying the Company's vessel replacement strategy. The goal is to have vessels that are able to operate effectively and efficiently on different routes in order to provide supplemental service during peak periods, refits and emergencies.

Standardization

Availability of used vessels is generally for one vessel. Availability of two identical or similar vessels is rare. There are no vessels identical to the S Class elsewhere. Acquiring used vessels usually does not contribute to fleet standardisation.

Entry into Service Costs

In general, the purchase price of a used vessel is substantially less than a new vessel. However, all used vessels will require some modification to operate successfully as part of BC Ferries' fleet. A foreign purchase (even if formerly Canadian flagged) must be brought up

to the current Transport Canada regulations for new construction (i.e. no "grandfathering"). The cost of these modifications, together with import duty if applicable, must be considered. All operating costs must also be considered (e.g. fuel, crew and maintenance).

BC Ferries' experience with used vessel acquisitions, such as the *Northern Adventure* and *Queen of Chilliwack*, show the variability and risk that comes with used vessels. Only acquiring two mutually-identical ships of a type and capacity closely suited to Route 1 would reduce used vessel risk to an acceptable level. However, no such vessel duo is realistically available on the used market and, as such, used vessels are not an option.

3.6 Project Financing

Affordability

Affordability can be defined as the ability of BC Ferries to undertake the Project, within the context of the larger capital plan, while adhering to debt covenants and maintaining access to capital markets at reasonable rates. The Company has developed a long term financial forecast and associated financing plan based on what are believed to be reasonable forecast assumptions (including assumed price caps beyond performance term 3 ("PT3")). This forecast demonstrates that this Project and the other forecast expenditures within the capital plan are affordable.

Financing

BC Ferries plans to finance the Project, along with other forecast expenditures in the capital plan, through a combination of cash flow generated from operations and issuance of incremental debt.

In 2004, BC Ferries entered into the Master Trust Indenture (May 2004) ("MTI"), a copy of which is available at www.SEDAR.com. The MTI established common security and a set of common covenants for the benefit of the Company's lenders. BC Ferries' financing plan encompasses an ongoing program capable of accommodating a variety of corporate debt instruments and borrowings ranking equally (or pari passu). Common share equity is not viewed as a potential source of capital, and there is no intention of offering common shares to the public or other investors.

The Company is also party to a credit agreement with a syndicate of Canadian banks that is secured under the MTI. Under this agreement, there is a revolving facility in the amount of $155 million, maturing April 2019. The facility is available to fund capital expenditures and for

other general corporate purposes. At June 30, 2014, there were no draws on this credit facility.

Over time, BC Ferries' debt portfolio will consist of both short term debt (including draws on the credit facility) and long term financial instruments such as bonds. From time to time, BC Ferries will have drawings under the credit facility until such time as they are paid down either through cash flow generated through operations or via the proceeds from a different financing instrument.

While BC Ferries has issued $400 million in bonds during PT3 to date (primarily to refinance two maturing bonds that totaled $390 million), no incremental borrowing (beyond draws on the credit facility) is currently forecast for the remainder of PT3. The initial cash flows projected for the S Class MLUs are expected to be partially funded with draws on the credit facility. By fiscal 2017 (the first year of performance term 4 ("PT4")), BC Ferries forecasts that incremental long term debt will need to be issued, allowing for any draws on the credit facility to be paid down, and to further fund expenditures forecast in the capital plan (including the S Class MLUs).

Incremental debt is likely to take the form of a bond issue. The Company targets a strong investment grade credit rating to maintain capital market access at reasonable interest rates. The results of the Company's last two bond placements have been very positive. BC Ferries' October 2013 bonds were rated "A" (DBRS) and "A+" (S&P) and the Company's April 2014 bonds were rated "A" (DBRS) and "AA-" (S&P).

The exact timing of new financing will depend on a number of factors, including the Project payment terms, other capital expenditures, seasonal operating cash flow and capital market conditions.

3.7 Price Cap Implications

Given the complex service that BC Ferries provides, it is difficult to assess the specific impact on the financial results of the Company of a capital project in isolation.

As described above, the Spirit Class vessel MLUs were developed as four separate WPs, one of which relates to the conversion of the propulsion systems to DF. For the purposes of determining the price cap implications of this Project, the Company compared two model scenarios:

- *Model Scenario 1*: assumes that BC Ferries continues to operate the vessels with diesel propulsion and only expenditures related to regulatory requirements as per WP 1- Option 1B plus additional regulatory expenditures required for the existing diesel engines. There is no MLU in this scenario. This is not a realistic scenario other than for the purpose of establishing a baseline for this analysis.

- *Model Scenario 2*: reflects the preferred WP options as summarized in Table 3-9.

The analysis assumes that all other material elements such as the service plan and the price of fuel would be the same for each scenario. In all calculations, BC Ferries' Long Term Forecasting Model was used. The model derived the average price cap growth rate required for each scenario by solving for a target leverage ratio of 82.5 percent at the end of the performance term.

Model Scenario 2 versus Model Scenario 1

The results indicate that Scenario 2 will have higher average annual price cap increases in PT4 by 0.60 percent but lower annual price cap increases during performance term 5 ("PT5") by 1.39 percent. This result reflects the benefits associated with Scenario 2 not materializing until later in PT4. Under Scenario 2, the price cap will be 3.19 percent lower than under Scenario 1 by the end of PT5 (fiscal 2024).

3.8 Scenarios for Reducing Capital Expenditures

BC Ferries believes that the proposed capital expenditure for the Project is reasonable and prudent. Extensive condition assessments and "stress testing" of scope assumptions means there are no obvious opportunities to reduce the proposed capital expenditure. WP 1 is required by statute and regulations. WP 2 and WP 3 are cost reduction and payback opportunities of net positive value to fare payers and, in the view of BC Ferries, should proceed. Only WP 4, the objective of which is asset reliability, has scope which might be considered for reduction.

In the planning and feasibility stages of the preparation of this Application, BC Ferries conducted numerous in-house consultations with technical, planning and operational staff. The purpose was to thoroughly vet the scope of work to be included in the MLU. At all stages, the Company posed the question: "What is the benefit to fare payers of the proposed scope?" In this "challenge process", staff members were required to justify their proposal with objective evidence or it was excluded. Most scope proposals had to survive three or four challenges before being included. Many scope items which staff believed might be in the long

term interest of the fare payers were eliminated because they could not be supported by objective evidence. Only about one-third of scope proposals made the final list.

Many WP 4 scope proposals were also subject to detailed review by external third party experts. The external parties were used to check BC Ferries' internal assessment of condition and reliability risk. In some cases, the external experts even recommended re-inclusion of scope which BC Ferries staff had excluded in the challenge process.

Appendix A presents the results of these exhaustive discussions. The justification for every line of scope is provided. In many cases, the supporting evidence for the scope of work has been provided by external experts rather than BC Ferries. Appendix A is, therefore, a rigorously vetted Project scope supported in large part by independent experts and driven by benefits to fare payers.

Notwithstanding the foregoing, MLU capital costs could be reduced by foregoing elements of WP 4 totalling, for example, 10 percent of Project cost. Several elements of WP 4 may be considered discretionary insofar as the S Class vessels will operate without the work, albeit at higher operating cost and lower reliability. Eventually the assets in WP 4 will require replacement, so these capital costs are being deferred and not truly foregone.

Section 4 - Procurement and Risk

4.1 Procurement Process

The Company has in place an S Class MLU Project Steering Committee chaired by the Executive Vice President & Chief Financial Officer, with membership that comprises the Operational Vice Presidents and senior technical and operational staff. The Committee is supported, as required, by external experts. The procurement of the prime contractor and main DF equipment supply will be undertaken under the auspices of this Committee.

The Project will use a three stage procurement process conducted by BC Ferries' Supply Chain department. The three stages are:

- *Request for Expression of Interest* – the first outreach by the Company to industry to determine the level of interest. Everything is non-binding on all parties at this stage.
- *Request for Pre-Qualification* – the Company issues an outline specification, *pro forma* contract and concept design of the work or equipment to all proponents who expressed interest in the RFEOI stage. Proponents respond with detailed technical and commercial proposals. Everything remains non-binding on all parties at this stage. Bidder meetings and exchanges of technical information occur in this stage.
- *Request for Proposal* – the Company requests "best and final" proposals from the proponents. Little or no new technical or commercial information is involved in this stage. The RFP submissions from the proponents is considered binding on the proponent.

The Project will involve two main procurement processes. They are:

1) *Procure integrated DF propulsion and fuel system equipment.* This equipment has long lead times, up to 18 months, and is a key risk to the project. BC Ferries must contract for this equipment as soon as practical after approval of this Application.

   BC Ferries issued an RFEOI for DF equipment supply in July 2014 and expects to issue the RFPQ in October 2014. Non-binding technical and commercial discussions will take place during fall 2014. Subject to the approval of this Application, a binding RFP will be issued to proponents in late 2014. BC Ferries expects to contract for the equipment in January 2015, 21 months before the first S Class vessel is removed from service. Although the equipment is not needed by the shipyard for several months into the

construction period, BC Ferries will require complete equipment supply to be at the shipyard not later than the first day of the construction period to mitigate schedule risk.

2) *Procure the services of a prime contractor*. The Company will contract for the DF conversion on an EPC basis. Under this regime, the prime contractor [23] is responsible for detailed design, engineering, procurement of equipment and services, and conversion of the vessels. The DF equipment supply contract will be novated to the prime contractor once selected. In this way, the majority of design and construction risk is placed on the prime contractor.

The Company plans to issue an RFEOI to industry in October 2014. BC Ferries has engaged an experienced international ship brokerage to assist with the identification of qualified prime contractors. The broker will assist with preparation of RFEOI documents, identify proponents, provide introductions to key personnel and advise during contract negotiations. The objective is to increase the number of proponents actively engaged with the prime contractor procurement process.

Similar to the DF equipment procurement process, the Company will carry out the non-binding RFPQ stage prior to and during the Commissioner's deliberations on this Application. A binding RFP stage will be conducted only after approval of this Application is obtained. If approval is obtained, BC Ferries intends to contract with a prime contractor not later than March 2015, some 17 months before the first S Class vessel is removed from service.

Work is currently underway to finalise a Statement of Operating Requirements and Technical Statement of Requirements, which set out the functional and technical requirements, operating performance targets and amenities that must be satisfied in the final design and conversion of the vessels. This work will be completed by internal BC Ferries resources, with validation by external experts as required.

An internal BC Ferries team comprised of senior technical and operational staff, with support by external experts as required, will evaluate the proposals submitted in response to the RFP and formulate a recommendation on a short list of preferred prime contractors to the Steering Committee. The Steering Committee will, in turn,

[23] The term 'prime contractor' is used in place of shipyard because shipyards are only one type of contractor who may bid. Non-shipyard owning marine contractors may also participate.

make a recommendation to the Company's Executive Management Committee for decision.

Discussions will be undertaken with the short listed prime contractors, leading to the signing of a letter of intent with a single preferred proponent. Final contract award will be subject to approval by BC Ferries' board of directors.

An overview of the procurement timeline is included in the project schedule in Appendix B.

4.2 Top Project Risks

The Company has carried out extensive risk discussions during the preparation of this Application. These discussions involved all levels of operational and technical management, as well as members of the Executive Management Committee. The MLU Project Team engaged closely with BC Ferries' Director of Risk and Insurance throughout the process. A detailed Project risk matrix and methodology has been developed.

Top risks and changing risks are reviewed by the Project Steering Committee at each meeting. The MLU Project Team proposes risk mitigations on all identified risks; these are reviewed and agreed with the Steering Committee. Trend and progression of risk over time is monitored.

The top risks facing the Project can be considered in four categories:

- Schedule – the critical need to re-enter service on schedule upon Project completion;
- Technical – the technical complexity of the DF conversion;
- Regulatory – the regulatory environment for LNG-fuelled ships in Canada is still not fully settled; and
- Financial – estimates of project costs are not yet confirmed in fixed price contracts.

The risk matrix for the Project lists multiple detailed risks in each of these risk categories. The risks considered highest as at the date of this Application are as follows:

Schedule Risk: Vessel is not ready for peak season

Both S Class vessels are scheduled to return to service prior to the May long weekend in 2017 and 2018. Delays in installation, commissioning, and training will delay the in-service day and result in loss of revenue and reputation, possibly putting the Company in breach of the CFSC. If the vessels are delayed, impacts to the Company's bottom line are severe.

Ongoing Mitigation Strategy:

- Schedule contingency of one month is built into the Project to buffer any delays in construction, commissioning and training.
- Work scope and progress will be reviewed regularly to determine any adverse effect on return to service schedule.

Planned Mitigation Strategy:

- Operationally critical scope has a higher priority during Project implementation to mitigate risk and allow the vessels to meet summer contractual requirements.
- Contingency plans are built to keep the Project on schedule, including reduction of scope if required.
- Insurance and a robust contracting strategy will be implemented to reduce externally influenced delays.
- The shipyard labour estimate will be evaluated in the bid evaluation process to confirm that the work can be completed within the pre-defined Project schedule.
- A fixed production and delivery schedule will be contractually required from the prime contractor and all service providers.

Technical Risk: Convert propulsion to DF

Technical issues may cause schedule delays, making the vessels unavailable for peak season; the Company may be unable to provide service as per the CFSC. Budget overruns caused by inexperience in converting propulsion to DF entail financial risk; may reduce the payback of converting to DF propulsion. The need to order DF equipment well in advance may limit the time to learn from other projects.

Ongoing Mitigation Strategy:

- An engineering consultant will be hired to provide schedules and budget data through feasibility studies as well as contact with ship owners who have completed or are in the planning phase of a DF propulsion conversion.
- Internal budget, payback and sensitivity assumptions will be defined and validated to ensure corporate consistency while leveraging other internal DF propulsion project work.
- A detailed budget and schedule will be developed with contingency mainly for the contracting process, equipment delivery schedule and conversion work scope.
- A contingency plan for installation and commissioning of the DF propulsion will be developed.
- The possibility of following the model used in the introduction to service of the DF *Viking Grace*, whereby the vessel would operate in diesel mode immediately after the

installation until the end of summer peak season to allow extra time for training and commissioning, will be considered.

- Provision for ongoing education regarding DF system conversion, regulations and operations for Project and operational teams will be developed.
- Operational training courses will be defined, planned, and implemented; BC Ferries will work with industry partners to develop a detailed training program.

Planned Mitigation Strategy:

- A thorough, bundled contracting process to acquire firm fixed prices early in the Project lifecycle will be pursued.
- Internal specialists, contractors and shipyards will be engaged on proposed conversion plans and feedback on schedule will be requested.
- International information on conversions or new installations that can be correlated to this conversion Project will be gathered and reviewed.
- System design and operation regulatory requirements will be confirmed and work with regulatory authorities at all levels will continue.
- The possibility of operating the vessels in diesel mode until corporate familiarization and training level is adequate for DF propulsion will be considered.
- Internal resources will be used to provide a detailed 'shipyard' schedule and budget for the conversion (piping, electrical, other conversion related issues).
- Internal course material will be developed ahead of completion of shipyard installation.
- Training, audit and clearance procedures for all operational staff on new DF equipment and systems will be developed.

Regulatory Risk: Changes in Regulatory Requirements

Any changes in regulatory requirements after design is signed off will impact the budget and schedule. Regulatory agencies such as classification society, Transport Canada, provincial government, municipal governments and others may introduce regulations/legislation that will impact scope, schedule and budget. Changes to the CFSC or CFA may require changes to the planned project business outcomes.

Ongoing Mitigation Strategy:

- A clear Project governance model has been developed and implemented.
- Key areas of concern that may be subject to regulatory change (environmental, service schedules, etc.) will be identified.
- Regulatory authorities will be consistently engaged with within an acceptable timeframe to implement change within the Project.

Planned Mitigation Strategy:

- Communication to stakeholders of any potential new legal or regulatory compliance requirements will be done as soon as possible.
- Key areas with the greatest potential to impact the Project will be identified and scheduled for reviews.
- Assumptions within the Project business case of expected changes and impacts of regulatory requirements, service schedules and other Project assumptions will be clearly identified and monitored.

Note on Regulatory Risk

The Project assumes that the vessels will continue as primary vessels on Route 1, which is classed as a Near Coastal Voyage, Class 2 (Restricted Home Trade III) by Transport Canada Marine Safety ("TC MS"). The vessels are classed with the ABS which has also acted as the Recognized Organization on the S Class vessels for TC MS since 2010. Under this system, ABS conducts drawing review and regular inspections on behalf of TC MS, as well as conducting their own surveys to ensure compliance with their class (technical) rules. TC MS retains an audit role and is responsible for determining safe manning levels.

Transport Canada also retains a significant role in the form of the Marine Transportation Review Board, which is empowered to grant exemptions from regulatory requirements. As coastal vessels operating in a restricted area, the S Class vessels were constructed and operate with a number of exemptions related to the roll-on/roll-off operation, and for the safety systems appropriate to a short transit passenger ferry (versus a deep sea vessel).

The Project will address regulatory issues arising from the implementation of the *Canada Shipping Act*, 2001 (CSA2001). Of particular concern will be: the safe manning documentation; the proposed Vessel Construction and Equipment Regulations ("VCER"); and the Canadian Pollution Prevention Regulations (as they pertain to overboard discharges and air emissions). These regulations are being revised to incorporate SOLAS (Safety of Life At Sea) regulations that are developed by the International Maritime Organization ("IMO").

A particular risk is the pending new VCER which incorporate IMO SOLAS Regulations by direct reference, modified only as necessary for domestic shipping by means of a "Canadian Supplement" (TP 1151E). The VCER does not apply retroactively to existing vessels. However, the draft regulations 5 incorporate broad language to limit "grandfathering" when a vessel undergoes a major refit. Without "grandfathering", a vessel undergoing a major refit must comply with all regulations applicable to new ships.

In this Project, BC Ferries has taken the conservative approach of assuming the S Class vessels will be treated as new vessels from a regulatory perspective. The emerging risk to the Project is the cost and time of alteration work necessary to be compliant with the VCER. As with the earlier Canadian regulations, the SOLAS regime/Canadian supplement has been written around requirements for an ocean-going vessel, so many of the existing exemptions (and possibly some new regulations) will have to be addressed.

BC Ferries has approached these exemptions as follows:

- Where compliance is subject to interpretation and there is reasonable likelihood of a MTRB approval for a variance, the scope has not been included in the Project. BC Ferries will seek a renewed MTRB exemption; the exemptions may require background risk assessment work before renewal.
- Where a MTRB approval is not likely, the Project incorporates the necessary modifications to bring the vessel into compliance with the new VCER. These items are treated as compulsory and included in WP 1.

The Canadian regime for regulating LNG-fuelled vessels references the IMO Code for Gas-fuelled Vessels (IGF Code) that is due to be ratified early next year (spring 2015). This code is strongly dependent on a series of risk assessments that must be reviewed by Class (ABS, in this case) and TC MS. The specific technical details of the installation will be governed by the ABS rules for gas-fuelled vessels.

Financial Risk

Pricing for the MLUs has been derived based on supplier and shipyard preliminary estimates, historical ship repair and construction costs, consultants' reports and internal estimations. While it represents the best available information at this time, final pricing will not be known until the RFP process is completed. The Company has included a contingency in the Project budget to address unforeseen cost pressures. However, should pricing received through the RFP process be significantly higher than forecast, a supplemental Application to the Commissioner may be required. Depending on the magnitude of the cost variance, scope changes to the Project may also be considered.

Conclusion

BC Ferries respectfully requests the Commissioner's approval pursuant to section 55(2) of the CFA for major capital expenditures for the Spirit Class Vessels Mid-Life Upgrades Project of up to $<> million, inclusive of IDC, and supplemental Project expenditures of up to $<>million, for total Project expenditures of up to $<> million. BC Ferries submits that this expenditure is reasonable, affordable, prudent, and is consistent with the Company's current five-year and 12-year capital plans approved by BC Ferries' board of directors, and the current CFSC. The Company believes that pursuance of the Project is in the best interests of taxpayers and fare payers as the proposed investments will help ensure the continued reliability of service on Route 1 and will enable further advances in efficient and effective service delivery, which will contribute positively to the financial performance of this route and reduce upward pressure on fares across all routes in the coastal ferry system.

Appendix A - Scope Listing

Purpose

This document describes the scope of the S Class MLU project.

Contents

WP 1 – Carry Out Regulatory Requirements
WP 2 – Convert Propulsion to DF
WP 3 – Implement Other Payback Projects
WP 4 – Implement Condition Based Requirements
Additional Detail: Modernize and Retain Existing Diesel Engines

Acronyms

ABS	America Bureau of Shipping
BCF	British Columbia Ferry Services Inc.
CCTV	Closed-circuit television
CFD	Computational Fluid Dynamics
CSA	Canada Shipping Act (also CSA(2001))
DF	Dual Fuel (LNG / Diesel)
FMU	Fleet Maintenance Unit
GA	General Alarm
GVU	Gas Valve Unit (LNG)
HVAC	Heating, ventilation and air conditioning
IGF	International Code of Safety for Ships Using Gases
IMO	International Maritime Organization
LNG	Liquefied Natural Gas
MEPC	The Marine Environment Protection Committee
MCD	Main Car Deck (Deck 2)
MOI	Major Overhaul and Inspection
MSEL	Master Systems Equipment List, BCF's master asset numbering system
MSI	Musculoskeletal Injury
MTRB	A decision document of Transport Canada's Marine Technical Review Board to allow variance from specific requirements of the *Canada Shipping Act and Regulations*
NPV	Net Present Value
OEM	Original Equipment Manufacturer
OSC	Operations & Security Centre
PA	Public Address System
PTO	Power Take-off Generator
SOBC / SBC	*Spirit of British Columbia*
SEA	Standardized Education & Assessment, BC Ferries operational training program
SOLAS	IMO Convention for the Safety of Life at Sea
VARD	VARD Marine Inc., the naval architecture and marine engineering consultant.
VCAP	Vessel Condition Assessment Program
SOVI / SVI	*Spirit of Vancouver Island*
TC	Transport Canada
TCMS	Transport Canada Marine Safety
TP	Technical Publication of TCMS
UCD	Upper Car Deck (Deck 4)
UPS	Uninterruptible Power Supply
VCER	Vessel Construction and Equipment Regulations

WP 1 – Carry Out Regulatory Requirements

MSEL	Description	Justification	Cost Type
1000 Hull & Superstructure	Strengthen aft void and steering flat structure	Structural failure pending – fatigue	MOI
	Renew steel in fore peak tanks	Structural failure pending – corrosion	MOI
	Renew or repair freeing ports	Functional/structural failure pending – corrosion; compliance with Load Line and stability requirements	MOI
	Renew galley pass through fire shutter	Ineffective fire boundary	MOI
	Renew rubbing strake hand rails	Hazard to employees; structural/functional failure - corrosion	MOI
	Overhaul watertight door actuator and control components	Ensure reliability	MOI
	Steel Thickness Survey	Ensure structural integrity	MOI
	Overhaul or renew shipside valves	Loss of watertight integrity – corrosion	MOI
	Survey tanks, machinery spaces, chain lockers, and voids	Vessel annual survey requirement	MOI
	Repair rubbing strake	Protect structural integrity of hull	MOI
2000 Propulsion	Survey propeller shafts	Class requirement	MOI
3000 Ship Service Systems	Provision for grey water holding and/or treatment	Statutory requirement	Capital
4000 Ancillary Systems	Modify waste collection system	Separate garbage into organics/non-organics to comply with municipal bylaws	Capital
	Upgrade to elevator safety voice communication system	Required by CSA code	Capital
5000 Passenger & Crew Services	None	N/A	N/A
7000 Instrumentation & Controls	None	N/A	N/A
8000 Communications	Service radio system	Vessel survey requirement	Capital
9000 Safety Equipment	Local fire suppression system over machinery	Existing fire suppression system does not meet requirements	Capital
	Renew and overhaul fire dampers.	Periodic inspection requirement	Capital
0000 Documentation Project Labour Administration	Complete surveys as required	Required for vessel certification	Capital
	Prepare Regulatory Regime – MTRB application	Non-overhead, incremental project costs	Capital
	Vessel docking	Regulatory requirement	N/A
	Vessel afloat berthing	Necessary to allow work	N/A
	Trials and commissioning	To verify safe system operation	Capital
	Training	Crew training for safe operation	Expense
	Crew labour & travel	Labour costs for onsite inspection	N/A
	Project Contingency	Risk mitigation	N/A
	Project Management and General Administration	Resources to manage project	N/A

WP 2 – Convert Propulsion to DF

MSEL	Description	Justification	Cost Type
1000 Hull & Superstructure	Install bunkering station(s) suitable for fuelling from deck	Required to fuel vessel	Capital
	Modify outside decks to provide space for passengers	Compensation for tank location if on exterior decks (Dk 6 Aft, Dk7 midships)	Capital
	Install forward passenger viewing area	Compensation for tank location if on exterior decks (Dk 6 Aft, Dk7 midships)	Capital
2000 Propulsion	Install new dual fuel engines	Match existing propulsion and power generation performance	Capital
	Renew exhaust piping and silencers and add components for inerting system	New DF engine installation and gas safety requirements	Capital
	Renew gearbox	New DF engines will be 720 RPM (vs existing 500 RPM); PTOs to be matched to generator requirements	Capital
	Maintain the waste heat recovery system	Modify existing heat recovery unit to function with the new LNG engine	Capital
3000 Ship Service Systems	Install ventilation for the new LNG storage and gas distribution systems	Meet design requirements – risk-based approach	Capital
	Install refrigeration circuit for refrigeration plant from LNG storage system	Utilization of cooling capacity in LNG for shipboard refrigeration	Capital
4000 Ancillary Systems	Install LNG and gas transfer and supply system (components for bunkering station, cold boxes, GVUs, for 2 x 75m3 tanks)	Specialized Gas Code requirements: transfer system for the safe handling of gas in liquefied and gaseous form	Capital
5000 Passenger & Crew Services	None	N/A	N/A
7000 Instrumentation & Controls	Renew engine controls and instrumentation	Installation of new DF engines	Capital
8000 Communications	None	N/A	N/A
9000 Safety Equipment	Install fire detection system for dual fuel propulsion system	Specialized Gas Code requirements	Capital
	Install fixed fire suppression system for dual fuel propulsion system	Specialized Gas Code requirements	Capital
0000 Documentation Project Labour Administration	Vessel afloat berthing	Necessary to allow work	Capital
	Trials and commissioning	To verify safe system operation	Capital
	Training	Crew training for safe operation	Capital
	Crew labour & travel	Labour costs for onsite inspection	Capital
	Project Contingency	Risk mitigation	Capital

WP 3 – Implement Other Payback Projects

MSEL	Description	Justification	Cost Type
1000 Hull & Superstructure	Renew hull coating with low friction coating	Positive NPV; fuel reduction initiative	MOI
	Modify bulbous bow to reduce hull resistance	Positive NPV; fuel reduction initiative; may be incorporated with steel renewal in forepeak tank to offset some cost	MOI
	Install a stern flow interceptor to reduce hull resistance	Positive NPV; fuel reduction initiative	MOI
2000 Propulsion	None	N/A	N/A
3000 Ship Service Systems	Renew lighting	Positive NPV; reduce load on power generation system	Capital
4000 Ancillary Systems	None	N/A	N/A
5000 Passenger & Crew Services	Expand giftshop	Increase passenger spend with extended retail offering	Capital
	Install a Coffee bar on Deck 6	Increase passenger spend by improved location of coffee bar to Deck 6	Capital
7000 Instrumentation & Controls	None	N/A	N/A
8000 Communications	None	N/A	N/A
9000 Safety Equipment	None	N/A	N/A
0000 Documentation Project Labour Administration	Vessel afloat berthing	Necessary to allow work	Capital
	Trials and commissioning	To verify safe system operation	Capital
	Training	Crew training for safe operation	Expense
	Crew labour & travel	Labour costs for onsite inspection	Capital
	Project Contingency	Risk mitigation	Capital

WP 4 – Implement Condition Based Requirements

MSEL	Description	Justification	Cost Type
1000 Hull & Superstructure	Upgrade Impressed Current Cathodic Protection system	Suitable for a 5-year docking cycle	MOI
	Renew coatings in required areas (MCD and UCD exhaust plenums, deck structures from Deck 5 to Deck 8, shipsides from rubbing strake to Deck 6, and ballast tanks)	Avoid damage to structural steel, BCF standards for visual appearance	MOI
	Overhaul main embarkation door components, renew control boxes, and (if permissible by regulations) remove inflatable sealing system	Age compromised reliability. Reduce system maintenance cost	MOI
	Repair coatings in required areas (non-potable water tanks, void spaces, machinery spaces, MCD and UCD spaces, housework, funnel)	Avoid damage to structural steel, BCF standards for visual appearance	MOI
	Renew rudder blades	Strength compromised by fatigue and materials loss due to corrosion	MOI
	Install a walkway forward of the bridge windows	Eliminate the need to use a man-lift for maintenance and repairs of bridge window; Scratched and dirty bridge windows reduce visibility and operational safety	MOI
	Renew fire and weather doors	Compromised fire safety and weather protection - corrosion	MOI
2000 Propulsion	Overhaul stern tube seals	Regular maintenance to prevent risk of high-cost damage and vessel out of service	MOI
	Renew seal liners and stern tube bearings	Age compromised reliability; risk of high-cost damage and vessel out of service	MOI
	Renew bow thrusters (SVI only)	Age compromised reliability: previously overhauled to the limits of the machinery	Capital
	Upgrade or renew steering gear	Failure history and wear	Capital
	Renew Oil Distribution Box housing and overhaul components	Components at maximum tolerance; no further repairs possible	Capital
	Rebuild the controllable pitch propeller hub	Vessel survey requirement	MOI
	Renew propeller blades with Ni-Br-Al	Failure history, high cost – fatigue	Capital
	Replace bow thruster motor (SBC only)	Larger motor to match size on SVI	MOI
3000 Ship Service Systems	Install redundancy in galley exhaust system	Eliminate single point of failure for primary food services delivery	Capital
	Rebuild the standby and emergency generators	Preventative maintenance required to ensure reliability	MOI
	Overhaul the shaft generators	Preventative maintenance required to ensure reliability	MOI
	Renew, repair and modify ventilation trunking; install additional ventilation in lockers and escapes	Correct leaks; save energy Provide ventilation to unventilated spaces. Changes in layout	Capital

WP 4 – Implement Condition Based Requirements

MSEL	Description	Justification	Cost Type
	Renew air compressors with a new specification for the duty requirements	**Not fit for purpose**	**Capital**
	Renew domestic water piping	Age compromised reliability	Capital
	Renew re-heat and pre-heat system components	Aged piping components leaks in accommodation areas and damage interior fixtures	Capital
	Overhaul supply and exhaust fans	Corroded, noisy, out of balance	Capital
	Renew UPS System and batteries as required	Age compromised reliability	Capital
	Renew switchboard and breakers (600V)	Age compromised reliability of a critical system switchgear; desupported by OEM	Capital
	Repair accommodation heating calorifiers	Age compromised reliability; desupported	Capital
	Renew air conditioning chiller plants and pumps	Age compromised reliability; desupported	Capital
	Modify or replace electric whistle	Signal inaudible to some water craft –modification required to change tone	Capital
	Renew forward and aft hydraulic power packs	Age compromised reliability; desupported	Capital
	Renew refrigeration plant and sea water pumps.	Age compromised reliability; desupported	Capital
	Renew and overhaul electrical components	Age compromised reliability; desupported	Capital
	Modernize HVAC system components	Passenger comfort and energy reduction	Capital
	Upgrade switchboards to comply with arc flash standards	Safety of personnel	Capital
	Convert bolt air plenum to hinged hatch	Eliminate back injury during removal and installation for vent cleaning	Capital
	Install natural ventilation in Deck 5 and 6 cleaning lockers	Provide ventilation to unventilated spaces; prevents mould formation which adversely affects occupational health	Capital
	Repair sewage collection system components	Vent pipe functions poorly	Capital
4000 Ancillary Systems	Renew and overhaul elevator machinery components	Improved reliability and reduce maintenance costs for this critical passenger access system	Capital
	Overhaul garbage compactor mechanical components	Age compromised reliability	Capital
	Renew oily water separator and circulating pump	Age compromised reliability	Capital
	Renew sea water service piping	Containment failure (leaks) - Corrosion	Capital
	Renew bilge valves, actuators and control system	Intermittent failures; ensure reliability	Capital
	Renew scupper and drain pipes	Containment failure (leaks) - corrosion	Capital
	Free the roller fairleads	Maintenance requirement; stuck roller fairlead damage mooring lines	Capital
	Install forward wire tie up hook (SVI only)	Standardize tie-up arrangements for S-Class vessels at Tsawwassen berths	Capital

WP 4 – Implement Condition Based Requirements

MSEL	Description	Justification	Cost Type
	Overhaul anchor winches and windlasses and renew hydraulic components and piping	Age compromised reliability	Capital
	Install plumbing for emptying the FO day tank for inspection	Improve effectiveness of tank cleaning for regulatory inspection	Capital
	Provide clean and dirty transfer lines to/from emergency generator	Prevent injury and oil spill in ship interior when transferring oil to the emergency generator on deck 7	Capital
	Install gates forward of the anchors on port side and the car deck	Replaces netting – reduce risk of injury	Capital
	Renew or overhaul pumps as required by survey	Age compromised reliability	Capital
	Renew FO/LO quick closing valves and overhaul operating mechanism	Intermittent failures; ensure reliability	Capital
	Install fall arrest systems	Satisfy fall restraint requirements	Capital
5000 Passenger & Crew Services	Modify and upgrade the washrooms	Customer Service: keep washrooms dry, easy to clean, reduce odour and provide fresh air circulation; improve ventilation and access to fittings for service	Capital
	Renew or repair catering and retail equipment	Deteriorating condition of interior fixtures; Improve customer service and comfort	Capital
	Upgrade and expand satellite TV system and Integrate into the AV system; upgrade passenger information system	Passenger entertainment and information	Capital
	Reconfigure the buffet, buffet galley, main galley, and provision storage	Age compromise functionality; improve service efficiency and reliability	Capital
	Renew the interior of Deck 5 forward, cafeteria and buffet, Deck 6 A Lounge, 6 B Lounge, and SeaWest Lounge to meet the latest fleet interior design standard; Repair the interior of deck 6 forward crew area.	Condition of flooring and seating; implementation of new deck design; improved passenger comfort	Capital
	Maintain elevator interiors	Deteriorating condition of interior fixture	Capital
	Modify and upgrade engineer's change room and mess	Too small; size necessary to accommodate full engineering complement	Capital
	Install loop wire technology in the Deck 5 forward lounge	Passenger comfort and safety; enables passengers with cochlea implant hearing aids to hear PA system clearly	Capital
	Upgrade Digital Signage System	Enhance safety message and marketing advertisement delivery to passenger	Capital
	Upgrade cleaning lockers, reduce sink height	Crew safety/MSI reduction	Capital
	Install bike racks	Fare payer value; insufficient bike racks for cyclists	Capital
	Renew non-skid flooring in stairway landings	Non-skid no longer effective	Capital
	Renew bridge windows and wipers	Visibility impaired by etching; age compromised reliability of wiper system	Capital

WP 4 – Implement Condition Based Requirements

MSEL	Description	Justification	Cost Type
	Modify and update pet area with information system, water and better drainage	Passenger comfort and safety	Capital
7000 Instrumentation & Controls	Renew electronic navigation equipment and standardize console	Standardization to reduce human error	Capital
	Renew condition monitoring and data logging system (Engine Control Room)	Age compromised reliability, obsolete, desupported	Capital
	Renew propulsion controls	Age compromised reliability, obsolete, desupported	Capital
	Renew propulsion safety and protection systems from shafting OEM.	Age compromised reliability, obsolete, desupported	Capital
	Renew power management system	Age compromised reliability, obsolete, desupported	Capital
	Install digital inclinometer on the Main Car Deck	Improve efficiency of loading commercial trucks for optimal trim/heel	Capital
	Install black out curtains and independent lighting at bridge back station	TCMS/SOLAS require an isolated damage control response area on/near bridge	Capital
8000 Communications	Install cabling to support IT wi-fi and IP network requirements	Customer Service: Infrastructure for advanced IT offerings for passengers and crew	Capital
	Renew vessel communication system (GA, PA, internal telephone exchange system, talkback, sound powered telephone)	Age compromised reliability, obsolete, desupported	Capital
	Remove radio transmission internal dead spots	Safety hazard, emergency response risk	Capital
	Renew the customer communication plans onboard	New safety equipment locations	Capital
	Renew way finding and safety signage	New safety equipment locations	Capital
	Upgrade the CCTV	To improve security camera coverage and standardize the BCF security system	Capital
	Maintain existing marketing signage	Maintain advertisement and decoration for customer amenities	Capital
9000 Safety Equipment	Renew fire detection and control system	Age compromised reliability, obsolete, desupported	Capital
	Install fire hose stations in the Aft Void and Shaft Gland Compartment	To control fire risk in referenced compartments	Capital
	Install four (4) 20 meter slide systems and rafts, including structural fire protection and relocating lifejackets to assembly stations	Existing system at end of life	Capital
	Install two (2) rescue boats and two (2) davits	Rescue boats end of life, existing davits non-compatible	Capital
	Renew drencher piping and fire pumps	Age compromised reliability Leak caused by corrosion; poor performance	Capital
	Overhaul funnel closing flap system	Compromised fire safety - corrosion	Capital
	Renew fire station boxes	Equipment reaching end of life and compromising reliability	Capital

WP 4 – Implement Condition Based Requirements

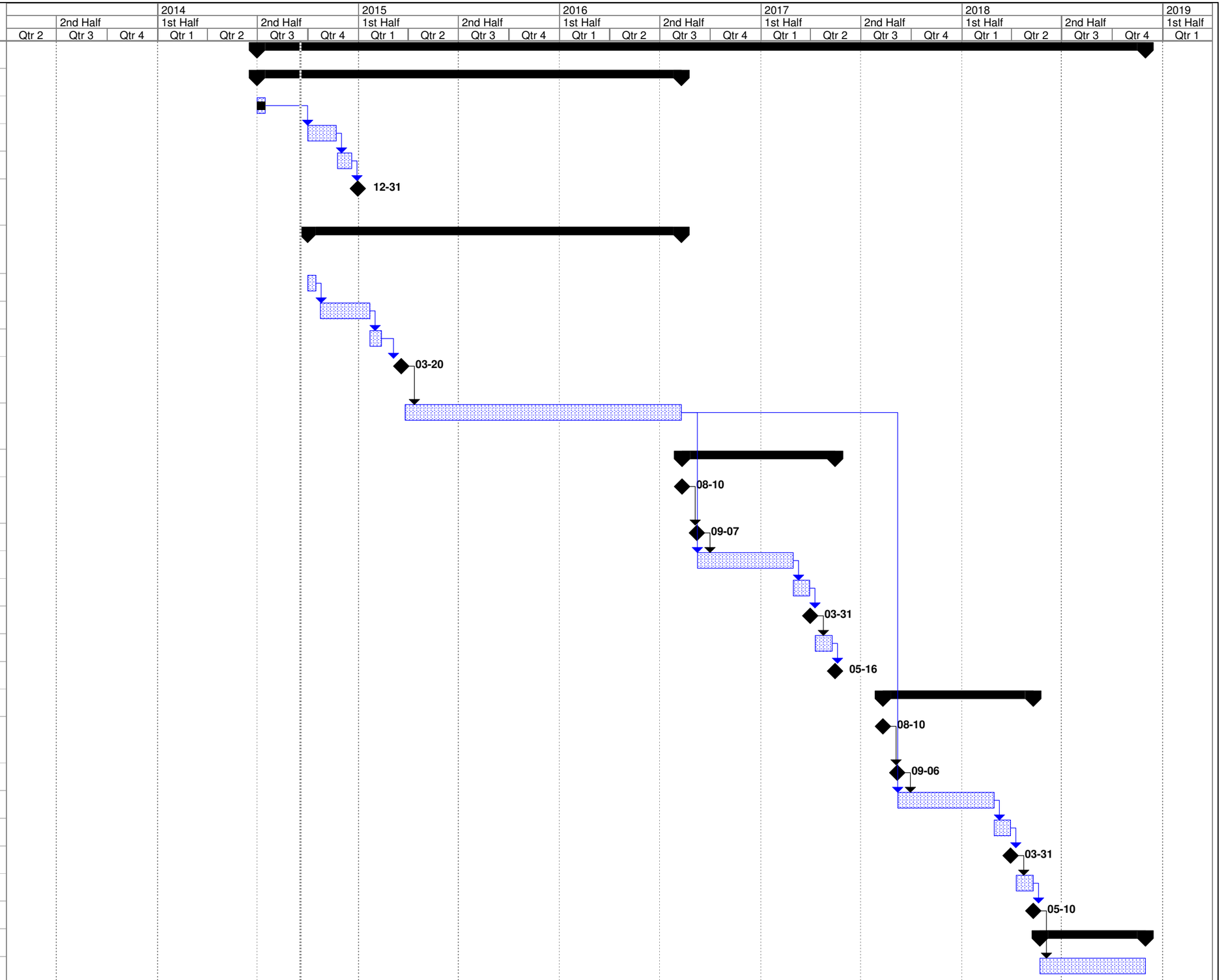
MSEL	Description	Justification	Cost Type
	Install platform at CO2 bottles to manually activate system	Current condition does not comply with the regulatory requirement	Capital
0000 Documentation Project Labour Administration	Vessel afloat berthing	Necessary to allow work	Capital
	Trials and commissioning	To verify safe system operation	Capital
	Crew labour & travel	Labour costs for onsite inspection	Capital
	Project Contingency	Risk mitigation	Capital

Additional Detail: Modernize and Retain Existing Diesel Engines

MSEL	Description	Justification	Cost Type
1000 Hull & Superstructure	None	N/A	N/A
2000 Propulsion	Renew on-engine components (turbochargers, governors, cylinder heads, air coolers, etc.)	Age compromised reliability	Capital
	Renew off-engine components (seawater cooling, high temperature, low temperature and pre-heat pumps and motors)	Age compromised reliability	Capital
	Renew fuel oil booster pumps	Age compromised reliability	Capital
	Install fuel metering system	Existing system unserviceable; improve fuel management	Capital
	Renew starting and control system	Age compromised reliability	Capital
	Renew gearbox components (lube oil pumps and motor, clutches, main engine couplings)	Age compromised reliability	Capital
	Renew engine electronic protection system (RCS51 and SUN System)	Age compromised reliability, obsolete, desupported	Capital
	None	N/A	N/A
3000 Ship Service Systems	None	N/A	N/A
4000 Ancillary Systems	None	N/A	N/A
5000 Passenger & Crew Services	None	N/A	N/A
7000 Instrumentation & Controls	None	N/A	N/A
8000 Communications	None	N/A	N/A
9000 Safety Equipment	None	N/A	N/A
0000 Documentation Project Labour Administration	Vessel afloat berthing	Necessary to allow work	Capital
	Trials and commissioning	To verify safe system operation	Capital
	Crew labour & travel	Labour costs for onsite inspection	Capital
	Project Contingency	Risk mitigation	Capital

Appendix B - Schedule Gantt Chart

ID	Task Name
1	**Spirit Class MLU Schedule**
2	**Dual Fuel Propulsion Package**
3	Propulsion RFEOI Process
4	Propulsion RFPQ Process
5	Propulsion RFP Process
6	Contract Award - Dual Fuel Propulsion Package
7	**Conversion Contractor Procurement Process**
8	RFEOI Process
9	RFPQ Process
10	RFP Process
11	Contract Award - Prime Conversion Contractor
12	Prime Conversion Contractor Engineering and Procurement
13	**Spirit of VI - Implementation**
14	Delivery - Dual Fuel Propulsion Equipment (SOVI)
15	Delivery - Vessel to Prime Contractor
16	Construction - Prime Contractor
17	Commissioning, Testing and Sea Trials
18	Delivery - BCF Home Port
19	BCF Internal Training at Home Port
20	SOVI Returns to Service
21	**Spirit of BC - Implementation**
22	Delivery - Dual Fuel Propulsion Equipment (SOBC)
23	Delivery - Vessel to Prime Contractor
24	Construction - Prime Contractor
25	Commissioning, Testing and Sea Trials
26	Delivery - BCF Home Port
27	BCF Internal Training at Home Port
28	SOBC Returns to Service
29	**Project Closeout**
30	Project Closeout



Appendix C - Client Feedback S Class

Vessel specific customer feedback 2009 – 2014
Spirit Class Vessels

Overview of customer feedback

Fiscal Year	Total comments	Category: On the ship	Vessel specific: Spirit Class
2009/2010	7,511	819	49
2010/2011	10,790	1,074	86
2011/2012	9,005	887	58
2012/2013	8,234	1,043	48
2013/2014	8,801	1,467	57

Spirit Class Vessels

Categories	Details
Passenger areas	➢ Washrooms: cleanliness / malfunction of self flushing device / provide warm water to wash hands / door difficult to open and slams shut / provide small steps for children to wash their hands ➢ Handicapped washroom: cleanliness / malfunction of automatic button to open door from inside ➢ Seating: insufficient during busy sailings ➢ Wi-Fi: slow & unreliable / provide access to streaming media / introduce Wi-Fi and cell phone free or "quiet" area ➢ Elevator: malfunctioning / doors closing on customer / post signs to give preference to elderly and handicapped customers / improve signage during outage ➢ Safety: life vests for infants ➢ Announcements: volume issues / too frequent / improve quality of recorded announcements ➢ Hand sanitizers: insufficient ➢ Children's play area: reserve seating closest to play area for parents / provide family room with baby change table nearby / remove smoking area right outside window to play area ➢ Video game room: too noisy ➢ Light bulbs: use energy efficient kind ➢ Computer/phone plug in stations: insufficient ➢ Debit card: provide connection to accept debit payments ➢ Air-conditioning: temperature uncomfortably low in in passenger lounges ➢ TV: eliminate / turn off volume
Car deck	➢ Pet area: cleanliness / cold / uncomfortable seating / wet floors / post signs to advise pet owners to clean up after their pets / announcement volume issues / no access to facilities / provide supplies such as dog bags, paper towels, hand sanitizer / provide dog kennels / allow small pets in carrier case in certain passenger areas / move pet area to passenger area / overcrowded / too noisy on the car deck ➢ Bike racks: insufficient / provide stabilizing straps ➢ Fire compression system: leaking onto parked vehicles ➢ Electric vehicle charging stations: growing demand ➢ Signs: add sign to disable car alarms
Outer decks	➢ Smoking area: cleanliness / limit to one side of the vessel / issue complete smoking ban

Appendix D – Vessel Utilization Report

Average of Vehicle Utilized Capacity (%)

Route 1 - Swartz Bay to Tsawwassen

Season	Departure Terminal	Day	07:00	*08:00*	09:00	*10:00*	11:00	*12:00*	13:00	*14:00*	15:00	*16:00*	17:00	*18:00*	19:00	*20:00*	21:00	*22:00*
Peak	Swartz Bay	Sun	57.6%	45.2%	69.5%	78.9%	78.8%	74.4%	82.6%	88.1%	89.3%	86.8%	90.1%	97.4%	91.4%	81.7%	64.1%	31.6%
		Mon	80.8%	62.7%	78.4%	82.7%	84.0%	72.8%	78.4%	75.3%	68.8%	67.9%	79.2%	75.5%	70.4%	79.1%	52.7%	5.9%
		Tue	84.5%	55.9%	70.4%	70.6%	73.4%	59.0%	66.2%	68.1%	61.0%	53.9%	68.7%	74.0%	66.8%		48.7%	71.7%
		Wed	86.0%	56.9%	76.8%	69.2%	69.2%	63.2%	63.7%	72.2%	61.3%	62.2%	74.4%	71.4%	62.0%		49.1%	
		Thu	87.7%	68.1%	78.9%	75.2%	77.0%	67.4%	76.8%	80.8%	73.6%	72.8%	88.1%	88.8%	76.1%	63.6%	54.9%	7.0%
		Fri	86.3%	63.7%	83.0%	84.5%	82.3%	77.9%	87.3%	89.0%	83.4%	80.7%	88.0%	91.0%	80.2%	39.3%	28.3%	9.9%
		Sat	75.4%	63.3%	89.4%	85.4%	79.6%	61.4%	65.6%	60.4%	52.5%	51.3%	69.1%	62.7%	70.7%	53.1%	52.5%	
	Tsawwassen	Sun	35.8%	55.4%	76.1%	72.5%	73.5%	89.7%	86.3%	82.3%	87.0%	90.4%	88.1%	82.0%	81.8%	85.5%	72.3%	33.9%
		Mon	66.7%	54.8%	72.8%	75.8%	80.9%	86.4%	78.0%	74.5%	81.6%	85.0%	82.2%	71.1%	72.9%	77.8%	64.8%	9.2%
		Tue	81.9%	67.1%	74.1%	74.0%	76.9%	86.2%	73.6%	65.4%	70.1%	81.8%	68.1%	57.3%	49.3%	78.8%	51.4%	
		Wed	77.3%	61.3%	71.3%	72.2%	70.9%	78.7%	69.5%	63.1%	65.6%	81.2%	62.7%	56.2%	51.7%		54.6%	
		Thu	75.5%	61.9%	77.3%	79.6%	77.5%	82.5%	78.9%	77.4%	77.1%	88.7%	79.0%	71.3%	67.7%	90.3%	64.7%	37.5%
		Fri	74.1%	65.3%	71.2%	83.5%	88.7%	88.2%	87.9%	84.1%	90.6%	91.7%	90.6%	88.8%	83.6%	98.2%	66.0%	13.6%
		Sat	69.2%	82.2%	85.3%	86.9%	92.4%	92.3%	84.4%	72.4%	69.3%	84.0%	72.3%	62.7%	51.5%	27.0%	52.8%	

Italized sailing time reflects supplementary service

Season	Departure Terminal	Day	07:00	*08:00*	09:00	*10:00*	11:00	*12:00*	13:00	*14:00*	15:00	*16:00*	17:00	*18:00*	19:00	*20:00*	21:00	*22:00*
Off Peak	Swartz Bay	Sun	45.4%	41.9%	70.7%	74.3%	81.5%	52.0%	75.2%	79.5%	87.8%	69.1%	77.7%	82.2%	76.4%	90.2%	43.3%	
		Mon	77.8%	54.8%	78.6%	72.3%	81.1%	73.9%	78.8%	69.9%	73.7%	74.4%	74.2%	81.7%	56.8%	94.7%	25.4%	
		Tue	78.5%	48.5%	71.8%	64.9%	74.0%	48.8%	73.2%	60.9%	76.5%	45.2%	77.8%	50.4%	61.3%		24.6%	
		Wed	80.7%	37.7%	73.2%	66.4%	73.6%	54.2%	75.2%	96.3%	81.5%	66.6%	83.1%	61.5%	64.8%		26.6%	
		Thu	81.8%	43.4%	78.2%	81.2%	80.8%	61.1%	76.6%	78.2%	82.4%	59.0%	82.5%	69.1%	76.8%		36.5%	7.2%
		Fri	80.2%	54.5%	84.6%	79.6%	84.2%	67.7%	81.0%	74.4%	79.5%	71.9%	78.7%	71.7%	65.8%	72.1%	29.3%	4.3%
		Sat	74.1%	45.0%	85.1%	71.1%	82.9%	66.2%	74.1%	43.8%	70.5%	40.3%	72.3%	38.7%	60.9%		28.5%	
	Tsawwassen	Sun	25.4%		62.9%	67.5%	75.0%	70.9%	80.4%	64.7%	80.5%	87.1%	88.1%	77.4%	69.7%		59.7%	66.1%
		Mon	73.6%	23.8%	69.3%	59.3%	79.0%	79.7%	80.3%	77.7%	79.0%	82.5%	83.0%	78.4%	68.8%		45.2%	9.9%
		Tue	77.7%	46.2%	72.9%	58.9%	69.0%	67.7%	77.9%	48.7%	75.8%	65.5%	80.1%	58.0%	66.9%		37.0%	
		Wed	79.1%	39.6%	69.9%	55.2%	67.3%	93.0%	75.9%	65.3%	75.9%	73.2%	83.2%	54.2%	70.3%		40.4%	
		Thu	75.4%	38.2%	72.1%	55.5%	73.8%	82.1%	80.6%	64.6%	76.5%	80.6%	82.6%	66.0%	66.0%	88.1%	49.4%	
		Fri	69.3%	64.7%	69.6%	73.3%	81.7%	76.0%	80.1%	70.3%	76.0%	82.6%	82.0%	81.0%	63.7%	90.0%	50.3%	4.9%
		Sat	53.3%	76.3%	87.0%	73.6%	79.2%	89.4%	81.4%	68.5%	73.1%	72.4%	83.1%	51.2%	70.8%		38.8%	

Average of Passenger Utilized Capacity (%)

Route 1 - Swartz Bay to Tsawwassen

Season	Departure Terminal	Day	07:00	*08:00*	09:00	*10:00*	11:00	*12:00*	13:00	*14:00*	15:00	*16:00*	17:00	*18:00*	19:00	*20:00*	21:00	*22:00*
Peak	Swartz Bay	Sun	29.9%	30.5%	44.8%	51.6%	50.4%	52.2%	53.7%	61.7%	62.9%	75.4%	77.1%	79.5%	78.5%	61.9%	42.8%	18.8%
		Mon	30.1%	36.9%	44.3%	47.0%	46.9%	45.9%	44.3%	45.9%	43.6%	56.6%	62.1%	57.8%	55.3%	61.1%	34.5%	3.8%
		Tue	30.1%	29.8%	37.2%	39.5%	38.5%	31.6%	33.4%	33.6%	32.2%	43.3%	48.3%	56.7%	49.2%		31.5%	42.1%
		Wed	30.0%	31.7%	46.3%	38.5%	39.2%	33.2%	31.3%	34.6%	32.9%	43.1%	52.2%	48.3%	44.6%		29.6%	
		Thu	30.5%	38.7%	41.6%	40.8%	40.3%	36.9%	38.7%	40.3%	37.9%	53.1%	61.6%	61.1%	60.0%	61.8%	32.2%	7.1%
		Fri	34.3%	37.0%	52.8%	51.4%	45.6%	46.0%	48.3%	48.0%	47.0%	60.6%	65.6%	63.2%	61.8%	28.5%	17.4%	6.6%
		Sat	39.5%	44.8%	68.8%	58.8%	53.4%	41.4%	41.8%	38.1%	35.9%	47.2%	64.2%	54.3%	77.2%	37.0%	43.7%	
	Tsawwassen	Sun	21.2%	48.2%	72.6%	67.4%	52.9%	63.3%	57.0%	57.8%	54.0%	59.7%	55.2%	58.5%	53.5%	52.4%	42.6%	18.5%
		Mon	22.3%	37.4%	65.8%	67.5%	51.4%	56.9%	44.3%	49.9%	45.8%	48.3%	43.9%	44.0%	37.6%	49.0%	31.7%	5.8%
		Tue	23.4%	44.2%	67.5%	64.9%	49.3%	51.8%	40.4%	35.1%	35.3%	41.7%	33.0%	33.2%	25.2%	42.0%	22.3%	
		Wed	21.5%	38.8%	62.8%	63.0%	46.6%	45.6%	37.7%	35.6%	33.1%	40.3%	31.8%	30.7%	27.3%		24.3%	
		Thu	22.6%	37.6%	69.3%	69.5%	49.4%	46.4%	39.7%	41.7%	37.4%	43.5%	38.5%	40.7%	35.2%	42.4%	27.7%	18.7%
		Fri	23.1%	46.5%	58.1%	70.3%	54.4%	53.5%	47.9%	52.4%	54.6%	54.1%	52.9%	61.9%	51.5%	55.0%	32.1%	8.8%
		Sat	38.4%	73.0%	97.1%	94.4%	81.7%	66.5%	59.1%	48.3%	45.8%	49.1%	46.7%	40.9%	35.6%	17.4%	34.9%	

Italized sailing time reflects supplementary service

Season	Departure Terminal	Day	07:00	*08:00*	09:00	*10:00*	11:00	*12:00*	13:00	*14:00*	15:00	*16:00*	17:00	*18:00*	19:00	*20:00*	21:00	*22:00*
Off Peak	Swartz Bay	Sun	22.6%	24.9%	47.2%	49.3%	52.2%	30.6%	52.0%	52.3%	66.6%	46.8%	61.5%	57.6%	59.6%	56.8%	26.1%	
		Mon	28.1%	26.2%	40.8%	43.9%	42.0%	39.9%	39.2%	52.1%	39.4%	55.0%	45.1%	63.1%	33.7%	58.7%	12.1%	
		Tue	26.9%	20.5%	32.8%	30.5%	33.7%	19.9%	31.2%	27.0%	33.7%	26.8%	40.6%	33.5%	30.4%		9.7%	
		Wed	27.4%	19.8%	36.2%	40.3%	35.7%	25.7%	30.7%	64.3%	35.2%	40.5%	45.5%	43.7%	32.1%		10.3%	
		Thu	29.5%	21.4%	37.9%	49.0%	38.8%	25.8%	33.7%	37.3%	38.3%	31.3%	49.1%	42.9%	42.3%		15.3%	4.7%
		Fri	33.1%	28.8%	49.8%	48.2%	46.1%	29.7%	43.4%	35.3%	47.3%	39.0%	60.0%	46.8%	45.8%	37.6%	15.1%	2.9%
		Sat	38.9%	29.4%	64.5%	44.0%	57.9%	38.7%	44.8%	27.4%	45.9%	27.9%	53.9%	25.9%	49.5%		21.1%	
	Tsawwassen	Sun	13.8%		51.7%	57.3%	53.6%	42.2%	54.6%	37.8%	55.8%	53.0%	65.8%	45.4%	49.3%		34.4%	28.7%
		Mon	21.5%	18.0%	42.9%	44.5%	43.9%	50.5%	41.7%	42.9%	41.3%	52.2%	41.7%	44.7%	32.6%		18.3%	6.5%
		Tue	20.1%	30.0%	42.0%	43.2%	35.9%	34.1%	35.7%	22.2%	33.2%	27.2%	34.7%	25.3%	27.2%		13.3%	
		Wed	20.4%	21.8%	43.3%	44.1%	36.5%	63.0%	35.1%	32.4%	33.9%	47.0%	38.2%	28.3%	28.9%		14.8%	
		Thu	20.9%	22.0%	44.6%	40.7%	38.8%	43.9%	37.6%	31.2%	36.4%	38.5%	41.4%	30.6%	31.4%	51.7%	19.0%	
		Fri	21.0%	41.8%	45.7%	57.2%	47.8%	39.7%	43.9%	37.2%	45.1%	44.3%	52.7%	45.4%	41.7%	59.9%	25.2%	1.2%
		Sat	24.5%	52.3%	77.0%	64.7%	60.1%	60.7%	55.0%	41.7%	46.8%	43.1%	53.0%	32.5%	45.9%		25.1%	

Appendix E – Drawings

1) Sun Deck 6 – Proposed General Arrangement

2) Passenger Deck 5 – Proposed General Arrangement

3) *Spirit of British Columbia* – Existing General Arrangement of Vessel

4) *Spirit of Vancouver Island* – Existing General Arrangement of Vessel

Redacted

SUN .... DECK 6

Redacted

PASSENGER .... DECK 5

Redacted

GENERAL NOTES

THIS DRAWING PREVIOUSLY CALLED SBC-003 REV. 1 DATED 31 MAY 2023

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	DATE
A	ISSUED FOR REVIEW	BK	13 DEC 2023

REVISIONS

DRAWING NO.
SBC 001

DRAWN: DN
CHECKED:
APPROVED:
REVIEWED:

SCALE: 1:200 @ 24" x 36"

SPIRIT OF BRITISH COLUMBIA
GENERAL ARRANGEMENT

BCFerries
British Columbia Ferry Services Inc.

Redacted

GENERAL NOTES

THIS DRAWING PREVIOUSLY NUMBERED SVI-003 REV. 2 DATED 27 APR, 2006

REFERENCE DRAWINGS

No.	DESCRIPTION	BY	DATE
0	NEW DRAWING	G.B.	05 FEB, 2016

REVISIONS

DRAWING NO.
SVI 001

APPROVED	DATE	
APPROVED	DATE	ISM
APPROVED	DATE	REVISION NO. 1 / 1 / 0
CHECKED	DATE	SCALE
DRAWN	DATE	1:200
G.B.	05 FEB, 2016	

SPIRIT OF VANCOUVER ISLAND
GENERAL ARRANGEMENT

BCFerries
British Columbia Ferry Services Inc.

Appendix F - Responses to Section 55 Application Guidelines Questions

	Section 55 Application Guidelines Questions	Reference in Application
	Project Description	
a.	Describe the proposal for the capital expenditure and provide a comparison to the capital currently in use, in terms, for example, of size, capacity and staff and/or crew requirements.	See sections 2 and 3.
b.	In the case of a new vessel, has an independent marine surveyor provided a condition assessment of the current vessel and is that assessment factored into the business case supporting the requested capital expenditure?	Although not a new vessel application, see section 2.4 and Supplemental Information.
c.	Is there a regulatory driver for the proposed capital expenditure?	See sections 2, 3.2 and 4.2.
d.	Provide information on the operating costs of the vessel, terminal, information technology or other capital asset to be replaced and/or to be upgraded, covering the most recent three year period, including the current year.	See Supplemental Information.
e.	Compare the annual maintenance costs of the existing capital asset with those expected for the replacement and explain any significant variances.	See section 3.2
f.	Have there been service disruptions due to inadequacy of the existing capital asset?	No, other than typical system malfunctions from time to time. See section 2.5.
g.	If age of the existing capital asset is a factor, what is the estimate of future costs of continuing its use?	See section 3.2.
h.	Have there been complaints from the public, or other stakeholders about the existing capital asset?	See Appendix C.
i.	Provide an estimate of the total capital costs associated with the proposed investment.	See section 3 and Supplemental Information.
j.	How was the cost estimate derived? Entirely with BC Ferries' staff or was there an external review?	Cost estimates were derived from external reports and internal BC Ferries estimating resources. For external reports see Supplemental Information.
k.	In the case of a new vessel was the international ship broking industry contacted to determine if there are existing vessels available for purchase that may, with adaptation, be appropriate?	Although not a new vessel application, this issue is considered in section 3.5.
l.	Provide an estimate of the incremental capital costs to provide "ancillary services," including catering and retail concessions, and provide estimates of the incremental operating costs to provide the ancillary services and the incremental revenue expected to be generated from those services.	See section 3.2.

m.	In the case of a new vessel, demonstrate on a lifecycle cost or present value basis that the decision to build a new vessel versus the cost of acquiring a second-hand vessel, if applicable, is a net benefit. Include sensitivity analysis in case of cost overruns.	Although not a new vessel application, this has been addressed. See section 3.5.
n.	Does the proposal include significant features that are innovative or untried?	The project proposes to convert the S class to DF LNG/diesel engines. The conversion process itself and the proposed bunkering methodology are innovative in an incremental sense in that they build on earlier innovations.
o.	Is there an allowance in the estimate for inflation from the date of acceptance of a proposal to the completion date (escalation clause)?	No.
p.	Are financing costs included in the cost estimate between first payment to the supplier and the in-service date?	Yes.
q.	Compare the operating costs of the existing capital asset with those expected for the replacement, to include, in the case of vessels, fuel costs, crew costs and depreciation.	See Supplemental Information.
r.	Does BC Ferries intend to capitalize any of its own internal costs with respect to the capital expenditure?	Yes, in accordance with BC Ferries' financial policies and International Financial Reporting Standards.
s.	Identify any parts of the capital expenditure that are to be provided by BC Ferries or its subsidiaries.	Project management responsibilities will rest with BC Ferries.
t.	In the case of vessels, if tenders are to be sought from foreign shipbuilders, what is the applicability of custom tariffs on importation of the vessels?	Not applicable.
u.	In the case of vessels, will BC Ferries require the contracting shipyard to bear the design and construction risk?	Yes. See section 4.
Timing and In-service Date		
a.	For new or replacement vessels what is the expected in-service or deployment date and how was it derived?	See sections 2 and 3.
b.	Were potential builders, for example shipyards, contacted to determine if the proposed date is reasonable?	Yes, several local and international yard find the lead times and duration realistic.
c.	What are the consequences of a delay in the in-service or deployment date?	See section 2.7

Does the Proposed Capital Expenditure Demonstrate Good Judgment, Based on Wisdom, Experience and Good Sense?		
i.	Why is the proposed capital expenditure required now, and what are the consequences of any delay?	See sections 2 and 3.
ii.	How has this capital expenditure project been prioritized relative to other capital expenditure projects within the long term capital plan?	Yes. This project is of a high priority based on the condition of the assets and the objective of reducing operating costs to lessen the pressure on fares. It has been included in BC Ferries' capital plans for more than 5 years. It is also a planned maintenance event in the Fleet Maintenance Strategy. See section 2.
iii.	What sources of expertise and experience have been relied upon in deciding to proceed with this capital expenditure?	Multiple external experts have been used. See Supplemental Information.
iv.	Provide detail on completed and/or planned consultations, in particular with the provincial government or other stakeholders.	As this is a renovation to existing assets, no external consultations have been done.
v.	In the case of new vessels, has BC Ferries considered any alternative to building and owning the new vessels?	Not applicable.
vi.	Will a new or replacement vessel require any modifications to any terminals? If so, at what additional cost?	No. See sections 3.1 and 3.2.
vii	What are the procurement cost risks and how will they be mitigated?	See section 4.
viii	What are the consequences or the alternatives if the application is rejected?	Section 3 sets out the preferred options in this Application and the consequences of their not being undertaken. At minimum, WP 1 will need to be undertaken to enable the Company to maintain regulatory compliance of the vessels.
Wise Use of Resources		
i.	Can an existing vessel be reassigned instead?	BC Ferries has no spare vessels which meets CFSC service level requirements.
ii.	For shorter routes, were non-vessel options considered, such as a fixed link?	Not applicable.
iii.	Were non-vehicle vessels (e.g. passenger only ferries, barges, other) or a mix of vessel types considered?	As this is a renovation of existing vessels, these options were not considered.
iv.	Has a used vessel option been considered?	See section 3.5.
v.	How does the vessel align with the concept of standardization of the fleet?	See section 2.
vi.	Would investments in technology, such as an expanded reservation system, better IT systems or a yield management program allow for a smaller sized vessel?	See section 2 and CFSC service level requirements.

Showing Due Consideration for the Future		
i.	How does the proposed new vessel contribute to overall fleet flexibility?	See section 2.
ii.	What new technologies or innovations will be incorporated, and why are they considered necessary?	See section 3.2.
iii.	Will there be provision for a conversion to an alternative to marine diesel engines, such as LNG?	Yes.
iv.	Is dual fuel capability planned and if so provide the rationale?	Yes. See section 3.2.
v.	Will the new or replacement vessel be appropriate if the ratio of vehicle to foot passenger traffic changes in future?	Not applicable.
vi.	Is vessel capacity sufficient to meet current and projected future demand?	The S class is considered sufficient to meet current and projected future demand.
vii.	What is the estimated impact of the proposed capital expenditure on future price caps assuming no change in non-passenger related revenues?	See section 3.7.
Not Excessive		
i.	What passenger amenities will be provided, and why are they considered appropriate for the intended use of this vessel?	See section 3.2.
ii.	Do any of the proposed passenger amenities require crewing levels to be higher than what is required by Transport Canada regulations?	See sections 2.7 and 3.2.
iii.	Is the vessel the right size and how has the capacity requirement been determined?	The vessel capacity is not changing and experience shows it is appropriate for the intended service.
iv.	Describe the objectives of BC Ferries' design standards for passenger accommodations for vessels of similar size and scope. Will the passenger accommodations for the replacement vessel deviate from these standards? If so, what is the rationale for the deviation and what impact, if any, will it have on the capital and operating costs of the vessel?	See section 3.2.
v.	Will the application of logos or other BC Ferries' brand images to the vessel be consistent with BC Ferries' current practice for similar vessels? If not, how will it differ and what will be the effect on capital costs?	See section 3.2.
vi.	What would have to be sacrificed to reduce total costs by 10%, and by 20%?	See section 3.8.
vii.	Does vessel design or expected operating speed have any impact on labour costs?	See section 2.
viii.	Are engines sized for efficient operations, fuel consumption and ability to recover schedule?	Yes. See section 3.2.

Demonstrating Good Value at a Fair, Moderate Price		
i.	For new vessels what alternatives were considered? Provide the rationale (cost or otherwise) for why the alternatives were not accepted.	Although not a new vessel application, see section 3.5.
ii.	Has the business case been built on a full life cycle costing basis?	Yes, see section 3.
iii.	How fuel efficient will the new vessels(s) be?	See section 3.2.
iv.	Will the new or replacement vessel have any impact on efficient use of labour?	See section 2.7 and 3.2.
v.	Are the operating costs reasonable?	Yes. See Supplemental Information.
vi.	How do the operating costs compare with the vessel being replaced?	Operating costs are significantly reduced compared with those pre-MLU. See section 3 and Supplemental Information.
vii.	Is there any expected impact on revenue?	Yes. See section 3.2.
viii.	Will crew training and certification activities be in excess of that required to meet regulatory requirements? If so, explain the rationale for this approach and whether it will result in incremental operating costs.	Yes, to the extent that crew will be trained to the Standardized Education and Assessment (SEA) Training Programs standard at BC Ferries. These requirements exceed the minimal regulatory standard and are considered essential to maintain the Company's high standard of safe operation.
Coastal Ferry Services Contract		
i.	Is the proposed capital expenditure consistent with the current Coastal Ferry Services Contract?	Yes. The vessels enable BC Ferries to meet the service level requirements for Route 1 as set out in the CFSC.
Long Term Vision for Coastal Ferry Services in British Columbia		
i.	How does the proposed expenditure support the government approved long term vision for the future of coastal ferry services?	The vessels were purpose built for service on Route 1. BC Ferries is unaware of any contemplation by government of a long term vision for coastal ferry services that would see the cancellation of or significant changes to Route 1 service.